www.janitza.com

Modularly expandable energy analyzer

UMG 800

User manual and technical data



Doc. no.: 2.053.222.1.c 10/2026

Janitza electronics GmbH
Vor dem Polstück 6
35633 Lahnau | Germany
Support: +49 6441 9642-22
info@janitza.com | www.janitza.com

Janitza

UMG 800
Modular, expandable multifunctional meter for recording power quality parameters

Doc. no.: 2.053.222.1.c
Date: 10/2026
The German version is the original edition of the documentation.

INFORMATION

The content of this document reflects the measurement device firmware version as of 1.8.0, which was current at the time of creation. Check for the presently current version (www.janitza.com) and keep the measurement device firmware up to date!

Subject to technical changes.

The contents of our documentation have been compiled with great care and reflect the current state of the information available to us. Nonetheless, we wish to point out that updates of this document are not always possible at the same time as technical refinements are implemented in our products. Please see our website under www.janitza.com for the current version.
Please see our website under www.janitza.com for the current version.

Information about the GridVis software

Janipedia: wiki.janitza.de

Tutorials: youtube.com/@gridvis

TABLE OF CONTENTS

1. Information on the device and the user manual 9

1.1 Disclaimer 9
1.2 Copyright notice 9
1.3 Technical changes 9
1.4 About this user manual 9
1.5 Defective device/disposal 10

2. Safety 11

2.1 Display of warning notices and safety instructions 11
2.2 Hazard levels 11
2.3 Product safety 11
2.4 Dangers when handling the device 12
2.5 Electrically qualified personnel 13
2.6 Warranty in the event of damage 13
2.7 Safety instructions for handling transformers 14
2.8 Handling batteries/accumulators 14

3. Product description 15

3.1 Device description 15
3.2 Incoming goods inspection 16
3.3 Intended use 16
3.4 Performance characteristics 17
3.5 Module slots and JanBus system limits 18
3.6 Conformity declaration 18
3.7 FCC Declaration of Conformity 18
3.8 Scope of delivery 19
3.9 Accessories 19
3.10 Measuring method 19
3.11 Transformers 19
3.12 Operating concept 20
3.13 Web server with measurement device homepage 20
3.14 GridVis network analysis software 20
3.15 Overview of the range of functions 20
3.15.1 Configuration 20
3.15.2 Communication 20
3.15.3 Measured values (with voltage component) 21

4. Design of the device 22

4.1 Controls, display elements and interfaces (views without terminals) 22

4.2 Side views (without terminals) 24

4.3 Rear view (without terminals) 24

4.4 Identification of the device (nameplate) 25

5. Mounting 26

5.1 Installation location 26

5.2 Bus connector 27

5.3 DIN rail mounting of the meter 27

6. Grid systems 29

7. Installation 30

7.1 Nominal voltages 30

7.2 Circuit breaker 31

7.3 Supply voltage 31

7.4 Voltage measurement 32

7.4.1 Overvoltage 33

7.4.2 Mains frequency 33

7.4.3 Connection variants for voltage measurement 34

7.4.4 Configuring voltage transformers 35

7.5 Current measurement - with current measuring modules 35

7.5.1 Configuring current transformers of connected current measuring modules 35

7.6 Digital inputs - with the 800-DI14 module 35

8. Operation and commissioning 36

8.1 Operating options for the meter 36
8.2 Controls and display elements 36
8.2.1 Service button 36
8.2.2 LED display elements 37
8.3 LED status of connected modules 37
8.4 Average value - gridded and moving 38
8.4.1 Gridded average value 38
8.4.2 Moving average value 38
8.4.3 Gridded and moving average value in the GridVis software 39
8.5 Comparator 40

9. PC connections 43

9.1 GridVis Quick Guide 43

10. Communication via the interfaces 44

10.1 Ethernet interfaces - Modbus TCP 44
10.2 Connection options "Switched mode" and "Dedicated mode" 45
10.2.1 "Switched mode" connection option 45
10.2.2 "Dedicated mode" connection option 45
10.3 OPC UA protocol 46
10.4 RS-485 interface (fieldbus) 47
10.4.1 Shielding 48
10.4.2 Termination resistors/Termination 48
10.4.3 Bus structure (bus segment) 49
10.5 JanBus interface 49
10.6 USB interface 50
10.6.1 USB storage medium 50
10.6.2 Reading a firmware update file 50
10.6.3 Reading a network configuration file (of Ethernet interfaces A and B) 51
10.6.4 Writing (saving) a network configuration file 52
10.6.5 Using a USB storage medium on the RD 96 52
10.6.6 External display RD 96 - optional 53
10.7 Overview of menu displays with external display (e.g. the RD 96) 54

11. Configuration 57

11.1 Events and transients 57

11.1.1 Events 57

11.1.2 Transients 57

11.1.3 Event and transient recording 58

11.1.4 Configuration of the waveform for events and transients 59

11.1.5 Half-wave RMS values for events 59

11.1.6 Update time for transients 60

11.1.7 Event and transient configuration in the GridVis software 60

11.1.8 Flicker 61

11.2 Virtual Meter 62

11.2.1 Application examples 62

11.2.2 Profile - Measurement group of 3 63

11.2.3 Profile - Measurement group of 4 66

11.2.4 Profile - User-defined measurement group 67

11.2.5 Configuration of the ***Virtual Meter*** using the measurement device homepage 69

11.2.6 Configuration of the ***Virtual Meter*** in the GridVis software 70

12. Connection example 71

13. Dismounting 72

14. Measurement device homepage 73

14.1 Dashboard 73

14.1.1 Login 74

14.1.2 Change password 74

14.2 Power Quality 75

14.3 Configuration 76

14.3.1 Device configuration 76

14.3.2 Modbus address list 77

14.3.3 Firmware update 77

14.3.4 Virtual Meter 77

15. Service and maintenance 78

15.1 Repair and calibration 78
15.2 Front panel foil and display 78
15.3 Service 78
15.4 Device adjustment 79
15.5 Firmware update via the measurement device homepage 79
15.6 Firmware update using the GridVis software 79
15.7 Clock/Battery 79
15.8 Battery replacement 79

16. Error messages 80

16.1 Overrange 80
16.2 Display of overrange on external display 80
16.3 Procedure in the event of a malfunction 81

17. Technical specifications 82

17.1 Technical data 82
17.2 Performance characteristics of functions 86
17.3 Parameter and Modbus address list 86
17.4 Information on saving measured values and configuration data 86

18. Dimensional drawings 87

18.1 Measurement device 87
18.2 Bus connector 88

1. Information on the device and the user manual

1.1 Disclaimer

Compliance with the usage information for the devices is a prerequisite for safe operation and attaining the stated performance characteristics and product features.

Janitza electronics GmbH assumes no liability for bodily injury, material damage or financial losses which result from disregard of the usage information.

Make sure that your usage information is readily available and legible.

1.2 Copyright notice

© 2024 - Janitza electronics GmbH - Lahnau.
All rights reserved.

Any reproduction, processing, distribution or other use of this informational product, in whole or in part, is prohibited.

All trademarks and the rights arising from them are the property of the respective owners of these rights.

1.3 Technical changes

- Make sure that your device (modules/components) matches the user manual.
- This user manual is valid for the UMG 800 (basic device). Separate validities and distinctions are marked.
- First make sure you have read and understood the usage information accompanying the product.
- Keep the usage information associated with the product available for the entire service life and pass it on to any possible subsequent users.
- Find out about device revisions and the associated modifications of the usage information associated with your product at www.janitza.com.

1.4 About this user manual

If you have questions, suggestions or ideas for improvement of the user manual, please let us know via email at: info@janitza.com.

INFORMATION

This user manual describes the UMG 800 and provides information on the operation of the device.

Also consult the additional documentation relevant for this user manual, such as:
- the installation manual.
- the data sheet.
- the "Safety instructions" supplement.
- if applicable, the usage information of the integrated modules and components of your meter and module topology (e.g. current and voltage transformers).

Furthermore, the **GridVis software** has an "online help" feature.

The illustrations and figures in this user manual may differ from the actual state of the device delivered!

INFORMATION

Our usage information uses the grammatical masculine form in a gender-neutral sense! This form always refers equally to women, men and diverse. In order to make the texts more readable, distinctions are not made. We ask for your understanding for these simplifications.

1.5 Defective device/disposal

Before sending **defective devices, modules or components** back to the manufacturer for testing:
· contact the manufacturer's Support department.
· send devices, modules or components complete with all accessories.
· when doing so, please bear the terms for transportation in mind.

Do not attempt to open or repair the device (the module, the component) on your own because otherwise all warranty claims become invalid!

For the **disposal** of the device (the module, the component), please observe national regulations! Dispose of individual parts, as applicable, depending on their composition and existing country-specific regulations, for example, as

· Electronic waste,
· Batteries and rechargeable batteries,
· Plastics,
· Metals.

Engage a certified disposal company as needed.

Information on servicing and maintenance of your device can be found in Sect. "15. Service and maintenance" on p. 78.

2. Safety

The chapter on Safety contains information which must be observed to ensure your personal safety and avoid material damage.

2.1 Display of warning notices and safety instructions

The warning notices shown below
· are found throughout all of the documentation,
· can be found on the devices themselves.
· indicate potential risks and hazards,
· underscore aspects of the information provided that clarify or simplify procedures.



The additional symbol on the device itself indicates an electrical hazard that can result in serious injury or death.



This general warning symbol draws attention to a possible risk of injury. Be certain to observe all of the information listed under this symbol in order to avoid possible injury or even death.



2.2 Hazard levels

Warning and safety instructions are marked by a warning symbol, and the hazard levels are shown as follows, depending on the degree of hazard:

⚠ DANGER
Warns of an imminent danger which results in serious or fatal injury.

⚠ WARNING
Warns of a potentially hazardous situation which could result in serious injury or death.

⚠ CAUTION
Warns of an immediately hazardous situation that may result in minor or moderate injury.

ATTENTION
Warns of an imminently hazardous situation that can result in material or environmental damage.

ⓘ *INFORMATION*

Indicates procedures in which there is **no** hazard of personal injury or material damage.

2.3 Product safety

The devices, components and modules reflect current engineering practice and accepted safety standards, but hazards can arise nonetheless.

Observe the safety regulations and warning notices. If notices are disregarded, this can lead to personal injury and/or damage to the product.

Every type of tampering with or use of this device,
· which goes beyond the mechanical, electrical or other operating limits can lead to personal injury and/or damage to the product;
· constitutes "misuse" and/or "negligence" under the product's warranty and thus voids the warranty for any possible resulting damage.

Before installing, operating, maintaining and using the device, read and understand the user manual and the device usage information. As applicable, also observe all further usage information on the components and modules of your system.

Only operate the device when it is in perfect condition and in compliance with this user manual and the enclosed usage information. Send defective devices back to the manufacturer in compliance with proper transport conditions.
Retain the user manual throughout the service life of the device and keep it at hand for consultation.

When using the device, also observe the legal and safety regulations for your system that are applicable for the respective use case.

2.4 Dangers when handling the device

When operating electric devices, components or modules, it is unavoidable for certain parts of these devices to conduct hazardous voltage. Consequently, severe bodily injury or material damage can occur if they are not handled properly.

Therefore, when handling our devices, components, or modules, always observe the following:

- Do not exceed the limit values specified in the user manual and on the nameplate! This must also be observed during testing and commissioning!
- Take note of the safety and warning notices in all usage information that belongs to the device, components or modules!

⚠ WARNING

Disregarding the connection conditions of the Janitza measurement devices, modules or components can lead to injuries or even death or to material damage!

- Do not use Janitza meters, modules or components for critical switching, control or protection applications where the safety of persons and property depends on this function.
- Do not carry out switching operations with the Janitza measurement devices, modules or components without prior inspection by your system manager with specialist knowledge! In particular, the safety of persons, material assets and the applicable standards must be taken into account!

⚠ WARNING

Risk of injury due to electrical currents and voltages!

Severe bodily injury or death can result! Therefore please abide by the following:

- **Switch off your installation before commencing work! Secure it against being switched on again! Check to be sure it is de-energized! Ground and short circuit! Cover or block off adjacent live parts!**
- **During operation and troubleshooting (especially with DIN rail devices), check the environment for dangerous voltages and switch these off if necessary!**
- **Wear protective clothing and protective equipment in accordance with applicable directives when working on electrical systems!**
- **Before making connections, ground the device / component / module by means of the ground wire connection, if present!**
- **Do not touch bare, stripped wires or device inputs that are dangerous to touch on the devices, components and modules. Equip stranded conductors with wire ferrules!**
- **Hazardous voltages can be present in all circuitry parts that are connected to the power supply.**
- **Protect wires, cables and devices with a suitable line circuit breaker/fuse!**
- **Never switch off, remove or tamper with safety devices!**
- **There can still be hazardous voltages present in the device or in the component (module) even after it has been disconnected from the supply voltage (capacitor storage).**
- **Do not operate equipment with current transformer circuits with ../5A (1A) current transformers with exposed connections.**
- **Only connect screw terminals and spring terminals with the same number of poles and design!**
- **Do not exceed the limit values specified in the user manual and on the nameplate! This must also be observed during testing and commissioning.**
- **Take note of the safety and warning notices in the usage information that belongs to the device, components or modules!**

The measurement device has an integrated self-resetting fuse, the resistance of which increases in the event of high electrical currents (e.g. a short circuit) due to self-heating. This switches off the supply to connected modules. Once the measurement device has cooled down, the self-resetting fuse switches back on and connected modules are again supplied with power. Therefore please abide by the following:

ATTENTION

Triggering the measurement device's self-resetting fuse in the event of a short circuit or overload can cause material damage to the meter and module topology (e.g. loss of data).
In the event of a short circuit or overload of the measurement device with connected modules, the self-resetting fuse of the measurement device switches off the modules. Afterward, proceed as follows:
· Observing the safety instructions, disconnect the measurement device from the supply voltage and allow it to cool down (approx. 15 min., depending on the ambient temperature).
· Eliminate the short circuit or overload on the measurement device, e.g. by checking the bus connector installation or reducing the number of modules on the measurement device.
· Then supply the measurement device with power again.

2.5 Electrically qualified personnel

To avoid bodily injury and material damage, only electrically qualified personnel are permitted to work on the devices and their components, modules, assemblies, systems and current circuits who have knowledge of:
· The national and international accident prevention regulations.
· Safety technology standards.
· Installation, commissioning, operation, disconnection, grounding and marking of electrical equipment.
· The requirements concerning personal protective equipment.

Electrically qualified persons within the scope of the technical safety information of all usage information associated with the device and its components (modules) are persons who can furnish proof of qualification as an electrically skilled person.

⚠ WARNING

Warning against unauthorized manipulation or improper use of the device or its components (modules)!
Opening, dismantling or unauthorized manipulation of the device and its components which goes beyond the mechanical, electrical or other operating limits indicated can lead to material damage or injury, up to and including death.
· **Only electrically qualified personnel are permitted to work on the devices and their components (modules), assemblies, systems and current circuits.**
· **Always use your devices or components (modules) as described in the associated usage information.**
· **If there is discernible damage, send the device or the component (module) back to the manufacturer!**

2.6 Warranty in the event of damage

Any unauthorized tampering with or use of the device, component or module constitutes "misuse" and/or "negligence" under the product's warranty and thus voids the warranty for any possible resulting damage. Note in this regard Sect. "3.3 Intended use" on p. 16.

2.7 Safety instructions for handling transformers

The field of transformer technology groups the totality of all devices that perform the function of a **current, voltage** or **measuring transformer** together as **sensors**.

In the usage information for our devices, modules and components, the terms **current transformer, voltage transformer** or **transformer** all refer to **sensors**.

For Janitza measurement devices, modules and components, use only **"transformers for measuring purposes"** which are suitable for the energy monitoring of your system! Please note Sect. "3.11 Transformers" on p. 19 and Sect. "7. Installation" on p. 30 in this regard.

2.8 Handling batteries/accumulators

The following apply for the battery used in the device:

⚠ CAUTION

Risk of injury due to fire or burns!
The battery used in the device may cause fire or burns if used improperly.
- **Only replace the battery with the same type or types recommended by Janitza!**
- **Observe the polarity when installing the battery!**
- **Remove batteries only with non-conductive tools (e.g. plastic tweezers)!**
- **Do not recharge, disassemble, burn or heat batteries above 100 °C (212 °F)!**
- **Do not dispose of batteries with household waste! Follow the disposal instructions in the respective device documentation!**
- **Keep batteries away from children and animals!**
- **In case of damage, return devices with a soldered battery to the manufacturer, observing proper transport conditions!**

3. Product description

3.1 Device description



Fig.: UMG 800 measurement device (without terminals)

The measurement device
- is a modular, expandable multifunctional meter for recording power quality parameters.
- measures and calculates electrical variables such as voltage, current, frequency, power, energy, harmonics, etc. in building installations, in distribution boards, circuit breakers and busbar trunking systems, in some cases via modules.
- stores and transmits measurement results via interfaces for further processing.
- is a DIN rail measurement device and shows measurement results on compatible external displays, e.g. the RD 96, via the USB interface.
- is suitable for connecting modules (e.g. expandable to up to 96 current measuring channels).
- has the option of integrating remote measurement points in the switchboard cabinet or small distribution boards using transfer modules.
- has an RS-485 gateway functionality and serves as a cache for measurement data.
- measures voltages and currents (via modules) from the same network.
- measures in low-voltage networks (3-phase 4-wire systems) in which nominal voltages up to a maximum value of see Sect. "17. Technical specifications" on p. 82, conductor to ground and surge voltages of overvoltage category III occur.
- measures in medium and high-voltage networks via voltage transformers.
- is suitable for fixed switchboard cabinets or small distribution boards, in any mounting orientation.
- is not a protective device against electric shock!
- is suitable for use in industrial areas.
- is particularly suitable for energy monitoring and use in data centers.
- has an integrated web server that displays a wide range of data in a clear format on a measurement device homepage.

Measurement results are displayed by the measurement device, e.g. via the measurement device homepage or an external display, and can be read out and further processed via interfaces (further information can be found at Sect. "8. Operation and commissioning" on p. 36).

⚠ CAUTION

Malfunction and damage of the device or risk of injury due to improper connection.
Improperly connected devices can deliver incorrect measured values, damage the device or pose a risk of injury to persons.
Observe the following:
- **That measured voltages and currents come from the same network.**
- **Do not use the device for measuring direct current!**
- **Ground current-conducting switchboards!**

3.2 Incoming goods inspection

Safe and trouble-free operation of this measurement device (with its modules and components) presupposes proper transport, storage, setup and assembly as well as operation and maintenance in addition to compliance with the safety information and warning notices.

Exercise due caution when unpacking and packing the device, do not use force and only use suitable tools. Check the following:
· The measurement device by visually inspecting it for perfect mechanical condition.
· The scope of delivery for completeness before beginning with assembly and installation.

If it can be assumed that safe operation of your measurement device is not possible, disconnect the measurement device immediately. To avoid electrical accidents, follow the 5 safety rules as follows:
1. **Disconnect the system (devices, as applicable modules and components also)!**
2. **Secure it against being switched on again!**
3. **Check to be sure it is de-energized!**
4. **Earth and short circuit the system (devices, as applicable modules and components also)!**
5. **Cover or block off adjacent live parts!**

Safe operation is impossible, if the measurement device:
· has visible damage,
· no longer functions despite an intact power supply,
· was subjected to extended periods of unfavorable conditions (e.g. storage outside of the permissible climate conditions without adaptation to the room climate, condensation, etc.) or transport stress (e.g. falling from an elevated position, even without visible external damage, etc.).

ATTENTION

Improper handling can damage the measurement device (possibly also modules and components) and lead to material damage!
The contacts of JanBus interfaces can bend or break off and destroy the interface.
· **Never touch or manipulate the contacts of JanBus interfaces!**
· **Never use force to mount bus connectors, modules and components! Please refer to the chapters "Mounting" and "Dismounting" here in the user manual and, if applicable, in the usage information of the modules and components that are used!**
· **Protect the contacts of the interfaces when handling, transporting and storing the measurement device (as applicable, the modules and components as well)!**

3.3 Intended use

The measurement device is
· Only for use in the industrial sector.
· Intended for installation in switchboard cabinets and small distribution boards.
· Designed as an indoor meter.

The measurement device is **not** for installation
· In vehicles! Use of the device in non-stationary equipment constitutes an exceptional environmental condition and is only permissible by special agreement.
· In environments with harmful oils, acids, gases, vapors, dusts, radiation, etc.
· In potentially explosive environments.

Safe and trouble-free operation of the measurement device requires proper transport, storage, assembly, installation, operation and maintenance.

3.4 Performance characteristics

General

- Space-saving DIN rail meter with dimensions W: 36 m m (2 HP) x H: 90 mm x D: 76 mm.
- For mounting on 35 mm DIN rail (for types, see section "Technical data").
- Supply voltage 24 VDC (PELV).
- Suitable for connecting modules and thus for setting up decentralized measuring concepts.
- Optional functional expansions with current measuring modules (e.g. expandable to up to 96 current measuring channels) and digital input modules. Further information can be found in the usage information of the respective modules.
- Integrated web server with measurement device homepage.
- Operating and configuration options via
  - the measurement device homepage.
  - A PC with installed software.
  - A compatible external display.
- Measurement data storage (4 GB).
- Password protection.
- Connection via screw and spring terminals.
- 4 voltage measurement inputs (overvoltage category 300 V CATIII according to IEC and UL).
- RS-485 interface (Modbus RTU, with DIP switch for termination).
- 2x Ethernet interface (RJ45).
- 1x USB interface for connecting the USB storage medium with the network configuration file or an external display (e.g. the RD96 for convenient device operation).
- Clock, battery (soldered in).

Measurement uncertainty

- Active energy, measurement uncertainty class 0.2 S for ../5 A transformers.
- Active energy, measurement uncertainty class 0.5 S for ../1 A transformers.
- Active energy, measurement uncertainty class 0.5 S for ../50 mA transformers.
- Reactive energy, class 1.

Measurement

- Measurement in TN, TT and IT networks.
- Measurement in networks with nominal voltages up to L-L 480 V and L-N 277 V.
- Measuring range, voltage 300 $V_{eff\ L-N}$; 520 $V_{eff\ L-L}$; 300 V_{N-PE}.
- True effective value measurement (TRMS).
- Continuous sampling of the voltage measurement inputs.
- Frequency range of the fundamental oscillation 40 Hz .. 70 Hz.
- Voltage: 1 .. 63rd harmonics (U_{L-N} and U_{L-L}).

3.5 Module slots and JanBus system limits

Before setting up a JanBus meter and module topology with the UMG 800 as the basic device, check the number of **module slots** required for your modules.

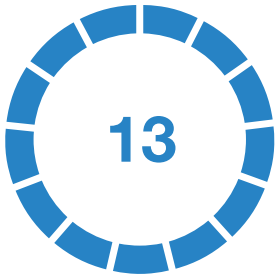
The UMG 800 has **13 free module slots** for communication via JanBus.
- The connected modules may have a maximum total of **96 current measuring channels**.
- In combination, up to 12 current measuring modules and one DI module can be connected.

Examples of module combinations on the basic device



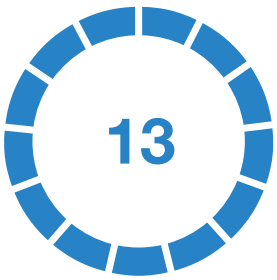
2 x Module 800-DI14 [1)]
\+ **6** x Module CT8-LP [1)]

8 module slots required on the basic device.



3 x Module 800-CT24 [2)]
\+ **4** x Module 800-DI14 [1)]

13 module slots required on the basic device.



1 x Module 800-DI14 [1)]
\+ **12** x Module CT8-LP [1)]

13 module slots required on the basic device.

[1)] *... occupies 1 module slot per module on the basic device.*
[2)] *... occupies 3 module slots per module on the basic device.*

... free module slots on the basic device.

... occupied module slots on the basic device.

Transfer modules do not occupy any module slots on the basic device!

INFORMATION

When setting up a meter and module topology with the UMG 800 as the basic device, also note the information in the usage information for the modules used, such as information on the following:
- The module slot assignment of the module.
- The various module combinations.
- The JanBus system limits.

3.6 Conformity declaration

The laws, standards and directives applied by Janitza electronics GmbH for the devices can be found in the declarations of conformity at www.janitza.com.

3.7 FCC Declaration of Conformity

The device:
- complies with Part 15 of the FCC Rules for Class B digital devices (limit values to protect against harmful interference in a residential installation).
- generates, uses and can radiate high-frequency energy
- can cause harmful interference to radio communications if not installed and used properly. There is no guarantee that interference will not occur in a particular installation.

If there is radio or television reception interference, which can be determined by turning the device on and off, proceed as follows:
- Align or reposition the receiving antenna.
- Increase the distance between the device and the radio/television receiver.
- Connect the device and the radio/television receiver in different current circuits.
- if necessary, contact Janitza support or a radio/television technician.

Code of Federal Regulations, Title 47, Part 15, Subpart B - Unintentional Radiators.

3.8 Scope of delivery

Quantity	Part. no.	Designation
1	52380XX	UMG 800 (basic device)
1	5238201	2HP bus connector for module connection
1	3303912	Installation manual DE/EN
1	3303342	"Safety instructions" supplement
1	5238250	Accessory pack

Tab. Scope of delivery

The device is delivered with the required terminals (accessory pack).

3.9 Accessories

Quantity	Part. no.	Designation
1	5231230	Module 800-CT8-A (current measuring module)
1	5231234	Module 800-CT8-LP (low-power current measuring module)
1	5231210	Set module 800-CON (set of 2 - transfer modules)
1	5231242	Module 800-CON-RJ45 (2HP transfer module)
1	5231301	Module 800-CT12-SVD-US (current measuring module with voltage detection)
1	5231247	Module 800-CT24 (current measuring module)
1	52312xx	Module 800-MF8 (Multifunction module)
1	5231214	Module 800-DI14 (digital input module)
1	5231212	RD 96 - External display

Tab. Accessories

INFORMATION

The delivery note documents all delivered options and design variants.

3.10 Measuring method

The device measures continuously and calculates all effective values using:
· A 200 ms period interval.
· The true RMS value (TRMS) of the voltages and currents applied to the measurement inputs.

