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Power Distribution Unit

Reliable power distribution in IT racks

White Paper IT 04

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“Across all industries, digitization means that companies have to install powerful IT systems at existing or new locations within a short time. Security and availability are essential criteria here, because many processes are no longer conceivable without fail-safe and protected IT. The Power Distribution Units (PDUs) directly at the racks play an important role in this. With intelligent PDUs, IT managers create the basis for the safe, efficient and energy-optimized operation of data centers.”

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1 Executive summary

The role of PDUs in cutting-edge IT infrastructures

The rapid spread of digitalisation across all industries is forcing companies to act quickly and install powerful IT systems at existing and new locations. This applies to core and cloud data centres as well as edge data centres on the periphery of the company network. Security and availability are the key criteria, because without a fail-safe and protected IT system, many processes we take for granted in day-to-day life, such as traffic control and airline bookings, not to mention production processes, are simply impossible.

Depending on the application and the relevant availability and security requirements, a data centre could be a standalone rack, an edge data centre at production sites and branches or a hyperscale cloud data centre. Energy supply plays a pivotal role in ensuring fail-safe operation in all these cases.

Power originates from the main power supply, is transferred through central UPS and sub-distribution systems, and is supplied to socket systems in the IT racks – the PDUs (power distribution units).

The PDUs provide a reliable energy supply to the IT components installed in the rack. These are high-quality multiple socket outlets fused to industry standards and offering optional monitoring, switching and measuring functions that help improve the energy efficiency and fail-safe operation of data centres.

Depending on their design, PDUs can monitor and control the power supply down to the level of the individual socket outlets. The devices also support remote maintenance, are network-capable and provide important functions for energy management in IT environments of any size.

Using additional sensors, intelligent PDUs record a wide range of environmental parameters – for example, sensors for access monitoring increase IT security at IT rack level. Especially when it comes to installations such as floor distributors and autonomous edge data centres, remote monitoring is a real advantage, as it makes it possible to integrate the IT rack into an overarching monitoring system via the PDU.

During the planning process, companies should ensure that their chosen PDU manufacturer has a wide product range so that a large number of applications can be met, using standard products and with the best configuration in each case. This saves on installation time and costs, for example, since technicians only have to get to grips with one PDU product family.

Figure 1: The comprehensive integration of the PDU into the IT infrastructure of a data center supports energy management and monitoring.

Basis for efficient IT operations

To improve energy efficiency in the data center, it is necessary to first record consumption.

Since companies are constantly upgrading their IT infrastructures, to drive forward the automation of production systems, for instance, ongoing IT operating costs are also rising. Optimising energy costs in data centres is therefore becoming increasingly important for companies – IT managers can use an intelligent PDU to monitor energy costs and what is causing them.

The first step in improving energy-efficiency in data centres is recording consumption. If determining energy efficiency or power usage effectiveness (PUE) is all that matters, it is enough to measure the power and current in the different phases that lead into the data centre. However, this doesn't help to identify untapped potential or reveal how new applications are changing load capacity. Measuring current and voltage down to the rack level is the

very least that should be done when trying to gain a useful insight into the energy-related parameters in the data centre and use this data to optimise IT operating costs.

In the case of spatially and geographically dispersed edge applications, it is particularly important to record energy consumption across all locations. To this end, PDUs can be integrated into building or IT management systems via standard interfaces.

Ultimately, large installations such as hyperscale cloud data centres require high-quality PDUs tailored to the IT components in the IT rack suites. Detailed monitoring, clear labelling and optional displays help technicians to find faults quickly and efficiently and change configurations in the IT rack.

As the examples illustrate, PDUs perform a vital role in the planning and modernisation of IT systems. When it comes to IT load management, PDUs provide precise data about energy consumption at IT rack level. This data flows into superordinate management platforms such as Data Centre Infrastructure Management (DCIM) and thus provide IT managers and Facility Management staff with key information for the overall commercial and technical planning of the data centres.

