



AUTOMATION
DIGITALISIERUNG

Flexible. Reliable. Durable.

DECENTRALIZED POWER SUPPLIES



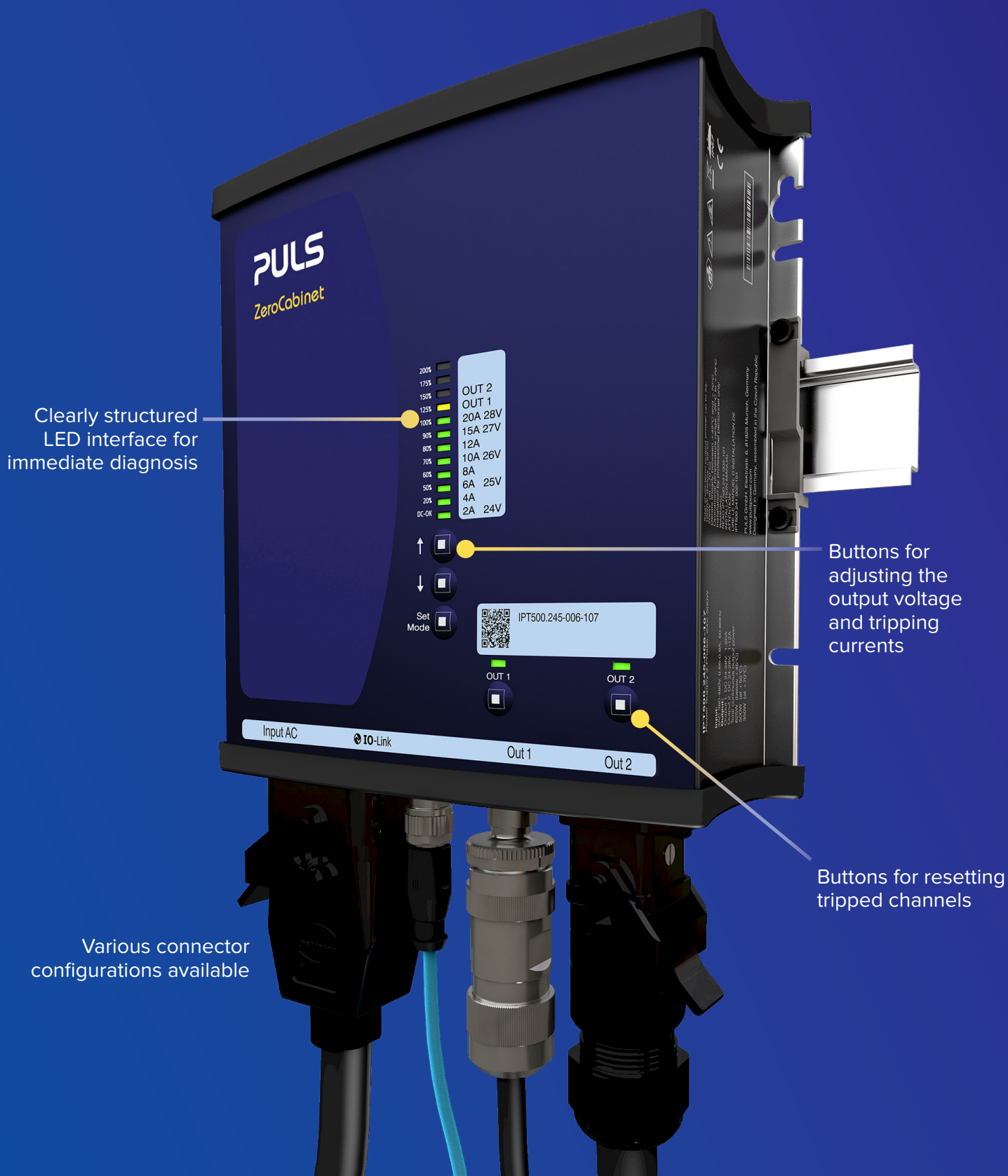
The alternative to ...

- Centralized cabinets
- Decentralized on-site cabinets
- Customer-specific solutions