3.11 Transformers

For Janitza measurement devices, modules and components, use **only** transformers designed for measuring purposes! Please observe the warnings in this regard in Sect. "7. Installation" on p. 30

"Transformers", unlike "protection transformers", go into saturation at high current peaks. "Protection transformers" do not have this saturation behavior and can therefore significantly exceed the rated values in the secondary circuit. This can overload the current measurement inputs of the measurement devices!

Furthermore, please note that Janitza measurement devices, modules and components are **not** to be used for critical switching, control or protection applications (protective relays)! Observe the safety and warning information in the "Installation" and "Product safety" chapters!

3.12 Operating concept

The meter has the following operating options, e.g. for commissioning, configuration and displaying measurement data:

1. With a network configuration file that the user loads via the USB interface of the meter (for information, see Sect. "10.6 USB interface" on p. 50).
2. Operation via the Ethernet interfaces A (DHCP mode) and B (static IP address) in conjunction with a PC on which the GridVis software is installed. (For information, see Sect. "10.1 Ethernet interfaces - Modbus TCP" on p. 44 and Sect. "9. PC connections" on p. 43).
3. Via an integrated web server with measurement device homepage. (For information see Sect. "14. Measurement device homepage" on p. 73).
4. Via a separately available display with function buttons connected to the USB interface of the meter (for information, see Sect. "10.6.6 External display RD 96 - optional" on p. 53).

INFORMATION

External displays, e.g. the RD 96 in combination with the basic device:
· are used for front panel installation inside a switchboard cabinet or small distribution board.
· ensure safe reading of measured values without having to open or touch live systems, system components, switchboard cabinets or small distribution boards!
For further information, please refer to the usage information for the display in use (e.g. RD 96)!

A standard Modbus address list is available at www.janitza.com.

3.13 Web server with measurement device homepage

The measurement device has an integrated homepage, and information on this can be found in Sect. "14. Measurement device homepage" on p. 73.

3.14 GridVis network analysis software

You can use the GridVis network analysis software available at www.janitza.com to configure your measurement device and read out data for analysis. To do so, connect a PC to your measurement device via the Ethernet interface.

GridVis software performance characteristics
· Configuring and reading out the measurement device.
· Graphic display of measured values.
· Analysis of read data.
· Store data in databases.
· Create reports.

Connections to the PC
Connections for communication between the PC and the measurement device can be found in Sect. "9. PC connections" on p. 43.

3.15 Overview of the range of functions

3.15.1 Configuration

To configure the meter, take note of the options in Sect. "3.12 Operating concept" on p. 20.

3.15.2 Communication

· USB interface for commissioning and configuring the measurement device (e.g. via a USB storage medium with a firmware update file and/or network configuration file) or for connecting an external display.
· One RS-485 interface for communication with Modbus/RTU devices.
· Firmware update via Ethernet (TCP/IP) and a PC with the GridVis software installed.
· 2 Ethernet interfaces for communication using various IP protocols (see Sect. "17. Technical specifications" on p. 82).

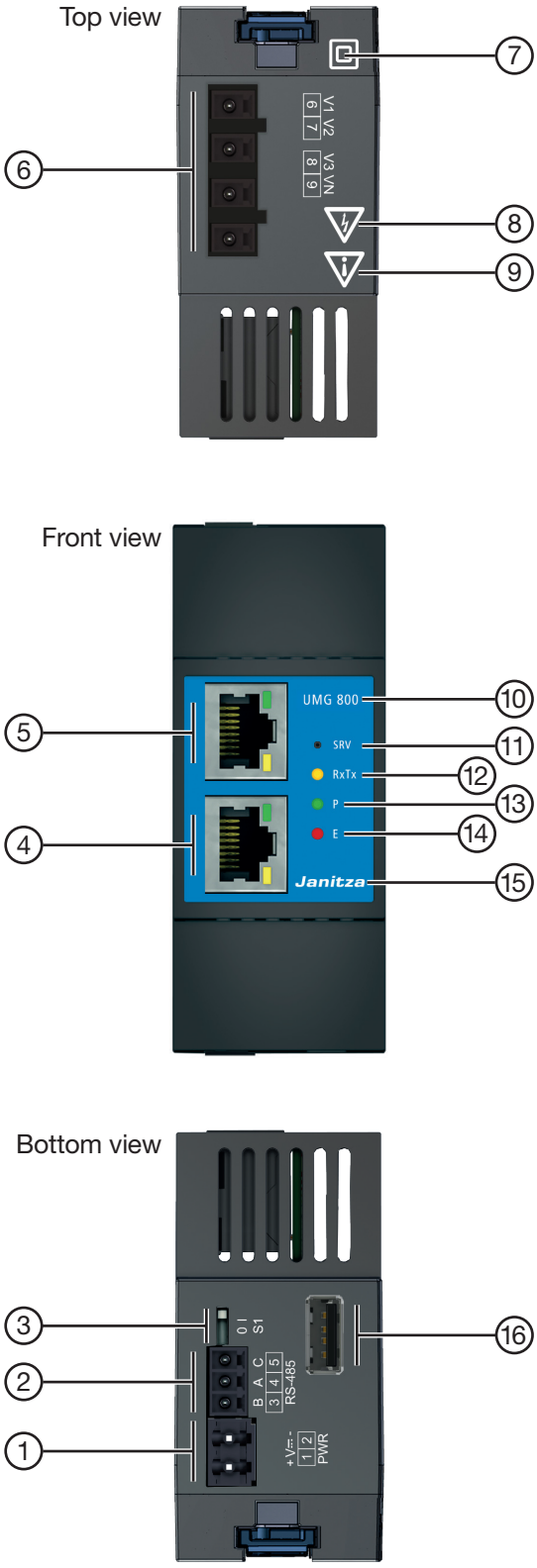
3.15.3 Measured values (with voltage component)

Measured values (with voltage component)	Device/system related	Channel related	Min. value	Max. value	Average value
Frequency	1		✓	✓	✓
Rotating field direction U	1			✓System	
Measurement of positive, negative, zero sequence component	1		✓	✓	✓
Imbalance in %	1		✓	✓	✓
Effective voltage U_{NPE_eff}	1			✓	
Effective voltage U_{LN_eff}		3	✓	✓	✓
Effective voltage U_{LL_eff}		3	✓	✓	✓
Distortion factor U_{LN_THD}		3	✓	✓	✓
Distortion factor U_{LL_THD}		3	✓	✓	✓
Real component Voltage Re{U_{LN}}		3	✓	✓	✓
Imaginary component Voltage Im{U_{LN}}		3	✓	✓	✓
Harmonics $U_{LN_1..63}$		3x63		✓	
Harmonics $U_{LL_1..63}$		3x63		✓	
Crest factor $U_{LN\text{-}Crest}$	3			✓System	

Table: Measured values recorded by the measurement device.
For more information on the measured values, see section "17.2 Performance characteristics of functions" on page 86.

4. Design of the device

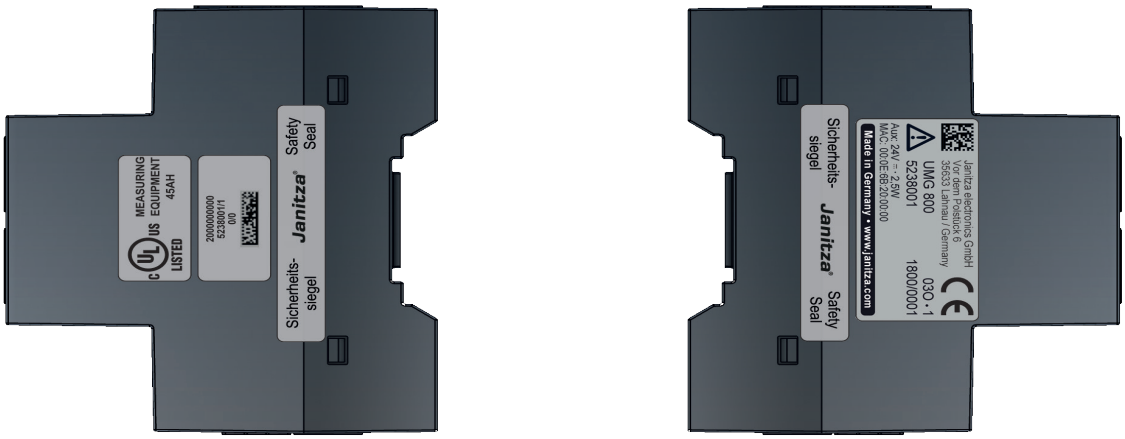
4.1 Controls, display elements and interfaces (views without terminals)



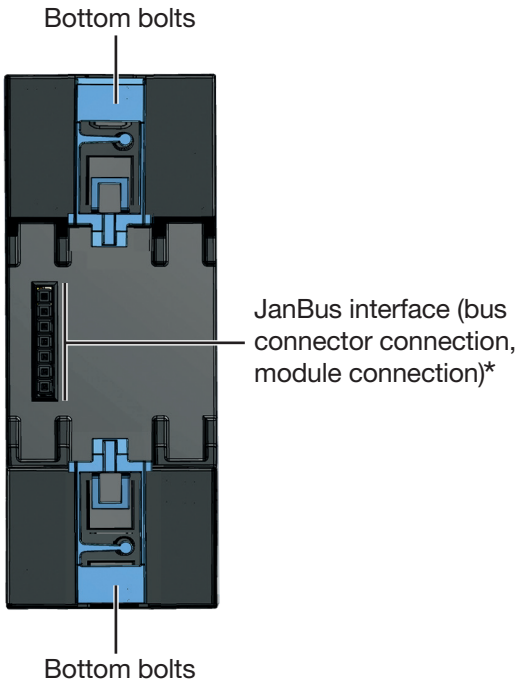
Item	Function/Designation	
1	Supply voltage connection.	
2	RS-485 interface.	
3	DIP switch for RS-485 termination - see Sect. "10.4 RS-485 interface (fieldbus)" on p. 47.	
4	Ethernet interface (RJ45) - Ethernet B - static mode (factory setting: IP address 10.10.10.200).	
5	Ethernet interface (RJ45) - Ethernet A - DHCP mode (factory setting: Dedicated mode).	
6	Voltage measurement inputs V_1, V_2, V_3 and V_N.	
7	Symbol "Protection class" - Protection class II (reinforced or double insulation) according to IEC 60536 (VDE 0106, Part 1).	
8	"Hazard symbol" – Warning symbol indicating an electrical hazard. Be certain to observe the warning notices applied to the device and shown in the documentation in order to avoid possible injury or even death.	
9	"Hazard symbol" – General warning symbol. Be certain to observe the warning notices applied to the device and shown in the usage information in order to avoid possible injury or even death.	
10	Device designation.	
11	SRV button - Service button.	(For detailed descriptions of the service button and the LEDs, see Sect. "8. Operation and commissioning" on p. 36).
12	Yellow LED (RxTx) - blinks during cyclical data exchange.	
13	Green LED (P) - lights up when the power supply is correct.	
14	Red LED (E) - · lights up when the meter is started and in the event of an error. · blinks in the event of an overvoltage greater than 520 V_{RMS} (L-N)	
15	Manufacturer's logo.	
16	USB interface, type A (e.g. connection for external displays or a USB storage medium with the network configuration file).	

Tab.: Device structure - interfaces, controls and display elements

4.2 Side views (without terminals)



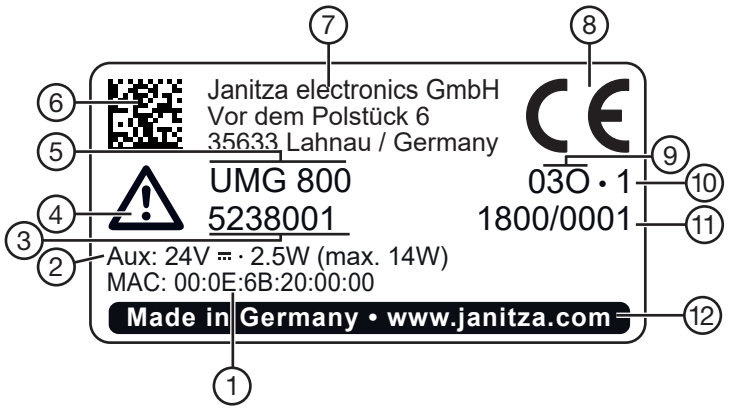
4.3 Rear view (without terminals)



INFORMATION

* When the device is delivered, the bus connectors are already plugged into the JanBus interface!

4.4 Identification of the device (nameplate)



Item	Designation	Description
1	MAC address	Unique identification of the device in a computer network.
2	Operational data	Supply voltage, power consumption and max. power consumption (with modules and ext. display).
3	Item number of the measurement device	Manufacturer's item number - marking for traceability (Actual item number may differ from illustration - see delivery note).
4	Symbol for "Danger sign"	General warning symbol. Be certain to observe the warning notices applied to the device and shown in the usage information in order to avoid possible injury or even death.
5	Device type	Device designation.
6	Data matrix code	Coded manufacturer data.
7	Manufacturer’s address	Full address of the device manufacturer.
8	CE conformity marking	See Sect. "3.6 Conformity declaration" on p. 18.
9	Manufacturer-specific data	Manufacturer data.
10	Hardware version	Hardware version of the device.
11	Type/serial number	Number for identification of the device.
12	Designation of origin/web address	Country of origin and manufacturer’s web address.

Tab.: Device identification, nameplate

5. Mounting

5.1 Installation location

⚠ DANGER

Danger of electric shock!
Electric shocks lead to serious injuries, including death.
Before installing and connecting the device:
- **Disconnect the supply of power to the system!**
- **Secure it against being switched on again!**
- **Check to be sure it is de-energized!**
- **Ground and short circuit!**
- **Cover or block off adjacent live parts!**
- **The installation must only be carried out by qualified personnel with electrical training!**

Mount the measurement device in switchboard cabinets or small distribution boards according to DIN 43880 on a 35 mm DIN rail (for type, see Sect. "17. Technical specifications" on p. 82) according to DIN EN 60715. The mounting orientation is arbitrary.

⚠ CAUTION

Property damage or personal injury due to disregard of the assembly instructions!
Disregard of the assembly instructions may cause damage to your basic device or your applications with modules and components or destroy them and/or may also result in personal injury.
- **In addition to the installation instructions for the measurement device, also observe the installation instructions for the devices integrated in your meter and module topology, in particular the safety and warning information.**
- **Provide adequate air circulation in your installation environment and cooling, as needed, when the ambient temperatures are high.**
- **Return defective measurement devices to Janitza electronics GmbH in accordance with the shipping instructions for air or road freight (complete with accessories).**
- **All usage information is also available as a download at www.janitza.com.**
- **More information on device functions, data and installation as well as the battery used in the device can be found in the user manual.**

ATTENTION

Improper handling or handling them too roughly can destroy your devices, modules and components!
Contacts, bottom bolts and retaining clips can be damaged or broken off during mounting or dismounting.
- **Never use force to mount or dismount devices, modules and components! Never tear devices, modules or components off of the DIN rail.**
- **When dismounting devices, modules and components, first remove the wiring (e.g. cables, current and voltage transformers, etc.).**
- **Carefully unlock the bottom bolts and retaining clips of the devices, modules and components with a screwdriver!**
- **Never touch or manipulate contacts! Protect the contacts during handling, transport and storage!**
- **Observe related usage information on the devices, modules and components!**

ATTENTION

Material damage due to improper handling or disregard of the installation instructions!
Incorrect mounting of the meter can destroy the contacts of the bus connector (JanBus interface)!
- **Use suitable DIN rails according to DIN EN 60715 for mounting the meter! Suitable DIN rail types see Sect. "17. Technical specifications" on p. 82.**
- **Before you begin mounting and wiring your meter on the DIN rail, plug the bus connector into the sockets on the back of the meter, if you have not already done so!**
- **Never:**
  - **touch or manipulate the contacts of the bus connector!**
  - **force the contacts into the bus connector sockets!**

5.2 Bus connector

INFORMATION

The measurement device is supplied with the appropriate bus connectors. Please also note the following before setting up a meter and module topology
· Mount the bus connector!
· The usage information of the integrated modules and components

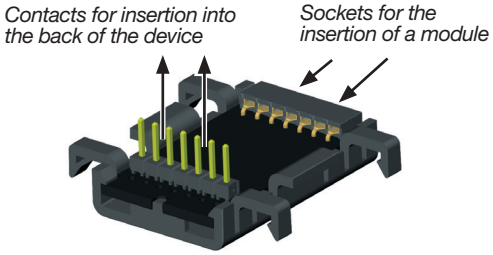


Fig.: 3D view - bus connector of the meter (scope of delivery)

5.3 DIN rail mounting of the meter

INFORMATION

Observe the dimensions of the terminals used on the connections of the device for DIN rail mounting! Provide sufficient free space for the wiring!

Proceed as follows to mount the meter on a DIN rail:

1. Check the installation of the bus connector (included in scope of delivery, pre-assembled) on the back of your device. If not already done, plug the contacts of the bus connector (JanBus interface) into the sockets on the back of the meter (see Figures 1 - 3 on the right).

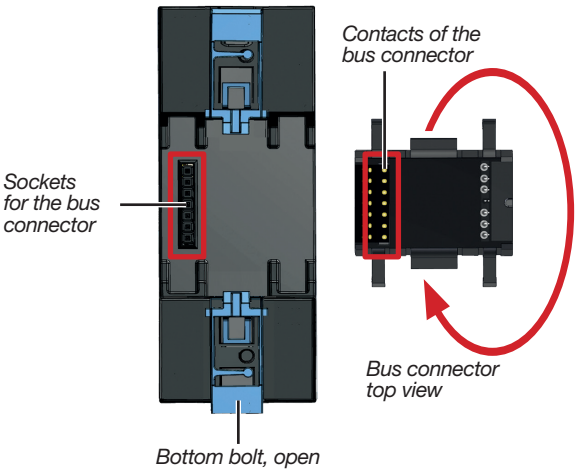


Fig. 1 - Bus connector installation: Rear of meter and front of bus connector

2. Press in the bottom bolt on the back of the meter.

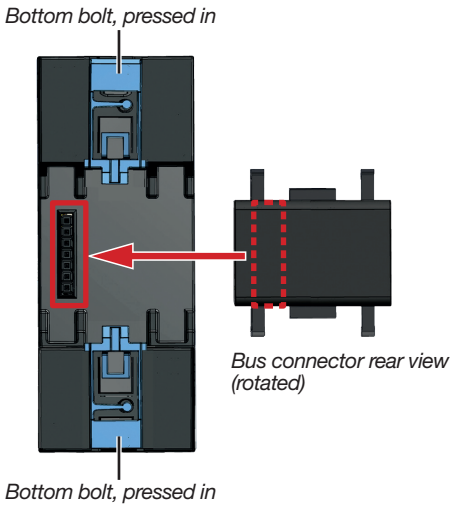


Fig. 2 - Bus connector installation: Measurement device and bus connector rear of device

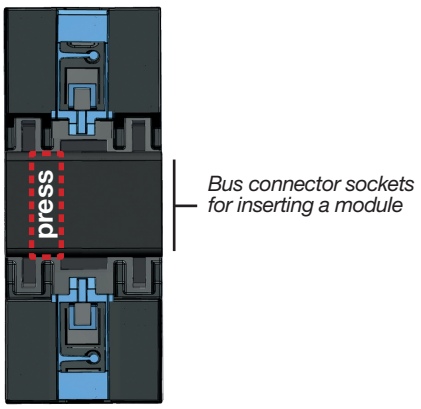


Fig. 3 - Bus connector installation: Rear of meter with mounted bus connector

3. Press your meter with the bus connector onto the DIN rail frontally until the bottom bolts engage (click).

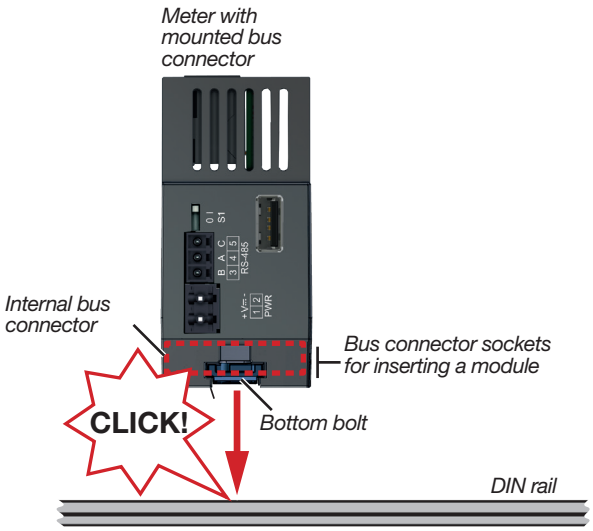


Fig.: Meter with internal bus connector (view from below)

4. Check the fit of your measurement device and mount end brackets. Also mount end brackets at all ends of measurement device and module series!
5. Wire your measurement device in compliance with the enclosed installation manual. For meter and module topologies, please note the usage information for all integrated devices and modules.

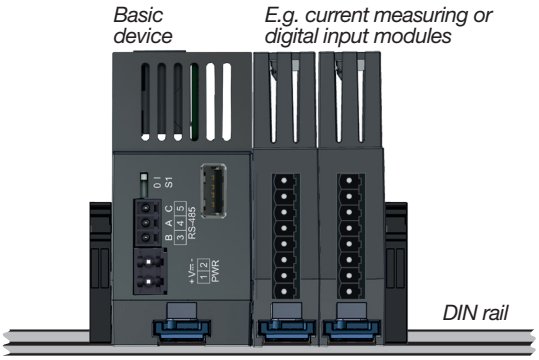


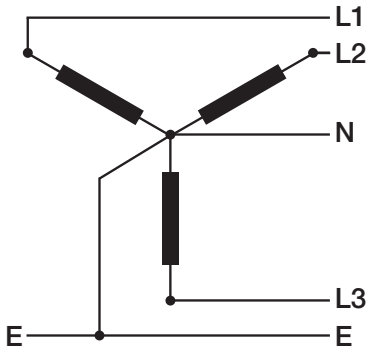
Fig.: Example of a meter and module topology

6. Install and connect additional modules, e.g. current measuring modules or digital input modules, by pushing their bus connector contacts into the sockets of the meter bus connector. The maximum number of modules that can be connected to a basic device via the bus connectors can be found in the user manual for the respective module.

6. Grid systems

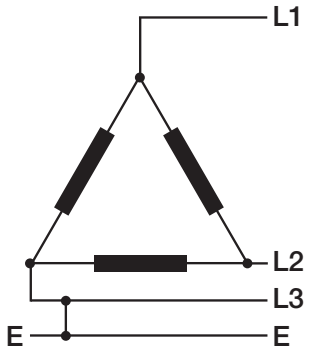
Suitable grid systems and maximum rated voltages according to DIN EN 61010-1/A1:

3-phase 4-wire systems
with grounded neutral conductor



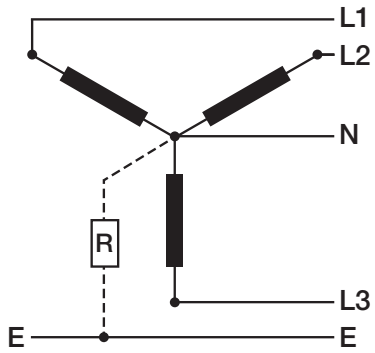
IEC	U_{L-N} / U_{L-L}: 270 V_{LN} / 480 V_{LL}
UL	U_{L-N} / U_{L-L}: 270 V_{LN} / 480 V_{LL}

3-phase 3-wire systems
with grounded phase



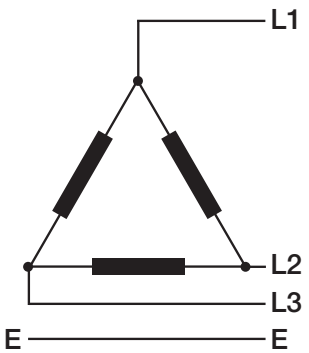
IEC	U_{L-L} 480 V_{LL}
UL	U_{L-L} 480 V_{LL}

3-phase 4-wire systems
with ungrounded neutral conductor (IT networks)



IEC	U_{L-L}: 480 V_{LL}
UL	U_{L-L}: 480 V_{LL}

3-phase 3-wire systems
ungrounded



IEC	U_{L-L}: 480 V_{LL}
UL	U_{L-L}: 480 V_{LL}

Range of application of the meter:
· 3 and 4-conductor networks (TN, TT and IT networks).
· Industrial areas.

⚠ WARNING

Risk of injury due to electrical voltage!
Rated surge voltages above the permitted over-voltage category can damage the insulation in the device. This impairs the safety of the device. This can result in serious injury or death.
· **Only use the device in environments which comply with the permissible rated surge voltage.**
· **Observe the limit values specified in the user manual and on the nameplate.**

INFORMATION

Use a separate, grounded power supply unit (PELV) for the supply of power for each measurement device!

7. Installation

Use the measurement device for voltage measurement in TN, TT and IT networks with the approved overvoltage category of 300 V CAT III in accordance with IEC and UL (rated surge voltage 4 kV).

⚠ WARNING

Risk of injury due to electrical voltage!
Do **not** short-circuit secondary connections of voltage transformers! This can result in serious injury or death.
· **Connect voltage transformers according to their documentation!**
· **Check your installation!**

⚠ WARNING

Disregard of the connection conditions of the transformers to Janitza measurement devices or their components can lead to injuries or even death or to material damage!
· Do not use Janitza measurement devices or components for critical switching, control or protection applications (protective relays)! It is not permitted to use measured values or measurement device outputs for critical applications!
· For Janitza measurement devices and their components use **only "Transformers for measurement purposes"** which are suitable for the energy monitoring of your system. **Do not** use **"transformers for protection purposes"**!
· Observe the information, regulations and limit values in the usage information on **"Transformers for measuring purposes"**, including during testing and commissioning of the Janitza measurement device, the Janitza component and your system.

