THE CHALLENGE OF
HIGH AVAILABILITY

ENERGY MONITORING FOR DATA CENTERS

Janitza®

CONTENTS

SAFETY AT THE HIGHEST LEVEL

Data centers are designed to supply power to IT components without interruption and to ensure IT productivity through appropriate redundancies. Accomplishing this requires the use of complex power supply systems, components such as UPS (uninterruptible power supply) systems and emergency power systems. Multiple feeds provide redundant current paths.

Monitoring systems for the transparency of electrical energy flows are essential to prevent energy bottlenecks at the system-relevant components. Electrical high availability must be monitored proactively and limit violations must be reported quickly.

This means the energy management systems in data centers must be able to do more than just record meter readings. They should be able to evaluate the power quality and identify weak points. To do so requires that, in addition to measuring current and voltage, the power factor and – if possible – current and vo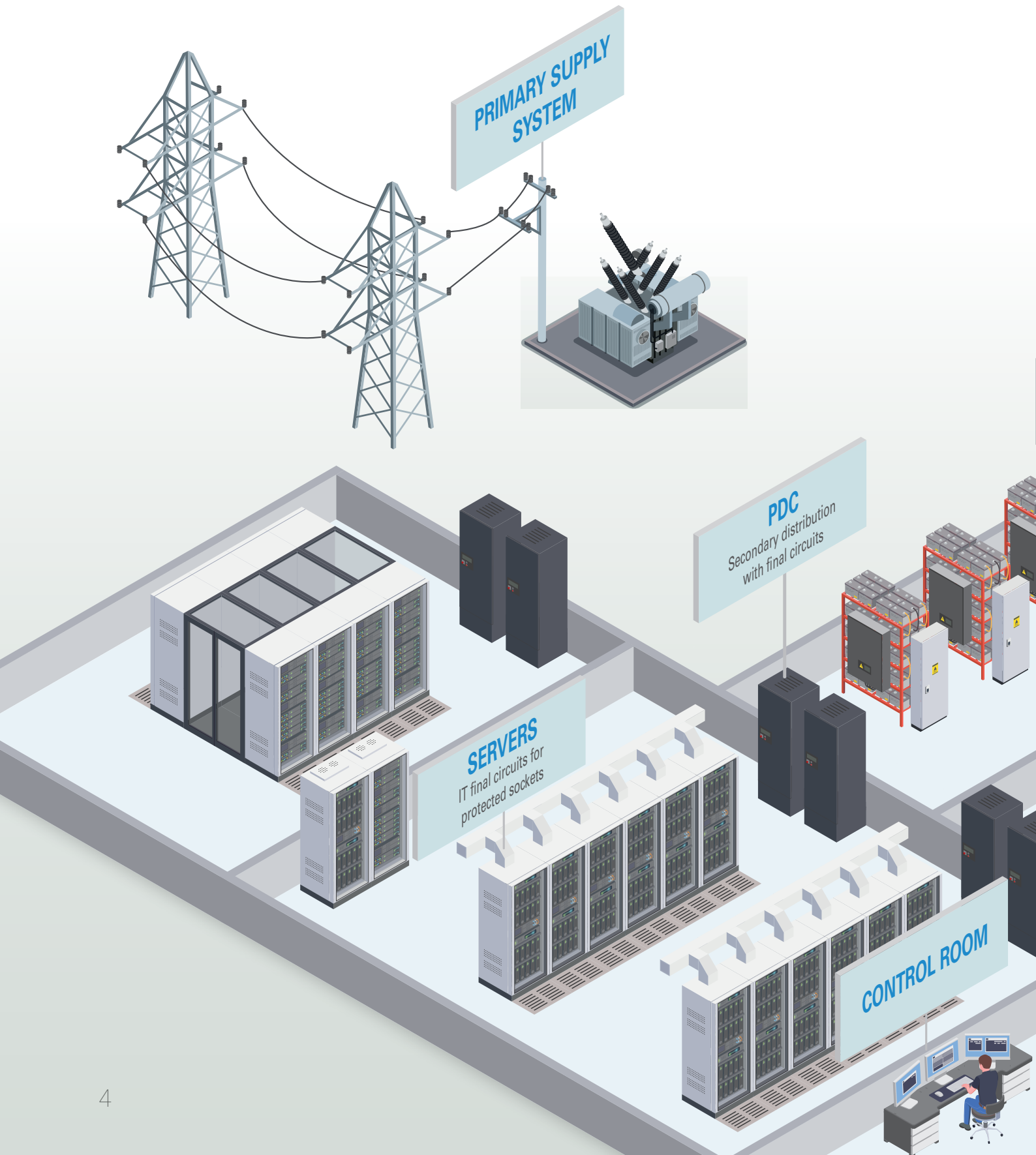ltage distortions on all connected phases as well as on the neutral conductor also be recorded. Ideally, the measurement devices should also detect residual current and monitor the condition of the 5-wire TN-S system.

The energy management system must record all major energy types at the key nodes. In addition, important parameters for compliance with principles of electrical high availability must be monitored and logged in the background. This requires fast measurement technology that continuously displays and records power quality parameters at high sampling rates. A high-performance alarm management system reports violations of limit values of the respective parameters immediately.

Janitza electronics offers modular system solutions to realize the requirements of an energy management system according to DIN EN ISO 50001 as well as energy efficiency enablement according to ISO/IEC DIS 22237-3.

ENERGY DATA ACQUISITION
IN DATA CENTERS

PRIMARY SUPPLY SYSTEM

PDC
Secondary distribution with final circuits

SERVERS
IT final circuits for protected sockets

CONTROL ROOM

HIGH AVAILABILITY

- Monitor high availability
- Provide evidence of power quality
- Monitor redundancies
- Avoid shutdowns

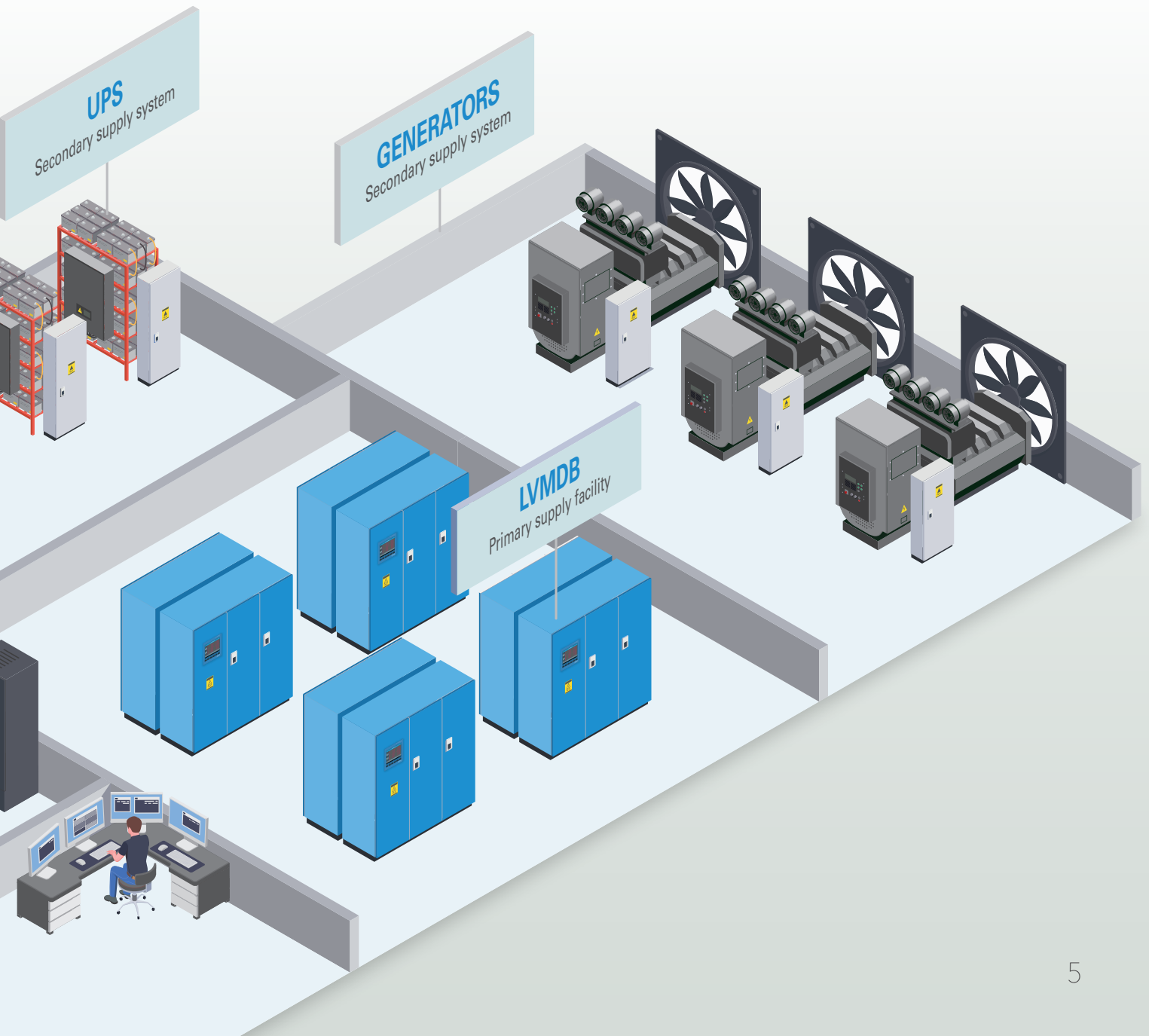## FIRE PROTECTION AND EMC

- Monitor residual current

ENERGY EFFICIENCY

- Show losses
- Calculate utilization
- Key performance indicators and forecasts
- Benchmarks

COST CENTER MANAGEMENT

- Calculate energy costs

CORE TASKS

UPS
Secondary supply system

GENERATORS
Secondary supply system

LVMDB
Primary supply facility

THE RIGHT MEASUREMENT TECHNOLOGY AT EVERY POINT

To ensure optimal energy efficiency and meet legal requirements requires that the right measurement technology be used in the right place. Conformity to standards must be observed, since the applicable standards already specify where and how measurements must be made. The harmonized standards ISO/IEC DIS 22237-3 define three levels of granularity with respect to energy efficiency enablement. They describe the measurement points at which the power consumption is to be recorded. In the range of granularity levels 1-2, the total energy of the data center and the IT is measured, and key performance indicators such as PUE (Power Usage Effectiveness) are calculated.

