

Power Analyzer

UMG 96-PA UMG 96-PA^{MID}

(Up to Firmware 1.12)

User Manual and Technical Data

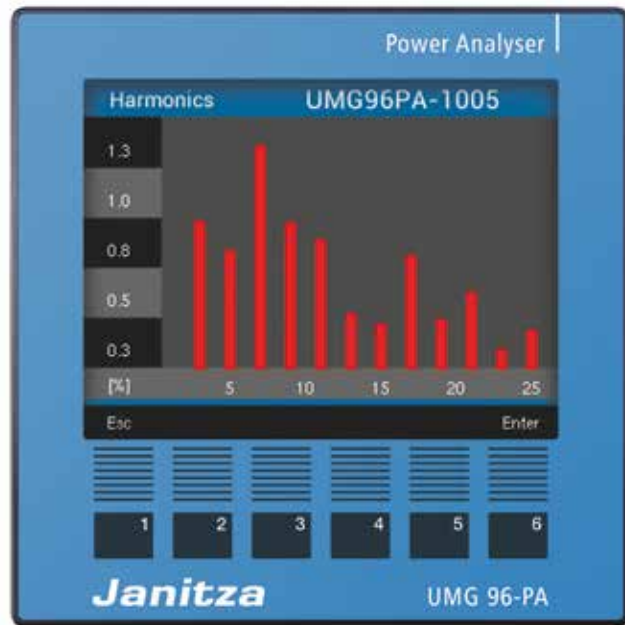


TABLE OF CONTENTS

1. Notes relating to the device and the user manual	6
1.1 Disclaimer	6
1.2 Copyright notice	6
1.3 Technical changes	6
1.4 About this user manual	6
1.5 Defective device/disposal	7
2. Safety	8
2.1 Presentation of warning notices and safety instructions	8
2.2 Danger levels	8
2.3 Safety measures	9
2.4 Qualified personnel	9
2.5 Warranty in the event of damage	9
3. Product description	10
3.1 Incoming goods inspection	10
3.2 EC declaration of conformity	10
3.3 Intended use	10
3.4 Scope of delivery	11
3.5 Additional scope of delivery for UMG 96-PA ^{MID}	11
3.6 Available accessories	11
3.7 Device description	12
3.8 Measurement method	12
3.9 Operating concept	12
3.10 GridVis [®] network analysis software	12
3.11 Performance features	13
4. Design of the device	14
4.1 Front view - display	14
4.2 Rear view - location of the connections	15
4.3 Nameplates	16
5. Assembly	17
5.1 Installation location	17
5.2 Installation position	17
5.3 Fastening	17
6. Network systems	18

7. Installation	18
7.1 Rated voltages	18
7.1.1 Three-phase 4-conductor network with grounded neutral conductor	18
7.2 Disconnectors	19
7.3 Supply voltage	19
7.4 Voltage measurement	20
7.4.1 Overvoltage	20
7.4.2 Frequency	20
7.4.3 Voltage measurement connection versions	21
7.5 Current measurement	22
7.5.1 Current direction	23
7.5.2 Summation current measurement	23
7.5.3 Ammeter	23
7.5.4 Current measurement connection versions	23
8. Port and PC Connections	24
8.1 Port versions	24
8.2 RS485 interface	24
8.3 Shielding	25
8.4 Termination resistors	25
8.5 Bus structure	26
9. Digital Inputs and Outputs	28
9.1 Digital inputs	28
9.1.1 S0 pulse input	28
9.2 Digital outputs	29
9.3 LED status bar	29
10. Analog Output	30
11. Operation	31
11.1 Key assignment	31
11.2 Measured value display “Overview”	31
11.3 Selection menu	31
11.4 Overview of main screens	32

12. Configuration	34
12.1 Language	34
12.2 Communication	34
12.3 Measurement	35
12.3.1 Rated frequency	35
12.3.2 Current transformer and voltage transformer / rated current	36
12.4 System	38
12.4.1 Firmware / serial number	38
12.4.2 Time	38
12.4.3 Password	38
12.4.4 Reset	39
12.5 Display	41
12.6 Colors	42
12.6.1 Brightness	42
12.6.2 Standby	42
12.6.3 Brightness (standby)	42
13. Commissioning	43
13.1 Connecting supply voltage	43
13.2 Measured voltage	43
13.3 Measured current	43
13.4 Frequency	44
13.5 Phase sequence	44
13.5.1 Principles of the pointer diagram	45
13.6 Exceeding the measurement range	46
13.7 Checking the time	46
13.8 Checking the power measurement	47
13.9 Checking the communication	47
13.10 Delete min./max. Values individually	48
13.11 Harmonics	48
13.12 Communication in the bus system	49
13.12.1 RS485	49
13.13 Digital Inputs/Outputs	50
13.13.1 Digital inputs	50
13.13.2 Digital outputs	52
13.14 Analog output	56
13.15 "Trailer pointer" function	57
13.15.1 Internal synchronization	57
13.15.2 External synchronization	58
13.15.3 Synchronization priority	60
13.16 Records	61
13.17 Tariff switchover	62

14. UMG 96-PA^{MID}	63
14.1 Intended use	63
14.2 Assembly	63
14.3 Measured value display active energy	64
14.4 Secured load reading (meter reading) of the MID device	64
14.5 Load profile	64
14.6 Log	65
14.7 Password configuration	65
14.8 Measured value display tariff	65
14.9 Device acceptance report	66
15. Overview Measured Value Displays	68
16. Service and maintenance	74
16.1 Repair and calibration	74
16.2 Front film and display	74
16.3 Service	74
16.4 Device adjustment	74
16.5 Firmware update	74
16.6 Clock/battery	75
17. Procedure in the event of errors	76
18. Technical data	77
19. Function characteristics	80
19.1 Modbus address list of the frequently required measured values:	82
19.2 Number formats	83
19.3 Dimensional drawings	84
19.4 Connection example 1	85

1. Notes relating to the device and the user manual

1.1 Disclaimer

It is essential that the information products for the devices are observed to ensure safe operation and achieve the specified performance characteristics and product features.

Janitza electronics GmbH assumes no liability for personal injuries, property damage and financial losses resulting from the failure to observe the information products.

Make sure that your information products are legible and accessible.

1.2 Copyright notice

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Any duplication, processing, distribution and any other kind of use, even in part, is prohibited.

All trademarks and any resulting rights belong to the respective holders of these rights.

1.3 Technical changes

- Make sure that the user manual matches your device.
- This user manual applies to the UMG 96-PA and UMG 96-PA^{MID}. It is designated accordingly where provisions apply separately or differ. Observe chap. „14. UMG 96-PAMID“ on page 63 In particular.
- First, make sure you have read and understood the document accompanying the product.
- Keep the documents accompanying the product accessible through its service life and hand them over to the subsequent owner where applicable.
- Refer to www.janitza.de for information concerning device revisions and the associated adjustments to the documentation accompanying the product.

1.4 About this user manual

Please send us any questions, comments or suggestions for improvement about the user manual via e-mail to info@janitza.com.

NOTE

This user manual provides a description of the UMG 96-PA and UMG 96-PA^{MID} devices and information on how to operate the devices. It is designated accordingly where provisions apply separately to each device or where they differ.

Observe the other applicable documentation to your device in addition to this user manual, such as:

- Installation instructions.
- “GridVis® Software” Quick Start.
- “Safety Instructions” enclosure.

Where applicable, also observe the documents relating to the expansion modules, such as

- User manuals and
- Installation instructions.

Furthermore, the **GridVis® software** also has its own “Online help”.

1.5 Defective device/disposal

Before returning your **defective devices (components)** to the manufacturer for inspection (complete with accessories), please contact the manufacturer's support team first. Here, take the transport terms and conditions into account.

NOTE

Please return any defective or damaged devices to Janitza electronics GmbH. Observe the shipping regulations for air freight and road transport (complete with accessories). Observe any special provisions relating to devices with installed batteries or battery packs!

Do not attempt to open or repair the device (components) on your own, because if you do so, the warranty rights will become void!

Please observe the national regulations for the **disposal** of the device (the components)! Dispose of individual parts, where necessary, depending on the properties and existing country-specific regulations, e.g. as:

- Electronic waste
- Batteries and accumulators
- Plastic
- Metal

or commission a certified disposal company with the scrapping.

For more information on servicing and maintaining your device, please refer to chap.,16. Service and maintenance“ on page 74.

2. Safety

Please read the present user manual and all other publications that are applicable for working with this product. This applies in particular for installation, operation and maintenance.

In the process, observe all safety requirements and warning notices. Failure to observe the notices can result in personal injury and/or damage to the product.

Any impermissible modification or use of this device exceeding the specified mechanical, electrical or other operating limits can result in personal injury and/or property damage.

Read the user manual prior to first-time use of the device. Keep it throughout the entire service life of the device and always have it readily available for reference.

Also observe the applicable legal and safety requirements for the respective application when using the device.

2.1 Presentation of warning notices and safety instructions

The warning notices listed below

- are used throughout the entire documentation.
- can be found on the devices themselves.
- point out potential risks and dangers.
- confirm information which clarifies or simplifies procedures.



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




The general warning symbol calls attention to possible risks of injury. Observe all the instructions listed under this symbol in order to prevent injuries or even death.



2.2 Danger levels

Warning notices and safety instructions are highlighted by a warning symbol and the danger levels are presented as follows depending on the level of risk:

 DANGER
Indicates an imminently dangerous situation that will result in serious or fatal injuries in the event of noncompliance.

 WARNING
Indicates an imminently dangerous situation that can result in serious or fatal injuries in the event of noncompliance.

 CAUTION
Indicates an imminently dangerous situation that can result in minor injuries in the event of noncompliance.

ATTENTION
Indicates an imminently dangerous situation that can result in property damage or environmental damage in the event of noncompliance.

NOTE
Points out procedures during which a danger of injuries or property damage does not exist.

2.3 Safety measures

When operating electrical devices, specific parts of these devices inevitably carry dangerous voltage. As a result, serious bodily harm or property damage can occur if they are not handled correctly:



WARNING

Risk of injury due to electric voltage!

Serious personal injuries or death may occur! Therefore, please observe the following:

- **Before starting work on your system, disconnect the system from the power supply! Secure it against being switched back on! Verify disconnection from power! Ground and short circuit! Cover or block off neighboring parts that are under voltage!**
- **Also make sure to check the surrounding area for dangerous voltage and switch it off if necessary during the operation and troubleshooting (especially with top hat rail devices)!**
- **For work on electrical systems, wear protective clothing and safety equipment according to applicable directives!**
- **Before connection, ground the device/ components at the ground wire connection, if available!**
- **Do not touch exposed or stripped cores that are under voltage! Fit wire end ferrules on the conductors made of individual wires!**
- **Dangerous voltages may be present in all circuit parts connected to the voltage supply.**
- **Secure the supply voltage with a suitable circuit breaker/fuse!**
- **Never switch off, dismantle or manipulate safety devices!**
- **There may still be dangerous voltages present in the device or in the components even after disconnection of the supply voltage (capacitor storage).**
- **Do not operate equipment with open current transformer circuits.**
- **Only connect screw-type terminals with the same numbers of poles and same type!**
- **Do not exceed the threshold values stated in the user manual and on the rating plate; this must also be observed during inspection and commissioning.**
- **Safety instructions and warning notices in the documents that accompany the devices and their components!**

2.4 Qualified personnel

To prevent personal injuries and property damage, only electrically qualified personnel may work on the devices and their components, modules, assemblies, systems and circuits. They must also have knowledge

- of the national and international accident prevention regulations.
- of safety technology standards.
- in installation, commissioning, operation, enabling, grounding and labeling of electrical equipment.
- of the requirements for personal protective equipment.

Electrically qualified personnel, in terms of the safety-related notes in all documents accompanying the device and its components, are persons who can prove a professional qualification as an electrician.



WARNING

Warning against impermissible manipulations or improper use of the device or its components!

Opening, dismantling or impermissible manipulation of the device and its components, which exceeds the specified mechanical, electrical or other operating limits, can result in property damage or injuries up to death.

- **Only electrically qualified personnel may work on the devices and their components, assemblies, systems and circuits!**
- **Always use your device or components as described in the associated documentation.**
- **Send the device or components back to the manufacturer in the event of visible damage!**

2.5 Warranty in the event of damage

Any impermissible manipulation or use of the device applies as "misuse" and/or "negligence" with respect to the product warranty and thus voids the warranty for coverage of potentially resulting damages. Observe chap. „3.3 Intended use“ on page 10 for this.

3. Product description

3.1 Incoming goods inspection

The prerequisites for smooth and safe operation of this device and its components include proper transport, storage, setup and assembly, operation and maintenance, as well as observance of the safety instructions and warning notices.

Exercise caution when unpacking and packing the device, without using force and only using suitable tools.

Perform a visual inspection of the device to ensure the fault-free mechanical condition.

Please check the scope of delivery for completeness before beginning with the installation of the device.

If you assume that safe operation is no longer possible, the device must be shut down immediately and prevented from unintended re-commissioning. It can be assumed that safe operation is no longer possible, when, for example, the 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 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.).

3.2 EC declaration of conformity

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

3.3 Intended use

The device is:

- intended for installation in switching cabinets and small installation distributors.
- not intended for installation in vehicles! Using the device in mobile equipment is considered an unusual environmental condition and is only permissible by special agreement.
- not intended for installation in areas exposed to harmful oils, acids, gases, vapors, dust and radiation, etc.
- designed as an indoor meter.

NOTE

All screw-type terminals that belong to the scope of delivery are plugged into the device.

NOTE

All options and design versions supplied are described on the delivery note.

The following applies to the battery used in the device:

CAUTION

Risk of injury due to fire or chemical burns!
The batteries used in the device can lead to fire or chemical burns if used improperly.

- **Only replace batteries with the same types or those recommended by Janitza!**
- **Observe the polarity when installing the battery!**
- **Remove batteries with non-conductive tools only (e.g. plastic tweezers)!**
- **Do not recharge, destroy, heat up over 100 °C (212 °F) or burn batteries!**
- **Do not dispose of batteries with household waste! Observe the disposal requirements in the respective device documentation!**
- **Keep batteries away from children and animals!**
- **Send devices with soldered batteries back to the manufacturer taking into consideration the transport conditions in the event of damage!**

3.4 Scope of delivery

Quantity	Item no.	Designation
1	52.32.001 ¹⁾	UMG 96-PA
1	52.32.003 ¹⁾	UMG 96-PA ^{MID}
1	33.03.360	Installation instructions
	33.03.342	“Safety Instructions” enclosure.
1	33.03.361	“GridVis Software” Quick Start
1	10.01.896	Screw-type terminal, pluggable, 3-pole (auxiliary power)
1	10.01.849	Screw-type terminal, pluggable, 4-pole (voltage measurement)
1	10.01.871	Screw-type terminal, pluggable, 6-pole (current measurement)
1	10.01.909	Screw-type terminal, pluggable, 3-pole (RS 485)
1	10.01.865	Screw-type terminal, pluggable, 10-pole (digital inputs and outputs, analog output)
1	52.22.251	Fastener set

1) For item number, see delivery note

3.5 Additional scope of delivery for UMG 96-PA^{MID}

Quantity	Item no.	Designation
1	29.01.092	Terminal cover supply voltage
1	29.01.093	Terminal cover measurement
1	29.01.065	Silicone seal, 96 x 96

3.6 Available accessories

Quantity	Item no.	Designation
	21.01.058	Battery type Lithium CR2032, 3 V (Approval according to UL 1642)
	29.01.065	Silicone seal, 96 x 96
	15.06.015	Interface converter RS485 <-> RS232
	15.06.025	Interface converter RS485 <-> USB

3.7 Device description

The device is suitable for

- Measurements and calculations of electric values such as voltage, current, power, energy, harmonics in the building installation, at distributors, circuit breakers and busbar trunking systems.
- Measuring voltages and currents originating from the same network.
- Measurements in low-voltage networks in which rated voltages of up to 417 V conductor to ground and surge voltages of overvoltage category III occur.
- Measurements in medium and high-voltage networks with current and voltage transformers. Generally, current and voltage transformers perform measurements in medium and high voltage networks!
- Current measurement via external ≈ 1 A or ≈ 5 A current transformer.
- Installation in permanently installed switch cabinets or small installation distributors, in any installation position.
- Use in residential and industrial sectors.

The measuring device shows the measurement results, whereas the measurement results are read and processed further via the interface.

ATTENTION

Malfunction or damage to the device due to improper connection.

Improperly connected devices can deliver incorrect measured values or damage the device.

Please observe the following:

- **The measured voltages and measured currents originate from the same network.**
- **Do not use the device to measure DC current!**
- **Ground conductive switchboards!**

3.8 Measurement method

The device measures

- seamlessly and calculates all effective values within a 200 ms interval.
- the true effective value (TRMS) of the voltages and currents generated at the measurement inputs.

3.9 Operating concept

The measuring device's operating concept consists of the following methods:

- **6 function keys with display** to configure and record data.
- The **network analysis and programming software GridVis®** for data programming and analysis.
- The **Modbus protocol and the Modbus address list** for data configuration and export. You can find the Modbus address list on www.janitza.de.

This user manual only describes the operation of the device via the 6 function keys. The GridVis® network analysis software has its own "Online help" and e-learning modules.

3.10 GridVis® network analysis software

Use the GridVis® network analysis software available on www.janitza.de to program your measuring device and to export data for analysis. To do so, connect a PC, for example via the serial interface (RS485) or a gateway (such as UMG 512-PRO) to your measuring device.

Use the GridVis® network analysis software to:

- Program your device.
- Configure and export recordings.
- Analyze the exported data.
- Save the data in databases.
- Graphically illustrate the measured values.
- Program custom applications.