7.1 Nominal voltages

Nominal network voltages in the three-phase 4-conductor network with grounded neutral conductor suitable for the measuring inputs of your meter:

U_{L-N} / U_{L-L}	
66 V / 115 V	
120 V / 208 V	
127 V / 220 V	
220 V / 380 V	
230 V / 400 V	
240 V / 415 V	
260 V / 440 V	
270 V / 480 V	**Maximum rated voltage of the network according to UL and IEC**
347 V / 600 V	
400 V / 690 V	
417 V / 720 V	
480 V / 830 V	

Tab.: Nominal network voltages suitable for measurement inputs acc. to EN 60664-1

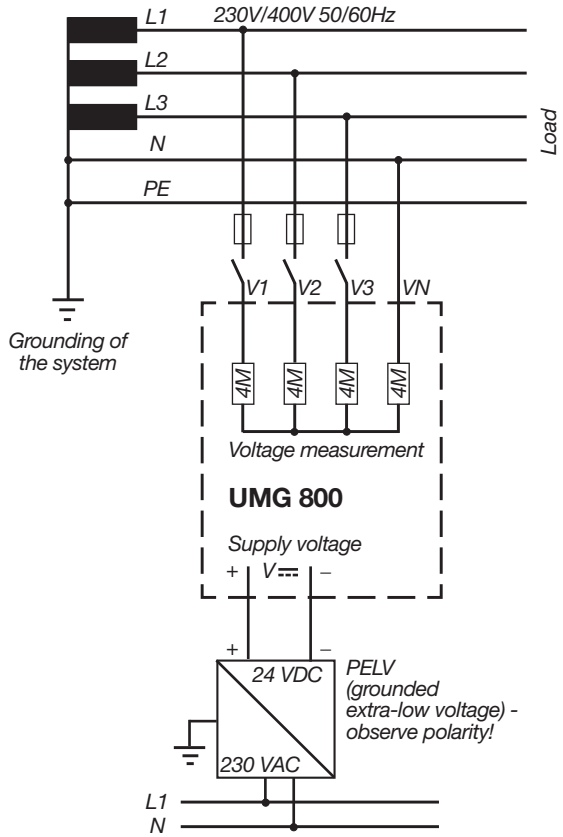


Fig. Schematic diagram: Three-phase 4-conductor network with grounded neutral conductor

INFORMATION

You can find more information on the technical data in the Sect. "17. Technical specifications" on p. 82

7.2 Circuit breaker

Provide a suitable circuit breaker for the supply voltage in the building installation to disconnect your system and thus your device from the supply of power.

- Install the circuit breaker of your system or device in such a way that it is easily accessible by the user.
- Mark the switch as an isolation device for your system or device.

INFORMATION

The fuse is a line protection, not a device protection!

7.3 Supply voltage

WARNING

Risk of injury due to electrical voltage!
Severe bodily injury or death can result from:
- Touching bare or stripped leads that are energized.
- Device inputs that pose a hazard when touched.

Disconnect your system from the power supply before mounting
- and connecting the device!
- Secure it against being switched on again!
- Check to be sure it is de-energized!
- Ground and short circuit!
- Cover or block off adjacent live parts!

Only operate the measurement device with a supply voltage of 24 VDC (PELV - observe polarity!)!

Use a separate power supply unit (with PELV) for each measurement device, as otherwise unfavorable potential shifts can cause residual currents that can lead to measurement errors.

The type and level of the supply voltage for your device can be found on the nameplate and the Sect. "17. Technical specifications" on p. 82.

The supply voltage is connected via plug-in terminals (scope of delivery) on the bottom of the device.

INFORMATION

Note that the meter requires an initialization phase (boot time) at startup!

After connecting the supply voltage and after the initialization phase, the green LED (P) lights up. If no LED lights up, check,
- the connection of your meter.
- whether the supply voltage is within the nominal voltage range.

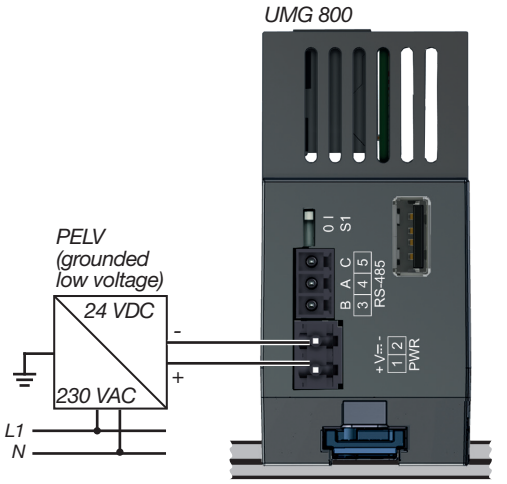


Fig. Measurement device view from below

ATTENTION

Material damage due to disregard of the connection instructions!
Disregard of the connection instructions or exceeding the permissible voltage range can damage or destroy your device.
Before connecting the device to the supply voltage, please note:
- **Voltage and frequency must correspond to the specifications on the nameplate!**
- **Observe the limit values as described (see Sect. "17. Technical specifications" on p. 82)!**
- **In the building installation, secure the supply voltage with a UL/IEC listed line circuit breaker/ fuse!**
- **Observe the following for the isolation device:**
  - **Install it close to the device and easily accessible for the user.**
  - **Mark it for the respective device.**
- **Do not tap the supply voltage from the voltage transformers.**
- **Provide a fuse for the neutral conductor if the neutral conductor terminal of the source is not grounded!**

7.4 Voltage measurement

The device has 4 voltage measurement inputs and is suitable for various connection variants.

⚠ WARNING

Risk of injury or damage to the device due to electrical voltage and improper connection!
Failure to comply with the connection conditions for the voltage measurement inputs can result in damage to the device or serious injury, including death.
Therefore, please observe the following:
- **Switch off your installation before commencing work! Secure it against being switched on again! Check to be sure it is de-energized! Ground and short circuit! Cover or block off adjacent live parts!**
- **Concerning the voltage measurement inputs:**
  - **Do not apply DC voltage to them.**
  - **Equip the voltage measurement inputs with a suitable, marked fuse and isolation device (alternatively: line circuit breaker) located nearby.**
  - **The voltage measurement inputs are dangerous to touch.**
- **Connect voltages that exceed the permissible nominal network voltages via a voltage transformer.**
- **Measured voltages and currents must originate from the same network.**

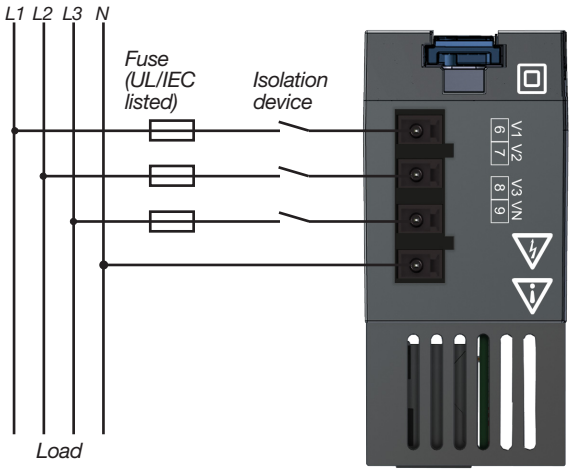


Fig. Connection example "Voltage measurement". Measurement device - view from above.

ⓘ INFORMATION

As an alternative to the fuse and isolation device, you can use a line circuit breaker.

7.4.1 Overvoltage

The voltage measurement inputs are designed for measurements in low-voltage networks in which nominal voltages occur as described in Sect. "17. Technical specifications" on p. 82.

Information on the rated surge voltages and overvoltage categories can also be found in the technical data.

7.4.2 Mains frequency

The device:
· Requires the mains frequency for the measurement and calculation of measured values.
· Is suitable for measurement in networks in which the fundamental oscillation of the voltage is in the range from 40 Hz to 70 Hz.
· Requires the following for automatic determination of the mains frequency:
  - A voltage L-N of greater than 20 V_{eff} at voltage measurement input V1.
  - A voltage L-L of greater than 34 V_{eff} at the voltage measurement inputs V1-V2 or V1-V3.
· calculates the sampling frequency of the voltage measurement inputs from the mains frequency.

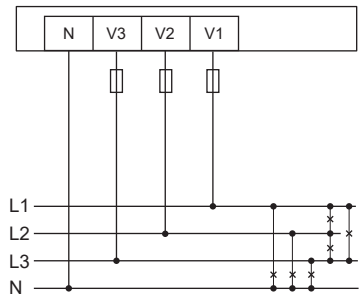
INFORMATION

The device only determines measured values if a voltage L-N of greater than 20 V_{eff} (4-wire measurement) is present at the voltage measurement input V1 or a voltage L-L of greater than 34 V_{eff} (3-wire measurement) is present at the voltage measurement inputs V1-V2 or V1-V3.

Use line protection with IEC/UL approval (1 - 10 A, tripping characteristic B) as an overcurrent protective device for the voltage measurements.

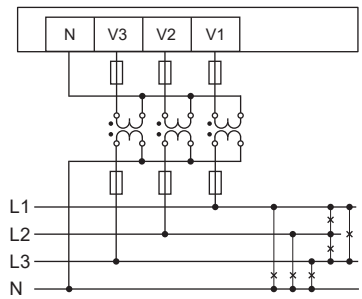
7.4.3 Connection variants for voltage measurement

3-phase 4-wire system



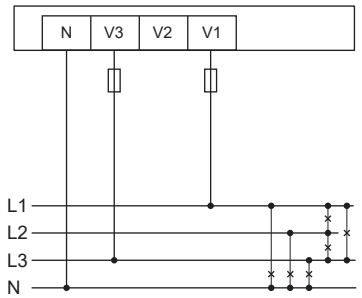
3-phase 4-wire system without voltage transformer

3-phase 4-wire system



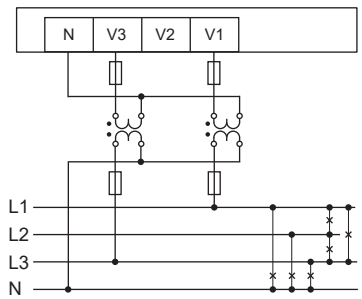
3-phase 4-wire system with voltage transformer

3-phase 4-wire system



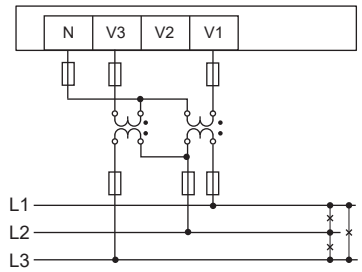
3-phase 4-wire system (symmetrical load)

3-phase 4-wire system



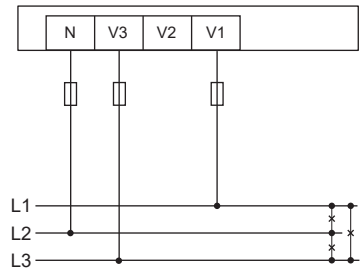
3-phase 4-wire system (symmetrical load)

3-phase 3-wire system



3-phase 3-wire system with voltage transformer

3-phase 3-wire system



3-phase 3-wire system (asymmetrical load)

INFORMATION

If the measuring range is exceeded at the voltage measurement inputs of the measurement device, the red LED "E" blinks (see Sect. "16. Error messages" on p. 80).

7.4.4 Configuring voltage transformers

Configure the voltage transformers on the measurement device:

1. Via the function buttons of an external display (e.g. RD 96) under *Menu* > *Configuration* > *Voltage transformers* (or *Current transformers* for connected current measuring modules).
2. On the integrated web server on the measurement device homepage (see Sect. "14. Measurement device homepage" on p. 73).
3. In the GridVis software.
4. Via an OPC UA server. Note in this regard Sect. "10.3 OPC UA protocol" on p. 46!

INFORMATION

· Connect transformers in compliance with the specifications on the device nameplate and the technical data! Observe the safety instructions for the transformers (see Page 14 and Page 19)!
· The default settings for the voltage transformers on the meter are 400 V (primary) / 400 V (secondary).
· The standardized data exchange method OPC UA requires advanced knowledge of its architecture! Only persons with certified specialist knowledge may work on the interfaces with OPC UA architecture!

7.5 Current measurement - with current measuring modules

As a basic device, the UMG 800 allows current measuring modules of the following types for current measurement

· Module 800-CT8-A
· Module 800-CT8-LP
· Module 800-CT24
· Module 800-CT12-SVD-US
· Module 800-MF8

INFORMATION

· To set up a measurement device and module topology with current measuring modules, observe the corresponding usage information for the module. In particular, the information on safety, handling and configuration of the current transformer ratios!
· Information on the "Virtual meters" and their configuration can be found in the section 11.2 on p. 62.

7.5.1 Configuring current transformers of connected current measuring modules

Current transformers of connected current measuring modules can be configured in the same way as the voltage transformers (see section 7.4.4).

7.6 Digital inputs - with the 800-DI14 module

An 800-DI14 digital input module extends the functional range of a basic device by 14 digital inputs.

INFORMATION

To set up a measurement device and module topology with digital input modules, observe the corresponding usage information for the module!

8. Operation and commissioning

8.1 Operating options for the meter

After mounting and installation, the measurement device has the following operating options, e.g. for commissioning, configuration and displaying measurement data:

· For commissioning, a USB storage medium (FAT32 formatted) transfers a network configuration file to the measurement device **after** the measurement device has started (initialization/boot process) (for information, see Sect. "10.6 USB interface" on p. 50).

· The Ethernet interface A in the DHCP mode of the meter (Sect. "10.1 Ethernet interfaces - Modbus TCP" on p. 44) is used for communication in Ethernet networks and therefore for configuration. In conjunction with a PC on which the GridVis software is installed, you can, for example, program and analyze measurement data (Sect. "9. PC connections" on p. 43).

· Via the measurement device homepage integrated into the measurement device (Sect. "14. Measurement device homepage" on p. 73).

· **Recommendation:** Via a separately available external display with function buttons on the USB interface (Sect. "10.6 USB interface" on p. 50).

INFORMATION

External displays, e.g. the RD 96 in combination with the basic device:
· are used for front panel installation inside a switchboard cabinet or small distribution board.
· ensure safe reading of measured values without having to open or touch live systems, system components, switchboard cabinets or small distribution boards!
For further information, please refer to the usage information for the display in use (e.g. RD 96)!

8.2 Controls and display elements

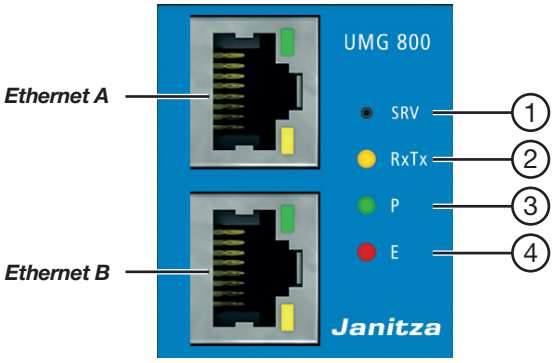


Fig. Front of measurement device: Operating and display elements

8.2.1 Service button

Item	Description
1	**SRV - Service button** · **Press for 3 seconds -** Meter restart. · **Press for 10 seconds -** Reset to factory settings with assignment of IP modes and meter restart: - Ethernet A = DHCP mode (Dedicated mode) - Ethernet B = Static IP address **10.10.10.200**

Tab.: Functions service button

8.2.2 LED display elements

Item	Description
2	**RxTx (Receive data, Transmit data) - LED (yellow)** · **Lights up** (continuously) in the event of a module communication error. · **Blinks** during operation and signals cyclical data exchange. · **Blinks slowly** at startup (initialization). · **Off** - Meter in operation but no module connected (no data exchange).
3	**P (Power) - LED (green)** · **Lights up** at startup (initialization). · **Lights up** when the power supply is correct. The measurement device is ready for operation. · **Blinks** during communication via the USB interface. · **Off** - Measurement device has no power supply.
4	**E (Error) - LED (red)** · **Lights up** at startup (initialization) and in the event of an error. · **Blinks** in the event of an overvoltage greater than 520 V_{RMS} (L-N). · **Off** - Meter is working correctly.

Tab.: Functions of LED display elements

INFORMATION

· After a successful start (initialization), the user can recognize a correctly functioning measurement device by the green LED (P) being lit and the yellow LED blinking (RxTx - cyclical data exchange).
· In the event of an error, please note Sect. "16. Error messages" on p. 80

8.3 LED status of connected modules

During the initialization (start) and operation of meter and module topologies, the LEDs of connected modules show and signal various states (for more information, see the usage information for the modules).

A missing module power supply is indicated by inactive LEDs on the modules. The reason for this may be, for example, that the self-resetting fuse integrated in the basic device has tripped.

The self-resetting fuse, whose resistance increases in the event of high electrical currents (e.g. a short circuit) due to self-heating. This switches off the power supply to connected modules and only supplies the modules with power again after the basic device has cooled down. Therefore please abide by the following:

ATTENTION

Triggering the measurement device's self-resetting fuse in the event of a short circuit or overload can cause material damage to the meter and module topology (e.g. loss of data).
In the event of a short circuit or overload of the measurement device with connected modules, the self-resetting fuse of the measurement device switches off the modules. Afterward, proceed as follows:
· Observing the safety instructions, disconnect the measurement device from the supply voltage and allow it to cool down (approx. 15 min., depending on the ambient temperature).
· Eliminate the short circuit or overload on the measurement device, e.g. by checking the bus connector installation or reducing the number of modules on the measurement device.
· Then supply the measurement device with power again.

8.4 Average value - gridded and moving

The measurement device records average values for the measured voltages, currents (via modules) and powers.

Use the **GridVis software (in the device configurator under General > Average value)** to define the averaging interval (time base) for determining the average value of the respective measured values. The average values and the associated minimum and maximum values can be read out via Modbus addresses or OPC-UA.

INFORMATION

The measurement device
- overwrites the average values and the associated minimum and maximum values with each interval.
- records the time stamp (time and date) for the gridded and moving averages in addition to the measured values.
- The GridVis software provides an option for selecting defined or user-defined recording sets with the averaging interval and the measured value calculation. Detailed information on this can be found in the online help for the GridVis software.

8.4.1 Gridded average value

The measurement device calculates gridded averages for a fixed time base (averaging interval).

If the measurement device is set to 15 minutes, the averaging intervals always start at the full hour, a quarter of an hour after, at the half hour and a quarter of an hour before the full hour.

INFORMATION

- **The measurement device records gridded average values and makes them available via Modbus. Further information can be found in the Modbus address list. These can be found on the measurement device homepage.**
- **The default setting for the time base (averaging interval) in the GridVis software is 10 min.**

Gridded averages allow you to compare the time periods from several measurement devices that are synchronized.

Example of a 15 min. averaging interval:

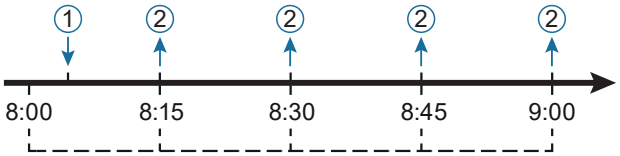


Fig.: Gridded averages - averaging interval = 15 min.:
1) Switch on (start measurement); 2) New average value from the previous 15 min. interval available

8.4.2 Moving average value

Moving averages always apply to the last elapsed time interval (averaging interval), starting from the current time.

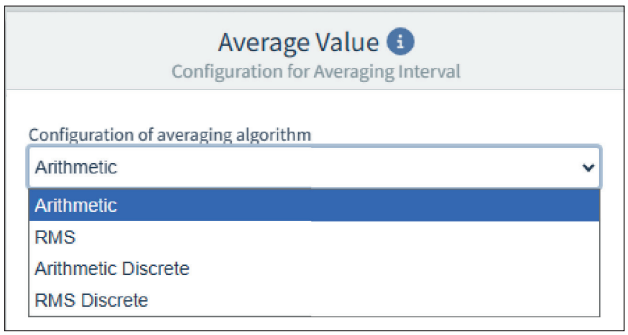
The time interval for determining the mean value must be defined in the GridVis software. The measurement device recalculates the average values every minute.

The averaging interval for moving averages is set to 10 min. in the measurement device factory settings.

Example - Moving average with an averaging interval of 15 min:
The measurement device is switched on at 10:05 and from this time on it continuously generates new average values for the previous 15 min.
The measurement device
- has the average value for 10:05-10:20 a.m at 10:20 a.m.
- has the average value for 10:06-10:21 a.m at 10:21 a.m.
- etc.

8.4.3 Gridded and moving average value in the GridVis software

As mentioned previously in section 8.4, the averaging interval (time base) and the type of averaging must be configured in the device configurator of the GridVis software under General > Averaging.
There are 4 options available for calculating the measured value (averaging):



Configuration of averaging in the GridVis software (type of averaging - Calculation of average values)

Averaging	Calculation
Arithmetic	Moving, arithmetic averaging.
RMS	Moving RMS (RMS ... root mean square).
Arithmetic Discrete	Gridded, arithmetic averaging.
RMS Discrete	Gridded, RMS averaging.

Tab. Configuration options for the averaging and calculating it

8.5 Comparator

Comparators are used to monitor limit values. The measurement device has **125 comparators** that can be logically linked together by the user in **32 comparator groups**.

The measurement device saves the results of the "AND" or "OR" linking of comparators in a comparator group, e.g. in a ModBus address or on the OPC UA server.

Comparators and comparator groups can be configured in the GridVis software under Logic > Comparators.

INFORMATION

In addition to selecting previously configured profiles for the comparators, you can also assign names for comparators and comparator groups in the GridVis software.

Further information on configuring the comparators and comparator groups can be found in the online help for the GridVis software.

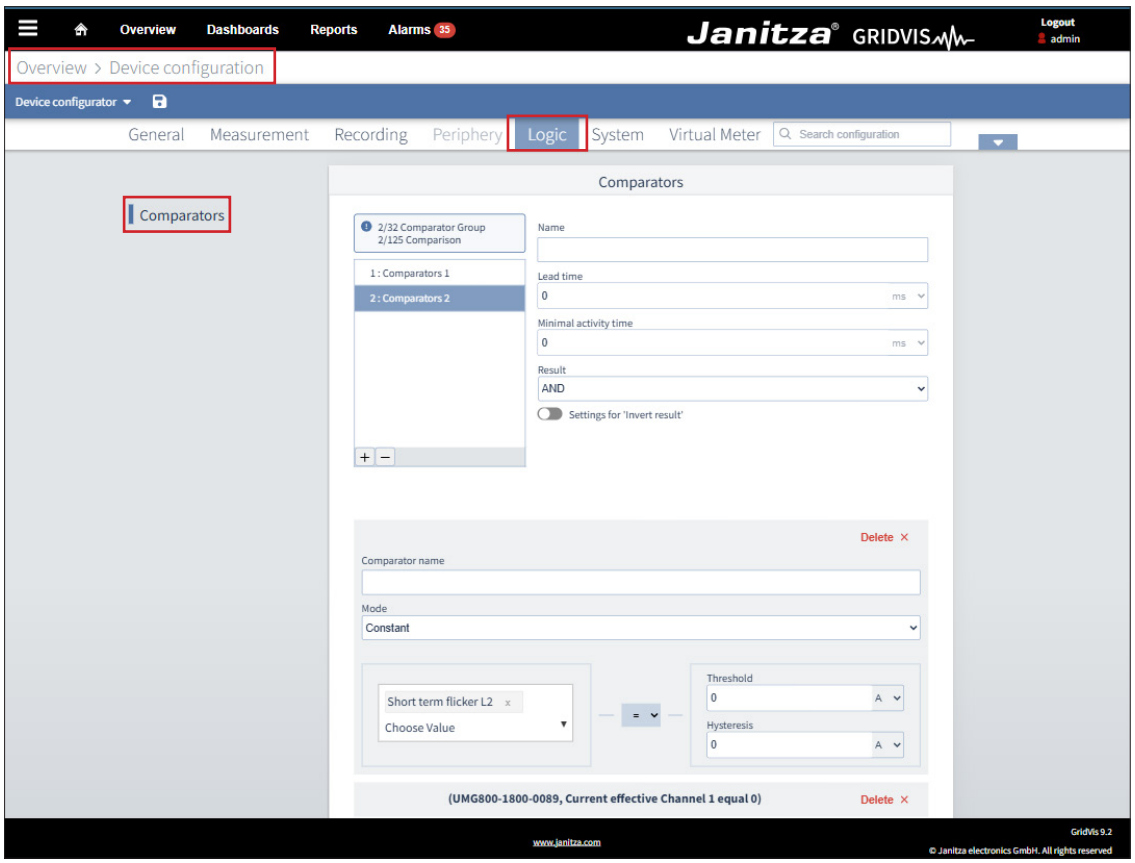


Fig. GridVis software:
Configuring the comparator and comparator groups in the configuration window of the measurement device

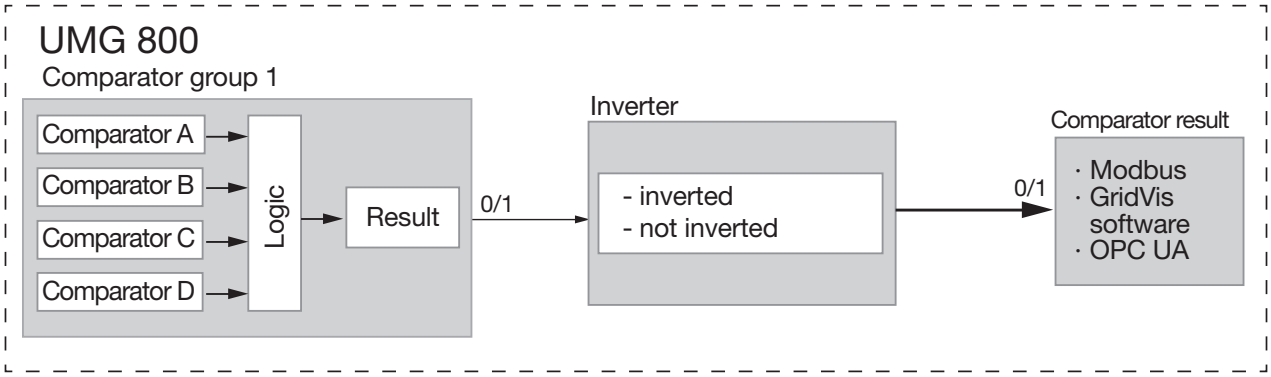


Fig. Application example: "Comparator results" block diagram

Comparator settings
Various parameters are of relevance for configuring comparator groups and comparators:

· **Lead time**
The set comparator condition (e.g., measured value > threshold value) must be met for at least the duration of the set lead time in order for the comparator result to be set to Active.

· **Minimum active time**
The minimum active time is the minimum duration for which a result remains active after the lead time. The result is reset only when the comparator condition is no longer met and the activity time has expired.

