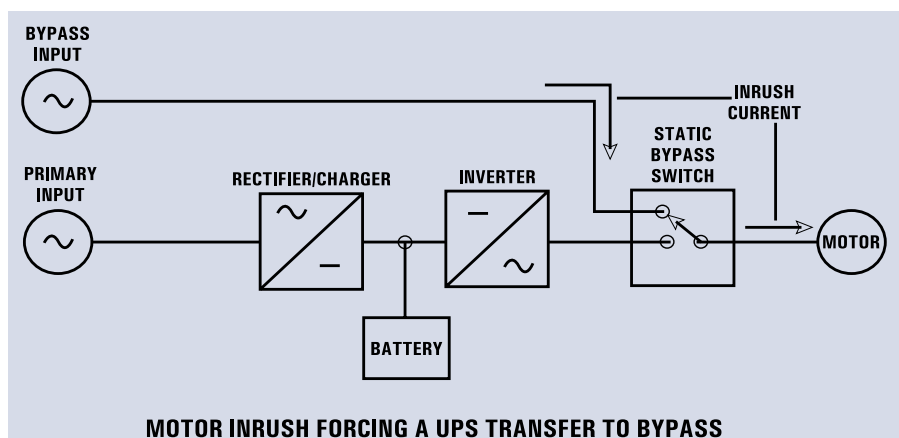


Features

In addition to smaller UPS cost savings, key benefits include:

- ▶ Reduced input feeder sizing plus weight and floor space requirements; in many previous applications, UPS were not used to support critical inrush loads due to these issues alone
- ▶ Under normal operating conditions the oversized devices are operating at a lower percentage of their current rating; this reduces the junction temperature of the device and will result in significantly increased component reliability and rated life
- ▶ By providing an oversized inverter as a part of the lower capacity UPS, we therefore are enabling the system to operate at its optimum efficiency level; cost savings result from the higher operating efficiency

Application Notes: High Inrush UPS Inverter



In industrial applications, UPSs are commonly used to drive load equipment that requires large currents when energized. These inrush currents can be several times the normal operating current and can last up to ten seconds or longer. Equipment that requires inrush current includes motors, transformers, drives and high power amplifiers. For example, a motor can require from 6 to 10 times its full load current when started. The following shows the current for a 10 HP standard motor (480 volts, three-phase):

| | |
|----------------------------|-----------------|
| Full Load Current - | 14 Amps. |
| Inrush Multiplier - | 6 |
| Starting Current = | 84 Amps |

Standard UPSs have temporary overload ratings for driving this type of inrush. This rating can be 25 to 50% over its rated capacity for up to 30 seconds. If the load current stays within this range, the system will operate normally. Commonly, overload rating is exceeded and UPS transfer to bypass occurs.

Although the UPS will eventually retransfer to the inverter (inrush returns to normal) the motor and other critical loads are at risk during this condition. Events may include:

- ▶ A power outage or other problem could occur while on bypass causing a loss of output
- ▶ If the UPS is powered by a limited power source, such as a generator, an inrush transfer applies load step significantly effecting the generator output; wide voltage deviations and frequency shifts in excess of ± 5 Hz often occur, and the result can be a shutdown of the UPS and other loads connected to the generator
- ▶ If the UPS bypass was not available, the inrush would cause the inverter to current limit reducing the output voltage, or shutdown resulting in a loss of output load

As can be seen, there are risks when depending on UPS transfers for driving inrush currents. To avoid this condition two types of solutions may be applied:

- Oversizing the UPS
- High Inrush UPS Inverter

Over-sizing the UPS

To insure continuous power protection for critical loads, sizing the UPS to drive the motor inrush in addition to other connected loads and stay within the 150% rating of the UPS is common. If we again used the 10 HP motor example and add an additional 30 Amp load, the minimum UPS would be calculated below:

| | |
|--------------------------|-----------------|
| Motor Current - | 84 Amps |
| Other Equipment - | 30 Amps |
| Total Load - | 114 Amps |

Minimum UPS Capacity =
Total Load Voltage 1.732
Overload Rating

114 Amps 480VAC 1.73 = 63.2 kVA 1.5

Over-sizing the UPS for inrush does add cost and increases input wiring to the UPS. A larger UPS weight and footprint will occur in many instances.

High Inrush UPS Inverter

As a part of the Powerware Industrial UPS series, a high inrush inverter is now available to drive these high inrush loads. The inverter overload capacity has been increased to a rating of 200% for 30 seconds. This feature was made possible by increasing the current rating of the IGBT components used to convert the DC to AC, by 100%. If we look at our sizing example, using our robust inverter design, the minimum UPS capacity required can be reduced by over 25%.

Minimum UPS Capacity =
114 Amps 480VAC 1.732 = 47.4 kVA 2.0

The high inrush UPS inverter is just one of several features now available with the Powerware series of Industrial Grade UPS. With more than 30 years of experience providing UPSs for a variety of industrial applications, we have developed features to support most critical industrial power protection needs.

Powerware

WORLDWIDE HEADQUARTERS
8609 Six Forks Road
Raleigh, NC 27615 U.S.A.
Toll Free: 1.800.356.5794
or 919.872.3020
www.powerware.com

CANADA
Ontario: 416.798.0112

IPM02INV
Revision 09/03
Reprint 09/03

EUROPE/MIDDLE EAST/AFRICA
Denmark: 45.3677.7910
Finland: 358.9.452.661
France: 33.1.60.12.74.00
Germany: 49.7841.6660
Italy: 39.02.66.04.05.40
Norway: 47.23.03.65.50
Sweden: 46.8.598.940.00
United Kingdom: 44.1753.608.700

ASIA PACIFIC
Australia: 612.9878.5000
China: 86.10.852.99.889
Hong Kong: 852.2745.6682
India: 91.11.2649.941418
Japan: 813.3447.5251
New Zealand: 64.9.576.6842
Singapore: 65.895.8330

LATIN AMERICA
Argentina: 5411.4343.6323
Brazil: 55.11.3616.8500
México: 5255.9171.7777

POWERWARE