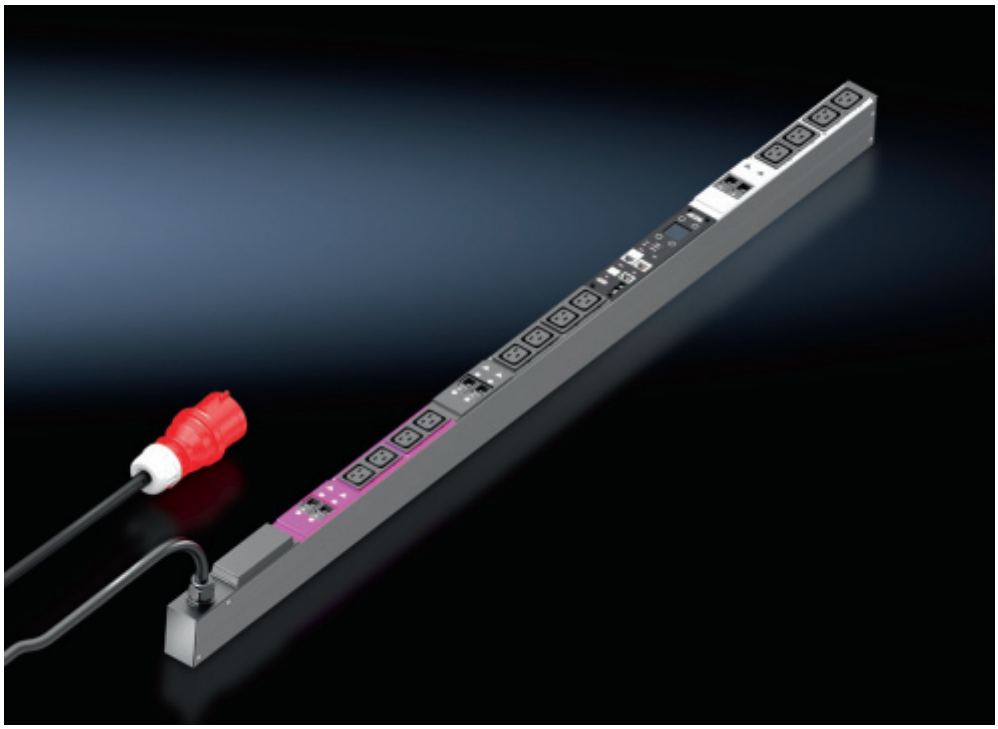

Figure 2: PDUs are high quality manufactured and industry standard secured multi-socket outlets that supply power to all components in the IT enclosure. Monitoring, switching and measuring functions are available as options.

2 Introduction

PDUs are a key component in setting up an IT rack, as they supply the power needed by all the IT equipment installed. When selecting a PDU, the space available in the IT rack first has to be noted. The PDUs are ideally mounted in the zero-U-space – in other words, in the space between the side panel and the 19″ mounting frame. This way, no height units are blocked, and maintenance and installation work can still be conducted on the IT components, even when an IT rack is fully fitted out.

The core task of a PDU is energy distribution. PDUs are therefore included in the A and B power supply on a redundant basis. PDU manufacturers should have a comprehensive product family so that suitable PDU models are available for the respective size of the IT rack. By using the product family of a single manufacturer, companies can optimise their spare parts stockpiling and cut initial staff training costs, as their technicians only have to familiarise themselves with one installation system.

Selecting a suitable model

A large number of criteria must be considered when selecting a PDU. These include, for example, load capacity, the number of sockets and the monitoring functions required. However, it is frequently overlooked that the PDUs' core purpose of power distribution means they have a vital role within the overall IT infrastructure and therefore have to be fully compatible with the other IT components. An IT rack should thus be tuned to the PDU and vice versa. Ideally, the PDU should be another element of a standardised modular IT kit that aids rapid, simple installation, prevents errors in installation thanks to clear labelling, and can be managed by superordinate management software without additional programming outlay.

Exactly which PDU is needed depends on the output that is to be distributed by the PDU. In other words, the load capacity of the connected consumers in the IT rack determines the output required of the PDU. This output can vary greatly depending on the configuration and planned usage of the IT systems. In high-performance computing (HPC), for instance, IT racks are operated with outputs of over 50 kW, while an output of around 3 kW is sufficient for simple IT systems with low user numbers. Comparing product models against their load capacity can save purchasing costs.

