

## Using AC Sources for Compliance Testing

*Associated Power Technologies, Inc.*

### Introduction

Due to international safety agency standards, electrical safety tests are an essential part of the design and manufacturing process if a company wishes to sell products into the EU or affix a safety agency mark to their products for sale domestically. Dielectric withstand (hipot) testers are perhaps the most commonly used instruments, as international safety agency specifications usually call for a hipot test to be performed as a 100% production line test. Other instruments are used to perform tests including the Ground Bond test, the Insulation Resistance test, and the Line Leakage test. While most if not all manufacturers perform these types of tests on the products they manufacture, many mistakenly forego the purchase of an AC power source and rely on utility power or an inexpensive variable transformer to power their products during compliance testing. Failure to use an AC power source can oftentimes result in an improper test setup or worse, noncompliance. In fact, in order to comply with many international standards that call for a Line Leakage test or a functional run test, an AC power source must be used during testing.

### Shortcomings of Traditional Power Alternatives

Traditional power alternatives such as utility power and variable transformers have several shortcomings that make them less than ideal for compliance testing. Perhaps the most obvious is that utility power output is fixed and unregulated. Therefore manufacturers that rely on utility power for compliance testing are not accurately following testing procedures. As we will discuss below, most standards call for products to be tested at 110% nominal line voltage. With no way to adjust the output voltage of utility power, manufacturers cannot comply with this specification. Further, many international standards call for testing to be performed at the nominal operating frequency of the product. In the case of the EU, this is 50 hertz. A

manufacturer in the US cannot simulate this output specification simply by plugging their product into a standard 60 hertz wall outlet and therefore cannot meet the test specification.

A common alternative to utility power is to use a simple variable transformer to step up the voltage to 110% of the nominal condition. While a variable transformer will perform this function adequately the operator usually has no way to accurately monitor the exact output voltage and current without additional metering equipment. Relying on additional equipment can be tedious, expensive, and further complicate the test setup while leaving more room for operator error. A variable transformer also fails to meet the 50 hertz specification that many standards call for, effectively prohibiting manufacturers from testing their products for shipment overseas to the EU.

### Real World Examples

Most electrical safety testing standards call for verification of the DUT's insulation and the continuity of the ground circuit in order for the product to receive a safety agency listing or the CE mark of conformity. Yet there are a variety of standards that call out for a functional test or a Line Leakage test in order to determine if the product is operating within nominal limits. The following examples are taken from a variety of industry specifications:

#### IEC 60065 Audio, Video and Similar Electronic Apparatus

4.2.1 The apparatus, except battery-operated apparatus, is connected to a supply voltage of 0,9 times or 1,1 times of any RATED SUPPLY VOLTAGE for which the apparatus is designed.

Section 4.2.1 of the above standard calls for the DUT to be powered up to 110% of nominal line voltage during testing. For customers that have limited AC power source requirements and whose products require no more than 500VA, the APT model 105 VariPLUS is the perfect choice

(Figure 1). The VariPLUS is a no frills alternative to a variable transformer and can output voltages at 110% of nominal operating voltage at either 50 or 60 hertz.



Figure 1: APT Model 105 VariPLUS Power Converter

### UL 508 Industrial Control Equipment

*44.1 An assembly using one or more electromagnetic switching components shall withstand 110 percent of the rated voltage without damage to the operating coil that prevents full closure of the switched contacts and shall operate at 80 percent of its rated voltage when for use on direct current or 85 percent of its rated voltage when for use on alternating current.*

As can be seen in the section 44.1 of UL 508, the DUT must be subjected to a voltage of 110% of the nominal input voltage as well as 85% of the nominal voltage in order to comply with the standard. In this specific case both utility power and a variable transformer fail to accurately meet the requirement. An AC power source on the other hand can easily be configured to operate at both 110% and 85% of the DUT's nominal input voltage, while accurately providing important information such as output voltage, current and power readings. The APT 5000 series

of manual AC power sources (Figure 2) provides a simple interface that allows manufacturers to easily comply with international testing standards. For test operators that are just getting started with compliance testing, or are more budget-conscious, this line of AC power sources provides all the features necessary for safe and efficient testing at an affordable price point.

