www.janitza.de

RCM modules

Residual current expansion modules for the UMG 96-PA / UMG 96-PA^{MID}

(as of firmware 2.0)

User manual and technical specifications

- Module 96-PA-RCM
- Module 96-PA-RCM-EL

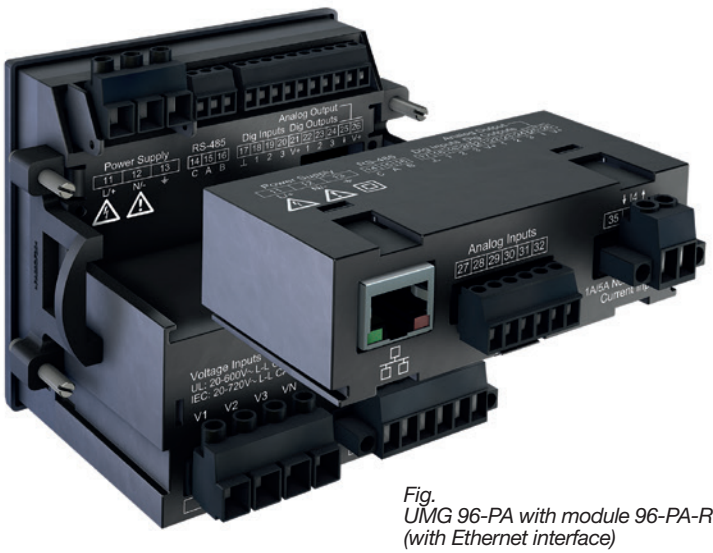


Fig.
UMG 96-PA with module 96-PA-RCM-EL (with Ethernet interface)

Doc. no. 2.061.033.0 09/2019

Janitza electronics GmbH
Vor dem Polstück 6
D-35633 Lahnau
Support tel. +49 6441 9642-22
Fax +49 6441 9642-30
Email: info@janitza.de
www.janitza.de

Janitza®

Module 96-PA-RCM and 96-PA-RCM-EL,
RCM modules for expanding the scope of functions of the
UMG 96-PA / UMG 96-PA^{MID} (as of firmware 2.0)

Doc. no.: 2.061.033.0
Date: 09/2019
The German version is the original edition of the documentation

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.de for the current version.
Please see our website under *www.janitza.de* for the current version.

Table of contents

1. General 8

1. 1 Disclaimer 8
1. 2 Copyright notice 8
1. 3 Technical changes 8
1. 4 About this user manual 8
1. 5 Defective device/disposal 8

2. Safety 9

2. 1 Display of warning notices and safety information 9
2. 2 Hazard levels 9
2. 3 Product safety 9
2. 4 Hazards when handling the device, components and modules 9
2. 5 Electrically qualified personnel 10
2. 6 Warranty in the event of damage 10
2. 7 Safety information for handling current transformers and devices with residual current measurement 11
2. 8 Safety information for analog inputs 11

3. Product description 12

3. 1 Module description 12
3. 2 Module's scope of functions 12
3. 3 Incoming goods inspection 12
3. 4 Intended use 13
3. 5 Overview of module functions 13
3. 6 EU conformity declaration 13
3. 7 Scope of delivery 13
3. 8 Operating concept 13
3. 9 GridVis network analysis software 14

4. Mounting 15

4. 1 Mounting requirements for the basic device for use with module 15
4. 2 Module mounting 15
4. 3 Module connections 16
4. 4 Module markings – Rating plates 17

5. Installation 18

5. 1 PC connection of the basic device 18

5. 2 PC connection of the basic device with module via the Ethernet interface (only RCM-EL) 18

5. 2. 1 Ethernet direct connection 18

5. 2. 2 Connection as a gateway (master) 18

5. 2. 3 Connection to a network 18

5. 3 PC connection of the basic device with module via RS-485 interface (Modbus) 18

5. 4 Connection option with terminal assignment 19

5. 5 Connection example of basic device with module 19

6. Inputs and interfaces 20

6. 1 Analog inputs I5 and I6 – Residual current input/current signal input 20

6. 2 Activate cable break detection (failure monitoring) RCM for I5 and I6 20

6. 3 Current direction for the current transformer on I5 and I6 21

6. 4 Residual current transformer example 21

6. 5 Important information about the residual current inputs 21

6. 6 Connection example 1 - Residual current measurement 22

6. 7 Connection example 2 - Residual current measurement 22

6. 8 Connection example 3 - Residual current monitoring 22

6. 9 Residual current limit values 23

6. 9. 1 Example graph “Calculation of the dynamic residual current limit value” 23

6. 9. 2 Example graph “Calculation of the static residual current limit value” 24

6. 9. 3 Example graph “Calculation of the incremental residual current limit value” 24

6. 10 Analog inputs I5 and I6/U6 – DC power 25

6. 11 Connection example – DC power measurement 25

6. 12 Current measurement input I4 – Neutral conductor measurement 26

6. 13 Temperature measurement input 27

6. 14 Ethernet interface (only module 96-PA-RCM-EL) 27

7. Operation and button functions of the basic device with module 28

7. 1 Operation 28

7. 2 Button function 28

7. 3 Measuring display 28

7. 4 Menu 28

7. 5 Overview of the additional menu items for basic devices with module 29

8. Communication **30**

8. 1 Basic device communication via the Ethernet interface (module 96-PA-RCM-EL) 30

8. 2 Basic device communication via the RS-485 interface (field bus) 31

8. 3 Restarting the basic device 31

8. 4 Module-relevant alarms 32

9. Module-relevant configurations **33**

9. 1 L4 current transformer (I4 - measurement) 33

9. 2 Module mode 34

9. 3 Temperature sensor 35

9. 4 Module-relevant configurations in the GridVis® software 36

9. 5 Modbus editor 36

10. Module-relevant measuring displays **38**

10. 1 Measuring display ***L4 current measurement*** 38

10. 2 Measuring display ***Residual current*** 38

10. 3 Measuring display ***DC power*** 39

10. 4 Measuring display ***External temperature*** 39

11. Technical data for the module **40**

11. 1 Technical data 40

11. 2 Performance characteristics of functions 42

12. Dimensional drawings and views **44**

12. 1 Dimensional drawings 44

12. 2 3D views of basic device with module 44

13. Dismounting **45**

14. Service and maintenance **46**

14. 1 Repairs and calibration 46

14. 2 Service 46

14. 3 Device adjustment 46

14. 4 Calibration interval 46

14. 5 Firmware update 46

14. 6 Procedure in the event of a malfunction 46

14. 7 Resetting the module to the standard factory settings 46

1. General

1.1 Disclaimer

Compliance with the informational products for the device 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 informational products.

Ensure that your informational products are readily accessible in a legible form.

1.2 Copyright notice

© 2019 - Janitza electronics GmbH - Lahnau.
All rights reserved.

Any reproduction, processing, distribution or other use, 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 matches the user manual.
· First read and understand the documents associated with the product.
· Keep the documents associated with the product available for the entire service life and pass them on to any possible subsequent users.
· Find out about device revisions and the associated modifications of the documentation associated with your product at www.janitza.de.

1.4 About this user manual

NOTE

This user manual describes the modules and provides information on the operation of the modules via the basic device (with the current firmware).

In addition to this user manual, also take note of the documentation of your basic device, such as:
· User manual
· Installation instructions
· “GridVis® Software” Quick Guide
· Safety information
· GridVis® online help

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

1.5 Defective device/disposal

Send **defective devices (components/modules)** back to the manufacturer for testing (including all accessories). Do not attempt to open or repair the device (the component/module) on your own because otherwise all warranty claims become invalid!

For the **disposal** of the device, the components and the module, please observe national and international regulations. Dispose of individual parts, as applicable, depending on their composition and existing country-specific regulations, e.g. as:
· Electronic waste
· Batteries and rechargeable batteries
· Plastics
· Metals
or engage a certified disposal company to handle scrapping.

Information on **Service and maintenance** for your basic device including the module can be found in chap. “14 Service and maintenance” on page 46.

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 information

The warning notices shown below
· are found throughout all of the documentation,
· are on the devices, components and modules themselves,
· indicate potential risks and hazards,
· underscore aspects of the information provided that clarifies or simplifies procedures.



The additional symbol on the device, its components or modules themselves indicates an electrical danger that can result in serious injuries 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 information is marked by a warning symbol, and the hazard levels are shown as follows, depending on the degree of hazard:

⚠ DANGER
Draws attention to an immediately hazardous situation which, when disregarded, leads to severe or fatal injury.

⚠ WARNING
Draws attention to an immediately hazardous situation which, when disregarded, can lead to severe or fatal injury.

⚠ CAUTION
Draws attention to an immediately hazardous situation which, when disregarded, can lead to minor injuries.

ATTENTION
Draws attention to an immediately hazardous situation which, when disregarded, can lead to material or environmental damage.

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

2.3 Product safety

The device, the components and the 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, the components or the modules,
· 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.

Read and understand the respective documentation and user manuals before installation, operation, maintenance and the use of this device, the components or the modules.
Only operate the device, components and modules when they are in perfect condition and in compliance with this user manual and the associated, included documents. Send defective devices, components and modules back to the manufacturer in compliance with proper transport conditions.
Retain the user manual throughout the service life of the device or components and modules and keep it at hand for consultation.
When using the device, components or modules, also observe the legal and safety regulations for your system that are applicable for the respective use case.

2.4 Hazards when handling the device, components and modules

When operating electric devices, certain parts of these devices can conduct hazardous voltage. Consequently, material damage and bodily injury including death can occur if they are not handled properly.
Therefore, when handling our devices, components, and modules, always observe the following:
· Do not exceed the limit values specified in the user manual and on the rating plate; this must also be observed during testing and commissioning.
· Take note of the safety and warning notices in all documents that belong to the device, components or modules.

⚠ WARNING

Risk of injury due to electrical voltage!
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! Check to be sure it is de-energized! Ground and short circuit! Cover or block off adjacent live parts!**
- **Wear protective clothing and protective equipment in accordance with applicable guidelines when working on electrical systems!**
- **Before making connections, ground the device / component / module by means of the ground wire connection, if present!**
- **Do not touching bare or stripped leads that are energized! Equip stranded conductors with wire ferrules!**
- **Hazardous voltages can be present in all circuitry parts that are connected to the power supply.**
- **Protect the supply voltage 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, components and modules even after being disconnected from the supply voltage (capacitor storage).**
- **Do not operate equipment with current transformer circuits when open.**
- **Only connect screw terminals with the same number of poles and design!**
- **Do not exceed the limit values specified in the user manual and on the rating plate; this must also be observed during testing and commissioning.**
- **Take note of the safety and warning notices in the documents that belong to the device, components and modules!**

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 documents associated with the devices and 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 and 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 device, component or module only in the manner described in the associated documentation.**
- **If there is discernible damage, send the device, component or 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. In this regard, please take note of chap. „3.4 Intended use“ on page 13.

2.7 Safety information for handling current transformers and devices with residual current measurement

⚠ WARNING

Risk of injury due to large currents and high electrical voltage on the current transformers!
Current transformers operated while open on the secondary side (high voltage peaks pose a hazard when touched) can result in severe bodily injury or death.
- **Avoid operating the current transformers while open; short circuit the unloaded transformers!**
- **Before interrupting the current supply, short circuit the secondary connections of the current transformers. Switch any test switches that automatically short circuit the secondary lines of the current transformers to the "Test" status (Check the test switch/ short circuiting connection beforehand)!**
- **Only use current transformers with basic insulation to IEC 61010-1:2010!**
- **Caution, even current transformers rated as safe for open operation can pose a hazard when touched during operation while open!**
- **Make sure that screw terminals for the current transformer connection on the device are adequately tightened!**
- **Comply with the information and provisions in the documentation of your current transformers!**

⚠ CAUTION

Risk of injury or damage to the device due to high measurement currents on the connections of the current transformers!
High measurement currents can cause temperatures of up to 80 °C (176 °F) on the connections of the current transformers
- **Use wiring that is designed for an operating temperature of at least 80 °C (176 °F)!**
- **The current transformers can be hot even after the power supply has been switched off. Allow the connections of the current transformers and the connecting cables to cool down before touching them!**

⚠ CAUTION

Risk of injury or damage to the device due to improper use!
Devices with residual current measurement can output warning pulses when limit values are exceeded. These serve the exclusive purpose of monitoring residual currents or failure monitoring. Use of the warning pulses as a stand-alone protective device against electrical shock can lead to injury or damage to the device or your system!
- **Do not use devices with residual current measurement as a stand-alone protective device. Employ suitable protective devices for your system!**

⚠ CAUTION

Risk of injury or damage to the device/your system due to short circuit!
Inadequate insulation of the operating equipment at the residual current measuring input with respect to the supply circuits can cause voltages at the measuring input which represent a hazard when touched or damage to your device or system.
- **Ensure reinforced or double insulation with respect to the supply circuits!**
- **Ensure galvanic isolation of the residual current measuring inputs from each other!**

2.8 Safety information for analog inputs

ATTENTION

Transmission errors and damage to the device and its components!
With cable lengths greater than 30 m (32.81 yd), there is a risk of transmission errors and damage to the device due to atmospheric discharge.
- **Use shielded cables for connections to the analog inputs.**
- **Take suitable shielding measures for cable lengths greater than 30 m (32.81 yd)!**
- **Use the recommended cables and wires!**

ATTENTION

Damage to the device/your system due to short circuit!
Inadequate insulation of the operating equipment at the analog inputs with respect to the supply circuits can lead to damage of your device or system.
- **Ensure reinforced or double insulation with respect to the supply circuits!**

ATTENTION

Operational failures or damage to the device due to connection mistakes.
The analog inputs are not short-circuit proof! Connection or wiring errors can lead to operational failures or damage to the device.
- **When making connections, ensure correct wiring and observe the requirements for connections and the limit values!**

3. Product description

3.1 Module description

The RCM module enhances the scope of functions of the basic device and is available in the following variants:

Part no.	Designation
52.32.011	**UMG 96-PA-RCM**
52.32.010	**UMG 96-PA-RCM-EL** (with Ethernet interface)

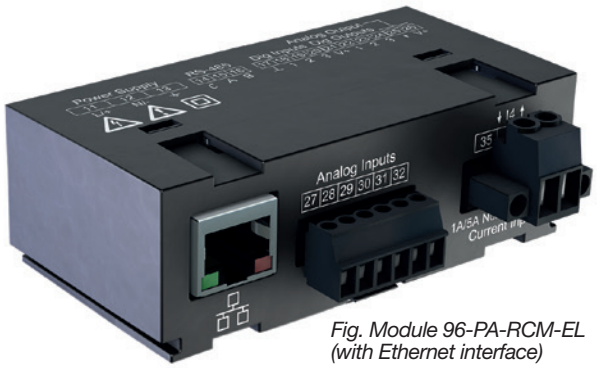


Fig. Module 96-PA-RCM-EL (with Ethernet interface)

3.2 Module's scope of functions

· Neutral conductor measurement (I4 - current measurement).
· Residual current measurement (RCM) or DC power measurement via 2 analog inputs.
· Temperature measurement (1 analog input).

