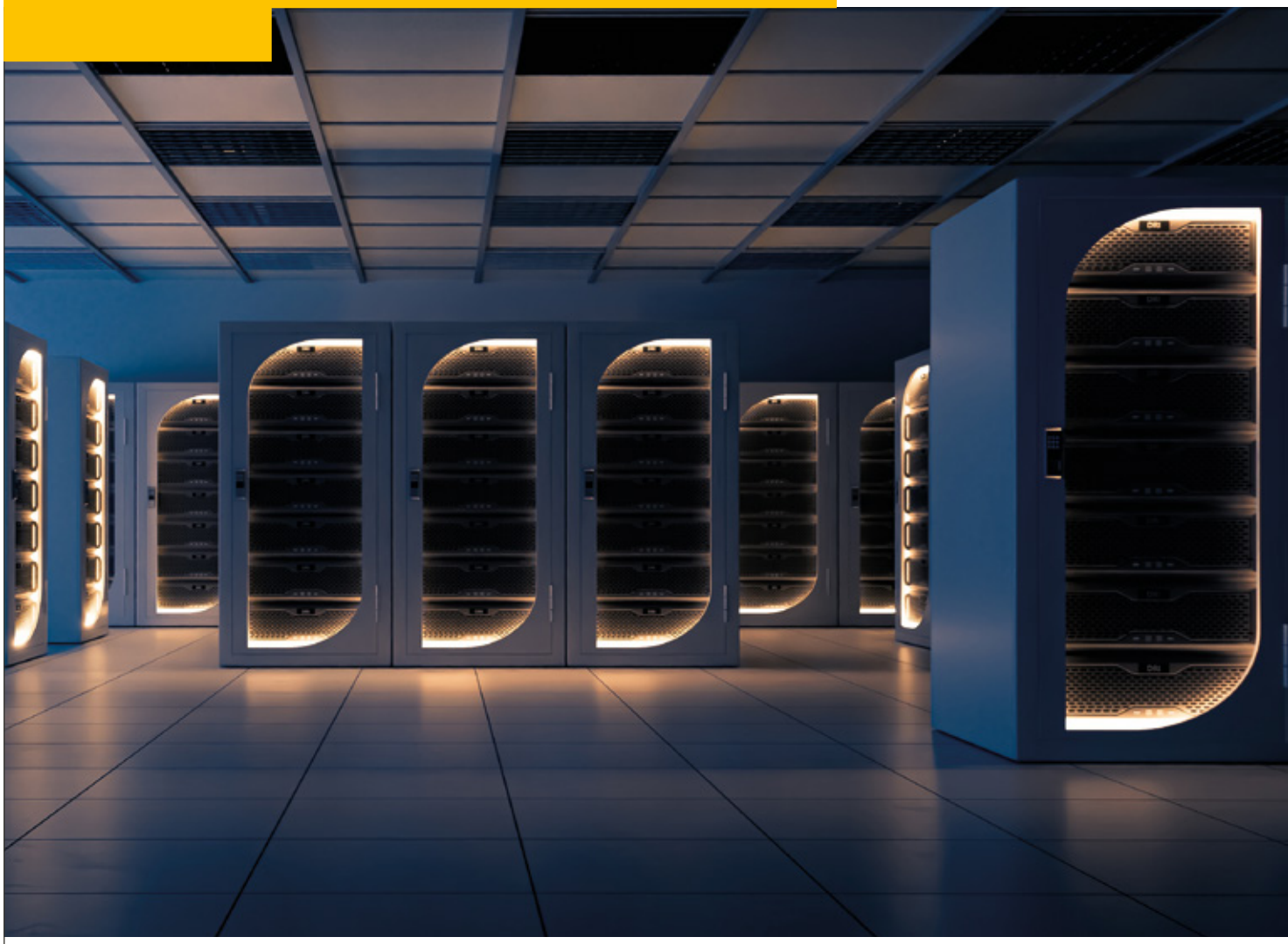
Data centres

Safety, maximum availability
and efficient operation



Design the future
of energy

BENDER

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Safety, maximum availability and efficient operation

Protect data

Data protection is one of the most important requirements for data centres. Great efforts are therefore being made to ensure that servers are not compromised. But when it comes to protecting data, it is not enough to focus solely on the IT infrastructure. Many other aspects have to be considered. Above all, a reliable power supply is important.

