DIMENSION – Innovation in the CP Series

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E1

CP Series: DIN rail power supplies with 120 to 480W

A new benchmark in efficiency, long lifetime and size

The power supplies in the CP series all feature an exceptional space-saving design and a high level of reliability. Traditionally these two features have proved a challenge during the development phase. The more compact a convectionally cooled power supply, the smaller the space for consistent airflow. The components are situated closer together, which makes it more difficult to dissipate the heat away from the device. Heat directly impacts durability as it makes the components age more quickly. Just a 10°C rise in temperature in the power supply halves the lifetime of the electrolytic capacitors and thus of the overall device.

The only way to ensure a long service lifetime and a small footprint is when as little heat as possible is being produced from the start. The heat is in turn the noticeable effect of losses. This conflict can only be resolved with as high a level of efficiency as possible, which is the key to achieving an optimum overall package. Once again, PULS has successfully delivered this with every device within the CP series.

The 240W CP10 power supplies (output voltages: 12 – 48V) have been defining the benchmarks in this performance class since 2015. PULS has now expanded the product range further with the new CP5 and CP20 versions.



Figure 1: DIMENSION CP Series 24V 5A, 10A, 20A

CP5: 120W power supplies with extra-long lifetime

In the 120W power class, the new CP5.121 (12V, 10A) and CP5.241 (24V, 5A) power supplies are setting new

benchmarks. With a width of just 32mm and a reduced depth of 102mm, the CP5 is the most compact DIN rail power supply in this performance class by some margin.

The lifetime of the 24V version is 131,000 hours and the 12V version achieves a minimum of 75,000 hours – in both cases under extreme conditions of 230Vac, continuous full load and +40°C ambient temperature. These high values are achieved using an LLC resonant converter. This advanced converter topology is atypical for a 120W power supply. The result sets a new record in efficiency levels in the performance class: 93.8% (CP5.121) and 94.3% (CP5.241) and puts both CP5 power supplies at the forefront of the compact class.



Figure 2: CP5.241 competitor comparison for efficiency, width and lifetime

Due to the high efficiency level, less heat is generated which is what makes the compact device design possible. No additional heat sink is required as the aluminium housing performs this function. Despite the robust metal housing, the CP5 power supplies are incredibly lightweight at just 440g. The low weight means less load on the DIN rail and guarantees a secure hold, even with significant shocks and vibrations.

CP20: 480W power supplies with 48mm width

With the CP20.241 (24V, 20A) and CP20.481 (48V, 10A) power supplies, PULS offers efficient solutions for all users requiring powerful yet space-saving 480W power supplies for their systems. With a width of only 48mm, PULS is setting a whole new standard.



Figure 3: CP20.241 competitor comparison for efficiency, width and lifetime

The compact design is possible thanks to an efficiency of 95.6% (CP20.241) or 96.0% (CP20.481). The most powerful CPs in the 480W performance class are setting new records. The devices have been optimised not only for the highest possible peak efficiency at full load but also excellent efficiencies in the partial load range. High efficiency levels across the entire load range mean lower energy costs for the user in the usage phase.

The CP20 power supplies also stand out from the competition when it comes to service lifetime. The devices achieve a service lifetime of at least 94,000 hours (CP20.241) or 118,000 hours (CP20.481), at +40°C ambient temperature, 100% load and 230Vac.

In addition to the high power density, users benefit from a comprehensive approvals package and helpful features. These features include a power reserve of 20 % (up to +45°C continuously and between +45°C and +60°C short-term), an exceptionally small input inrush current, full output power between -25°C and +60°C (with derating up to +70°C) as well as high immunity to transients and over-voltages.

E2

DIN rail power supplies with IEC 60601-1, 3rd edition

Fanless medical power supplies now with DIN rail mounting

Medical applications demand the highest requirements in terms of reliability, minimal space, special approvals and stringent safety standards. In other words, it is the perfect environment for optimising the full potential of the CP series.

