Uninterruptible power supplies

A Critical Power Play

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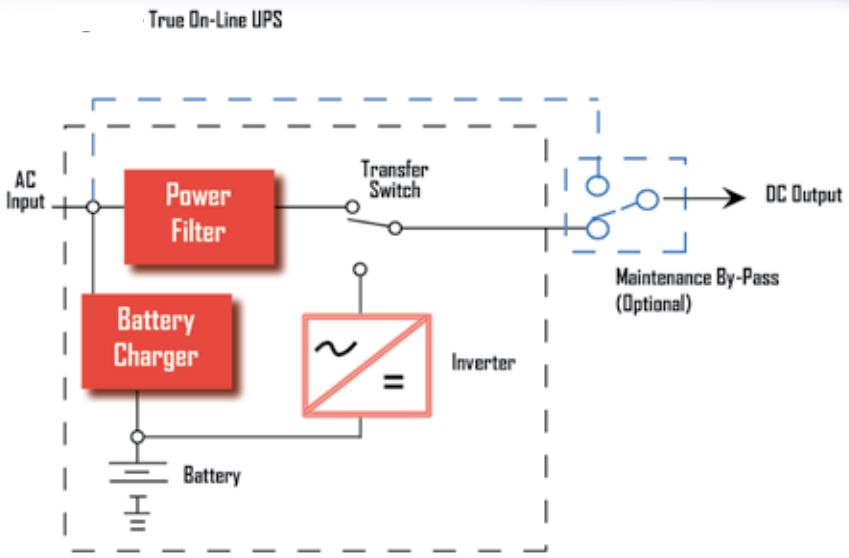


UPS: Standby Systems Ideal For Small Applications

In today's world of high speed and high expectations, critical facility systems or sensitive equipment downtime is not acceptable. Uninterruptible power supplies (UPS) can be essential components of standby power-distribution systems to protect equipment from events such as power interruptions, voltage variations, frequency variations, and transient disturbances.

A UPS is a stored energy system that provides ride-through power to critical equipment between the loss of normal — utility — power and the facility standby generators coming online, as well as during an orderly shutdown of the equipment.

Starting a generator and transferring power to a standby source often can take 10 seconds or more. According to the Electric Power Research Institute (EPRI), 98 percent of power outages last less than 10 seconds. Additionally, most electronic equipment will not tolerate more than a few cycles of power disruption before they shut down.

Standby Systems

A standby UPS, also called an offline UPS, is the most common small unit facilities use in personal computer applications. Under normal conditions, the standby UPS draws alternating current (AC) from utility power and switches to battery power within a few milliseconds after detecting a power failure. A standby UPS also provides noise filtration and surge suppression for improved power quality.

Among their benefits, the typical size ranges from 100 volt amps (VA) to 1 kilovolt amps (kVA). These units offer high energy efficiency, they are physically small, and they are relatively low-cost. On the downside, they are not suitable for larger applications.

True Online UPS Offer Higher Power Quality, Compact Size

Under normal operation, a true online UPS runs continually on the battery via the inverter, while the line power runs the battery charger. In some cases, this type of UPS is called a double conversion, or double conversion online.

For a true online UPS, no transfer time occurs upon loss of utility power. The system provides power-factor correction and frequency regulation, in addition to surge suppression and power filtering.

In rare occurrences, the inverter fails. In that case, the UPS will switch to power provided directly from utility power via the UPS power filter/surge suppressor.

Converting all the power from AC to direct current (DC) and back to AC lowers efficiency and raises heat output. One method to reduce this inefficiency is to replace the battery charger with a delta-conversion online UPS. Instead of providing all the output from the battery under normal circumstances, some of it goes directly from the delta-converter from the input line power. In the event of a power failure, the unit operates like a regular true online UPS.