GRANULARITY LEVEL 1

Granularity Level 1 provides measurement of power supply characteristics of the primary, secondary and additional supplies (as appropriate) and at the output of the UPS equipment supplying the protected sockets. This is where what can be considered an incoming goods inspection of the energy takes place. The energy consumption must be recorded with measurement Class 0.5 for active energy and active power on all phases. The current transformers must comply with at least IEC 61869-2:2012, Class 0,5 and the measurement devices with the requirements of IEC 62053-22:2003, Class 0,5S or EN 61557-12:2008 Class 0.5; better however, is class 0.2 in combination with Class A measurement devices such as the UMG 512-PRO.

GRANULARITY LEVEL 2

Granularity Level 2 provides measurement of power supply characteristics at appropriate intermediate points between the primary distribution equipment and the outputs of the final secondary distribution equipment. Energy consumption must be measured with measurement Class 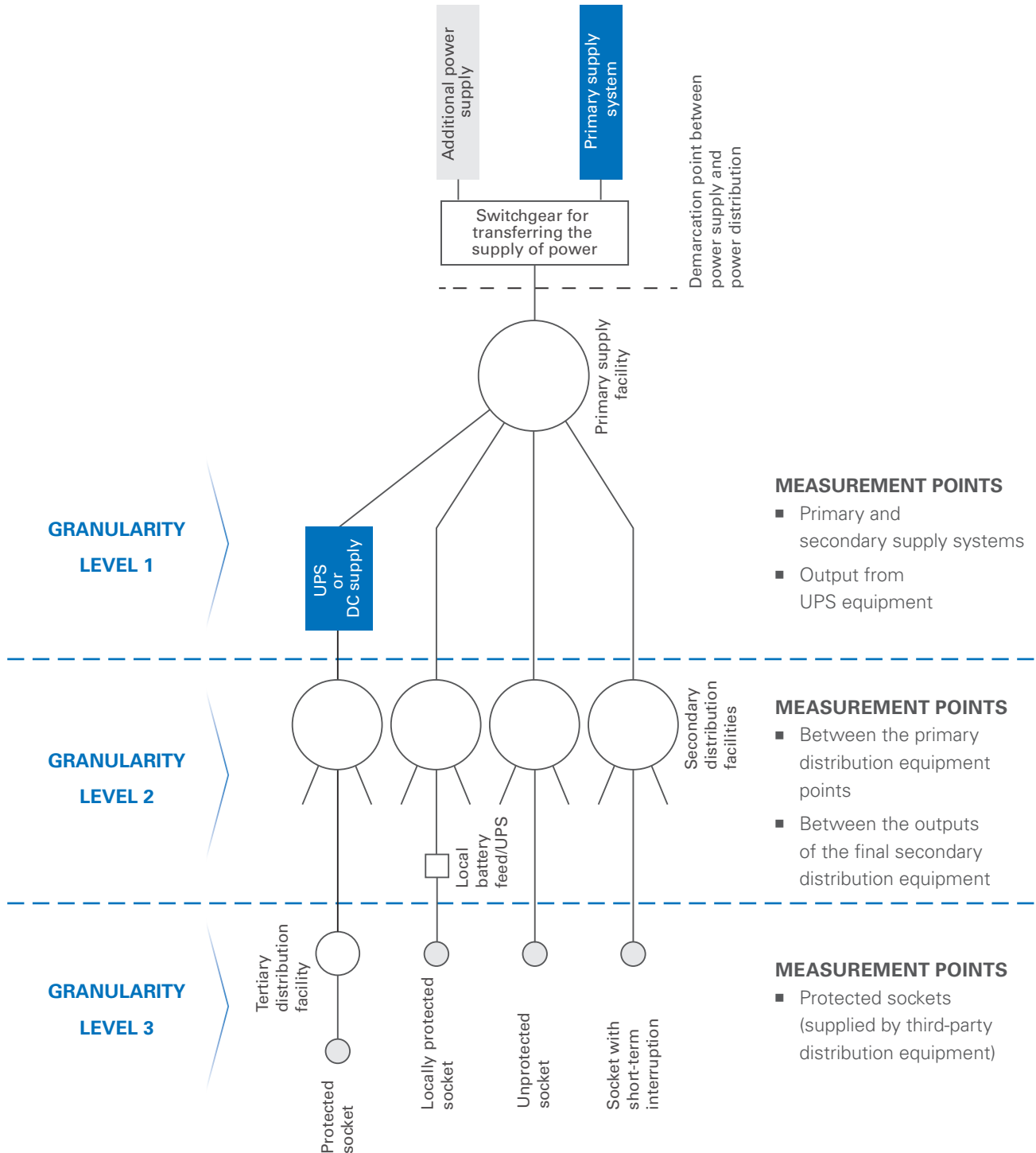1 for active energy and active power on all phases. The current transformers should at least comply with IEC 61869-2:2012, Class 1 and the measurement devices with the requirements of IEC 62053-22:2003 or 61557-12:2008 Class 1. The measurement devices UMG 509-PRO, UMG 96RM-E or UMG 96-PA-MID are suitable for this purpose.

GRANULARITY LEVEL 3

Granularity Level 3 provides measurement of power supply characteristics to protected sockets served by tertiary distribution equipment. The standard states: "When sockets supplied and protected by tertiary distribution equipment are installed in groups [...] serving different types of loads (e.g. IT, fuse or control of environmental conditions), granularity level 3 must support separate measurement of each of the individual load types. The distribution equipment shall be selected to enable measurement at protected sockets of output voltage, current and power factor on all phases present. The equipment used should provide the following accuracies for the parameters measured: for current transformers, IEC 61869-2:2012, Class 2 and for measurement devices, IEC 62053-21:2003, Class 2. However, higher classes are recommended." The UMG 20CM or UMG 801 measurement devices, for example, are suitable for this, in each case in combination with modular expansion modules and, for billing purposes, the Janitza MID DIN rail meters.
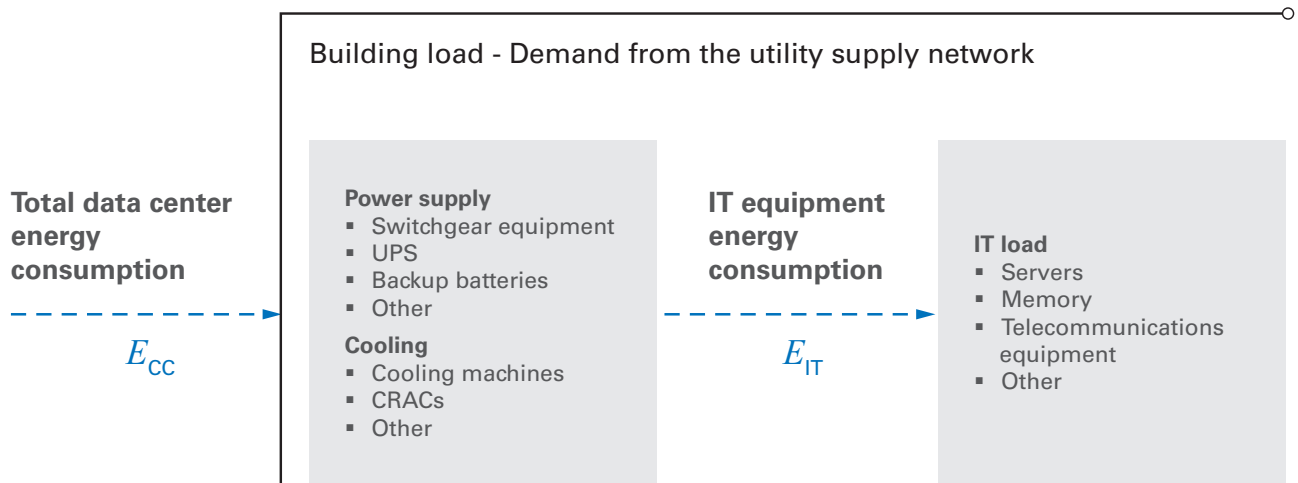
HOLISTIC
ENERGY TRANSPARENCY