Both module variants are suitable for monitoring:
· Residual currents (RCM) - Type A, B and B+.
· AC currents.
· DC currents and pulsating DC currents.

The additional measurement results obtained from the module are output by basic device.

NOTE

Because the modules are designed simply as plug-in modules (via a module connector) for a basic device, please also observe all informational products that belong to your basic device! Take particular note of the insert entitled "Safety and warning notices"!

3.3 Incoming goods inspection

The prerequisites for trouble-free and safe operation of the modules include proper transport, storage, setup and assembly, as well as proper operation and maintenance.
Exercise due caution when unpacking and packing the device, do not use force and only use suitable tools.
Check:
· The modules by performing a visual inspection to ensure flawless mechanical condition.
· The scope of delivery (see user manual) with respect to completeness before beginning with assembly and installation.

If it must be assumed that safe operation of your basic device with module is not possible:
1. **Switch off the power to your system (your device)!**
2. **Secure it against being switched back on!**
3. **Check to be sure it is de-energized!**
4. **Ground and short circuit the system (device)!**
5. **Cover or block off adjacent live parts!**

Safe operation is impossible, if, for example, the device with module:
· 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 thresholds without adjustment 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 may cause damage to the module and result in material damage!
The contacts of the module connector can bend or break, which would destroy the module.
· **Never touch or manipulate the contacts of the module connector!**
· **Never use force to press the module connector plug into the socket!**
· **When handling, transporting and storing the module, protect the contacts of the module connector!**

3.4 Intended use

The **modules 96-PA-RCM** and **96-PA-RCM-EL**
· Are intended as plug-in modules for a basic device (UMG 96-PA) in switch cabinets and small distribution boards. The device can be installed in any mounting position (please observe the documentation belonging to the basic device).
· Must only be mounted on basic devices that are disconnected from the power supply (see "Mounting" step).

The basic device with attached module is:
· **Not** intended for installation in vehicles! Use of the basic device with module in non-stationary equipment is considered an exceptional environmental condition and is only permissible by special agreement.
· Not intended for installation in environments with harmful oils, acids, gases, vapors, dusts, radiation, etc.

3.5 Overview of module functions

· 3 analog inputs for:
  - 2x residual-current and current measurement with cable break detection.
  - 1x temperature measurement
· I4 current measurement channel for I4 current measurement via a current transformer (.../5 A or .../1 A)

Communication:
· Modbus RTU protocol (RS-485 interface of the basic device).
· Only **Module 96-PA-RCM-EL:** RJ45 Ethernet interface

Important module performance characteristics can be found in chap. „11. Technical data for the module" on page 40.

3.6 EU conformity declaration

Please see the EU declaration of conformity posted at www.janitza.de for the laws, standards and directives applied by Janitza electronics GmbH for the devices. The CE conformity marking requirements for the device arise from the EU conformity declaration and the laws, standards and directives mentioned therein.

3.7 Scope of delivery

Quantity	Part no.	Designation
1	52.32.011	Module 96-PA-RCM
	or	
1	52.32.010	Module 96-PA-RCM-EL

1	33.03.374	Installation instructions DE/EN
1	33.03.342	Safety information, 12 languages
1	08.01.505	Patch cable, 2 m (2.19 yd), twisted (connection of UMG - PC/switch)
1	10.01.873	Screw terminal, plug-in, 6-pole (temperature, I5, I6/U6)
1	10.01.875	Screw terminal, plug-in, 2-pole (current measurement, I4)

The screw terminals required for the device are included in delivery.

3.8 Operating concept

There are several options for programming the device with module or reading out the measured values, e.g. via the
· buttons on the basic device,
· GridVis® network analysis software,
· RS-485 interface or Ethernet interface.

NOTE

Please take note of the documentation of your basic device (without the module)!
Basic or identical information and chapters, such as
· Commissioning
· Configuration
· Technical data
· Error messages
· Procedure in the event of a malfunction, etc.
can be found in the documentation of your basic device.

NOTE

A list of parameters and Modbus addresses with data on your basic device with module is available for you as a download at www.janitza.de.

3.9 GridVis network analysis software

With the GridVis® software, you have the perfect tool for programming, reading out and visualizing measurement data (download at www.janitza.de).

Performance characteristics of the GridVis® software

· Device configuration.
· Graphic display of measured values
· Report and read-out functions
· Alarm management.

Connections to the PC (GridVis® software)
Connections for communication between the PC and the device with module can be found in chap. „5. Installation“ on page 18.

NOTE
This user manual describes the module and provides information on the operation of the module via the basic device. The GridVis® software has an “online help” feature.

4. Mounting

4.1 Mounting requirements for the basic device for use with module

For use with the **modules 96-PA-RCM and 96-PA-RCM-EL**, the basic device requires:
· At least **hardware version 4**.
· The **latest firmware version (from 2.0)**.
The **hardware version** of your basic device is specified on the rating plate. For more detailed information on this, refer to the user manual of your basic device.
You can check the installed **firmware version** in the user interface of your basic device under: *Menu > Configuration > System > Version.*

The latest firmware version for your basic device can be found at www.janitza.de as a download. Your Janitza partner or the support team are happy to be of assistance to you with regard to questions on updating the hardware version or firmware installation.



Fig.:
Rating plate of the basic device with indication of the hardware version.

4.2 Module mounting

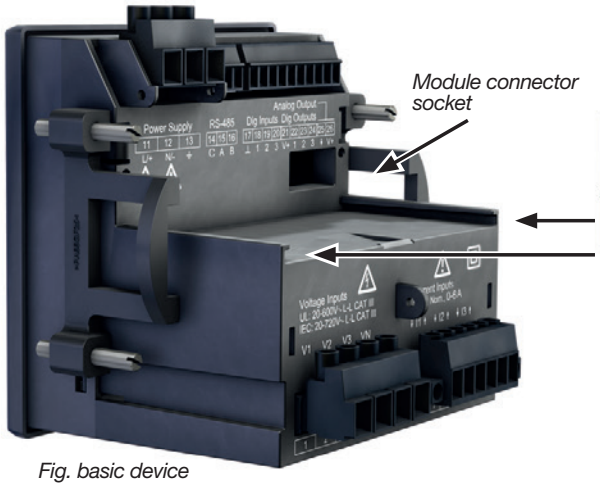


Fig. basic device

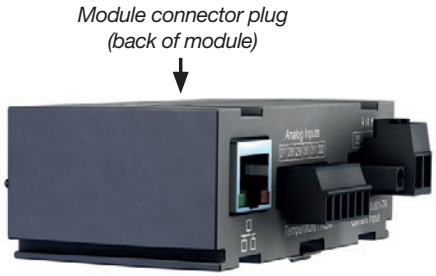


Fig. Module 96-PA-RCM-EL (with Ethernet interface)

Mounting module:
1. Disconnect the system (basic device) from the power supply!
2. Remove the transport protection from the module connector plug of the module and the protection from the module connector socket of the basic device.
3. Slide the module into the slot on the rear side of the basic device and use slight pressure to press it into the basic device until the module connector audibly snaps in.
4. Connect the system (basic device) to the power supply. The basic device recognizes the plugged in module automatically.

⚠ CAUTION

Non-observance of the assembly instructions may result in property damage or cause personal injury!
Non-observance of the assembly instructions may cause damage to your basic device with module or destroy it and/or may also result in personal injury.
· **Observe the assembly instructions of your basic device.**
· **Disconnect your basic device from the power supply prior to assembly!**
· **Provide adequate air circulation in your installation environment and cooling, as needed, when the ambient temperatures are high.**
· **Before mounting, remove the transport protection from the module connector plug of the module and the protection from the module connector socket of the basic device.**

NOTE

If the basic device does not recognize the module during the power-up procedure, the module functions are not supported (such as residual current or DC power). If there is no communication with the module:
· Disconnect your system (the basic device) from the power supply and check the positioning of the RCM module. Carefully press the module onto the basic device until it audibly snaps in.
· If necessary, restart the basic device (chap. “8.3 Restarting the basic device” on page 31).
· If these measures are unsuccessful, please contact our support team (www.janitza.de).

4.3 Module connections

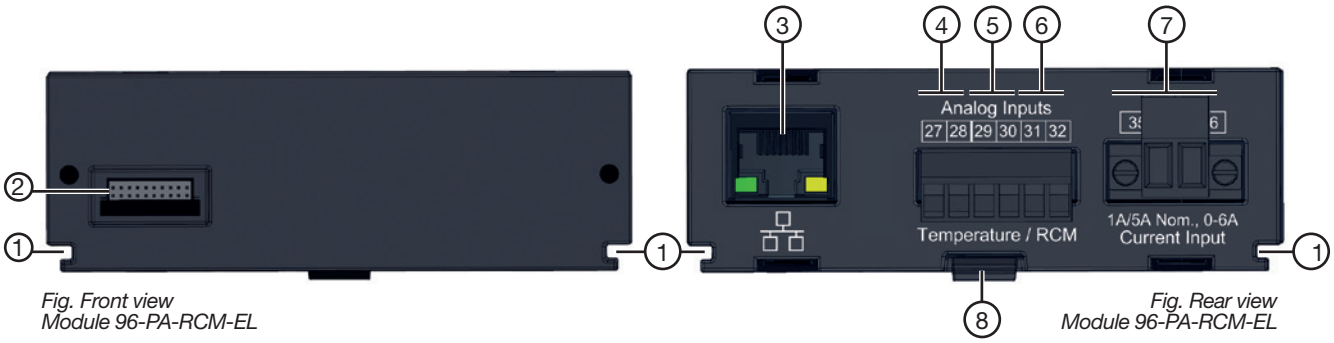


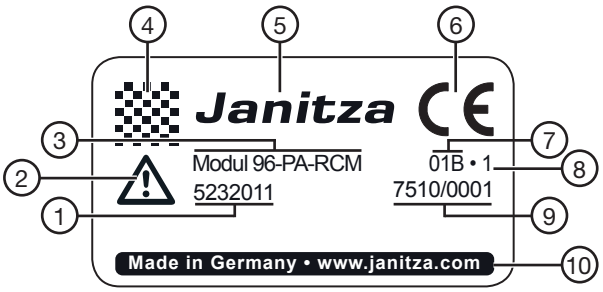
Fig. Front view
Module 96-PA-RCM-EL

Fig. Rear view
Module 96-PA-RCM-EL

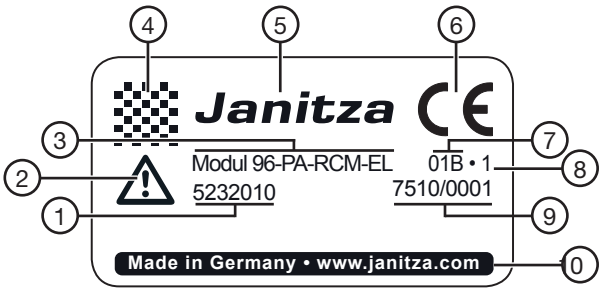
Item	Designation	Description
1	Groove	Guide groove for the mounting/dismantling of the module.
2	Module connector	Interface to basic device
3	RJ45	**Only module 96-PA-RCM-EL:** Ethernet interface (10/100Base-T)
4	Analog inputs - terminals 27 / 28	Temperature measurement
5	Analog inputs - terminals 29 / 30	Residual current measurement I5
6	Analog inputs - terminals 31 / 32	Residual current measurement I6 or voltage measurement U6 for the DC power.
7	Current measurement input - terminals 35 / 36	Current measurement I4
8	Snapping mechanism	For mounting/removal of the module (snap in/snap out).

4.4 Module markings – Rating plates

Module 96-PA-RCM



Module 96-PA-RCM-EL



Item	Designation	Description
1	Part number	Manufacturer's part number
2	Symbol for "Danger sign"	General hazard symbol. 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.
3	Device type	Device designation
4	QR code	Coded manufacturer data
5	Manufacturer's logo	Logo of the device manufacturer
6	CE conformity marking	See "3.6 EU conformity declaration" on page 13
7	Manufacturer-specific data	Manufacturer data
8	Hardware version	Hardware version of the module
9	Type/serial number	Number for identification of the device
10	Designation of origin/ web address	Country of origin and manufacturer's web address

5. Installation

5.1 PC connection of the basic device

A PC connection to the basic device with module is achieved via the

1. **RS-485 interface.**
   See chap. 5.3 on page 18.

2. **Ethernet interface (only RCM-EL).**
   To configure and read data, connect your basic device via the Ethernet interface of module 96-PA-RCM-EL with the PC (GridVis® software).

5.2 PC connection of the basic device with module via the Ethernet interface (only RCM-EL)

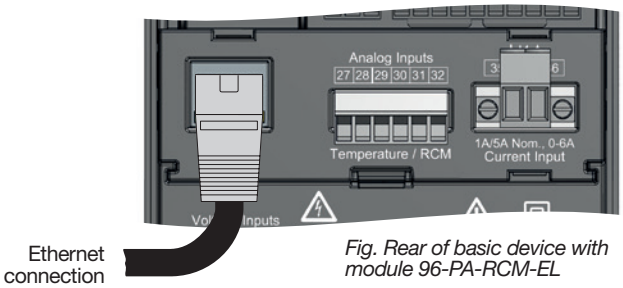


Fig. Rear of basic device with module 96-PA-RCM-EL

NOTE

For communication, your basic device with module 96-PA-RCM-EL is equipped with
· 1 Ethernet interface and
· 1 RS-485 interface (field bus),
which you must configure in the *Communication* window.
When the PC is connected via Ethernet, the basic device with **module 96-PA-RCM-EL** may be used as a gateway (master).

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.