To be prepared for power failures, data centres have an alternative power supply (e. g. diesel generators). This should guarantee uninterrupted operation of servers and other important components. However, if one of these components fails due to a technical fault, a UPS alone is not enough. Further measures must be taken to prevent failures and ensure high availability 24/7/365.

Prevent failures

Data centres are highly complex systems. They consist of the IT components and other electrically operated system parts that ensure that the IT components can run smoothly. This includes the cooling system as well as the power supply with all the components required to provide the electricity. If even just one of the components fails, other parts of the system or even the entire data centre can fail, which is associated with considerable costs and possibly also data loss.

Ensure safe operation

Fewer and fewer staff are required to monitor and maintain the highly complex operation of data centres. Smooth and efficient operation of the data centre can only be ensured by monitoring systems that enable staff to easily monitor and assess the condition of the entire system at all times. This is the only way to detect errors quickly and ensure high availability.

Enable efficient operation

In times of high energy prices, greater attention must be paid to the cost efficiency and cost-effectiveness of data centres in order to remain competitive. Systematic energy management in accordance with ISO 50001 helps operators to increase the efficiency of data centres and save energy.

Electrical safety, availability and DIN EN 50600

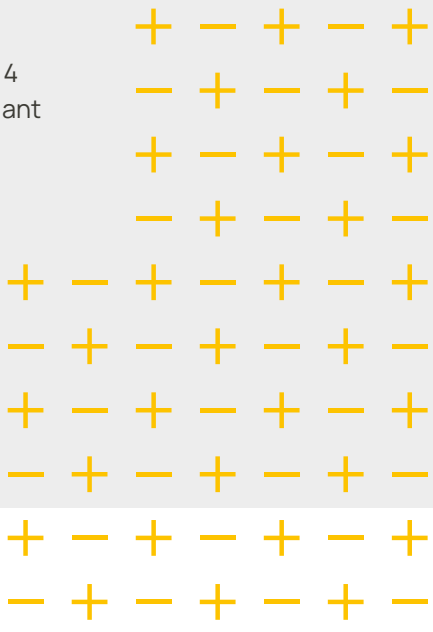
The DIN EN 50600 or ISO / IEC TS 22237 standard (often referred to as the data centre standard) specifies how a data centre must be structured in order to ensure safe and efficient operation. It specifies requirements for the building construction, power supply, air conditioning, cabling and safety systems and describes requirements for operation.

DIN EN 50600 distinguishes between four availability classes for data centres. Depending on the availability class, different measures must be taken to maintain operations.

Availability class	Availability class 1	Availability class 2	Availability class 3	Availability class 4	Availability class 4 advanced
Availability	low	medium	**high**	**very high**	
DIN EN 50600-2-2 power supply	no redundancy	components redundancy	**maintenance in ongoing operation**	**fault tolerance (transfer switch)**	
Supply paths	of an N	of an N+1	several 2N	several 2N	
DIN EN 50600-2-3 Monitoring of the environment	—	no fail-safety	**Components redundancy**	**maintenance in ongoing operation**	
Supply paths	—	of an N	of an N+1	of an N+1	several 2N

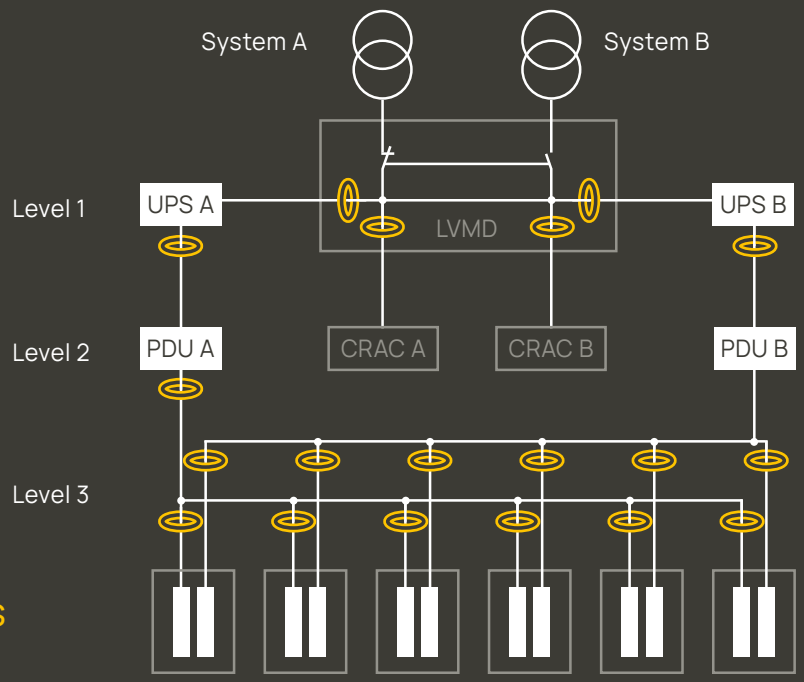
Data centres that are operated according to availability class 3 or 4 require additional precautionary measures in addition to redundant systems. This also applies to the power supply. This may not be spontaneous or unpredictable.