Additional power supply

Primary supply system

Demarcation point between power supply and power distribution

Switchgear for transferring the supply of power

Primary supply facility

GRANULARITY

LEVEL 1

UPS or DC supply

MEASUREMENT POINTS

- Primary and secondary supply systems
- Output from UPS equipment

GRANULARITY

LEVEL 2

Secondary distribution facilities

Local battery feed/UPS

MEASUREMENT POINTS

- Between the primary distribution equipment points
- Between the outputs of the final secondary distribution equipment

GRANULARITY

LEVEL 3

Tertiary distribution facility

Locally protected socket

Unprotected socket

Socket with short-term interruption

Protected socket

MEASUREMENT POINTS

- Protected sockets (supplied by third-party distribution equipment)

DETERMINATION OF THE PUE

STANDARDS-COMPLIANT ENERGY EFFICIENCY DETERMINATION

The efficiency of energy usage over a certain period of time is given by the PUE value (key performance indicator for the energy used). The PUE value is the quotient of the total energy consumed in the data center and the energy consumption of the computers. The calculation of PUE requires the recording and documenting of EDC and EIT over a coincident period of 12 months. This part of ISO/IEC 30134 does not specify the frequency of measurements of EDC and EIT, since

PUE is calculated on an annual timeframe. However, the frequency of measurement employed will define the timing of subsequent PUE calculations on a rolling annual basis.

The PUE and other characteristic values, such as energy performance indicators (EnPIs) and key performance indicators (KPIs), can be evaluated very well using the ISO 50001/50006 certified Janitza GridVis® power grid monitoring software.

Building load - Demand from the utility supply network

Total data center energy consumption

E_{CC}

Power supply
- Switchgear equipment
- UPS
- Backup batteries
- Other

Cooling
- Cooling machines
- CRACs
- Other

IT equipment energy consumption

E_{IT}

IT load
- Servers
- Memory
- Telecommunications equipment
- Other

$$PUE = E_{CC} / E_{IT}$$

ACCURACY OF THE PUE

THE PUE ACCORDING TO ISO/IEC 30134-2

PUE 1 – BASIC RESOLUTION

The IT load is measured at the output of the UPS (or equivalent) equipment and may be read:

- From the UPS front panel
- Through a meter on the UPS output
- Through a single meter on the common UPS output bus – in cases of multiple UPS modules

The incoming energy is measured from the utility service entrance that feeds all of the electrical and mechanical equipment used to power, cool, and condition the data center. If UPS or an equivalent power failure ride through or conditioning unit is not available, other categories may apply.

PUE 2 – INTERMEDIATE RESOLUTION

The IT load is measured at the output of the PDUs within the data center and is typically read from the PDU front panel or through a meter on the PDU output (with or without transformer, the measurement point is then after the transformer). Individual branch circuit measurement is also acceptable for Category 2.

PUE 3 – ADVANCED RESOLUTION

The IT load is measured at the IT equipment within the data center. This can be achieved either by metered rack (e.g. plug strips) that monitors aggregate set of IT systems or at the receptacle level or by the IT device itself. Note that non-IT loads shall be excluded from these measurements.

Calculating and evaluating key performance indicators in GridVis®

ELECTRICAL HIGH AVAILABILITY

NORMATIVE SPECIFICATIONS

Measurement technology plays a crucial role in monitoring high availability. By detecting voltage events in time, the damage and impairments which result from them can be avoided. Consequently, power quality must be monitored according to normative specifications such as IEC 61000-2-4:2002, IEEE 519 and ITIC (CBEMA). Depending on which area of the data center you are in, different standards and limit values apply.

The power quality of the primary and secondary supply systems is defined by the EN 50160 standard, which specifies the characteristics of voltage for public electricity supply networks.

The IEC 61000-2-4:2002 defines the compatibility levels for low-frequency conducted disturbances. Different power quality parameters such as harmonics

and transients are described, and network compatibility levels are defined. The standard applies for up to 36 kV and is to be used with Class 1 to 2 for the entire data center.

The power quality in the ancillary supply equipment not provided by the electric utility must comply with Class 2 according to the EN 61000-2-4: 2002 standard, while Class 1 applies between the UPS and protected sockets.

Compliance with the compatibility levels defined in EN 61000-2-4 must be 100%.

If the levels are exceeded, failures and damage may occur for which the supplier is not responsible. The Janitza UMG 509, 512, 604 and 605 network analyzers can evaluate the state of the power quality in compliance with standards and detect critical anomalies in the µs range.
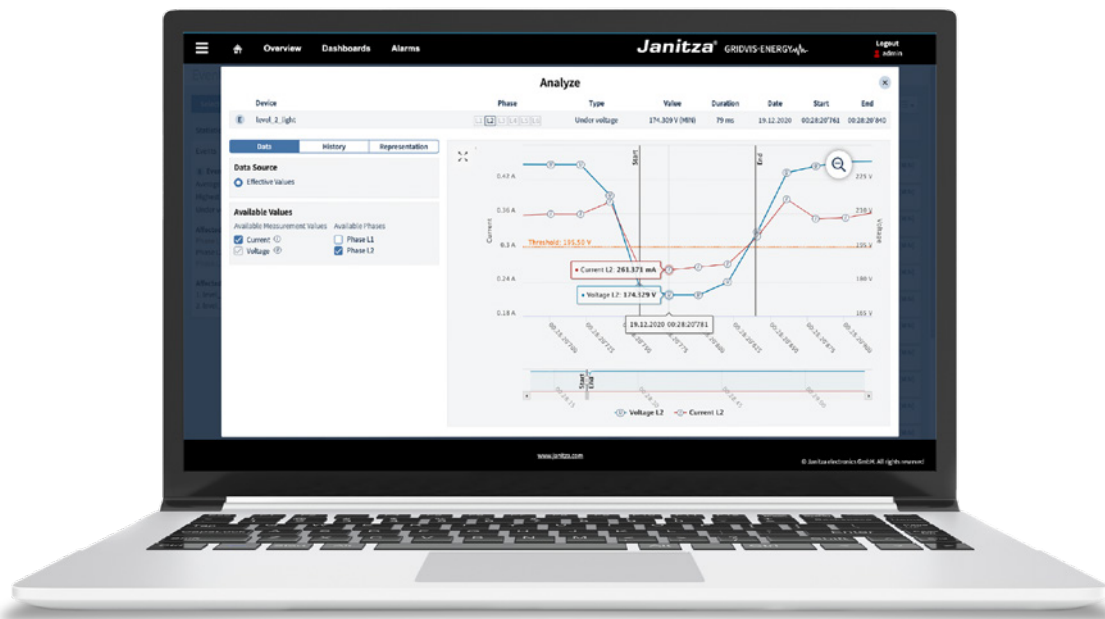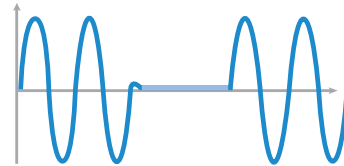
POSSIBLE IMPAIRMENTS
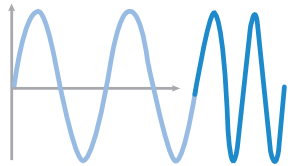
Frequency variations

Frequency variations represent a deviation from the 50/60 Hz fundamental oscillation frequency. These variations can have a negative effect on the operation of electrical equipment, such as servers.

Voltage dips & interruptions

Dips and interruptions are caused by switching operations or disturbances, among other things. The consequences are memory loss, hardware failure or damage, software crashes and data errors.
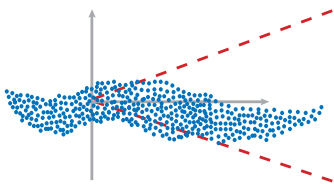
Inductive and capacitive phase shifts

Modern systems make it possible to achieve an optimal power factor (cos phi) when power electronic components are used. These components, in combination with cabling and old compensation equipment, can cause networks to become capacitive.
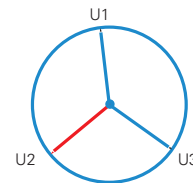
Unbalance

Unbalances are caused by uneven loading of the phase conductors. They cause an additional load on the neutral conductor and can lead to overload and fires. This means the symmetry must be restored quickly and efficiently through applied technological means.
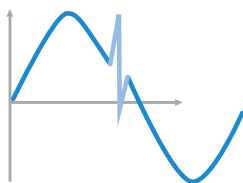
Transients

Transients are unpredictable, non-periodic voltages or currents. They arise, among other things, from equalizing currents and equalizing voltage when the network state changes. High transient overvoltages can lead to insulation damage and the destruction of equipment.
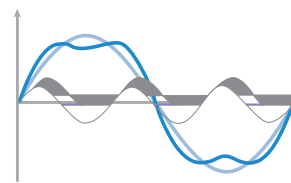
Harmonic loads

Harmonics are currents or voltages whose frequency is a multiple of the fundamental oscillation. Current harmonics are a strain on the network and are the main cause of power quality problems. In addition to enormous costs for repairs and replacement investments, grid distortions can lead to outages.