5.2.1 Ethernet direct connection

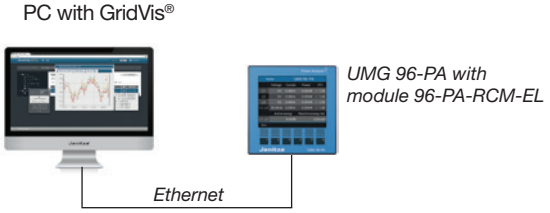


Fig. example: Basic device connected via the Ethernet interface of module 96-PA-RCM-EL as a direct connection

5.2.2 Connection as a gateway (master)

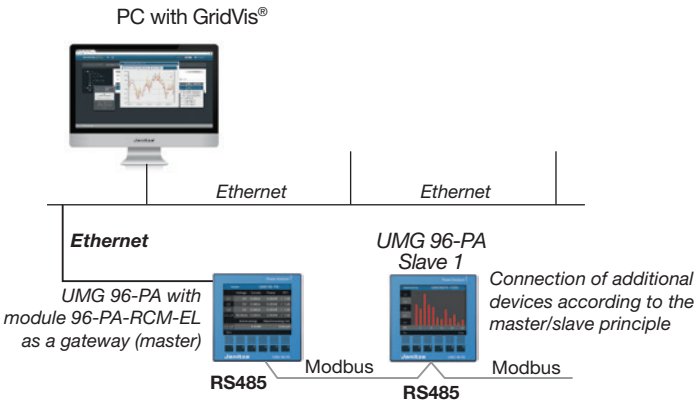


Fig. example: Basic device connected via the Ethernet interface of module 96-PA-RCM-EL as a gateway (master)

5.2.3 Connection to a network

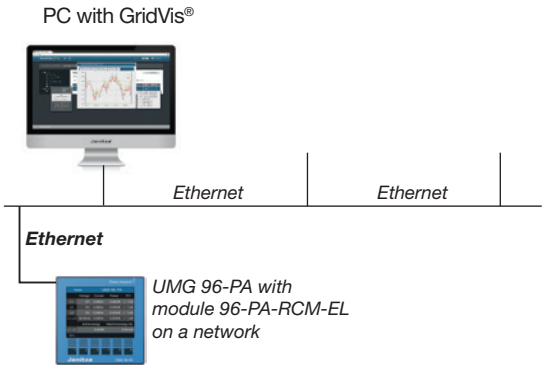


Fig. example: Basic device connected via the Ethernet interface of module 96-PA-RCM-EL to a network.

5.3 PC connection of the basic device with module via RS-485 interface (Modbus)

Another method of connecting the basic device with **module** to the PC (GridVis software), to configure it and read out the data is to use the **RS-485 interface** of the basic device.

Connect the basic device with **module 96-PA-RCM** to your PC via the RS-485 interface. In this regard, please take note of the following:

NOTE

Detailed information on connection via the **RS-485 interface** of the basic device and to the RS-485 bus structure (Modbus) based on the master-slave principle can be found in the documentation for the basic device.

5.4 Connection option with terminal assignment

Connection variant with module 96-PA-RCM-EL

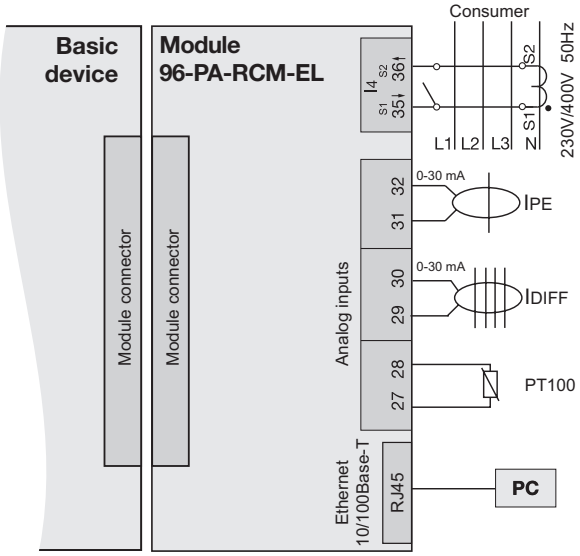


Fig. Connection variant:
Basic device with module 96-PA-RCM-EL

Terminal	Description
RJ45	Ethernet interface (only module 96-PA-RCM-EL)
27 / 28	Temperature measurement
29 / 30 and 31 / 32	Each with residual current measurement with cable break detection
or	
29 / 30 and 31 / 32	Residual current measurement (I_{DIFF}) and current measurement PE (I_{PE}) (see left connection variant)
or	
29 / 30 and 31 / 32	DC current measurement I5 and DC voltage measurement U6
35 / 36	Current measurement I4

NOTE

You can find more detailed information about voltage measurement, current measurement and connection variants in the documentation of the basic device.

5.5 Connection example of basic device with module

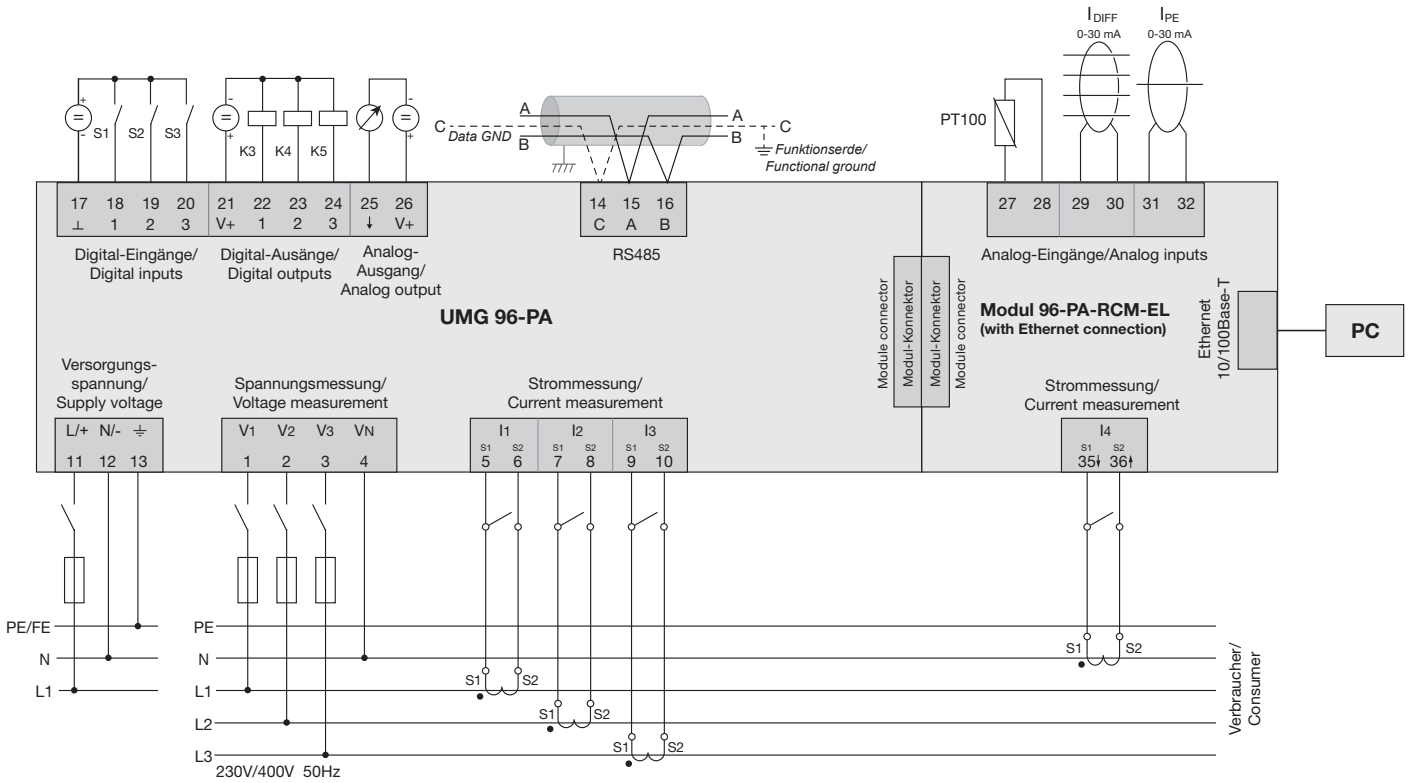


Fig. Connection example "Basic device with module 96-PA-RCM-EL"
Information on overcurrent devices can be found in the user manual of your basic device

6. Inputs and interfaces

6.1 Analog inputs I5 and I6 – Residual current input/current signal input

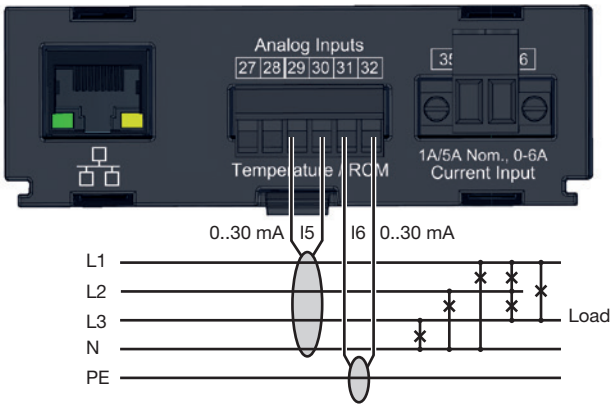


Fig. Connection variant, residual current measurement via current transformer (Type A).

The basic device with module is suitable for use as a residual current monitoring device (RCM) for monitoring alternating currents, pulsating direct currents and direct currents.

With the monitoring of residual currents (RCM, Residual Current Monitor) of an electrical system via inputs I5 and I6 (terminals 29/30 and 31/32), the basic device with module is able to trigger warning pulses when the limit value is exceeded. The system operator can be alerted before a protective device is triggered.
The measurements in medium and high voltage networks are made via current and voltage transformers.

NOTE

· The residual current monitoring monitors the residual currents via external current transformers and, if a threshold value is exceeded, can trigger a warning signal.
· Limit values and warnings for the device or system operator can be configured easily in the GridVis® software.

NOTE

The basic device with module is not an independent protective device against electric shock!

The basic device with module measures residual currents according to IEC/TR 60755 (2008-01) of:

Type A

Type B and Type B+ (enhanced frequency range)

Connection of suitable external residual current transformers with a nominal current of 30 mA can be made on residual current transformer inputs I5 (terminals 29/30) and I6 (terminals 31/32).

6.2 Activate cable break detection (failure monitoring) RCM for I5 and I6.

The basic device with module has a “Cable break detection” feature (failure monitoring). With this feature, the basic device with module monitors the connection to the residual current transformers on the measuring inputs I5 and I6 (module mode *Residual current - see chap. 9.2 on page 34*).

The cable break detection for I5 and I6:
· Can be activated via **Modbus addresses** or in the **GridVis®** software.
· Is **only available in the AC mode**.

Modbus addresses for activating the cable break detection (failure monitoring):

Modbus addr.	Measuring input	Value/function
20051	I5	0 = Failure monitoring inactive 1 = Failure monitoring active
20052	I6	

You can check whether the cable break detection is activated in the user interface of your basic device with module under *Menu* > *Configuration* > *Measurement* > item *Residual current*.

If there is an interruption in the connection to the current transformers, the following Modbus addresses of the respective measuring inputs (I5 and I6) indicate the fault:

Modbus addr.	Measuring input	Value/function
20418	I5	0 = Connection to residual current transformer **error free** 1 = **Error** in the connection to the residual current transformer
20618	I6	

The GridVis® software also displays the interruption in the connection.

NOTE

For further Modbus addresses, see the Modbus address list for the device (download at www.janitza.de).

6.3 Current direction for the current transformer on I5 and I6.

For residual current measurements at the measuring inputs I5 and I6, the device makes no distinction between the current directions. This means that incorrect connection does not require reconnection afterwards.

NOTE

The device makes no distinction between the current directions of the residual currents.
The residual currents of the grid side or load side are **not directionally sensitive.**

⚠ WARNING

Risk of injury due to large currents and high electrical voltage on the current transformers!
Current transformers operated while open on the secondary side (high voltage peaks pose a hazard when touched) can result in severe bodily injury or death.

- **Avoid operating the current transformers while open; short circuit the unloaded transformers!**
- **Before interrupting the current supply, short circuit the secondary connections of the current transformers. Switch any test switches that automatically short circuit the secondary lines of the current transformers to the "Test" status (Check the test switch/ short circuiting connection beforehand)!**
- **Only use current transformers with basic insulation to IEC 61010-1:2010!**
- **Caution, even current transformers rated as safe for open operation can pose a hazard when touched during operation while open!**
- **Make sure that screw terminals for the current transformer connection on the device are adequately tightened!**
- **Comply with the information and provisions in the documentation of your current transformers!**
- **Existing ground connections on the secondary windings of the current transformers must be connected to ground!**
- **Observe the general safety information for handling current transformers and devices with residual current measurement in chap. 2.7 on page 10.**
- **Comply with the information and provisions in the documentation of your current transformers!**

ATTENTION

Damage to the device/your system due to short circuit!
Inadequate insulation of the operating equipment at the analog inputs with respect to the supply circuits can lead to damage of your device or system.

- **Ensure reinforced or double insulation with respect to the supply circuits!**

6.4 Residual current transformer example

A residual current transformer is used to measure on insulated mains wiring in a 300 V CAT III network.
Solution:
Provide basic insulation for 300 V CAT III for the insulation of the network wiring and the insulation of the residual current transformer. This corresponds to a test voltage of 1500 V AC (1 min. duration) for the insulated network wiring and a test voltage of 1500 V AC (1 min. duration) for the residual current transformer.

6.5 Important information about the residual current inputs

⚠ CAUTION

Risk of injury or damage to the device/your system due to short circuit!
Inadequate insulation of the operating equipment at the residual current measuring input with respect to the supply circuits can cause voltages at the measuring input which represent a hazard when touched or damage to your device or system.

- **Ensure reinforced or double insulation with respect to the supply circuits!**
- **Ensure galvanic isolation of the residual current measuring inputs from each other!**

NOTE

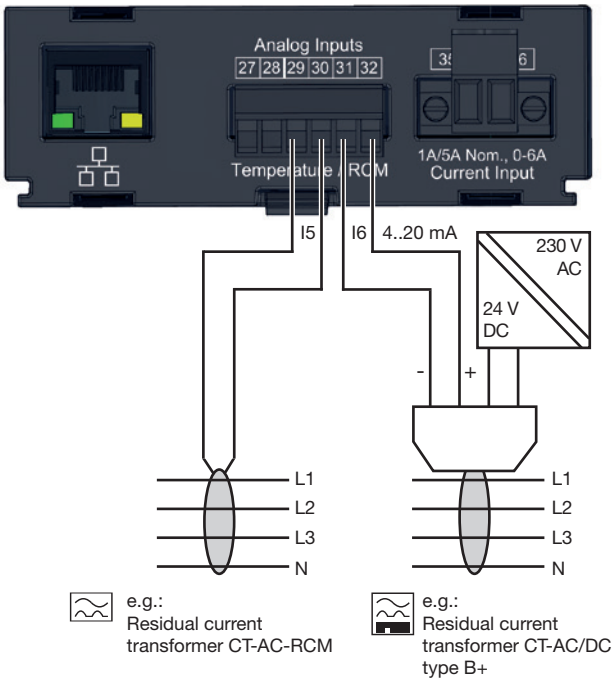
For the residual current monitoring, the basic device with module requires the mains frequency. For this purpose, apply a measured voltage or configure a fixed frequency.