Open frame power supplies were previously the only option available to medical device manufacturers. With the CP series medical power supplies, PULS is the first to offer an efficient, fanless DIN-rail power supply conforming to the highest technological standards and one that is always available from stock.

Medical applications in hospitals (theatre equipment, patient monitoring, call systems), building technology (door openers, lighting) and imaging diagnostics (CT, MRT, ultrasound) can greatly benefit from the high industry standard. There is also an increasing number of applications within laboratories requiring standardised DIN-rail power supplies.



Figure 1: CP power supplies with medical approval

DIN rail mounting increases flexibility

The most obvious difference from the open frame power supplies is the design and mounting on the DIN-rail. The DIN rail installation, a long established standard in industry, is new for medical appliances.

The most important benefits of DIN rail mounting are rapid installation and a high degree of flexibility that facilitate a modular system design. This means that individual components from different manufacturers can be combined to create the best option for the application regarding efficiency, performance and price. A

further advantage of DIN-rail mounting is that users can affix power supplies from different performance classes on an integrated installation system. This also allows for retrofitting or replacing of components.

Fanless power supplies – reliable and quiet

The 100 percent convection cooling of the CP medical power supplies (CP10.241-M1 and CP20.241-M1) is an appealing option for medical technology in particular. The devices do not require any mechanical fan to dissipate the heat. This applies to the entire output range and is thanks to low heat losses. This makes unreliable and noisy fans unnecessary. The CP power supplies work completely quietly in the background, contributing to a quiet environment for patients. In addition, the minimal heat generation means that high reliability and a long service lifetime are achieved. This makes the devices ideally suited for many years of use in medical devices.

Maximum safety level (2 MOPP) for patients and operators

The CP medical power supplies conform to all requirements defined in the standards IEC 60601-1, 3rd Edition and IEC 60601-1-2, 4th Edition. The power supplies provide two means of protection for patients (2 MOPP – Means Of Patient Protection) and operators. Compliance with the EMC test is also provided in full, without any additional measures such as external filters.

E3

DC/DC converters with EN 50155 railway approval

Reliable DIN rail power supply for railway applications

PULS has worked extensively to meet reliability expectations for railway applications. There are many parallels with industrial environments such as efficiency, size, availability, service lifetime and resistance to EMC and ambient conditions, which are equally important for power supplies in all application areas.

Based on decades of experience in developing and manufacturing large-scale industrial power supplies, PULS has developed a range of products specifically designed for railway users: the DIN-RAILway range.

The product range includes DC/DC converters (power range: 100W, 200W and 400W), for DIN rail installation, that also conform to all EN 50155 requirements in terms of EMC, shock and vibration as well as fire protection. The DIN-RAILway devices conform to the latest technological advances and impress with high levels of efficiency and long service lifetimes. Users also benefit from the high quality standards owing to large-scale production. The latest member of this innovative, market-specific series is the CP10.241-60 (24V, 8.3A).



Figure 2: DIN-RAILway power supplies with rail approval

CP10 as DC/DC converter for the railway

The CP10.241-60 is tested in accordance with railway standard EN 50155 and is entirely weather-resistant due to the conformal-coated PC-boards. It has been adapted for the input voltage typical for railway applications of 96 - 110Vdc (-30%/+40%) and can be operated at full load – in other words entirely without derating - across an extra-wide temperature range of -40°C to +70°C – and for a time period of 10 minutes, up to +85°C. The device has been fitted with robust spring-clamp terminals to increase reliability in the event of strong vibrations and to minimise the amount of maintenance required. The CP10.241-60 is therefore

resistant to shocks and vibrations. In addition, the device has an active inrush current limiter and integrated inverse-polarity protection for DC voltages on the input.

Technical modifications to the circuit design were necessary primarily because of the input voltage range, which differs from industry requirements. 96 - 110Vdc is supported with the tolerances ±30% constant and ±40% for 100ms.

All the key attributes of the standard CP10, such as the high efficiency, small footprint and long service lifetime, have been successfully retained in the railway version. The efficiency is 94.5% and the width is just 39mm. The lifetime of the railway version is 119,000 hours at full load and +40°C ambient temperature.