The simplest variants come as single-phase models starting from 16 amps. The higher output classes are designed with three phases, for outputs of 16, 32 or 63 amps. The three-phase design with 63 amps per phase can distribute slightly over 43 kW. If redundant distribution is set up using two PDUs and different supply paths, almost 90 kW of electrical output can be distributed per rack. This output data is required for HPC applications or when climate control technology elements are to be supplied with power. Since the load capacity of the PDUs represents a major cost factor, it is extremely important for users to determine the

current and future loads in advance and select the PDUs accordingly. In general, a three-phase system with 16 amps per phase will cover almost all applications in the rack.

PDUs offer several variants for energy monitoring. The advantage of devices with displays is that staff can also quickly read the current status from the outside. Another possible alternative is to set up automatic notification of the current status via text message or e-mail.

To switch or not to switch

Generally, the variants can be divided into products without any additional functions, products with measuring functions, and combined solutions that include measuring and switching functions. A PDU with switching function is not required in every scenario. After all, when a data centre is staffed around the clock, there is no need to have remote control options for a server's power supply. On the other hand, where there is a "lights-out" operating mode or where a data centre is maintained remotely, having remote access to the PDUs is frequently the only way to provide support or perform a restart.

For security reasons, the Ethernet switches that connect the PDUs to a network management system should not be routed through switched sockets, otherwise administrators could lock themselves out of the PDU management interface by mistake. Anyone who wants to ensure that only the correct socket is switched has to start off by doing their homework: Correct documentation, sensible processes during changes and new installations, as well as consistent access control all prevent errors and sabotage.

Tip – how to save energy

PDUs have two different switching processes for interrupting the energy supply – the loads can be switched using electronic or mechanical relays. However, if there is a power failure that affects only the PDU, both the electronic and the mechanical relays lose their control current and fail. This usually only shuts down the slot concerned and its consumer. In addition, a constantly energised mechanical relay permanently consumes energy. In a fully populated PDU, this can amount to as much as 50 watts. This energy consumption is unnecessary and reduces the service life of the continuously operating relay.

For energy saving, PDUs with bistable relays should be used. These remain current-free in their respective switching state and thus reduce their own energy consumption.

Units with bistable relays are therefore one energy-saving solution. These remain at zero current in their respective switching state, thereby lowering the inherent consumption of a PDU. This way, energy costs can be perceptibly reduced, especially in the case of 24/7 operation.

Safeguarding energy supply

To achieve a high level of reliability, the energy supply in the IT rack should feature a redundant design, using an A/B power supply with two identical PDUs. Implementing this requires forward planning, as dual power cabling is needed. In particular, where the rack is populated

with mixed IT and network components, wiring must be planned in advance so that efficient maintenance will still be possible in the future.

Well networked

PDUs are networked via a standard Ethernet port and protocols such as IPv6, SNMP, Modbus/TCP or OPC-UA. An external supply for the PDU control electronics is needed so that the PDUs can still be controlled if the supply voltage fails. Power over Ethernet (PoE) should be used for switchable PDUs. This has the advantage of requiring one less supply route, while still achieving full redundancy by separating the load and control supply.

Switchable PDUs with Power-over-Ethernet (PoE) save one supply path despite full redundancy by separating load and control supply.

Hot server waste air and PDUs

In an effort to optimise the energy costs for IT cooling, the input temperatures at which servers can operate have been continuously increased over recent years. This means the waste air temperature has also risen, reaching more than 50 degrees Celsius in the case of some server types. PDUs are fully or partially exposed to this waste air. A PDU housing and all components must therefore be able to operate under these conditions reliably and for the long term.

Precise measuring technology as a basis for energy optimisation

PDUs are available with a wide range of measuring functions. This means technicians in the data centre can keep a close eye on the energy, capacity utilisation and phase symmetry of each rack. A PDU will deliver very different measuring data depending on its design. If determining energy efficiency is all that matters, it may be enough to measure the power and current in the different phases that lead into the data centre. However, that would mean missing the opportunity to identify changes in load that are caused by new applications.

Measuring current and voltage down to the rack level is the very least that should be done when trying to gain an insight into the energy-related parameters in the data centre. After installing PDUs with measurement functions on a broad basis, customers often discover that power supplies they thought were being fully utilised actually offer a lot of untapped potential. Particularly when three phases are being used, it is vital to distribute the load symmetrically. A phase load display can save much planning and testing, because it depicts the ratio of the utilisation perfectly.