3.11 Performance features

General information

- Integrated front panel unit with the dimensions 96 x 96 mm
- Expansion with module technology
- Connection via pluggable screw terminals
- 320 x 240 px color graphics display
- Operation via 6 keys
- 3 voltage measurement inputs (600 V CAT III)
- 3 current measurement inputs (via current transformer)
- 3 digital outputs
- 3 digital inputs
(configured as pulse counter with simultaneous output calculation)
- 1 analog output (0 - 20 mA)
- Data storage 4 Mbyte flash drive
- RS485 interface (Modbus RTU, slave, up to 115 kbps)
- Recording of more than 2000 measured values
- Clock and battery
- Operating temperature range -10 °C – +55 °C

Measurement uncertainty

- Active energy, measurement uncertainty class 0.5S for ../5A transformer
- Active energy, measurement uncertainty class 1 for ../1A transformer
- Reactive energy, class 1

Measurement

- Recording of more than 800 measured values
- Measurement in TN and TT networks
- Measurement in networks with rated voltages up to L-L 720 V_{rms} and L-N 417 V_{rms}
(according to IEC)
- Current metering range 0.005 .. 6 A_{rms}
- True effective value measurement (TRMS)
- Continuous scanning of the voltage and current measurement inputs.
- Frequency range of the power frequency 45 Hz .. 65 Hz
- Measurement of odd harmonics 1st through 25th for U_{LN} and I.
- U_{LN}, U_{LL}, I, P (consumption/export), Q (ind./cap.)
- 2 rates (switchover via Modbus or digital input 1)

4. Design of the device

4.1 Front view - display

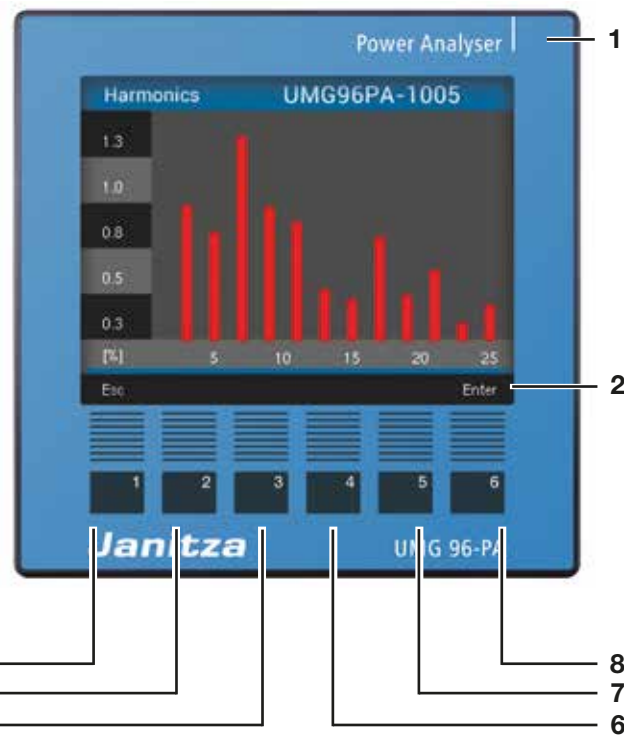


Fig. Front view of UMG 96-PA

- 1 Device type
- 2 Description of the function keys
- 3 Key 1: Configuration menu, back (ESC)
- 4 Key 2: Select number, mark check box (◀)
- 5 Key 3: Reduce number by 1, select menu item (▼), mark check box (▼)
- 6 Key 4: Increase number by 1, select menu item (▲), mark check box (▲)
- 7 Key 5: Select number, mark check box (▶)
- 8 Key 6: Open selection menu, activate input, confirm selection (Enter)

4.2 Rear view - location of the connections

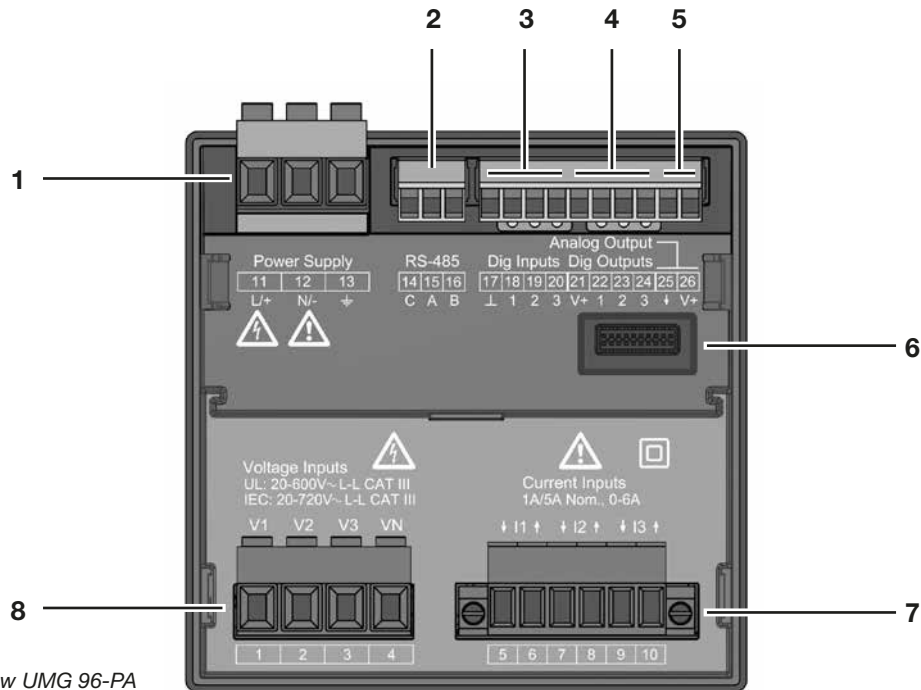
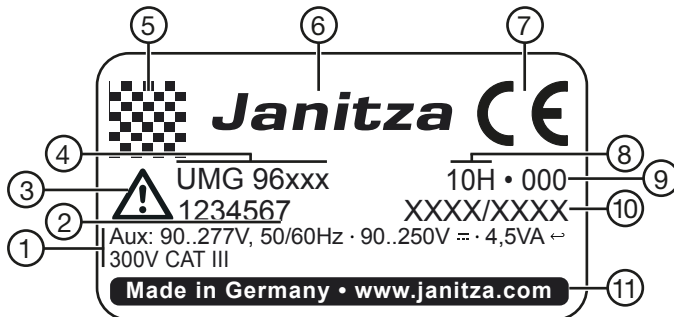


Fig. Rear view UMG 96-PA

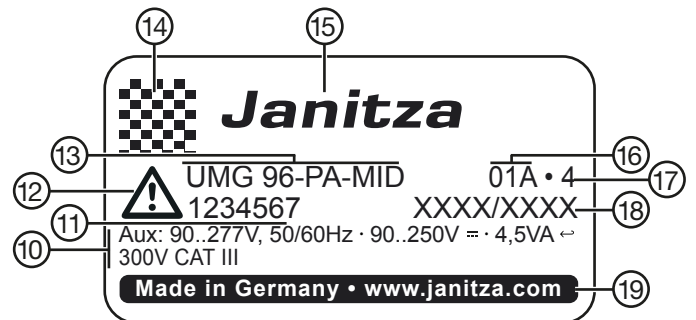
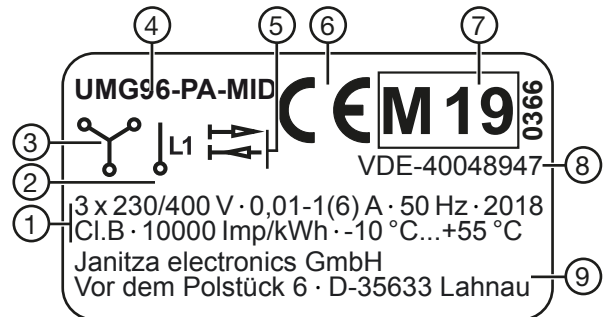
- 1 Supply voltage
- 2 RS485 interface
- 3 Digital inputs
- 4 Digital outputs
- 5 Analog output
- 6 Module connector
- 7 Current measurement inputs I1 to I3
- 8 Voltage measurement inputs V1 to V3

4.3 Nameplates

UMG 96-PA



UMG 96-PA^{MID} (has two nameplates)



Pos.	Designation	Description
1 (10)	Operating data	<ul style="list-style-type: none"> · AC supply voltage in V · Rated frequency in Hz · DC supply voltage in V · Power consumption in VA · Overvoltage category
2 (11)	Item number	Item number of the manufacturer
3 (12)	“Danger sign” symbol	General danger symbol. Observe the warning notices depicted on the device and listed in the documents in order to prevent injuries or even death.
4 (13)	Device type	Device designation
5 (14)	QR code	Coded manufacturer data
6 (15)	Manufacturer logo	Logo of the device manufacturer
7	CE mark	See chap. 3.2 on page 10.
8 (16)	Manufacturer-specific data	Coded manufacturer data
9 (17)	Hardware version	Hardware version of your device
10 (18)	Type/serial number	Number for identifying the device
11 (19)	Designation of origin/web address	Country of origin and web address of the manufacturer

Table “Nameplate UMG 96-PA”

Pos.	Designation	Description
1	Operating data	<ul style="list-style-type: none"> · Voltage range in V · Current range in A · Frequency range in Hz · Year of manufacture · Accuracy class · Pulse value in pulse/kWh · Measurement temperature range
2	Single phase system	Network system
3	Three-phase system	Network system
4	Device type	Device designation
5	“MID active power” symbol	<ul style="list-style-type: none"> · Delivered · Purchased
6	CE mark	See chap. 3.2 on page 10.
7	MID approval mark	Combined with the CE mark, is considered an MID conformity mark (calibration mark).
8	VDE ID number	VDE certification number
9	Manufacturer’s address	Manufacturer’s address data
10-19	See table “Nameplate UMG 96-PA”	

Table “Nameplate UMG 96-PA^{MID}”

5. Assembly

5.1 Installation location

The device is suitable for indoor installation in a stationary and weather-protected switch board.

Ground conductive switchboards!

ATTENTION

Property damage due to noncompliance with the assembly instructions!

Non-observance of the assembly instructions may damage or destroy your device.

- Observe the information for the installation location in the “Assembly” and “Technical data” sections.
- Ensure sufficient air circulation in your installation environment and, where applicable, sufficient cooling with high temperatures!

5.2 Installation position

The cut-out size in the switchboard is $92^{+0.8}$ mm x $92^{+0.8}$ mm.

Keep the following minimum distances to ensure sufficient ventilation:

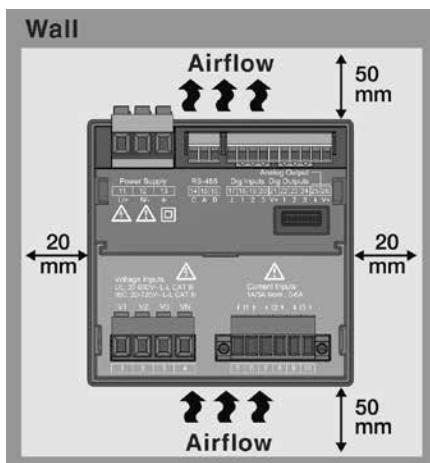


Fig. Rear view of installation position of UMG 96-PA

5.3 Fastening

Fasten the device using the side mounting brackets inside the switchboard (mounting plate). To this end, take the following steps:

- Before inserting the device, remove the mounting brackets by applying horizontal lever movement (with a screw driver, for example).

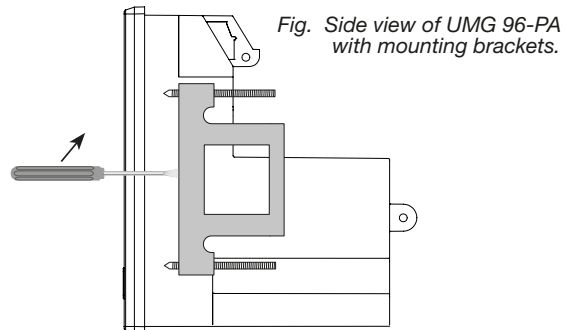
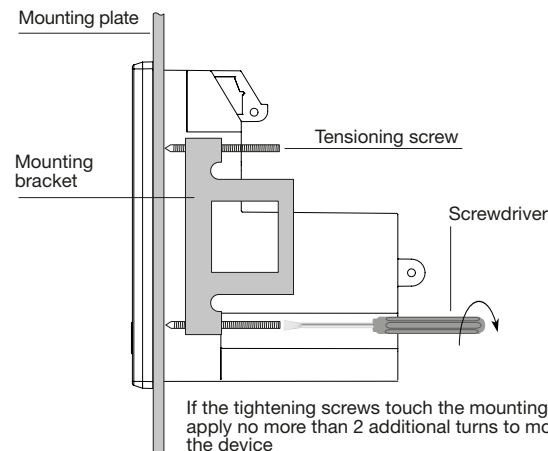


Fig. Side view of UMG 96-PA with mounting brackets.

- Guide your device from the front through the switchboard (mounting plate).
- Fasten the brackets on the side of the device by inserting and snapping them in.
- Screw in the tensioning screws until they touch the mounting plate.
- Then, apply two additional turns and carefully tighten the tightening screws. Tensioning screws that are tightened too firmly may destroy the mounting brackets!



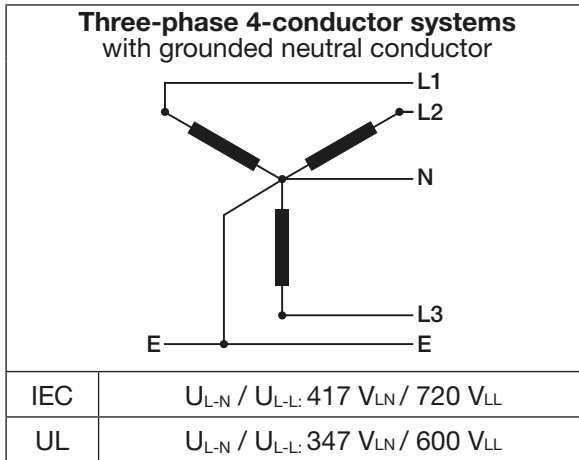
If the tightening screws touch the mounting plate apply no more than 2 additional turns to mount the device

NOTE

UMG 96-PA^{MID}: Observe the additional information about assembly in section 14.2 on page 63.

6. Network systems

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



The device can be used in

- TN and TT networks
- residential and industrial sectors.

! WARNING

Risk of injury due to electric voltage!
Measurement voltage surges over the approved overvoltage category can damage insulation in the device. The safety of the device will be impaired. This can result in serious personal injuries or death.

- **Only use the device in environments in which the permissible measurement voltage surge can be observed.**

7. Installation

The UMG 96-PA is suitable for voltage measurement in TN and TT systems. The voltage measurement in the UMG 96-PA is classed in the overvoltage category 600V CATIII (rated surge voltage 6 kV).

! WARNING

Risk of injury due to electric voltage!
Do not short circuit secondary side connections of voltage transformers! This can result in serious personal injuries or death.

- **Connect voltage transformers according to their documentation!**
- **Check your installation!**

7.1 Rated voltages

7.1.1 Three-phase 4-conductor network with grounded neutral conductor

Networks and rate voltages suitable for your device:

U_{L-N} / U_{L-L}	
66V / 115V	
120V / 208V	
127V / 220V	
220V / 380V	
230V / 400V	Maximum rated voltage of the network according to MID (UMG 96-PA ^{MID})
240V / 415V	
260V / 440V	
277V / 480V	Maximum rated voltage of the network according to UL
347V / 600V	
400V / 690V	
417V / 720V	Maximum rated voltage of the network

Fig. Suitable network rated voltages for measurement inputs according to EN 60664-1:2003

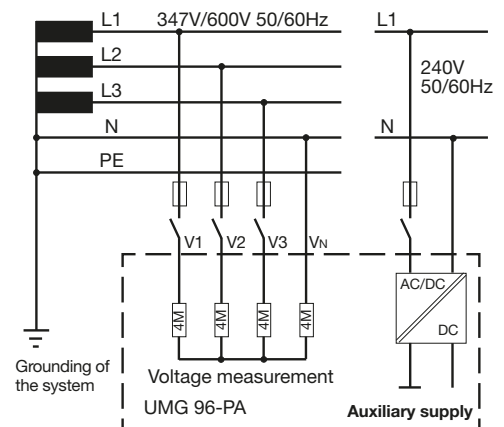


Fig. Schematic diagram - measurement in three-phase 4-conductor system.

7.2 Disconnectors

Install a suitable disconnector for the supply voltage in the building installation in order to de-energize the device from current and voltage.

- Install the disconnector near the device in a location that is easily reachable for the user.
- Mark the disconnector as a disconnecting device for this device.

7.3 Supply voltage

A supply voltage is required for device operation. The type and level of the supply voltage for your device can be found on the rating plate. Please also observe the following:

- Before connecting the supply voltage, ensure that the voltage and frequency correspond to the specifications on the nameplate.
- Connect the supply voltage an UL/IEC approved fuse to the plug-type terminals on the rear side of the device.
- After connecting the supply voltage, a screen appears on the display. If no screen appears, check whether the supply voltage is within the rated voltage range.

WARNING

Risk of injury due to electric voltage!

Serious personal injuries or death can occur due to:

- Touching live exposed or stripped cores.
- Device inputs that are dangerous to touch.

Before starting work, disconnect your system from the power supply! Secure it against being switched back on! Verify disconnection from power! Ground and short circuit! Cover or block off neighboring parts that are under voltage!

CAUTION

Property damage due to noncompliance with the connection conditions.

Noncompliance of the connection conditions can damage or destroy your device.

Therefore, please observe the following:

- **Observe the specifications on the nameplate relating to voltage and frequency!**
- **Connect the supply voltage via a fuse pursuant to the technical data!**
- **Do not tap the supply voltage at the voltage transformers!**
- **Provide a fuse for the neutral conductor if the neutral conductor connection is not grounded to the source!**

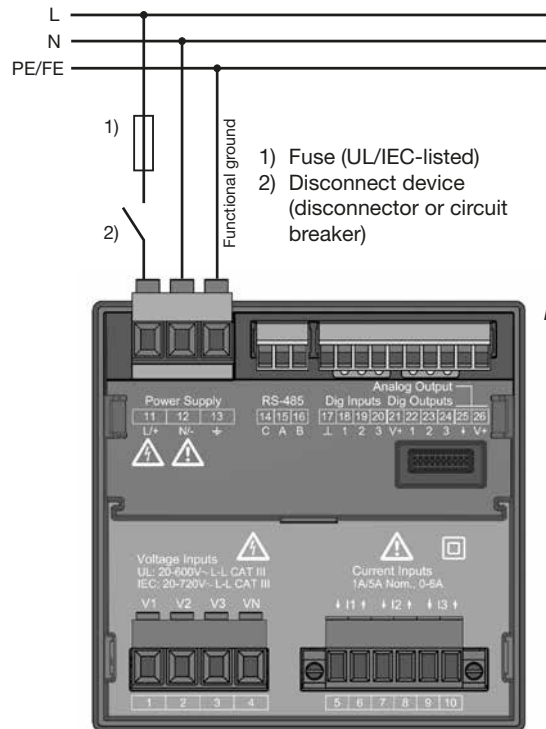


Fig. Connection example "Supply voltage"

NOTE

Without functional ground, the device shows a non-applied residual voltage.

Overcurrent protection device for the line protection of the supply voltage

Recommendation for the overcurrent protection device for line protection of the supply voltage (depending on the device versions):

- Option 230 V --> 6 - 16 A (Char. B)
- Option 24 V *--> 1 - 6 A (Char. B)

HINWEIS

*The 24 V option applies only to the UMG 96-PA!

Recommendation for the maximum number of devices on one circuit breaker depending on the versions:

- 230 V option:
For a B6A circuit breaker, a maximum of 4 devices.
For a B16A circuit breaker, a maximum of 11 devices.
- 24 V option:
For a B6A circuit breaker, a maximum of 3 devices.
For a B16A circuit breaker, a maximum of 9 devices.

NOTE

The fuse is only a line protection - **is not** device protection!

7.4 Voltage measurement

The device has 3 voltage measurement inputs (V1 to V3) that are on the rear side of the device.

7.4.1 Overvoltage

The voltage measurement inputs are suitable for measuring in networks in which category 600 V CAT III overvoltages can occur (rated surge voltage 6 kV).

7.4.2 Frequency

The device:

- requires the power frequency for the measurement and calculation of measured values.
- is suitable for measuring in networks in which the power frequency of the voltage is in the 45 Hz to 65 Hz range.

