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All-Round Telecom Power

Power Supplies for Use Worldwide

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In network globalization, it is often the case that telecom system builders must conform to international standards and power requirements. For a power supply to be used successfully worldwide, it is necessary to combine wide-range input, an international approval package and high operational reliability.

Input Voltage Range

Global use requires input voltages within the ranges of 85 to 265 VAC (single-phase) and 320 to 575 VAC (three-phase), and input voltages fluctuations in some countries may require operational voltages from +/- 10 percent from nominal. If one module can cover these voltage ranges, then this makes logistics easier and saves storage costs. But caution is advised here, because wide-range input can be based on very distinct technologies. For instance, so-called "auto range circuits" are frequently used in the input circuit. With these devices, an internal circuit attempts to detect the correct input voltage. If transient or lasting voltage drops occur, however, the recurring voltage is often wrongly identified. The result is damage to the power supply and possibly even a system shutdown. Other power supplies are equipped with a continuous wide-range input. These products preclude faulty switching.

Network Stability

To work safely with international networks, two factors are of particular importance, namely a high power failure bridging time and unrestricted operation, even during lasting phase loss. In practice, short voltage drops up to 20 ms occur whenever the local power supplier switches between two networks. A lasting phase loss, on the other hand, is more often caused by the operators, e.g. when they safeguard various loads by using shared circuit breakers in their equipment. A faulty single-phase load alone is sufficient to trigger the shared circuit breaker. The consequence is that the three-phase power supply is operated with just two phases. In situations such as these, many power supplies switch off or even transmit undefined voltage impulses to the load. Unfortunately, power supplies are only rarely equipped with generously-sized intermediate circuit capacitators, despite the fact that this is a reliable method of buffering against power failure up to 20 ms, even under full capacity (see fig. 1). Moreover, even in cases of lasting phase loss, the 24 VDC level can be maintained without restriction.

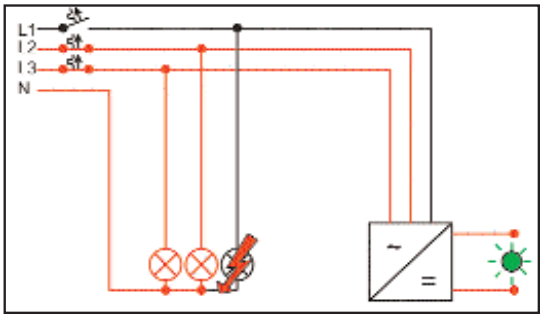

Figure 1. Safe operation at two phases.

Climate & Performance Requirements

Telecom systems are often located in uncontrolled outdoor plant environments where space constraints and robust performance are critical. Internal temperature requirements demand temperature hardened power supplies that can operate from -40°C to 85°C. Performance at temperature extremes is critical in evaluating power supply selection and determining operational performance. Beyond the environmental challenges that Outdoor Plant applications present network planners the space constraints offered are equally as challenging. Power Supplies that can be DIN-rail mounted can take up to 1/3 the space of rack mount or panel mount systems in addition to reducing assembly time and enhancing system flexibility.

International Approval

The issue of approval has to be addressed in due time for systems originally intended for the local market and now foreseen for international use. The consistent use of devices with an inter-

national approval package ensures safety. That is why it is particularly useful to have a CB scheme certificate. Country-specific approvals thus just require written confirmation, eliminating time- and cost-intensive inspections on site.

Power Reserves

It is not always possible to know how much power the planned installation will really need in future. Until now, system planners were faced with the choice between an oversized device which would fit the job but was also costly, and an undersized module that had to be replaced with a larger device if necessary. Phoenix Contact power supplies are equipped with a performance reserve called Power Boost (see fig. 2). This enables power supplies to be used to full capacity. Over-sizing or defining a utilization factor for the entire system is thus rendered superfluous. If several 24 VDC loads have to be retrofitted during operation, the power supply automatically reports when the output voltage drops more than 10 percent. The fault is signaled visually via a flashing LED, and electrically via a transistor switching output and a zero-voltage relay output. Then a power supply of the same type can be connected in parallel at any time to increase performance. Time-intensive adjustment is not required.

Figure 2. Phoenix Contact's QUINT power supply has a wide-range input, power reserve and international approvals.

Redundancy

Parallel power supplies not only serve to enhance performance, they are also needed to develop redundant systems. This is always necessary whenever system availability takes highest priority, e.g. N+1 is usually a standard requirement in communication systems. In redundancy, power supply output is dimensioned such that all connected loads can also be supplied by a single power supply. If a fault occurs in the no. 1 power supply, then the no. 2 power supply takes over without interruption. The defective power supply emits a signal that can be evaluated via a telecontrol system or a PLC (programmable logic controller). But what happens if the no. 1 power supply fails to the extent that it shorts the output circuit? In this case, the no. 2 power supply would also short circuit and the loads would be without power. Dimensioning the output stage generously can minimize the likelihood of this scenario. Yet this would never occur using a redundancy module, because two power supplies of the same type can be fully decoupled (see fig. 3). Essentially, a redundancy module consists of two decoupling diodes thermally connected to a heat sink. For industrial applications, the double diode is placed on a common semiconductor substrate. This optimizes the symmetry of the load current distribution and the thermal connection to the heat sink. Two power supplies of the same type, with output currents up to 28 A each or with parallel inputs up to 56 A, can be decoupled by using a redundancy module (see fig. 4). Because of the low surface temperature, the device has been approved by the KEMA test center for use in Zone 2 areas at risk from explosion.

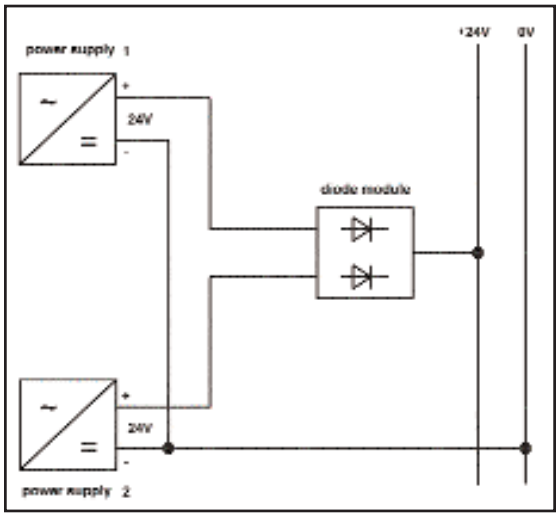

Figure 3 A decoupling diode increases system reliability.

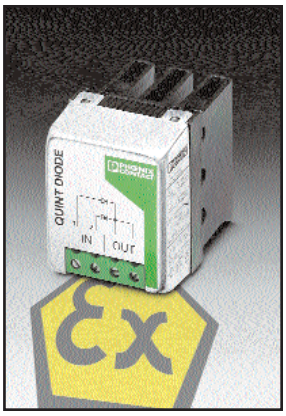

Figure 4. The QUINT diode redundancy module provides 100 percent redundancy of power supplies when connected in parallel.

Conclusion

Due to ever-shortening innovation cycles in telecom technology, system planners have to focus on key tasks. Universal power supplies must therefore fulfill all essential requirements. Features such as wide-range input and a complete approval package are basic preconditions for use internationally. A power reserve and the suitability for redundant expansion enhance operational safety as well.

Paul McClusky has more than 20 years of experience in the telecommunication power industry. He is currently the Telecom Industry Marketing Manager for Phoenix Contact, and his primary responsibilities include marketing and business development to the telecom industry.

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