Display speeds up fault-finding

Optional temperature, humidity and access control sensors can be added to PDUs to monitor the physical ambient conditions in the IT rack. There is also the option of having this important information displayed on a small screen on the PDU so key measurements can be read off quickly and easily.

However, even without the display panel, clear labelling is something to look out for when making a purchase. Colour-coding of the phases and clearly labelled A/B supply paths is ideal. If the individual slots can be highlighted with LEDs or other visual indicators, that is very helpful for service assignments, as technicians looking at the PDU can clearly see which devices are to be unplugged.

Figure 3: For a visual check, PDUs are also available with a display that shows the status of the power supply, for example.

Safety for humans and machines

Statistics on the causes of fire published in 2018 by the Institut für Schadenverhütung und Schadenforschung (Institute of loss prevention and loss research – IFS) place electricity at the top of the list, with 31 percent. When compiling these statistics, the IFS investigated fires that caused considerable damage to buildings. Data centre operators should therefore only use high-quality components for power supply and distribution.

In this connection, IT managers should pay close attention to Section 4.1 of standard DIN VDE 0100-420. In its current version (VDE 0100-420 2019-10), this states that electrical equipment must not represent a fire hazard to the things around it. Using simple, undersized socket strips in a data centre is a major risk. Faults often arise when a PDU or distributor strip designed for low outputs gradually starts to be used as a central distribution station because more and more new servers are being added to the IT rack. This can then overload the contacts, which in turn generates heat that can then lead to a fire.

Another key requirement for PDUs is reliable protection against overvoltage. This is even more important for PDUs than for other components in data centres, as PDUs also have to protect the end consumers connected to them from the effects of overvoltage. Protective circuit-breakers that respond extremely quickly are therefore a basic feature of a high-quality PDU. The PDUs must also be protected against overloading from surge currents or short circuits.

Fast reacting protective circuit-breakers in the PDU protect the connected end consumers from overvoltage.

Relevant standards and regulations

Internationally, IEC connectors to standard C13 and C19 as per IEC 60320 are the norm for connecting together IT components in the rack. For instance, blade servers are predominantly connected to the power supply using C19 plugs. This standard permits 16 amps with 250 volts, while the C13 norm only permits 10 amps. The advantages of the IEC connectors include the minimal space requirements and thus greater possible packing densities.

In Germany, safety plugs (earthing-pins) as per the CEE 7/4 standard (Type F) are still used in data centres. These are of very robust design and the high insertion forces involved prevent the plug from being accidentally pulled out. In general, strain relief for the cables or locks for the power connectors should be used to prevent loose connections. There is no general recommendation for plug types, but the C13/C19 version saves space, though locks should be used to stop it slipping.

The IT rack itself is finally connected to the mains via a CEE three-phase connector or Cekon plug to IEC 60309. There are red connectors for three-phase alternating current with neutral and protective conductors and a rated voltage of 400 V, as well as blue connectors with only one external, neutral and protective earthing wire for a voltage of 230 V.

Tip – safety, security and flexibility for power outlets

The PDU should be available as a modular system so that the required plug types can be mixed in one device. In addition, unused slots should be protected against unauthorised access – covers increase safety for technicians.

Meeting compliance requirements

Depending on the industry and area of application, PDUs must comply with superordinate specifications, and must certainly carry a CE marking. The associated protection requirements are laid out in the EU Low Voltage Directive 2014/35/EU. A key standard for information technology equipment – which includes PDUs – is EN 62368 from 2019. Part 1 of this standard defines the general requirements PDUs must always meet. To be used in other countries, the products have to meet other requirements such as UL (Underwriters Laboratories) in the United States and EAC (Eurasian Conformity) in Russia.

3 Rittal PDU models and application scenarios

Modular system for maximum flexibility

The PDUs from Rittal use a modular system that enables customised configuration. It is therefore possible to tailor the PDU perfectly to the application. Variables customers can specify themselves include the length of the cable, the connector plug, the position of the display and the number and type of the sockets. On top of this, additional modules can be added to a PDU, for example to measure differential current or for overvoltage protection.

Modular system for individual configuration.

Importantly for technicians, the modular design ensures that the PDU controller and overvoltage protection can be replaced while the system is operational. If one component fails, it is therefore not necessary to replace the entire PDU.