The power frequency is calculated using the phase L1 measured voltage. The sampling frequency of the voltage and current measurement inputs is calculated based on the power frequency.

The frequency of the voltage power frequency can no longer be calculated accurately while measuring with severe voltage distortion. What this means is that a fixed value should be specified for the corresponding power frequency for measured voltages with severe voltage distortion. Voltage distortions occur, for example, when measuring consumers that are operated with a phase angle control. Current distortions do not have an impact on the determined frequency.

NOTE

The MID device only supports an automatic frequency calculation (45 -65 Hz)!

More information can be found in chapter „12.3.1 Rated frequency“ on page 35

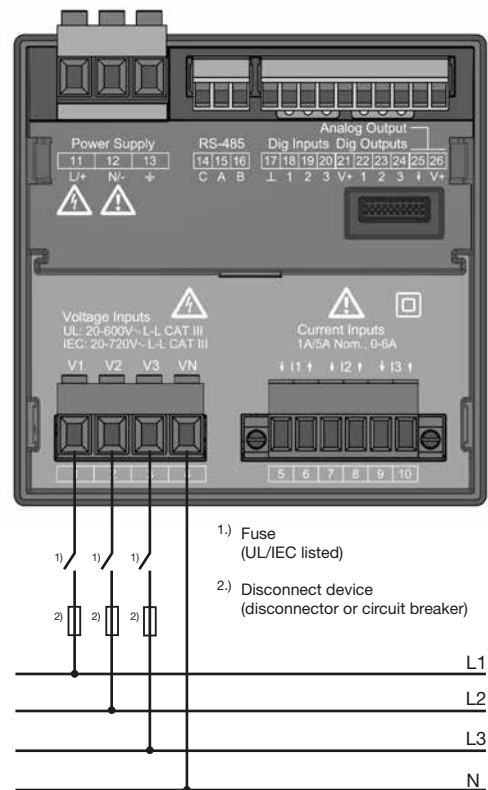


Fig. Connection example for voltage measurement.

⚠ WARNING

Risk of injury due to electric voltage!

Non-observance of the connection conditions for voltage measurement inputs may result in severe injuries or death.

Therefore, please observe the following:

- Before starting work, disconnect your system from the power supply! Verify that there is no current!
- Use voltage transformers to connect voltages exceeding the permitted rated line voltages.
- The voltage measurement inputs on the device are dangerous live parts!
- Attach a disconnecter as described in section 7.2 on page 19.
- Use a UL/IEC approved overcurrent protection device with a rated value that is rated for the short-circuit current at the connection point.

⚠ CAUTION

Improper connection will cause the device to malfunction.

Faulty measured values will result if the device is improperly connected.

Therefore, please observe the following:

- Measured voltages and currents originate from the same line.
- The device is not suitable for measuring DC current.

NOTE

- The device only calculates measured values if voltage L1-N is greater than 20 V_{eff} (4-conductor measurement) or voltage L1-L2 is greater than 34 V_{eff} (3-conductor measurement) at voltage measurement input V1.
- Use a line protection (1 - 10 A) with IEC/UL approval as fuse protection for the voltage measurement.

7.4.3 Voltage measurement connection versions

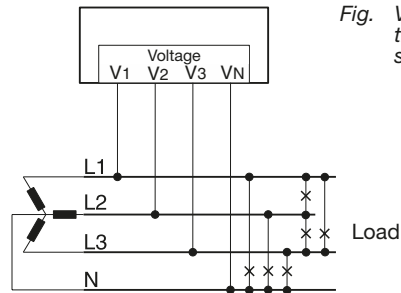


Fig. Voltage measurement in the three-phase 4-conductor system

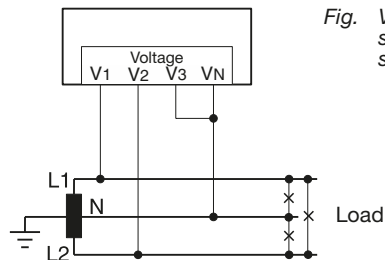


Fig. Voltage measurement in the single-phase 3-conductor system

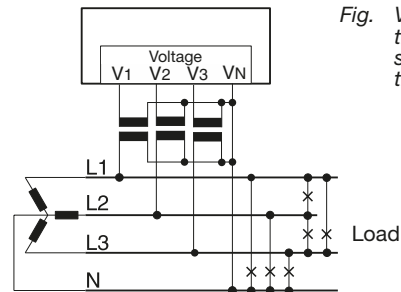


Fig. Voltage measurement in the three-phase 4-conductor system via a voltage transformer

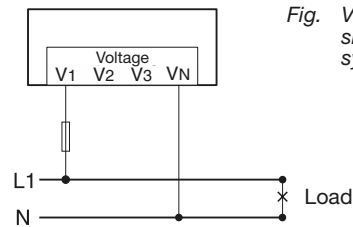


Fig. Voltage measurement in the single-phase 2-conductor system

7.5 Current measurement

The device:

- is designed for the connection of current transformers with secondary currents of $\dots/1$ A and $\dots/5$ A.
- is only approved for a current measurement using the current transformer.
- does not measure DC currents.

The default current transformer ratio is set to 5/5 A and may need to be adjusted to the current transformer used.

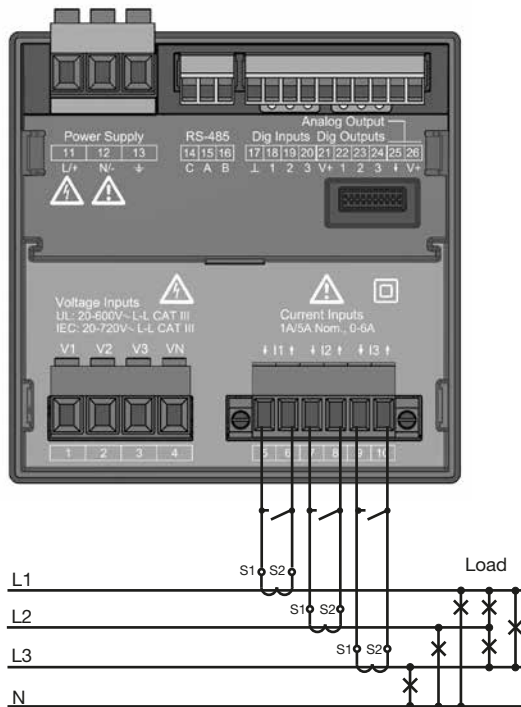


Fig. Example of "Current measurement via current transformer" connection

! WARNING

Risk of injury due to electric voltage on current transformers!

High voltage spikes that are dangerous to touch can arise on current transformers that are operated open on the secondary side, which can result in serious injuries or even death.

Therefore, please observe the following:

- **Before starting work, disconnect your system from the power supply! Verify that there is no current!**
- **Avoid open operation of the current transformer.**
- **Short-circuit the unloaded current transformer.**
- **Before interrupting the power supply, it is critical to short circuit the secondary connections of the current transformer.**
- **If a test switch is present that automatically short circuits the secondary lines of the current transformer, it is sufficient to put it in the "test" position provided that the short-circuiters have been checked beforehand.**
- **Only use current transformers that have a basic insulation according to IEC 61010-1:2010.**
- **Fasten the attached screw-type terminal to the device with the two screws.**
- **Even safe open current transformers are dangerous to touch if they are operated open.**
- **Observe the documentation for the current transformers!**

! WARNING

Risk of injury due to electric voltage!

During high measured currents, temperatures up to 80 °C can arise at the connections.

Use lines which are designed for an operating temperature of at least 80 °C.

! WARNING

Risk of injury due to electric voltage!

Serious personal injuries or death can occur due to:

- Touching live exposed or stripped cores.
- Device inputs that are dangerous to touch.

De-energize your system before beginning to work! Check that there is no voltage! Ground the system!

Use the ground connection point with the ground symbol for this.

NOTE

You can easily configure the **current transformer ratios** via

- the device menu (Configuration > Measurement > Measurement).
- the GridVis® software.

7.5.1 Current direction

You can correct the current direction for each phase individually using the existing serial interfaces. So, there is no need to subsequently reconnect the current transformer in the event of an improper connection.

7.5.2 Summation current measurement

For a summation current measurement via two current transformers, first set their total transformation ratio on the device. A description of how to set the current transformer ratios is provided in chapter 12.3.2 on page 36.

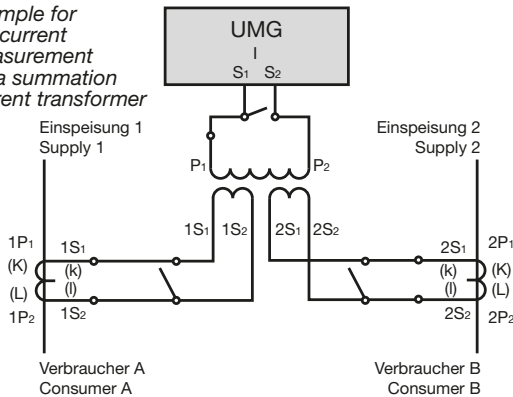
Example:

The current measurement occurs via two current transformers. Both current transformers have a transformation ratio of 1000/5 A. The summation measurement is performed with a summation current transformer 5+5/5 A.

The device must then be set as follows:

Primary current: 1000 A + 1000 A = 2000 A
 Secondary current: 5 A

Fig. Example for the current measurement via a summation current transformer



7.5.4 Current measurement connection versions

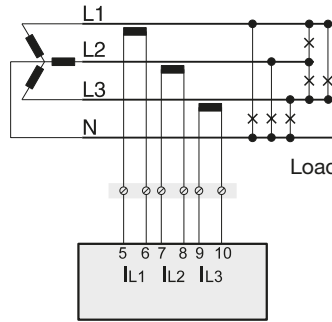


Fig. Current measurement via the current transformer in the three-phase 4-conductor system

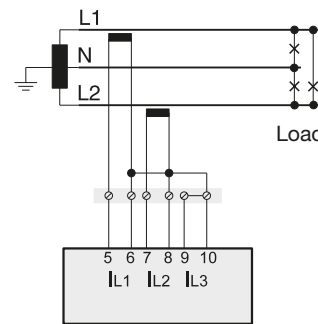


Fig. Current measurement in the single-phase 3-conductor system

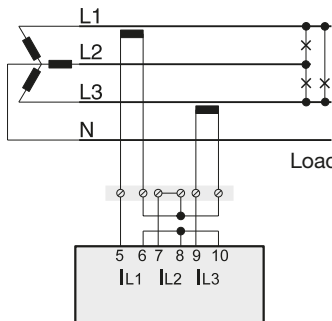


Fig. Current measurement via 2 current transformers in the three-phase 4-conductor system

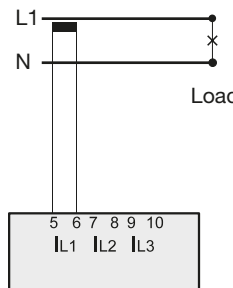
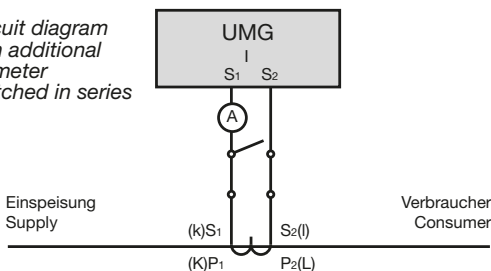


Fig. Current measurement in the single-phase 2-conductor system

7.5.3 Ammeter

If you want to measure the current not only with the UMG, but also with an ammeter as well, switch the ammeter in series to the UMG.

Fig. Circuit diagram with additional ammeter switched in series



NOTE

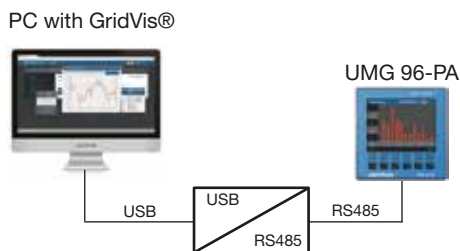
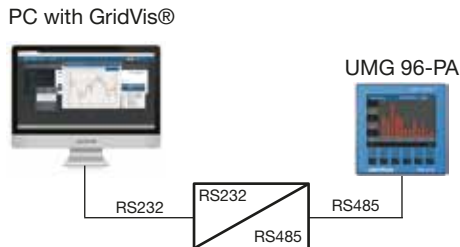
If the measuring range is exceeded, the device display shows the warning notice **Measuring range exceeded and specifies the current and voltage path.**

8. Port and PC Connections

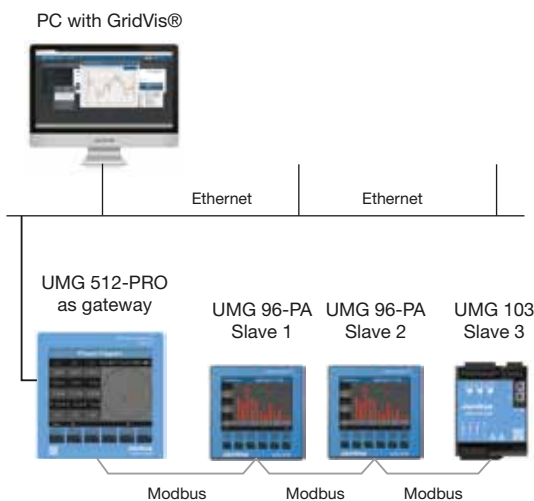
8.1 Port versions

There are various options available to connect the device to a PC:

1. Connection via an interface converter:



2. Use of the UMG 96-PA (slave) via an UMG (master) using a Gateway function (such as UMG 512):



CAUTION

Property 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.

8.2 RS485 interface

The RS485 interface for this device is designed as a 3-pole plug contact and communicates via the Modbus RTU protocol.

Recommended cable type:

- **Unitronic Li2YCY(TP) 2x2x0.22 (Lapp cable).**

Connection capacity of the terminal:

- 0.2 - 1.5 mm²

(see chapter “Technical Data”)

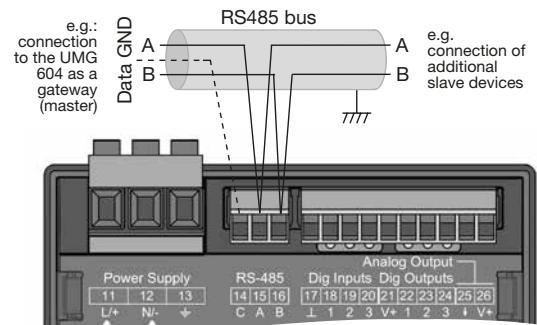


Fig. Fig. RS485 interface, 3-pole plug contact

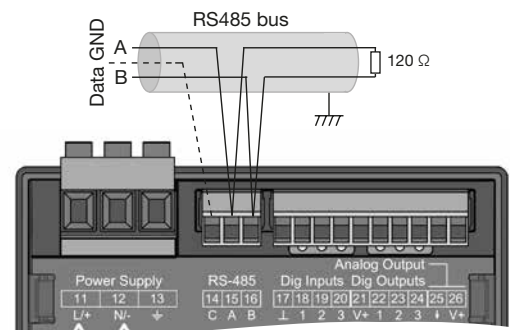


Fig. RS485 interface, 3-pole plug contact with termination resistor (item no. 52.00.008)

NOTE

CAT cables are not suitable for the bus wiring! Use the cable types recommended for this (see above).

A segment of an RS485 bus structure can contain up to 32 participants/devices. Use repeaters to connect segments with more than 32 participants/devices.

The device does not contain an integrated termination resistor (see chap. „8.4 Termination resistors“ on page 25).

8.3 Shielding

For connections via the interfaces, provide a twisted and shielded cable and observe the follow points for the shielding:

- Ground the shields of all cables that lead into the cabinet at the cabinet entrance.
- Connect the shield over a large area and with good conductivity to a noiseless ground.
- Do **NOT** connect the shield to terminal C (GND)
- Mechanically trap the cable above the grounding clamp in order to prevent damage caused by cable movement.
- Use appropriate cable entries for guiding the cable into the switch cabinet, for example, PG glands.

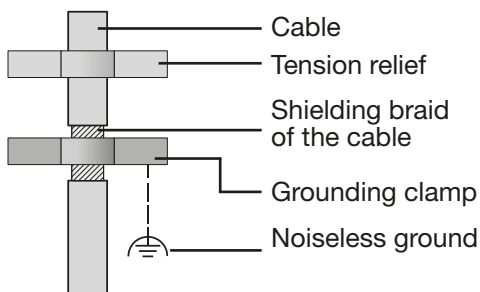
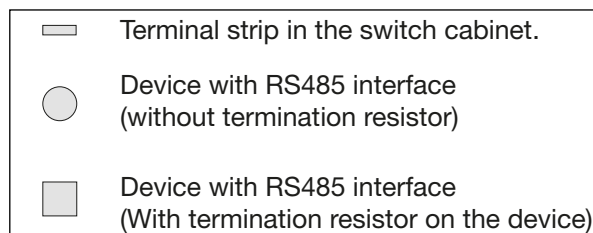
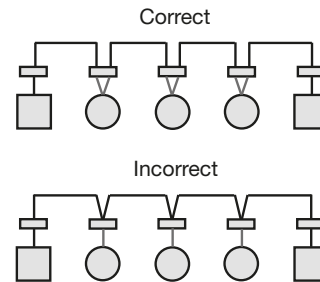


Fig. Shielding design at cabinet entrance.

8.4 Termination resistors

The cable is terminated with resistors (bus terminator, 120 Ω , 1/4 W) at the start and end of a segment.

The device does not contain an integrated termination resistor.



WARNING

Transmission errors and risk of injury due to electrical disturbance!

Due to atmospheric discharge, errors in the transmission and dangerous voltages on the device can arise.

Therefore, please observe the following:

- **Place the shielding at least once on functional ground (PE).**
- **If there is a greater source of interference or the frequency converters are in the switch cabinet, connect the shielding as close as possible on the device to the functional ground (PE).**
- **Adhere to the maximum cable length of 12000 m at a baud rate of 38.4 k.**
- **Use shielded cable.**
- **Lay interface lines separated or additionally insulated from the system parts carrying mains voltage.**

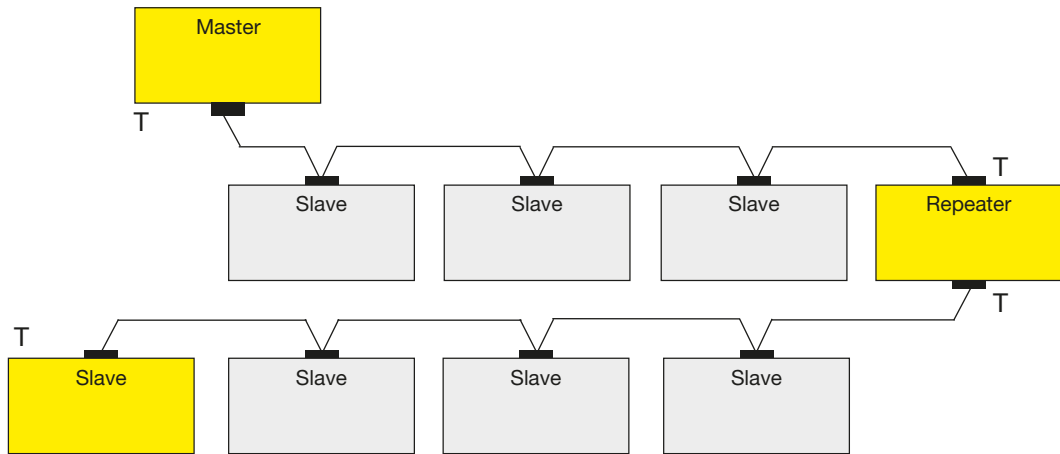
8.5 Bus structure

In a bus structure

- all devices are connected in line.
- each device has its own address (see chap. „12.1 Communication“ on page 34).
- up to 32 participants/devices can be interconnected in a segment. The cable is terminated with resistors (bus terminator, 120 ohm, 1/4 W) at the start and end of a segment.
- Repeaters (line amplifiers) are used for more than 32 subscribers to connect the segments.

