

MEASUREMENT TECHNOLOGY FOR ENERGY SUPPLIERS

Complete monitoring solutions for your load flows





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DISTRIBUTION NETWORKS IN TRANSITION

In the past, distribution networks were planned according to the clear "top-down" direction of energy flow. Equipment was dimensioned on the basis of the housing units to be supplied, typical load profiles, statistical simultaneity factors and a sufficiently large safety factor.

New conditions and market participants

For some years now, the classic planning model and the technology of electrical energy supply have been changing due to many external circumstances. The requirements for more efficient networks play just as important a role here as the steadily increasing delivery capacity from renewable energy sources. The charging processes for electric vehicles and increasingly capacitive loads are also new challenges. Most of these influences affect the low-voltage network. Critical operating states and overloads may occur there, as traditionally planned networks were not designed for this.

Local distribution stations are increasingly being transformed into intelligent nodes: They perform tasks ranging from pure measurement, fault detection and power quality analysis to complete remote control and automation. Particularly when retrofitting existing distribution stations, these general conditions must be taken into account.



FUNDAMENTAL CONDITIONS FOR RETROFITTING

- Limited space: Additional monitoring and telecontrol systems have to be adapted to the low expansion reserves of compact distribution stations.
- Cost effectiveness: Components have to be very easy to install using "plug-and-play", but at the same time, they also have to be as low-cost as possible during operation.
- Scalability: Solutions need to offer an economical entry level yet be easily expandable according to current needs and the desired resolution.

The challenge of distribution networks



Distribution station: Measurement transformer including all outgoing feeders (UMG 801 and modules)

Development of intelligent networks

RENEWABLE ENERGY CHALLENGES

POWER NETWORKS IN TRANSITION

Electricity from renewable energy is fed into the networks at all levels. It is becoming apparent that the expansion of the distribution networks cannot keep pace with the steadily increasing share of renewables in the energy mix. The increasing number of electric vehicles and the associated charging operations may also push the existing infrastructure to its limits.

One indication of this is the increasing number of regulatory interventions in the distribution networks, i.e. the curtailment of renewable energy systems. According to the German government, every 300th kWh generated from renewable energy sources today is subjected to curtailment. Distribution network operators are therefore faced with the challenge of expanding capacities and investing in modern smart networks.

In its pilot study on the integrated energy system transition, the German Energy Agency (dena) put the cost of the necessary expansion and conversion at 152.6 billion Euro by 2050. However, these costs can be reduced using intelligent measurement technology.



IMPLICATIONS FOR THE ENERGY INDUSTRY

The transformation of the power grid will have serious consequences for:

- Load flow reversal and regenerative feedback
- Equipment overloads
- Voltage range increases at the feed-in point
- Capacitive loads on networks
- Asymmetries, especially in low-voltage networks
- Increased need for storage media
- Infrastructure measures for electromobility
- Network loading through non-linear loads



MEASURING ACROSS 3 LEVELS

For comprehensive monitoring of energy distribution networks, measurements will have to be made at three levels in the future:

- Transformer stations
- Distribution stations
- Cable distributors / distributed generation plants / Special-contract customer connection points

Comprehensive measurement requires the installation of measurement devices at all three levels. Moreover, the fact that intelligent energy distribution networks require more powerful measurement technology than conventional systems also has to be taken into account. Janitza offers customized, scalable solutions with high quality technology for these applications.



YOUR BENEFITS WITH MEASURE-MENT TECHNOLOGY AT 3 LEVELS

- Increased availability: Reduction of downtime
- Reduction of transmission, distribution and non-technical losses
- Management of distributed energy production (e.g. photovoltaics, hydroelectric power plants, etc.)
- Voltage regulation in distribution stations
- Compliance with regulatory and tariff requirements (documentation obligation)
- Monitoring of power quality (e.g. according to EN 50160)
- Controlled integration of new technologies (e.g. electric vehicles, energy storage)
- Faster fault analysis
- Solid basis for network planning
- Data basis for automation and control equipment