NOTE

The ratios for the residual current transformer inputs can be configured individually on the basic device with module, or, along with additional parameters relevant for the module, via the GridVis® network visualization software.

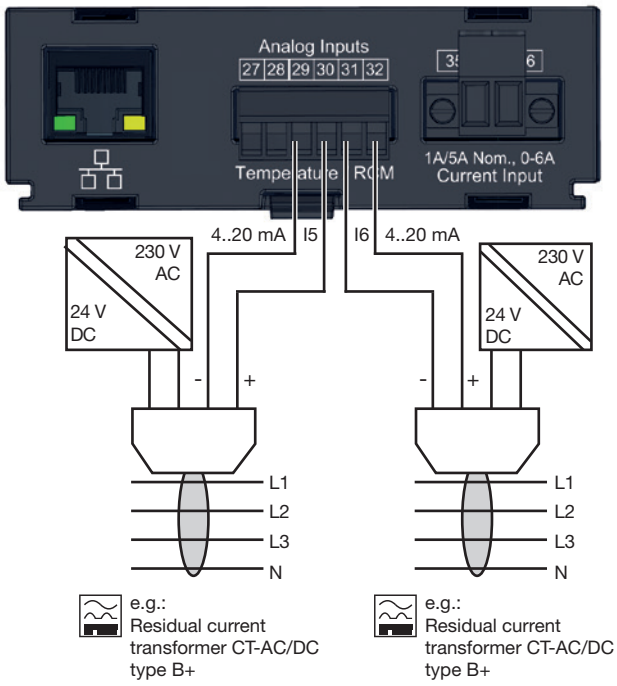
6.6 Connection example 1 - Residual current measurement

Fig. Connection variant, residual current measurement via current transformer Type A and Type B. (Power supply with U = 24 V DC, residual ripple < 5%, output = 24 W.



6.7 Connection example 2 - Residual current measurement

Fig. Connection variant, residual current monitoring via current transformer of Type B. Each residual current transformer of the series CT-AC/DC type B+ RCM requires its own power supply (with U = 24 V DC, residual ripple < 5%, power = 24 W). Electrically insulate the secondary sides of the power supplies from each other (24 V DC)!



6.8 Connection example 3 - Residual current monitoring

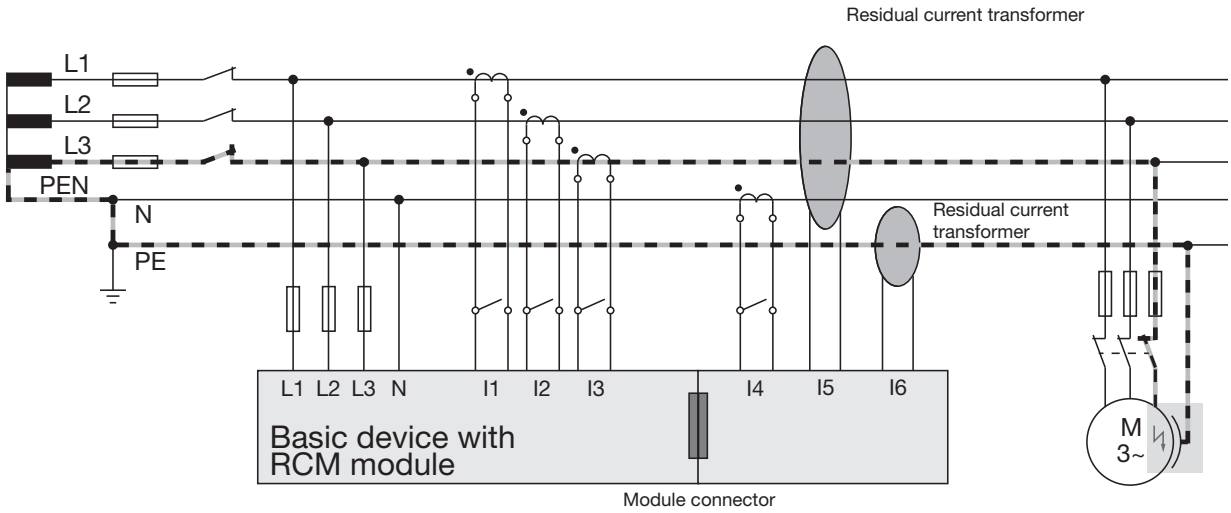


Fig. Connection example for residual current monitoring of a basic device with module

6.9 Residual current limit values

For setting and calculation of the residual current limit value, the basic device with module requires parameters which are set in the **GridVis®software**. **Depending on the mode, the limit value calculation requires the following parameters:**

1. **“Calculation of the dynamic residual current limit value”**

· Minimum overrun time.
· Maximum for the residual current.
· Warning when the set percent value of the calculated dynamic residual current limit value is reached.
· Reference value.
· Tolerated residual current (dynamic value per reference value unit).
· Residual current pro consumer.
· Number of consumers.
· Offset for residual current measurement.

2. **“Calculation of the static residual current limit value”**

· Minimum overrun time.
· Warning when the set percent value of the static residual current limit value is reached.
· Residual current limit value

3. **“Calculation of the incremental residual current limit value”**

· Minimum overrun time.
· Warning when the set percent value of the incremental residual current limit value is reached.
· Reference value.
· Input of up to 10 residual current limit values for the respective power levels (increments).

6.9.1 Example graph “Calculation of the dynamic residual current limit value”

The example graph shows the relationship between the permitted residual current and the reference value power (of the system) with the following settings:
· Reference value: Power in kW
· Dynamic scaling: 10 mA / kW
· Absolute maximum for residual current: 200 mA
· Offset for residual current measurement: 20 mA

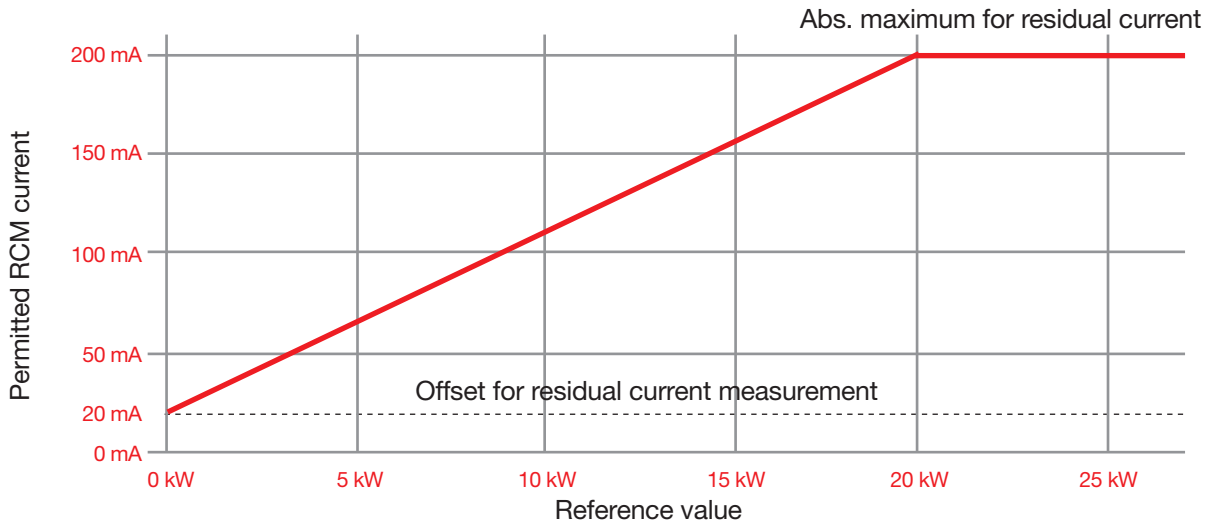


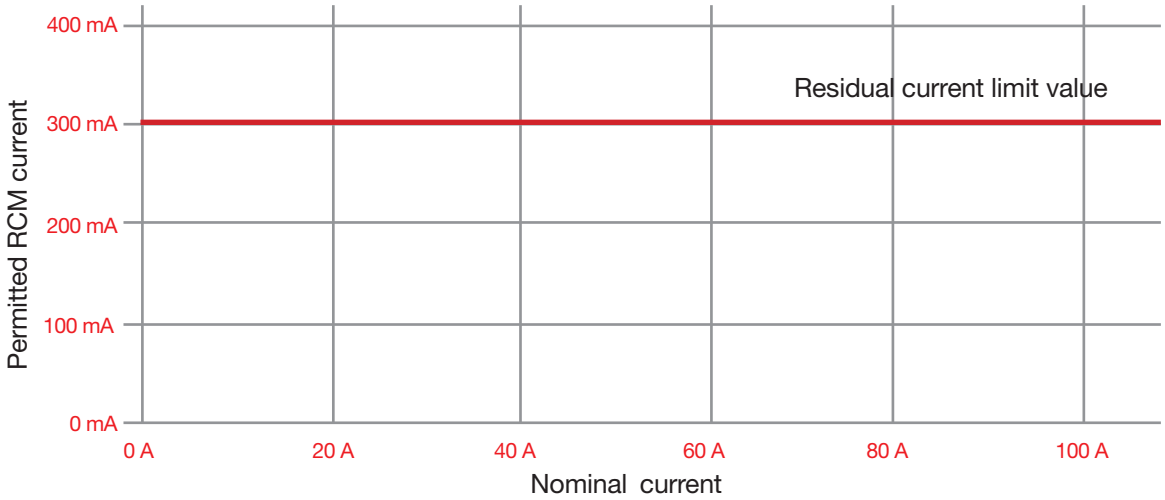
Fig. Example graph with the mode “Calculation of the dynamic residual current limit value”

The graph shows the user of the function:
· That the dynamic limit value calculation is active (static limit value calculation = horizontal line).
· The permitted residual current (RCM current) per power reference value.
· At what power reference value the maximum for the RCM current is reached.

6.9.2 Example graph “Calculation of the static residual current limit value”

The example graph shows a static residual current limit value that applies for every nominal current value (of the system):
· Nominal current reference value (not configurable).
· Residual current limit value: 300 mA.

Fig. Example graph with the mode “Calculation of the dynamic residual current limit value”

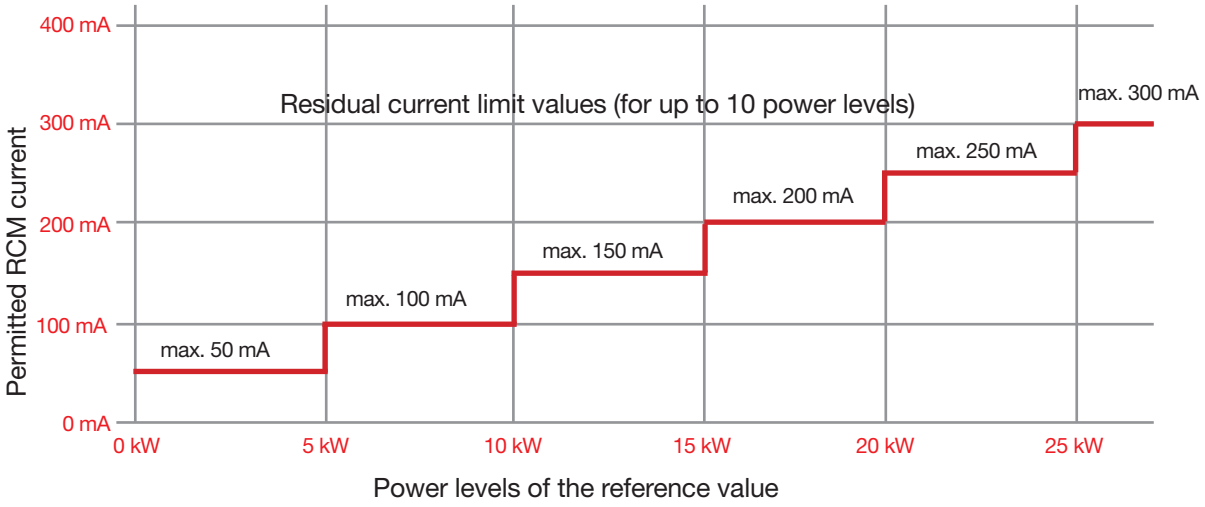


The graph shows the user of the function:
· That the static limit value calculation is active.
· The permitted residual current (RCM current) of the system.

6.9.3 Example graph “Calculation of the incremental residual current limit value”

The example graph shows the incremental increase of the residual current limit values of the power reference value (of the system) with the following increments (power levels):
· Reference value: Power in kW.
· Residual current limit value per power level: 50 mA.

Fig. Example graph with the mode “Calculation of the incremental residual current limit value”



The graph shows the user of the function:
· The incremental limit value calculation is active.
· The permitted residual current (RCM current) of the system per increment (power level).

6.10 Analog inputs I5 and I6/U6 – DC power

As an option for measuring the residual current, the basic device with module also permits use of the analog inputs I5 and I6 (U6) for a DC power measurement.

In a DC power measurement, the current channel I6 effectively becomes a voltage measurement input, U6. When a residual current transformer of the type CT-AC/DC Type B+ is connected, it converts an input voltage into an output current signal. The current signal changes proportionately to the measured value of the input variable.