- Devices with an activated bus terminator must be supplied with power.
- Placing the master at the end of a segment is recommended. If the master is replaced with an activated bus terminator, the bus is deactivated.
- The bus can become unstable if a slave is replaced with an activated bus terminator or is de-energized.
- Devices, which are not subscribed to the bus terminator, can be replaced without making the bus unstable.

Fig. Illustration of a bus structure



Speisung notwendig / power supply necessary

Master - e.g. UMG 604-PRO

T Busabschluss eingeschaltet / bus terminator on

Slave - UMG 96PA

9. Digital Inputs and Outputs

The device has

- 3 digital inputs and
- 3 digital outputs.

9.1 Digital inputs

The device has three digital inputs allowing a connection, for example, to one signal each. If a signal is active, the corresponding LED is illuminated green.

The device recognizes an input signal on the digital input if

- A voltage of at least 18 V and no more than 28 V DC (typically at 4 mA) is applied.
- A current of at least 0.5 mA and no more than 6 mA is applied.

NOTE

Observe the polarity of the supply voltage.

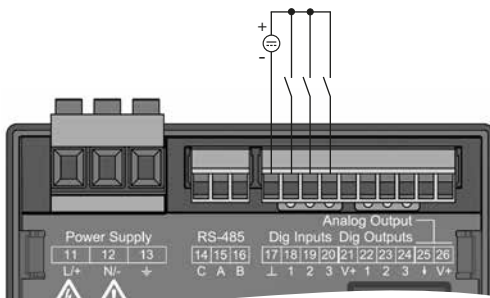


Fig. Port for digital inputs

CAUTION

Transmission errors and property damage due to electrical failure.

At a line length exceeding 30 m, there is a likelihood of transmission errors and damage to the device as a result of atmospheric discharge. **Use shielded lines for connecting to the digital inputs and outputs!**

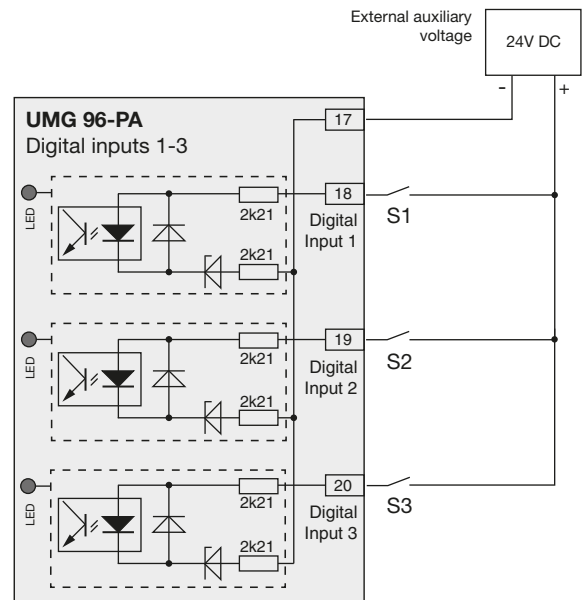


Fig. Example for connecting the external switching contacts S1-S3 to the digital inputs 1, 2 and 3.

9.1.1 S0 pulse input

Every digital input is designed for connecting an S0 pulse generator according to DIN EN62053-31.

You require an external auxiliary voltage with an output voltage in the range of 18 - 28 V DC and a resistance with 1.5 kOhm.

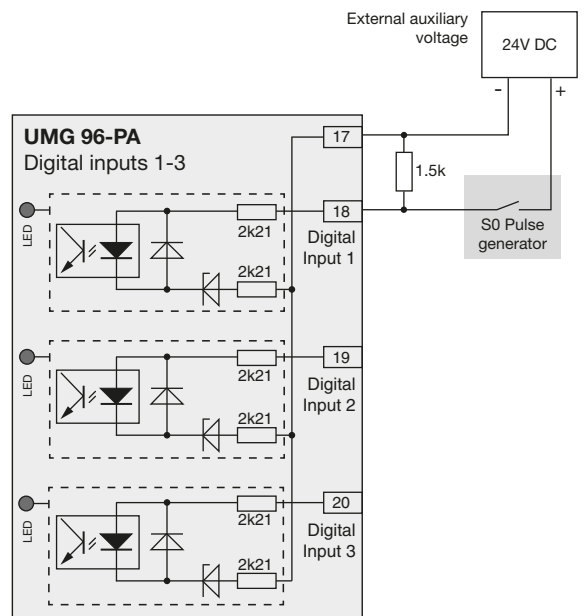


Fig. Example for connecting an S0 pulse generator to a digital input 1.

9.2 Digital outputs

The device has 3 digital outputs that

- Are electrically isolated from the analysis electronics via an optical coupling.
- Have a common reference.
- **Are not** short-circuit proof.
- Require an auxiliary voltage.
- Can be used as pulse outputs.
- Can switch DC and AC loads.
- Can be controlled via Modbus.
- Can emit results from comparators.

CAUTION

Property damage due to connection fault.
The digital outputs are not short circuit proof!
Therefore, connection faults may cause damage to the connections.
When connecting the outputs, ensure that the wiring is correct.

NOTE

- Functions for the digital outputs can be easily and clearly configured in the GridVis® software (see www.janitza.de).
- A connection between the device and the PC is required via an interfaces for use of the GridVis software®.

UMG 96-PA^{MID}:

- The function “MID active energy” is assigned to digital output 1 (terminal 21/22) of the UMG 96-PA^{MID}. The function “MID active energy” is allocated to Digital output 1 and can be neither modified nor configured otherwise!

CAUTION

Measurement errors when used as a pulse output.

When using the digital outputs as a pulse output, measurement errors may occur as a result of residual current.

For the supply voltage (DC) of the digital inputs and outputs, use a power adaptor with a residual current below 5% of the supply voltage.

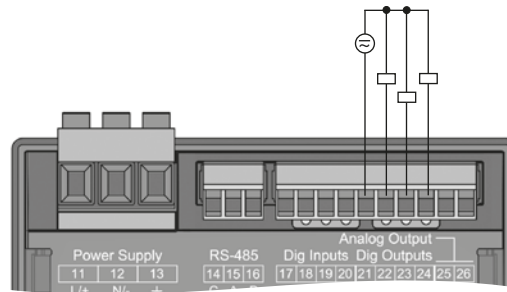


Fig. Port for digital/pulse outputs

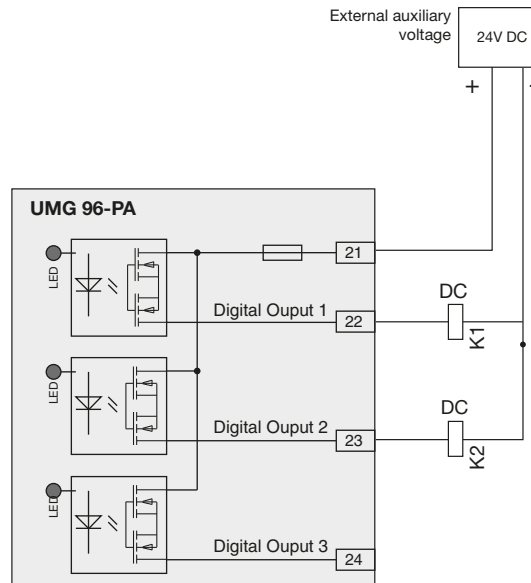


Fig. Connection example of two relays to the digital outputs

9.3 LED status bar

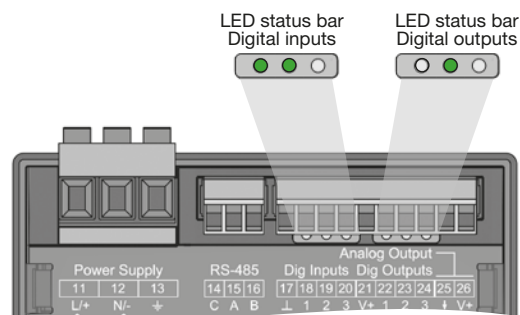
The LED status bar on the rear of the device shows the different input and output states.

Digital inputs

Each LED assigned to the input is illuminated in green if a signal of at least 4 mA flow at this interface.

Digital outputs

Each LED assigned to the input is illuminated in green if the output is set as active - irrespective of any additional connection to this interface.



10. Analog Output

The device has one passive analog output that can output a current of 0 - 20 mA. An external power adapter (24 V DC) is required for operation.

The connectable load must not exceed a resistant of 300 ohm.
 If the analog output is loaded with a higher resistance, the output range (20 mA) is limited.

The measured value assigned to the analog output, the start and end values and the output range 4 - 20 mA or 0 - 20 mA must be set via the GridVis® software (more information can be found in chapter „13.13 Analog output“ on page 56)

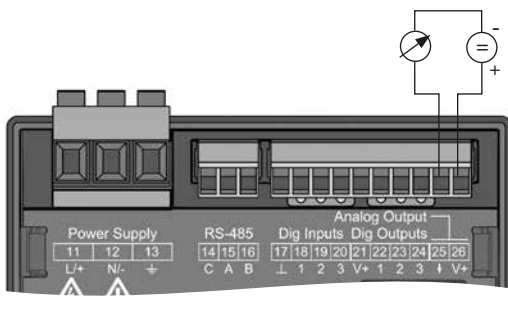
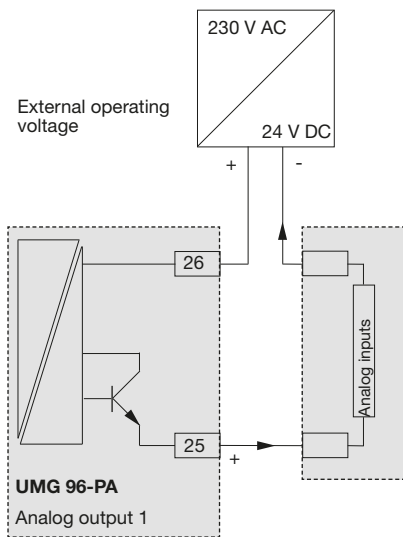


Fig. Analog output connection



11. Operation

The device is operated via six function keys, which, depending on the context, are assigned various functions:

- Selecting displayed measured values.
- Navigation within the menus.
- Editing device settings.

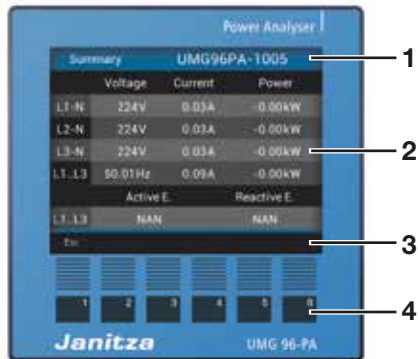


Fig. 96-PA measured value display "Overview"

- 1 Display title
- 2 Measured values
- 3 Labeling of the function keys
- 4 Function keys

11.1 Key assignment

Key	Function
	<ul style="list-style-type: none"> · Selection menu · Exit menu, back (Esc) · Press several times: Back to measured value display "Overview"
	<ul style="list-style-type: none"> · Select number · Set check box (◀)
	<ul style="list-style-type: none"> · Change (number -1) · Set check box (▼) · Select menu item (▼)
	<ul style="list-style-type: none"> · Change (number +1) · Set check box (▲) · Select menu item (▲)
	<ul style="list-style-type: none"> · Select number · Set check box (▶)
	<ul style="list-style-type: none"> · Open selection menu · Activate input · Confirm selection (Enter)

11.2 Measured value display "Overview"

Start screen UMG 96-PA:

After the power returns, the **UMG 96-PA** starts with the measured value display "Overview".

Start screen UMG 96-PA^{MID}:

The **UMG 96-PA^{MID}** starts with the measured value display "MID active energy".

This measure value display contains the device name and an overview of important measured values. In delivery state, the device name consists of the device type and the serial number of the device.

Pressing key 1 (Esc) several times branches out the measured value display "Overview"!

Summary		UMG96PA-1005	
	Voltage	Current	Power
L1-N	224V	0.03A	-0.00kW
L2-N	224V	0.03A	-0.00kW
L3-N	224V	0.03A	-0.00kW
L1..L3	50.01Hz	0.09A	-0.00kW
	Active E.		Reactive E.
L1..L3	NAN		NAN
Esc			

Fig. Measured value display "Overview"

11.3 Selection menu

If you are in the measured value display "Overview", open the main menu by pressing key 1 (Esc).

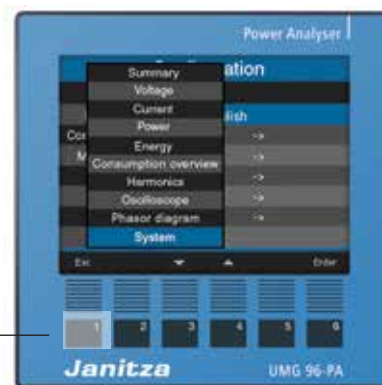
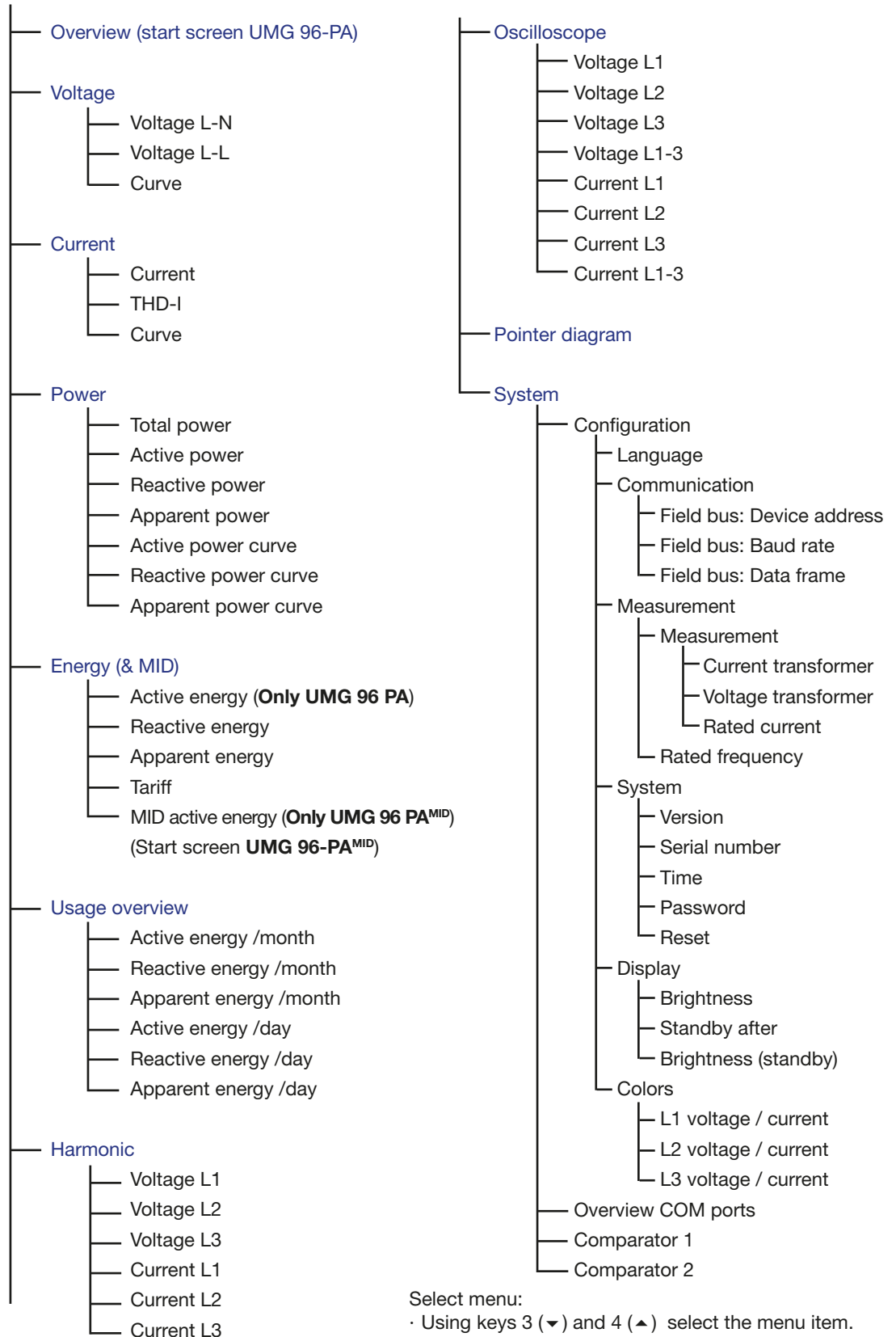


Fig. UMG 96-PA main menu

Key 1 (Esc): Main menu

11.4 Overview of main screens

Main menu



Select menu:

- Using keys 3 (▼) and 4 (▲) select the menu item.
- Confirm this using key 6 (Enter).
- Exit the selection with key 1 (Esc).

12. Configuration

To configure the device, connect the supply voltage. For this purpose, proceed as described in 13.1 on page 43.

NOTE

The configuration of the UMG 96-PA^{MID} is password protected (cf. „14.7 Password configuration“ on page 65).

- If you are **not** in the measured value display “Overview”, switch to this view by pressing key 1 (Esc) several times.
- Press key 1 (Esc) to open the main menu. With keys 3 (▼) and 4 (▲) select the “System” and confirm your selection with key 6 (Enter).
- Select “Configuration” and confirm the selection with key 6 (Enter).

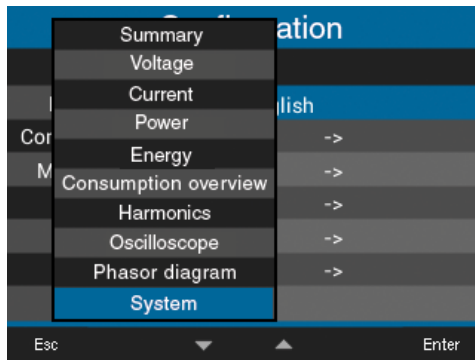


Fig. Main menu, “System” selection

12.2 Language

In the configuration menu, set the desired language for the measured value displays and menus under “Language”.

- Open the configuration menu (see chapter 12 “Configuration”).
- Using keys 3 (▼) and 4 (▲) select the item “Language”.
- Confirm using key 6 (Enter).

