AUTOTRANSFORMERS OF ALL TYPES

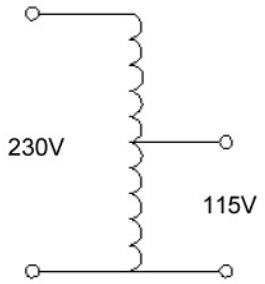
GENERAL INFORMATION

Voltage and frequency (Hz) vary throughout the world, and, in some cases, within the same country. Most appliances are made to operate on a single voltage and frequency.

When using electrical appliances/equipment designed for a specific voltage, it is necessary to adjust the local voltage to the voltage for which the equipment was designed. This is done with a transformer.

For the purpose of this article, all types of appliances, tools, equipment, machinery, etc. shall be referred to as the *load*.

An autotransformer is a tapped winding transformer that changes the voltage available locally to the voltage required by a particular load. Thus, a load may operate anywhere around the world, as long as a transformer is available to convert the local voltage to the voltage it requires.



An autotransformer, with a single tapped winding (diagrammed above), is generally preferred to an isolation transformer, with 2 separate windings, for many reasons. An autotransformer is much smaller and lighter than an isolation transformer. It also has better voltage stability and greater overload tolerance. Autotransformers perform in much the same way as the transformer that the electric company uses to bring electricity to a building.

No transformer of any type can change frequency. Frequency is unimportant to the normal operation of most loads: most motor driven loads will simply run at a slightly different speed than they did at their rated frequency; simple heating equipment (broilers, coffee pots, etc.) will operate with no problem at all. However, motor loads whose proper operation depends upon frequency, such as clocks, turntables, timers, cassette players, etc. must be converted for voltage with a transformer and then also have their gears and/or pulleys changed for speed correction.

Some motor loads are heat sensitive to frequency changes. To avoid overheating sensitive motors, such as those that *continuously* stop and start, or run non-stop -- refrigerators, air conditioners, washing machines, shop equipment, etc., it is good practice to run 60 Hz motors at 10% less voltage when operated on 50Hz (e.g. 115 V 60 Hz equipment should operate at 100 - 105 V at 50 Hz). Conversely, to obtain full power from a 50 Hz motor operated on 60 Hz, it is necessary to supply it with 10% extra voltage (e.g. 220 V at 50 Hz should be operated at 250 - 260 V at 60 Hz).

HOW TO CHOOSE A TRANSFORMER

Transformer capacity is rated in Volt-Amps (VA) which is generally the same as wattage (Watts). Most loads are *labeled* with their proper operational voltage (Volts), current (Amps), frequency (Hz), and wattage (Watts or VA).

To compute a load's VA requirements, multiply its rated voltage (Volts) by its rated current (Amps). This information is usually found on the back of the load — on its nameplate. If you cannot locate the labeled voltage and current (to calculate the VA), use the wattage (Watts), if shown. Exceptions are fluorescent lights, neon signs, gas discharge lamps, specialized electronic controls, etc which require a transformer with a VA capacity 1.5 times the wattage rating, if the volts and amps are not shown. Select a transformer with a VA rating *equal to* or *larger than* the VA found on the nameplate of the load. **USING A TRANSFORMER WITH A SMALLER VA CAPACITY THAN THAT REQUIRED BY THE LOAD WILL CAUSE THE TRANSFORMER TO OVERHEAT AND EVENTUALLY BURN OUT, *UNLESS A TEMP-GUARD MODEL IS USED.***

YOU CAN ALWAYS USE A TRANSFORMER WITH A *LARGER* VA RATING THAN THE LOAD REQUIRES.

Example #1

You wish to use a 120 V 60 Hz electric drill on 230 V 50 Hz. The nameplate reads:

INPUT: 120V 50/60Hz 2.4 A

This means that the required operating voltage is 120 Volts, with a current of 2.4 Amps. Thus, the load is found to be 288 VA, so a 300 VA transformer (SD-43) should be used. The frequency will only slightly affect the drill speed.

Example #2

It is desired to operate several different 120 V appliances *one at a time* on 230 V...

Computer Printer	120 V — 0.9 A = 108 VA
Vacuum Cleaner	120 V — 11.9 A = 1428 VA
Sewing Machine	120 V — 1.2 A = 144 VA

Since they will be used *one at a time*, choose a 1500 VA transformer (SD-14) that will be sufficient for the largest item, the vacuum cleaner. Of course, the other 2 loads, the sewing machine and printer, may be operated at other times, singly, or even at the same time since their total VA is only 252.

Example #3

It is necessary to operate several appliances at the *same time*...

Microwave Oven	120 V — 6.25 A = 750 VA
Electric Fan	120 V — 1.2 A = 144 VA
CD Player	120 V — 0.7 A = 84 VA

Total load = 978 VA

Choose a transformer of 1000 VA capacity (SD-13, which is closest to, but not smaller than, the total VA of all appliances used). This will supply all of the above loads all at once or one at a time if you so choose.

GROUNDED VS UNGROUNDED

If the load has a third pin ground (washing machine, microwave, etc.), use a transformer with a grounding power cord and receptacle. If the load has only 2 prongs and no grounding pin (lamp, toaster, blender, charger, etc.), choose a less expensive transformer with a 2 pin format and no grounding pin. To accommodate both grounded or ungrounded plugs, choose a transformer with a third pin ground which is usable for *both* types. TODD SYSTEMS manufactures many transformers with different styles of mounting and electrical connectors (ungrounded, grounded, wiring leads, junction boxes for permanent wiring, etc.). Choose a transformer with the most convenient style as well as sufficient VA rating.