· **Comparator result**
The comparator result shows the current status of the comparator. If the comparator condition is met and the lead time has elapsed, the comparator result becomes active. The comparator result remains active as long as the comparator condition is met, but at least for the duration of the minimum activity time.

· **Hysteresis**
The hysteresis delays the reset of the comparator result.

Example: In a comparator with the condition "Measured value > Threshold," the measured value must fall below the threshold minus the hysteresis in order for the result to be reset.

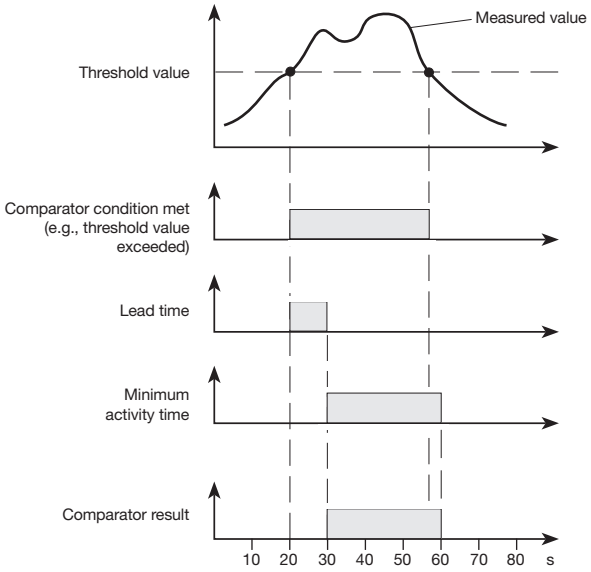


*Fig. Comparator **without hysteresis** Example with 10 s lead time and 30 s minimum activity time*

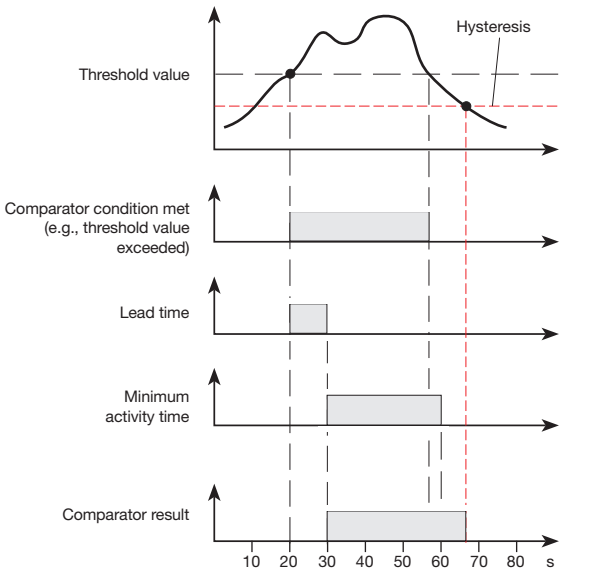


*Fig. Comparator **with hysteresis** Example with 10 s lead time and 30 s minimum activity time*

9. PC connections

The most common connection methods for communication of the measurement device with a PC (with the GridVis software installed) are described below.

ATTENTION

Material damage due to incorrect network settings.
Incorrect network settings can cause faults in the IT network!
Consult your network administrator for the correct network settings for your device.

1. Connection to a DHCP server and PC. The DHCP server automatically assigns IP addresses to the device (Ethernet A) and the PC. In the factory settings, the measurement device has DHCP mode for Ethernet interface A (Dedicated mode - see Sect. "10.1 Ethernet interfaces - Modbus TCP" on p. 44). For adaptation to a company network, ask your network administrator!

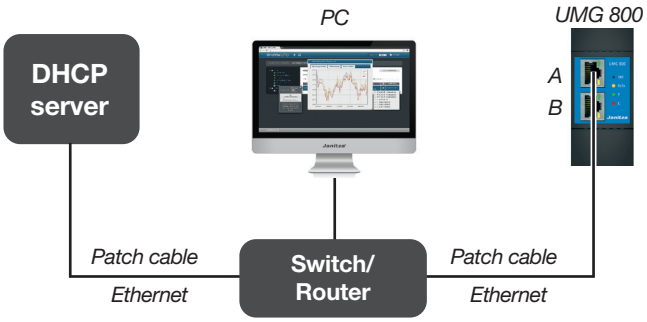


Fig.: The DHCP server automatically assigns IP addresses to the measurement device and PC (ask the network administrator for the fixed IP address of the measurement device in a company network).

2. Connection as a client device (formerly master) with gateway function and downstream RS-485 bus structure (Modbus RTU) to a PC and OPC UA server. For adaptation to a company network, ask your network administrator!

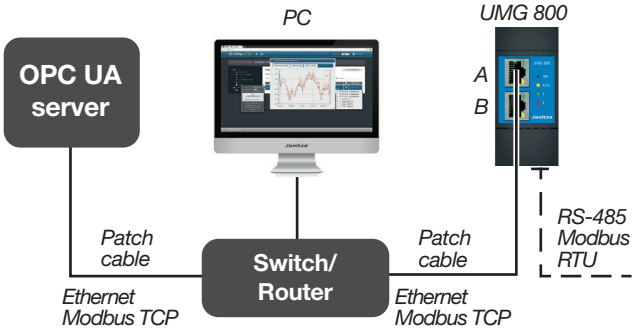


Fig.: Connecting the measurement device with a patch cable (Ethernet interface Modbus TCP) via a switch/router to the OPC UA server and the PC (ask the network administrator for the fixed IP address of the measurement device in a company network).

3. PC direct connection. PC and device require a fixed IP address.

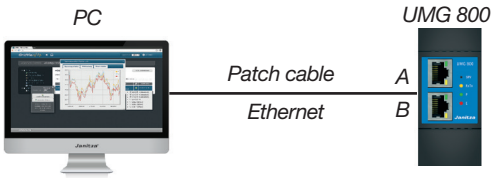


Fig.: PC and measurement device require a fixed IP address

9.1 GridVis Quick Guide

Explains how to create a new project in the GridVis software after connecting the PC, and how to add and configure the device:

wiki.janitza.de/x/jgIgCQ

10. Communication via the interfaces

10.1 Ethernet interfaces - Modbus TCP

ATTENTION

Material damage due to security vulnerabilities in programs, IT networks and protocols.
Security vulnerabilities can lead to data misuse and faults and even the standstill of your IT infrastructure.
To protect your IT system, network, data communications and measurement devices:
- **Inform your network administrator and/or IT representative.**
- **Always keep the meter firmware up to date and protect the communication to the meter with an external firewall. Close unused ports.**
- **Take protective measures against viruses and cyber attacks from the Internet, e.g. through firewall solutions, security updates and virus protection programs.**
- **Eliminate security vulnerabilities and update or renew existing protection for your IT infrastructure.**

ATTENTION

Material damage due to incorrect network settings.
Incorrect network settings can cause faults in the IT network!
Consult your network administrator for the correct network settings for your measurement device.

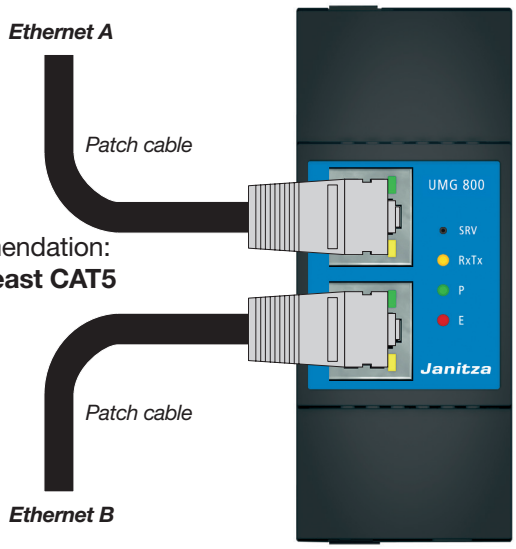
The measurement device has Ethernet interfaces A and B for communication in Ethernet networks.
When the meter is delivered, the Ethernet interfaces are configured as follows:

- **Ethernet interface A:**
  DHCP mode - the measurement device is assigned an IP address from a network.

- **Ethernet interface B:**
  Static mode with IP address 10.10.10.200

INFORMATION

The following options are available for configuring the Ethernet interfaces:
- **Configuration on the measurement device homepage (for more information, see Sect. "14. Measurement device homepage" on p. 73).**
- **Configuration via the GridVis software (see Sect. "9. PC connections" on p. 43).**
- **Configuration via a USB storage medium connected to the USB interface (for more information, see Sect. "10.6 USB interface" on p. 50)**
- **Configuration on an external display connected to the USB interface (see Sect. "10.6 USB interface" on p. 50).**



Recommendation:
Use at least CAT5 cable!

Fig.: Measurement device with Ethernet interfaces A and B

In this illustration, there is only a connection if:
- The supply voltage is applied to the measurement device.
- The measurement device has started.

Also note the connection interruptions during restarts!

Meaning of the Ethernet interface LEDs:

LED	Function
Yellow	Blinks during network activity.
Green	Is illuminated when there is a connection (link).

10.2 Connection options "Switched mode" and "Dedicated mode"

In addition to integrating the measurement device with the Ethernet interfaces A and B, the following options are available for integrating the measurement device into Ethernet networks:

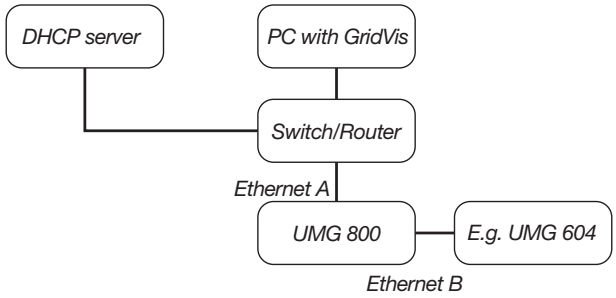
1. **Measurement device integration in a network with additional switch function (switched mode).** The measurement device is automatically assigned an IP address by a DHCP server in an IT network via Ethernet interface A, for example. Ethernet interface B has a switch function via which further devices (hardware components) can be connected in series. The measurement device also allows the reverse use of the Ethernet interfaces (e.g. "B" for the IP address from a network and "A" for further devices)!
2. **Measurement device integration in 2 different networks (dedicated mode)**.
   The Ethernet interfaces A and B of the measurement device are each assigned different IP addresses by 2 different networks.

INFORMATION

Please note when integrating the measurement device into Ethernet networks:
- **The switched and dedicated modes of the measurement device can be configured in the GridVis software.**
- **A mode change only takes effect after a hard reset (disconnect the measurement device from the supply voltage while observing the safety regulations)!**

10.2.1 "Switched mode" connection option

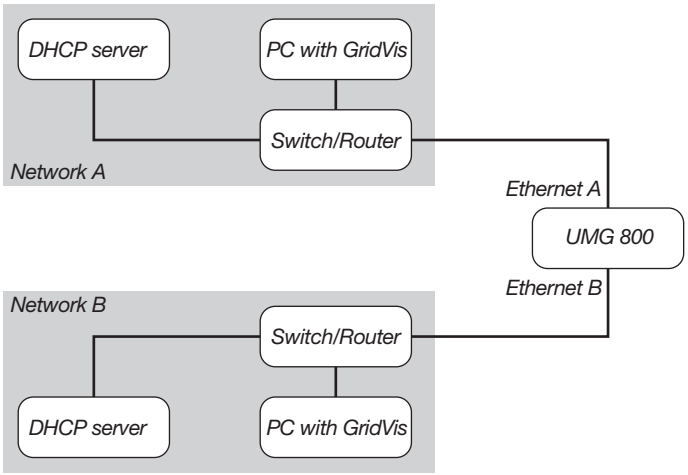
With this connection option, several devices (hardware components) are connected with each other in series:



Switched mode:
Ethernet interface B of the UMG 800 for connecting an Ethernet device. The measurement device also allows the reverse use of the Ethernet interfaces (A for the Ethernet device and B for an IP address from a network).

10.2.2 "Dedicated mode" connection option

Connection option for 2 networks with different IP addresses (separately usable Ethernet interfaces for complex meter and module topologies, for example):



Dedicated mode:
Different IP addresses for Ethernet interfaces A and B for separate networks.

INFORMATION

Information on the connection and communication of your measurement device with the software can be found in the online help for the GridVis software.

10.3 OPC UA protocol

Data is transferred using the OPC UA protocol via the Ethernet interfaces of your measurement device.

INFORMATION

- Consult your network administrator for the correct Ethernet network settings for your measurement device.
- Information on connecting your measurement device and its communication with the software can be found in the corresponding help formats (e.g. online help for the software).
- **The standardized data exchange method OPC UA requires advanced knowledge of its architecture! Only persons with certified specialist knowledge may work on the interfaces with OPC UA architecture!**

The Ethernet interfaces and the data transmission using the OPC UA protocol can be configured conveniently in the GridVis software.

The measurement device supports "static node IDs" on the OPC UA server. Static nodes always have the same ID!

Nodes in a certain number range of node IDs have either a static or a dynamic node ID. The ID range for static nodes can be found in the information of the corresponding "Namespace" in the server area of the OPC UA tree.

In contrast to static node IDs, dynamic node IDs can change. For example, after a restart, an update, a reconfiguration or other changes (e.g. changes to the recording duration).

10.4 RS-485 interface (fieldbus)

The measurement device has a 3-pin RS-485 interface (serial) for communication via the Modbus RTU protocol.

The connection capacity of the RS-485 terminals can be found in Sect. "17. Technical specifications" on p. 82.

Connection example at the beginning or end of a bus topology as a client device (formerly master device):

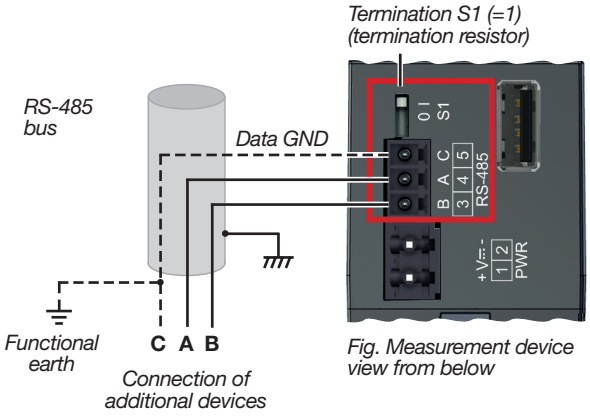


Fig. Measurement device view from below

Connection example in the middle of a bus topology as a server device (formerly slave device):

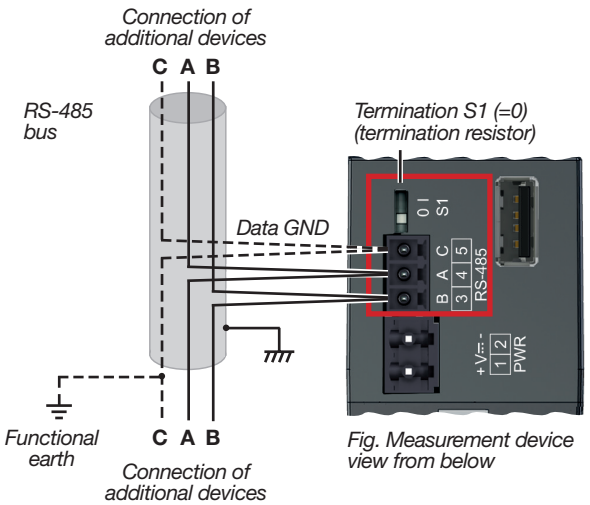


Fig. Measurement device view from below

INFORMATION

- If you use the measurement device as a client device (formerly master device), always position it at the beginning or end of a bus segment! Terminate the integrated termination resistor, S1, to switch position "I" (on) (default setting on delivery of the measurement device).
- CAT cables are unsuitable for bus wiring! **Recommendation:** Use Unitronic Li2YCY(TP) 2x2x0.22 cable (Lapp cable) for the bus wiring.
- A segment of an RS-485 bus structure can contain up to 32 nodes/devices. Use repeaters for more than 32 nodes/devices (see Sect. "10.4.3 Bus structure (bus segment)" on p. 49).
- To prevent the addition of leakage currents when using several devices, install the Data GND as a functional earth (see adjacent figures)!

10.4.1 Shielding

For connections via the interfaces, use a twisted and shielded cable and observe the following for the shielding:

- Ground the shields of all cables leading into the switchboard cabinet at the cabinet entrance.
- Route the cables into the switchboard cabinet through suitable cable inlets, e.g. PG glands.
- Connect the shield to a noiseless ground and ensure a large surface area with good conductivity.
- Do **NOT** connect the shield to terminal C (GND).
- Mechanically restrain the cables before the grounding clamp to prevent damage from cable movement (strain relief).

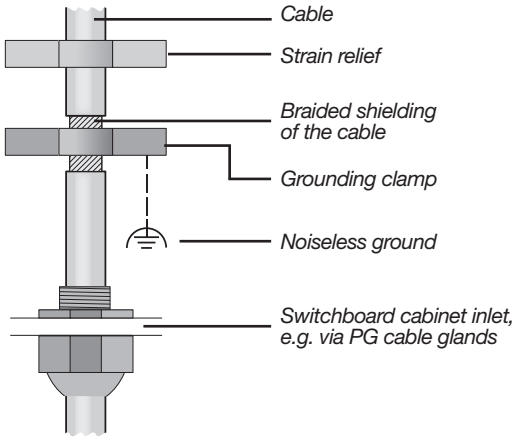


Fig. Shielding design at entrance to switchboard cabinet.

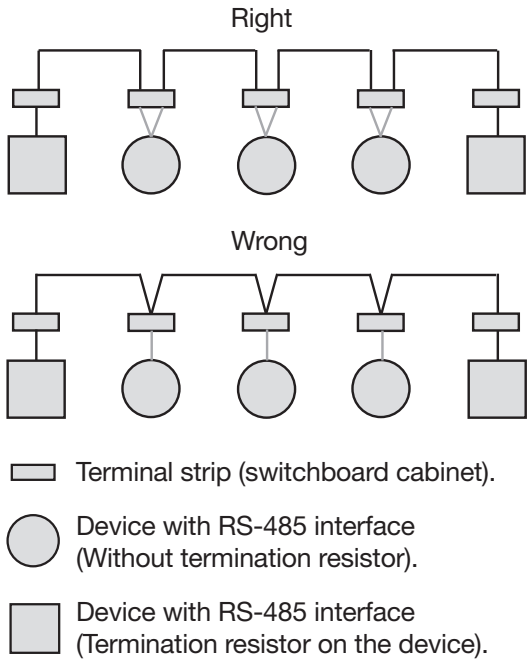
⚠ WARNING

Risk of injury due to high currents and high electrical voltages!
Atmospheric discharge can cause transmission errors and dangerous voltages on the device. Therefore please abide by the following:

- **Connect the cable shielding to functional earth (PE) at least once.**
- **For larger sources of interference or frequency converters in the switchboard cabinet, connect the shielding to functional earth (PE) as close to the device as possible.**
- **Comply with the maximum cable length of 1,200 m at a baud rate of 38.4 kbps.**
- **Use shielded cables.**
- **Route interface cables spatially separated or additionally insulated from mains voltage-carrying system components.**

10.4.2 Termination resistors/Termination

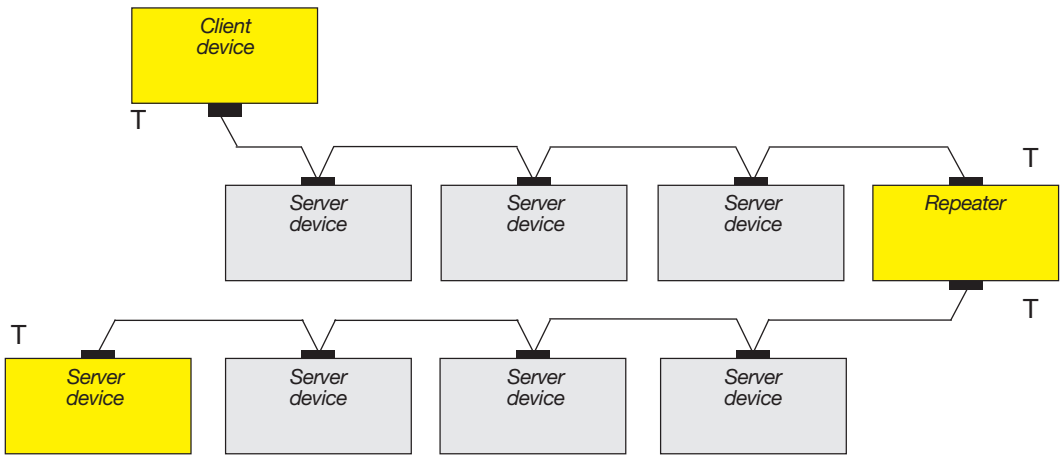
The device contains an integrated termination resistor (S1). Terminate the beginning and end of your bus segments with termination resistors (switch S1 of the measurement device = "I" or with a termination resistor of 120 Ω/0.25 W - see Sect. "10.4.3 Bus structure (bus segment)" on p. 49).



10.4.3 Bus structure (bus segment)

In a bus structure:
· Connect all devices in line.
· Each device has its own device address.
· You can integrate up to 32 devices (nodes). Terminate the beginning and the end of your bus segment with termination resistors (inside the devices or with 120 Ω/0.25 W termination resistors).
· Use repeaters (signal amplifiers) to connect bus segments if there are more than 32 nodes.
· Devices with bus termination switched on must be powered.
· It is recommended that the client device (formerly master device) be placed at the end of a segment. If the client device is replaced with the bus termination switched on, the bus is out of operation.
· The bus can become unstable if a server device (formerly slave device) with bus termination switched on is replaced or is de-energized.
· Devices that are not involved in the bus termination can be replaced without the bus becoming unstable.

Fig. Representation of a bus structure



- Power supply necessary
T - Bus terminator on
Client device (master device) - e.g. UMG 800
Server device (slave device) - e.g. UMG 96-S2

INFORMATION

In a Modbus system, the Modbus organization (modbus.org) uses the terms **"client"** and **"server"** to describe Modbus communication. This is characterized by communication between **client devices - formerly master devices** - that initiate communication and make requests, and **server devices - formerly slave devices** - that process the requests and return an appropriate response (or error message).

10.5 JanBus interface

The JanBus interface:
· Is a proprietary interface that is used to connect the measurement device with modules (e.g. current measuring modules or digital input modules).
· Is located on the back of the meter and supplies connected modules with power.
· Information on connecting modules can be found in the usage information for the modules.

10.6 USB interface

The measurement device has a USB interface (type A) for connecting a compatible:

1. USB storage medium.
2. External displays, e.g. the RD 96 (available separately).

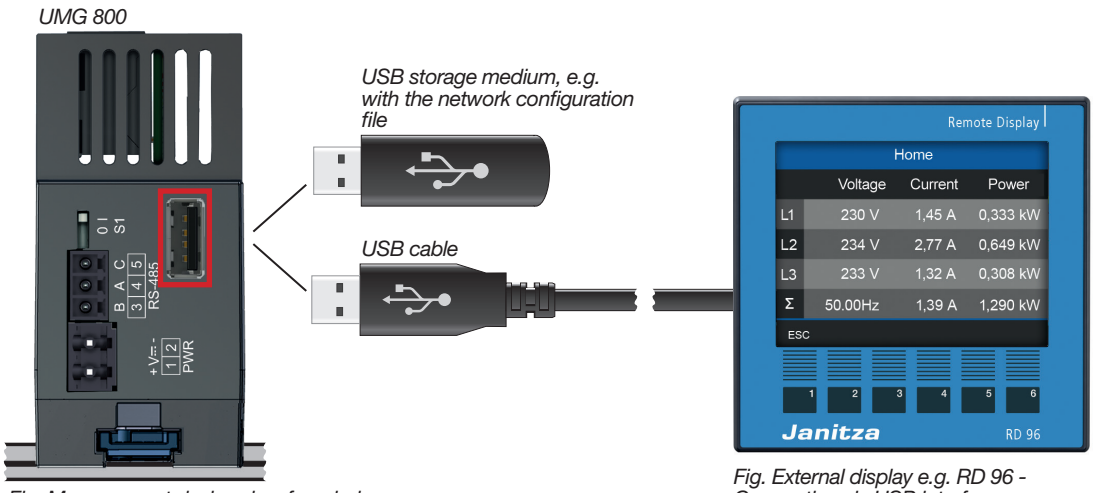


Fig. Measurement device view from below

Fig. External display e.g. RD 96 - Connection via USB interface.

10.6.1 USB storage medium

A USB storage medium (FAT32 formatted) on the USB interface of the measurement device is used:
· To perform a meter firmware update (read a firmware update file).
· To read or write a network configuration file (Ethernet interfaces).

INFORMATION

When updating the meter firmware or configuring the network, do not insert the USB storage medium with the corresponding files (see sections 10.6.2 to 10.6.4) into the USB port until **after startup of the measurement device has been completed**! Otherwise the meter will not perform any action!

When the measurement device accesses (reads and writes) a USB storage medium, the green LED (power) blinks - do not remove the USB storage medium!

Once access is complete, the green LED is lit continuously - the storage medium can be removed!

10.6.2 Reading a firmware update file

For a firmware update, the user requires a firmware update file in **zip format (compressed swu file).**

The name of the firmware update file begins with the name of the meter type, e.g.

umg800-1.7.0+154216e8.241015083602.b876.zip (umg800.swu)

If the measurement device finds **one** compatible firmware update file when a USB storage device is inserted, the firmware update starts.

Actions such as "Read network configuration" (see section 10.6.3) or "Write" (see section 10.6.4) are not possible during a firmware update.

If the measurement device finds several files of the same format when a USB storage medium is inserted, it uses the file with the highest alphanumeric sequence.

Example: The file umg800-1.7.0.zip **has priority over** umg800-1.6.3.zip!

ⓘ INFORMATION

Further options for updating the meter's firmware include:
· Via the measurement device homepage (see Sect. "14.3.3 Firmware update" on p. 77).
· Via the GridVis software.
· Via an external display, e.g. the RD 96 (see section Sect. "10.6.5 Using a USB storage medium on the RD 96" on p. 52).

The latest firmware for the measurement device can be found at www.janitza.com.