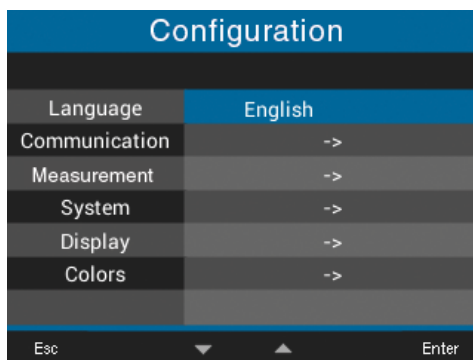


Fig. Configuration menu, “Language” selection

Using the keys 3 (▼) and 4 (▲) select the desired language (“German”, “English”).

- Confirm the selection using key 6 (Enter).
- Exit the configuration screen by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu. Select the desired measured value display with keys 3 (▼) and 4 (▲). Confirm the selection with key 6 (Enter) or navigate directly to the measured value display “Overview” by pressing key 1 (Esc).

12.1 Communication

In the configuration menu, set the parameters for the RS485 interface of your device.

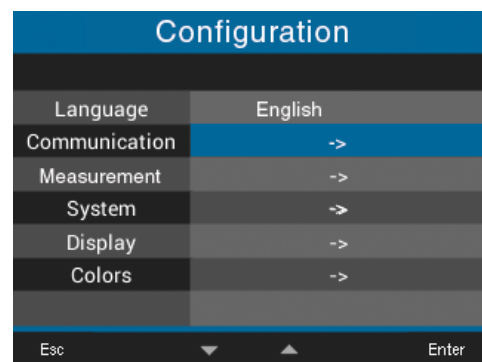


Fig. Configuration menu, “Communication” selection

- Open the configuration menu (see chapter 12 “Configuration”).
- Using keys 3 (▼) and 4 (▲) select the menu item “Communication”.
- Confirm using key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the desired parameters
 - Device address,
 - Baud rate
 - Data frame.
- Confirm the selection using key 6 (Enter).
- Change the parameter values with keys 3 (▼) and 4 (▲).
 - Device address: Using keys 2 (◀) and 5 (▶) set the number position.
- Confirm using key 6 (Enter).
- Close the “Communication” menu by pressing key 1 (Esc).
- Exit the configuration menu by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲). Confirm the selection with key 6 (Enter) or navigate directly to the measured value display “Overview” by pressing key 1 (Esc).

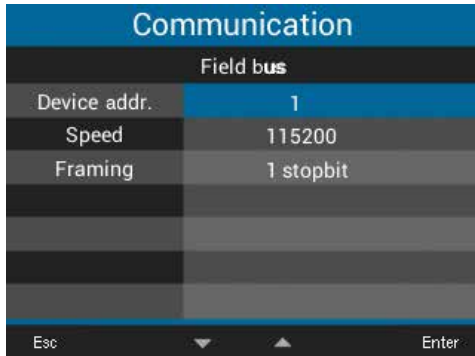


Fig. Menu communication, selection "device address"

Settings:

- Device address:
Select a device address for the device, which is used to address the device in the bus. This address must be unique in the bus structure.
Setting range: 1 - 250
Default setting: 1
- Baud rate:
Select the baud rate consistently for all devices in the bus structure.
Setting range: *Auto*, 9600, 19200, 38400, 57600, 115200 kbps
Default setting: *Auto*
- Data frame:
Set the data frame consistently for all devices in the bus.
Setting range:
 - "odd" (parity odd or odd with 1 stop bit)
 - "even" (parity even or even with 1 stop bit)
 - "1 stop bit" (parity none or none with 1 stop bit)
 - "2 stop bits" (parity none or none with 2 stop bit)
 - Default setting: 1 stop bit (no parity)



CAUTION

Property 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.

12.3 Measurement

In the "Measurement" menu, you configure the ratio of the current and voltage transformer (primary to secondary side), the rated current and the rated frequency.

12.3.1 Rated frequency

The power frequency is required to measure and calculate measured values. The device is suitable for measurements in lines with a frequency in the range of 45 Hz to 65 Hz.

- Open the configuration menu (see chapter 12 "Configuration").
- Using keys 3 (▼) and 4 (▲) select the menu item "Measurement" from the configuration menu.
- Confirm using key 6 (Enter).
- With keys 3 (▼) and 4 (▲) select the item "rated frequency" and confirm with key 6 (Enter).

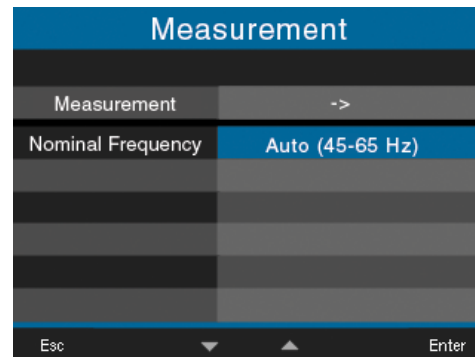


Fig. Menu Measurement, selection rated frequency

- With keys 3 (▼) and 4 (▲) select the desired setting and confirm it with key 6 (Enter). Cancel this action with key 1 (Esc).

NOTE

The UMG 96-PA^{MID} only supports automatic frequency calculation (45 -65 Hz)!

- Exit the "Measurement" menu by pressing key 1 (Esc).
- Exit the configuration menu by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲) . Confirm the selection with key 6 (Enter) or navigate directly to the measured value display "Overview" by pressing key 1 (Esc).

Setting range:

- *Auto (45-65 Hz)*
- 60 Hz (const. frequency) - only UMG 96-PA
- 50 Hz (const. frequency) - only UMG 96-PA

Standard setting:

- *Auto (45-65 Hz)*

NOTE

Devices set to automatic frequency recognition require about 5 seconds until the power frequency is determined. During this time, the measured values do not adhere to the promised measurement uncertainty.

To determine power frequency, a voltage greater than 20 V_{eff} (4-conductor measurement) or a voltage L1-L2 greater than 34 V_{eff} (3-conductor measurement) must be present at voltage measurement input V1.

NOTE

If the power frequency is outside of the 45-65 Hz range

- No errors or warning message is issued.
- If a constant frequency is indicated (50/60 Hz), the relevant setting is used.
- The last frequency calculated in the range of 45-65 Hz is used if automatic frequency detection (*auto*) is selected.

The frequency calculation runs for a period of 10 seconds. The frequency does not constitute a 200 ms measured value!

12.3.2 Current transformer and voltage transformer / rated current

In order for the device to operate as defined, you will need to set the correct current and voltage transformer ratios and the rated current.

When connecting voltage transformers, observe the measurement voltage specified on the device nameplate!

- Open the configuration menu (see chapter 12 "Configuration").
- Using keys 3 (▼) and 4 (▲) select the menu item "Measurement" from the configuration menu.
- Confirm using key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the submenu "Measurement" and confirm by pressing key 6 (Enter).
- Press keys 2 to 5 (◀ ▼ ▲ ▶) to select the desired setting and confirm it with key 6 (Enter).
- Using keys 2 (◀) and 5 (▶) set the number position.
- Using keys 3 (▼) and 4 (▲) to change the number (-1 / +1).

- Confirm your entries with key 6 (Enter) or cancel the action with key 1 (Esc).
- Exit the view "Measurement L1..L3" by pressing key 1 (Esc).
- Exit the view "Measurement" by pressing key 1 (Esc).
- Exit the configuration menu by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲) . Confirm the selection with key 6 (Enter) or navigate directly to the measured value display "Overview" by pressing key 1 (Esc).

Settings:

- Current transformer (primary):
Setting range: 0 - 32000 A
Default setting: 5 A
- Current transformer (secondary):
Setting range: 1 - 5 A
Default setting: 5 A
- Voltage transformer (primary):
Setting range: 0 - 32000 V
Default setting: 400 V
- Voltage transformer (secondary):
Setting range: 0 - 999 V
Default setting: 400 V
- Rated current:
Setting range: 0 - 999999 A
Default setting: 150 A

Measurement		
	primary	secondary
Current Transformer	5A	5A
Voltage Transformer	400V	400V
Nominal Current	150A	
Esc ◀ ▶ ▶ ▶ Enter		

Fig. Display "Measurement L1..L3", configuration of the current and voltage transformer ratios and the rated current

NOTE

The adjustable value "0" for the primary current transformer does not yield a reasonable energy value and must not be used.

NOTE

The **UMG 96-PA^{MID}** has an integrated log. **The log:**

- only appears in the MID device (see „14.6 Log“ on page 65).
- records password changes and changes in current and voltage transformer ratios (CT and VT).
- records a maximum of 48 changes with the recording of the respective meter reading.

After 48 entries are made in the log, the device locks the configuration of passwords and transformer ratios. Contact the support department of the device manufacturer.

12.4 System

Displays device-specific system settings, password assignment and a function for resetting values.

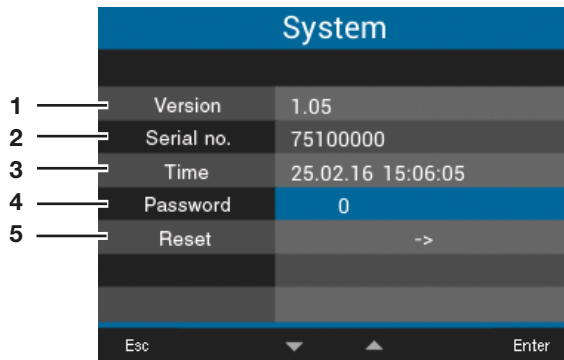


Fig. Screen "System"

- 1 Firmware version
- 2 Device's serial number
- 3 Device time / date
- 4 Password function
- 5 Reset settings

The "System" screen is displayed:

- Open the configuration menu (see chapter 12 "Configuration").
- Using keys 3 (▼) and 4 (▲) select the menu item "System" from the configuration menu.
- Confirm using key 6 (Enter).

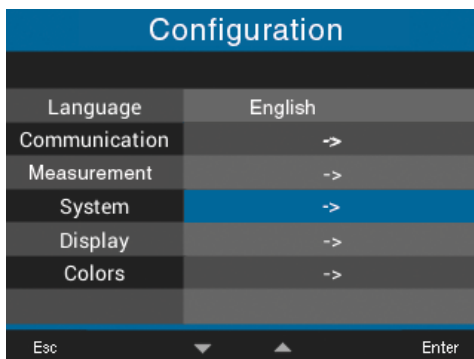


Fig. Screen "Configuration", selection "System"

12.4.1 Firmware / serial number

Export the device firmware version and the device-specific serial number for potential support inquiries or to register on the Janitza homepage (www.janitza.de).

12.4.2 Time

Displays current device time. You can change the settings for time synchronization, date/time zones and time via the GridVis® software or using the respective Modbus addresses.

12.4.3 Password

You can use a password to block access to the configuration. The device can only be configured after entering the password.

The password consists of a number combination of up to 5 digits.

Setting ranges (**devices without MID**):

- 1-99999 = With password
- 0 = No password

Default setting:

- 0 = No password

No password (=0) is programmed for UMG 96-PA by the factory!

NOTE

Other requirements for password configuration apply to the **UMG 96-PA^{MID}** (see „14.7 Password configuration“ on page 65).

To change the password, you need the current password.

NOTE

- Note your password and keep it in a safe place!
- You cannot configure your device without a password. Contact Janitza support if you lose the password!

Setting the password:

- Open the configuration menu (see chapter 12 “Configuration”).
- Using keys 3 (▼) and 4 (▲) select the menu item “System” from the configuration menu.
- Confirm using key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the submenu “Password” and confirm by pressing key 6 (Enter).

System	
Version	1.05
Serial no.	75100000
Time	25.02.16 15:06:05
Password	0
Reset	->

Fig. Screen “System”, selection “Password”

- Use keys 2 to 5 (◀ ▼ ▲ ▶) to set the desired password. With keys 2 (◀) and 5 (▶) set the numbers position. Using keys 3 (▼) and 4 (▲) to change the number (-1 / +1).
- Confirm your entries with key 6 (Enter) or cancel the action with key 1 (Esc).
- Exit the view “System” by pressing key 1 (Esc).
- Exit the configuration menu by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲). Confirm the selection with key 6 (Enter) or navigate directly to the measured value display “Overview” by pressing key 1 (Esc).

NOTE

In addition to changes to the current and voltage transformer ratios, the **UMG 96-PA^{MID}** also stores each **password change** in the integrated log. The device blocks password configuration after 48 entries in the log.

12.4.4 Reset

Measured values and device parameters are deleted and reset with this function.

Energy

You can delete all energy meters in the device at the same time. It is not possible to select specific energy meters.

NOTE

When resetting the **UMG 96-PA^{MID}**, the certified energy values active energy can be supplies and pulled (device parameters 6444 and 6448), but not deleted!

- Open the configuration menu (see chapter 12 “Configuration”).
- With keys 3 (▼) and 4 (▲) select the menu item “System” and confirm with key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the submenu “Reset” and confirm with key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the desired function.
- Confirm the entries with key 6.

Reset	
Energy	No
Min./Max. values	No
Factory settings	No
Restart	No

Fig. Display “Reset”, Reset the energy meter

- Using the keys 3 (▼) and 4 (▲) select the desired option “Yes” or “No”.
- Confirm your entries with key 6 (Enter) or terminate the action with key 1 (Esc).
- Exit the view “Reset” by pressing key 1 (Esc).
- Exit the view “System” by pressing key 1 (Esc).
- Exit the configuration menu by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲) and confirm with key 6 (Enter) or switch to the measured value display “Overview” with key 1 (Esc).

Min. / max. Values

You can delete all minimum and maximum values in the device at the same time. It is not possible to select specific energy meters.

NOTE

Before commissioning, delete possible production-related contents of the energy meter, the min./max. Values and recordings.



Fig. Menu "Reset", delete min./max. values

- Open the configuration menu (see chapter 12 "Configuration").
- Using keys 3 (▼) and 4 (▲) select the menu item "System" from the configuration menu.
- Confirm using key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the submenu "Reset" and confirm with key 6 (Enter).
- With keys 3 (▼) and 4 (▲) select the function "Min./max. values" and confirm with key 6 (Enter).
- Using the keys 3 (▼) and 4 (▲) select the desired option "Yes" or "No".
- Confirm your entries with key 6 (Enter) or terminate the action with key 1 (Esc).
- Exit the view "Reset" by pressing key 1 (Esc).
- Exit the view "System" by pressing key 1 (Esc).
- Exit the configuration menu by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲). Confirm the selection with key 6 (Enter) or navigate to the measured value display "Overview" by pressing key 1 (Esc).

Factory settings

Under the entry "Factory settings" in the "Reset" window, you reset all settings, such as configuration and recorded data, to the factory default settings.

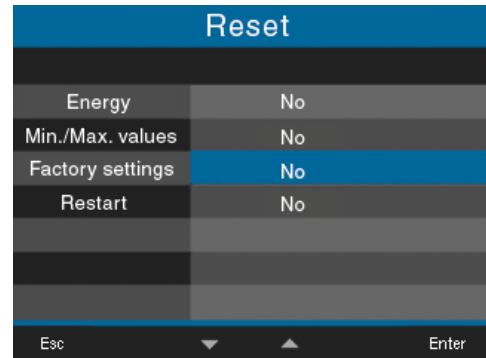


Fig. "Reset" menu, load factory state

- Open the configuration menu (see chapter 12 "Configuration").
- Using keys 3 (▼) and 4 (▲) select the menu item "System" from the configuration menu.
- Confirm using key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the submenu "Reset" and confirm with key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the function "Factory setting" and confirm with key 6 (Enter).
- Using the keys 3 (▼) and 4 (▲) select the desired option "Yes" or "No".
- Confirm with key 6 (Enter) or cancel the action with key 1 (Esc).
- Confirm the warning with key 6 (Enter) or cancel the action with key 1 (Esc).
- The device restarts.

NOTE

When resetting the **UMG 96-PA^{MID}** to factory settings, the current and voltage transformer settings **cannot** be reset!

Restart

Proceed as follows to restart the device manually:

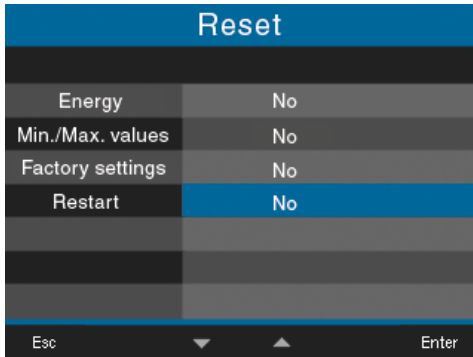


Fig. "Restart" menus, restart the device

- Open the configuration menu (see chapter 12 "Configuration").
- Using keys 3 (▼) and 4 (▲) select the menu item "System" from the configuration menu.
- Confirm using key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the submenu "Reset" and confirm with key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the function "Restart" and confirm with key 6 (Enter).
- Using the keys 3 (▼) and 4 (▲) select the desired option "Yes" or "No".
- Confirm your entries with key 6 (Enter) or terminate the action with key 1 (Esc).
- The device restarts.

12.5 Display

Adjust the device's display settings from this menu item:

- Brightness
- Standby after
- Brightness (st. by)



Fig. "Display" menu

- Open the configuration menu (see chapter 12 "Configuration").
- Using keys 3 (▼) and 4 (▲) select the menu item "Display".
- Confirm using key 6 (Enter).
- With keys 3 (▼) and 4 (▲) select the desired submenu and confirm with key 6 (Enter).
- With keys 2 to 5 (◀ ▼ ▲ ▶) select the display value.
- Using keys 2 (◀) and 5 (▶) set the number positions.
- Using keys 3 (▼) and 4 (▲) to change the number (-1 / +1).
- Confirm your entries with key 6 (Enter) or terminate the action with key 1 (Esc).
- Exit the "Display" menu by pressing key 1 (Esc).
- Exit the configuration menu by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲).
- Confirm the selection with key 6 (Enter) or switch to the measured value display "Overview" by pressing key 1 (Esc).

12.5.1 Brightness

Set the device's display brightness.

- Setting range: 30 - 100
Default setting: 70

with 30 % = dark
100 % = very bright

12.5.2 Standby

Set the time in seconds, after which the display brightness switches to the set standby brightness.

- Setting range: 60 - 3600
Default setting: 900

12.5.3 Brightness (standby)

Set the display brightness to which the device switches over after the end of the standby time.

- Setting range: 20 - 60
Presetting: 30

with 20 % = dark
60 % = very bright

12.6 Colors

Set the colors for illustrating current and voltage in the graphic illustrations.



Fig. "Color" menu,

- Open the configuration menu (see chapter 12 "Configuration").
- Using keys 3 (▼) and 4 (▲) select the menu item "Colors" from the configuration menu.
- Confirm using key 6 (Enter).
- With keys 3 (▼) and 4 (▲) select the desired option and confirm with key 6 (Enter).
- Set the color with keys 3 (▼) and 4 (▲).
- Confirm your entries with key 6 (Enter) or cancel the action with key 1 (Esc).
- Exit the "Color" menu by pressing key 1 (Esc).
- Exit the configuration menu by pressing key 1 (Esc).
- Press key 1 (Esc) to open the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲). Confirm the selection with key 6 (Enter) or navigate directly to the measured value display "Overview" by pressing key 1 (Esc).