Protected against lightning and heat

Rittal PDUs are made from robust components, ensuring they deliver the best possible performance even in high waste air temperatures. At an operating temperature of 50 degrees Celsius, the PDU continues to deliver 100 percent output, at 60 degrees it maintains output with calculated derating.

There is an option for integrated overvoltage protection using replaceable arresters and an alarm contact to protect the sensitive electronics in the IT rack from voltage peaks such as those caused by lightning strikes. Other optional features include an RC circuit-breaker and the established thermal magnetic circuit-breaker. Flat circuit-breakers (Carling type) are still integrated into the PDU housing.

Detailed monitoring for improved safety and security

Thanks to the PDUs' high level of flexibility, an IT rack can be comprehensively monitored. Integrated CMC functions such as an alarm relay, a digital input and an alarm signal transmitter enable the flexible incorporation of the PDU into an overarching IT security concept.

Almost every model in the Rittal PDU range supports the connection of additional sensors for recording environmental data such as temperature, humidity and the status of switch contacts. This makes it possible to monitor the electronic handles of an IT rack, for example. Another measuring function includes fault current monitoring (RCM type B), meaning doors are prevented from opening when a dangerous amperage is detected in the IT rack, for example.

Up to eight sensors from the CMC III Controller portfolio can be connected to Rittal PDUs. This gives administrators a detailed overview of the environmental conditions on site, enabling them to integrate monitoring functions into their management systems. The switch contact, for instance, reports whether the rack door has been opened and someone has gained access to the rear of the server. USB ports can be used to operate a webcam and thus also make visual checks.

Installation

Any technician who regularly has to install PDUs will prefer tool-free installation. When using the conventional fixing method, it is also easy for a tool to slip and a sharp edge to cut into the cable insulation. No additional tools are therefore needed to install Rittal PDUs in Rittal IT racks, as they use a clip attachment in the zero-U-space on the 19″ frame. This installation does not restrict access to the 19″ level, meaning network and power cabling can still be carried out there and IT devices can be retrofitted while the rack is operational.

Figure 4: Technicians can install Rittal PDUs quickly and easily, without the need for tools. This saves valuable assembly time.

Mechanical compatibility (in other words fitting PDUs from manufacturer “A” in rack systems from manufacturer “B”) can usually be accomplished nowadays with the aid of adaptors for the respective mounting rails. In larger settings with dozens or even hundreds of PDUs, accessories are a key cost factor. Rittal therefore supplies a universal fastener as standard. Furthermore, baying adaptors can be used to install a second PDU, either fitted perfectly to the side of the 19″ level in the case of an 800 mm-wide rack or fitted to the frame of the IT rack in the case of the VX model, without needing an additional mounting bracket.

Master/slave concept protects investments

Modular system for individual configuration.

For reasons of efficiency, IT managers try to expand their existing IT racks as far as possible, and require more sockets to do so. Instead of installing a second PDU with a full range of functions in the IT rack at this point, it may be more cost-effective to implement the master/slave concept and use a slave PDU. Under this concept, the administrator sees only one logical PDU with the total number of slots and functions, no matter how many slaves there are.

The master and slave PDUs have the same design and are configured for their planned usage via software settings. The connection between master and slave is generally proprietary, Rittal uses a CAN (Controller Area Network) bus for this.

Interfaces

A fully redundant Gigabit network interface enables rapid connection of IT management systems and supports the connection of up to 16 PDUs. Unlike under the master/slave concept, each PDU gets its own IP address in this set-up. This solution reduces the outlay for cabling the individual PDUs.

Powerful switching

Bistable relays permit up to 300 amps of starting current on all switchable PDUs, and their functions help reduce the power consumption of a PDU in stand-by mode.

Quick and easy layout

The Rittal Configuration System (RiCS) allows individual configuration of the PDU via a web browser.

The Rittal Configuration System (RiCS) enables custom configuration of the PDU via a web browser. The PDUs are delivered in a compact, 44 mm-wide (1 U), 70 mm-deep casing. The length varies according to the range of functions and number of sockets.

The configurator can be used, for example, to define plugs such as C13, C19 or earthing pin sockets such as CEE 7/3 and BS 1363 (UK) for each PDU individually, in line with the requirements of the IT rack. Up to three different types of socket are possible per PDU or phase.