High demands of the railway fulfilled

The requirements in the rail industry are high: even in the case of high mechanical shock loads, no failures can occur in a greatly extended temperature range. The CP10.241-60 fulfils all railway requirements with reference to EMC (EN 50121-3-2), shock and vibration (EN 61373) and fire protection (EN 45545-2).

Cooling fans are not generally desirable as they represent a likely point of failure. Therefore, high efficiency levels are required for compact devices that dissipate their heat loss via natural convection. The CP10 also excels in this area with efficiency levels to meet even the highest industrial standards.

Thanks to the successful EN 50155 test and the modified switching topology, all DIN rail power supplies in the DIN-RAILway series can be used in trains. Typical application areas include the central power supply, air-conditioning technology, train communications, infotainment and train safety.

E4

CP power supplies with conformal-coated PCBs

Maximum reliability in tough environmental conditions

PULS DIN rail power supplies are inherently robust. They deliver high efficiency, reliability and long service lifetime – even under challenging ambient conditions.

However, these properties can be diminished, especially in tough ambient conditions such as high air humidity with high levels of condensation, and high concentration of conductive particles in the environment, e.g. the attraction of dust particles due to electrostatic charge, etc.

To ensure long-term reliability of a system under such conditions, power supplies with conformal-coated PCBs are recommended. . PULS offers conformal-coated versions for all 120W, 240W and 480W DIN rail power supplies in its CP series. Users who have experienced regular power failures in their systems have already benefited from these conformal-coated devices and have been able to increase system reliability.

The conformal-coated PCBs prevent short-circuits that are caused, for example, by particle deposits. Corrosion on the conductor paths, components and solder joints is no longer a problem. This maintains the excellent characteristics of the devices in terms of efficiency, reliability and lifetime.

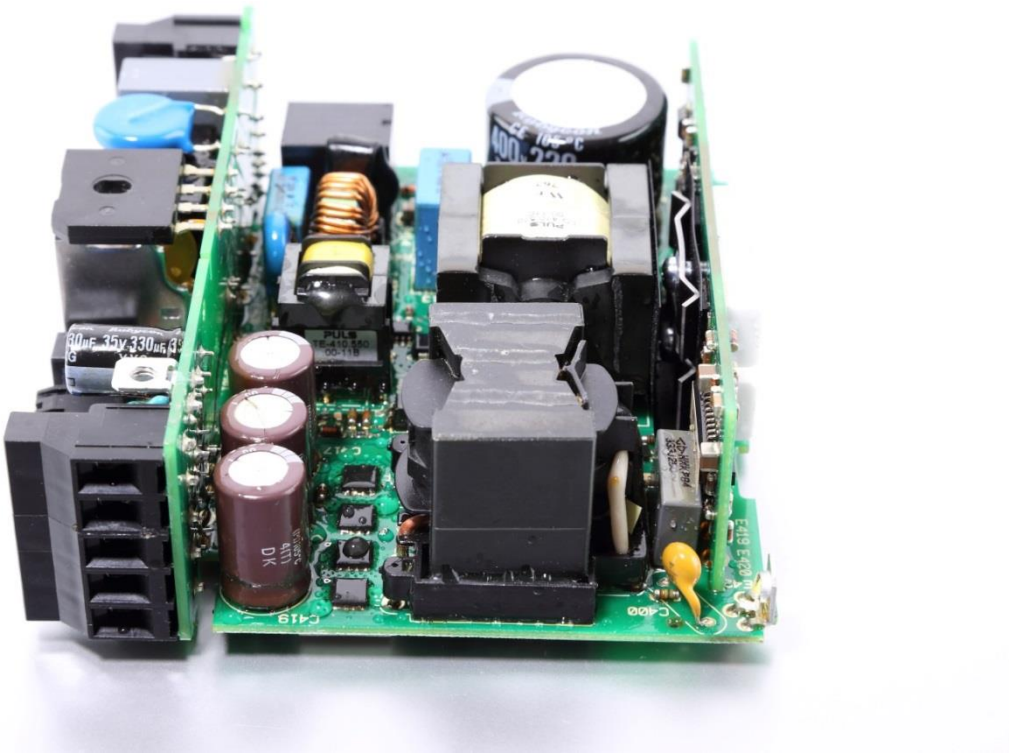


Figure 3: Conformal-coated PCB in the CP10.241-C1

Conformal coating maintains high quality

To give users the perfect end result, PULS uses a special coating method based on a selective coating with a protective liquid film. This coating method is neither the traditional spray nor dip technology.