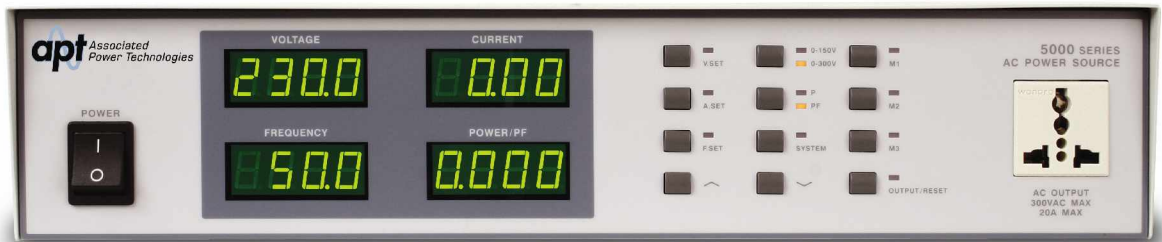


Figure 2: APT Model 5005 Manual AC Power Source

### UL 8750 Light Emitting Diode (LED) Equipment for Use in Lighting Products

8.1.2 All electrical measurements, unless otherwise specified, are to be conducted:

- a) In a draft-free room,
- b) At an ambient temperature of  $25 \pm 5^{\circ}\text{C}$  ( $77 \pm 9^{\circ}\text{F}$ ) unless a higher ambient temperature is specified by the manufacturer, and
- c) With the unit connected to a supply source of nominal frequency that is adjusted to within 5percent of the marked rated voltage.

Note in section 8.1.2(c) above that the specification calls for the DUT to be operated at the nominal frequency at 5% of the rated voltage. Oftentimes variable transformers don't include a voltage meter accurate enough to confirm whether or not this specification is being met. Utility power also fails to satisfy this requirement if the product is to be sold in the EU. Further, neither

of these alternatives carry a CE mark (which is often required on all test equipment used for testing products to be sold in the EU). For customers that are looking to satisfy these types of specifications, but have a more advanced automated test area, either the APT 6000 and 7000 (CE) series of programmable AC power sources (6000 Series shown in Figure 3 below) is the ideal choice. These automated sources will satisfy even the most demanding compliance testing applications and can be controlled with a PC via a variety of communications interfaces such as USB, Ethernet and GPIB.

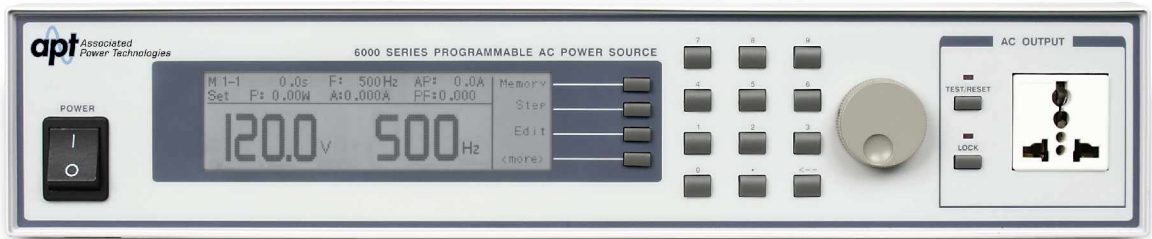


Figure 3: APT 6005 Programmable AC Power Source

### Exclusive APT Benefits for Compliance Testing

APT's line of AC power sources is ideal for satisfying a wide variety of compliance testing applications. Perhaps one of the most beneficial features of APT power sources is their compatibility with Associated Research, Inc. electrical safety testing equipment. When used in tandem, APT AC power sources along with Associated Research electrical safety testers can provide an efficient, no-hassle test system that fully complies with most international compliance testing standards while reducing test setup complexity and increasing productivity. Several APT models (including the LS, 6000, 7000 and 300XAC series) will function in a dedicated master/slave relationship with Associated Research electrical safety testers to provide the necessary DUT power during hipot testing, Line Leakage testing, and functional Run testing.

## Conclusion

While electrical safety testing equipment is quite common in the production area, many manufacturers fail to realize the benefits that an AC power source can provide to them during compliance testing. Not only will using an AC power source increase productivity and save bench space by eliminating the need for other equipment, but also ensure that the production facilities test setup and methodology are compliant with international standards. While shortcuts in test systems setups may be appealing, the cost of an audit or accidental customer injury are far worse than the short-term benefit gained by using traditional power alternatives like a variable transformer or utility power. For these reasons, an AC power source is a welcome addition to any electrical product manufacturer's production area.