13. Commissioning

13.1 Connecting supply voltage

1. Connect the supply voltage with a terminal on the rear of the device.
2. After connecting the supply voltage, the measured value display "Overview" appears on the screen.
3. If no screen appears, check whether the supply voltage is within the rated voltage range.

CAUTION

Property damage due to noncompliance with the connection conditions.

Noncompliance of the connection conditions can damage or destroy your device.

Therefore, please observe the following:

- Observe the specifications on the nameplate relating to voltage and frequency.
- Do not use the device to measure DC current.

NOTE

Before commissioning, delete possible production-related contents of the energy meter, the min./max. Values and recordings.

13.2 Measured voltage

Voltage measurements in lines with rated voltage exceeding the maximum specified rated voltage (see chapter 6.2 "Rated voltages") must be connected using voltage transformers.

Connect the measured voltage:

1. Connect the measured voltage with a terminal on the rear of the device.
2. After the measured voltage has been connected, the measured value displayed by the device for voltages L-N and L-L must match those at measurement input.
3. You may need to account for the set voltage transformer factors.

WARNING

Risk of injury due to electric voltage!

If the device is subject to impulse voltages exceeding the permissible overvoltage category, safety-relevant insulations in the device may suffer damage. As a result, the safety of the product can no longer be guaranteed.

Only use the device in environments in which the permissible overvoltage category is not exceeded.

13.3 Measured current

The device:

- is designed for the connection of current transformers with secondary currents of $\dots/1$ A and $\dots/5$ A.
- does not measure DC currents.
- features current measurement inputs that can be loaded with 60 A (sinusoidal) for 1 second.

The default current transformer ratio is set to 5/5 A and may need to be adjusted to the current transformer used.

1. Short circuit all current transformer outputs except for one.
2. Compare the current displayed on the device with the applied input current.
 - The currents must match allowing for the current transformer transformation ratio.
 - The device must display approx. 0 amperes in the short circuited current measurement inputs.

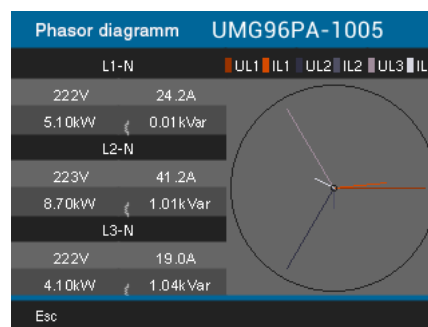


Fig. Pointer diagram

13.5 Frequency

The device requires the rated or power frequency to measure and calculate measured values, which can either be specified by the user or automatically determined by the device.

NOTE

The UMG 96-PA^{MID} only supports automatic frequency calculation (45 -65 Hz)!

- To determine power frequency, a voltage greater than 20 V_{eff} (4-conductor measurement) or a voltage L1-L2 greater than 34 V_{eff} (3-conductor measurement) must be present at voltage measurement input V1.
- The power frequency must be within the range of 45 to 65 Hz.
- If the applied voltage is not sufficiently high, the device will be unable to determine the power frequency and thus will also not be able to conduct a measurement.

More information can be found in chap. „12.3.1 Rated frequency“ on page 35

13.4 Phase sequence

Verify the direction of the rotating field voltage in the measured value display of the device.

- Normally a “right” rotation field exists.

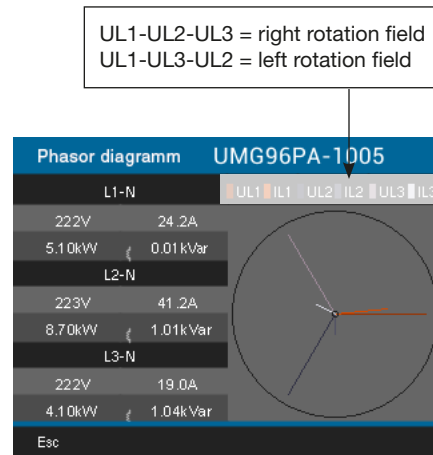


Fig. Illustration of the phase sequence according to the rotation field direction.

To do this, open the menu screen “Pointer diagram”:

- If you are **not** in the measured value display “Overview”, switch to this view by pressing key 1 (Esc) several times.
- Press key 1 (Esc) to open the main menu.
- With keys 3 (▼) and 4 (▲) select “Pointer diagram” and confirm your selection with key 6 (Enter).

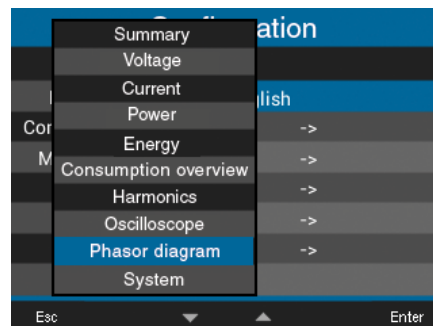


Fig. Main menu, “Pointer diagram” selection

13.5.1 Principles of the pointer diagram

The pointer diagram provides a graphic description of the phase shift or the phase angle between voltage and current. The pointers rotate with a consistent angle speed - proportionate to the frequency of voltage and current - around an original source. Thus, the pointer diagram shows the current state of the variables in an AC circuit.

Illustration of ohmic resistance:

- Voltage and current are in phase

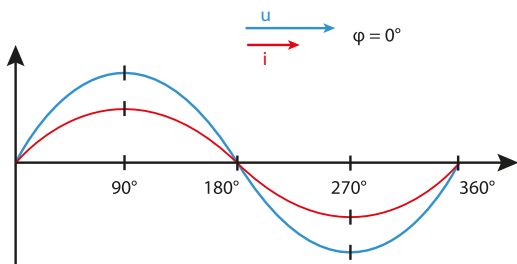


Illustration of inductance:

- The voltage leads the current
- For an ideal coil, the phase shift is 90°

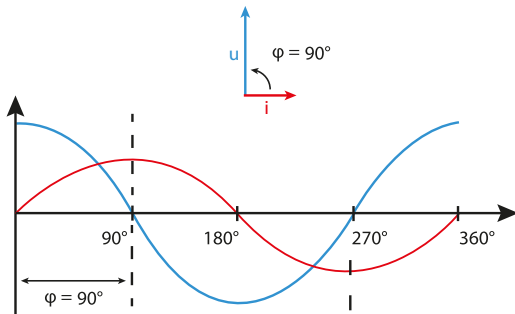
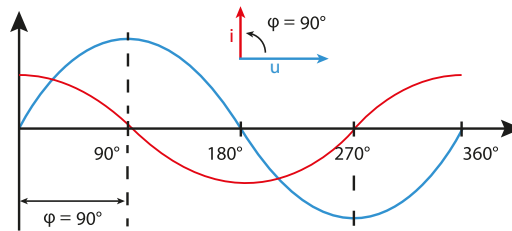
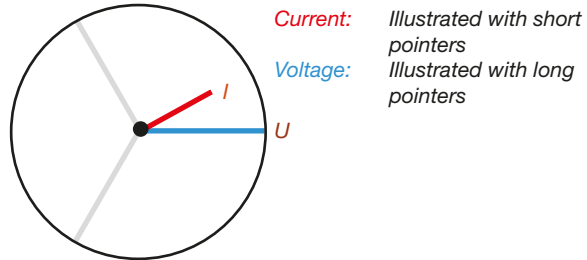


Illustration of capacitance:

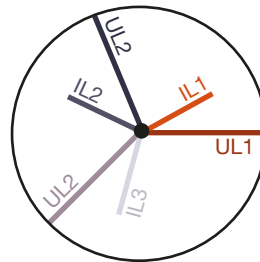
- The current leads the voltage
- For an ideal capacitor, the phase shift is 90°



In a combination of the states, the phase angle "current to voltage" can assume values of between -90° and $+90^\circ$.



Example pointer diagram (3 phases)



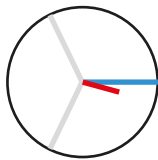
Current and voltage are out of phase. The current leads the voltage, causing a capacitive load to the line.

Controlling the voltage and current inputs using a pointer diagram:

The pointer diagram can be used to control improper connections to voltage and current inputs.

Example 1

Predominant ohmic load.

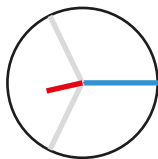


Voltage and current are only slightly displaced in the phase.

- The current measurement input is assigned to the correct voltage measurement input

Example 2

Predominant ohmic load.



Voltage and current show a displacement of approximately 180° in the phase.

- The measured current input is assigned to the correct voltage measurement input.
- In the current measurement under consideration, connections k and l are reversed, or power is being fed back into the supply network.

	WARNING
Property damage due to noncompliance with the connection conditions.	
Voltages and currents outside of the permissible measurement range may destroy the device.	
Observe the measuring range specifications defined in the technical data.	

13.6 Exceeding the measurement range

If the measuring range is exceeded, the device display shows the warning notice “*Measuring range exceeded*” and specifies the current and voltage path.

Exceeded measuring ranges are displayed as active as long as they are present and cannot be acknowledged. An exceeded measuring range is present if at least one of the voltage or current inputs is outside of its specific measuring range.

Limit values for exceeded measuring range (200 ms effective value):

$$I = 6 A_{rms}$$

$$U_{L-N} = 600 V_{rms}$$

Summary		UMG96PA-1005	
	Voltage	Current	Power
L1-N	Measurement over range		W
L2-N			W
L3-N			W
L1..L3			W
L1..L3	U-1	I-1	
	U-2	I-2	
	U-3	I-3	
Esc			

Fig. Warning notice when the measuring range is exceeded in the current and voltage paths I1-I3 and U1-U3.

13.7 Checking the time

To enable correct assignment of times to the measurement data records requires a correct specification of the time. Check and, if needed, correct the time and date settings in the *Configuration / System* menu (see chap. „Time“ on page 38).

13.8 Checking the power measurement

Short circuit all current transformer outputs except for one and verify the powers displayed.

- The device may only display one power in the phase with the current transformer output that is not short circuited.
- If this is not the case, verify the connections of the measured voltage and the measured current.

If the value of the active power is correct, but the sign is negative, this can have two causes:

1. Reversed connections S1(k) and S2(l) on the current transformer, or
2. Active energy is being fed back into the network.

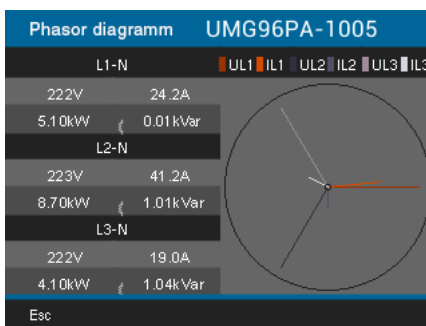


Fig. Illustrated in the pointer diagram are voltages with long pointers and currents with short pointers.

Pull up the pointer diagram with details about the power:

- If you are **not** in the measured value display “Overview”, switch to this view by pressing key 1 (Esc) several times.
- Press key 1 (Esc) to open the main menu.
- With keys 3 (▼) and 4 (▲) select “Pointer diagram” and confirm your selection with key 6 (Enter).

13.9 Checking the communication

The device counts all received (RX), all transmitted (TX) and all faulty data packages.

Ideally, the number of faults shown in the Faults column equals 0.

System UMG96PA-1005			
Port	RX	TX	Error
RS485	0	0	0
I/O	Nr. 1	Nr. 2	Nr. 3
Digital In	0	0	0
Digital Out	0	0	0
Analog Out	0mA		
Esc			

Fig. “Overview” menu with view of communication parameters (Com. View).

- If you are **not** in the measured value display “Overview”, switch to this view by pressing key 1 (Esc) several times.
- Press key 1 (Esc) to open the main menu.
- Using keys 3 (▼) and 4 (▲) select “System” from the main menu.
- Confirm using key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the submenu “Overview COMports” and confirm with key 6 (Enter).

Pulling up main menu:

- If you are in the view “Overview COMports” pull up the submenu with key 1 (Esc).
- Press key 1 (Esc) again to pull up the main menu.
- Select the desired measured value display with keys 3 (▼) and 4 (▲) . Confirm the selection with key 6 (Enter) or navigate directly to the measured value display “Overview” by pressing key 1 (Esc).

13.10 Delete min./max. Values individually

In the measured value displays for voltage, current and power with

- Voltage L-N and voltage L-L
 - Current and THD-I
 - Total power and
 - Active, reactive and apparent power
- each of the min./max. Values can be deleted with key 6 (Enter).

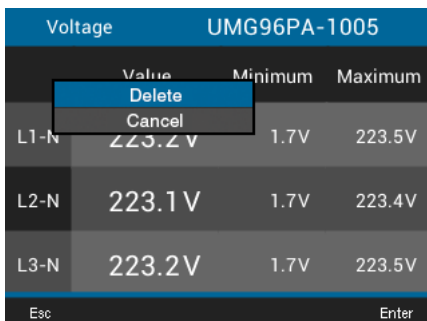


Fig. Measured value display "Voltage L-N" with menu "Delete/Cancel"

- If you are **not** in the measured value display "Overview", switch to this view by pressing key 1 (Esc) several times.
- Press key 1 (Esc) to open the main menu.
- With keys 3 (▼) and 4 (▲) select the menu item "Voltage" or "Current" or "Power" and confirm with key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select a measured value display (see above) and confirm with key 6 (Enter).
- Delete the corresponding min./max. Values in the measured value display with key 6 (Enter).
- To do so, confirm the "Delete/Cancel" note by pressing key 6 (Enter). With the "Cancel" option (selection with key 3 or 4) and by confirming with key 6 (Enter), you cancel the action.

13.11 Harmonics

Harmonics are caused, for example, by operating resources with a non-linear characteristic curve. The additional frequencies represent the integer multiple of a fundamental oscillation and show how the operating resources affect the power grid. Potential effects of harmonics are, for example:

- Operating resources heat up even more
- Additional current on the neutral conductor
- An overload and a reduced service life of electric consumers

Harmonic loads are the main cause for invisible voltage quality problems which involve huge costs for repairs and require an additional investment to replace defective devices.

The device measures harmonics of the voltage in the range of 45 to 65 Hz. The calculated harmonics of the voltages and currents relate to this power frequency.

The device calculates harmonics up to 25x the fundamental oscillation.

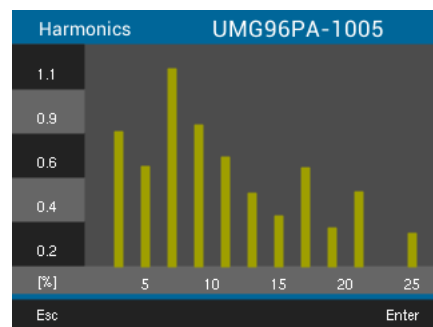


Fig. Measured value display "Harmonics"

- If you are **not** in the measured value display "Overview", switch to this view by pressing key 1 (Esc) several times.
- Press key 1 (Esc) to open the main menu.
- With keys 3 (▼) and 4 (▲) select the menu item "Harmonics" and confirm with key 6 (Enter).
- With keys 3 (▼) and 4 (▲) select the harmonics for the relevant voltage and/or current and confirm with key 6 (Enter).

13.12 Communication in the bus system

13.12.1 RS485

Data from the list of parameters and measured values can be accessed from the MODBUS RTU log with CRC check at the RS485 interface (see chapter 12.1 on page 34).

Modbus functions (slave)

03 Read Holding Registers

04 Read Input Registers

06 Preset single register

16 (10Hex) Preset multiple registers

23 (17Hex) Read/write 4X registers

The order of the bytes is high byte before low byte (Motorola format).

Transmission parameters

Data bits: 8

Parity: odd
even
none (1 Stopbit)
none (2 Stopbits)

Stopbits (UMG 96-PA): 1 / 2

Stopbits, external: 1 / 2

Number formats

short 16 bit ($-2^{15} .. 2^{15} - 1$)

float 32 bit (IEEE 754)

For more information on configuring the interface, refer to chapter 12 *“Configuration / Communication”*.

Example: Reading out the voltage L1-N

The voltage L1-N is stored in the measured value list under address 19000. The voltage L1-N is available in FLOAT format.

In this example, 01 is assumed as the device address.

The “Query message” then appears as follows:

Designation	Hex	Remark
Device address	01	Address=1
Function	03	“Read Holding Reg”
Start address Hi	4A	19000dec = 4A38hex
Start address Lo	38	
Number of Hi values	00	2dec = 0002hex
Number of Lo values	02	
Error check (CRC)	-	

The “Response” of the device may then appear as follows:

Designation	Hex	Remark
Device address	01	Address=1
Function	03	
Byte counter	06	
Data	00	00hex = 00dec
Data	E6	E6hex = 230dec
Error check (CRC)	-	

The voltage L1-N returned by the address 19000 is 230 V.

13.13 Digital Inputs/Outputs

You device has 3 digital outputs and three digital inputs.

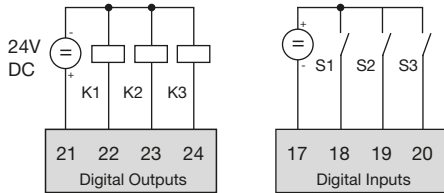


Fig. Digital Outputs and Inputs

- You configure the digital inputs and outputs using the GridVis[®] software.
- You can download the GridVis[®] software from our website (www.janitza.de).

NOTE

The **UMG 96-PA^{MID}** features limited digital output configuration!

13.13.1 Digital inputs

From the digital inputs, you send information from other devices that have a digital output directly to your device.

In addition, there is also an option to configure digital inputs as functional inputs (function mode). As a functional input, each digital input has its own function. A functional input cannot be configured as a pulse counter.

From the configuration window of the GridVis[®] software, you can configure digital inputs from the “Peripherals” area:

Function mode

- Function assigned to the digital input.

Pulse counter

- Value type of the arriving signal (such as electric power, gas/water consumption, CO₂,...)
- Pulse value for measurement or power values.
- Length of the averaging time.

The states of the digital inputs are each stored on their own Modbus address.

For each digital input, the last 16 switching activities (incidents) are logged with a time stamp.

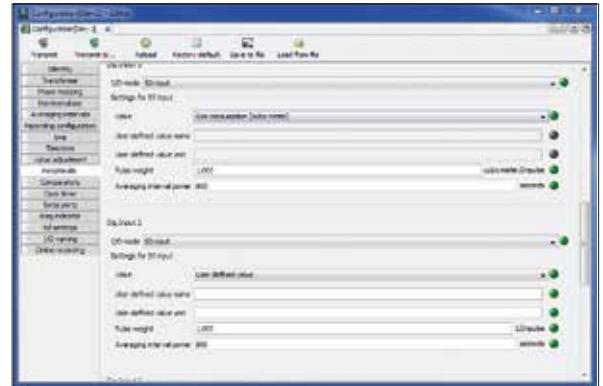


Fig. Configuring the digital inputs using the GridVis[®] software

Function mode

Each digital input can be assigned a specific function.

