

AUTOMATION CRITICAL: CLEAN RELIABLE POWER IN A COMPACT PACKAGE



This white paper will discuss the critical state of providing DC power to the ever expanding needs of manufacturing automation, including plant floor equipment, robotics, the industrial internet of things (IIoT), and other enterprise resources.

Power management is a huge concern in industrial and manufacturing applications for everything from food and beverage machines to industrial control cabinets and more. Providing clean, reliable power under greater limitations can be challenging. As the lifeblood of automation—whether part of a packaging system, robot or cobot, conveyor system, or any other machine—DC power supplies today must be rugged, compact, efficient, and comply with multiple standards.

Designing for Compactness

Control and power supply equipment are designed to fit into cabinets that protect them from the varied environments equipment is often operated in (see Figure 1). These cabinets typically use a DIN rail system to provide quick and easy installation. It doesn't matter whether used in medical equipment, telecommunications, or transportation, the growth of control electronics, sensor systems, and IIoT interfacing means that the space inside a cabinet for additional functions is getting harder to come by.

As control cabinets become more tightly packed with electronics the need for systems that can withstand greater temperatures becomes important as well. All this leads to design engineers being continually on the lookout for the latest generation of small, efficient and rugged DIN rail power supplies to incorporate into their equipment. The key element of such supplies include availability, ease of installation, and performance reliability for long life cycles. Furthermore, with a global



Figure 1: Power supplies are a critical component in a wide variety of applications, including telecommunications, industrial panels, water treatment facilities, and conveyors as illustrated here.

customer base, companies need a single product range that offers multiple certifications.

Greater Innovation

Design constraints based on these needs spurred innovation in electronic power components and power supply topologies. Switch mode power supplies using high-frequency electronics were able to dramatically boost efficiency, seeing power density rapidly climb together with efficiency and reliability. Advances in electronics like these have evolved through a new generation of power components—such as power transistors, inductors and transformers—which support increases in power density while improving voltage regulation, reducing electromagnetic interference (EMI), and boosting long-term reliability. All told, these

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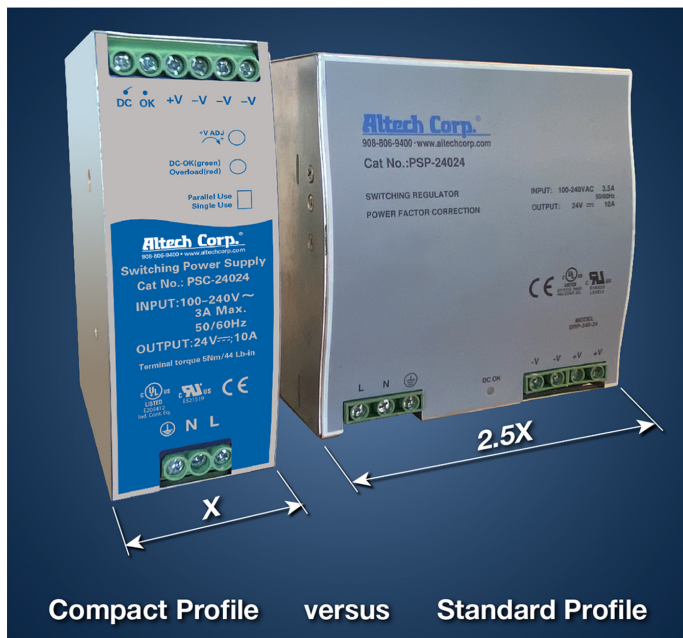


Figure 2: This illustrates the size difference between a standard and compact power supply due to the power density technologies now available.

advancements have allowed for products supplying 480 W to now fit into the space formerly occupied by 120 W power supplies (see Figure 2).

Multiple Solutions

As such an important component in any piece of industrial equipment, Altech has designed and manufactured a series of ultra slim metal case DIN rail power supplies for industrial applications such as video inspection, auxiliary power, and machine tools. These components were designed to take up less than half the space that a current power supply would normally occupy on a DIN rail. If you consider the 120 W supply as mentioned above, a normal DIN rail version would take up about 2.5 inches of DIN rail space, whereas Altech’s PSC-120 series needs only 1¼ inches of space (see Figure 3). With this ultra-compact power supply, Altech makes it easier for customers to include additional functionality

in the same space as well as for use in shallow cabinets—without increasing costs.

These ultra-compact high efficiency units support 1+1 or N+1 redundancy and built-in current sharing functions. Regardless of power supply output, every product in the series has an input requirement of 85-264 VAC/127-360 VDC. Output specifications for the PSC series power supplies are from 12 VDC to 48 VDC and up to 480 Watts. The PSC series is rugged for industrial use, offers high efficiency operation with a wide adjustment range, are lightweight and compact.