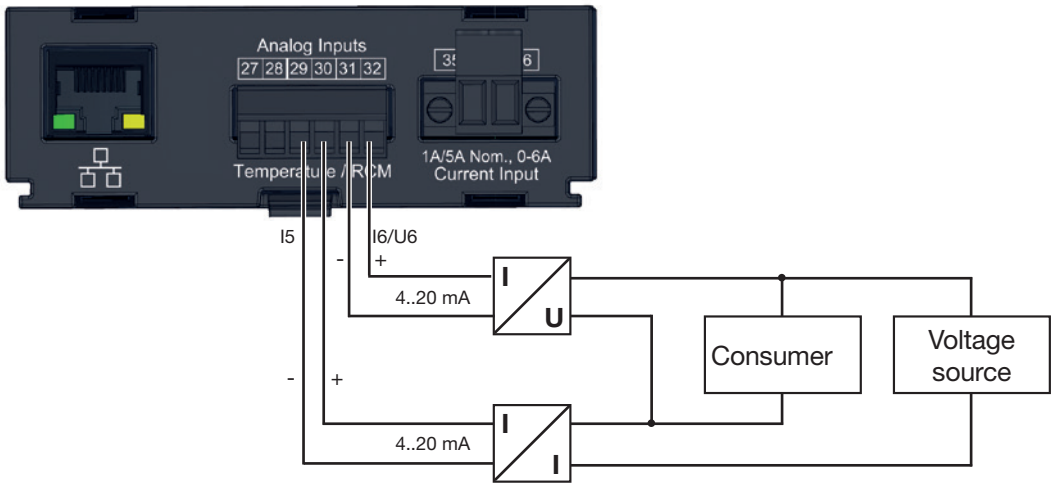
For a DC power measurement, the basic device with module supports input current signals with the values
· 0 ... 20 mA
· 4 ... 20 mA

ATTENTION

Damage to the device/your system due to short circuit!
Inadequate insulation of the operating equipment at the analog inputs with respect to the supply circuits can lead to damage of your device or system.
· **Ensure reinforced or double insulation with respect to the supply circuits!**
· **Observe the general safety information in chap. “2.8 Safety information for analog inputs” on page 11.**

6.11 Connection example - DC power measurement

Fig. Connection variant, DC power measurement via current transformer and DC voltage sensor



6.12 Current measurement input I4 – neutral conductor measurement

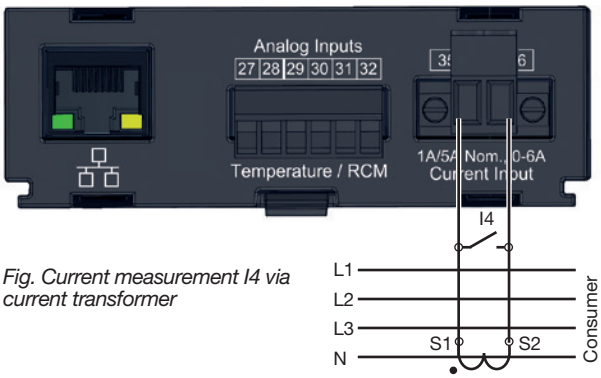


Fig. Current measurement I4 via current transformer

Because of the missing multiplier with a voltage, only an apparent current measurement is performed during the current measurement input I4 (terminals 35/36). Therefore, no power measurements are possible using this input.
The current measurement input I4 of the basic device with module:

- Is **only** approved for a current measurement using a current transformer (**no** direct measurement).
- Is designed for the connection of current transformers with secondary currents of ../1 A and ../5 A.
- Has the current transformer ratio set to 5 / 5 A by default.
- Measures alternating currents (**no** direct currents).

NOTE

Because of the missing multiplier with a voltage, only an apparent current measurement is performed during the current measurement input I4. Therefore, no power measurements are possible using this input.

The current transformer ratio of the I4 current measurement input of your basic device with module can be configured in the **user interface of your basic device** or in the **GridVis®** software.

⚠ CAUTION

Risk of injury or damage to the device due to high measurement currents at the connections of the current transformers or the current measurement inputs of the device!
High measurement currents can cause temperatures of up to 80 °C (176 °F) on the connections of the current transformers

- **Use wiring that is designed for an operating temperature of at least 80 °C (176 °F)!**
- **The current transformers can be hot even after the power supply has been switched off. Allow the connections of the current transformers and the connecting cables to cool down before touching them!**
- **Make sure that screw terminals for the current transformer connection on the device are adequately tightened!**
- **Existing ground connections on the secondary windings of the current transformers must be connected to ground!**
- **Observe the general safety information for handling current transformers and devices with residual current measurement in chap. 2.7 on page 10.**
- **Comply with the information and provisions in the documentation of your current transformers!**

6.13 Temperature measurement input

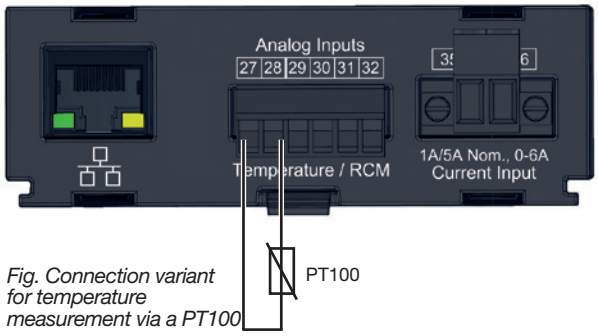


Fig. Connection variant for temperature measurement via a PT100

With a module, the basic device is equipped with a temperature measurement input. Temperature measurement is carried out via the analog input on terminals 27 and 28.

The measured values of the thermistor input are obtained through determination of the average value from cumulated resistance values. The average value is converted to a temperature value in the basic device and is displayed.

The basic device with module supports the following temperature sensors:

· PT100 (default setting)
· PT1000
· KTY83
· KTY84

ATTENTION

Damage to the basic device, the module and/or your system due to short circuit!
Inadequate insulation of the operating equipment (such as temperature sensor) at the analog inputs with respect to the supply circuits can cause damage to your basic device, module and/or system.
· **Ensure a reinforced or double insulation of your operating equipment with respect to the supply circuits!**
· **Use shielded lines to connect the temperature sensor!**
· **Do not exceed a total load of 4 kΩ (temperature sensor and cable)!**

Example of temperature sensor:
A temperature sensor is used for measurement in the proximity of non-insulated mains wiring in a 300 V CAT III network. Solution:
Use reinforced or doubled insulation for the temperature sensor for the 300V CAT III network! This corresponds to a test voltage of 3000 V AC (1 min. duration) for the temperature sensor.

6.14 Ethernet interface (only module 96-PA-RCM-EL)

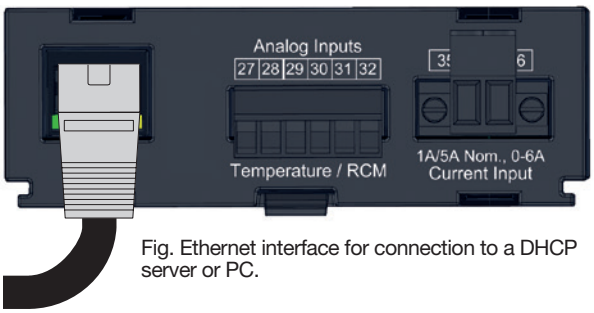


Fig. Ethernet interface for connection to a DHCP server or PC.

The PC connection to the GridVis® software can be made for the basic device with module 96-PA-RCM-EL via the Ethernet interface.
When connecting the Ethernet interface, ensure there is sufficient space in the connection area (at least 50 mm), depending on the bending radius and the plug type of the Ethernet cable. More information on the Ethernet connection can be found in the chap. „5.1 PC connection of the basic device“ on page 18.

The communication settings for the Ethernet connection of your basic device with module 96-PA-RCM-EL can be found in chap. „8.1 Basic device communication via the Ethernet interface (module 96-PA-RCM-EL)“ on page 30.

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.

NOTE

· Use a CAT5 cable for the connection to the Ethernet interface.
· The standard factory setting of the basic device with module is DHCP (dynamic assignment of IP address)! More information on the communication settings of the basic device with module can be found in chap. “8.1 Communication of the basic device via the Ethernet interface (module 96-PA-RCM-EL)” on page 30.
· The Ethernet settings can be easily configured in the GridVis® software.

Meaning of the LEDs

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

7. Operation and button functions of the basic device with module

7.1 Operation

Your basic device with **module 96-PA-RCM** or **96-PA-RCM-EL** can be operated via 6 function buttons for:
· Selecting measuring displays.
· Navigation within the menus.
· Editing device settings.

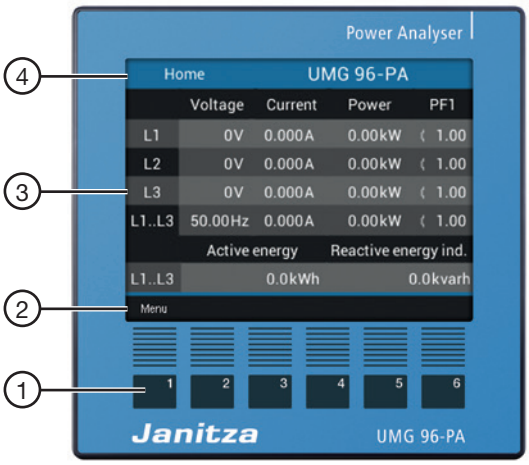


Fig. Basic device - measuring display

Item	Description
1	Function buttons
2	Function button labels
3	Measured value display
4	Title displayed

7.2 Button function

Button	Function
1	· *Display Menu* · *Exit* Menu · Cancel action (*ESC*)
2	· Switch to *Home* display · Select position (to the left " ◀ ")
3	· Select menu item or position (down " ▼ ") · Change (selection, number -1)
4	· Select menu item or position (up " ▲ ") · Change (selection, number +1)
5	· Select position (to the right " ▶ ")
6	· Confirm selection (*Enter*)

7.3 Measuring display

After restoration of network power, the **UMG 96-PA with module** starts with the measured value display *Home*.

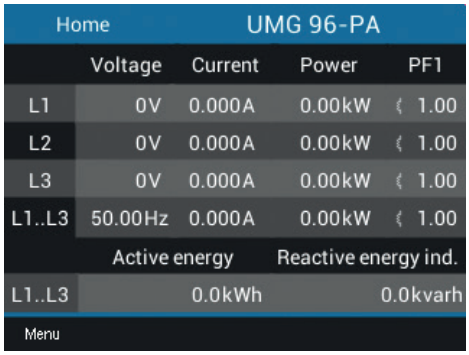


Fig. Measured value display *Home*

In the as-delivered condition of the basic device with module, the title of the measured value display *Home* consists of the device type and the serial number.

7.4 Menu

Pressing button 1 opens the *Menu* containing the selection of all parameters and measured variables to be set (menu items).

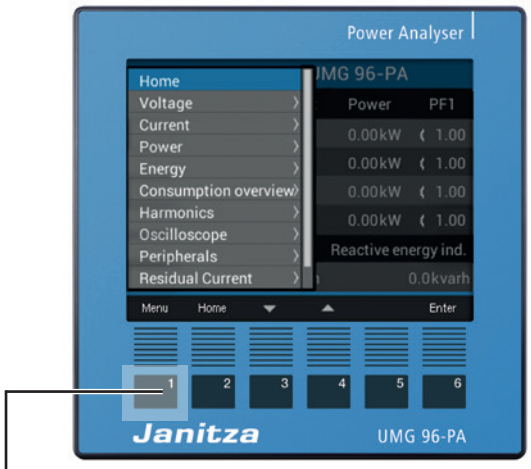


Fig. Measured value display *Home* with scroll menu

Button 1 *Menu*

NOTE

You can find detailed information on operation, measuring displays and button functions in the installation instructions or in the user manual of your basic device.

7.5 Overview of the additional menu items for basic devices with module

Menu items for the measuring modes ***Residual current***

- Menu
  - Home
  - Voltage
  - Current
  - Power
  - Energy
  - Consumption overview
  - Harmonics
  - Oscilloscope
  - Peripherals
  - Residual current
    - Overview
    - Bar chart
    - History, res. current 1
    - History, res. current 2
  - Configuration
    - Language
    - Communication
      - Field bus
      - Ethernet config. (-EL module only)
    - Measurement
      - Transformer
        - Current transformer
        - Voltage transformer
        - L4 current transf.
      - Nominal current
      - Nominal frequency
      - Module mode
        - Residual current
        - DC power
      - Residual current
        - Analog CH 1 type
        - Analog CH 2 type
        - Transformer
        - Cable break detect.
      - Temp. sensor
    - Display
    - System
    - Modbus editor

Menu items for the measuring modes ***DC_power***

- Menu
  - Home
  - Voltage
  - Current
  - Power
  - Energy
  - Consumption overview
  - Harmonics
  - Oscilloscope
  - Peripherals
  - DC power
    - Overview
    - Bar chart
  - Configuration
    - Language
    - Communication
      - Field bus
      - Ethernet config. (-EL module only)
    - Measurement
      - Transformer
        - Current transformer
        - Voltage transformer
        - L4 current transf.
      - Nominal current
      - Nominal frequency
      - Module mode
        - Residual current
        - DC power
      - DC power
        - Analog CH 1 type
        - Analog CH 2 type
        - Transformer
        - Cable break detect.
      - Temp. sensor
    - Display
    - System
    - Modbus editor

8. Communication

8.1 Basic device communication via the Ethernet interface (module 96-PA-RCM-EL)

The basic device with module 96-PA-RCM-EL has six ways to allocate addresses for an Ethernet connection (TCP/IP):

1. Static
The user selects the IP address, netmask and gateway on the device. Use this mode for simple networks with no DHCP server.

2. BOOTP
Automatically integrates your device in an existing network. BOOTP is an older protocol and has a smaller range of functions than DHCP.

3. DHCP
On start-up, the device is automatically given an IP address, netmask and gateway from the DHCP server.

4. Static gratuitous ARP
The user selects the IP address, netmask and gateway on the device. The device automatically logs into the network with IP and MAC address.

5. BOOTP ARP Probe
Simplified protocol for the automatic assignment of IP addresses to the MAC addresses. The device automatically logs into the network with IP and MAC address.

6. DHCP ARP Probe
Protocol for the automatic assignment of IP addresses to the MAC addresses. The device automatically logs into the network with IP and MAC address.

NOTE

- **The standard factory setting of the basic device with module 96-PA-RCM-EL is “dynamic assignment of IP address” (DHCP mode).**
- **Consult your network administrator for the Ethernet settings for your device.**

Configure the Ethernet settings or obtain details from the window *Communication > Ethernet (TCP/IP)*:

- Press button 1 in the *Home* window to open the *Menu*.
- With button 3 or 4, select the menu item *Configuration and confirm with key 6.*
- In the *Configuration* window, use button 3 or 4 to select the item *Communication* and confirm with key 6.
- In the *Communication* window, use button 3 or 4 to select the item *Ethernet Config* and confirm with button 6.
- The window *Communication* appears with the Ethernet settings:

Configure your Ethernet (TCP/IP) settings as described in chap. „7. Operation and button functions of the basic device with module “ on page 28.