- Digital input 1
Configuration possible as a tariff switch (HT/NT).
- Digital input 2
Configuration to synchronize the device clock with the option to synchronize to the minute or to the hour.
The device can also be synchronized from a Modbus address.
- Digital input 3
Configuration as a reset input for synchronous value of the trailer pointing function. The trailer pointer can also be synchronized from the Modbus address.

Pulse counter

All digital inputs can be operated with a frequency of 25 Hz. Here, the pulse duration and the pulse pause must be greater than 20 ms. The typical pulse duration for S0 pulses is 30 ms.



Due to the minimum pulse duration and the minimum pulse pause, the result is a maximum number of pulses per hour as follows:

Pulse length (Pulse duration)	Pulse pause (Pulse pause)	Max. pulses/h
20 ms	20 ms	90 000 pulse/h
30 ms	30 ms	60 000 pulse/h
50 ms	50 ms	36 000 pulse/h
100 ms	100 ms	18 000 pulse/h
500 ms	500 ms	3 600 pulse/h
1 s	1 s	1 800 pulse/h
10 s	10 s	180 pulse/h

Fig. Examples for the maximum possible number of pulses per hour.

The pulse counters can be configured with a simultaneous measured value or power calculation. The pulses are counted as a 64 bit number and during continuous operation (25 Hz) spill over after approx. 1.17×10^{10} years.

Pulse value

Each digital input can be assigned a pulse value. With the pulse value you specify which measured value or power value (such as energy) should correspond to a pulse.

NOTE

The pulse interval is proportional to the power within the selected settings.

Measured values calculation:

$$\text{Measured value} = \text{pulse} \times \text{pulse value}$$

Power value calculation:

$$\text{Power value} = \frac{\text{pulse} \times \text{pulse value}}{\text{Time [s]}}$$

Because the pulse interval can be quite large, there is an option to continuously calculate the measure or power values. For this reason, only average values are calculated. The calculation of the average values results from the average value calculation from the number of pulses per period multiplied by the pulse value. To calculate the average power values, divide this value by a configurable time value.

The period is assigned to the digital input and can be configured in the range between 1 to 60 minutes. After the period has expired, the value can be called up via Modbus.

An external synchronization can be switched for each digital input, whereas one sync pulse completes one period and starts a new one. A capture time of 30 seconds is predefined as a set value for external synchronization. If no sync pulse is available after the period has expired, the system waits a maximum of 30 seconds and is then synchronized by the software. All additional periods are then synchronized by the software.

A period of 15 mins is set from the factory!

The calculation results for the S0 power value are not available until the end of this period.

NOTE

During the programming with the GridVis[®] software, you will receive a selection of energy values which are derived from the power values.

13.13.2 Digital outputs

Different functions can be assigned to the three digital outputs:

- Digital output 1¹⁾
 - Pulse output for active energy
 - Output for timer
 - Modbus remote output
- Digital output 2
 - Pulse output for reactive energy
 - Output for comparator group 1
 - Output for timer
 - Modbus remote output
- Digital output 3
 - Output for comparator group 2
 - Output for timer
 - Modbus remote output

From the configuration window of the GridVis[®] software, you can configure digital outputs from the “Peripherals” area:

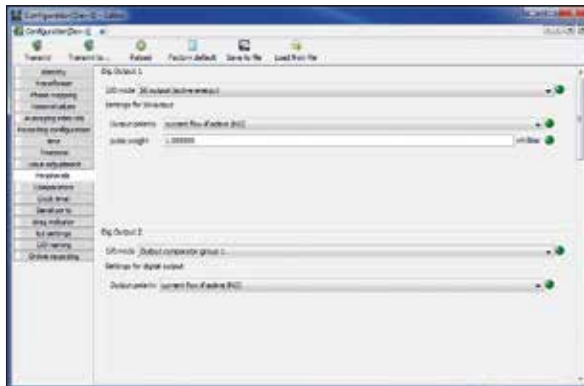


Fig. Configuring the digital outputs using the GridVis[®] software

Pulse output

Digital output 1¹⁾ and 2 can be used for the output of pulses for counting active energy and reactive energy. For this purpose, a pulse is applied at the output after a certain configurable energy quantity is reached.

NOTE

¹⁾ The function MID active energy is dedicated to digital output 1 of the **UMG 96-PA^{MID}**.

In order to use a digital output as a pulse output, you must make various settings using the GridVis[®] software within the configuration menu:

- Pulse width
- Modbus for digital input: S0 output
- Output polarity: NO, NC
- Pulse value

NOTE

The default setting for the pulse duration is 30 ms for the MID device and cannot be adjusted!

Pulse value

The pulse value specifies how much energy (Wh or varh) a pulse should correspond to.

The pulse value is determined by the maximum connected load and the maximum number of pulses per hour.

If you specify a pulse value with a:
 positive sign, pulses are only output if the measured value also has a positive sign.
 · negative sign, pulses are only output if the measured value also has a negative sign.

NOTE

Since the active energy meter works with a non-return device, pulses are only output during consumption of electrical energy.

Since the reactive energy meter works with a non-return device, pulses are only output during an inductive load.

Determining the pulse value

1. Establish the pulse length according to the requirements of the connected pulse receiver. With a pulse length of e.g. 30 ms, the device can emit a maximum number of 60,000 pulses per hour (see table “Maximum number of pulses”).
2. Calculate the maximum connected load.

Example:

Current transformer = 150/5 A
 Voltage L-N = max. 300 V

Power per phase = 150 A x 300 V
 = 45 kW

Power with 3 phases = 45 kW x 3
 Max. connected load = 135 kW

3. Calculate the pulse value:

$$\text{Pulse value} = \frac{\text{max. connected load}}{\text{max. number of pulses/h}} \quad [\text{Pulses/Wh}]$$

Pulse value = 135 kW / 60000 pulses/h
 Pulse value = 0.00225 pulse/kWh
 Pulse value = 2.25 pulse/Wh

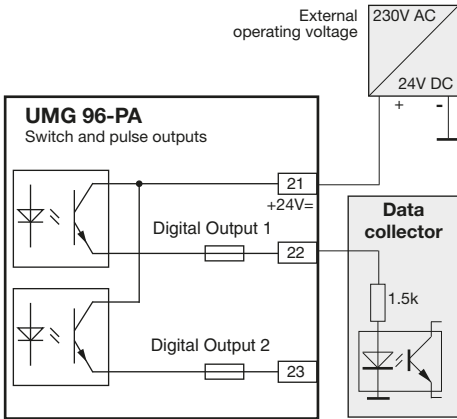


Fig. Connection example for switching as pulse output.

⚠ CAUTION

Measurement errors when used as a pulse output.
 When using the digital outputs as a pulse output, measurement errors may occur as a result of residual current.
For the supply voltage of the digital inputs and outputs, use a power adaptor with a residual current below 5% of the supply voltage.

Timer output

64 independent weekly timers can be configured in the device with:

- A resolution of 1 minute.
- A definable active period within a day. You can select the active day within the week.

Example:

Time 9:25 to 11:45 am Sunday, Monday and Friday.

- The weekly timers can be configured as
- Tariff switch (1 and 2)
 - Set the digital outputs 1 to 3
 - "No function"

The status can be called up via Modbus. The states of the timers on the digital output are "OR" linked.

The weekly timers are configured using the GridVis[®] software in the configuration area "Timer"

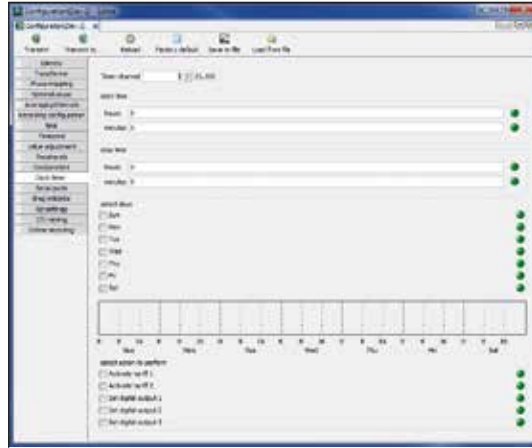


Fig. Configuring the weekly timer (GridVis[®] software)

Output for Modbus Remote

Allows the outputs to be switched via a Modbus address.

This function is configured using the GridVis[®] software:

- Open the GridVis[®] device configuration.
- Set the mode of the digital outputs under "Peripherals" to "Modbus Remote Output".
- Define the output polarity with:
 - Current flow enabled (NO)
 - Current flow disabled (NC)

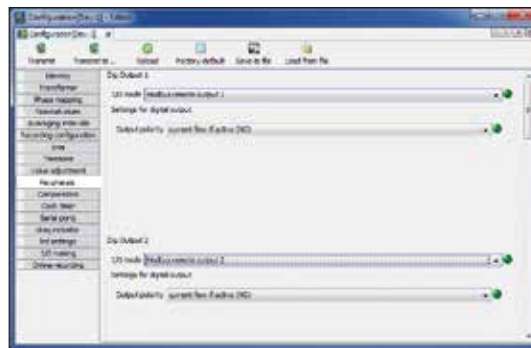


Fig. Configuring the digital outputs as "Modbus Remote" in the GridVis[®] software

Output for comparator group

Two comparator groups (comparator 1 and 2) are available with 3 comparators each (A - C) to monitor limit values.

The results of the comparators A to C can be linked with “AND” or “OR”.

The linking results of the comparator group 1 can be assigned to digital output 2 and the linking results of the comparator group 2 can be assigned to digital output 3.

The comparators are configured exclusively using the GridVis® software in the configuration area “Comparator”.

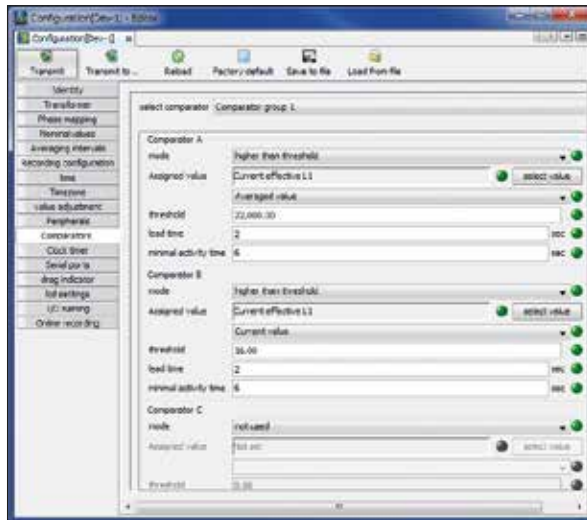


Fig. Configuring the comparators in the GridVis® software

Exporting comparator settings at the device:

- Using keys 3 (▼) and 4 (▲) select “Overview” from the main menu.
- Confirm using key 6 (Enter).
- Using keys 3 (▼) and 4 (▲) select the submenu “Comparator 1” for comparator group 1 and “Comparator 2” for comparator group 2.
- Confirm using key 6 (Enter).

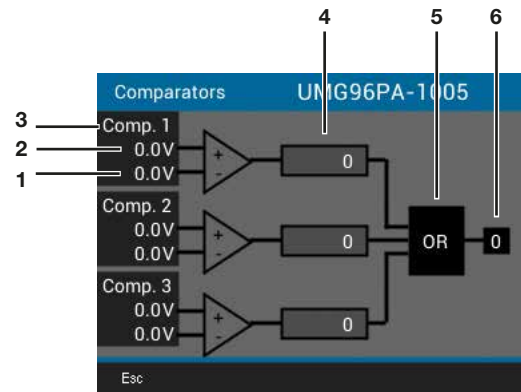


Fig. “Comparators” in the “Overview/ comparators” menu

- 1 Actual value
- 2 Limit value
- 3 Comparator
- 4 Comparator duration
- 5 Logic
- 6 Status

Comparator duration

Comparator durations are time counters that add up for a set comparator output. That is, if the condition of the comparator has been met and the lead time has expired, the counter increases by the relevant time amount - the minimum switching time is not considered here!

Comparator with set limit violation

- The set limit value is compared with the measured value.
- If a limit value violation is active at least for the duration of the lead time, the comparative result is changed.
- The result remains unchanged at least for the duration of the minimum switch-on time and no more than for the duration of the limit violation. The result is reset once there is no more limit violation and the minimum switch-on time has expired.

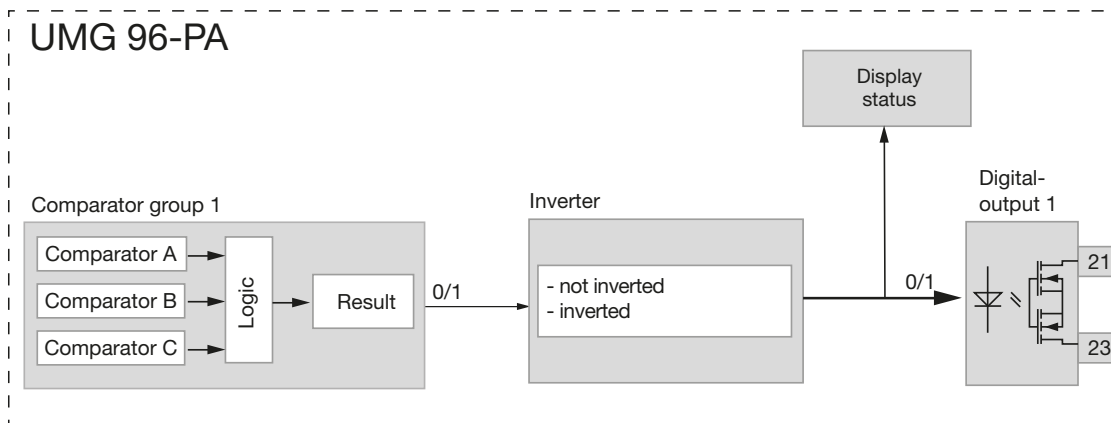
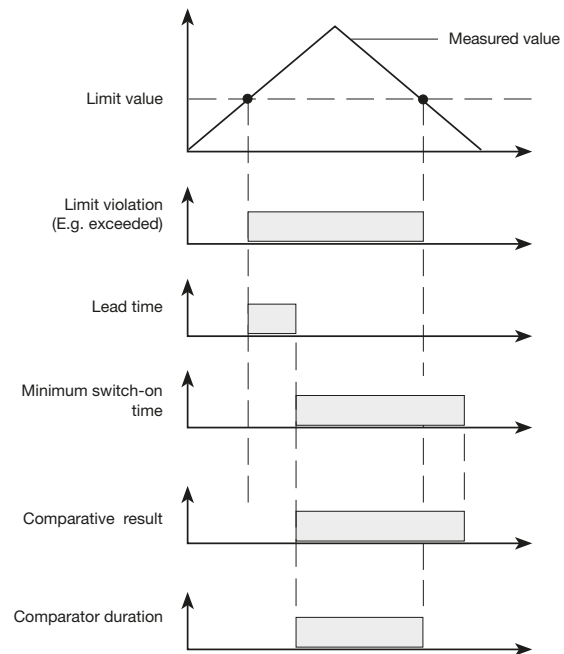


Fig. Block diagram: Use of digital output 2 for limit value monitoring

13.14 Analog output

The device has one analog output that can output a maximum current of 20 mA. An external 24 V DC power adapter is required for operation.

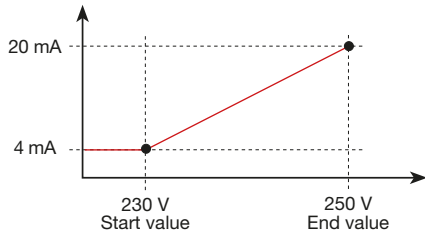


Fig. Principle analog output with voltage monitoring

The analog output configuration is easily set using the GridVis[®] software. To do so, specify the assigned measured value, the start and end value and the output range in the device configuration under “Peripherals”.

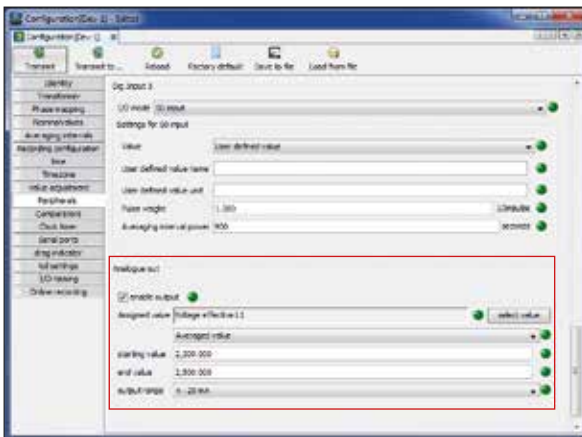
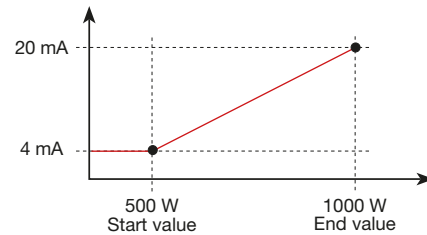


Fig. Configuring the analog output in the GridVis[®] software

Examples:

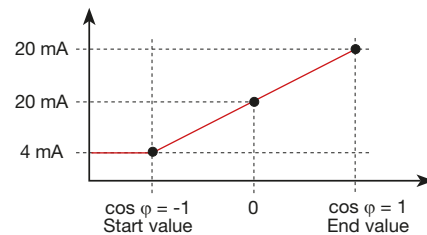
Assignment of active power L1 (output range 4 - 20 mA)



- At an active power of 500 W, the current at the analog output is 4 mA, at an active power of 1000 W -> 20 mA.

The measured active power is proportionate to the current at the analog output.

Assigning the calculated active power factor cos φ (math.) (output range 4 - 20 mA).



- Monitoring the active power factor $\cos \varphi$ (math.) where:
 - $\cos \varphi$ (math.) > 0 active power obtained.
 - $\cos \varphi$ (math.) < 0 active power supplied.

13.15 “Trailer pointer” function

The “trailer pointer” function describes the three highest average values of value types via a defined period duration (time base).

- The calculated average values can be called up via the GridVis[®] software and via a parameter with time stamp.
- The period duration (time base), synchronization and capture time can be set in the GridVis[®] software by setting the corresponding parameters.
- The average value is calculated using the measured values of the following value types:
 - Current L1
 - Current L2
 - Current L3
 - Active power L1
 - Active power L2
 - Active power L3
 - Total active power (L1...L3)
 - Apparent power L1
 - Apparent power L2
 - Apparent power L3
 - Total apparent power (L1...L3)

Period duration (time base):

Period duration that can be set individually in seconds for calculating the average values throughout this period (duration of the measured value recording). When an internal synchronization is selected, the average values are recalculated after the set period of time has expired.

Synchronization mode:

A synchronization determines a start time for the calculation periods of the average values. Here, synchronization is triggered

- By the internal clock (*internal synchronization*);
- By setting a parameter (*via Modbus*); or
- Optionally via the digital input 3 (*external synchronization*).

Capture time:

The *Capture time* that can be set individually describes a time window in which an incoming pulse performs a synchronization of the time. If the device receives a pulse outside of the capture time, the calculated average values are deleted and the time is reset.

Note: The capture time setting - for example in the GridVis[®] software — describes half the time window of the entire capture time!