POWER SUPPLY WITHOUT SHUTDOWNS

High availability and fire protection

High availability and fire protection are essential in data centers. The functionality of TN-S systems can be monitored and logged using a comprehensive residual current monitoring (RCM) system. Fires and failures can be detected and prevented before they occur.

$$I_\Delta = I_{ges} - I_1$$
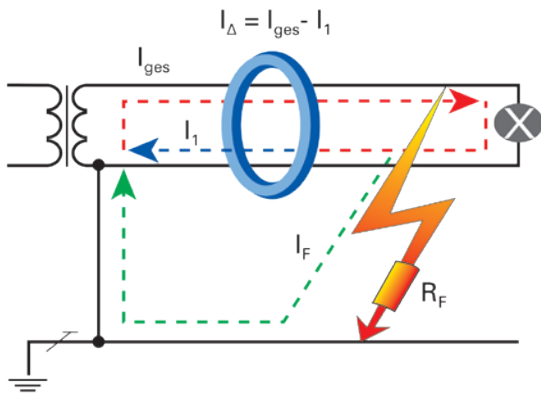
Principle of operation

In practice, all three phases and the neutral conductor run through the summation current transformer. In systems without a neutral conductor, for example, with controlled drives, only the three phases are fed through the summation current transformer. When the system is in the fault-free state, the summation current is zero or close to zero (within the tolerance range), so that the current induced in the secondary circuit is also zero or close to zero. If, on the other hand, a residual current flows to ground, the current imbalance causes a current in the secondary circuit which is detected and evaluated by the RCM measurement device.

EARLY REPORTING INSTEAD OF SWITCHING OFF

The decisive factor is the detection of any disturbances early on, before fuses or residual current devices (RCDs) of the affected systems or socket power circuits are shut down. To do so, the increases in residual currents, which are typically very gradual (e.g. triggered by insulation faults and operating currents of system components or consumers that become too high), must be monitored, evaluated and reported before failures occur.
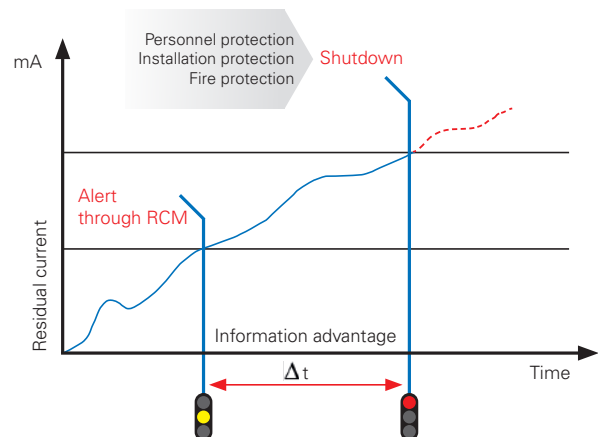
STANDARDS-COMPLIANT MEASUREMENTS

IEC 61000-2-4:2002

Equipment shall be installed that is capable of measuring and logging of residual current at the connection 991 between the protective earth and neutral conductors of the power distribution system of the data center 992 buildings!

Since no residual current circuit breakers can be used in data centers, RCM provides maximum alternative safety by permanently monitoring residual currents. Furthermore, shutdowns for the inspection of electrical systems can be avoided by omitting the insulation measurement. In addition to the measurement equipment, organizational measures must be provided as part of the risk assessment.

Janitza offers multifunctional devices that combine residual current monitoring, energy data acquisition and power quality according to standards. The Janitza GridVis® software serves as a management system for analysis and documentation of the measurement data.

RCM AT GRANULARITY LEVEL 1

Whether the TN-S system is functioning without errors can be checked, for example, with the UMG 512-PRO. It allows comprehensive observation of the power quality and electromagnetic compatibility (EMC) at the feeders. This even allows the initiating phase of a ground fault to be recorded and analyzed. The phase current then increases in parallel to the central grounding point current. The current at the CGP must always be considered in relation to the total power of the TN-S system and the type of consumers. This means that, on the one hand, operational leakage currents are tolerated and, on the other hand, abnormal deviations at the CGP are reported by the RCM. A useful leakage current limit for IT components is, for example, 0.5 mA per A.

RCM AT GRANULARITY LEVEL 2

The powerful UMG 96-PA and UMG 96-PQ-L network analyzers with module or the UMG 96RM-E measure intermediate points such as primary and final secondary distribution equipment.

They monitor the phase conductors, neutral conductors and RCM current sums in the respective subdistribution panels and can record parameters to evaluate the power quality.

RCM AT GRANULARITY LEVEL 3

In complex electrical installations with a large number of points to be monitored, the RCM 202-AB as well as the 20-channel UMG 20CM are ideal options. These measurement devices can meas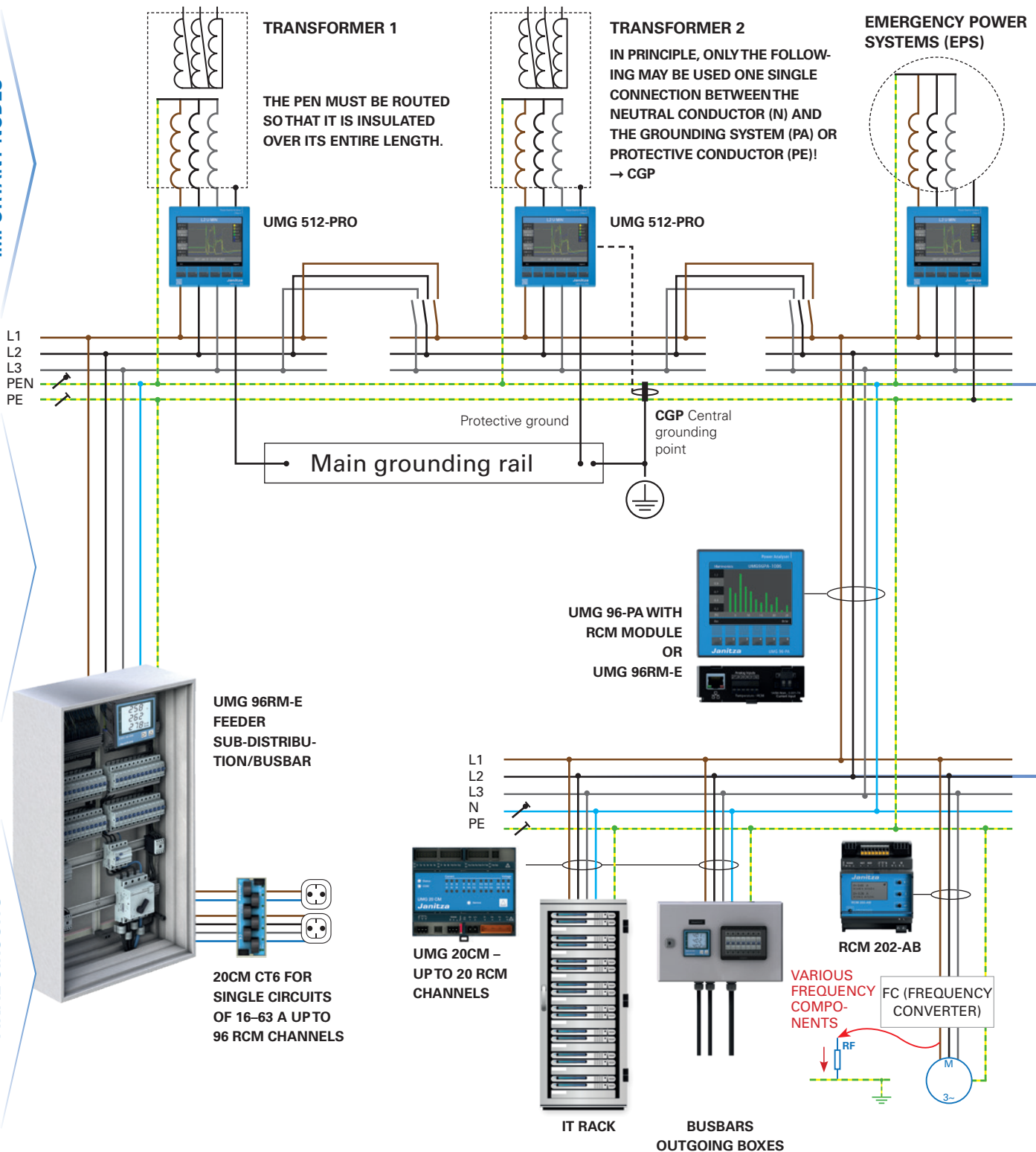ure and continuously record fault, residual and operating currents in any combination via the associated measuring current transformers (e.g. CT-6-20). This is a perfect match for the requirements involved in measuring socket power circuits for IT.

HOLISTIC ENERGY & RESIDUAL CURRENT MONITORING

MAIN POWER SUPPLY, CGP AND IMPORTANT NODES

TRANSFORMER 1

THE PEN MUST BE ROUTED SO THAT IT IS INSULATED OVER ITS ENTIRE LENGTH.