POWERED BY
PULS

publish
industry
verlag

ZeroCabinet



Basic Versions

1 DC output | 300 or 500 W
Decentralized, cabinet-free power supplies
pp. 8–9



eFused Versions

Up to 4 DC outputs | 300 or 500 W

Decentralized power supplies with up to 4 current-limited outputs each

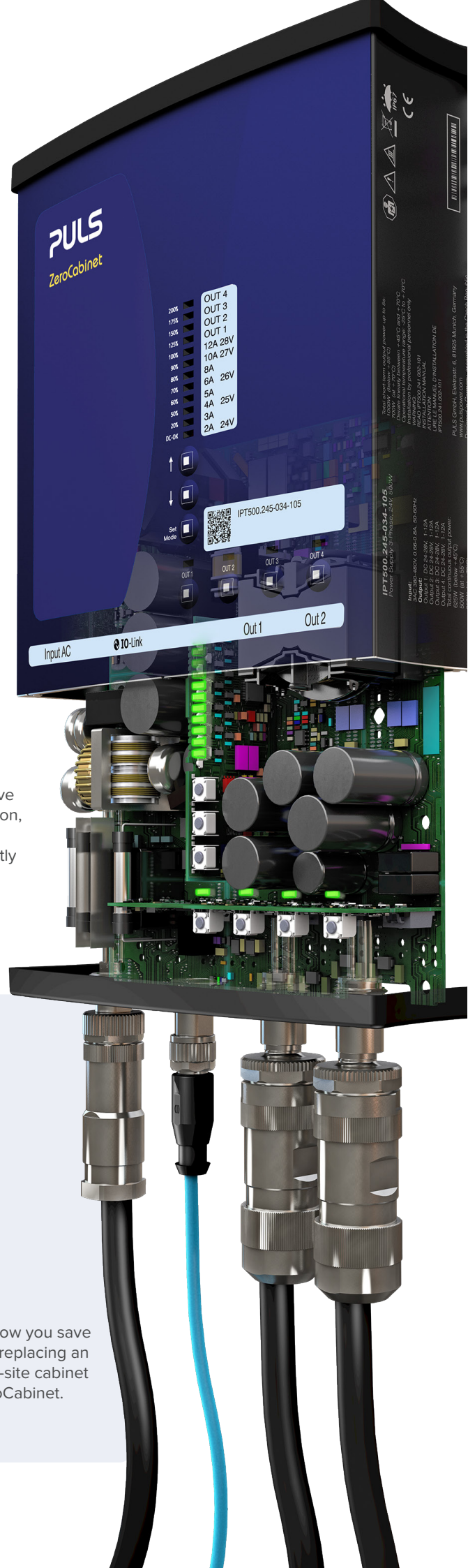
pp. 10–13

CONTENTS

- 2 Overview of ZeroCabinet
- 5 Editorial: “The heart of the system continues to evolve”
- 6 Decentralized, cabinet-free power supplies
- 8 Straight from the cabinet to the field
- 10 Decentralized power supplies with current-limited outputs
- 14 Interview: “Decentralization made easy”

10

Here is how to establish selective current distribution, protection, and monitoring directly in the field.



Decentralized cabinet



ZeroCabinet

| | | |
|--------|----------------------------------|--------|
| \$\$ | IP67 housing | |
| \$\$ | Power supply | \$\$\$ |
| \$ | Electronic output fuse | |
| \$ | Input fuse (optional) | |
| \$ | Distribution terminal | |
| \$ | Cabling | \$ |
| \$ | Plug connectors for input/output | |
| \$\$\$ | Working time | \$ |
| \$\$ | Space | \$ |

13

Here is how you save costs by replacing an entire on-site cabinet with ZeroCabinet.

THE HEART OF THE SYSTEM CONTINUES TO EVOLVE



The power supply is the heart of any system. This is a role it has held for decades now, working away in the background from inside the cabinet. Recent years, however, have seen the power supply increasingly distance itself from this modest role.

The variety of applications – not to mention the requirements that go with them – certainly work in favor of this development. This implies that, in addition to the typical function as a converter, there is a growing demand for complete power supply systems featuring integrated communication, redundancy, and protection functions. And then, of course, there is decentralization, which also has a crucial role to play with regard to power supply and current distribution.

If we want to be able to meet this demand with standard products, a flexible product platform is needed to form the basis for implementing the various solutions. This platform also has to offer the fundamental qualities of a power supply, which include outstanding efficiency, a compact design, exceptional reliability, and a long service life.

It is with all of this in mind that we came up with ZeroCabinet – our decentralized power supply system. The efficient 300 W and 500 W power supplies are accommodated within a very compact housing unit that offers a high level of IP protection (IP54–IP67). These are available in various versions ex stock – including current-limited outputs for selective current distribution, a variety of different plug connectors, IO-Link as a communication interface, and decoupling MOSFETs for developing redundant systems.

ZeroCabinet opens up whole new worlds of possibilities for system developers and integrators when it comes to modern system planning. So no matter whether you are looking for a centralized or decentralized solution, PULS is set to ensure that the power supply remains the reliable heart of your system for the foreseeable future.

A handwritten signature in blue ink, appearing to read 'Bernhard Erdl'.

Bernhard Erdl
CEO | Owner | Chief Developer
PULS GmbH

Focusing on decentralization

DECENTRALIZED, CABINET-FREE POWER SUPPLIES

The demand for flexible, modular systems is shaping the world of systems engineering as we know it, and the decentralization of system components is shaping up to be a major development in this regard. By speeding up the system planning process, simplifying maintenance tasks, and facilitating straightforward expansions, more and more components now feature a degree of protection from IP54 to IP67 and are being relocated directly into the field. As a result, cabinets can be made smaller than ever or else dispensed with entirely.

By Maximilian Hülsebusch

So what exactly is going on with the power supply in decentralized systems and machine engineering? The products currently available on the market basically allow three different strategies:

1. No decentralization of the power supply

The power supply is not included in the decentralization process and remains in the central cabinets. When it comes to supplying the decentralized peripheral devices in the field, long cable harnesses with a large cross-section have to be taken into account. The power supply has to be oversized due to the loss of performance caused by the long cables.