10.6.3 Reading a network configuration file (of Ethernet interfaces A and B)

The measurement device requires a "network configuration file" to configure the Ethernet interfaces of a measurement device. The user transfers the "network configuration file" via a USB storage medium. For the meter to be able to read the **"Network configuration file"**, the USB storage medium must **not contain** a firmware update file. Name the network configuration file as follows:

networkconfig-<sn>.json

<sn> ... corresponds to the 8-digit serial number of the meter.

This gives you the option of saving different network configuration files for different measurement devices on a single USB storage medium.

Example:
networkconfig-47000218.json

If the measurement device finds neither a firmware update file nor, as described above, a "network configuration file with serial number", it searches for a **"general network configuration file" (without serial number):**

networkconfig.json

The measurement device reads the network configuration file and applies the configuration of the Ethernet interfaces with the following format (code example):

ⓘ INFORMATION

The structure of the code for the "Network configuration file with or without serial number" is identical! Network configuration files with serial number are intended for a specific measurement device!

```
{
  "A": {
    "DhcpActive": true,
    "Gateway": "0.0.0.0",
    "Ip": "0.0.0.0",
    "Netmask": "0.0.0.0"
  },
  "B": {
    "DhcpActive": false,
    "Gateway": "10.10.10.1",
    "Ip": "10.10.10.200",
    "Netmask": "255.0.0.0"
  },
  "dnsAutomaticFlag": true,
  "dnsServer": [
    "",
    "",
    ""
  ]
}
```

Fig. Example code of a network configuration file called "networkconfig.json"

· "DhcpActive": true, ... IP address is assigned to the measurement device by a DHCP server (Ethernet interface A).
· "DhcpActive": false, ... IP address of the measurement device (Ethernet interface B).
· When "dnsAutomaticFlag": true, this configures the DNS server address via DHCP.
· The DNS servers listed after "dnsServer": are used as fallbacks.

Depending on the device configuration, the network configuration file may contain only data for Ethernet interface A or for Ethernet interface A and B. Accordingly, only the data for the available interfaces is transferred. It is not mandatory for a configuration for Ethernet interface B to be included.

ATTENTION

Material damage due to incorrect network settings.
Incorrect network settings can cause faults in the IT network!
Consult your network administrator for the correct network settings for your measurement device.

10.6.4 Writing (saving) a network configuration file

Regardless of whether the measurement device has a **"Network configuration file with or without serial number"** on the USB storage medium, it **always** saves its current network configuration file on the USB storage medium in the file networkinfo-<sn>.json. This allows a user to determine the IP address of a measurement device that has been configured with DHCP, for example.

<sn> ... corresponds to the 8-digit serial number of the meter.

Example:
networkinfo-47000218.json

The format (the code) in networkinfo-<sn>.json **is identical** to the network configuration file (sec. 10.6.3).

10.6.5 Using a USB storage medium on the RD 96

Another option for a firmware update or a network configuration for the measurement device is via the USB 2.0 (type A) interface of a connected external display (e.g. RD 96):

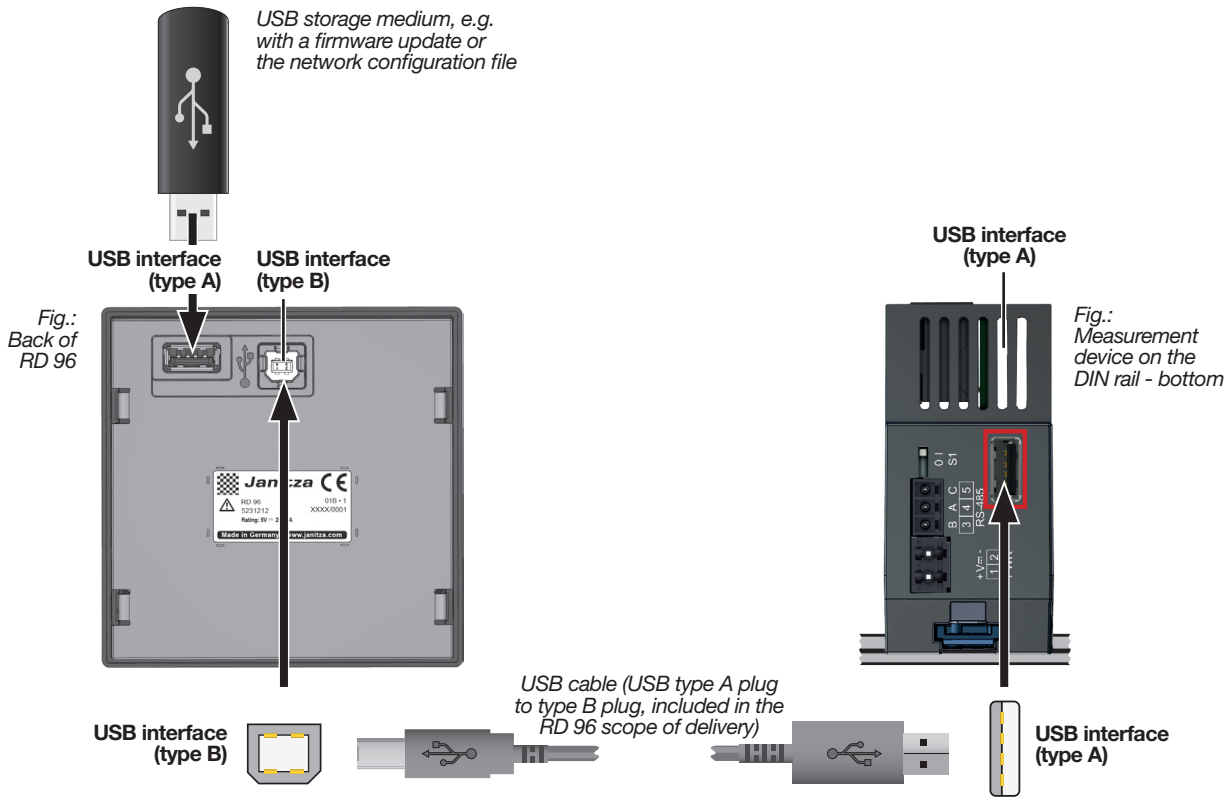


Fig. Example USB storage medium on the RD 96

10.6.6 External display RD 96 - optional

Use the separately available RD 96 display (see Sect. "3.9 Accessories" on p. 19) to visualize measurement data and configure the following functions of the measurement device (menu > Configuration):

· Ethernet A
· Ethernet B.
· Fieldbus (RS-485 interface).
· Current transformer (only for connected current measuring modules).
· Voltage transformer.
· Display functions (language, standby and brightness).
· System functions (PIN, restart, time and date).
· Reset (factory settings, configuration, min/max/avg. values, energy values and historical data).

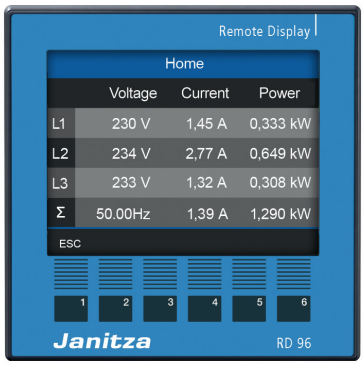


Fig. External display e.g. RD 96 - Connection via USB interface.

10.7 Overview of menu displays with external display (e.g. the RD 96)

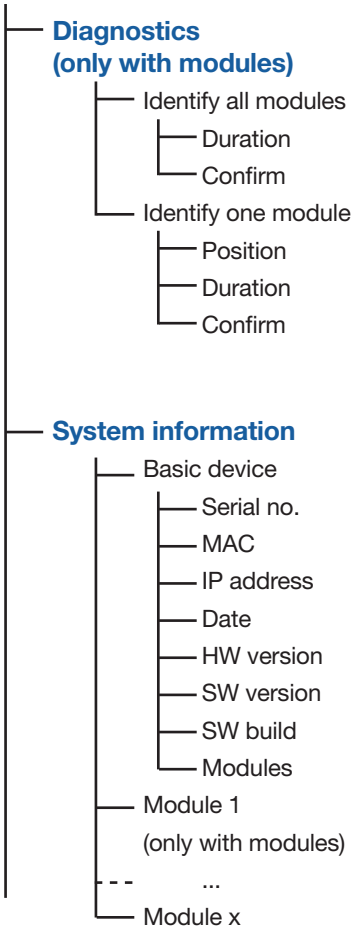
INFORMATION

The following overview of the menu displays shows:
- No specific use case and may vary depending on the connection of the measurement device and the measuring environment, e.g. for measurements in 3 or 4-wire networks (TN, TT and IT networks) or with connected modules.
- The measurement device with factory settings in the "English" language.

Menu

- **Home (start screen of basic device)**
- **Virtual Meter (only with current measuring modules**
  - Measurement group 1
  - Measurement group 2
  - ...
  - Measurement group 32
- **Phasor diagram (only with current measuring modules)**
  - 1. Modules 1-4
  - 1. Modules 5-8
  - 2. Modules 1-4
  - ...
  - x. Module xx
- **Voltage**
  - LN
  - LL
  - THD U
- **Current (only with current measuring modules)**
  - Current
    - 1. Modules 1-4
    - ...
    - x. Module xx
  - THD I
    - 1. Modules 1-4
    - ...
    - x. Module xx
- **Power (only with current measuring modules)**
  - Power summery
    - 1. Modules 1-4
    - ...
    - x. Module xx
  - Active power
    - 1. Modules 1-4
    - ...
    - x. Module xx
  - Reactive power
    - 1. Modules 1-4
    - ...
    - x. Module xx
  - Apparent power
    - 1. Modules 1-4
    - ...
    - x. Module xx
  - Power factor
    - 1. Modules 1-4
    - ...
    - x. Module xx
- **Energy (only with current measuring modules)**
  - Active energy
    - 1. Modules 1-4
    - ...
    - x. Module xx
  - Reactive power
    - 1. Modules 1-4
    - ...
    - x. Module xx
  - Apparent energy
    - 1. Modules 1-4
    - ...
    - x. Module xx

- **Drag indicator (Funct. not available)**
- **Voltage detection (only with current measuring module 800-CT12-SVD-US)**
  - 1. Modules 1-4
  - 1. Modules 5-8
  - 2. Modules 1-4
  - ...
  - x. Module xx
- **Multifunction channels (Funct. not available)**
- **Digital I/O status (only with digital input module)**
  - Digital I/O status module
- **Configuration**
  - Ethernet config. A (Ethernet config. A)
    - IP config. (IP sett.)
    - IP address
    - Netmask
    - Gateway
  - Ethernet config. B (Ethernet config. B) (Standard factory setting)
    - IP config. (IP sett.)
    - IP address
    - Netmask
    - Gateway
  - Fieldbus
    - Device addr. (Device address)
    - Baud rate
    - Data frame
  - Current transformer (only with modules)
    - Device
      - 1. Module (1.)
      - ...
      - x. Module x
    - Transformer prim./sec.
  - Voltage transformer
    - Transformer 1..4 prim./sec. (Transformer 1..4 prim./sec.)
  - Display
    - Language
    - Standby delay
    - Brightness
    - Standby mode
  - System
    - PIN
    - Reboot
    - Time
    - Date
  - Reset
    - Factory settings
    - Configuration
    - Min./Max./Avg.
    - Energy
    - Historical data



Select the menu item:

- Press button 1 *ESC*.
- The *Menu* window appears.
- Use the buttons 2 "▲" and 5 "▼" to select your menu item.
- Confirm your menu item with button *3 Enter*.
- The window of the selected menu item appears.
- Button 1 *ESC* undoes your step, or pressing it several times takes you back to the *Home* window.

ⓘ *INFORMATION*

After the meter is reset to the factory settings, the menu displays appear in English.
Change the language if necessary (Configuration > Display > Language).

11. Configuration

11.1 Events and transients

The measurement device contains functions and triggers (pulses that trigger processes) that can, for example, point out to a plant operator the energy supply quality requirements that have not been met. ***Events and transients*** are considered power quality parameters for evaluating
supply reliability. The measurement device records half-wave RMS values (HW RMS) and waveforms.

ⓘ *INFORMATION*

· ***Events and transients*** can be configured on the **measurement device homepage** (see section 14 on p. 73) and in the **GridVis software**. Program help and online help provide assistance with configuration.
· The measurement device records ***Events and transients*** for the integrated voltage measurement group.
· The measurement device homepage shows recorded events and transients in list format with a time stamp and an error report (see Sect. "14.2 Power Quality" on p. 75).
· The event browser in the GridVis software visualizes ***Events and transients*** in list format and in curve displays for evaluating and analyzing the power quality parameters.

11.1.1 Events

The meter has the following power quality parameters (events), which it obtains through observation of half-wave RMS values (HW RMS). The limit values for this must be configured in relation to the nominal values and the corresponding hysteresis:

Measurement of voltage events:
· *Undervoltage*
· *Fast voltage change*
· *Overvoltage*
· *Voltage interruption*

Measurement of frequency events
· *Frequency change*
· *Underfrequency*
· *Overfrequency*

11.1.2 Transients

Transients are detected in the measurement device by:
· The difference between the sample value of the current period and the sample value of the previous period. The result is compared with the static, configured limit value --> **"*Envelope*"** mode.
· The comparison of the current sampled value (measured value) with a limit value --> Mode **"*Absolute*"**.
· The comparison of the momentary sample value (measured value) with the previous sample value --> **"*Rapid increase*"** mode.
.

The measurement device has the following power quality parameters, or **"transients"** which allow the configuration of limit values:

Voltage measurement
· Transient voltage **"*Envelope*"**
· Transient rapid overvoltage **"*Absolute voltage*"**
· Transient voltage **"*Rapid increase*"**

You can use a "slide button" in the GridVis software to activate an **automatic recording** of transients for the measurement device. Configure the following limit values for this case:

Transients	Limit value "Automatic"
Voltage **"Envelope"**	**±5%** of the nominal voltage
Rapid overvoltage **"Absolute voltage"**	**110%** of the momentary 200 ms RMS value
Voltage **"Rapid increase"**	**10%** of the momentary 200 ms RMS value

ⓘ *INFORMATION*

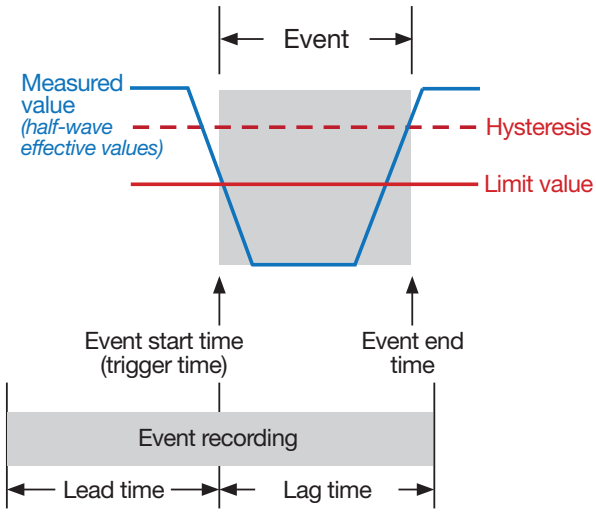
Fundamental explanations of "events and transients" can be found in the document "Energy Supply Quality Characteristics – Power Quality Solutions from Janitza" and on www.janitza.com.

11.1.3 Event and transient recording

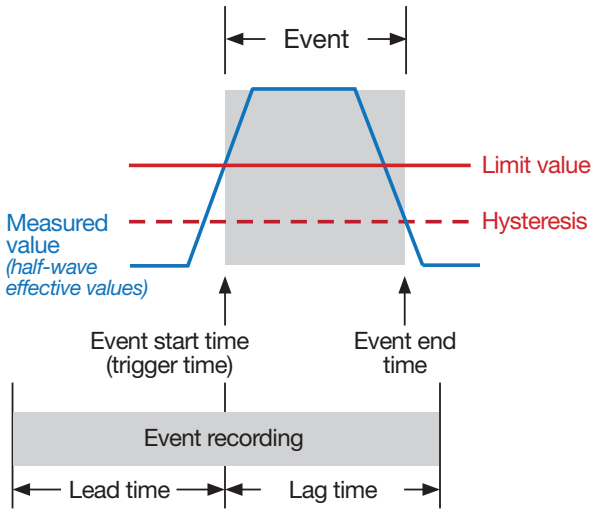
When an event or transient occurs, the measurement device records half-waves (half-cycles) and data points around the respective event/transient trigger (pulses which trigger events). A distinction is made between lead time (pre-recordings) and lag time (post-recordings). These recordings occur at the start and end of an event or transient.

The event recording includes the average, minimum and maximum value, as well as the start and end time and, in the case of longer events, the waveform at the beginning and end of an event as well.
The set hysteresis is applied by the measurement device at the ending time of an event.

Example display:
Event recording of an **undervoltage**

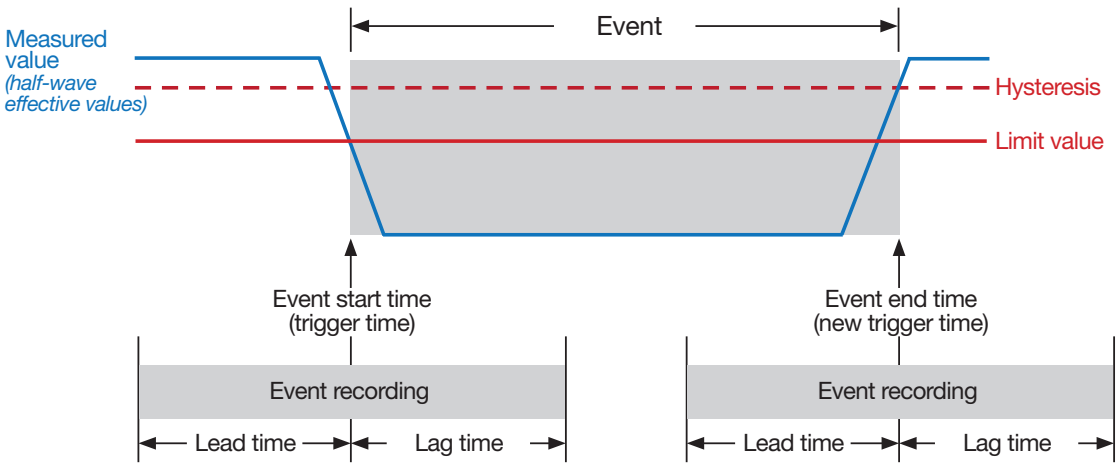


Example display:
Event recording of an **overvoltage**



Example displays:
In the event recording (undervoltage and overvoltage), the end time of the event is within the lag time!

Example display:
Event recording of an **undervoltage**



The end time of the event is outside the lag time of the previous event recording. **The measurement device starts another event recording at the end time.**

Example display:
In the event recording (e.g. undervoltage), the end time is outside the lag time of the previous event recording.

11.1.4 Configuration of the waveform for events and transients

You can configure the recording length (lead time and lag time - see Sect. "11.1.3 Event and transient recording" on p. 58) for events and transients **in the device configurator in the GridVis software, in the Recording menu under Waveform.**

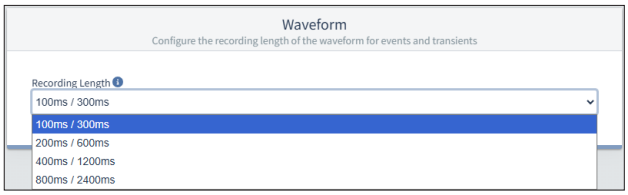


Fig. Waveform window with the configuration of the lead time and lag time in the Recording menu of the GridVis software - Configuration of the recording length.

Using the maximum sampling rate of 50 kHz, a recording length of max. 400 ms can be achieved, which captures **20,000 data points**. A longer recording length with the same number of data points reduces the sampling rate and thus the resolution of the event recording as shown in the following table:

Events and transients [Recording lengths]	Lead time	Lag time
Sampling rate 50 kHz (default setting)	100 ms	300 ms
Sampling rate 25 kHz -	200 ms	600 ms
Sampling rate 12.5 kHz -	400 ms	1200 ms
Sampling rate 6.25 kHz -	800 ms	2400 ms

Tab. Recording lengths at 20,000 data points for events and transients as a function of the sampling rate.

INFORMATION

Detailed information on the configuration of events and transients can be found in the online help of the GridVis software.

11.1.5 Half-wave RMS values for events

Within half-waves (10 ms), the measurement device compares the measured value (effective) with the limit value configured by the user (measurement device homepage or GridVis). If a measured value exceeds the limit value, the measurement device updates the event trigger (pulse that triggers an operation). The measurement device positions the event trigger at the beginning of a 10 ms window (start of the event).

Recording is then performed as described in Sect. "11.1.4 Configuration of the waveform for events and transients" on p. 59.

The event recordings of the half-wave RMS values are made at the following time intervals between the measured values:

Parameter/ Fault	Update time for the half-wave RMS values at f = 50 Hz [1)]	Update time for the half-wave RMS values at f = 60 Hz [1)]
Undervoltage	10 ms	8.33 ms
Fast voltage change	10 ms	8.33 ms
Overvoltage	10 ms	8.33 ms
Voltage interruption	10 ms	8.33 ms
Frequency change	10 ms	8.33 ms
Underfrequency	10 ms	8.33 ms
Overfrequency	10 ms	8.33 ms

1) ... Period between the measured values.

11.1.6 Update time for transients

If a measured value exceeds the configured limit value (measurement device homepage or GridVis), the measurement device detects a transient. When transients occur, the meter captures data points around the respective transient trigger.

Recording is performed as described in Sect. "11.1.4 Configuration of the waveform for events and transients" on p. 59.

The update time of the transient recording takes place in the following time intervals between the measured values - see adjacent table:

Parameter/ Fault	Update time for the half-wave RMS values at f = 50 Hz [1)]	Update time for the half-wave RMS values at f = 60 Hz [1)]
Rapid overvoltage (Absolute voltage)	20 µs	20 µs
Voltage (envelope)	20 µs	20 µs
Voltage (rapid increase)	20 µs	20 µs

1) ... Period between the measured values.

11.1.7 Event and transient configuration in the GridVis software

In addition to the configuration of events and transients via the measurement device homepage (see section 14.2 on p. 75), the GridVis software also offers all the parameters for configuring events and transients in the *Measurement* and *Recording* (Waveform) menus of the UMG 800 device configurator.

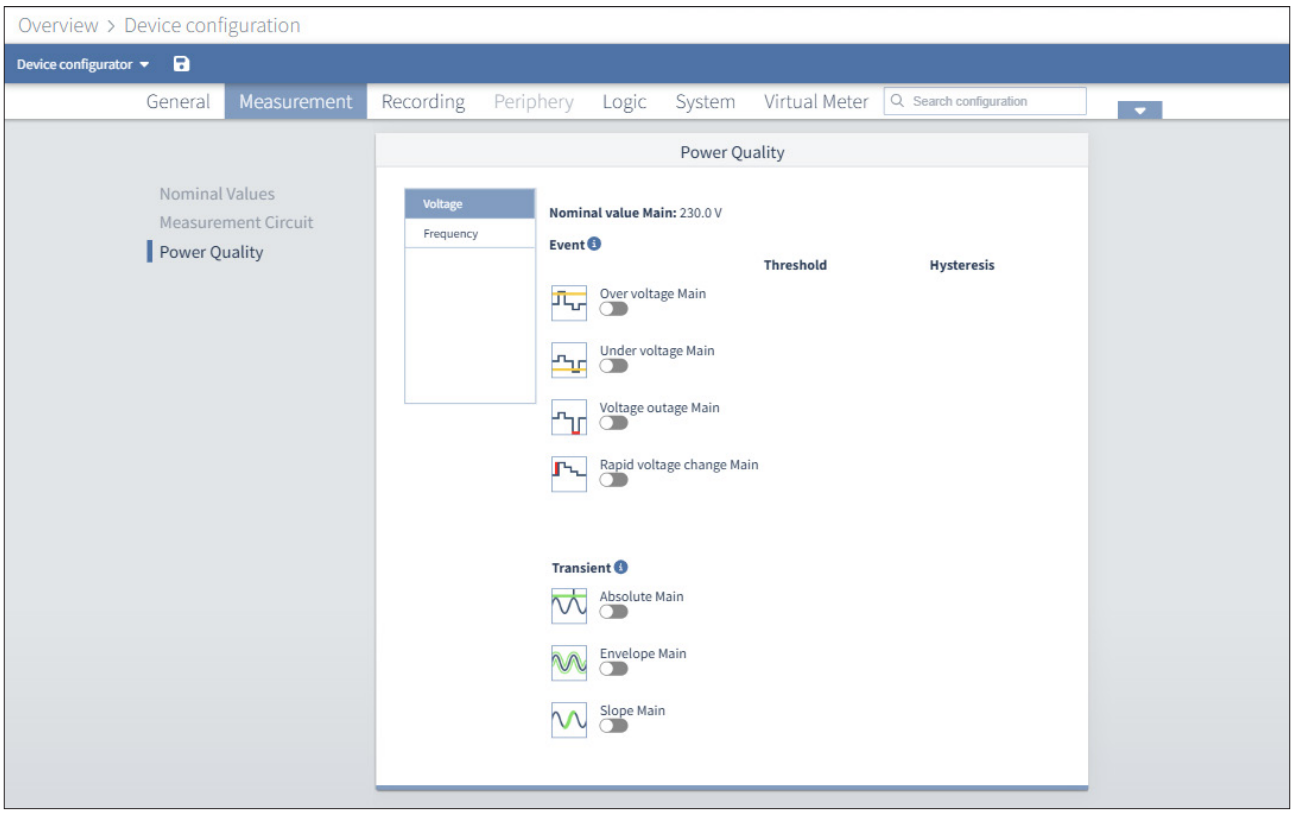


Fig. "Power quality" window in the GridVis software with the configuration of the virtual measurement groups (virtual Meters).

11.1.8 Flicker

The measurement device requires the fundamental network values for the voltage and frequency-dependent measurement and calculation of the flicker values (flicker measurement according to DIN EN61000-4-15).

The device user configures the fundamental network values (nominal values) in the device configurator in the GridVis software using the following entries:

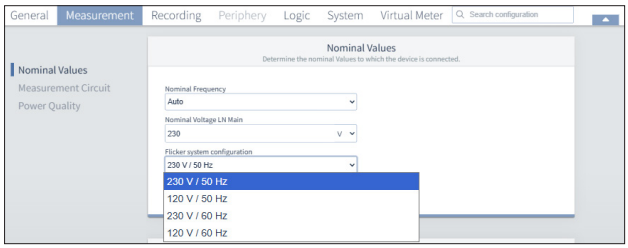


Fig. "Nominal values" window in the GridVis software with the configuration of the nominal values for the flicker measurement.