UMG 512-PRO

TRANSFORMER 2

IN PRINCIPLE, ONLY THE FOLLOW-ING MAY BE USED ONE SINGLE CONNECTION BETWEEN THE NEUTRAL CONDUCTOR (N) AND THE GROUNDING SYSTEM (PA) OR PROTECTIVE CONDUCTOR (PE)! → CGP

UMG 512-PRO

EMERGENCY POWER SYSTEMS (EPS)

L1
L2
L3
PEN
PE

Protective ground

CGP Central grounding point

Main grounding rail

SECONDARY DISTRIBUTION

UMG 96-PA WITH RCM MODULE OR UMG 96RM-E

UMG 96RM-E FEEDER SUB-DISTRIBU-TION/BUSBAR

L1
L2
L3
N
PE

END CONSUMERS & FINAL CIRCUITS

20CM CT6 FOR SINGLE CIRCUITS OF 16–63 A UP TO 96 RCM CHANNELS

UMG 20CM – UP TO 20 RCM CHANNELS

RCM 202-AB

VARIOUS FREQUENCY COMPO-NENTS

FC (FREQUENCY CONVERTER)

RF

M 3~

IT RACK

BUSBARS OUTGOING BOXES

MAIN POWER SUPPLY, CGP AND IMPORTANT NODES

6-channel operating current, residual current and power quality

UMG 509-PRO & UMG 512-PRO

- Power quality monitoring valid for legal purposes to class A (only UMG 512-PRO)
- Recording of operating and residual currents
- Ideal for feeders
- Monitoring mode for fluctuating and constant loads

SECONDARY DISTRIBUTION

6-channel operating and residual current

UMG 96RM-E

- Recording of operating and residual currents
- Ideal for larger outgoing feeders and sub-distributors
- Monitoring mode for fluctuating and constant loads

UMG 96-PA & UMG 96-PQ-L & RCM module
Modular retrofitting capability

END CONSUMERS & FINAL CIRCUITS

Multi-channel operation and residual current monitoring

UMG 20CM

- Ideal for many outgoing feeders and circuits
- Monitoring mode for constant loads
- Header device for the 20CM-CT6

20CM-CT6

- Expandable by up to 96 current channels
- Measured value acquisition in parallel via six integrated current transformers

20 + 96 RCM channels = 116 channels

UMG 801

- Modular expandability to up to 92 current measurement channels

GridVis®

The strategic Power Grid Monitoring software for energy data, power quality and RCM in one system

USING ENERGY DATA EFFECTIVELY

STANDARDS-COMPLIANT ANALYSIS AND EVALUATION

The scalable GridVis® network analysis software enables realization of all three applications: energy management, power quality monitoring and residual current monitoring. GridVis® is certified to ISO 50001 and identifies energy saving potentials, analyzes parameters and helps to optimize the utilization of operating equipment. Automation functions and configurable alarms facilitate handling.

GridVis® offers many options for data access, import and export, e.g. via REST API, OPC UA or CSV. The collected data can be evaluated and analyzed using reports and numerous tools. In particular, ready-made reports that focus specifically on certain requirements and standards provide all the information you need quickly and clearly.

SAFETY & ALARM MANAGEMENT
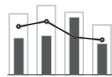
ENERGY MANAGEMENT

CONNECTIVITY

VISUALIZATION & DOCUMENTATION

NETWORK ANALYSIS & EVALUATION

AUTOMATION

The GridVis® Report Editor

- Numerous functions for creating your own reports and visualizing the data, e.g. tables and diagrams
- Transfer data directly from the software to the report with no intermediate steps
- Embed logos and images
- Create templates and master pages
- Output and archive reports as PDFs

The GridVis® KPIs

- Create individual performance indicators
- Calculate and visualize directly in the software

- Show changes in key performance indicators using the trend and evaluation system
- Monitor energy efficiency
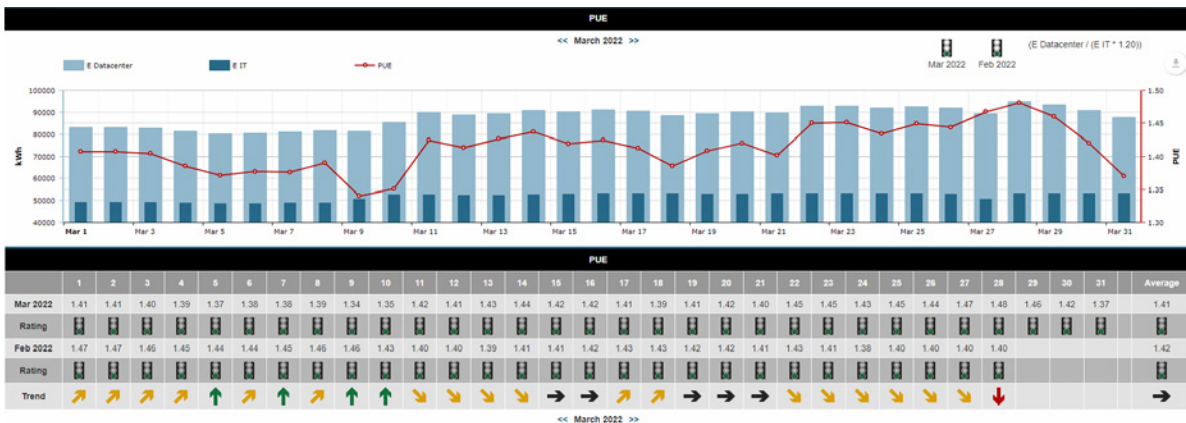
SIMPLE EVALUATION

The GridVis® Event Browser

- Provide a clear overview of voltage and current events from a selected period

- Graphical evaluation of events and transients

- Recognize and analyze temporal relationships

- Search for event types or measurement points with the search and filter function

- Integrated ITIC curve (CBEMA)

The GridVis® Utilization Report

- Nominal currents over the entire power supply system with primary and final secondary distributors

- Utilization of all selected measurement points in percent and absolute values

- Limit violations, excessive utilization and reserves can be seen at a glance

- Free configuration of related feeds

- Display redundant pairs and room totals

- Select and set the period yourself
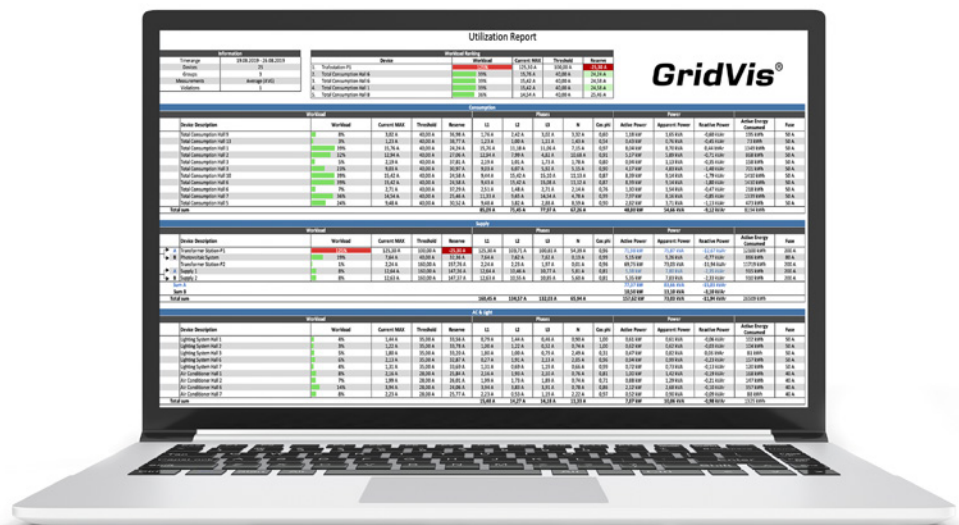
The GridVis® High Availability Report

- Evaluation of the electrical high availability over many measurement points in one report
- Clearly shows at which point of the power supply system a failure has occurred
- Voltage availability with absolute downtimes and percentage values
- Calculation of the mean time between failures (MTBF)

- Evaluation of causes and impacts through a simultaneous display arrangement of the events
- Allows statements to be made about selectivity or the start time
- Show statistics on the affected phase conductors and determine on which phase the short circuit or ground fault occurred
- Check assured availability times with a few clicks
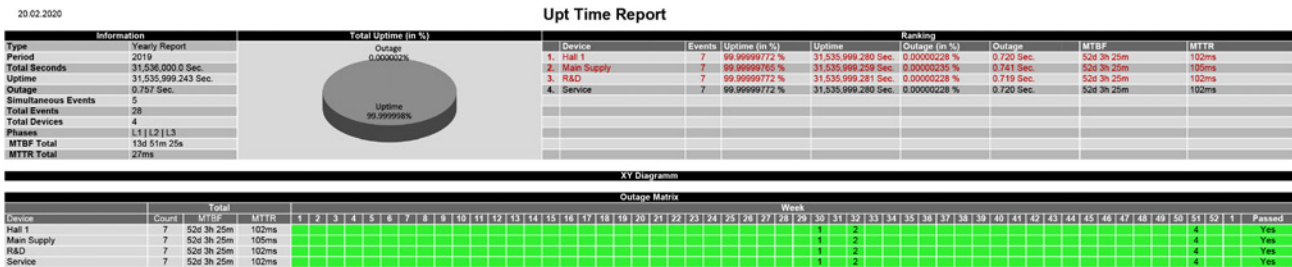
GridVis® RCM Report