Faults in the power supply or cabling must therefore be detected early and reliably in order to prevent failures and keep the data centre up and running.



Energy efficiency qualification in accordance with DIN EN 50600

In addition to the availability classes, DIN EN 50600 also specifies requirements for energy efficiency. The standard defines three so-called granularity levels to measure electricity consumption and thus uncover potential savings. These differ in the degree of coverage of the measurements – i.e. in the number of measuring points and in the analysis of the power consumption of individual circuits, subsystems and components.



Granularity levels
for **monitoring** electrical loads
in data centres

The PUE value (Power Usage Effectiveness) is usually used to measure energy efficiency in data centres. Operators should always keep this value in mind. A PUE of 2.0 means that for every watt used to operate IT devices, a further watt must be used for power distribution and for cooling the IT devices. The closer the PUE comes to a value of 1.0, the more efficiently the energy is used for the actual computing power. To fulfil the energy efficiency requirements of DIN EN 50600, the use of an energy management system is recommended. In addition to the current energy consumption, this must also monitor and log other important measurement data. These include voltage quality, power factor, voltage fluctuations, harmonics, frequency fluctuations, flicker and transients. Under- or overruns of defined limit values must be reported promptly.

Periodic inspections in accordance with DGUV Regulation 3

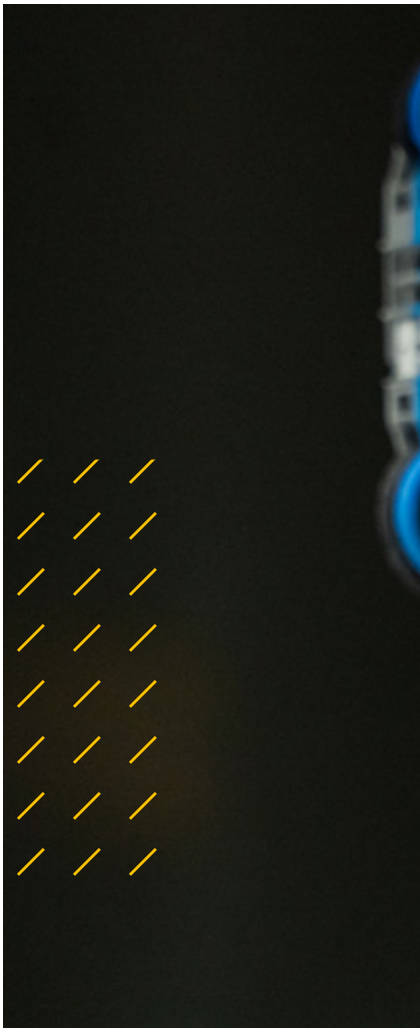
No electrical system runs permanently without faults. Faulty electrical devices or installations pose a danger to people. To prevent accidents caused by electric shock, the German Social Accident Insurance stipulates that operators and those responsible for electrical installations must check them regularly and rectify any defects immediately (see DGUV Regulation 3).

The electrical systems and equipment must be switched off and disconnected from the power supply before the test can be carried out and defects rectified. In a data centre that has to be available 24/7, such interruptions are undesirable. In addition, the inspection only provides a snapshot of the condition of the system.

Operators can take technical, organisational and personal safety measures to prevent systems and equipment from being switched off.

One such safety measure can be the installation of a measuring device that replaces the time-consuming testing of systems and equipment.