The measurement device records all flicker data, such as instantaneous, long-term and short-term flicker.

The flicker data is stored in the "Online values" and "Historical values" value tree windows of the GridVis software and can be displayed and evaluated by the device user as required using the graph function.

INFORMATION

Additional information on flickers can be found in the online help of the GridVis software.

11.2 Virtual Meter

With the ***Virtual Meter*** function, the meter user can assign channels of real measurement points to a virtual meter, for example, to perform summation calculations and calculations of system values or to group channels of different modules.

Since current measuring modules and their division into measurement groups do not map any totals calculations, this function is provided by the basic device by means of the ***Virtual Meter*** function. The following current measuring modules support the ***Virtual Meter*** function of the basic device:

- **Module 800-CT8-A**
- **Module 800-CT8-LP**
- **Module 800-CT24**
- **Module 800-CT12-SVD-US**
- **Module 800-MF8**

The actual current measuring modules and their measurement groups remain unchanged and are configured as described in the respective usage information for the current measuring modules.

ⓘ *INFORMATION*

To configure the ***Virtual Meter*** function on the basic device with current measuring modules, please also refer to the further information
- in the respective usage information for the current measuring modules.
- In the help formats of the GridVis software and the measurement device homepage.

The basic device with current measuring modules has up to **32 virtual measurement groups**. The user then configures profiles:
- For 3-channel, 4-channel or user-defined measurement groups.
- **In the GridVis software or on the measurement device homepage.**

The following profile descriptions simplify configuration and show examples of application specifications. The schematic diagrams show the 800-CT8-LP and 800-CT24 modules as examples. The ***Virtual Meter*** function of the basic device supports all the above-mentioned current measuring modules!

11.2.1 Application examples

Configuration examples for current measurements with the virtual meter in various meter and module topologies:

Virtual Meter configuration example 1:
3-channel measurement (three-phase measurement L1, L2, L3 - e.g. in a 3-phase 3-wire system - see "Profile - Measurement group of 3"on page 63).
- L1 - 1st module - channel 1
- L2 - 1st module - channel 2
- L3 - 1st module - channel 3
- L4 - free
- Neutral conductor current is calculated (system value)
- Sum L1 ... L3 (calculated)

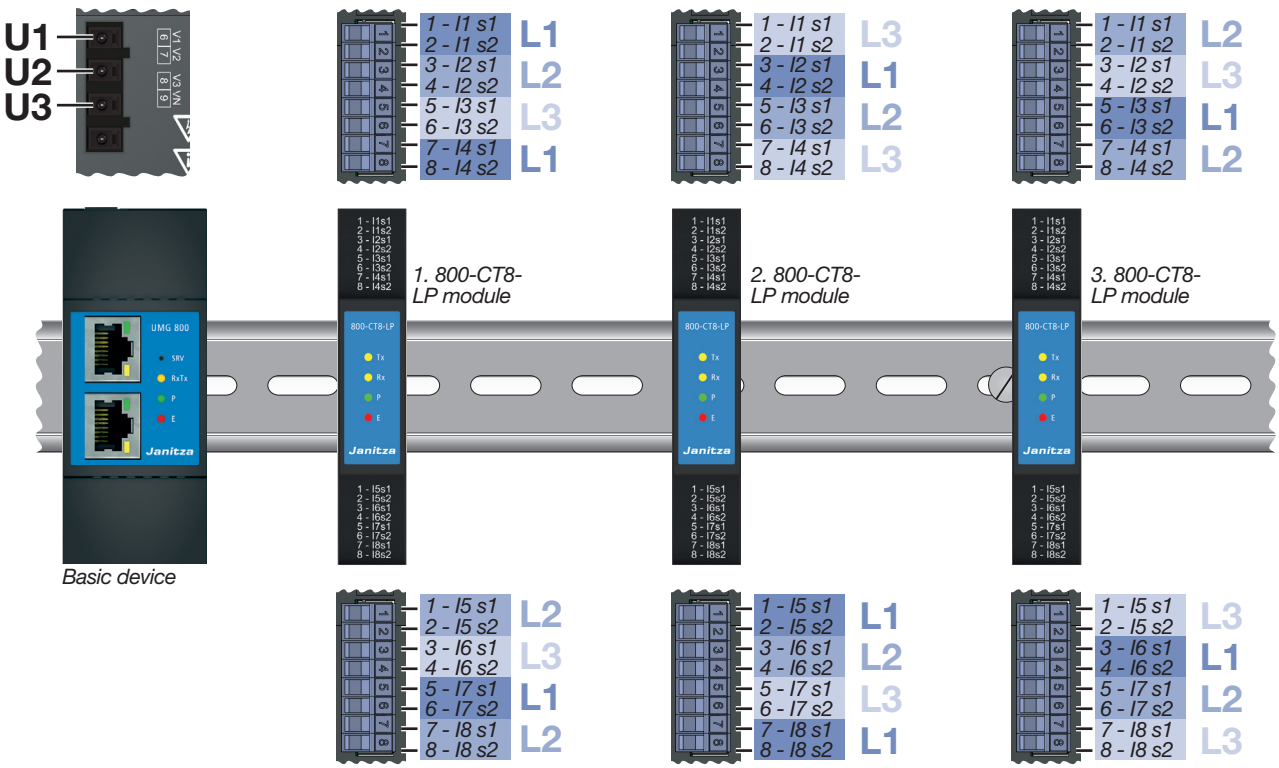
Virtual Meter configuration example 2:
4-channel measurement (three-phase measurement L1, L2, L3 + single measurement L4 or neutral conductor measurement LN - e.g. in a 3-phase 4-wire system - see "Profile - Measurement group of 4"on page 66).
- L1 - 1st module - channel 1
- L2 - 1st module - channel 2
- L3 - 1st module - channel 3
- L4 (LN) - 1st module - channel 4
- Neutral conductor current is calculated (system value)
- Sum L1 ... L3 (calculated)

11.2.2 Profile - Measurement group of 3

The following figure shows an example of the profile **"Measurement group of 3"** in the ***Virtual Meter*** function using a meter and module topology of the basic device with 3 800-CT8-LP current measuring modules. In the "Measurement group of 3" profile of the function:

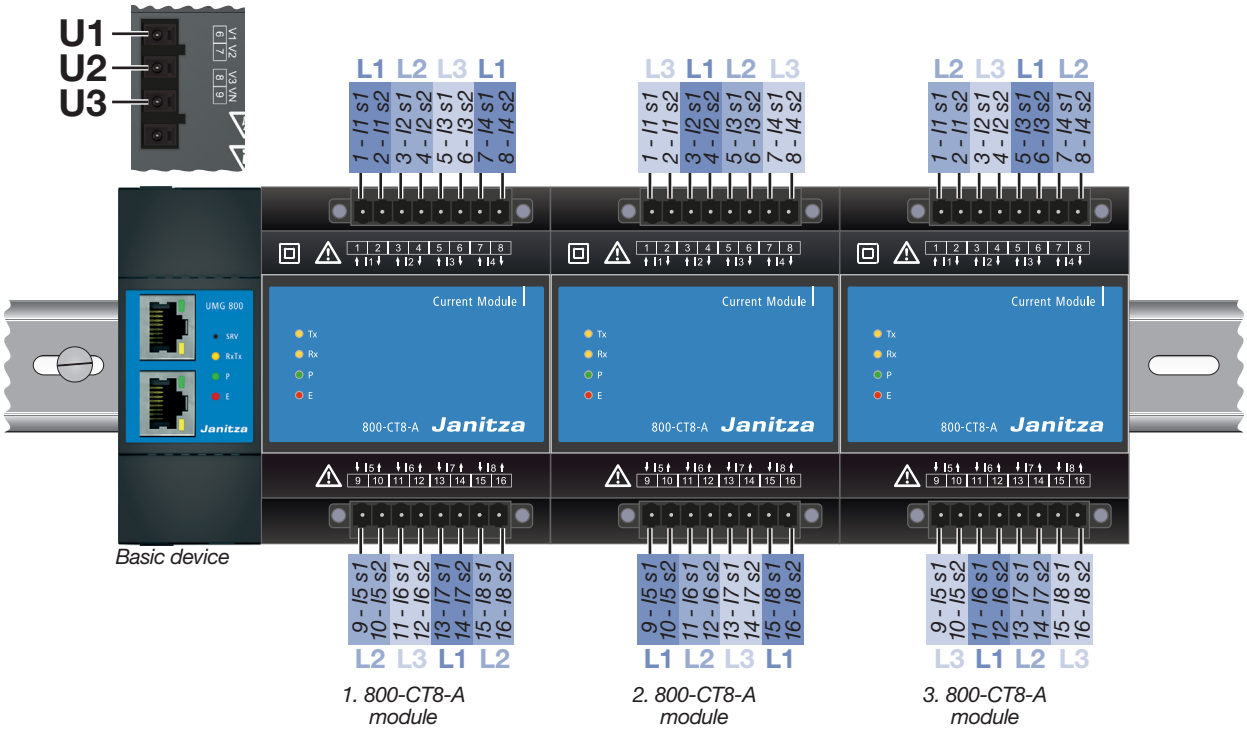
- Select 3 consecutive channels (L1, L2, L3) on the current measuring modules from which the total values are to be formed.
- The neutral conductor current is calculated from the sum values L1, L2, L3.
- The values for current from the 3 channels (L1, L2, L3) are used for power measurement (calculated with the respective voltage U1, U2, U3 of the basic device - see Sect. "7.4 Voltage measurement" on p. 32).
- This results in up to 8 virtual measurement groups in the example.

Example 1:



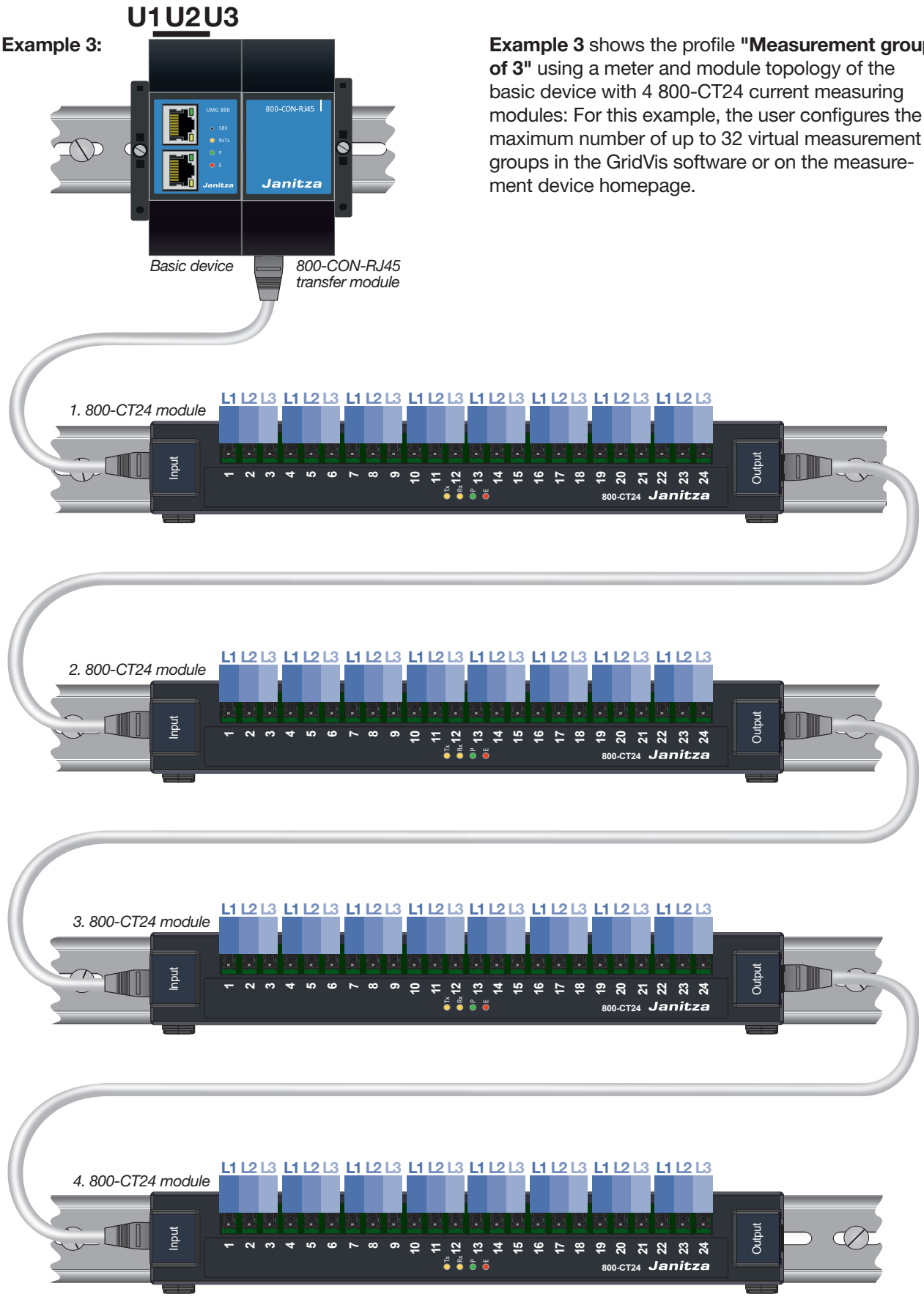
Example: Measurement groups of 3 (color-coded in "blue tones") in a meter and module topology with 3 800-CT8-LP modules result in up to 8 measurement groups

Example 2 shows the profile **"Measurement group of 3"** in the *Virtual Meter* function using a meter and module topology of the basic device with 3 800-CT8-A current measuring modules:



Example: Measurement groups of 3 (color-coded in "blue tones") in a meter and module topology with 3 800-CT8-A modules result in up to 8 measurement groups

Example 3:



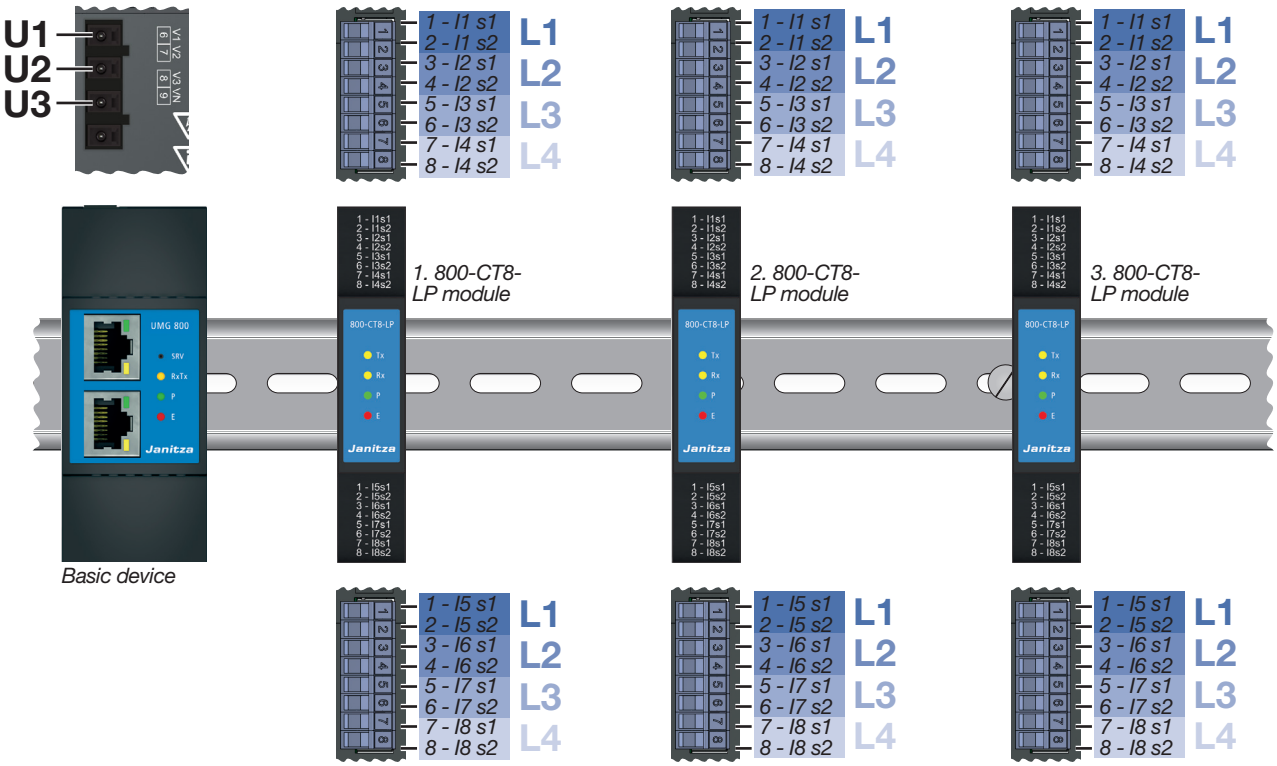
Example 3 shows the profile **"Measurement group of 3"** using a meter and module topology of the basic device with 4 800-CT24 current measuring modules: For this example, the user configures the maximum number of up to 32 virtual measurement groups in the GridVis software or on the measurement device homepage.

Example: Measurement groups of 3 (color-coded in "blue tones") in a meter and module topology with 4 800-CT24 modules result in up to 32 measurement groups

11.2.3 Profile - Measurement group of 4

The following figure shows an example of the profile **"Measurement group of 4"** in the *Virtual Meter* function using a meter and module topology of the basic device with 3 800-CT8-LP current measuring modules. In the "Measurement group of 4" profile:

- Select 3 consecutive channels (L1, L2, L3) on the current measuring modules from which total values are to be formed and a 4th channel (L4) which only belongs to the measurement group.
- The measurement device calculates the neutral conductor current from the sum values L1, L2, L3 (as in a "Measurement group of 3").
- Channel L4 is for a single measurement or for measuring the neutral conductor current (L4 =L_N/L_{PEN} = $I4_{eff}$, e.g. important if there is an unbalanced load in a four-wire system).
- The values for current from the 3 channels (L1, L2, L3) are used for power measurement (calculated with the respective voltage U1, U2, U3 of the basic device - see Sect. "7.4 Voltage measurement" on p. 32).
- This results in up to 6 virtual measurement groups in the example.



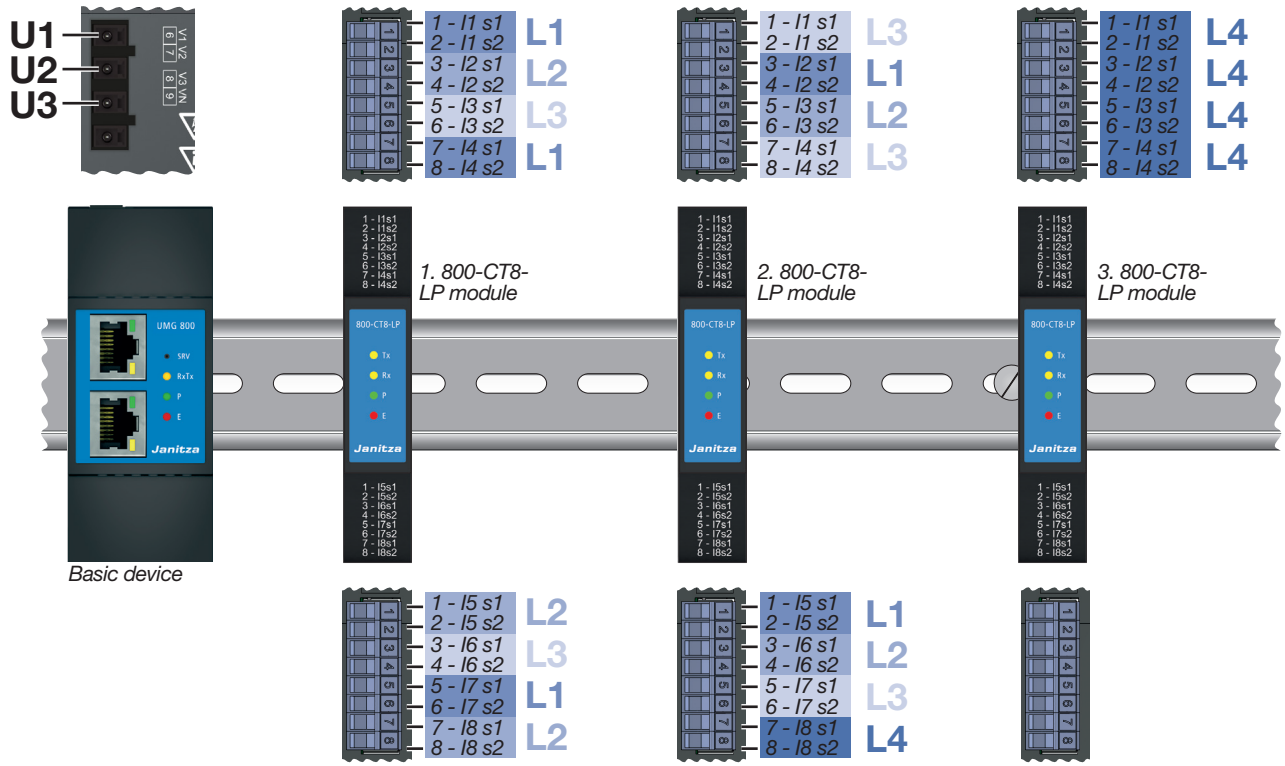
Example: Measurement groups of 4 (color-coded in "blue tones") in a meter and module topology with 3 800-CT8-LP modules result in up to 6 measurement groups

11.2.4 Profile - User-defined measurement group

The following figures show examples of the profile **"User-defined measurement group"** in the ***Virtual Meter*** function using a meter and module topology of the basic device with 3 800-CT8-LP current measuring modules. In the "User-defined measurement group":

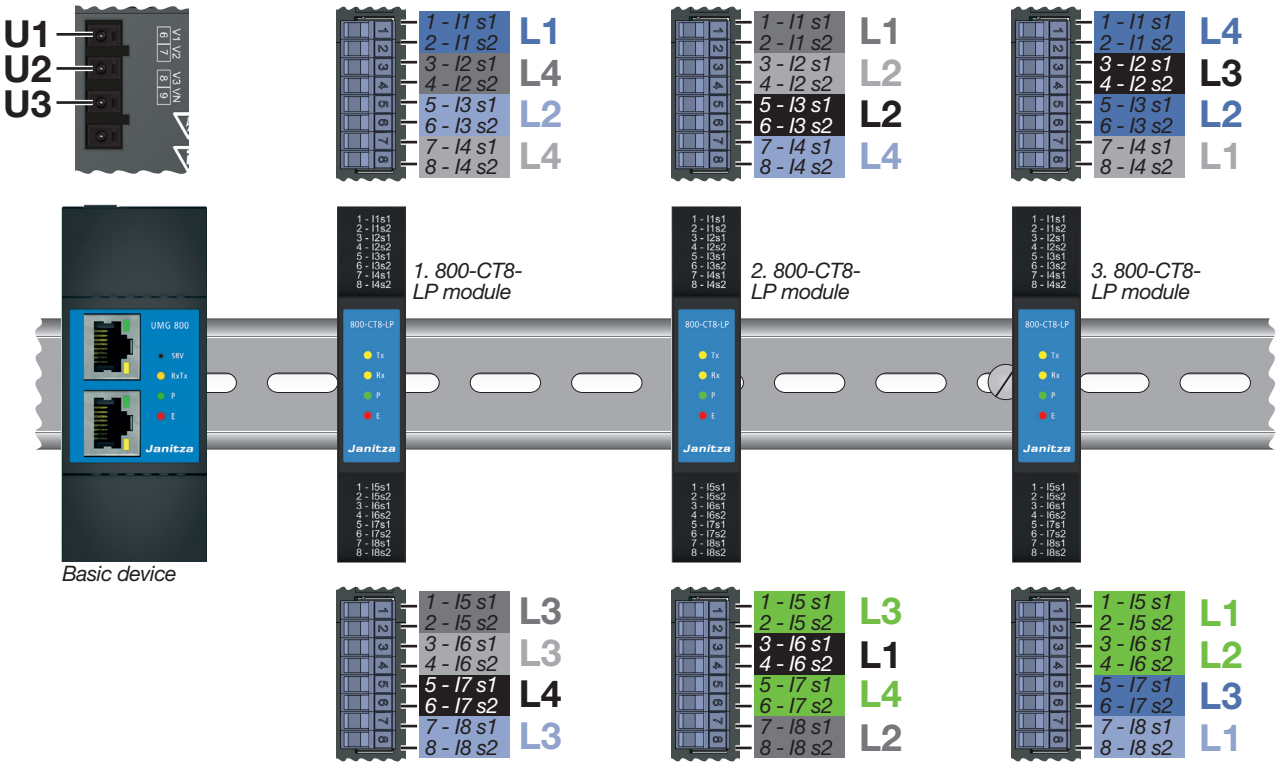
- Select the distribution of the channels on the current measuring modules at random (see the following examples).
- The measurement device calculates the neutral conductor current from the sum values L1, L2, L3 (as in a "Measurement group of 3").
- Optionally select a 4th channel (L4) that belongs to the measurement group.
- Channel L4 is for a single measurement or for measuring the neutral conductor current (e.g. L4 =L_N/ L_{PEN} = $I4_{eff}$).
- The values for current from the 3 channels (L1, L2, L3) are used for power measurement (calculated with the respective voltage U1, U2, U3 of the basic device - see Sect. "7.4 Voltage measurement" on p. 32).