- Meaningful statistics on exceedances of limit values for residual currents and operational interruptions
- Support for system testing and the obligation to provide verification
- Status overview with signal colors for a general overview
- Status report on the insulation properties of the power supply system
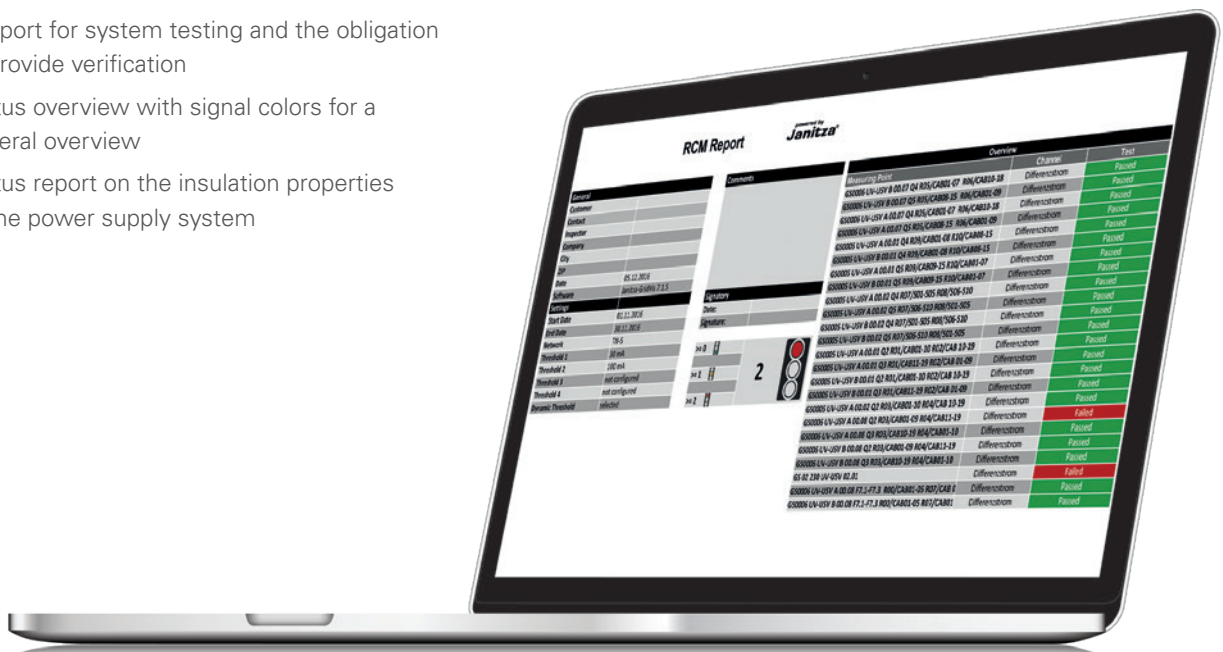
CAPTURE COST CENTER DATA

COLLECT AND EVALUATE ENERGY METERING VALUES

In colocation data centers, cost centers must be established and their energy metering values must be provided on a monthly basis. With MID measurement devices such as the UMG 96-PA-MID+ or MID direct meters, the values for individual racks or rental areas can be recorded, charged and assigned to customers by means of cost centers. GridVis® can also be used to assign several measurement points to a customer and calculate totals by means of virtual measurement devices. Extensive energy reports and data exports can also be generated with GridVis®.

PROFESSIONAL ENERGY BILLS

- Energy bills with an itemized table
- Optional column display with column name
- Addresses, information and labeling fields
- Individual customer logo
- Price groups with additional information
- Output of the extra reactive energy
- Fixed and relative costs
- Bar chart for history and comparison period
- Additional tables for history and comparison period
- Item markers for limit violations
- Energy variable as an area ratio
- XLS, XLSX or PDF file with power values (AVG, MAX), electrical energy values and user-defined energy values (e.g. gas, water, oil)

HIGHLY ACCURATE MEASUREMENT OF POWER QUALITY AND EVENTS

MEASURING CRITICAL NODES AT GRANULARITY LEVELS 1 AND 2

The UMG 509-PRO and UMG 512-PRO power quality analyzers are used at important junctions to monitor the power quality and for energy data management. The Ethernet-capable devices can easily be integrated into higher-order systems such as PLCs and SCADA thanks to various interfaces and IP protocols such as SNMP, BACnet and Modbus. The UMG 509-PRO is suitable for continuous monitoring as well as for the analysis of electrical disturbance variables in the event of network problems. The UMG 512-PRO is a Class A certified power quality analyzer. It allows a holistic view of power quality, energy consumption and total residual current at the feeders and captures power quality parameters such as harmonics up to the 63rd harmonic and flicker according to Class A. The power quality analyzers comply with EN 61000-2-4 and EN 50160* and allow the creation of a CBEMA*.

- Class A certified according to IEC 61000-4-30 (UMG 512-PRO) and EN 50160*/61000-2-4

- Network compatibility level, total residual currents and energy for higher system availability

- Monitoring of electrical high availability

- Recording of operating and residual currents

- RCM limit values can be optimized for each use case – with a fixed or dynamic limit value

- Monitoring mode for fluctuating and constant loads

- Alarm outputs

- Historical data – long-term monitoring of measured variables

- Dynamic CGP limit values based on the total energy

- Harmonics current up to the 63rd harmonic

UMG 512-PRO/UMG 509-PRO

* UMG 509-PRO only as a reference

HIGHLY ACCURATE MEASUREMENT OF POWER QUALITY AND EVENTS

MEASURING CRITICAL NODES AT GRANULARITY LEVELS 1 AND 2

The Janitza UMG 604-PRO and UMG 605-PRO network analyzers can evaluate the state of the power quality in compliance with the standards and detect critical anomalies in the µs range. You are able to support continuous power quality monitoring according to EN 50160* and EN 61000-2-4 as well as to create a CBEMA curve*. The network analyzers have their own device homepages which enable control of the devices – or control them directly via the device display. This ensures the data are available at any time without installation of additional software. Numerous interfaces and protocols such as SNMP, BACnet and Modbus also facilitate integration into higher-order systems. The measurement devices can be expanded with APPs and are programmable so that your own custom functions can be added.

- Continuous power quality monitoring (e.g. EN 50160)
- Overview of events and transients in the network
- Harmonics analysis up to the 63rd harmonic as well as interharmonics

- Distortion factor THD-U / THD-I
- Flicker measurement according to DIN EN 61000-4-15
- 4 voltage and 4 current measurement inputs
- Ethernet Modbus gateway

- Online data, historical data and much more can be accessed directly via the device homepage
- Programmable
- Functional enhancements through APPs are possible

UMG 604-PRO/UMG 605-PRO

* UMG 604-PRO only as a reference

POWER QUALITY, ENERGY AND RCM IN ONE DEVICE

MEASURING CRITICAL NODES AT GRANULARITY LEVEL 2

The modularly expandable UMG 96-PQ-L network analyzer can ensure complete transparency of the power quality at all levels and helps to avoid failures. Full-wave events and other power quality parameters are displayed directly. The optional RCM module can be used to additionally provide residual current measurement. Residual currents and leakage currents are detected and recorded with reference to ground according to IEC 60755 type A and B. An additional 1/5 A current input is available for neutral conductor monitoring. The modular network analyzers allow monitoring according to EN 61000-2-4 and EN 50160 as well as the creation of a CBEMA curve as of 20 ms with a Class S activation.

- Harmonics current up to the 65th harmonic
- 20 ms RMS value memory
- Alarm outputs
- Historical data – long-term monitoring of measured variables
- Full-wave events

- RCM limit values can be optimized for each use case – with a fixed or dynamic limit value
- Ethernet connection and integrated thermistor input for thermocouples via module UMG 96-PA-RCM-EL

- Two analog inputs in the module: Optionally as 0–20 mA analog inputs or as RCM measurement inputs with cable break detection or additional temperature measurement
- Drag indicator history on the display

UMG 96-PQ-L

ENERGY BILLING WITH MID AND RCM IN ONE DEVICE

MEASURE AND BILL KWH AT GRANULARITY LEVEL 2

The UMG 96-PA-MID+ energy analyzer combines the functions of energy management and power quality monitoring in one device. It has MID certification and is used for standards-compliant recording of cost centers as well as for billing purposes.