2. Power supply in a decentralized on-site cabinet

The power supply – along with other standard components such as electronic fuses or switches – is taken out of the central cabinet and placed directly onto the machine in smaller, decentralized IP67 cabinets. Companies often handle the planning and assembly of these cabinets themselves.

3. Customer-specific solution

A customer-specific, decentralized solution is developed especially for the power supply. The size and mechanics are also specifically tailored to the system along with the electrical specifications.

Benefits of a decentralized power supply

Many users have already sprung into action after recognizing the benefits of a decentralized power supply: it starts with the system planning process, which offers greater freedom. There are many applications, such as conveyor belts or production lines that can be supplied with energy much more efficiently and flexibly on a decentralized basis. The power supply no longer has to be oversized, and the individual system parts can be put together on a modular basis, allowing them to

be extended, maintained, and converted more quickly and effectively than ever.

By making the cabinets smaller, or even doing away with them entirely, the newly gained space can also be used to expand added-value system components. Even the cable lengths and cross-sections can be reduced, which in turn saves on the costs of copper.

Past obstacles on the road to a decentralized power supply

The cost of implementing a decentralized power supply does, however, remain high with the currently existing solutions. Even straightforward, decentralized on-site cabinets, for example, often comprise more than 10 components. All of these have to be ordered, stored, and ultimately combined into a system by a technician.

As for developing customer-specific solutions, this is even more time consuming, expensive, and only worthwhile in larger volumes.

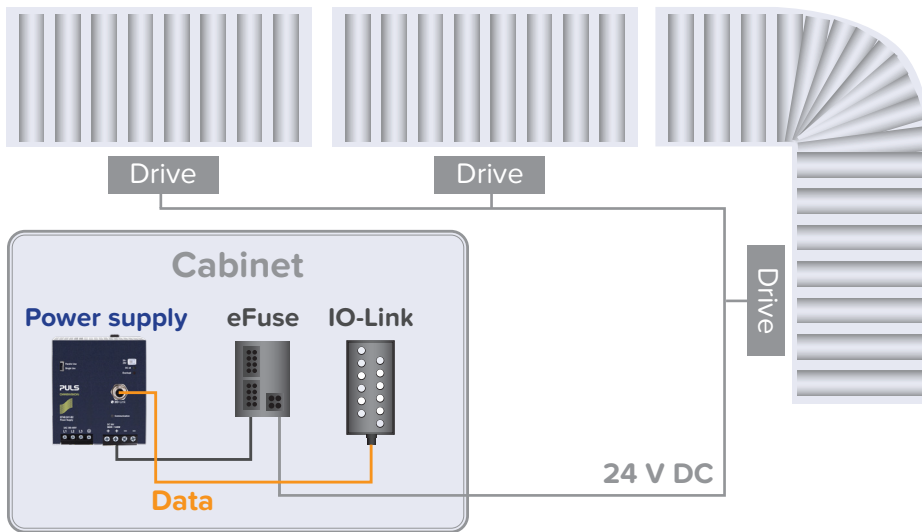
Until now, there hasn't been a decentralized standard power supply that is available to order ex stock, easy to install, and flexible enough to offer a viable alternative in all three cases.

Cabinet-free power supply system as a solution

With the launch of the ZeroCabinet product family, the developers at PULS are closing this gap in the decentralization market to open up whole new worlds of possibilities for users with reference to cabinet-free planning of their systems and machines.

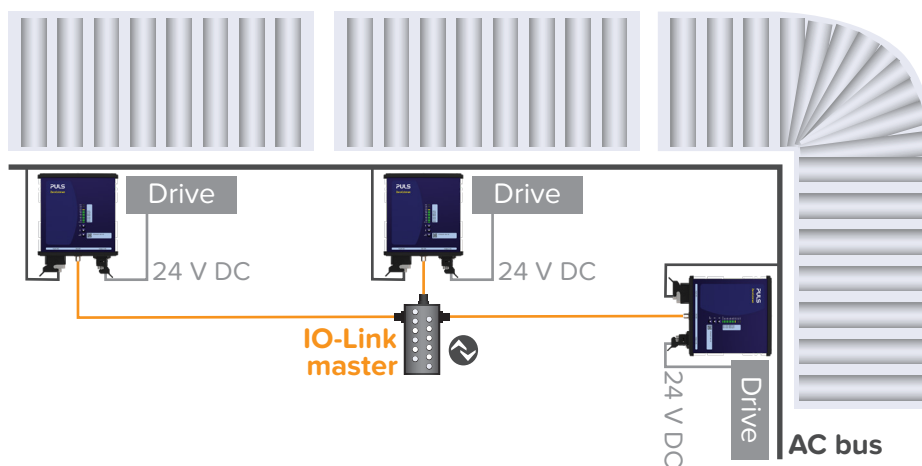
The range is based on 1-phase and 3-phase IP54–IP67 power supplies with 300 W or 500 W output power. It also features an IO-Link or output OK signal as a communication

Without ZeroCabinet – centralized



When relying on a centralized supply for the peripheral devices in the field, long cable harnesses with a large cross-section have to be taken into account. The power supply has to be oversized due to the associated loss of performance.