Five product variants cover every application

In designing the product range, care was taken to make operation and installation easier using clear labelling. For example, installation is extremely easy for technicians as the fuse circuits are clearly marked with white and black arrows. In addition, the blocks of sockets are numbered, meaning they cannot be confused.

The Rittal PDU range consists of five basic models that build on each other's functions and are individually configurable. The models are as follows:

- Basic (simple power distribution)
- Metered (measurement per phase)
- Metered Plus (measurement per output slot)
- Switched (measurement per phase, switching function per output)
- Managed (measurement and switching per output)

Figure 5: The Rittal PDU range consists of five basic models that build on each other's functions and are individually configurable.

Basic (simple power distribution)

The "PDU Basic" model works passively and takes care of energy distribution in the IT rack. The PDU does not contain any other electronic components.

Practical application: This model is always used where there is a need for reliable power distribution in the IT rack that complies with standards and regulations. Power consumption is measured elsewhere, for example in the sub-distribution.

Metered (measurement per phase)

The “PDU Metered” model is a compact PDU for energy distribution and energy data recording. The fundamental functions and casing are identical to the basic model.

In addition, it has measuring functions that record the voltage, phase current, frequency, neutral conductor current, active/reactive/apparent power, active/apparent energy (energy consumption overall or per phase), power factor, crest factor (even for single-phase PDUs) and THDU/THDI (now for three-phase PDUs, too), for example. An operating hours meter records the utilization period. When using this model, technicians can also custom configure alarm limits for voltage, current and active power.

THD is the “Total Harmonic Distortion” of sinusoidal voltage or AC current that can be caused by the use of non-linear (non-Ohmic) consumers in power supply networks. In an IT setting, this effect is caused by switchable server power supplies, for example.

Metered PDUs support load management in the IT rack.

Practical application: In a professional data centre, a metered PDU can support load management in the IT rack. The data recorded shows whether the IT cooling is correctly tailored to the load on the active components, for example. Furthermore, this solution makes it possible to record approximate costs at IT rack level. Anyone planning to modernise a data centre can use these measurements to determine the untapped potential in IT racks with regard to IT cooling capacity.

Metered Plus (measurement per output slot)

In addition to the above-mentioned functions, this solution also offers the possibility to record energy data for each output slot. Again, technicians are able to record a range of different energy consumption and performance parameters and set custom alarm limits for current and active power.

Practical application: The Plus model enables detailed energy billing for each user. For example, if the IT department shows as a profit centre within its own organisation, the PDU Plus makes it possible to bill energy costs at consumer level, since each individual server can be monitored separately. If the development department would like to run a dedicated server in the data centre for test purposes, for instance, this PDU model can be used to determine and bill consumption in detail. Operators of colocation data centres can use this model to monitor and bill the costs of leased server slots or whole IT racks.

Switched (measurement per phase, switching function per output)

The “Switched” model combines energy distribution functions with energy data capture and energy management. The electronic construction, design and functions all build on the PDU Basic and Metered models. The name of this PDU model comes from the switchable output sockets with signal LEDs.

A new feature compared to previous products is the option of sequential switching with configurable activation behaviour after a power failure. The options are “Everything off”, “Everything on” or switching to the last slot status before the power failure (socket on or off). Also new is the programmable activation sequence for the individual slots, time-controlled activation of slots, programmable activation delay (all or specific slots) and the grouping of slots that can be switched together. In addition, it is also possible to block individual slots to prevent accidental switching – a vital safety function when it comes to supporting fail-safe IT operations.

Practical application: In many cases, the switching function makes it easier to manage remotely operated IT sites, including autonomous edge data centres. However, the Switched model also gives IT administrators more control over the IT racks – sometimes technicians connect new devices via the PDU without previous approval. In this case, administrators maintain complete control over the switchable sockets, because the PDU slots are only activated with their approval.

Automated sequential switching ensures safe start-up of the IT infrastructure.

Sequential switching is a vital function if there is a possibility the start-up current could get too high when the data centre starts up. Automated sequential switching makes it possible to safely start up the IT infrastructure. This function is useful for black building tests, for example, or for DGUV v3 accident insurance tests – the insulation must be measured without current for DGUV v3 §5, for instance.