Example 1:



Example 1: User-defined measurement groups (arbitrary arrangement - color-coded "blue tones") in a meter and module topology with 3 800-CT8-LP modules

Example 2:



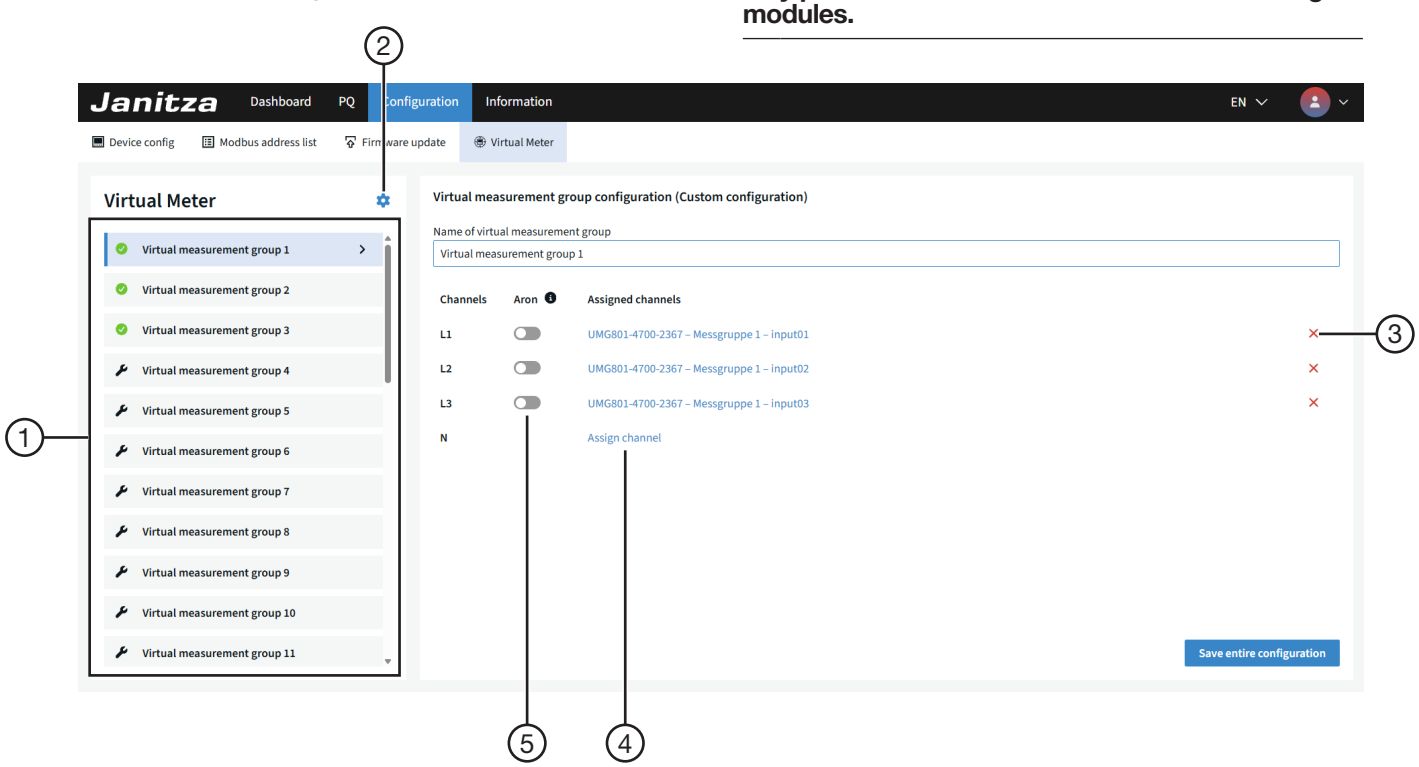
Example 2: User-defined measurement groups (arbitrary arrangement - color-coded) in a meter and module topology with 3 800-CT8-LP modules

11.2.5 Configuration of the *Virtual Meter* using the measurement device homepage

The configuration of the *Virtual Meter* can be accessed under **Configuration > Virtual Meter**.

INFORMATION

The configuration of the virtual measurement groups via the measurement device homepage is only possible with connected current measuring modules.



Item	Control element	Description
1	Selection list *Virtual measurement groups*	Selection list with up to 32 virtual measurement groups. The selected virtual measurement group is displayed and can be configured in the user-defined configuration mode.
2	Button *Settings*	Opens the settings for the *Virtual Metermode*: ***Virtual Meter mode***: Choice of the *Virtual Meter* measurement group profile: · *User-defined configuration:* Individual assignment of channels possible (see section 11.2.4 on p. 67). · *Three-channel:* Continuous assignment of the current measurement channels to measurement groups of 3 (see section 11.2.2 on p. 63). If the number of physical channels is not divisible by 3, some channels are not assigned when the configuration is transferred. · *Four-channel:* Continuous assignment of the current measurement channels to measurement groups of 4 (see section 11.2.3 on p. 66). ***Module inversion:*** In three-channel and four-channel modes, this causes an inversion (reversed numbering) of the channels and measurement groups of the connected 800-CT12-SVD-US modules. · *Module start position for inversion*: The inversion takes effect from the selected module for all subsequent 800-CT12-SVD-US modules. All connected modules are counted for the starting position.
3	*x (Reset)* button	Reset the assignment of the physical measurement channel to the virtual measurement channel
4	Button *Assign channel*	· Active only in the *User-defined configuration* of the virtual meter. · Opens the selection of physical channels that can be assigned to the channels of the virtual measurement group.
5	Slide Button *Aron*	· Active only in the *User-defined configuration* of the virtual meter. · Activates the Aron circuit (the activated current channel is calculated) in 3-phase 3-wire systems or in symmetrically loaded 3-phase 4-wire systems.

Tab. Homepage > Configuration > Virtual Meter

11.2.6 Configuration of the *Virtual Meter* in the GridVis software

Configuration of the *Virtual Meter* in the GridVis can be accessed under
Overview > **Device configurator** (via the three-point menu of the device) > **Virtual Meter**.

Further information can be found in the GridVis online help at **Working with GridVis** > **Device configurator**.

INFORMATION

· **The configuration of the virtual measurement groups via GridVis is only possible with connected current measuring modules.**

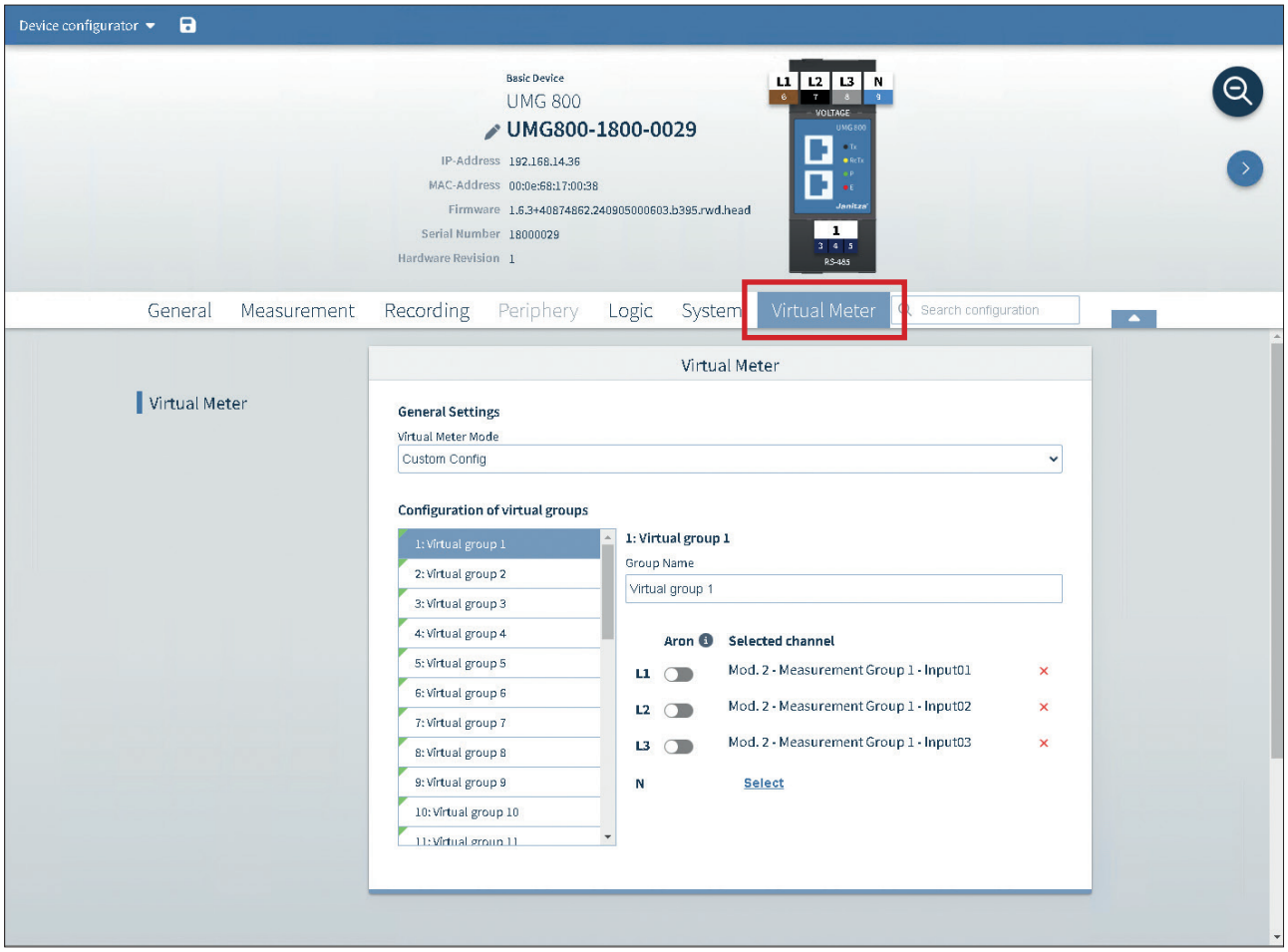


Fig. "Device configurator" window in the GridVis software showing the configuration of the virtual measurement groups (virtual meters).

12. Connection example

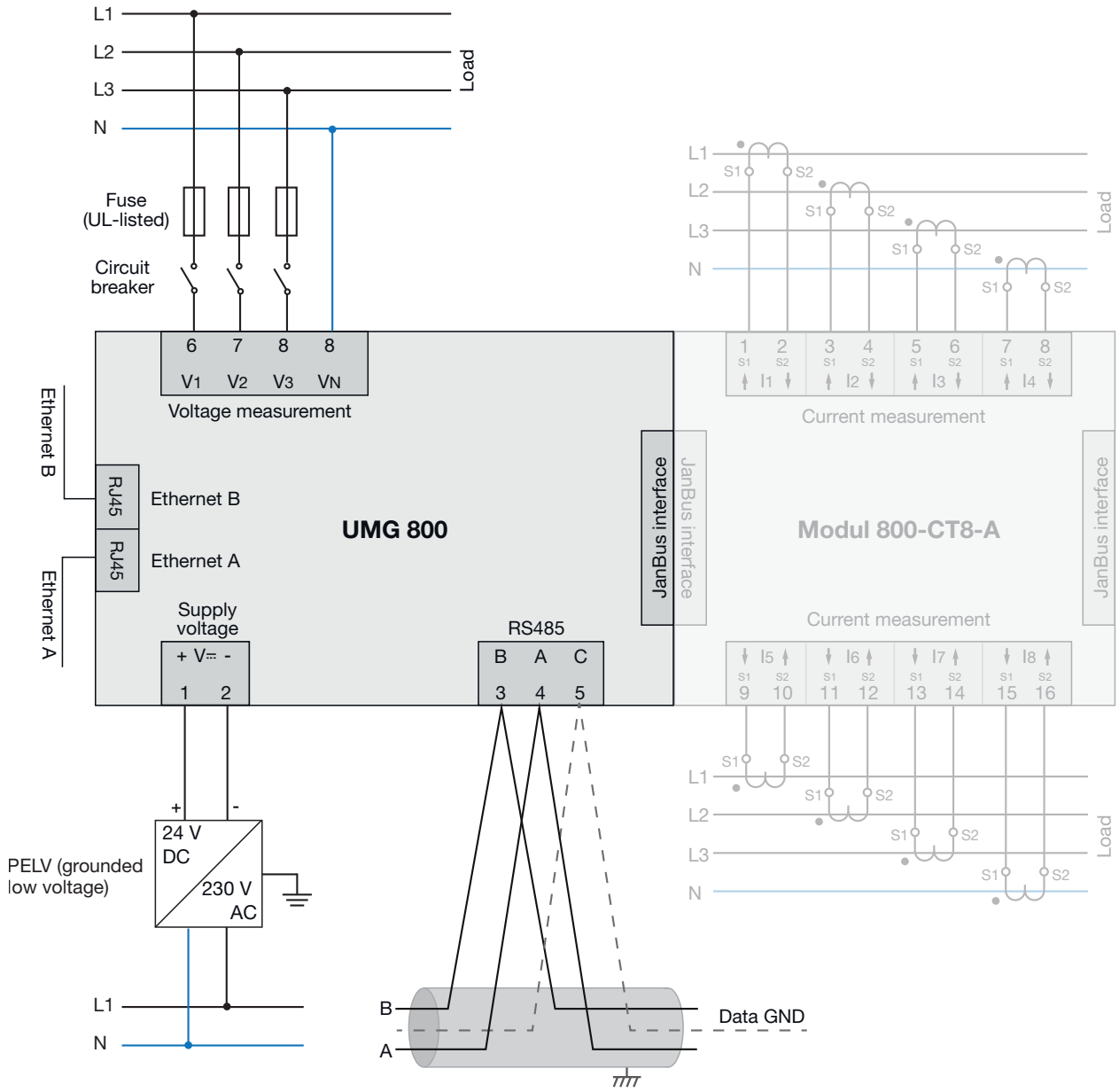


Fig. Connection example with current measuring module

13. Dismounting

Dismounting the measurement device:

1. **Disconnect the system/measurement device from the power supply before starting work! Secure it against being switched on again! Check to be sure it is de-energized! Ground and short circuit! Cover or block off adjacent live parts!**
2. Disconnect the wiring and connection terminals of the meter and any connected modules.
3. Remove the end brackets and, if applicable, also the end brackets of connected modules.
4. Unlock all bottom bolts of the measurement device. If necessary, use a screwdriver. For measurement device and module series, disconnect the modules from the basic device beforehand!
5. Pull the measurement device vertically out of the bus connector.
6. Disconnect the bus connector by opening the retaining clips (screwdriver).

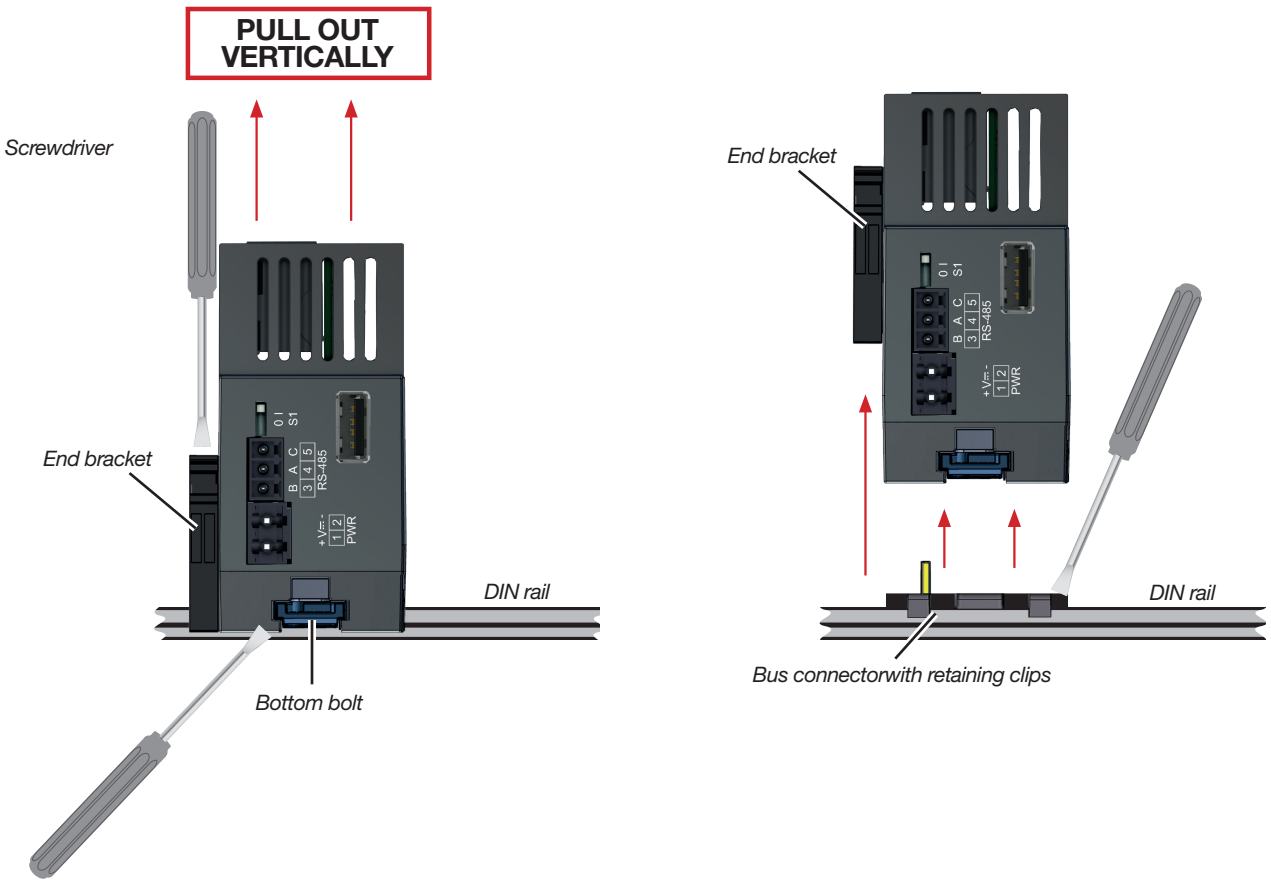


Fig. Dismounting the meter (view from below)

14. Measurement device homepage

The UMG 800 has an integrated web server, which displays a wide variety of data in a clear form on a measurement device homepage. You can access the measurement device homepage with a web browser.

This means a PC with a web browser installed be used without separate software to:
· Call up current measured values.
· Configure basic settings configured on the meter.
· Create an "IP address whitelist" containing legitimate and verified devices that have access to the Modbus via the Ethernet interfaces of the UMG 800.

The measurement device homepage uses the standardized transmission protocol HTTP.

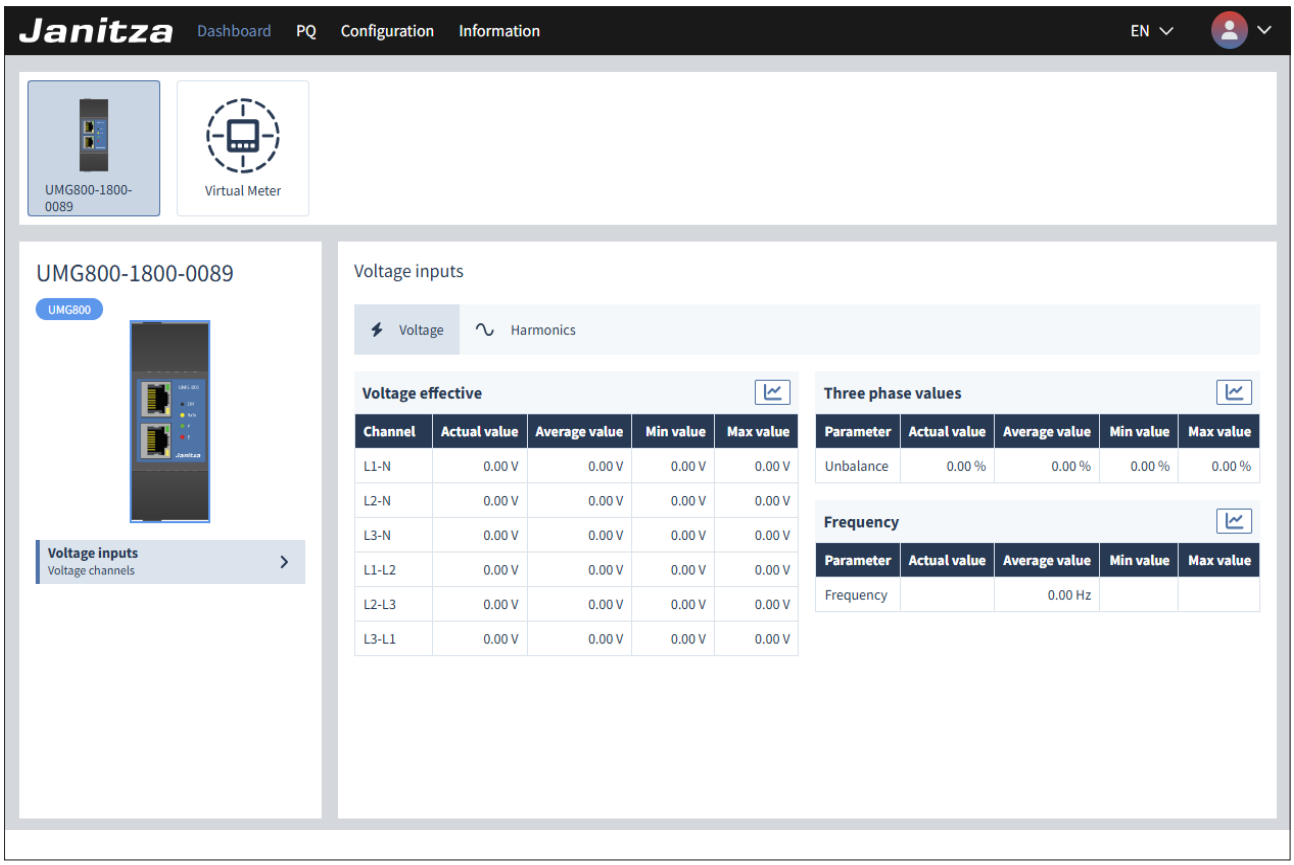
You can access the measurement device homepage by entering the measurement device IP address in the web browser of your end device (see Sect. "10.1 Ethernet interfaces - Modbus TCP" on p. 44).

INFORMATION

The following screenshots from the measurement device homepage do not show a specific use case. The screenshots may vary depending on the way the measurement device is connected and the measuring environment, e.g. measurements in 3- or 4-wire networks (TN, TT and IT networks) or with connected modules and their functions!

14.1 Dashboard

The dashboard is the start page of the measurement device homepage. It shows an overview of the measured values of the device and of the individual channels.



14.1.1 Login

To configure the measurement device (or modules) via the measurement device homepage, you need the login data, consisting of an unchangeable ***User name*** and the corresponding ***Password***.

Default settings:
· User name (unchangeable): ***admin***
· Password: ***Janitza***

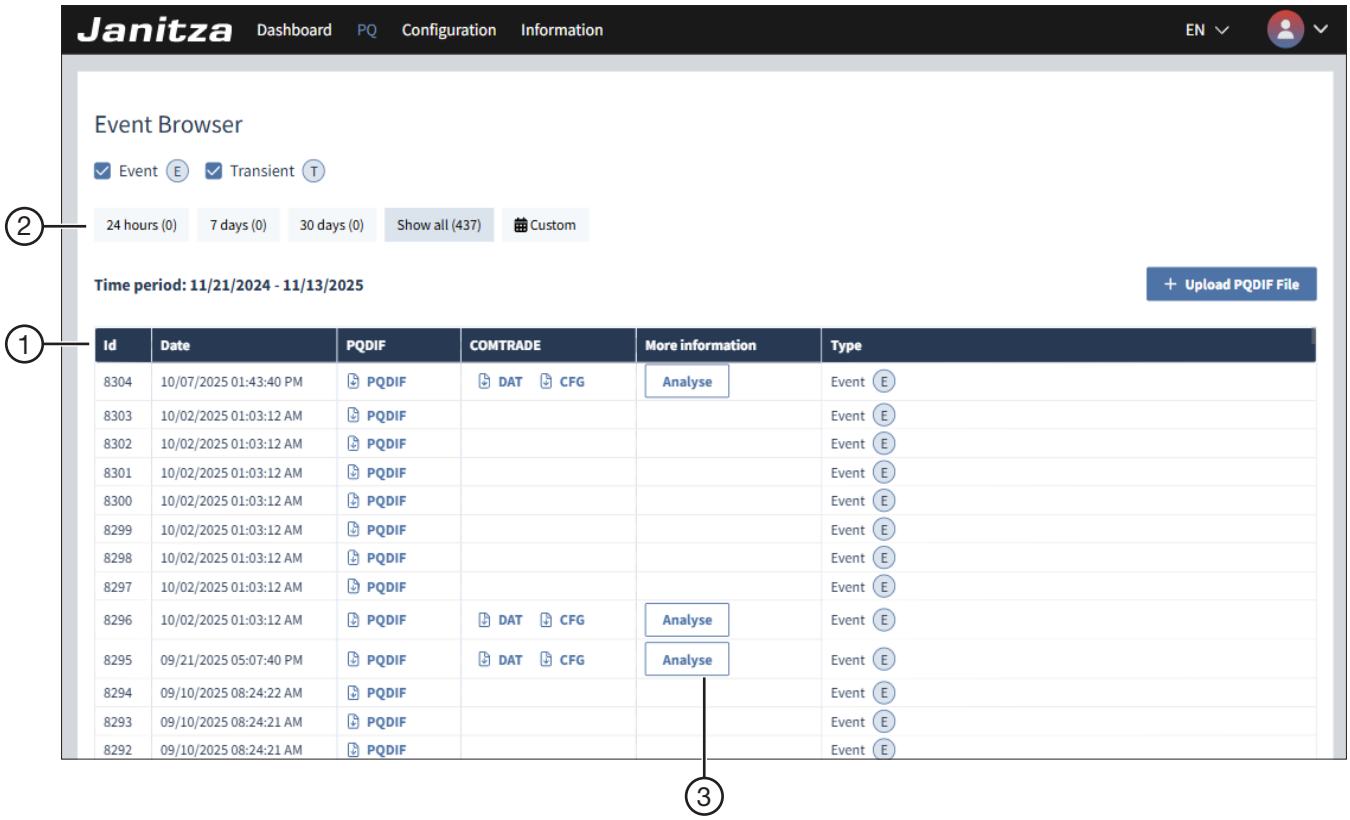
14.1.2 Change password

After logging in for the first time, change the password under **Configuration** > **Device configurator** > **Change password**.

INFORMATION

Protect yourself from data misuse by changing your password after entering it for the first time. Keep the password in a safe place.