With ZeroCabinet – decentralized



There are many applications that can be supplied on a decentralized basis and in an energy-efficient and flexible manner. Individual system parts can be put together on a modular basis, allowing them to be extended, maintained, and converted more effectively.

interface. The various versions are based on this platform with numerous connector configurations as well as optional safety and redundancy functions. PULS classifies the devices into the two ZeroCabinet product series of Basic and eFused.

The devices in the Basic series have a single output, for which the various plug connectors such as M12-L/-T/-A, 7/8", or the HAN-Q series are available. Furthermore, the Basic version is also available with an integrated decoupling MOSFET on the output side and a soft output regulation characteristic. These two functions make the devices particularly ideal when it comes to assembling reliable redundant systems outside of

the cabinet and help to increase performance by establishing parallel connections.

The ZeroCabinet eFused series comes complete with up to four internally protected outputs. Thanks to the built-in current limitation, these devices can easily be used for selective current distribution and protection. The outputs are configured and monitored via IO-Link or via the practical human-machine interface located directly on the front panel of the device.

ZeroCabinet Basic series with single output

STRAIGHT FROM THE CABINET TO THE FIELD

With the ZeroCabinet Basic series, PULS is relocating the power supply from the cabinet directly into the field to offer an all-in-one power supply system for decentralized systems engineering.

BENEFITS

Flexibility

The compact housing with a high degree of IP protection (IP54–IP67) and various connection options facilitates flexible positioning directly on the machine.

Cost savings

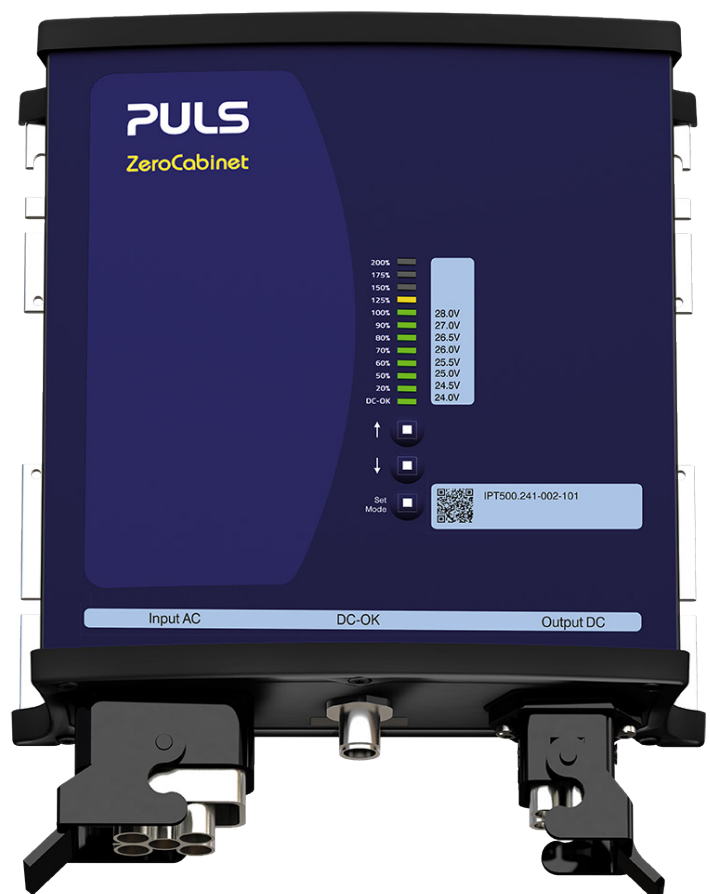
ZeroCabinet makes it possible to use shorter cables and smaller cable cross-sections. This not only saves on the costs of copper, but also on the installation work for the cabling.

Ease of use

The diagnostics and configuration of the output voltage take place directly on the front of the device or else remotely via IO-Link.

Environmentally friendly

The high degree of efficiency of >95% keeps the device cool. This means there is no need for any harmful potting compound.



| Technical overview | | 1-phase | 3-phase |
|--------------------|---------------------|----------------------|------------------|
| Input | | 85–264 V [170–264 V] | 320–550 V |
| Voltage | | 24–28 V | 24–28 V |
| Power | nominal | 300 W [500 W] | 300 W or 500 W |
| | continuous (<45 °C) | 360 W [600 W] | 360 W or 600 W |
| | 5 s | 600 W [1,000 W] | 600 W or 1,000 W |
| Efficiency | | >95% | >95% |
| Weight | | 1,400 g | 1,400 g |

Q & A

QUESTIONS & ANSWERS

Where can the ZeroCabinet devices be used?

The potential applications of ZeroCabinet are virtually limitless. That said, modular applications in the field of conveyor systems, storage technology, robotics, control technology, regulation technology, and material handling in particular all benefit from this technology.

What degree of protection is available for ZeroCabinet products?