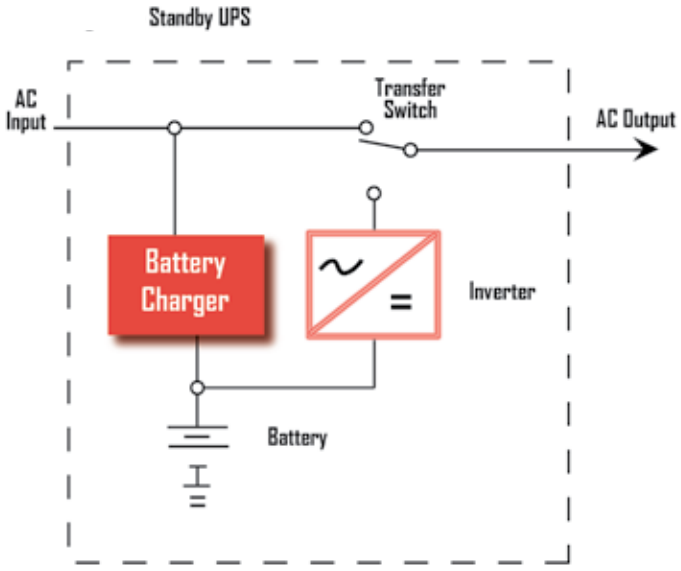
Typical applications include large servers, data centers and large sensitive equipment, and the typical size ranges from 5-5,000 kVA. The advantages of true online UPS include:

- Greater reliability because of redundant system components and pathways
- Higher power quality because power output is isolated from power input. The unit also provides power factor correction and frequency regulation.
- Compact physical size, compared to line-interactive systems.

Among its disadvantages are: low energy efficiency, generally 85-92 percent; higher heat output; higher initial and operating cost; frequent battery replacement, typically every five years; and greater maintenance requirements because components have shorter service lives than line-interactive units.

Standby Online Hybrid UPS Improve Energy Efficiency

Standby online hybrid UPS, also referred to as double conversion on demand, are similar to true online UPS, but with higher energy efficiency. The significant difference is standby online hybrid UPS loads are served directly from utility power as long as the power is within acceptable tolerances. Once the power exceeds the set tolerances, the UPS switches to standard true online operation.



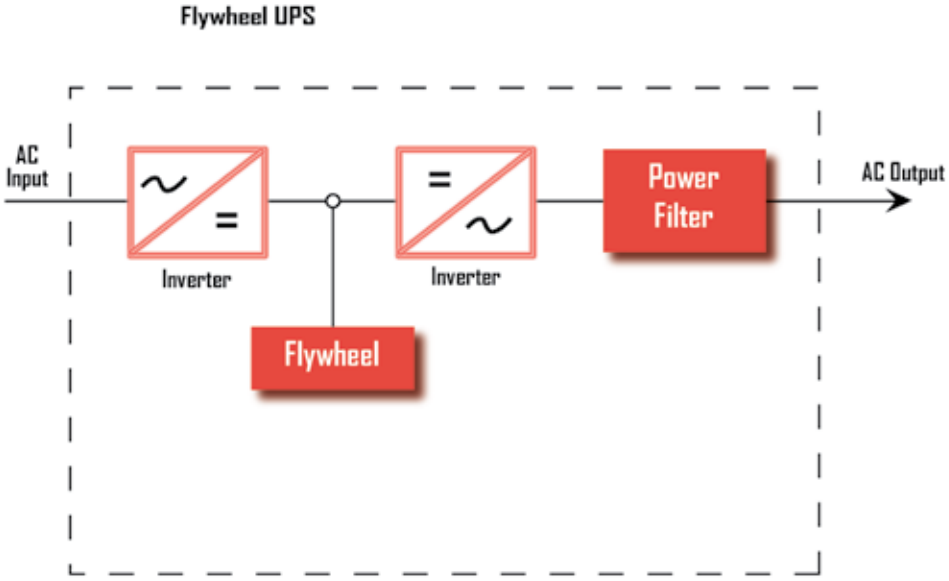
Typical applications include server rooms, and the typical size ranges from 15 kVA units up to 75 kVA per rack.

Advantages include: grater reliability because of redundant systems; energy efficiency that can be more than 97 percent; greater power quality because the power output is isolated from power input; and a smaller footprint than line-interactive systems.

Disadvantages include higher initial and operating cost; batteries that require replacement every five years; and greater maintenance requirements because components have shorter service lives than line-interactive UPS.