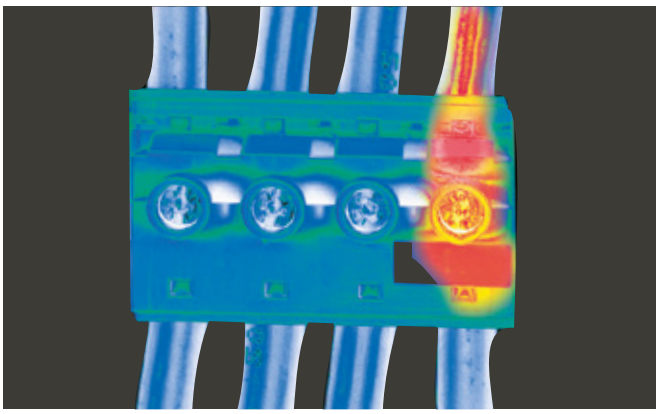
The residual current monitoring solutions from Bender fulfil these requirements.



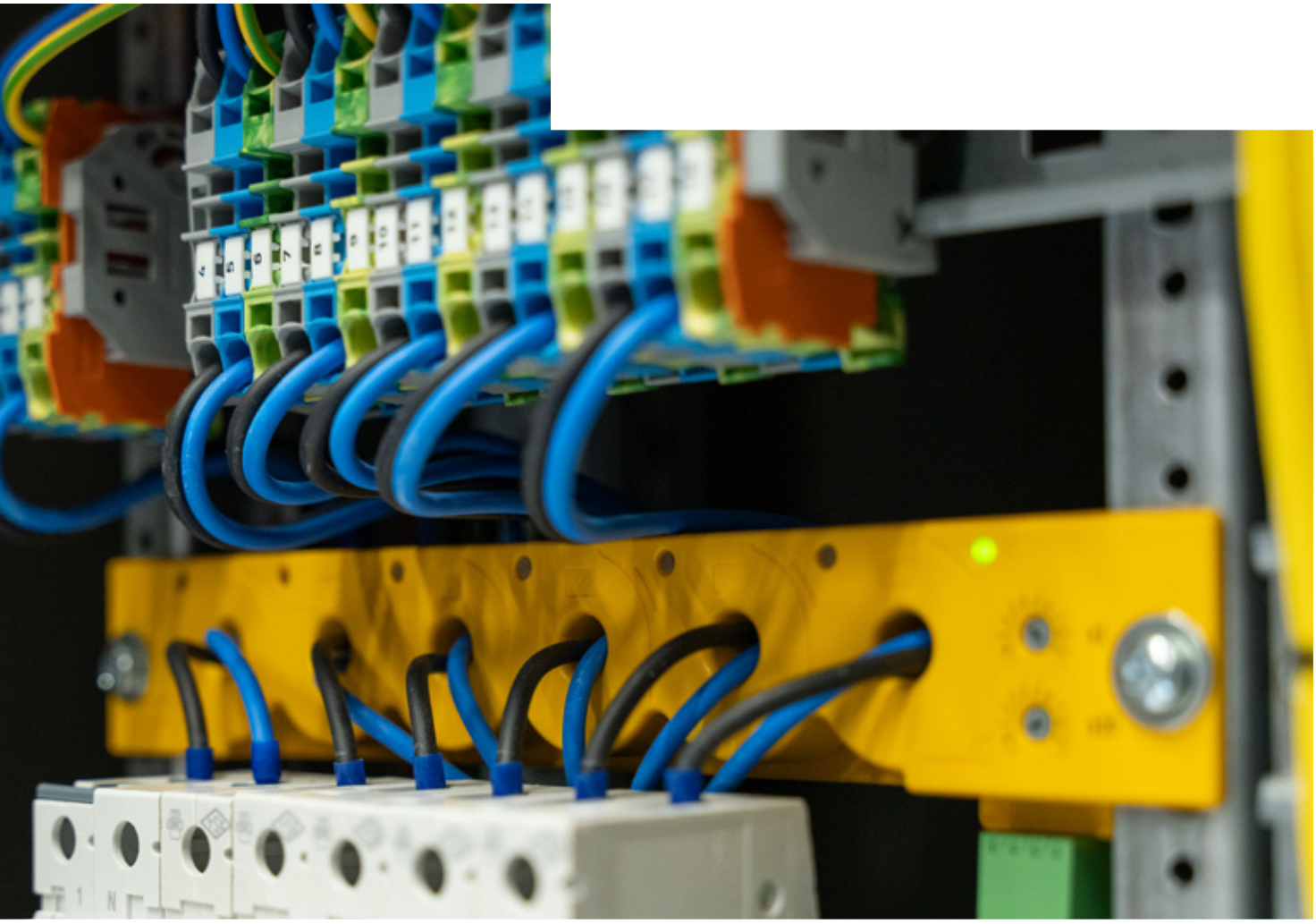
Fire protection

Even the smallest electrical faults can lead to fires. The main cause of fires in electrical devices or systems is insulation faults and the resulting residual currents. These can be caused by inadequate insulation, mechanical damage to device connection cables or brittle insulation of devices due to permanent thermal stress.