Managed (measurement and switching per output)

The “Managed” product variant combines the functions of Metered Plus and Switched. It is therefore capable of power distribution, recording energy data for each output slot and energy management with switching function for each socket. The electrical construction and design is equivalent to the PDU Basic solution.

As a result of the combined functions, technicians have a wide range of options for measuring electrical power, active/reactive/apparent power, active and apparent energy and the power and crest factors. Again, separate alarm limits can be set for current and active power. The comprehensive switching functions of the Switched model are also available, such as sequential switching with configurable activation procedure after power failures, programmable activation sequence and delayed activation.

Practical application: The combination of precise energy data recording and full control over the sockets is relevant for all IT organisations that need to bill on a user-by-user basis while maintaining complete control of the sockets. Managed PDUs are particularly useful tools for large, decentralised edge infrastructures, as they make it possible to record the costs for each location while at the same time monitoring the energy supply remotely.

4 Functions for remote access

Web interface and management console

Administrators can simplify remote maintenance by using intelligent PDUs: If an IT rack is difficult to access, for example, or if the system also has to be maintained at the weekend, a PDU with switchable connectors is a useful aid, since individual sockets can be remotely switched. Comprehensive remote functions are vital for geographically dispersed and autonomous edge data centres, too.

Administrators simplify remote maintenance with intelligent PDUs.

A web server is built into the device for remote management and can be called up via a browser to give users a straightforward web interface. The PDU supports SNMP (Simple Network Management Protocol) and can also be incorporated into superordinate management frameworks.

At the time of purchase, companies should always make sure that any slots are arranged in groups so that multiple devices or the A/B power supply can be switched off with just one click.

5 Security

Boosting IT security

Additional security features are needed when intelligent PDUs with switching functions are being used. State-of-the-art PDUs integrate directory services such as Active Directory from Microsoft for this, so as to conduct authorisations for individual users.

In addition, sensors use standard protocols to pass on data about temperature and humidity or issue a notification about an open rack door. This makes it possible to communicate with DCIM (Data Center Infrastructure Management) software solutions such as Rittal RiZone for IT management or facility management-based control stations.

Remote access – access protection and rights management

It is important to clearly regulate who is to have access to the control functions of a PDU. State-of-the-art PDUs have integrated clients for directory services; they can be connected to Active Directory (the Microsoft directory service) or another directory service via LDAP (Lightweight Directory Access Protocol). Thus, company-wide user information is also available for assigning access rights. It is also important to be able to group related PDUs and their individual ports to efficiently manage access rights. Alongside the rights management systems integrated into the PDU, the PDU parameters can also be passed on to external DCIM software via SSL.

It is important to have clear rules on who has access to the control functions of a PDU.

Protecting people from fault currents

The safety of technicians should always have top priority. As a result, Rittal PDUs make it possible to conduct an even more precise fault analysis than is achievable with centralised differential current measurement. For the highest level of safety, PDUs have 1x, 2x, 3x, 6x measuring points for faster fault localisation. Fault currents of up to 100 mA (AC) and 6 mA (DC) can be detected, and individual limits or offset values can be set for existing, system-related fault currents. When these limits are breached, the PDU issues a configurable alarm.

One potential application involves locking the IT rack when the measurement system detects a fault current that is too high. The rack can then only be opened by service personnel or a plant electrician. This ensures comprehensive protection for people and also boosts the operational reliability of the IT systems.

6 Planning and preparation

Web configurator for product selection

PDUs can be adapted to specific requirements using the Rittal Configuration System (RiCS). Whether it be the length of the connection cable or connector plugs, the position of the display or the infeed – a PDU can be tailored to specific requirements. The configurator also offers a range of optional accessories, such as C13 protective covers or various sensors that can be connected to the PDUs.

Overview and configuration: www.rittal.com/pdu

The following expanded functions are available for all PDU models via the online configurator:

- The length of the PDU casings is set and tailored to the Rittal IT rack range, but custom configuration is possible.