Comprehensive measurement



Maximum transparency on 3 network levels

MEASUREMENT TECHNOLOGY FOR EVERY NETWORK LEVEL

UMG 801

UMG 512-PRO Certified power quality analyzer (Class A according to IEC 61000-4-30) Modularly expandable energy measurement device with a high overvoltage category and data security





UMG 512-PRO	Certified power quality analyzer (Class A according to IEC 61000-4-30)
UMG 509-PRO	Multifunctional power quality analyzer
UMG 605-PRO	Power quality analyzer (Class S according to IEC 61000-4-30)







UMG 96-PA	Modularly expandable energy measurement device (MID)		
UMG 96-PQ	Modularly expandable power analyzer		
UMG 801	Modularly expandable energy measurement device (acquisition of up to 22 outputs, 3- or 4-wire, with one device)		
UMG 604-PRO	Functionally expandable power analyzer		
UMG 605-PRO	Power quality analyzer (Class S according to IEC 61000-4-30)		



Maximum transparency on 3 network levels

TRANSNISSION NETWORK

DISTRIBUTION NETWORK

High voltage network

The transmission networks are the backbone of a modern energy supply system. They transport large quantities of electricity from the power plants over long distances to the downstream distribution networks. Transmission system operators ensure that generation and consumption are in balance at all times.

Medium voltage network

The medium voltage network distributes electricity over distances of up to 100 kilometers and is fed from the high voltage networks. Large consumers such as industrial companies may have their own medium voltage connection and larger regenerative generation plants also feed into medium voltage networks.

Low voltage network

LOCAL NETWORK

Distribution stations are the link between the medium voltage and the low voltage network. There, transformers convert the medium voltage to low voltage. Whereas the system previously only had to transmit electricity from the generator to the consumer, there is now a requirement to transmit regenerative, decentrally generated electricity into the medium voltage network.

Technical solution

JANITZA SOLUTIONS FOR DISTRI-BUTION NETWORK OPERATORS

The number of network elements to be managed, such as feed-ins or e-mobility, is constantly increasing. Decentralized generators in particular may put a strain on networks and are often difficult to assess. Nevertheless, optimal power quality has to be ensured. Janitza offers comprehensive support to achieve this: From planning and analysis to the installation of suitable hardware and software and on to maintenance.

Hardware

Functional safety and reliability are ensured with the right measurement device for the various applications as well as coordinated system components. A modular system approach allows the user to select the desired individual components.

In addition to the enormous time savings in engineering, this saves costs at all levels and allows the system to be expanded step by step. This means that the system can easily be adapted to changing conditions and also offers the necessary flexibility for future challenges.

With an open communication structure, all recorded data can be integrated into existing systems. This enables convenient diagnosis of network conditions from your control room or via various end devices such as smartphones or tablets.

Software

Intelligent evaluations make the amount of data manageable and provide valid bases for decisions. Processes can be adapted and thus ensure stability and safety in the distribution network. Reporting allows quick and easy evaluation of the power quality in accordance with EN 50160 and provides a legally valid documentation.

The GridVis[®] power grid monitoring software, operated in parallel with the control room, provides indispensable advantages in the evaluation of network utilization and the network status (PQ reports, high availability report, etc.).

ADVANTAGES

- Full transparency from high voltage to low voltage
- Safe and self-sufficient operative management at the low voltage level
- Automated network status detection for each network node
- Optimal utilization of the existing infrastructure
- Low voltage level becomes intelligent
- Modularly expandable system solution
- Versatile connection to the network control center
- Minimization of interruptions and downtime
- Reduce investment costs using intelligence instead of copper

Technical solution



Measurement technology installed in a transformer station with the UMG 512-PRO as the master device for the UMG 103 slaves for the outgoing feeders.

Communication

COMMUNICATION CHALLENGES

Flexible architecture

Due to the increasing amount of data (Big Data), control and management systems are becoming more and more complex. Hierarchies have increased depth, control algorithms are more comprehensive and data security requirements are on the rise.

At the high and medium voltage level, the data flow for control systems is increasing. Then there is the monitoring at the low voltage level with its 35,000 data records (quarterhourly values) per measurement point per year.