The robust devices are available with IP54 (dust-protected, splash-proof), IP65 (dust-tight, jet-proof), or IP67 (dust-tight, temporarily immersible) protection, making them well protected against water, dust, and other contaminants.

Do ZeroCabinet devices have power reserves?

Yes, all devices provide 200% for 5 s and 120% continuously (at an ambient temperature of up to +45 °C).

What temperature range can the devices be used in?

ZeroCabinet products can be operated in ambient temperatures ranging from -25 °C to +55 °C without any loss of performance. With linear derating, temperatures of up to +70 °C being allowed.

Which plug connectors are available?

ZeroCabinet devices are available with the following plug types: 7/8", M12-L/-T/-A, HAN-Q series, and Quickon. Other plug configurations are available on request.

Is it possible to connect multiple ZeroCabinet devices in parallel?

Yes, it is easy to connect multiple ZeroCabinet Basic devices in parallel if you would like to increase power or achieve redundancy, for example. PULS offers a special ZeroCabinet version complete with droop function (soft output regulation characteristic) for load sharing in parallel operation and with integrated decoupling MOSFET for safe redundancy – even without an external redundancy module.

Can the device also be installed on the DIN rail?

Yes, all ZeroCabinet devices can be installed in three different ways: By simply attaching it to a DIN rail, by hanging and fixing it in place via the integrated keyholes, or by screw mounting. No matter which option you choose, no additional accessories are required.



ZeroCabinet devices can be connected in parallel to increase performance or achieve redundancy.

DECENTRALIZED ALTERNATIVE TO A POWER SUPPLY IN...

...A CENTRALIZED CABINET.

...A DECENTRALIZED ON-SITE CABINET.

...A COMPLEX, CUSTOMER-SPECIFIC SOLUTION.

ZeroCabinet eFused series with up to four outputs

DECENTRALIZED POWER SUPPLY WITH CURRENT-LIMITED OUTPUTS

With the ZeroCabinet eFused series, it couldn't be easier to establish selective current distribution, protection, and monitoring directly in the field. This gives you a decentralized alternative to power supplies protected by either an external, electronic four-channel protection module, four circuit breakers, or four external fuses.

The selective current distribution makes the eFused versions ideal for simultaneously supplying electromechanical loads (e.g., motors) and sensitive consumers such as PLC or sensors using a decentralized, fused power supply unit. What's more, the selective shut-down of faulty outputs makes for a high level of operational reliability. The eFused devices continue to impress on account of the clear benefits they offer over other solutions on the market.

Space savings

The integrated, current-limited outputs result in no additional protection modules being required. The high degree of protection (IP54–IP67) facilitates decentralized use directly on the machine.

Excellent system availability

The selective protection means only faulty outputs are switched off, which makes for excellent system availability.

Ease of operation

Tasks such as setting the tripping currents, resetting faulty electric circuits, and monitoring can all be completed via IO-Link or directly on the front of the device.

Straightforward admin and logistics

An all-in-one solution is used rather than several different components. This means less work when it comes to managing part numbers and less space taken up in the warehouse.



Q&A

QUESTIONS & ANSWERS

What happens in the event of a fault?

The device selectively switches off only the faulty outputs and reports this via IO-Link or output OK signal and the intuitive LED interface on the front of the device. Active current limitation means all other outputs continue to be supplied with voltage without restrictions. This is particularly important for sensitive and safety-critical loads such as PLCs or sensors.

Can the faulty electric circuits be reset remotely?

Yes, the electric circuits can be reset by IO-Link or even directly on the device.

How do you adjust the tripping circuits?

You can set your preferred tripping currents easily using the buttons on the device or remotely via IO-Link.

Is it also possible to create NEC class 2 compliant circuits?

Yes, that's possible. You can set the tripping current to the NEC class 2 standard either directly on the device or via IO-Link. In the event of an overload, the current is limited for a set period. The current limitation then intervenes to ensure that the maximum permissible power peak of 100 VA defined for NEC class 2 is not exceeded at any point.

What has to be taken into consideration in terms of the order of the outputs?

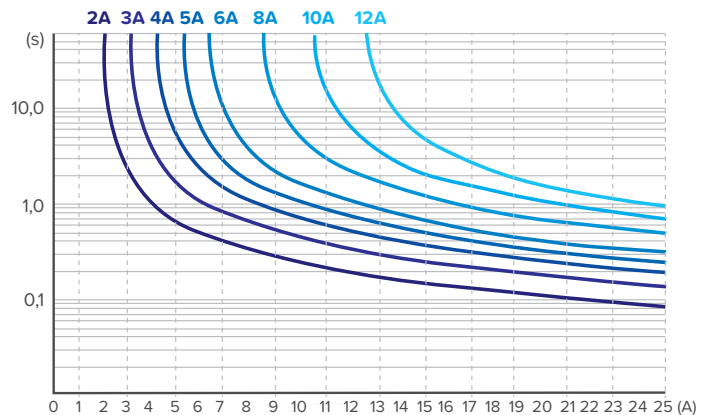
The devices have a selectivity function that enables prioritized protection of sensitive loads. Output 1 has the highest priority, output 4 has the lowest. If the current budget is exceeded, the device switches off the outputs with the lowest priority first.