14.2 Power Quality

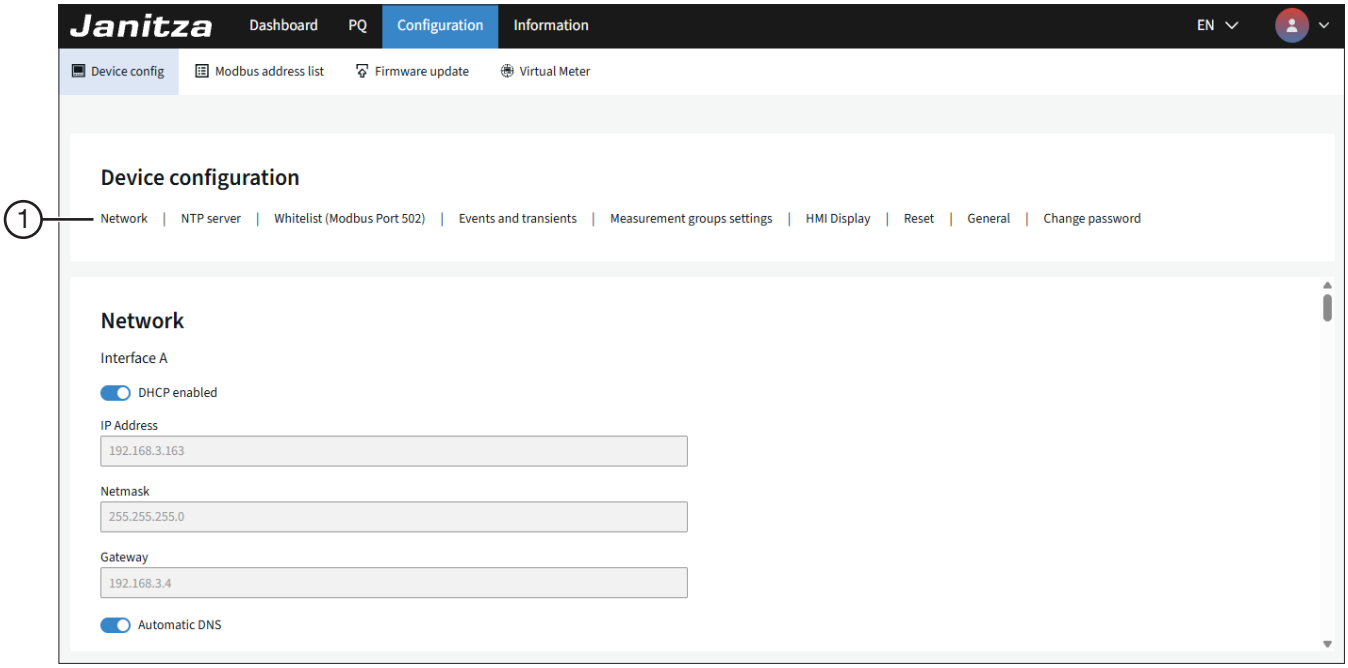


Item	Control element	Description
1	List of *Events and transients*	List display of events and transients with time stamp and error report as a download in PQDIF format / COMTRADE in DAT and CFG format.
2	Selection of *Time period*	Display of events and transients sorted by the time periods: · The last 24 hours · The last 7 days · The last 30 days · All · User-defined
3	Button *Analyze*	Opens the *Analyze* window with a graphical display and the option to export in various formats.

Tab. Events and transients

14.3 Configuration

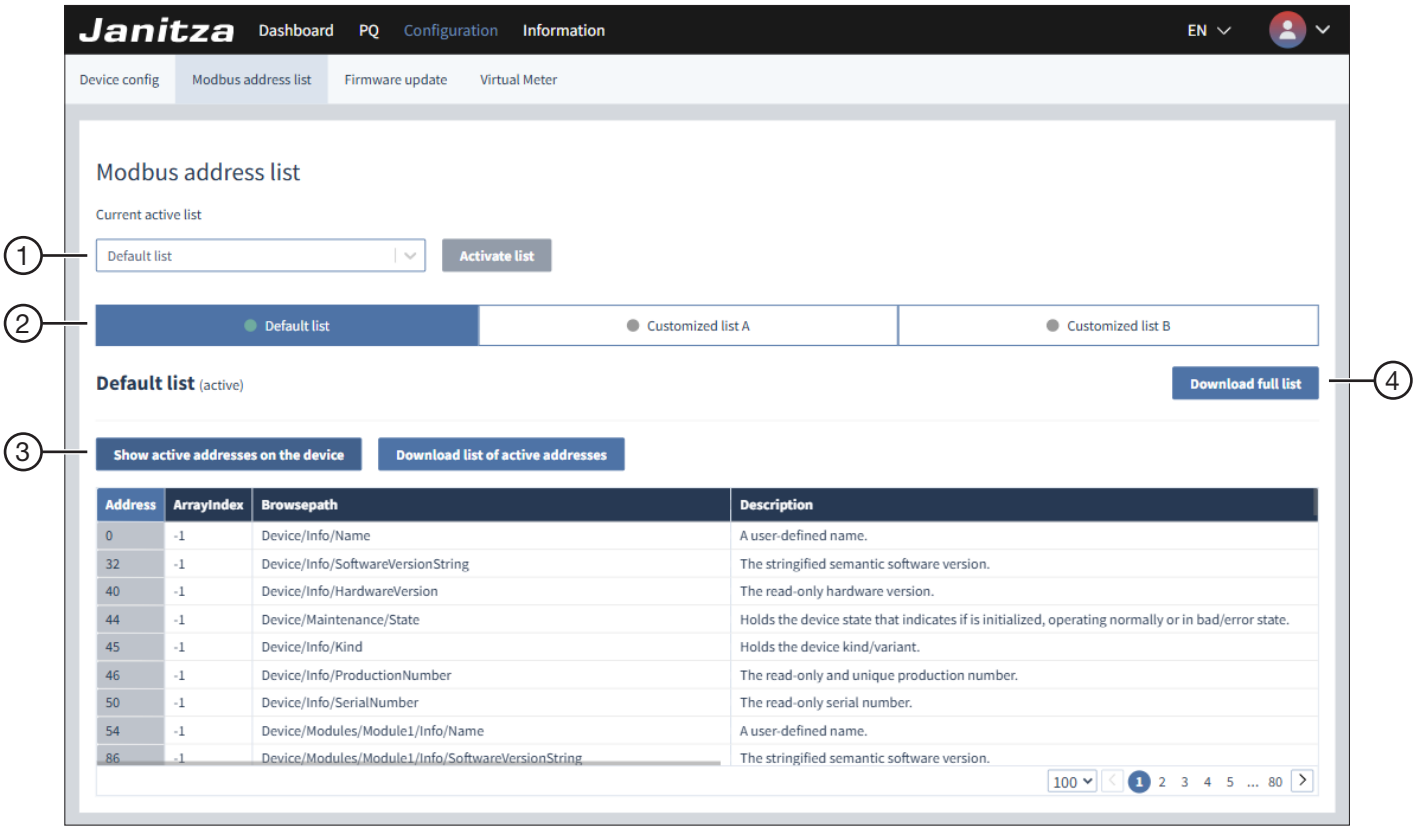
14.3.1 Device configuration



Item	Control element	Description	
1	Selection *Configuration of submenus*	**Network**	Configuration of the Ethernet interfaces.
		NTP server:	Activate/deactivate and configure up to 6 NTP servers (standard server for time synchronization)
		Whitelist (Modbus port 502):	Configure a whitelist of legitimate, verified devices that have access to the Modbus via the UMG 800's Ethernet interfaces. If no device is entered in the *Whitelist* , the "Whitelisting" feature is deactivated.
		Events and transients	Configuration of events and transients with specification of threshold value and hysteresis.
		Measurement group settings	Configure measurement groups and enter current and voltage transformer ratios.
		HMI display	Set the screensaver and timeout for an external display.
		Reset	Reset statistics and energy values.
		General	Activate or deactivate saving of the minimum and maximum values of all measured variables. If saving is deactivated, the values are not restored when the device is restarted.
		Change password	

Tab. Brief description of submenus

14.3.2 Modbus address list



Item	Control element	Description
1	Drop-down menu *Current active list*	Select and activate the Modbus address list.
2	Selection *List*	· **Standard list**: List of standard Modbus addresses (meter factory settings). · **User-defined lists**: Opens an upload window for a user-defined Modbus address list. The uploaded Modbus address list can be displayed and activated in the *Current active list* drop-down menu.
3	Buttons	Display or download active Modbus address list
4	Button *Download complete list*	Downloads the activated Modbus address list as a .csv file (with the Modbus addresses for modules, if applicable).

Tab. Modbus address list

14.3.3 Firmware update

A firmware file can be loaded to the device using the button or via drag & drop. The latest firmware for the device can be found on the Janitza homepage.

14.3.4 Virtual Meter

In the *Virtual Meter* menu, you can make the settings for the measurement group mode and configure the virtual measurement groups. Further information on configuration can be found in the section "11.2 Virtual Meter" on page 62.

15. Service and maintenance

The manufacturer, Janitza electronics GmbH, subjects the device to various safety tests before delivery and marks it with a seal.

INFORMATION

- Opened devices (damaged or removed seal) require new safety checks for safe operation!
- The manufacturer warranties only unopened devices!

15.1 Repair and calibration

Repair and calibration of the device must only be carried out by the manufacturer or an accredited laboratory!
The manufacturer recommends calibrating the device every 8 years!

⚠ WARNING

Warning of unauthorized tampering or improper use of the device.
Opening, dismantling or unauthorized manipulation of the device which goes beyond the mechanical, electrical or other operating limits indicated can lead to material damage or injury, up to and including death.
- **Only electrically qualified personnel are permitted to work on the devices and their components, assemblies, systems and current circuits!**
- **Always use your device or component only in the manner described in the associated documentation.**
- **In the event of visible damage, or for the purpose of repair and calibration, return the device to the manufacturer!**

15.2 Front panel foil and display

Please note the following for the care and cleaning of the front foil and the display:

ATTENTION

Material damage due to improper care and cleaning of the device.
The use of water or other solvents, such as denatured alcohol, acids, acidic agents for the front foil or the display can damage or destroy the device during cleaning. Water can, for example, penetrate into the device housing and destroy the device.
- **Clean the device, the front foil or the display with a soft cloth.**
- **Use a cloth moistened with clear water for heavy soiling.**
- **Clean fingerprints on the front foil or the display, for example, with a special LCD cleaner and a lint-free cloth.**
- **Do not use acids or acidic agents to clean the devices.**

15.3 Service

For questions not answered or described in this manual, please contact the manufacturer. Please be certain to have the following information ready to answer any questions:
- Device designation (see nameplate).
- Serial number (see nameplate).
- Software release (see system display).
- Measured voltage and supply voltage.
- An exact error description.

15.4 Device adjustment

The manufacturer adjusts the devices before delivery. No readjustment is required when the environmental conditions are complied with.

15.5 Firmware update via the measurement device homepage

For a firmware update via the measurement device homepage, please refer to the descriptions in Sect. "14. Measurement device homepage" on p. 73.

15.6 Firmware update using the GridVis software

To update the firmware, connect your device to a computer and access it via the GridVis software:
· Open the Firmware Update Assistant by clicking "Update device" in the "Extras" menu.
· Select your update file and perform the update.

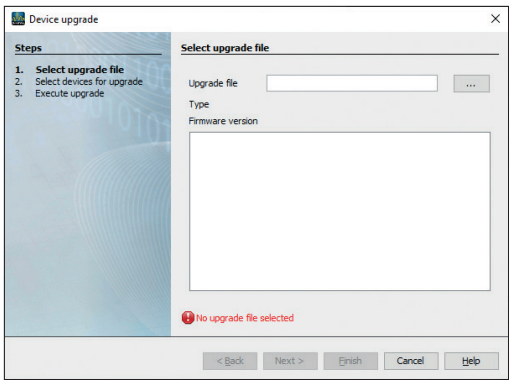


Fig. Updating the device firmware in the Grid Vis software

15.7 Clock/Battery

The supply voltage supplies the internal clock of the measurement device. If the supply voltage fails, the battery takes over the supply of voltage to the clock. The clock provides date and time information, e.g, for recordings, minimum/maximum values and events.

The battery of the device cannot be replaced! The life expectancy of the battery is at least 5 years at a storage temperature of +45 °C (113 °F). The typical life expectancy of the battery is 8 to 10 years.

15.8 Battery replacement

Have a battery replacement carried out by a qualified electrician and observe the following warnings:

⚠ WARNING

Risk of injury due to electrical voltage! Serious personal injury or death may occur due to:
· Touching bare or stripped leads that are energized.
· Device inputs that pose a hazard when touched.
Also observe the following when handling your device and when changing the battery, before starting work:
· Disconnect the system/device from the power supply!
· Secure it against being switched on again!
· Check to be sure it is de-energized!
· Ground and short circuit!
· Cover or block off adjacent live parts!

⚠ CAUTION

Risk of injury due to fire or burns!
The battery used in the device may cause fire or burns if used improperly.
· Replace the battery only with the same type or the type recommended by Janitza (see **Sect. "17. Technical specifications" on p. 82)!**
· **Observe the polarity when installing the battery!**
· **Remove batteries only with non-conductive tools (e.g. plastic tweezers)!**
· **Do not recharge, disassemble, burn or heat batteries above 100 °C (212 °F)!**
· **Do not dispose of batteries with household waste! Follow the disposal instructions in the respective device documentation!**
· **Keep batteries away from children and animals!**
· **Return devices with soldered batteries to the manufacturer for replacement or in the event of damage, observing proper transport conditions.**

INFORMATION

Grease or dirt on the contact surfaces forms a contact resistance which shortens the service life of the battery. Touch the battery only at the edges or with non-conductive tools.

16. Error messages

ATTENTION

Material damage due to disregard of the connection instructions!
Voltages and currents outside the permissible measuring range can destroy the device.
· Follow the measuring range specifications from **Sect. "17. Technical specifications" on p. 82.**
· **If the measuring range is exceeded, check your installation and connections! If necessary, use voltage transformers for voltage measurements!**

16.1 Overrange

The measuring range is exceeded if at least one of the voltage measurement inputs lies outside its measuring range.

If the measurement range is exceeded at the voltage measurement inputs, the red LED (E) blinks.

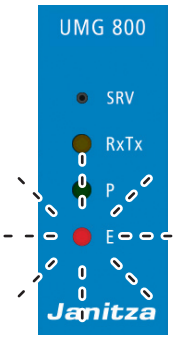


Fig. Measurement device front with blinking LED

INFORMATION

The device indicates that the measuring range has been exceeded until this is rectified! After the measuring range has been exceeded, the device switches to normal operation with the LED functions, see Sect. "8. Operation and commissioning" on p. 36.

The limit value for exceeding the measuring range (200 ms effective values):

U_{L-N} = 520 V_{eff}

16.2 Display of overrange on external display

If the measuring range is exceeded on an external display, e.g. the RD96, the following warning appears for the voltage "*Measuring range exceeded*" with the indication of the voltage circuit.

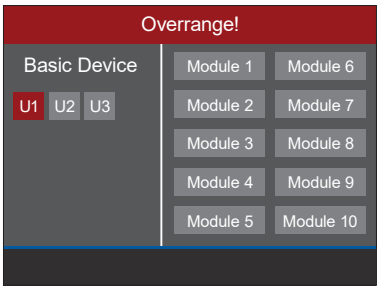


Fig. Example warning of the measurement device when uses as the basic device in a meter and module topology with 10 modules.

INFORMATION

The device indicates that the measuring range has been exceeded until this is rectified! After elimination of the overrange, the corresponding measuring display appears.

16.3 Procedure in the event of a malfunction

Enhanced risk	Cause	Remedy
No display (LED)	External fuse for the supply voltage has tripped.	Replace fuse.
No voltage measurement	No measured voltage connected.	Connect measured voltage.
Voltage is too high (red LED blinks)	Overrange.	Check the connection and correct if necessary, and Use a voltage transformer.
	Voltage transformer incorrectly configured.	Read the voltage transformer ratio on the voltage transformer and then configure accordingly.
Measurement device switches off connected modules (module LEDs are off)	The self-resetting fuse of the meter has tripped and switched off any connected module series (short circuit or overload).	· Observing the safety instructions, disconnect the meter from the supply voltage and allow it to cool down (approx. 15 min.). · Check/replace the bus connector installation (eliminate short circuit) or reduce number of modules (overload).
The measurement device does not recognize a newly connected module or identifies it as the wrong module type.	The module may not be compatible with the firmware on the measurement device.	Contact the support team.
Despite the above measures, the device does not function.	Device defective.	Send the device and error description to the manufacturer for inspection.

Tab.: Procedure in the event of a malfunction

ATTENTION

Material damage due to overloaded measurement inputs!
Too high current and voltage values overload the measurement inputs and can damage the device.
· Adhere to the limit values specified on the nameplate and in the technical data starting on **Page 82.**
· **Check your installation and connections!**

17. Technical specifications

17.1 Technical data

General	
Net weight (with plug-in terminals)	approx. 120 g (0.265 lbs)
Device dimensions	Approx. B = 36 mm (1.42 in), H = 90 mm (3.54 in), D = 76 mm (2.99 in)
Width in width units (HP)	2 HP (1 HP = 18 mm)
Battery	Lithium CR1632, 3 V, non-replaceable (UL1642 approval)
Integrated memory	4 GB
Mounting orientation	As desired
Fastening/mounting - Suitable DIN rails - 35 mm (1.38 in)	· TS 35/7.5 according to EN 60715 · TS 35/10 · TS 35/15 x 1.5
Clock error - in the temperature range of 18 °C (64 °F) .. 28 °C (82 °F)	±5 ppm (equivalent to 3 min./year)
Impact resistance	IK07 according to IEC 62262

Transport and storage The following specifications apply for devices transported and stored in the original packaging.	
Free fall	1 m (39.37 in)
Temperature	-25 °C (-13 °F) to +70 °C (158 °F)
Relative humidity	5 to 95% at 25 °C (77 °F), no condensation

Environmental conditions during operation	
The device: · Is for weather-protected and stationary use. · Fulfills operating conditions according to DIN IEC 60721-3-3. · Has protection class II according to IEC 60536 (VDE 0106, part 1), a ground wire connection is not required!	
Rated temperature range	-10 °C (14 °F) to +55 °C (131 °F)
Relative humidity	5 to 95% at 25 °C (77 °F), no condensation
Operating elevation	0 .. 2000 m (6562 ft) above sea level
Pollution degree	2
Ventilation	No forced ventilation required.
Protection against foreign matter and water	IP20 according to EN60529

Supply voltage	
Nominal range	DC: 24 V, PELV (earthed power supply unit - observe polarity!)
Operating range	+/-10% of nominal range
Power consumption	2.5 W
Maximum power consumption with modules and external display	14 W
Recommended overcurrent protective device for line protection	2-6 A, (Char. B), IEC/UL approval

Voltage measurement	
3-phase 4-wire systems with rated voltages up to	277 V_{LN} / 480 V_{LL} (+/-10%) according to IEC 277 V_{LN} / 480 V_{LL} (+/-10%) according to UL
3-phase 3-wire systems (grounded) with rated voltages up to	480 V_{L-L} (+/-10%) according to IEC 480 V_{L-L} (+/-10%) according to UL
3-phase 3-wire systems (ungrounded) with rated voltages up to	480 V_{L-L} (+/-10%) according to IEC 480 V_{L-L} (+/-10%) according to UL
Overvoltage category	300 V CAT III according to IEC 300 V CAT III according to UL
Rated surge voltage	4 kV
Protection of the voltage measurement	1 - 10 A tripping characteristic B (with IEC/UL approval)
Measuring range L-N	0 .. 300 V_{eff} (max. overvoltage 520 V_{eff}) The device only measures if a voltage L-N greater than 20 V_{eff} is applied to L1.
Measuring range L-L	0 .. 520 V_{eff} (max. overvoltage 900 V_{eff}) The device only measures if a voltage L-N greater than 34 V_{eff} is applied to L1-L2 or L1-L3.
Measuring range N-PE	0 .. 300 V_{eff}
Resolution	0.01 V
Crest factor	2 (referenced to the measuring range)
Impedance	3 MΩ/phase
Power consumption	approx. 0.1 VA
Sampling frequency	51.2 kHz
Frequency of fundamental oscillation - Resolution	40 .. 70 Hz 0.01 Hz
Harmonics	1 ... 63rd

Peripherals

RS-485 interface 3-conductor connection with A, B, GND	
Protocol	Modbus RTU/Server (formerly slave) Modbus RTU/Gateway
Transmission rate	9.6 kbps, 19.2 kbps, 38.4 kbps, 57.6 kbps, 115.2 kbps
Termination	DIP switch (S1)

Ethernet interfaces	
Connection	2 x RJ45 · 10BASE-T/100BASE-TX with auto-negotiation of transmission speed and duplex mode (half/full) in accordance with IEEE 802.3u · No manual configuration of transmission speed or duplex mode · 1000BASE-T is not supported
Function	Modbus gateway, embedded web server (HTTP)
Protocols	TCP/IP, DHCP client (BootP), Modbus/TCP (port 502), ICMP (ping), NTP, FTP

USB interface	
Connection	USB 2.0, type A
Function	Connection for · external display. · USB memory stick (FAT32 formatted) with the firmware update file and/or network configuration file.

Connection capacity of the terminals - supply voltage Connectible conductors: Only connect one conductor per terminal point!	
Single core, multi-core, fine-stranded	0.2 - 4 mm^2, AWG 28-12
Wire ferrules (insulated/non-insulated)	0.2 - 2.5 mm^2, AWG 26-14
Tightening torque	0.4 - 0.5 Nm (3.54 - 4.43 lbf in)
Strip length	7 mm (0.2756 in)

Connection capacity of the terminals - voltage measurement Connectible conductors: Only connect one conductor per terminal point!	
Single-wire	0.5 - 1.5 mm^2, AWG 21-16
Fine wire	0.5 - 2.5 mm^2, AWG 21-14
Wire ferrules (insulated/non-insulated)	0.5 - 2.5 mm^2, AWG 21-14
Strip length	10 mm (0.3937 in)

Connection capacity of the terminals - RS-485	
Single core, multi-core, fine-stranded	0.2 - 1.5 mm^2, AWG 28-16
Wire ferrules (insulated/non-insulated)	0.2 - 1.5 mm^2, AWG 28-16
Tightening torque	0.2 - 0.25 Nm (1.77 - 2.21 lbf in)
Strip length	7 mm (0.2756 in)

Potential isolation and electrical safety of the interfaces
The interfaces (RS-485, Ethernet and USB) have: · Double insulation to the voltage measurement inputs. · A functional isolation to each other, to the supply voltage, to the measurement inputs. The interfaces of the connected devices require double or reinforced insulation to mains voltages (according to IEC 61010-1).

17.2 Performance characteristics of functions

Function	Symbol	Accuracy class	Measuring range
Frequency	f	0.05 (IEC61557-12)	40 .. 70 Hz
Voltage	U_{L-N}	0.2 (IEC61557-12)	20 .. 300 V_{eff}
Voltage	U_{L-L}	0.2 (IEC61557-12)	34 .. 520 V_{eff}
Voltage harmonics currents	Uh	Cl. 1 (IEC61000-4-7)	1 .. 63rd
THD of the voltage	THDu	1.0 (IEC61557-12)	0 .. 999%

INFORMATION

Detailed information on the device functions and data can be found in the usage information enclosed with the device or is available for download at www.janitza.com!

17.3 Parameter and Modbus address list

INFORMATION

A standard Modbus address list with explanations of measured values and a formulary can be found in the download area at www.janitza.com.

17.4 Information on saving measured values and configuration data

INFORMATION

The device stores the following measured values every 5 minutes at the latest:
· S0 meter readings
· Min. / max. / average values
· Energy values (work values)
The device saves configuration data immediately (1-2 s)!

18. Dimensional drawings

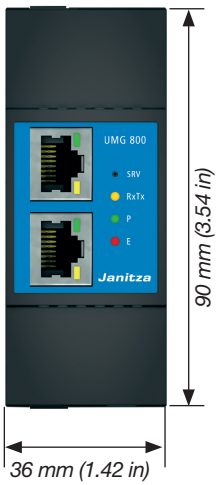
· The figures are for illustration purposes only and are not to scale.
· Please also note the dimensions of the terminals used during installation!
· All dimensions in mm (in).

INFORMATION

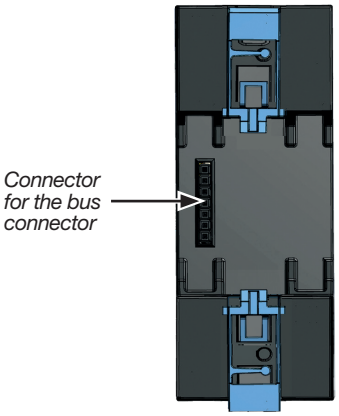
In addition to the dimensional drawings in this user manual, also refer to the dimensional drawings in the usage information for the expansion modules, components, and especially the usage information for project-specific applications!

18.1 Measurement device

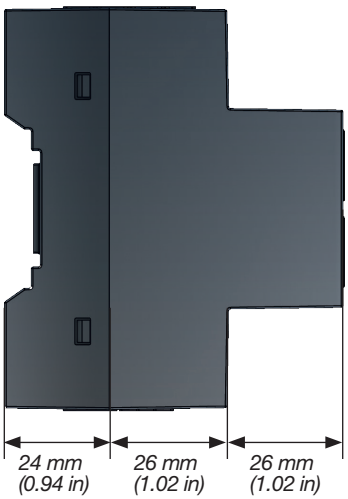
Front view



Rear view



View from left



Bottom view

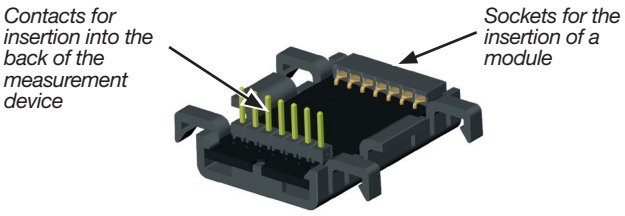


Top view



18.2 Bus connector

Bus connector of the measurement device for mounting modules:



INFORMATION

Observe Sect. "5. Mounting" on p. 26 when mounting the measurement device with bus connector.

NOTES

Janitza

Janitza electronics GmbH
Vor dem Polstück 6 | 35633 Lahnau
Germany

Tel.: +49 6441 9642-0
info@janitza.com | www.janitza.com

Doc. no. 2.053.222.1.c | 10/2026 | Subject to technical changes.
The current version of the document can be found in the download area at www.janitza.com.