Detecting insulation faults and the associated residual currents in good time is an important part of fire protection in data centres.



Overload of the neutral conductor



Electrical safety for data centres

How can data centres be operated economically and with high availability without having to compromise on system safety and personal safety?

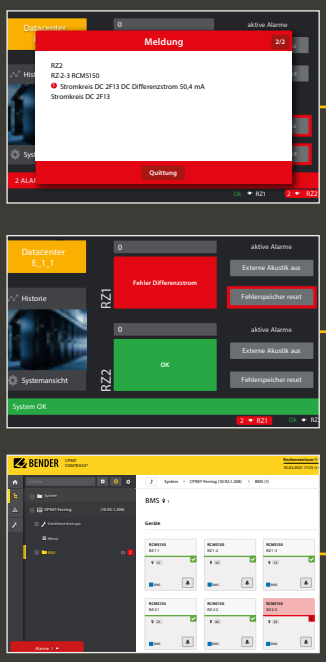
Continuous monitoring of the entire electrical system (server, air conditioning, infrastructure), including power supply and cabling, is essential in order to meet the requirements for safe operation. If data centres are to be operated in accordance with availability class 3 or 4, measures must also be taken to prevent interruptions to operations due to maintenance or faults.

The use of a **Condition Monitoring System with residual current monitoring is recommended here**. This system continuously monitors the condition of the entire electrical system and detects faults quickly and reliably before an unplanned interruption to operation occurs. In addition, faults can be easily localised with a residual current monitoring system. This enables operators to react quickly and in a targeted manner in order to rectify the fault and avoid critical operating states.

What advantages the Condition Monitoring solution from Bender offers

The advantages lie primarily in prevention. **As the measurements are taken continuously, any faults and critical operating states are recognised at an early stage, long before a failure is imminent**. At the same time, the risk of electrical fires is reduced and personal protection is improved, as an alarm is signalled if fault currents occur that could endanger people. Permanent residual current monitoring is also a recognised measure for dispensing with R_{iso} measurement during periodic testing in accordance with DGUV Regulation 3. This means that it is not necessary to switch off individual devices, system components, servers or server strands. In addition, the personnel and administrative costs for manual R_{iso} measurement are reduced.

With continuous residual current monitoring, the data centre can be operated not only more economically, but also more safely.



Examples of status displays for a Bender Condition Monitoring System

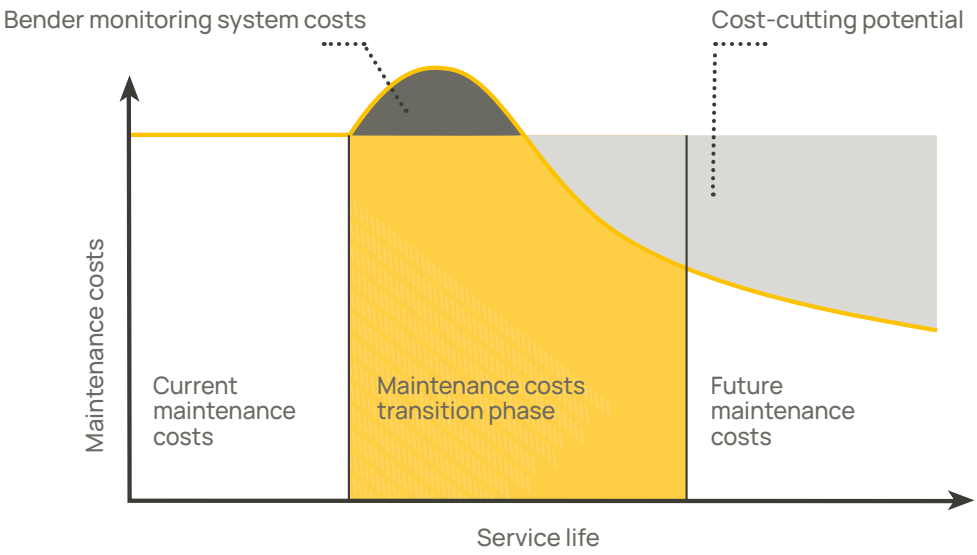
The benefits at a glance

- Continuous monitoring of the system
- Simple overview
- Early fault detection
- Fault localisation
- Cost of testing according to DGUV Regulation 3 decreases
- Lower risk of electrical fires

For you as a data centre operator, this means

- Risk of spontaneous and unplanned business interruptions is reduced
- Improved availability and cost-effectiveness
- Increased personal and system protection
- Personnel expenses are reduced

The purchase of a Bender Condition Monitoring System is of great benefit to data centre operators and pays for itself after a relatively short time.