Are the outputs activated on a staggered basis?

Yes, the outputs are switched on according to their priority and in 100 ms increments.

Which tripping characteristics are the devices based on?

A different characteristic curve applies in each case depending on the set tripping current. For example: if the tripping current is set to 4 A, the output allows 1.25 times the nominal current – i.e., 5 A – for 2 seconds and then switches off. Take a look at the graphic for details.



The graphic shows the characteristic curves that form the basis for shutting down the outputs. A different characteristic curve applies in each case depending on the set tripping current.

THE DECENTRALIZED ALTERNATIVE TO A POWER SUPPLY WITH...

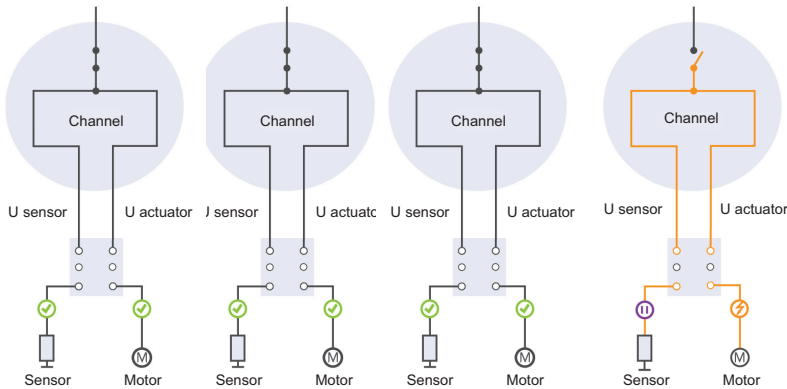
...AN EXTERNAL, ELECTRONIC, 4-CHANNEL PROTECTION MODULE.

...4 CIRCUIT BREAKERS.

...4 EXTERNAL FUSES.

THE PERFECT SOLUTION FOR EVERY APPLICATION

The ZeroCabinet eFused devices are available with various output configurations. This results in the following circuit designs.

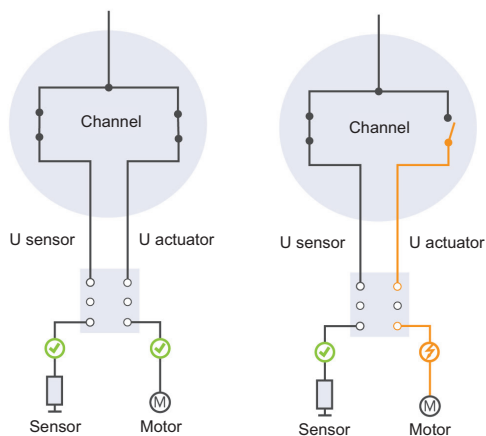


Option 1 4 outputs. 4 load branches.

In this version, the sensors and actuators share a load branch. In the event of a fault, the circuit opens and all components connected to this output are no longer supplied. The other outputs are not affected by this fault.

The following ZeroCabinet eFused versions are suitable for this solution:

- 3-phase, 300 W* M12-A: **IPT300.246-042-101**
- 3-phase, 300 W* 7/8": **IPS300.245-016-101**

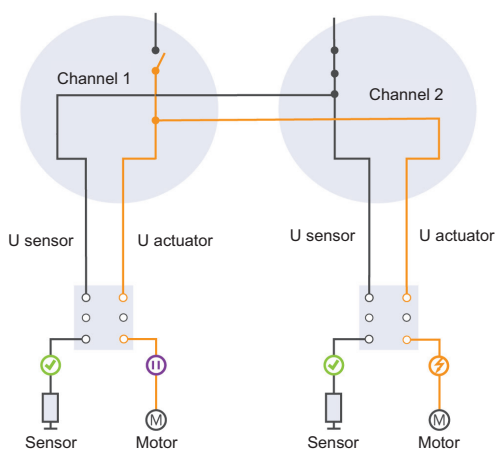


Option 2 2 outputs. 4 load branches.

This circuit allows for two separate circuits for sensors and actuators for each output. With this configuration, a maximum of 4 separate load branches can be established with two connectors.

The following ZeroCabinet eFused versions are suitable for this solution:

- 1-phase, 300 W* 7/8": **IPS300.245-018-103**
- 1-phase, 500 W* 7/8": **IPS500.243-018-104**
- 3-phase, 500 W* M12-L: **IPT500.245-034-105**
- 3-phase, 500 W* 7/8": **IPT500.245-018-103**



Option 3 2 outputs. 2 load branches.