In order to limit the amount of data, Janitza measurement devices allow individual, customer-specific selection of the measurement parameters and definition of the averaging times. Thanks to programming options, critical parameters can be monitored at the measurement point and only relevant data need to be transmitted to the control room.

Different transmission protocols and protocol converters ensure simple system connectivity.

Safety

Networks are critical infrastructures and are therefore subject to the highest security standards. Preference is given to end-to-end encryption technologies.

The guideline for data security is the BDEW white paper "Requirements for Secure Control and Telecommunication Systems".

Obligation to provide verification

Class A power quality analyzers from Janitza allow proof of delivery (e.g. of power quality) in a manner that is valid for legal purposes. This allows defense against unjustified claims and the uncomplicated organization of the reporting requirement for the Federal Network Agency*.

* These kinds of requirements may vary from country to country.

EFFICIENT INTEGRATION

- Open protocols
- Historical data even without communication due to large measurement data memory
- Support of various transmission options
- Remote access to the device parametrization
- Transmission of additional data such as temperature integrated directly in the measurement device

Communication

VARIOUS COMMUNICATION OPTIONS



Examples of data communication possibilities. The options shown are only possibilities; any specific implementation requires an adaptation to the individual case.

THE ALL-IN-ONE MONITORING SOLUTION



DATA SECURITY

Secure communication through OPC UA security structures

CONNECTIVITY

Simple integration and open communication through various interfaces

DATA MEMORY

Large integrated measurement data memory of 4 GB

FLEXIBILITY

Multifunction channels for flexible application (e.g. temperature, RCM, channels may be mixed flexibly)

MODULARITY

Space-saving, compact measuring system, modularly expandable to up to 22 four-channel outputs (transformer measurement & outputs)

RELIABILITY

Surge voltage resistance up to 1000 V CAT III (690 V CAT IV)

Modularly expandable network analyzer - UMG 801 modules

MODULAR EXPANSION





For further information, please see: https://www.janitza.com/umg-801.html

SIMPLE EXPANSION

Plug & play plug-in concept for quick and easy connection

No separate measuring and supply voltage required for the expansion modules

ON-SITE DISPLAY



Visualization of the measured values and configuration at the switchboard cabinet via the practical RD 96 (Remote Display 96 x 96 mm)

COST REDUCTION

Cost-effective solution for outgoing feeder measurements

FULL TRANSPARENCY FOR YOUR DISTRIBUTION STATION







For further information, please see: https://www.janitza.com/umg-96-pa.html

DATA MEMORY

Data memory for 15 years at 20 measured values in 15 minutes. Recording & short-term memory for power quality*

MAXIMUM VALUES

Display and reset on the display

DRAG INDICATOR VALUES

For current, active and apparent power

TEMPERATURE

Temperature measurements, for example with 2 configurable limit values

COLOR GRAPHIC DISPLAY

Oscilloscope function on display

MID CERTIFICATION

Tamper-proof and legally valid recording of energy data**

Certified power quality analyzer - UMG 512-PRO

POWER QUALITY TO CLASS A





For further information, please see: https://www.janitza.com/umg-512-pro.html

CLASS A

Legally valid measurements according to IEC 61000-4-30

DATA MEMORY

Integrated measurement data memory for 10 million measurement data points

CONNECTIVITY

Comprehensive communication and connection options through numerous interfaces

COLOR GRAPHIC DISPLAY

Display of the measured values in numerical or graphical form, e.g. oscilloscope function

POWER QUALITY

Acquisition and storage of numerous power quality parameters

CONFIGURATION

PQ recording templates preconfigured for standard norms UMG 605-PRO power quality analyzer & UMG 604-PRO network analyzer

STANDARDS-COMPLIANT PQ MONITORING





For further information, please see: https://www.janitza.com/umg-605-pro.html

DATA MEMORY

Measurement data memory with about 5 million measurement data points

PROGRAMMABLE

Program up to seven user programs that run in parallel

DEVICE HOMEPAGE

Graphical display of measurement data without software installation

CONNECTIVITY

Fast, reliable communication and easy integration via Ethernet as well as master function via Modbus RTU