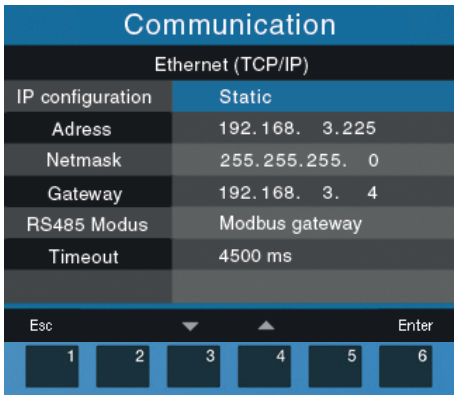


Fig. Window Communication > Ethernet configuration

8.2 Basic device communication via the RS-485 interface (field bus)

Communication via the RS-485 interface (field bus) operates identically for basic devices with and without module and can be accessed on the user interface as follows:

1. **Basic device with module 96-PA-RCM:** Display *Home* > button *Menu* > menu item *Configuration* > item *Communication*

2. **Basic device with module 96-PA-RCM-EL:** Display *Home* > button *Menu* > menu item *Configuration* > item *Communication* > item *Field bus*

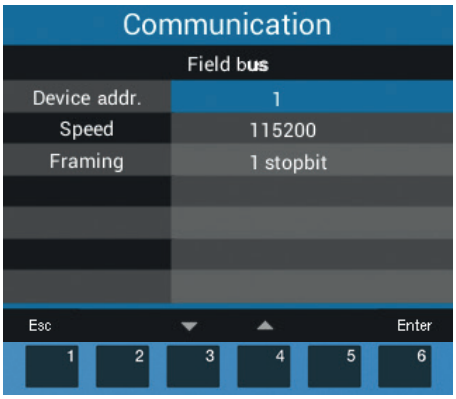


Fig. Window Communication > Field bus configuration

NOTE

A detailed description of the **Basic device communication via the RS-485 interface (field bus)** can be found in the user manual of your basic device.

8.3 Restarting the basic device

Some configurations might require a restart of your basic device. To do so, proceed as follows:

1. In the *Home* display, press button 1, *Menu.*
2. In the scroll menu which appears, use buttons 3/4 ("▼"/"▲") to select the *Configuration* menu item.
3. Press button 6 *Enter.*
4. The *Configuration* window appears.
5. In the *Configuration* window, use buttons 3/4 ("▼"/"▲") to select the item *System* and confirm with button 6 *Enter*.
6. The System window appears.
7. In the System window, use buttons 3/4 ("▼"/"▲") to select the item *Reset* and confirm with button 6 *Enter*.
8. The *Reset* window appears.
9. In the *Reset* window, use buttons 3/4 ("▼"/"▲") to select the item *Restart* and confirm with button 6 *Enter*.
10. The option *No* blinks.
11. Use button 4 to select the option *Yes* and confirm using button 6 *Enter*.
12. The basic device will restart.

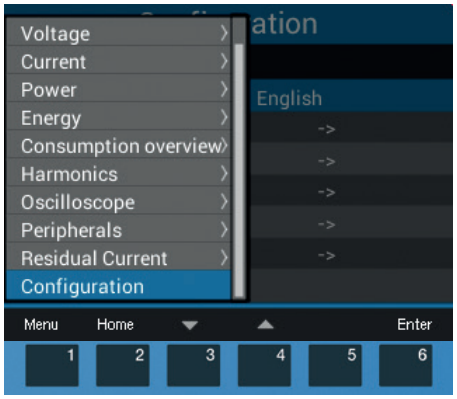


Fig. Configuration menu item

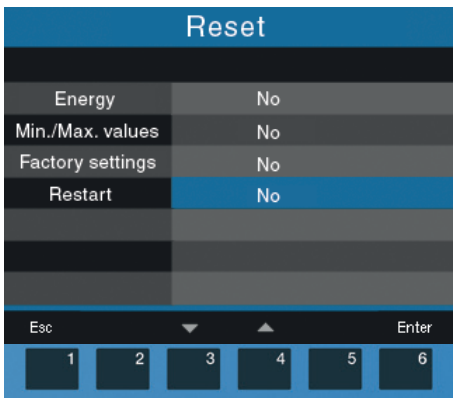


Fig. Window Resetting with the Restart menu item

8.4 Module-relevant alarms

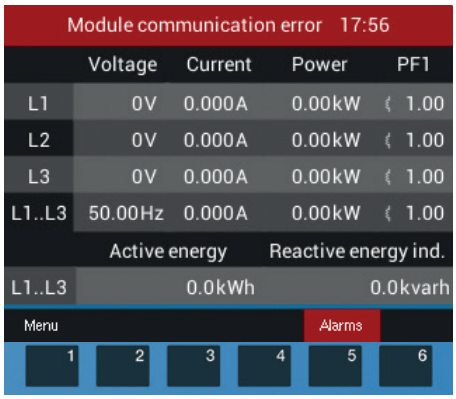


Fig. Example “Basic device warning alert when communication to module is faulty”.

When there is an alarm, the following warning alert appears:
When there is an alarm, the title bar of your device display is shown in *red* with the time indicated. It is also possible to activate blinking of the display when there is an alarm using the Modbus editor or the GridVis® software (see table below).

Pressing function button 5 displays a list of all alarms that have occurred, regardless of from which menu window it is pressed. In the alarm list, alarms can be selected and deleted.

Once all alarms have been deleted, the device closes the alarm list and goes to the last menu window.

ATTENTION

A disconnected or defective module disrupts the communication with the basic device and leads to a device fault.
If communication between the basic device to the module is lacking or faulty during operation, a warning signal will appear on the display of the basic device.
- **Disconnect your system (the basic device) from the power supply prior to mounting the module.**
- **Check the positioning of the RCM module. If necessary, apply slight pressure to press the module onto the basic device until it audibly snaps in.**
- **Check the display of your basic device (if the menu item *Residual current*is present, the basic device has recognized the module).**
- **Prior to remounting, it may be necessary to restart the basic device (chap. “8.3 Restarting the basic device” on page 31).**
- **If the measures indicated here are unsuccessful, please contact our support team (www.janitza.de).**
- **If there is discernible damage, send the device, component or module back to the manufacturer in compliance with proper transport conditions.**

ATTENTION

Improper handling may cause damage to the module and result in material damage!
The contacts of the module connector can bend or break, which would destroy the module.
- **Never touch or manipulate the contacts of the module connector!**
- **Never use force to press the module connector plug into the socket!**
- **When handling, transporting and storing the module, protect the contacts of the module connector!**

Module-relevant alarm list:

Alarm description	Display property
Warning limit value for RCM channel 1 exceeded	
Alarm limit value for RCM channel 1 exceeded	Display blinks
Warning limit value for RCM channel 2 exceeded	
Alarm limit value for RCM channel 2 exceeded	Display blinks
Overcurrent L4	
Cable break on RCM channel 1	
Cable break on RCM channel 2	
No module communication for the last 10 seconds	Display blinks

Tab. Alarm list with module-relevant alarms

NOTE

- **More information on alarms and warning alerts can be found in the user manual of your basic device.**
- **A Modbus address list can be found in the download area at www.janitza.de.**

9. Module-relevant configurations

Configure the relevant parameters for the module in the ***Measurement*** window of your basic device with module. To do so, use the function buttons of the basic device to go to the **Measurement *window***:

- Open the *Menu* by pressing button 1 in the *Home* window.
- Use buttons 3/4 ("▼"/"▲") to select the menu item *Configuration* and confirm with button 6 *Enter.*
- In the *Configuration* window, use buttons 3/4 ("▼"/"▲") to select the item *Measurement* and confirm with button 6 *Enter*.
- The *Measurement* window appears with the following **settings for the RCM module**:

A. **Transformer for the basic device (I1 to I3) and L4 current transformer (I4 - neutral conductor measurement).**

B. **Transformer for the module mode *Residual current* or *DC power*.**

C. **Temperature sensor.**

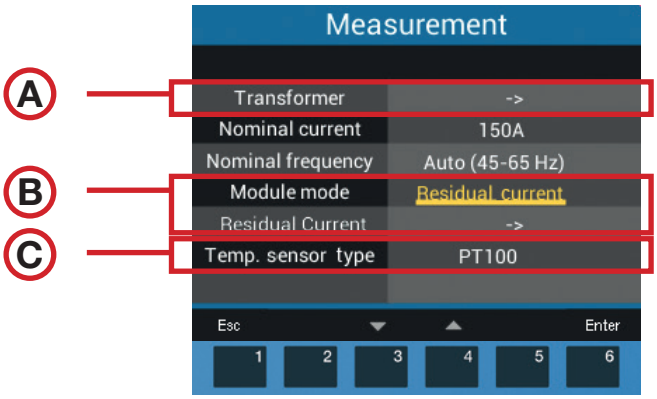


Fig. Window Measurement with the settings for the RCM module

A

9.1 L4 current transformer (I4 - measurement)

The ***Transformer*** item allows configuration of the current and voltage transformer ratios of the basic device as well as the current transformer ratios for the L4 current measurement (e.g. neutral conductor measurement).

1. Use buttons 3/4 ("▼"/"▲") to select the item *Transformer* and confirm with button 6 *Enter.*
2. The Window for configuration of the L4 (I4) current transformer appears.
3. Select the item *L4 (I4) current transformer* and confirm with button 6 *Enter*.
4. Use the function buttons of the basic device to configure the current transformer ratio as described in chap. „6.2 Activate cable break detection (failure monitoring) RCM for I5 and I6“ on page 20.

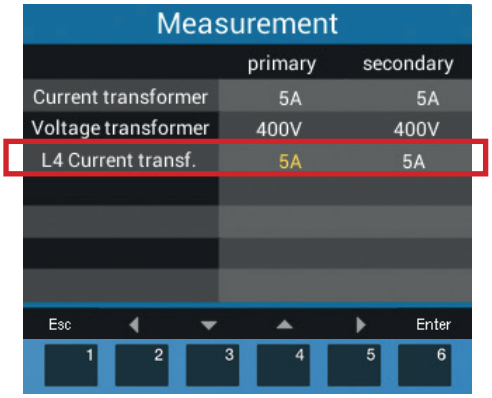


Fig. Window Measurement with the L4 current transformer for the RCM module (default setting 5 / 5 A).

9.2 Module mode

The ***Module mode*** item in the *Measurement* window is for switching the measurement modes

1. ***Residual current*** or
2. ***DC power.***

1. Module mode *Residual current*

- Use buttons 3/4 ("▼"/"▲") to select the item *Module mode* and confirm with button 6 *Enter.*
- The measuring mode set is displayed in yellow (default setting *Residual current*).
- If necessary, use buttons 3/4 ("▼"/"▲") to select the item *Residual current* and confirm with button 6 *Enter*.
- Afterwards, in the *Measurement* window, select the item *Residual current* and confirm with button 6, *Enter*.
- The window *Display "Residual current"* appears with the parameters to be set:

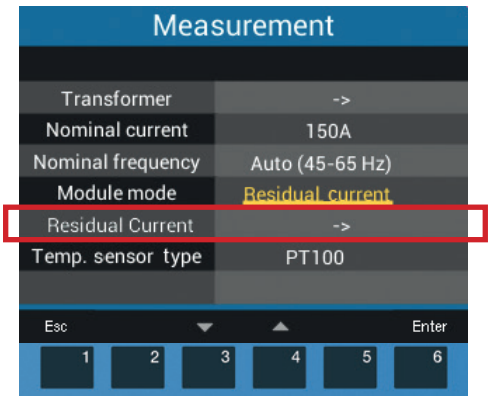


Fig. Window Measurement > Module mode "Residual current"

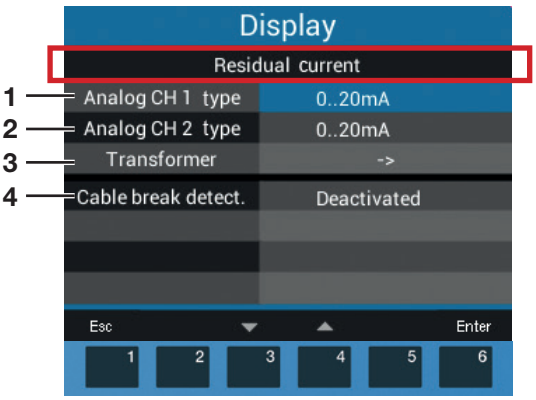


Fig. Window Display "Residual current" with the settings of the parameters for the measuring modes Residual current.

No.	Residual current parameters	Settings
1	Analog CH 1 type, I5 terminal 29/30	Suitable transformer types: · AC (0 .. 30 A_{rms}) · 0 .. 20 mA · 4 .. 20 mA
2	Analog CH 2 type, I6 terminal 31/32	Suitable transformer types: · AC (0 .. 30 A_{rms}) · 0 .. 20 mA · 4 .. 20 mA
3	Transformer ratios	Current transformer: · CH 1 - prim. and sec. · CH 2 - prim. and sec.
4	Cable break detection	Configurable in the GridVis® software and in the Modbus editor (basic device).

Tab. Settings options in the residual current module mode

2. Module mode *DC power*

- Use buttons 3/4 ("▼"/"▲") to select the item *Module mode* and confirm with button 6 *Enter.*
- The measuring mode set is displayed in yellow.
- Use buttons 3/4 ("▼"/"▲") to select the item *DC power* and confirm with button 6 *Enter*.
- Afterwards, in the *Measurement* window, select the item *DC power*.

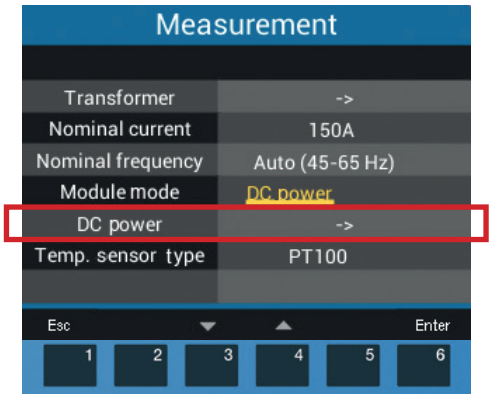


Fig. Window Measurement > Module mode "DC power"

- To go to the *Display* window with the parameters for the *DC power* measurement modes to be set, press button 6 *Enter*.