The optional RCM module additionally integrates residual current measurement. Residual currents and leakage currents are detected and recorded with reference to ground according to IEC 60755 type A and B. An additional 1/5 A current input is available for neutral conductor monitoring.
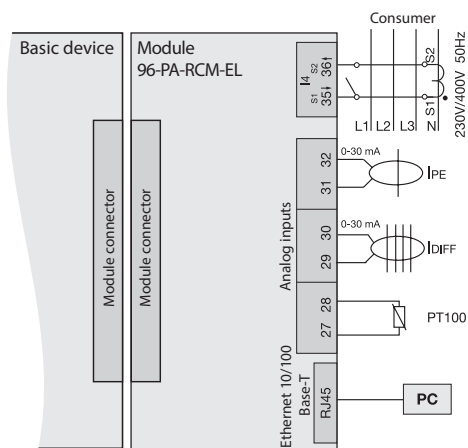
- MID measurement:
  Tamper-proof and legally valid recording of energy data
- Record and bill racks or rental areas and allocate them to cost centers
- Historical data:
  Long-term monitoring of measured variables

- RCM limit values can be optimized for each use case – with a fixed or dynamic limit value
- Ethernet connection and integrated thermistor input for thermocouples via module UMG 96-PA-RCM-EL
- Alarm outputs

- Harmonics current up to the 40th harmonic
- Two analog inputs in the module: Optionally as 0–20 mA analog inputs or as RCM measurement inputs with cable break detection or additional temperature measurement

UMG 96-PA-MID+

ENERGY MONITORING AND RCM IN ONE DEVICE

MEASURING AT GRANULARITY LEVEL 2

The UMG 96RM-E is suitable for energy and residual current monitoring as well as for harmonics analysis. Continuous monitoring of the residual current in current distributions is possible in addition to the normal measurement of the operating currents. The RCM limit values can be set dynamically as a function of the total power, which avoids false alarms. Residual currents and leakage currents are detected and recorded with reference to ground according to IEC 60755 type A and B. An optimal residual current limit value is also ensured in the low-load range.
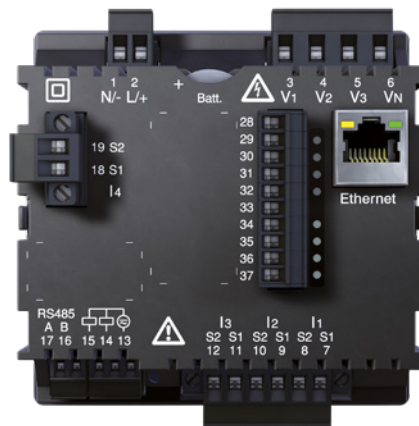
- Analysis of residual current events as well as of the harmonic residual current components
- SNMP alarms
- Email alarms
- Alarm outputs

- Historical data: long-term monitoring of measured variables
- RCM limit values can be optimized for each use case – with a fixed or dynamic limit value

- RCM diagnostic variables
- Optimal residual current limit value – even in the low-load range
- Harmonics current up to the 40th harmonic

UMG 96RM-E

ENERGY AND RCM IN ONE DEVICE

MEASUREMENT AT GRANULARITY LEVELS 2 AND 3

The UMG 806 energy measurement device offers the right solution for various requirements. Residual currents can be measured and recorded. The UMG 806 can be enhanced with three modules for communication.

- 4 current channels via 1/5 A current transformers
- Temperature and residual current input
- Pulse output
- Modbus RTU
- Modbus TCP and SNMP V2c per module
- Ideal for DIN rail applications
- Harmonics current up to the 31st harmonic
- Compatible with RCM 202-AB through module EI1, for retrofitting residual current measurement type A and type B

UMG 806

ENERGY BILLING FOR FINAL CIRCUITS

The MID meters are available in different variants and sizes for DIN rail use. They can be used for both direct measurement and transformer measurement.

- MID-certified measurement: Tamper-proof and legally valid recording of energy data
- Integrated tariff selection
- Optional interfaces: M-Bus. RS-485 (Modbus RTU)
- Pulse output included
- Tested and approved according to MID and IEC
- Available in different versions

MID ENERGY METERS

# THE SOLUTION FOR MANY CRITICAL FINAL CIRCUITS

MODULAR ENERGY MEASUREMENT DEVICE WITH POWER QUALITY AND EVENT LOGGING FOR GRANULARITY LEVEL 3

The Janitza Branch Circuit Monitoring (BCM) solution is implemented using a modularly expandable network analyzer and combines energy monitoring with single circuit monitoring.

The networking capabilities of the Janitza BCM solution maximize its benefits and minimize the effort required for integration into higher-order systems. The measurement device is equipped with two simultaneously usable Ethernet interfaces for direct wiring and data transmission as well as an RS-485 interface for reading out the acquired data or for setting up a measurement topology.

A wide range of expansion modules allows the solution to be specifically adapted to the application in question.

Together with the modules, which offer up to 24 current inputs, an optimal branch circuit monitoring solution can be achieved for fine granular measurement at the third level so that each individual consumer can be captured.
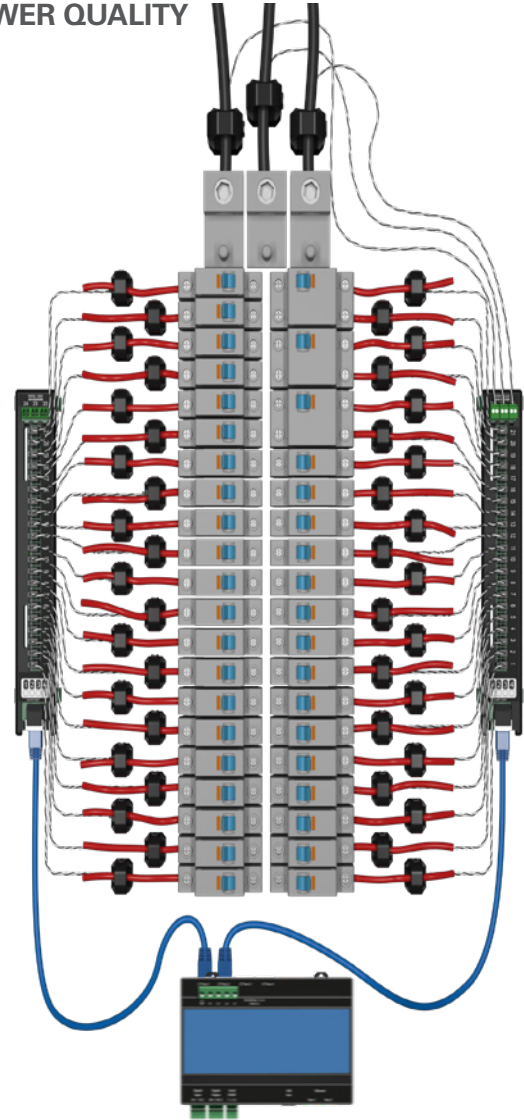
- Modular extension of the measurement points using measuring modules
- Multifunction channels can be used flexibly depending on the required application: RCM, temperature or current measurement
- Easy system expansion through flexible scaling for up to 92 current measurement channels
- Power quality parameters such as events and transients
- IPv4 and IPv6 Ethernet and IP addresses

BCM SOLUTION

The system includes current transformers for new installations or separable current transformers for existing installations, making it ideal for retrofits.

The footprint is very small and optimized for applications with many final circuits.
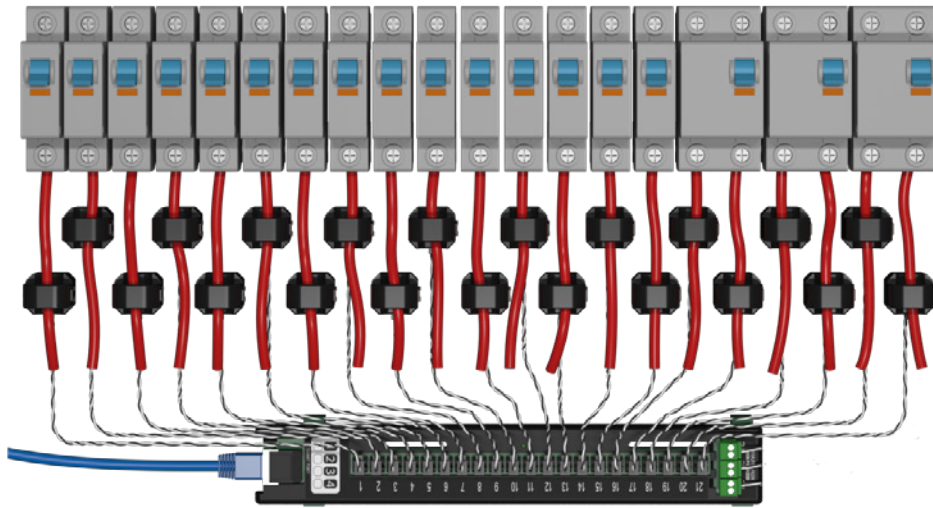
Solid-core transformers

- Cost-effective solution for monitoring new PDUs
- Space-saving installation for power distribution

Split-core transformers

- Cost-effective solution for monitoring new or existing installations in switchgear or other electrical equipment
- Compact solution that is mounted near the fuse

Real circuit display

- Enables data to be displayed according to the actual configuration of the switchboard cabinet. For example, the pole position or circuit type, as well as other data for each circuit, can be displayed.

BCM MODULES

OPERATING CURRENT & RESIDUAL CURRENT FOR MANY FINAL CIRCUITS

MODULAR MEASUREMENT FOR GRANULARITY LEVEL 3

The UMG 20CM operating and residual current monitoring device with connectable current measuring transformers is used for measuring operating ccurrent or, alternatively, for RCM measurement. It is particularly suitable for power distributors with many final circuits.

20 current measurement channels (inputs) are available for connecting current transformers for measuring 0-600 A of operating current and for residual current measurement from 10 mA to 15 A. They can be expanded to up to 116 current measurement channels via modules.