- 19-inch versions and vertical PDUs up to a length of 2095 mm
- Halogen-free PDU variants
- Different casing colours to indicate the A+B circuits
- Connection cable length and connector
- Overvoltage protection integrated into PDU
- Differential current measurement to monitor fault current (for each PDU/phase/fuse)
- Up to three different types of socket per PDU phase (only two in series-standard PDU products)
- Fault current circuit-breaker (e.g. IT applications in Austria, otherwise not recommended)
- Thermal magnetic circuit-breaker (32 A PDUs)
- Different fuse characteristics selectable

Fast delivery

All the series-standard PDU products are available from stock. The PDU BTO version (built to order) is a preconfigured solution that is delivered within 14 days. The PDU CTO version (configure to order) is a customer-specific solution that can take longer than 14 days to deliver and is dependent on the respective scope of the configurations.

7 Appendix

Glossary, abbreviations

CAN: The CAN (**C**ontroller **A**rea **N**etwork) bus system was developed for networking controllers.

CE labelling: The CE (**C**onformité **E**uropéenne) symbol is displayed on products that meet the requirements of all applicable EU directives. However, only in rare cases has an independent testing and certification authority actually tested the product.

CEE standard: The "**C**ommission on Rules for the Approval of **E**lectrical **E**quipment" is an international commission that regulates the approval of electrical equipment and standardises e.g. connectors.

CMC: The CMC (**C**omputer **M**ulti **C**ontrol) range of products is an alarm system from Rittal for network and server racks, enclosures, containers and technical rooms.

DCIM: A software solution for **D**ata **C**entre **I**nfrastructure **M**anagement offers a range of function blocks that are needed for everything from ongoing operations to planning the capacity of IT infrastructures.

DGUV: Deutsche **G**esetzliche **U**nfall**v**ersicherung e.V. (German Statutory Accident Insurance) is the umbrella organisation for professional associations and accident insurers.

EAC: The EAC (**E**ur**a**sian **C**onformity) label indicates to consumers and supervisory bodies in the Eurasian Economic Union that a product complies with technical specifications and safety requirements. It is comparable with the European CE symbol.

Edge data centres: These data centres are located close to where data is generated which can be a remote manufacturing site, retail outlet or 5G transmitter station – hence the term "edge". The aim is to process data in real time on site.

HPC: High-**P**erformance **C**omputing is an umbrella term for the types of high-performance computers used in research, for crash tests and other simulations, and for weather forecasting.

LDAP: The **L**ightweight **D**irectory **A**ccess **P**rotocol is a network protocol for conducting enquiries or changes on a directory service within an IT infrastructure.

LED: Light **E**mitting **D**iodes are lights based on opto-electronic semi-conductors.

Modbus: This communication protocol facilitates data exchange between a master and several slave devices. The open protocol is part of the industry standard for connecting computers with measuring and control systems.

OPC-UA: The "**O**pen **P**latform **C**ommunications **U**nified **A**rchitecture" is a collection of standards for communication and data exchange in the context of industrial automation and for machine-to-machine communication.

RCM: Residual **C**urrent **M**onitoring monitors the differential current in electrical systems.

PDU: A **P**ower **D**istribution **U**nit is a high-quality socket strip manufactured to safety standards. It is used for distributing power in IT racks.

PoE: Power **o**ver **E**thernet makes it possible to supply power to network-compatible devices via an Ethernet cable.

PUE: Power **U**sage **E**ffectiveness is a metric that can be used to map the energy efficiency of a data centre.

SNMP: The **S**imple **N**etwork **M**anagement **P**rotocol is used to monitor and configure network elements remotely, and also to draw attention to and transmit information about faults.

SSL: The **S**ecure **S**ockets **L**ayer is an Internet protocol for safely transmitting data between two systems.

TCP: The **T**ransmission **C**ontrol **P**rotocol is one of the core elements of the TCP/IP family of protocols for end-to-end connections on the Internet.

THD: Total **H**armonic **D**istortion is the full harmonic distortion of sinusoidal voltage or AC current. THDI refers to the distortion of the current, while THDU refers to the distortion of the voltage.

UL: Underwriters **L**aboratories, Inc. from the United States is one of the largest independent test institutes that is permitted to issue a seal for certified products.

UPS: An **U**ninterruptible **P**ower **S**upply filters the mains voltage and safeguards the energy supply to the IT components when there are fluctuations or failures in the mains power.

Zero-U-Space: Describes the space between the side panel and the 19″ mounting frame of an IT rack.

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