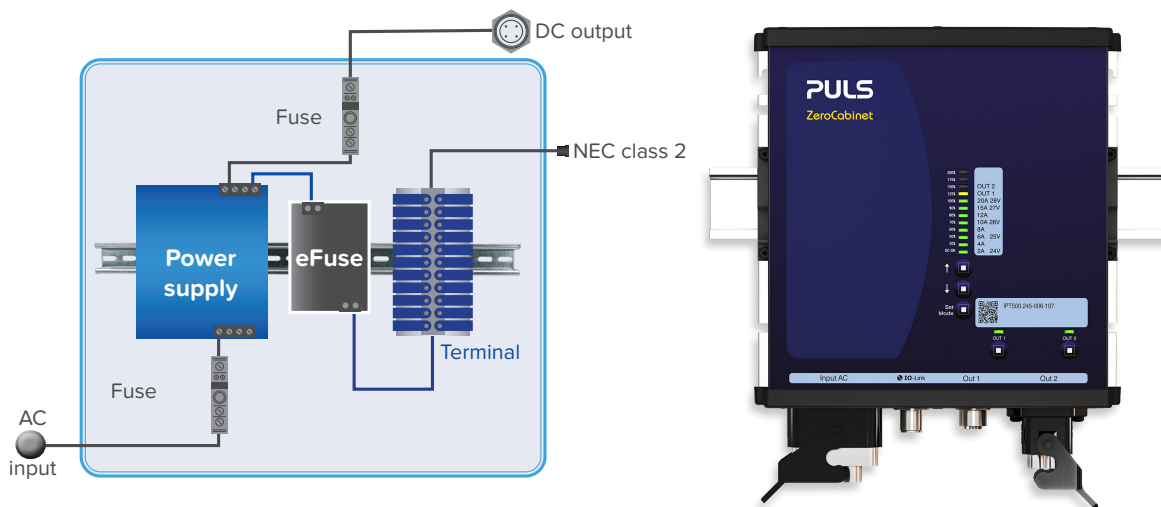
This circuit shows that a separately protected actuator and sensor circuit can be set up, regardless of which output the components are connected to. In the event of an actuator fault, only the voltage for the actuators (e.g. motor) is switched off. All sensors continue to be supplied without restriction.

Several ZeroCabinet eFused versions are currently being developed for this solution.

*Other versions available

THE ALTERNATIVE TO AN ON-SITE CABINET

ZeroCabinet eFused is also available with a current-limited high-power channel (20 A) and an additional fused low-power channel (2–12 A). The compact ZeroCabinet device can be attached directly to the machine and replaces decentralized on-site cabinets such as those comprising a 24 V 20 A power supply and an electronic fuse for creating an electric circuit compliant with NEC class 2 standards.



| Decentralized cabinet | ZeroCabinet |
|----------------------------------|----------------------------------|
| IP67 housing | IP67 housing |
| Power supply | Power supply |
| Electronic output fuse | Electronic output fuse |
| Input fuse (optional) | Input fuse (optional) |
| Distribution terminal | Distribution terminal |
| Cabling | Cabling |
| Plug connectors for input/output | Plug connectors for input/output |
| Working time | Working time |
| Space | Space |



Kamil Buczek from PULS on the ZeroCabinet platform

“DECENTRALIZATION MADE EASY”

Decentralization is one of the latest major trends in the production industry. Kamil Buczek, ZeroCabinet Product Manager for PULS – the power supply specialists – tells us more about how a decentralized power supply is set to become a crucial component in factories of the future.

**So Kamil, what would you have to say about ZeroCabinet in an elevator pitch?
We'll give you two sentences to pique our interest – over to you!**

If your existing power supply solution is slowing you down in your decentralization plans, we should talk.

**The ZeroCabinet products are more expensive than an IP20 power supply.
Why should customers be prepared to invest more in their power supply?**

Well it's a little misleading to try and make a direct comparison with the purchase price of an IP20 power supply in the cabinet. With the ZeroCabinet platform, you can replace entire cabinets, including all cables, connections, and electronic fuses. So when you put it in perspective the ZeroCabinet product is actually more cost-effective than decentralized in-house models or customer-specific solutions. Cross out and on top of the lower material costs, you also have to remember the savings in terms of time required for installation and maintenance, not to mention the significant savings on space.

What are your plans for ZeroCabinet going forward?

Our aim is to develop ZeroCabinet into a comprehensive system that will allow us to offer a suitable, decentralized standard solution to as many customers as possible. This is why it is so important for us to talk to lots of companies about their potential applications. We want to understand what our customers really need and find out how our ZeroCabinet platform can help them make their decentralization plans successful. We are currently in the process of analyzing which other performance classes have the highest demand, for example.

Do you have any more examples of how you plan to develop the system?

Yes, a potential customer from Japan recently asked us about a ZeroCabinet solution featuring integrated Power over Ethernet channels. This is a really exciting application that we hadn't come across before, so we are now looking into how we can implement this with our platform and whether this could also lay the foundations for another standard product.