Transparency and efficiency for data centres

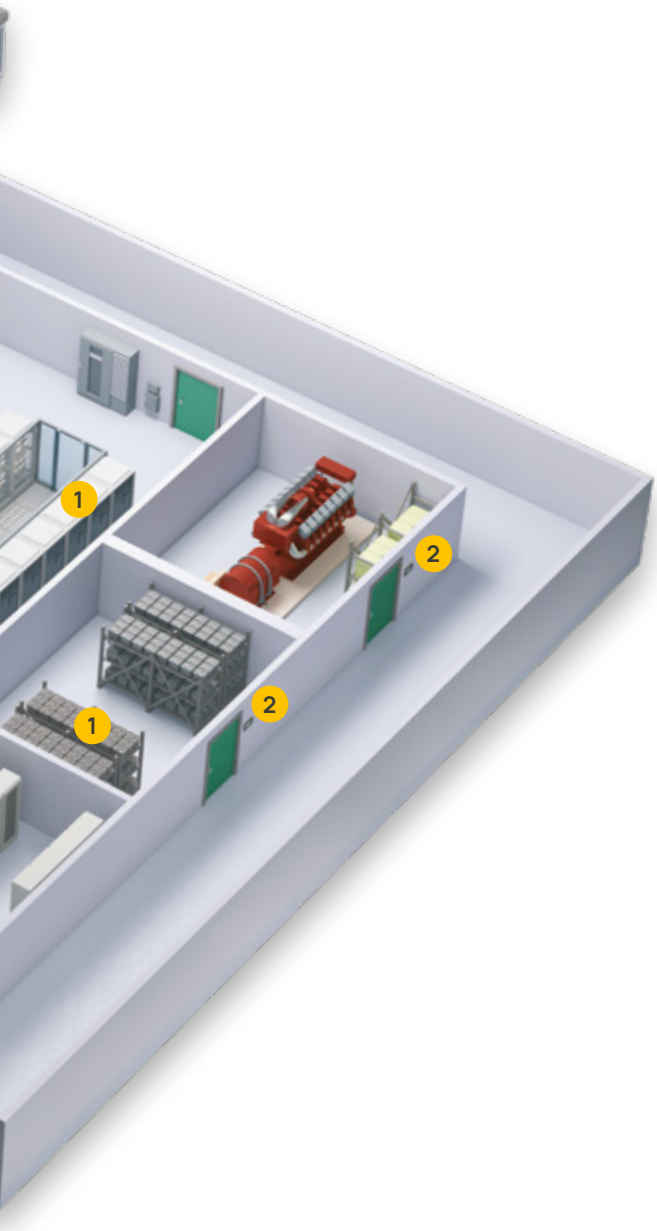
Efficient monitoring and management with higher-level software solutions

The use of a Datacenter Infrastructure Management System (DCIM) is essential to minimise risks and optimise the performance of data centres, as well as to ensure high availability and sustainability. The **DAMS C** IT platform enables efficient monitoring of all important processes in data centres: from asset and cable management to the administration of IMAC processes and workflows to performance and energy monitoring.

The energy data management solution included in **DAMS C** is ISO 50001 certified and supports the entire process from meter data collection to the visualisation of real time consumption or company processes. With the help of the DAMS C software and Bender sensors, energy efficiency can be realised in accordance with DIN EN 50600. Typical key figures such as the PUE value are calculated continuously.

The web-based software solution **POWERSCOUT®** from Bender is the ideal complement to the Data Centre Infrastructure Management System DAMS C to further increase system and operational reliability and reduce costs due to unplanned downtime. It helps to recognise faults at an early stage and eliminate the causes economically. The data and measured values are displayed on clear dashboards and reports and constantly adapted to the process requirements.

Additional analysis functions allow the system status to be assessed over a longer period of time, trends to be visualised and the causes of faults to be easily identified. POWERSCOUT® also saves the data and creates automated reports for the periodic inspection in accordance with DGUV Regulation 3.