The company’s PSD series of compact DIN rail power supplies also share the input requirements of 85-264 VAC/127-360 VDC as the PSC series of products (see Figure 4). The difference is that the PSD series power supplies cover wattages from 15 W up to 100 W. Standard voltages for these supplies include 5, 12, 15, 24 and 48 VDC. These high efficiency supplies are designed for a wide range of industrial applications as well as consumer applications such as elevators, escalators, and other building systems.



Figure 3: The Ultra-Compact PSC series is a rugged power supply for industrial use.

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Figure 4: The PSD series of power supplies provide a low profile for use in tight spaces such as equipment enclosures.

Features for both product lines include 100% full load burn-in, low voltage and current ripple, Class II isolation, and overload, overvoltage, overtemperature and short-circuit protection. These supplies provide users efficiencies of over 90% for lower power dissipation and enhanced thermal performance. They also feature conformally coated PCBs to provide greater protection against contamination and humidity.

Worldwide Capabilities

The Flex line of DIN rail power supplies designed and manufactured by Altech is based on semi-resonant switching power supply technology to provide dynamic output power efficiencies to 93%. Used for electronic loads, motor loads, PLCs, sensors, and other common industrial loads, one unit can cover most input voltage options. The wide range of input voltages enables these products to operate in any part of the world.

The company's PSA and PSB lines are DIN Rail mountable for ease of installation and maintenance. As compact, robust and reliable units, they also offer IP20 protection. Both the PSA and PSB units are designed to provide 1, 2, and 3-phase input up to 600 W with current ratings

ranging to 25 A, and power flexibility that reaches 50% of the rated current I_n (see Figure 2). These specifications are meant to provide solutions for industrial application that are in constant evolution, which makes them remarkably flexible. These series of products offer a declared ambient temperature operations field that ranges from -25°C to 70°C . Besides offering 1-phase, 115-230 VAC units, the company also offers 2-phase, 230-500 VAC units, which allows customers to be able to use and store only one product.

These product lines are also equipped with three short-circuit overload protection features. The hiccup mode is a default factory setting for each product in the FLEX line of power supplies. In case of a short-circuit or overloading, the output current is interrupted. The device will try again to re-establish output voltage and normal conditions about every two seconds until the problem has been cleared. A manual reset is available to the operator as well. In order to restart the output after an overload or short-circuit has interrupted the output, it is necessary to switch off the input circuit for about one minute. This approach is offered where safety procedures specifically require that reset be carried out by an authorized person only. The units also offer a continuous output mode where the output current is kept at a high value with near zero voltage during a short-circuit or overload condition. In this case, the current can reach up to three times the rated current. This mode is used to meet the requirements of demanding loads such as motors, solenoid valves, lamps, PLCs with highly capacitive input circuits, and other loads with marked transient overload behavior.

Certifications

In order for equipment to be sold and operated in various parts of the world, it is important that companies adhere to the certifications needed for their specific applications. As power supplies are such an integral part

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| Model | Output Current A @ 40°C | Input Voltage VAC | Output Voltage VDC |
|-----------|-------------------------|-------------------|--------------------|
| PSA-6024 | 3 | 110-230 | 24 |
| PSA-12024 | 5 | 110-230 | 24 |
| PSA-18024 | 7.5 | 110-230 | 24 |
| PSA-36024 | 14 | 110-230 | 24 |
| PSA-60024 | 25 | 110-230 | 24 |
| PSB-12024 | 5 | 230-400-500 | 24 |
| PSB-18024 | 7.5 | 230-400-500 | 24 |
| PSB-36024 | 14 | 230-400-500 | 24 |
| PSB-60024 | 25 | 400-500 3-phase | 24 |

Figure 2: This chart shows the product range available from the PSA and PSB flexible power supply line.

of every system, having proper certification is a critical requirement. Products mentioned here offer a number of key certifications, including UL, CE and CSA approvals. Others include UL508 listed for USA and Canada, 89/336/EEC EMC directive, 006/95/EC (low voltage), IEC 61000-6-4 for emissions, and IEC 61000-6-2 for immunity. Also note that the units offer safety approvals including EN60204-1, EN60950, and military standard MIL-HDBK-217F. In addition, the PSD low profile units are UL62368-1 recognized as well.

Conclusion

Power supplies are critical components to the industrial automation landscape. They must be reliable, robust, highly efficient, and compact in order to fit today's needs. Through the use of DIN rail systems and the latest power density designs, the latest power supplies provide thousands of hours of operation as well as savings in installation time and overall cost. Altech offers several lines of power supply products to fit most applications with the clean, reliable, and high-performance they need for worldwide distribution of systems.

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