Flywheel UPS Require Less Maintenance

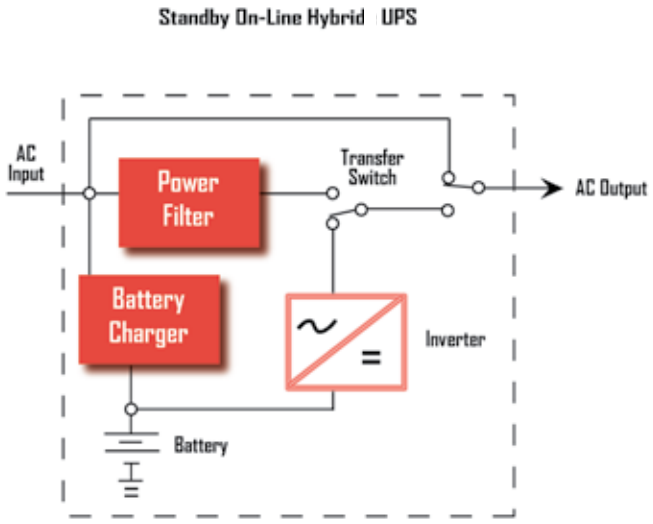
A flywheel UPS uses a heavy, rotating disc to store energy and convert DC power to AC power to serve critical and sensitive electronic loads. During voltage fluctuation or interruption, a flywheel UPS acts as a power generator until stored energy dissipates.



With a ride-through time of 15-40 seconds, this UPS keeps critical loads online until utility power returns or generators come online. Managers also can opt to install flywheel UPS ahead of typical UPS battery systems to increase battery life.

Typical applications include data centers, industrial buildings, and health care facilities, and a typical size is a 60 kVA unit capable of multiple mega-volt-ampere systems connected in parallel.

Advantages include: very high energy efficiency — up to 98 percent

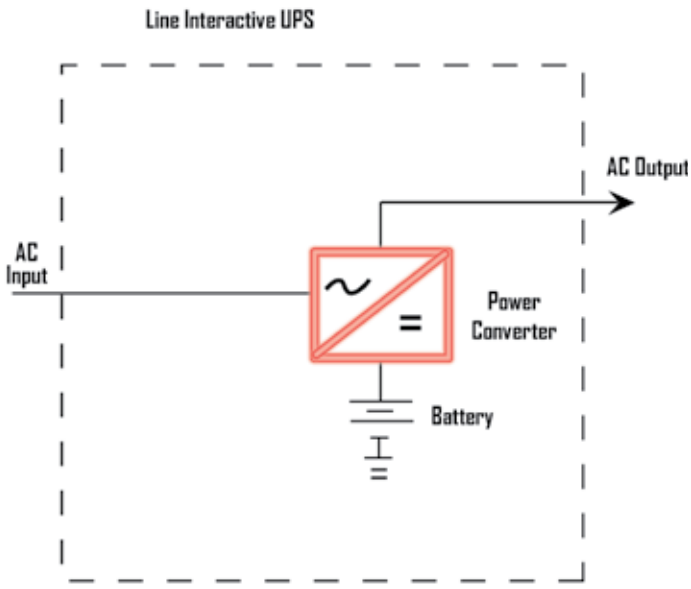


— and low heat output; sustainability because the unit requires no battery replacement or disposal; low carbon dioxide emissions; lower life-cycle costs; fewer maintenance requirements because the units have no batteries to maintain; and one-half the footprint of a battery-type UPS so managers can install it in most spaces without ventilation.

Disadvantages include higher initial cost and possible problems with ride-through time if standby generators do not come online in 15-20 seconds.

Maintenance Requirements For Uninterruptible Power Supplies

Frequent testing of UPS equipment will help identify problems and minimize devastating power interruptions. For larger systems, managers should specify a maintenance bypass switch, which will allow technicians to test and, if needed, replace UPS components while the unit still provides power to critical loads.



Many newer UPS also feature advanced monitoring systems that provide system status for items such as system voltage, battery back-up time, and battery test schedules. Other monitoring components include whether the UPS is operating on batteries, utility power or maintenance bypass.

If a manager decides to have qualified in-house technicians test and maintain the UPS equipment, these individuals should understand and adhere to requirements of the National Fire Protection Association (NFPA) 70E, Electrical Safety in the Workplace. Whenever UPS testing occurs, the technicians should place the system into bypass mode or transfer the load to the redundant system, if design allows.

Technicians also must take caution when maintaining the equipment to prevent an unscheduled outage. The technician should be familiar with equipment, manufacturers' testing requirements, specifications and safety precautions.

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