How does the holistic monitoring solution from Bender work?

Monitoring systems from Bender consist of sensors for recording energy consumption, power quality and electrical safety parameters, a condition monitor and the higher-level monitoring software. The Condition Monitor is a kind of gateway that collects the data from the sensors and forwards it to the higher-level software solution, but can also process and visualise it locally.

Residual current sensors (e.g. LINETRAXX® RCMS series) monitor the electrical system for possible faults. Other sensors permanently record current, voltage and consumption data. The measured values as well as alarm and status messages are forwarded to the Condition Monitor (e.g. COM465 or CP9...-I) via the available interfaces (e.g. Modbus RTU/TCP). Measured value curves and statuses in the electrical system are displayed locally either on a screen via an Internet browser (COM465) or on a Condition Monitor with display (CP9...-I). The data from the Condition Monitor is usually passed on to a higher-level software solution. In Bender's overall solution, this software solution is the Datacenter Infrastructure Management System DAMS C from partner speedikon FM AG and the cloud solution POWERSCOUT® for the area of electrical safety.

As this holistic monitoring system works 24/7 without interruption, the system status can be assessed over a longer period of time. This gives staff an optimum overview of the status of the electrical system at all times.

1

Sensors and evaluation units

2

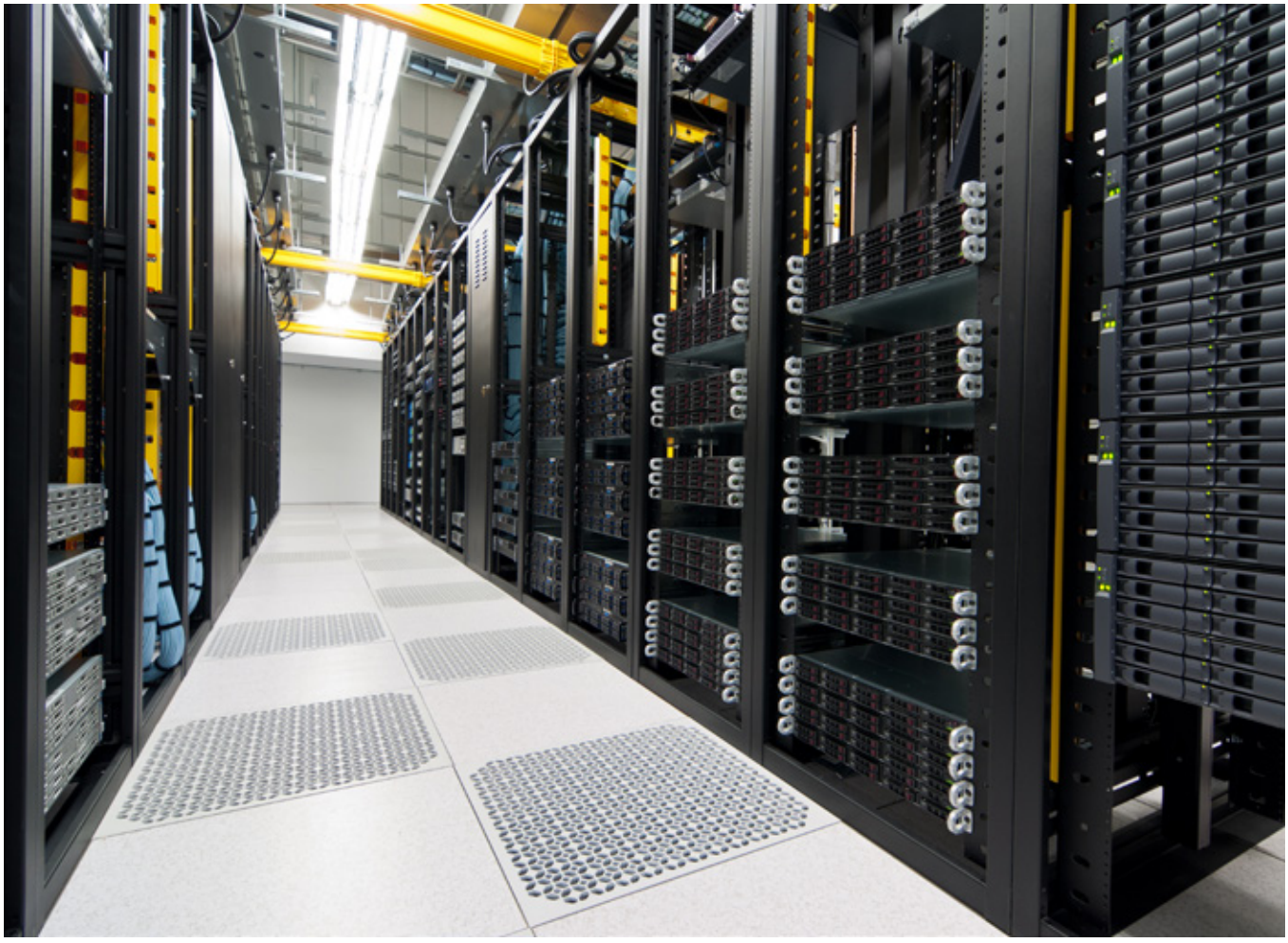