POWER QUALITY

Acquisition and storage of numerous power quality parameters

Power quality analyzer (Class S according to IEC 61000-4-30)*

* Only for the UMG 605-PRO

Mobile data readout - GridVis® Collector

COLLECT DATA – SECURE AND MOBILE





For further information, please see: https://www.gridvis.com/extensions.html

DATA SECURITY

Standards-compliant communication structure according to DIN 27001

Compliance with legal requirements through 4096-bit encryption

EASY TO OPERATE

Uncomplicated readout of measurement data and management of up to 500 measurement devices/ measurement points

FLEXIBLE AND MOBILE

Can be operated without specialist knowledge

Data storage in a central database even when using several collectors

THE SIMPLE COMMUNICATION SOLUTION



GATEWAY

Communication gateway for wireless and wired communication

CONNECTIVITY

Connect UMG measurement devices to a PC via LTE network

SOFTWARE

Perform activation, setup and selection conveniently via GridVis® software

THREE APPLICATIONS – ONE SOFTWARE PROGRAM

ENERGY MANAGEMENT – POWER QUALITY – RESIDUAL CURRENT MONITORING

Get an overview of your network with the scalable GridVis[®] network analysis software. The functions for visualization and evaluation support workflows and standards-compliant reports facilitate documentation. GridVis[®] offers various options for limit value monitoring and alarm management. Individual measures, such as optical signals or the automatic sending of e-mails, can be defined.



Communication options in connection with the GridVis® power grid monitoring software. Transfer options for data from the GridVis® Software. Power Grid Monitoring Software – GridVis®

CONNECTIVITY

DATA TRANSFER TO OTHER SYSTEMS / DATA TRANSFER FROM OTHER SYSTEMS

GridVis® offers various options for transferring your data to other systems, for example process control:

COMTRADE

■ REST

OPC UA

EXCEL / CSV

MSCONS





Measurement data analysis – GridVis® reports

HIGH AVAILABILITY REPORTS

The high availability report evaluates under-voltage events. The availability and downtime of each individual phase of a measurement point are analyzed and clearly visualized.

- Availability calculation
- Balancing the electrical high availability of complex power supply systems
- Failure matrix

LET REPORT

The LET report is specialized for the output of limit violations, events and transients. For example, EN 50160 annual evaluations with events and transients can be created and further elements can be integrated.

- Histogram
- Heatmap
- Detailed overview



Power Grid Monitoring Software – GridVis®

EVENT BROWSER

The event and transient browser gives you a quick overview of what is happening. In addition, graphical evaluations of the events and transients can be created.

- Graphical analysis of short-term interruptions and transients
- Grouping of events



EN 50160 POWER QUALITY REPORT

The EN 50160 report allows you to evaluate your power quality according to the EN 50160 standard. The nominal voltage and frequency as well as the evaluation period can be adapted individually to suit your needs.

- Comprehensive EN 50160 analysis of the entire distribution network over 52 weeks at the push of a button
- Standards-compliant to EN 50160
- One report for several measurement devices





For further information, please see: https://www.gridvis.com/ Retrofitting

QUICK AND EASY RETROFITTING





Services

THE RIGHT SUPPORT FOR EVERY CHALLENGE



Project groundwork

- Exclusive seminars
- Consulting in all project phases

Courses & training

- GridVis[®] Basic courses
- GridVis[®] Expert courses

Maintenance

- System check
- Calibration with calibration reports
- Remote maintenance contracts on an annual basis

Support & field service

- Remote sessions
- Field service

Commissioning

- Parameter configuration of measurement devices, data loggers and other components
- Installation and setup of the required functions
- Brief instruction of operating personnel

Measurement data analysis & rental equipment

- Measurement data analysis with final report
- PQ Quick Check
- Mobile network analyzers for temporary measurements and fault analysis

International network

- On-site support
- Quality made in Germany

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SERVICE

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