Compared to these traditional methods, selective coating is far more precise and delivers faultless results with a constant level of quality. The protective coating is applied as a thin layer of film. This eliminates any air pockets, which can occur with the wet spray method. Selective coating also prevents droplet formation which may result in uneven layers when using dip coating.

The exact coating process is digitally stored for each coated PULS product. The programming controls the targeted application of the coating on the defined PCB areas, leaving out components that do not need to be coated. The thickness of the coating layer always remains uniform. In addition, no masking is required to cover the components for this process.

This production technology means that users benefit from the highest quality protective coatings. The inherently reliable CP power supplies are ideally equipped for use in challenging environmental conditions for electronics.



E5

Push-in, spring-clamp terminal and screw

The right connection for every application

All CP power supplies are quick and easy to install. The terminals are generously sized and can be connected easily. Different connection technologies are required depending on the application. This is why the 24V CP devices (CP5.241, CP10.241 and CP20.241) are available with different terminal options: Push-in terminals accessible from the front, robust spring-clamp terminals and traditional screw terminals.



Figure 8: One device, three possible connection options: screw connection, spring-clamp terminal and push-in

Push-in terminals - ready for robot-assisted wiring

As part of the continuous automation of production processes, the assembly and wiring of series-manufactured control cabinets is increasingly robot-assisted. For fully automatic wiring, the front-accessible push-in terminals on the CP power supplies are the perfect solution. The wiring robots can perfectly reach the side-by-side terminal entry points, visually inspect them, insert the wires and connect them to the other components in the control cabinet. This means that the CP power supplies are fully ready for further processing in fully digitised and automated factories.

Push-in terminals are also ideally suited for manual installation. The clamps can be installed without tools, with low insertion forces and in a minimal amount of time. In addition, they are completely resilient to shocks and vibrations.

Spring-clamp terminals – Perfect for challenging conditions

Spring-clamp terminals can be used without the need for any tools. The integrated spring ensures perfect contact pressure which is necessary for long-lasting and reliable contact. This also applies to environmental conditions with violent vibrations and shocks which can occur, for example, in railway or marine applications. Even under extreme conditions, the corrosion-resistant spring-clamp terminals offer maximum contact reliability.

The spring-clamp terminals used by PULS are equipped with a mechanism to ensure the terminal remains in either the open or closed position. The lever does not need to be held during wiring, simplifying insertion of the wires.

A connection can be made and unfastened entirely without the use of any tools: pull up the lever and remove the wire. The spring-clamp terminals meet the requirements of the pull-out forces according to the relevant IEC and UL standards.

Screw terminals – Tried and tested

The traditional screw terminal is still popular and is used in numerous applications. When installing and maintaining power supplies with screw terminals, it is important to adhere strictly to the manufacturer's guidelines. If the wiring is carried out perfectly and the screws are tightened exactly in accordance with the manufacturer's installation specifications, it is a very reliable connection, with a large contact area and a very low contact resistance.

Screw terminals are not recommended for applications with persistent shocks, vibrations or temperature changes. These external influences can loosen the screws. To prevent this, the screws would have to be tightened regularly; additional tasks that would incur extra maintenance costs and could easily be overlooked. In this case, spring-clamp or push-in terminals are the safest choice.

Safety and functionality in focus

Minimal system downtime, cost efficiency and the lowest possible maintenance costs are the primary focus for many users. PULS therefore provides its customers with comprehensive advice in choosing the optimum power supply for their specific applications, and this includes making the right choice of terminal type.