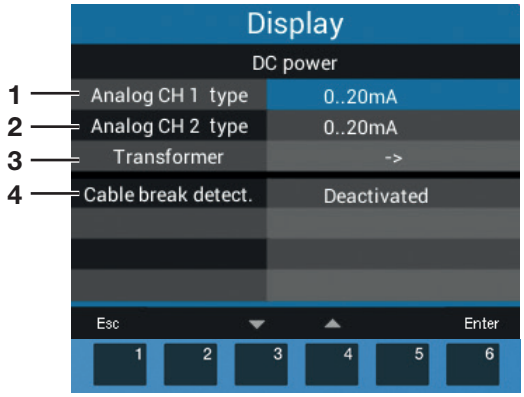


Fig. Window Display with the DC power parameters

No.	DC power parameters	Settings
1	Analog CH 1 type, I5 terminal 29/30	Suitable transformer types: · 0 .. 20 mA · 4 .. 20 mA
2	Analog CH 2 type, I6/U6 [1] terminal 31/32	Suitable transformer types: · 0 .. 20 mA · 4 .. 20 mA
3	Transformer ratios [2]	Current transformer: · CH 1 - prim. and sec. · CH 2 - prim. and sec.
4	Cable break detection	Configurable in the GridVis® software and in the Modbus editor (basic device).

1) Power is determined from inputs I5 and I6 (U6) during the DC power measurement. A voltage (U6) is converted into a current signal by an active current transformer. The current signal responds proportionately to the value of the input voltage.

2) To set the transformer type 0..20 mA for CH2, configure a primary voltage and a proportional secondary current for the transformer ratio.

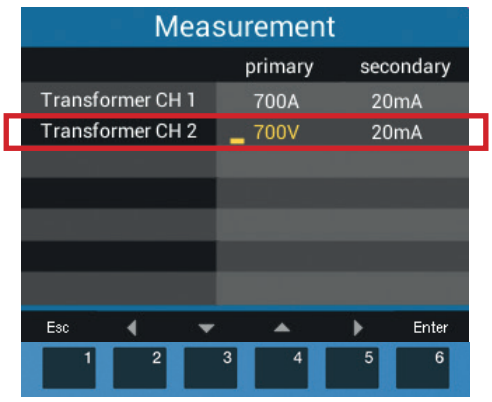


Fig. Window Measurement with the configuration of the transformer for the DC power measuring modes.

DC power measurement:
Transformer ratio for the input I6/U6

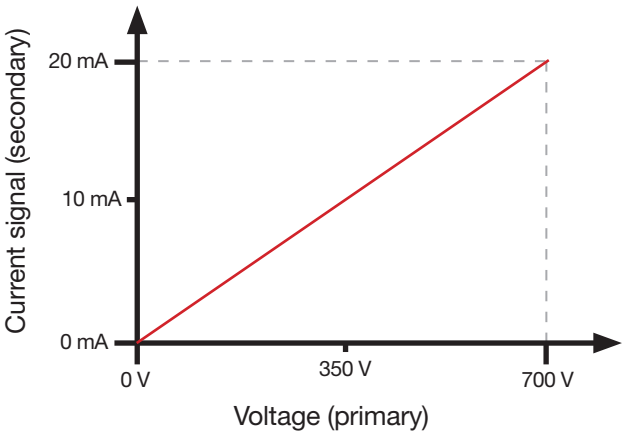


Fig. Graph "Transformer" analog input I6/U6

C

9.3 Temperature sensor

1. In the *Measurement* window, select the item *Temperature sensor* and press button 6 *Enter*.
2. The temperature sensor item blinks.
3. Use buttons 3/4 ("▼"/"▲") to select your temperature sensor from the list:
   - PT100 (default setting)
   - PT1000
   - KTY83
   - KTY84
4. Confirm using button 6 *Enter*.

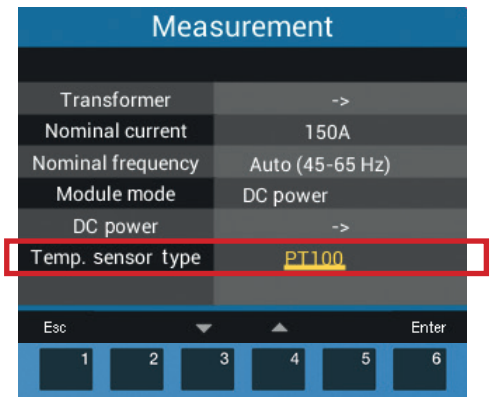


Fig. Window Measurement > Configuration of the temperature sensor

NOTE

You can also configure the temperature sensor of your basic device conveniently via the PC connection to the GridVis® software (in scope of delivery).

9.4 Module-relevant configurations in the GridVis® software

All module-relevant settings can also be easily configured in the GridVis® network visualization software.

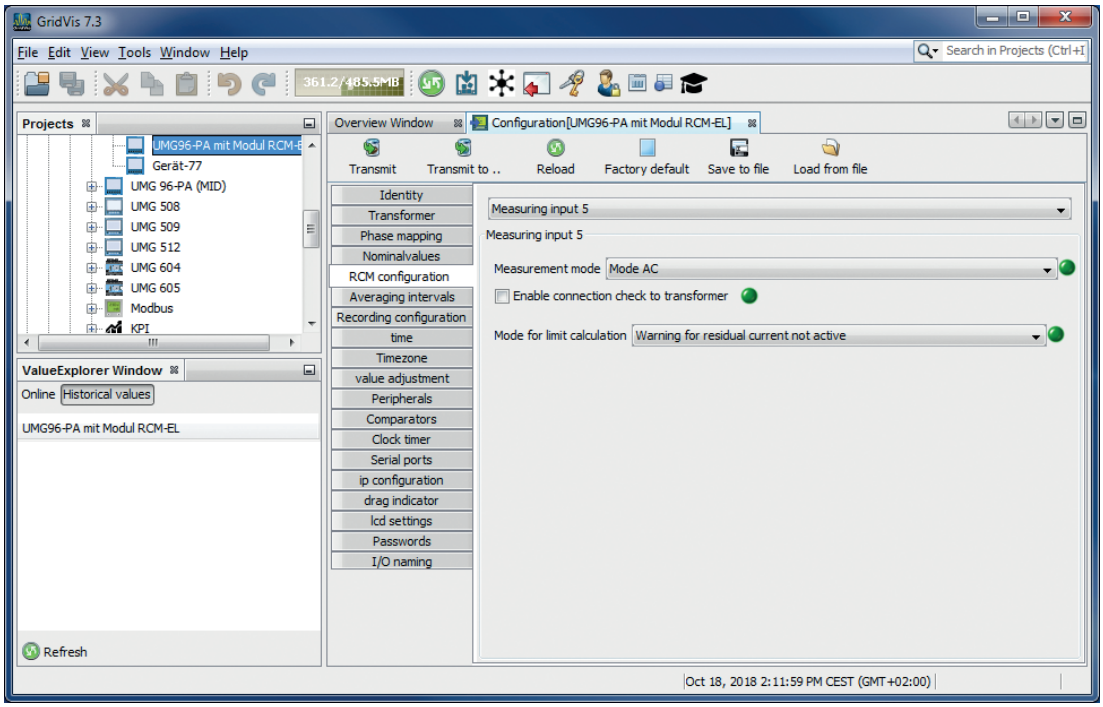


Fig. User interface of the GridVis® network visualization software

9.5 Modbus editor

The basic device with module has a *Modbus editor* in the user interface. The *Modbus editor* item in the *Configuration* window provides access (read/write) to the Modbus addresses (*Menu* > *Configuration* > *Modbus editor*).

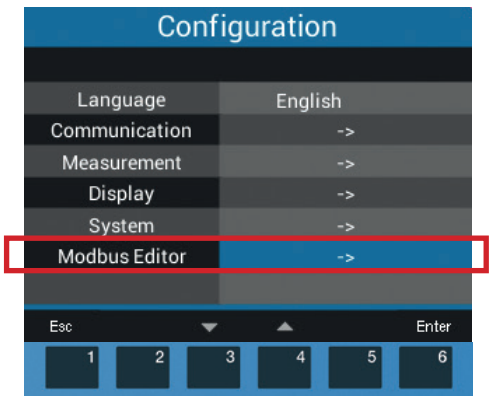


Fig. Window Configuration with the Modbus editor menu item

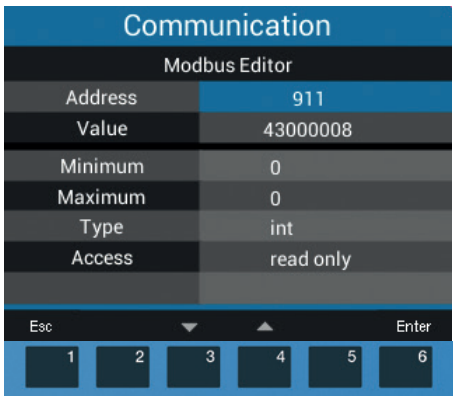


Fig. Configuration of the Modbus editor

NOTE

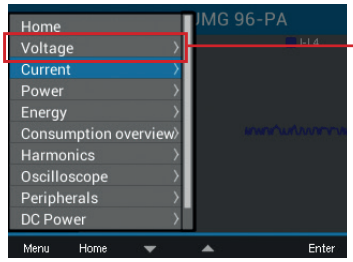
There is a Modbus address list available for download at www.janitza.de.

Recommendation:
We recommend use of the GridVis® network visualization software for convenient and fast configuration of all module-relevant settings.

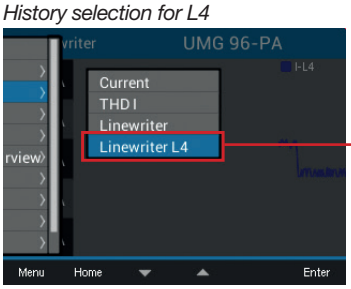
10. Module-relevant measuring displays

10.1 Measuring display *L4 current measurement*

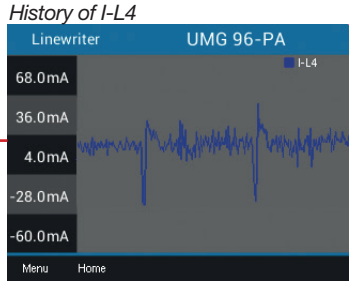
Current menu



History selection for L4

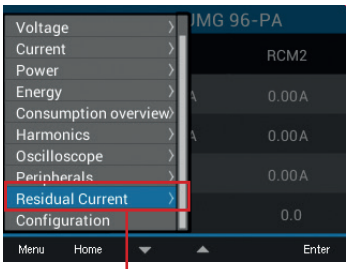


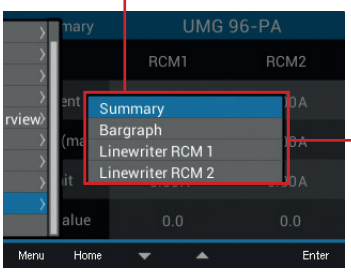
History of I-L4



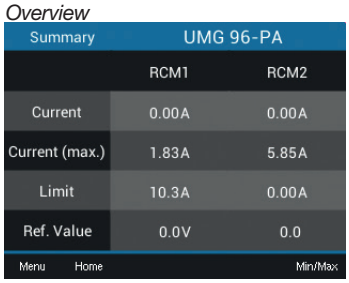
10.2 Measuring display *Residual current*

Residual current menu



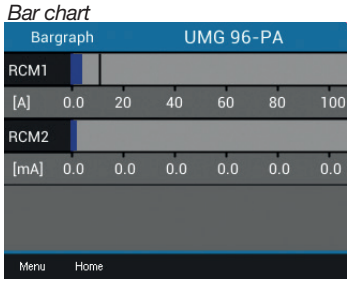


Overview



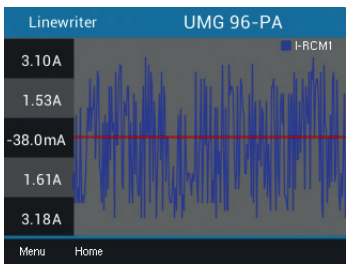
Measuring display for Current, Current (max.), Limit value and Reference value of RCM1 and RCM2.

Bar chart



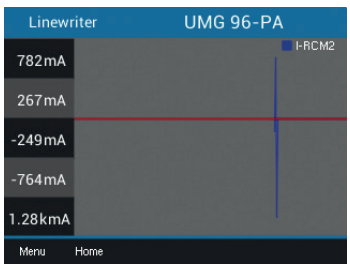
Bar chart of the I-RCM1 and I-RCM2 measured values.

History, res. current 1



History of I-RCM1

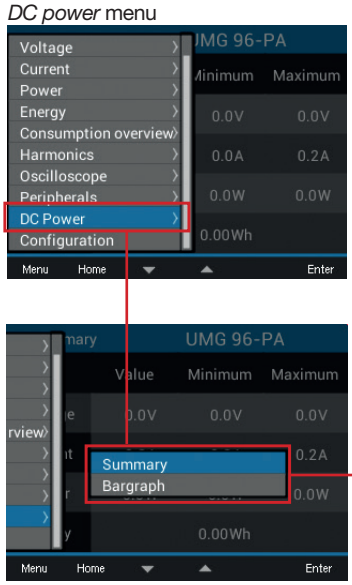
History, res. current 2



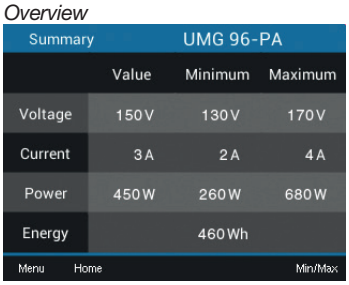
History of I-RCM2

10.3 Measuring display *DC power*

DC power menu

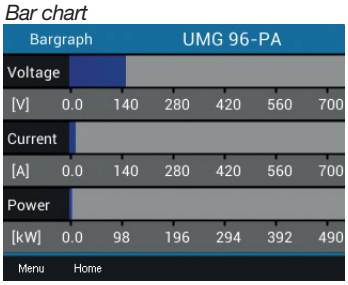


Overview



Measuring display for Voltage, Current, Power and Energy (plus min and max. values).

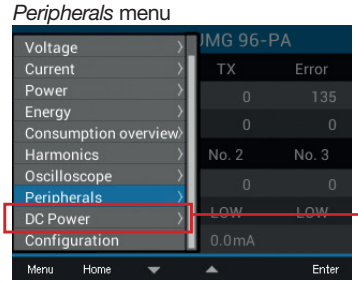
Bar chart



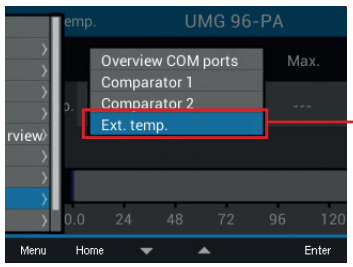
Bar chart of the voltage, current and power measured values.

10.4 Measuring display *External temperature*

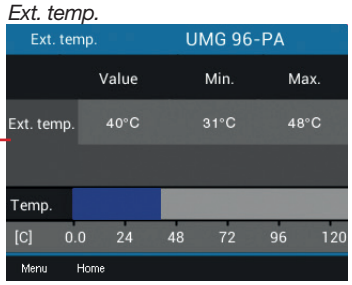
Peripherals menu



Selection of Ext. temp.