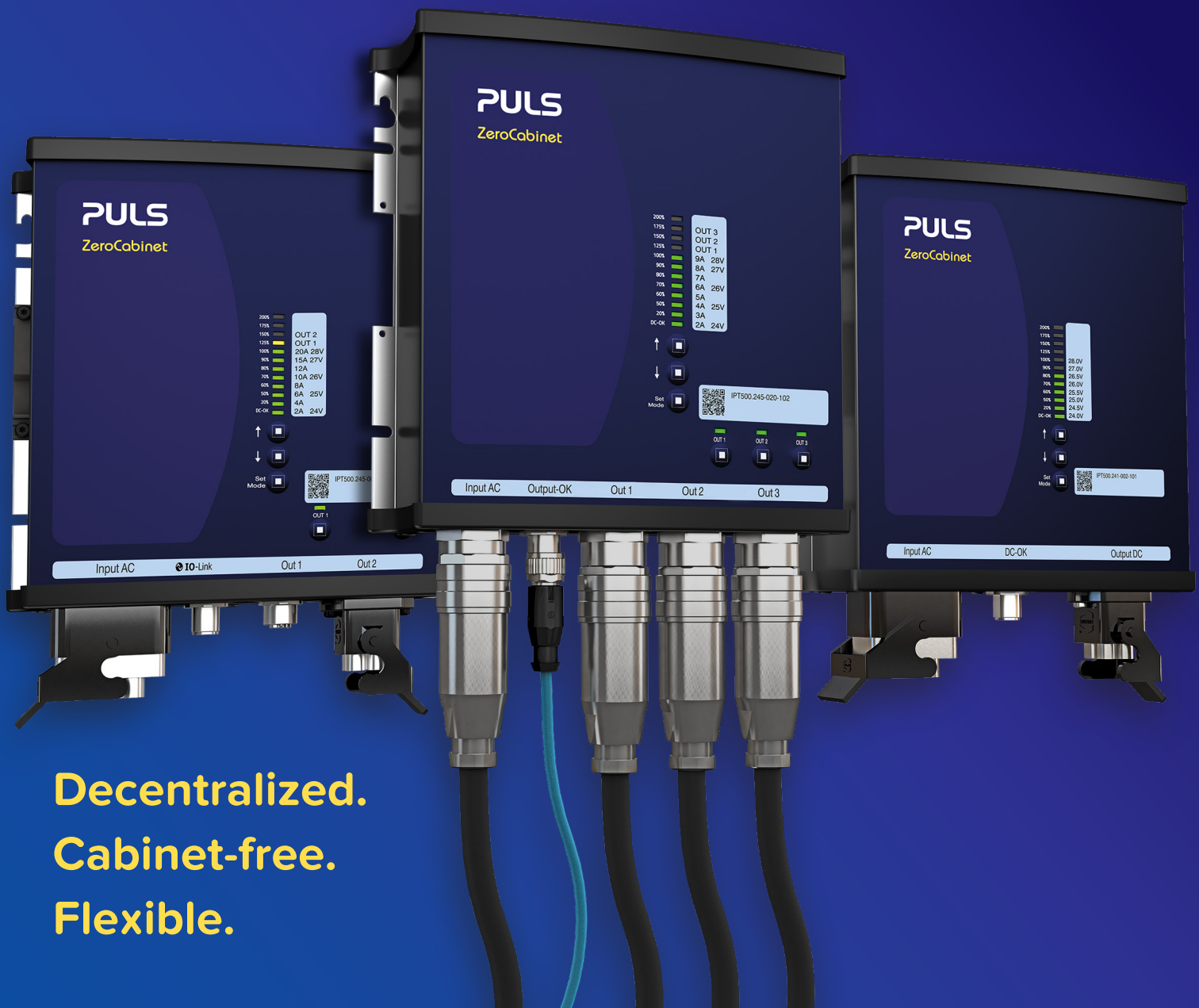
When will the ZeroCabinet products be available?

We will have devices in stock from Q2/2020. My colleague Ulrich Ermel and I will be sharing more details on our roadmap, planned approvals, and the technical workings of the devices as part of our A&D webinar on June 19.

ZeroCabinet

Power supply systems

1-phase, 3-phase, 300 W or 500 W



**Decentralized.
Cabinet-free.
Flexible.**

IP54–IP67 housing | Wide variety of options | Optional current limitation
Environmentally friendly design without potting

D

Webinar

Decentralized power supplies

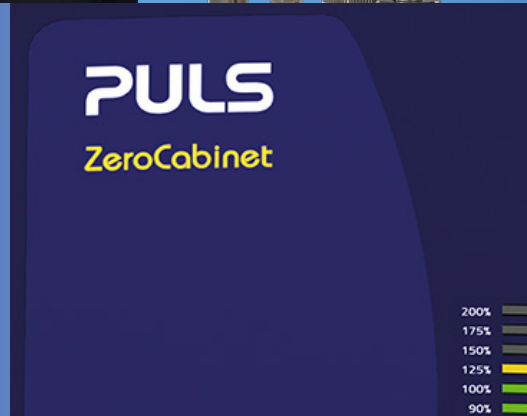
What's already possible today.



Kamil Buczek



Ulrich Ermel



PULS ZeroCabinet Webinar

Find out how a decentralized power supply system can save you material costs, installation time, and space in your applications and warehouse.

Friday, 6/19/2020 from 10:00 to 11:00 a.m.

Register here: bit.ly/ZeroCabinet

