

# Rectifier Brings Universal Input to Telecom Power

By David Morrison, Editor, *Power Electronics Technology*

**E**ltek Valere's X5000A4, a 100-A, high-efficiency ac-dc rectifier, extends the concept of universal input range to three-phase telecom power applications.

While rectifiers in this class typically require two models — one for a 208-Vac input and another for 480 Vac — the X5000A4 will operate from either voltage. Efficiency at full load typically ranges from about 86% efficiency at low line to about 92% at high line (table).

Meanwhile, the 12.75-in. × 3.40-in. × 10.39-in. unit delivers a maximum output power of 5800 W for a power density of 12.9 W/in<sup>3</sup>. An addition to the company's Scalable Power System, the X5000A4 can be configured with any of the company's X5000 family of rectifiers to deliver up to 10,000 A of 48-V output. Its 208-Vac to 480-Vac input range enables a carrier to standardize on the X5000A4 for all of its central office, mobile switching center and data center applications.

Historically, three-phase rectifier solutions have tended to be split, with one solution being optimal for low-range input voltages (208 Vac/240 Vac) and another solution for high-range input voltages (440 Vac/480 Vac). According to Rick Barnett, lead designer on the X5000A4, a big reason for these separate designs has been the availability of highly efficient power semiconductors (MOSFETS and diodes) in the 600-V range.

Although the 600-V voltage rating is suited to three-phase rectifier designs using standard topologies at the low input-voltage range, it's insufficient for similar topologies operating at the high input-voltage range. A common approach to allow the use of these 600-V parts is to use multilevel topologies, says Barnett.

"With the advent of more-efficient semiconductors in the 1200-V range, it is now possible to design a rectifier with standard topologies that have reasonable efficiency across the entire ac voltage range. The X5000A4 is designed to provide such a wide-range solution. It is made up of interleaved power trains for ripple current reduction, which leads to reduced size of input and output filtering," says Barnett.

"Each building block consists of an 800-V PFC boost stage paired with a novel 800-V input dc-dc stage. The boost uses 1200-V semiconductors in a standard, easily implemented approach. The dc-dc is a symmetrical resonant-transition



The X5000A4 from Eltek Valere is a 100-A, three-phase telecom rectifier that operates over the 208-Vac to 480-Vac input range.

|        | 208 Vac | 240 Vac | 440 Vac | 480 Vac |
|--------|---------|---------|---------|---------|
| 12.5 A | 80.3%   | 81.1%   | 87.2%   | 88.4%   |
| 25 A   | 85.4%   | 86.4%   | 90.9%   | 92.0%   |
| 50 A   | 87.3%   | 88.2%   | 92.8%   | 92.4%   |
| 75 A   | 87.2%   | 88.2%   | 92.0%   | 92.4%   |
| 100 A  | 86.1%   | 88.1%   | 91.7%   | 92.3%   |

Typical efficiency of X5000A4 versus output current for various line voltages.

ZVS half-bridge solution with a low component count for reliability," explains Barnett.

The X5000A4 has an I<sup>2</sup>C communications bus for programming, horizontal airflow, internal fans and front-panel LED indicators for monitoring. The rectifier is hot-pluggable.

The X5000A4 rectifier works with the company's XC family of controllers to provide advanced local interfaces and remote management options. Interfaces are available to support RS232, wireline and wireless modems, and full Ethernet interfaces from TCP/IP, Web, UDP, SNMP and Telnet. The XC system controllers simplify installation with preconfigured settings and improve system reliability with advanced battery management and control capabilities.

The Scalable Power System is designed around half-width (12-in.) power bays taking up half the floor space of a traditional power enclosure, and each power bay can support up to 15 of the X5000 rectifiers.

Now available, the X5000A4 three-phase rectifier is priced starting at \$1900. For additional information, visit [www.eltekvale.com](http://www.eltekvale.com).

**PETech**