- 20 current measurement channels: 20 LEDs – one LED for each current channel
- Expandable to up to 96 current measurement channels with modules

- 6 channels per module with integrated current transformer
- Status display on the module via LEDs
- Analysis of the harmonic residual current components

- RCM diagnostic variables
- Limit value programming
- Alarm outputs
- RS-485 (Modbus RTU)

UMG 20CM

MONITORING OF RESIDUAL CURRENTS, TYPE A TO B+

Can be used at all measuring levels

The two-channel residual current monitoring device meets the requirements of the DIN EN 62020 standard. A recurring insulation test can be omitted or at least limited. Typical applications are low-voltage main distribution boards (LVMDB) and subdistribution panels (SDP) in grounded systems (e.g. TN-S systems). The RCM 202-AB is a technical alternative usable across all industries when power interruptions due to a residual current circuit breaker (RCD) or insulation resistance measurement cannot be tolerated.

Complete integration into the GridVis® Power Grid Monitoring software is possible. The device can be integrated directly via the RS-485 interface. It can be used as an RCM at any point, e.g. in direct current systems, for frequency converters, or in applications with increased fire protection requirements. The RCM 202-AB allows type B/type B+ monitoring with common passive residual current transformers. Type B measurement is also possible with separable transformers, making it an ideal solution for existing systems.

- Residual current measurement, up to 2 residual current transformers
- Measuring range, AC/DC 10 mA ... 20 A
- Detection, evaluation and monitoring of residual current types A, B and B+ according to DIN EN 62020
- Evaluation of AC and DC

- Harmonics spectrum up to 2 kHz, type B
- Mixed current up to 20 kHz, type A, type B+
- Memory for measured values and extreme values with time stamp
- High resolution LCD display with intuitive operation

- Peripherals:
  – 2 analog outputs
  – 2 alarm outputs
  – compatible with RCM inputs of the UMG 96RM-E & UMG 96-PA with RCM module
- RS-485 interface (protocol: Modbus RTU)
- Patented measuring method

RCM 202-AB

MEASUREMENT TECHNOLOGY FOR DATA CENTERS

Selection guide

Janitza®

Janitza®

Product designation	UMG 512-PRO (UL certified)	UMG 509-PRO (UL certified)	UMG 605-PRO (UL certified)	UMG 604-PRO (UL certified)
Part number	52.17.011	52.26.001	52.16.227	52.16.201 (EP)
Field of application and main functions				
Granularity level 1 / 2 / 3	• / • / •	– / • / •	• / • / •	– / • / •
Compliant with DIN EN 50600 1 / 2 / 3	•	•	•	•
Critical load monitoring & high availability voltage	•	•	•	•
GridVis® CBEMA compatibility & high availability report	•	•	•	•
EN 50160 / IEC 61000-2-4	• / •	Following / •	• / •	Following / •
General				
Transients	> 39 µs	> 50 µs	> 50 µs	> 50 µs
Short-term interruptions	•	•	•	•
Residual current inputs for RCM	2	2	–	–
N measurement / N calculation	• / •	• / •	• / •	• / •
Cost center according to MID	–	–	–	–
Current measuring channels	4	4	4	4
Harmonics current V / A	1st – 63rd	1st – 63rd	1st – 63rd	1st – 40th
Thermistor input	1	1	1	1
Distortion factor THD-U / THD-I in %	•	•	•	•
Accuracy V; A	0.1%; 0.1%	0.1%; 0.2%	0.2%; 0.25%	0.2%; 0.25%
IEC 61000-4-30	Class A	Class S	Class S	–
Active energy class	0.2S (.../5 A)	0.2S (.../5 A)	0.5S (.../5 A)	0.5S (.../5 A)
Digital inputs	2	2	2	2
Digital / pulse output	2	2	2	2
Analog output	–	–	–	–
Memory for min. / max. values	•	•	•	•
Memory size / recording duration (according to factory setting)	256 MB / approx. 3.11 months	256 MB / approx. 95.95 months	128 MB / approx. 2.37 months	128 MB / approx. 47.97 months
Clock	•	•	•	•
Integrated logic	Jasic® (7 prg.)	Jasic® (7 prg.)	Jasic® (7 prg.)	Jasic® (7 prg.)
Web server / Email	• / •	• / •	• / •	• / •
Interfaces				
RS-485	•	•	•	•
USB	–	–	–	–
Ethernet	•	•	•	•
Protocols				
Modbus RTU	•	•	•	•
Modbus gateway	•	•	•	•
Profibus DP V0	•	•	•	•
Modbus TCP/IP, Modbus RTU over Ethernet	•	•	•	•
SNMP	•	•	•	•
OPC UA	–	–	–	–
BACnet IP	•*2	•*2	•*2	•*2

• : Included

– : Not included

*1 Other voltages are also available optionally

*2 Option

*3 SNMP for internal Profinet communication only

*4 With module + 1 current measurement channel

UMG 96-PQ-L (UL certified)	96-PA-MID+ (UL certified)	& UMG 96-PA Modules (UL certified)	UMG 96RM-E (UL certified)	UMG 806	MD energy meters
52.36.001*1 52.36.021*1 52.36.005 52.36.025	52.32.004*3	52.32.010 (96-PA-RCM-EL) 52.32.011 (96-PA-RCM)	52.22.062	14.02.025	14.01.353 | 14.01.356 14.01.359 | 14.01.354 14.01.357 | 14.01.360 14.01.355 | 14.01.358 14.01.361
– / • / •	– / • / •	–	– / • / •	– / • / •	– / – / •
•	•	–	•	•	•
•	–	–	–	–	–
•	–	–	–	–	–
Following / •	–	–	–	–	–
–	–	–	–	–	–
•	–	–	> 200 ms	–	–
2 RCM-EL required	2 RCM-EL required	2	2	1	–
RCM-EL required / •	RCM-EL required / •	– / •	• / •	• / •	–
–	•	–	–	–	•
3*4	3 + 1 with RCM-EL	1	4	4	3
1st – 65th	1st – 40th	–	1st – 40th	1st – 31st	–
–	–	1	2	1	–
•	•	–	•	•	•
0.2%; 0.2%	0.2%; 0.2%	–	0.2%; 0.2%	0.2%; 0.2%	0.5%; 0.5%
Class S*8	–	–	–	–	–
0.2S (.../5 A)	0.2S (.../5 A)	–	0.5S (.../5 A)	0.5S (.../5 A)	1
3	3	–	3	–	–
3	3	–	5	1	–
1	1	–	–	–	–
•	•	–	•	•	–
64 MB / Partition A: approx. 45 months, Partition B: approx. 20 months	8 MB / approx. 3 months (MID+ load profile: approx. 24 months)	–	256 MB / Partition A: approx. 106 months, Partition B: approx. 26 months	4 MB	–
•	•	–	•	•	–
Comparator	Comparator	–	Comparator	–	–
–	–	–	• / •	With 806 EC1 module	–
•	•	•	•	•	•
–	–	–	–	–	–
–	RCM-EL required	•	•	With 806 EC1 module	–
•	•	–	•	•	•
–	RCM-EL required	•	•	–	–
–	–	–	–	–	–
–	RCM-EL required	•	•	With 806 EC1 module	–
–	–	–	•	With 806 EC1 module	–
–	–	–	–	–	–
–	–	–	•	–	–

*5 MID certified

*6 On the basic device

*7 To query the slave devices

*8 Applies to part no. 52.36.021 and 52.36.025

Comment: For detailed technical information, please refer to the respective operating manuals and the Modbus address lists.

UMG 801 (UL certified)	800-CT8-A module (UL certified)	UMG 804	UMG 20CM	Module 20CM-CT6	RCM 202-AB
52.31.001	52.31.201	14.02.001	14.01.625	14.01.626	52.17.011
– / – / •	–	– / – / •	– / – / •	– / – / •	RCM only
Yes (central voltage measurement)	–	–	Yes (central voltage measurement)	Yes (central voltage measurement)	RCM only
•	–	–	–	–	RCM only
•	–	–	–	–	–
Following / •	–	–	–	–	–
> 20 µs voltage > 39 µs current	–	–	–	–	–
10 ms	–	–	–	–	–
4	–	–	20	6	2
• / •	–	• / –	• / –	• / –	–
–	–	–	–	–	–
max. 94 with accessories	8–80 (max. 10 modules)	max. 96	20*5	6–96 (max. 16 modules)*5	2
1st–127th / 1st–63rd	1st, 3rd, 5th ... 15th	–	1st – 63rd	1st – 63rd	RCM type A, B up to 20 kHz
4	–	–	–	–	–
•	THD-I only	•	•	THD-I only	–
0.2%; 0.2% (basic device)	0.5%	0.5%; 0.5%	1%; 1%	– ; 0.5%	–
–	–	–	–	–	–
0.2S (.../5 A)	0.5S (.../5 A)	0.5S	1	2	–
4	–	2	–	–	–
4	–	2	2	–	–
1	–	–	–	–	2
•	*6	–	•	•	•
4 GB / no factory setting	–	–	768 KB / approx. 1 month	Only via UMG 20CM	756 KB / approx. 3 month
•	*6	•	•	Only via UMG 20CM	•
–	–	–	Current limit values per channel	Current limit values per channel	Configurable alarm outputs
–	–	• / –	–	–	–
•	*6	•	•	Only via UMG 20CM	•
•	–	•	–	–	–
2	*6	•	–	–	–
•	*6	•	•	Only via UMG 20CM	•
•*7	–	–	–	–	–
–	–	–	–	–	–
Modbus TCP/IP	*6	•	–	–	–
–	–	•	–	–	–
•	*6	–	–	–	–
–	–	•	–	–	–

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