



Technical Note TN-003

Glossary of AC Power Conversion Terms

Ambient Temperature - The temperature of the environment adjacent to the converter, normally specified in degrees Centigrade ($^{\circ}\text{C}$).

Apparent Power - The product of a circuit's RMS voltage and its RMS current. Apparent power is not indicative of the actual power consumed by an apparatus.

Brownout - A reduction of the voltage in the distribution system caused by overload, a failure in the distribution system, or a deliberate action by the utility company in an effort to reduce power consumption.

Converter - An apparatus which can convert one power form to that of another. In the case of shore power converters this form can include voltage, frequency, or the number of phases.

Current Crest Factor - The ratio of the peak instantaneous current in a load circuit to the RMS current. A linear load will produce a ratio of 1.414:1; non-linear electronic loads may produce values as high as 5:1. As a general rule: as the current crest ratio increases, the power factor will decrease.

Derating - The reduction in a system's performance resulting from operating conditions other than nominally specified, including temperature, output load, or input voltage.

Design Life - The period of time a converter will perform to its published specifications. Random failure is not a factor.

Efficiency - The ratio, specified in percent (%), of output power to input power. Although normally specified at full rated load current, multiple data points can be useful when determining thermal burdens under typical conditions.

EMI - The abbreviation for **Electromagnetic Interference**, the undesirable electronic noise that can be generated by a power converter. This noise, if not contained inside the converter, can interfere with the proper operation of other

equipment in the vicinity of the noise source.

Floating Output - The output of the converter is galvanically isolated from the input and from chassis. Floating outputs are useful in eliminating ground loops from distribution systems as the output neutral can be re-established as required.

Ground - An electrical safety connection, usually connected to earth, whose purpose is to eliminate the potentially dangerous voltage levels sometimes present on equipment surfaces due to leakage currents or equipment failure.

Ground Loop - An alternate feedback path, usually unintentional, between devices sharing a common ground.

IGBT - Insulated Gate Bipolar Transistor, a type of switching transistor which combines the ruggedness of the bipolar transistor with the ease of control of the MOSFET. Serves as the basic switching element for most modern converters.

Input Line Filter - Typically an internally located low-pass filter used to remove the unwanted noise generated by a converter from being transmitted to the input wiring.

Inrush Current - The peak current drawn by a device upon first application of the supply voltage, usually the result of transformer magnetizing current or the charging of input filter capacitors. Some converters feature circuits which will reduce inrush current, thus eliminating nuisance tripping of input circuit breakers.

Inverter - A solid state power source which is used to convert one voltage form, usually DC (*Direct Current*), to another.

Line Regulation - The change in a converter's output voltage due to a change in the input line voltage, usually expressed in percent over a specified input voltage range.

Load Regulation - The change in a converter's output voltage due to a change in the load current, usually expressed in percent at two or more specified load levels.

Mains - A term referring to the utility distribution system.

MTBF - **Mean Time Between Failures**, a term used to specify the rate of failure occurrence under a defined set of operating conditions. Most commonly the rate is calculated using MIL-STD-217.

Output Noise - The undesirable component of the converter output voltage, usually as a byproduct of the conversion process itself. The most common form of noise is the high frequency component remaining after filtering the

PWM (see definition below) signal.

Power Factor - The ratio of the real power to the apparent power in an electrical circuit. The most efficient use of mains energy occurs when the circuits power factor is high, with 1.00PF being the ideal. Low power factors can be the result of reactive and nonlinear load elements.

Primary - The input side of an isolating device. In a shore power converter it is connected to the supply mains (*dock power*).

PWM - **Pulse Width Modulation**, a technique used in modern converters to efficiently change DC (*Direct Current*) to AC (*Alternating Current*). Before being used, the resulting output must be filtered to remove the unwanted high frequency elements from the signal.

Real Power - In an AC circuit, true power indicates the actual power consumed by a device. Used with apparent power to calculate power factor.

Soft Start - A circuit or device placed in the primary side of a converter to limit the inrush current drawn during turn-on. Refer to Inrush Current above.

Switching Frequency - The rate the solid state switches (IGBTs) are turned off and on in the production of a PWM signal. In modern converters this rate varies between 18kHz to 100kHz, with higher rates offering better dynamic performance at the expense of efficiency and cost.

Transient Recovery Time - The time required by a converter to return the output voltage to the specified level following a load level or line voltage variation. Modern solid state converters offer recovery periods rated in microseconds, motor controller based systems in tens of milliseconds, and generators in seconds.