

Superior power performance of the Powerware 9390 UPS

The industry's best combination of efficiency, management of THD, power factor, and power protection

Features

- ▶ High efficiency of up to 94 percent reduces overall cost of ownership by reducing the cost of power to support protected loads and the cost of cooling your facility
- ▶ Low total input harmonic current distortion (THD) of less than 4.5 percent enhances compatibility with upstream power systems, especially generators
- ▶ Input power factor of 0.99 reduces the input kVA required to power the UPS, minimizes auxiliary generator sizing requirements, and provides more power to unity power factor servers
- ▶ Output power rated at 0.9 power factor accommodates high power factor load requirements
- ▶ Double-conversion design completely isolates your equipment from all types of power contamination and creates clean, perfect sine-wave power for downstream systems—the best level of power protection available

Ironically, some power protection systems actually introduce power problems of their own. For example, many uninterruptible power systems (UPSs) consume or dissipate an inordinate amount of power all by themselves, leaving less available to power your equipment. Others create or propagate power anomalies that can affect protected loads or upstream power sources, such as generators.

The Powerware 9390 UPS minimizes or eliminates these issues with innovations that deliver the industry's best overall power performance. Built on more than 40 years of UPS design expertise, the Powerware 9390 provides superior performance on four key factors:

- ▶ **Efficiency** - maximum useable output power relative to input power
- ▶ **Total harmonic distortion (THD)** - keeping input current distortion within acceptable limits
- ▶ **Power factor** - managing phase shifts between voltage applied and current drawn by circuits
- ▶ **Double-conversion topology** - complete isolation of protected loads from input utility power

High efficiency reduces overall cost of ownership

With any UPS system, a modest amount of input power is consumed to operate the UPS itself, and some energy is dissipated as heat as it passes through internal components in the UPS. The efficiency rating of a UPS is a measure of how little energy is wasted in this manner—expressed as a ratio of UPS output power compared to

utility input power. For example, a UPS that is 90 percent efficient delivers 90 kW of useful output power for every 100 kW it takes in.

The more efficient the UPS, the less utility power you have to buy to serve protected loads. Furthermore, since most of the lost power is dissipated as heat, the more efficient the UPS, the less it costs to cool your facility.

Even a small increase in efficiency can quickly translate into thousands of dollars. The 90-percent efficient UPS in our example above would waste 87,600 kW-hours of utility power each year. At \$0.08 per kWh, that would translate to \$7,008 a year in energy (mostly dissipated as heat), plus an additional \$2,336 in air conditioning to cool that heat—a total of \$9,344 in wasted energy. In contrast, a UPS that operated at 94 percent efficiency would dissipate only 52,560 kW-hours of utility power each year—equating to \$4,205 for non-utilized energy and \$1,388 for cooling, yielding a total savings of \$3,751 compared to the less-efficient model.

With a transformer-less design and sophisticated sensing and control circuitry, the Powerware 9390 UPS delivers an efficiency of up to 94 percent. In addition to dramatic cost savings, this level of system efficiency extends battery run times and produces cooler operating conditions within the UPS, which extends the life of components and increases overall reliability and performance.

Low THD enhances compatibility with generators

Electronic devices, including UPSs, are built with some components that are non-linear or “reactive.” When voltage is applied to a circuit constructed of non-linear components, the circuit may not respond linearly, that is, current may not follow the voltage in a linear manner. Non-linear components may even create frequencies other than the fundamental applied frequency (60Hz).

These frequencies are called harmonics, because they will occur in odd multiples of the fundamental frequency. The degree of this occurrence is called Total Harmonic Distortion or THD. If the power source is not able to respond to all the frequencies demanded by the circuit, then further distortion of the applied voltage may occur—which in turn creates more complication.

All UPSs produce a certain level of harmonics on the upstream power system. Unchecked, harmonics can reduce overall power factor, cause sensitive electronic devices to malfunction, prematurely age equipment, and cause screens and displays to flicker.

To avoid these negative effects, the Powerware 9390 uses a new input circuit that is uniquely capable of keeping THD low—less than 4.5 percent—without compromising efficiency. A key benefit is that this UPS is therefore uniquely compatible with a wide range of generators, even though generator output frequencies will fluctuate when the UPS transitions to generator power and as other loads are started up.

Power factor performance maximizes compatibility and meets high power factor load requirements

“Power factor” describes the slight phase shift between the voltage applied to the circuit and the current the circuit draws in response to the voltage applied. The maximum power factor possible is unity (1.0) which means that there is

no phase shift between the voltage applied and the circuit current response—for maximum transfer of power between source and load. However, in the real world, the UPS must be able to accept power from and deliver power to circuits that have a wide range of power factors.

With the Powerware 9390 UPS, the input circuit that controls input THD also resolves this input power factor requirement. As a result, the Powerware 9390 UPS is exceptionally compatible with diverse power sources, especially auxiliary generators.

On the output side, this new UPS can also provide its full power capability to loads that have a wide range of leading and lagging power factors, spanning all known computer loads.

Double-conversion topology provides the best protection possible

With the Powerware 9390 UPS, your sensitive electronic systems are completely isolated from raw utility power and all its irregularities, using a double-conversion process. Incoming utility AC power is conditioned and converted to DC power, a small portion of which is used to charge the UPS battery. The remaining DC power travels to the inverter, which produces a new, perfect sine wave to power your protected equipment. This double-conversion process provides the highest level of protection available and enables equipment to perform to manufacturer specifications.

To find out more about the new Powerware 9390 UPS, visit our website at www.powerware.com/9390, or contact us at 1-800-356-5794.

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9390SPP
Revision 04/04
Reprint 04/04

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France: 33.1.6012.7400
Germany: 49.7841.666.0
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