Ext. temp.



Bar chart and measuring display for the temperature (with min. and max. values)

11. Technical data for the module

11.1 Technical data

General	
Net weight of **module** (with attached plug-in connectors)	78 g (0.17 lbs)
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	K55 -25° C (-13 °F) to +70° C (158 °F)
Relative air humidity (non-condensing)	0 to 90% RH

Environmental conditions during operation, see the usage information for your basic device.

Analog inputs	
Differential or current signals	2x
Temperature measurement	1x

Residual current input	
Nominal current	30 mA_{rms} | 0...20 mA | 4...20 mA
Measurement range	0 .. 30 mA_{rms}
Operating current	50 µA
Resolution	1 µA
Cable break detection (failure monitoring)	Can be activated
Crest factor	1.414 (relative to 30 mA)
Load	4 Ω
Overload for 1 s	1 A
Constant overloaded	200 mA
Measurement of residual currents	According to IEC/TR 60755 (2008-01): Type A  Type B and B+ 

Temperature measurement	
Update time	200 ms
Suitable thermal sensor	PT100, PT1000, KTY83, KTY84
Total burden (thermal sensor and lead)	max. 4 kΩ

Thermal sensor type	Temperature range	Resistance range	Measurement uncertainty
PT100	-99 °C (-146.2 °F) ... +500 °C (932 °F)	60 Ω ... 180 Ω	±1,5% rng
PT1000	-99 °C (-146.2 °F) ... +500 °C (932 °F)	600 Ω ... 1,8 kΩ	±1,5% rng
KTY83	-55 °C (-67 °F) ... +175 °C (347 °F)	500 Ω ... 2,6 kΩ	±1,5% rng
KTY84	-40 °C (-40 °F) ... +300 °C (572 °F)	350 Ω ... 2,6 kΩ	±1,5% rng

Current measurement I4	
Nominal current	5 A
Measurement range	0.005 .. 6 A_{rms}
Crest factor	2 (relative to 6 A_{rms})
Overvoltage category	300 V CAT II
Power consumption	approx. 0.2 VA (Ri = 5 mΩ)
Sampling frequency	8,33 kHz
Resolution	16 bit
Rated surge voltage	2.5 kV
Overload for 1 s	60 A (sinusoidal)

Ethernet interface (only module 96-PA-RCM-EL)		
Connection	RJ45	
Functions	Modbus gateway	
Protocols	ARP, IPv4, ICMP (ping)	
	TCP, UDP	Port: Application specific
	Modbus TCP	Port: 502
	Modbus UDP	Port: 502
	DHCP/BootP	Port: 67/68 (UDP)
	DNS server	Port: 53 (UDP)
	NTP server	Port: 123 (UDP)

Terminal connection capacity – Analog inputs (residual current, current signals, temperature) Connectible conductors Connect one conductor per terminal position!	
Single core, multi-core, fine-stranded	0.2 - 1.5 mm^2, AWG 28-16
Wire ferrules (non-insulated)	0.2 - 1.5 mm^2, AWG 26-16
Wire ferrules (insulated)	0.2 - 1.5 mm^2, AWG 26-16
Tightening torque	0.2 - 0.25 Nm (1.77 - 2.21 lbf in)
Strip length	7 mm (0.2756 in)

Terminal connection capacity (current measurement I4) Connectible conductors Connect one conductor per terminal position!	
Single core, multi-core, fine-stranded	0.2 - 4 mm^2, AWG 28-12
Wire ferrules (non-insulated)	0.2 - 4 mm^2, AWG 26-12
Wire ferrules (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)

Cable lengths for analog input, residual current input, temperature measurement input, current measurement input I4	
Up to 30 m (32.81 yd)	Unshielded
Greater than 30 m (32.81 yd)	Shielded

Potential isolation and electrical safety of the temperature measurement input
The temperature measurement input has: · Double insulation relative to the current measurement inputs, voltage measurement inputs and the supply voltage. · No insulation relative to the residual current input (RCM). · A functional isolation relative to the Ethernet interface. The external temperature sensor must have double insulation relative to hazardous contact voltage (according to IEC 61010-1:2010).

11.2 Performance characteristics of functions

Function	Symbol	Accuracy class	Measurement range	Display range
Neutral conductor current I4, measured	I_N	1 (IEC61557-12)	0 .. 6 A_{rms}	0 A .. 999 kA
Neutral conductor current I4, calculated	I_{Nc}	1.0 (IEC61557-12)	0.03 .. 25 A	0.03 A .. 999 kA
Residual currents I5, I6	I_{Diff}	1 (IEC61557-12)	0 .. 30 mA_{rms}	0 A .. 999 kA
Temperature	T	-	See temperature sensor types	0 °C ... +100 °C (32 °F ... 212 °F)

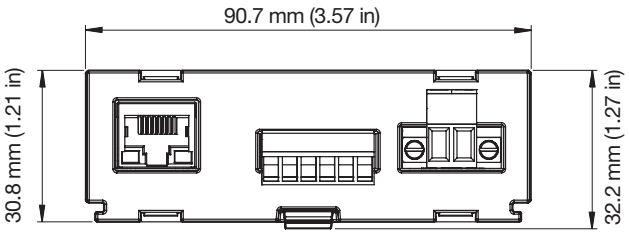
Table of module-relevant “Performance characteristics of functions”.

12. Dimensional drawings and views

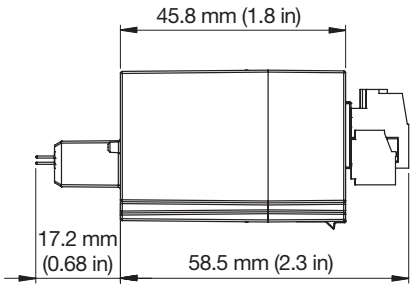
12.1 Dimensional drawings

· All specifications in mm (in).
· The figures show the module 96-PA-RCM-EL and serve the purpose of illustration.
· The views shown are not true to scale.

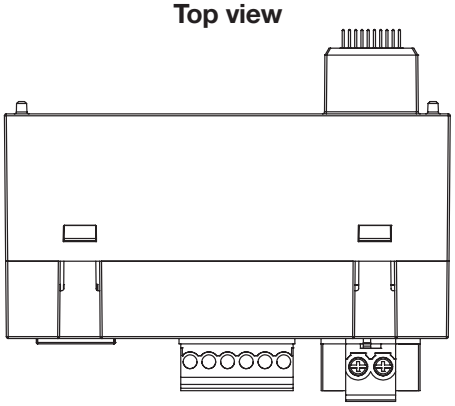
Rear view (with connections)



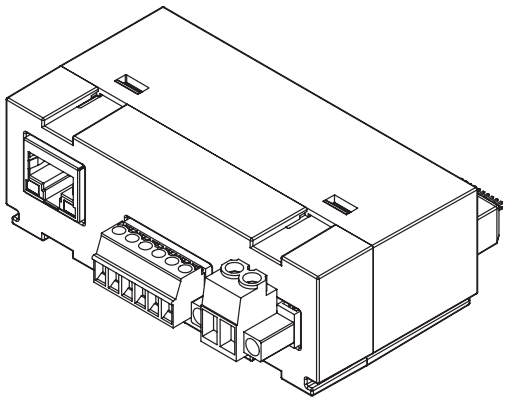
Side view



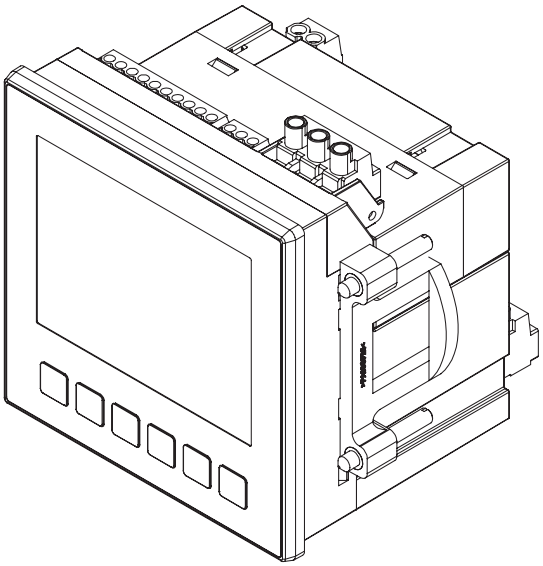
Top view

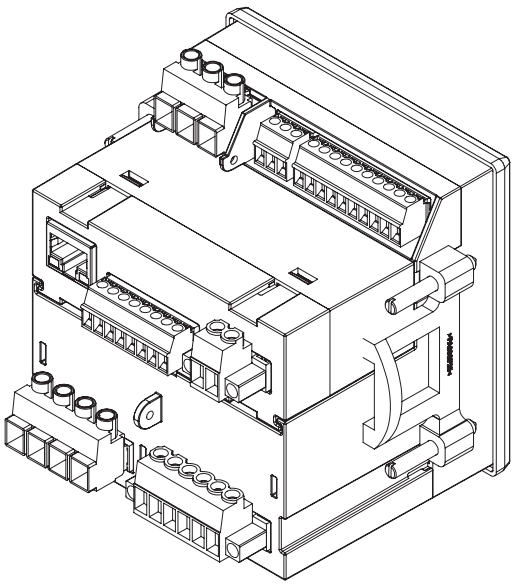


3D view



12.2 3D views of basic device with module





13. Dismounting

Dismounting module 96-PA-RCM or **96-PA-RCM-EL**:

1. Disconnect the system (basic device) from the power supply!
2. Unsnap your module by carefully lifting the snapping mechanism (using your fingernail or a screwdriver, if necessary) and pull it out of the slot.

ATTENTION

Handling your module too roughly may cause damage to the module and result in material damage!
When snapping in the module, the snapping mechanism can be damaged or broken off.
· **Lift the snapping mechanism with care and using only slight pressure! Preferably use your fingernail (or a screwdriver, if necessary) to do so.**

ATTENTION

Dismounting or disconnecting the module while it is communicating with the basic device will result in a device fault!
If communication between the basic device to the module is lacking or faulty during operation, a warning signal will appear on the display of the basic device (see chap. "8.4 Module-relevant alarms" on page 32
· Disconnect your system (the basic device) from the power supply prior to dismounting or disconnecting the module!
· Prior to remounting, it may be necessary to restart the basic device (chap. **"8.3 Restarting the basic device" on page 31).**

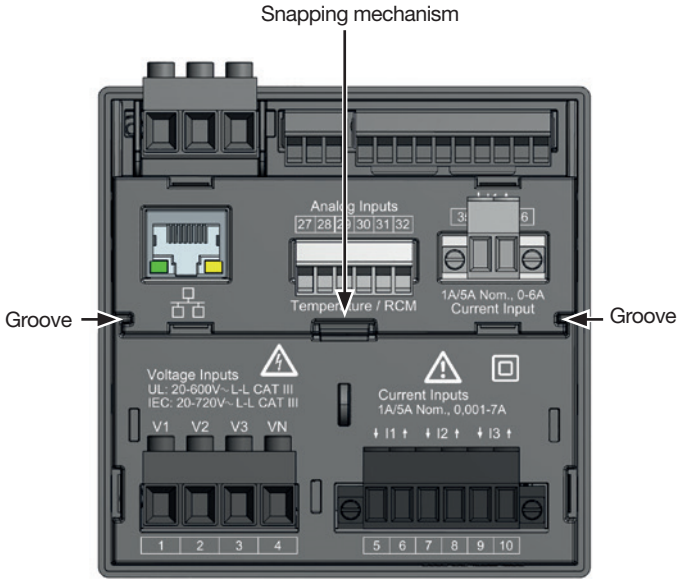


Fig. Rear view of basic device with module, snapping mechanism and groove

14. Service and maintenance

Prior to outbound delivery, your device (component/module) is subjected to various safety tests and is marked with a seal. If the device (component/module) is opened, the safety tests must be repeated. The warranty is only valid for unopened devices (components/modules).

14.1 Repairs and calibration

Repairs and calibration can only be carried out by the manufacturer.

14.2 Service

If questions arise which are not described in this user manual, please contact the manufacturer.
To answer your questions, it is essential that you provide the following information:
· Device designation (see rating plate).
· Serial number (see rating plate).
· Hardware version (see system display).
· Software release (see system display).
· Measured voltage and supply voltage.
· An exact error description.

14.3 Device adjustment

Devices (components/modules) are adjusted by the manufacturer prior to outbound delivery. No readjustment is required when the environmental conditions are complied with.

14.4 Calibration interval

A recalibration by the manufacturer or an accredited laboratory is recommended after about 5 years.

14.5 Firmware update

To carry out a firmware update, connect the basic device with module to your computer with the **GridVis®** software installed:

· Open the Firmware Update Assistant in the GridVis® software by clicking “Update device” in the “Extras” menu.
· Select a corresponding update file and carry out the update.

NOTE

This user manual describes the module and provides information on the operation of the module via the basic device.

In addition to this user manual, also take note of the documentation of your basic device, such as:
· User manual
· Installation instructions
· “GridVis® Software” Quick Guide
· Safety information

Moreover, the **GridVis®** software has an “online help” feature.

14.6 Procedure in the event of a malfunction

ATTENTION

An error in the communication with the basic device leads to a device fault!
If communication between the basic device to the module is lacking or faulty during operation, a warning signal will appear on the display of the basic device.
· Disconnect the basic device (system) from the power supply prior to dismounting or disconnecting the module!
· Prior to remounting, it may be necessary to restart the basic device (see chap. **“8.3 Restarting the basic device” on page 31).**
· **Also take note of the chapter “Procedure in the event of a malfunction” in the documentation of your basic device.**
· **If the measures indicated here are unsuccessful, please contact our support team (www.janitza.de).**
· **If there is discernible damage, send the device, component or module back to the manufacturer in compliance with proper transport conditions.**

14.7 Resetting the module to the standard factory settings

“**Reset to standard factory settings**” can be carried out for the module via your basic device. A description of this can be found in the user manual of your basic device.

Janitza®

Janitza electronics GmbH
Vor dem Polstück 6
D-35633 Lahnau

Tel.: +49 6441 - 9642-0
Fax: +49 6441 - 9642-30
Email: info@janitza.de
info@janitza.de | www.janitza.de

Doc. no. 2.061.033.0 | Date 09/2019 | Subject to technical changes.
The current version of the document can be found in the download area at www.janitza.de.