Condition Monitor

3

POWERSCOUT® and DAMS-C

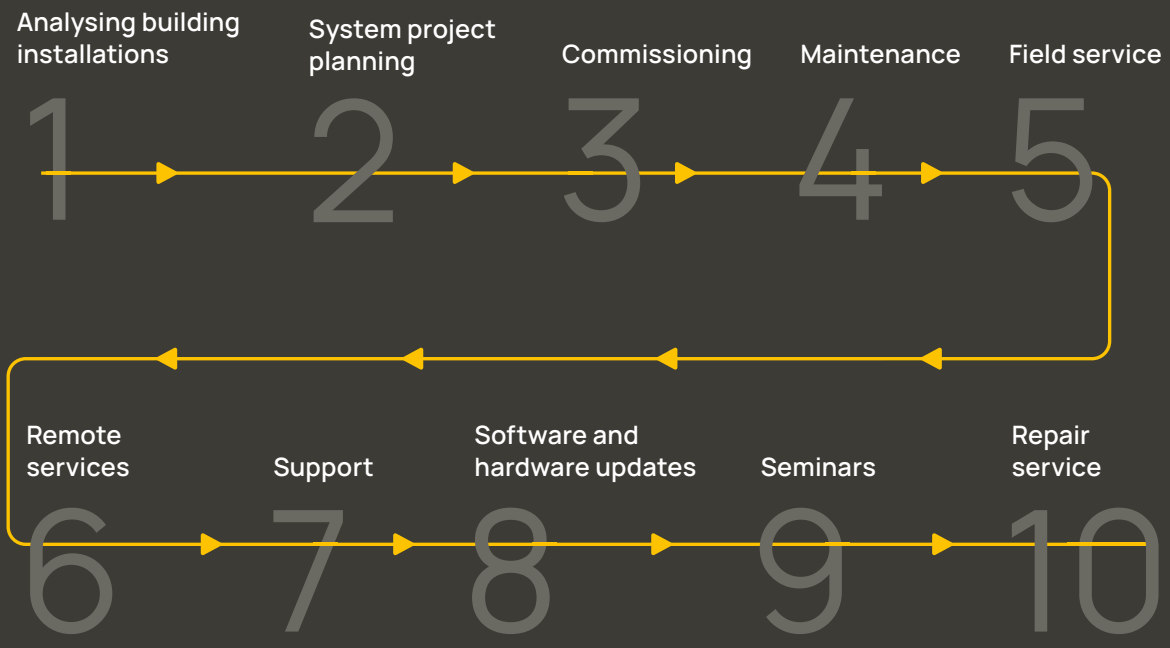
Intelligent planning
for small and large data centres

The larger a data centre is, the larger and more complex the entire electrical system is. The more parts of the system that are monitored, the better the overview of energy consumption and system statuses and the more precisely any faults that occur can be quickly localised and rectified.**When planning a data centre, it is important to consider how detailed a monitoring system should be designed** in order to meet the operational and normative requirements, in particular those from DIN EN 50600 or ISO/IEC TS 22237 and their availability classes (see page 6) and granularity levels (see page 7). In addition, the use of Data Centre Asset and Infrastructure Management software during the planning phase can increase efficiency and support the design and documentation process.



Economical and safe

From planning to after-sales service
Competent service from your expert for safety and high availability



Bender has decades of experience in the field of electrical safety and offers practical solutions that pay off and ensure greater safety.

Do you have any questions? We support you in all matters relating to electrical safety and energy management, from planning to after-sales service.

You can find your contact person here:
www.bender.de/en/contact/bender-worldwide/

You can find more information about our data centre solutions here:
https://www.bender.de/en/solutions/data-centres/

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