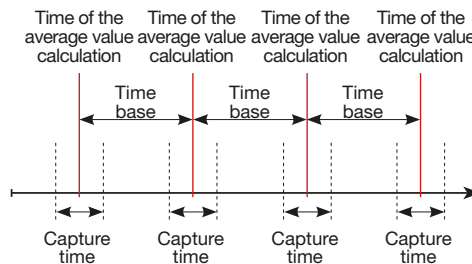


Fig. Synchronization principle

13.15.1 Internal synchronization

The average values are calculated after the configurable period duration (time base) has expired. The internal synchronization occurs at the full minute if it describes a multiple of the time base.

Time base [min]	Sync 1 (Time)	Sync 2 (Time)	Sync 3 (Time)	Sync 4 (Time)
2	09:00:00 AM	9:02:00 AM	9:04:00 AM	9:06:00 AM
5	09:00:00 AM	9:05:00 AM	9:10:00 AM	9:15:00 AM
15	09:00:00 AM	9:15:00 AM	9:30:00 AM	9:45:00 AM

Fig. Examples of an internal synchronization with different time bases

NOTE

To perform an *internal synchronization*, the options *Synchronization via Modbus* **AND** *Synchronization via the digital output 3* must be disabled!

13.15.2 External synchronization

An external synchronization for calculating the three highest values is performed

- Via digital input 3 (e.g. via a pulse generator), or
- Via a Modbus command

External synchronization scenarios:

“No pulse despite setting”

If no pulse is emitted via digital input 3 or a Modbus command, the measured values are stored as they would be for an internal synchronization, however not just to the full minute!

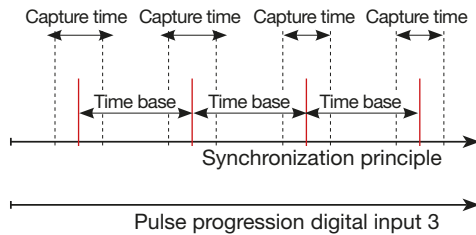


Fig. Synchronization principle with “No pulse despite setting”

Example	Maximum value	Value	Time stamp
Effective current L1	Trailer pointer 1	3.51 A	9:13:07 AM
Effective current L1	Trailer pointer 2	2.52 A	9:08:07 AM
Effective current L1	Trailer pointer 3	1.52 A	9:03:07 AM

Fig. Example trailer pointer storage with time stamp (with time base set for 5 min)

“A pulse”

If the device receives a pulse once or a Modbus command outside of the capture time, the number of measured values summed up until then is reset to calculate the average value and the time. The time is newly defined as a relative zero point and a new calculation is performed!

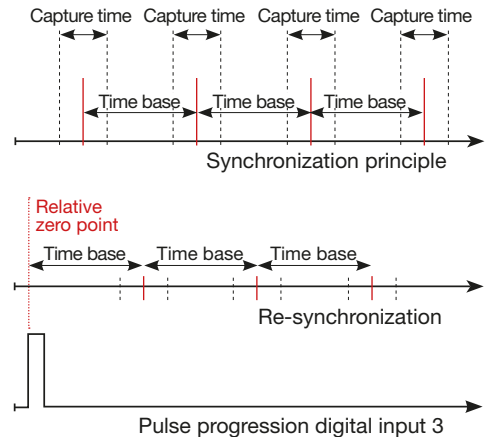


Fig. Synchronization principle with “A pulse outside of the capture time”

Example:

Example	Maximum value	Value	Time stamp
Active power L1	Trailer pointer reference 1	396.73 W	9:18:47 AM
Active power L1	Trailer pointer Reference 2	207.34 W	9:13:47 AM
Active power L1	Trailer pointer Reference 3	80.59 W	9:08:47 AM

Fig. Example trailer pointer storage with time stamp (with time base set for 5 min)

The power increases while time progresses. With the pulse (09:06:47 AM) outside of the capture time, the values are reset to 0. From this time on, a new summation of intermediate values starts. Because no more pulse arrives, the average value is calculated based on the set time (time base).

“Periodic pulse”

Several scenarios apply if the device receives periodic pulses via the digital input 3 or periodic Modbus commands.

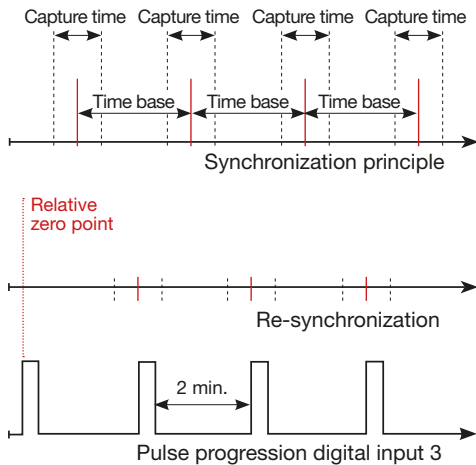
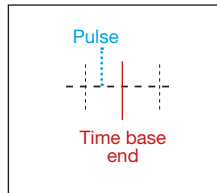


Fig. Synchronization principle with “Periodic pulses” at digital input 3

Scenario “Pulse prior to time base, within the capture time”:

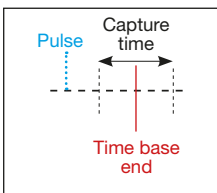
- Perform value calculation now.
- The time is set to 0 (new relative zero point).
- Delete summed intermediate values.

**NOTE**

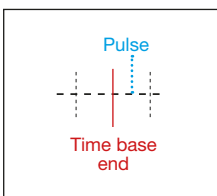
With periodic synchronization, the time is synchronized with each pulse!

Scenario “Pulse outside of the capture time”:

- Summed intermediate values are set to 0.
- The time is set to 0 (new relative zero point).
- No value is calculated.

**Scenario “Pulse according to time base, but within the capture time”:**

- Summed intermediate values are set to 0.
- The time is set to 0 (new relative zero point).
- No value is calculated.



13.15.3 Synchronization priority

An external synchronization is performed based on different priorities where:

- *Priority 1: Modbus synchronization*
For this, via the Modbus tool, set the “Enable flag” (Addr: 822) or select the option “Synchronization via Modbus” in the GridVis® software in the configuration area for the trailer pointer.
- *Priority 2: Synchronization via digital input 3*
For this, set the Modbus parameter “FUNC_SYNC_RECORD” (Addr. 30048, to value 4) or select the option “Trailer pointer synchronization” in the GridVis® software in the configuration area for peripherals (digital input 3).
Note: Do **NOT** select the “Synchronization via Modbus” option in the trailer pointer configuration!
- *Priority 3: Internal synchronization*

Modbus address	Function	Setting range
820	Sets a trigger flag for the trailer pointer synchronization	0 .. 1
821	Time base in seconds	60 .. 65535
822	Enable flag of the Modbus trigger	0 .. 1
823	Capture time in seconds	0 .. 255
30048	Input configurations	0 .. 4*

* 0 = FUNC_NONE;
1 = FUNC_TARIF;
2 = FUNC_SYNC_CLOCK_MIN;
3 = FUNC_SYNC_CLOCK_H;
4 = FUNC_SYNC_RECORD

Fig. Table Modbus address for synchronization



Fig. Trailer pointer configuration in the GridVis® software

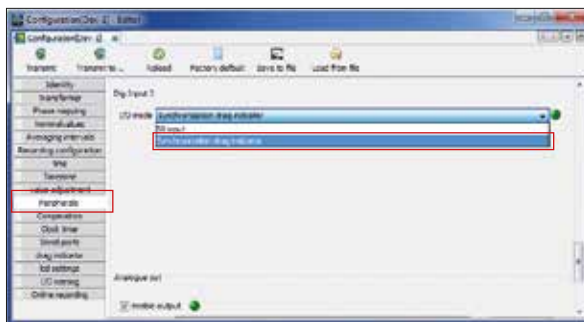


Fig. Configuration “Synchronization” via the Digital input 3 in the GridVis® software

13.16 Records

Two recording profiles are pre-configured in the factory settings for the device. Records are adjusted and expanded with the GridVis® software.

- The smallest time base for recording is set for 1 minute.
- A maximum of 4 records with 29 measured values each are possible. If minimum and maximum values are defined in addition, the number is reduced to 19 or 14 values.
- Within the record configuration, measured values are defined using time base by the types *average value*, *Sample*, *Maximum* or *Minimum*.
 - Type *average value*: An arithmetic mean of the measured values using a defined duration.
 - Type *Maximum* and *Minimum*: Maximum or minimum value of a defined duration.
 - Type *Sample*: Measured value at the end of a defined duration.

Note: Work values are only recorded with the type *Sample*.



Fig. Recording configuration in the GridVis® software

Record 1

The following measured values are recorded with a time base of 15 minutes:

- Effective voltage L1
- Effective voltage L2
- Effective voltage L3
- Effective current L1
- Effective current L2
- Effective current L3
- Total effective current L1..L3
- Active power L1
- Active power L2
- Active power L3
- Total active power L1..L3
- Apparent power L1
- Apparent power L2
- Apparent power L3
- Total apparent power L1..L3
- cos phi(math.) L1
- cos phi(math.) L2
- cos phi(math.) L3
- Total cos phi(math.) L1..L3
- Reactive power fundamental oscillation L1
- Reactive power fundamental oscillation L2
- Reactive power fundamental oscillation L3
- Total reactive power fundamental oscillation L1..L3

Record 2

The following measured values are recorded with a time base of 1 hour:

- Obtained active energy L1
- Obtained active energy L2
- Obtained active energy L3
- Total obtained active energy L1..L3
- Inductive reactive energy L1
- Inductive reactive energy L2
- Inductive reactive energy L3
- Total inductive reactive energy L1..L3

13.17 Tariff switchover

Electric energy values (active, reactive and apparent energy) are recorded by an internal counter for two tariffs each.

A switchover between tariffs (HT/NT) is supported via

- Modbus,
- The digital input 1 (see chapter "Digital inputs"), or
- The weekly timer (See chapter "Timer output")

Tariff UMG96PA-1005			
Tariff	Active E. [kWh]	Reactive E. [kVAh]	Apparent E. [kVAh]
1	0	0	0
2	0	10	10
1 + 2	0	10	10
Esc			

Fig. Device displays of the total (L1..L3) of the active, reactive and apparent energy by tariffs

NOTE

The UMG 96-PA^{MID} features software-controlled tariffs that are **not MID-compliant!** For non-compliant tariffs, the following symbol appears in the *Tariff* screen of the MID device: ⚠

Configure the tariff switchover with the GridVis® software.

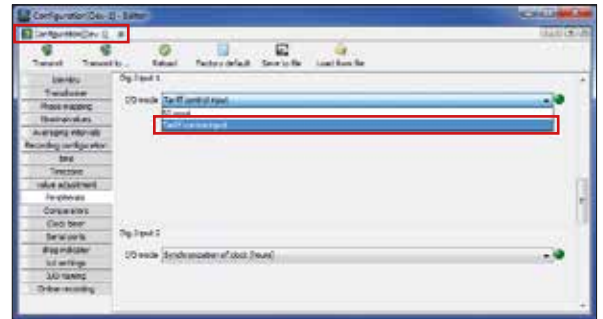


Fig. Digital input 1 configuration as tariff control input in the GridVis® software

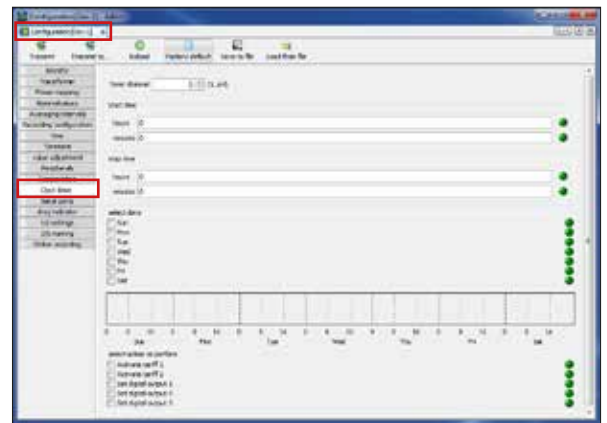


Fig. Timer configuration in the GridVis® software

14. UMG 96-PA^{MID}

The UMG 96-PA^{MID} is certified according to the Measuring Instruments Directive (MID) and differs to the UMG 96-PA with respect to installation and operation. More information on the MID Measuring Devices Directive can be found at www.janitza.de/mid-messgeraete-richtlinie.html



Fig. Front of device UMG 96-PA^{MID}

14.1 Intended use

The UMG 96-PA^{MID} must be used in accordance with national requirements. The calibration validity period is based on the applicable national law.

Before using the device, make sure you are aware of the national provisions and current regulations relating to electronic counters, on calibration duration periods and the extensions thereof.

NOTE

UMG 96-PA^{MID}:

- Use calibrated measurement transducers to use the device for billing purposes.

14.2 Assembly

NOTE

UMG 96-PA^{MID}: For tamper-proof installation (MID-compliant)

- Install the MID device with the supplied silicone seal (scope of delivery) between the device and the installation recess in the protected switch cabinet.
- After installing the device (refer to chapter 6 on page 18), use the supplied terminal covers (scope of delivery) and seal them with seals on the designated devices.

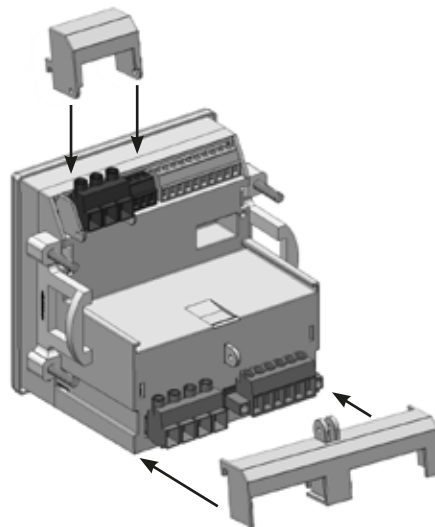


Fig. Installation of the terminal covers on the UMG 96-PA^{MID}

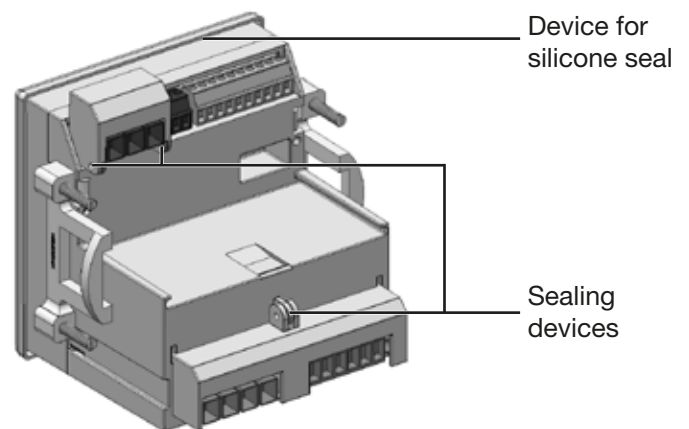


Fig. Rear view of the UMG 96-PA^{MID} with terminal covers, sealing devices and device for silicone seal.

14.3 Measured value display active energy

The default display of the UMG 96-PA^{MID} is the measured value display *Active energy*: The default display appears

- After power returns.
- After 1.5 minutes with no entry.

The measured value display *Active energy* shows the measured values relevant for calibration regulations.

Pressing key 1 *Esc* several times will bring you to the measured value display *Overview*.

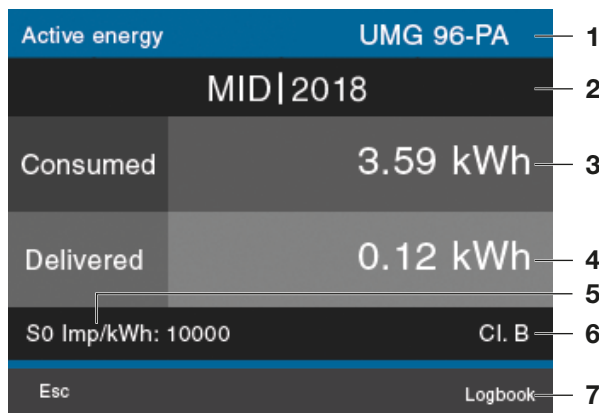


Fig. Functional Enhancement UMG 96-PA^{MID}

- 1 Display title
- 2 MID inspection year
- 3 MID active energy, obtained
- 4 MID active energy, supplied
- 5 S0 pulse value
- 6 Accuracy class
- 7 Log

14.4 Secured load reading (meter reading) of the MID device

A load reading or the load curve describes the measured energy over a defined period.

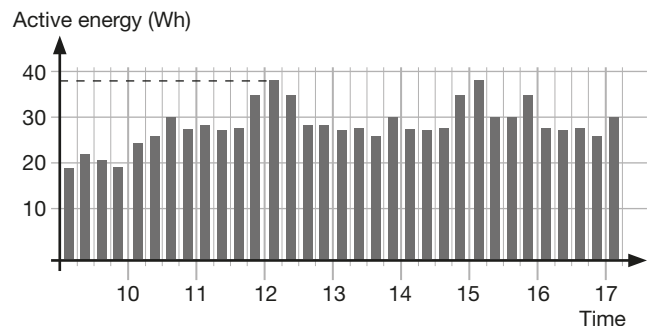
The energy measuring device features the “secured load reading” function. With it, the MID device records

- MID-calibrated meter readings of the energy values (active energy obtained and supplied) every 15 minutes.
- The energy values with increased accuracy, time stamp (UTC) and checksum.
- Data records (measured data) of up to 10000 points in time (approx. 100 days of measured records at a time interval of 15 min.).
- Measured data on a separate partition of the internal device storage that cannot be modified.
- Measured data with relevant information for legal purposes, which can be accessed via the GridVis[®] software.

14.5 Load profile

You can create a so-called load profile with the GridVis[®] software. In the process, the counter readings of the active energy (obtained and supplied) are offset against already recorded active energy measured data and the difference is presented in a capture period (in Germany = 15 min.).

Load profile example:



Consumption measurement 12:00 PM: 558 Wh
 Consumption measurement 11:45 AM: 520 Wh
 Difference: **38 Wh**

14.6 Log

The log

- records password changes and changes in current and voltage transformer ratios (CT and VT).
- records a maximum of 48 changes with the recording of the respective meter reading.
- Can be reached in the MID window by pressing key 6.

Logbook		UMG96PA
Meter reading [kWh]	Adjustment	
Con.	0.00	pr. CT from 5A
Del.	0.00	to 10A
Con.	0.00	
Del.	0.00	
Con.	0.00	
Del.	0.00	
Bez.	0.00	
Del.	0.00	
Esc	▼	▲

NOTE

The device blocks password configurations after 48 entries in the log.

14.7 Password configuration

The configuration of your device can be blocked with a password.

You will need the password to make any change in the device configuration.

NOTE

- Note your password and keep it in a safe place!
- You can only configure your device with a password! Contact Janitza support if you lose the password!

- The **MID device** is configured ex works with the password **10000**.
- For legal reasons, password protection cannot be disabled on the **MID device**.
- After the password is entered incorrectly four times, the device blocks the configuration for 15 minutes.

Setting range: 10000 - 99999

Standard setting: 10000 (MID device)

Instructions on setting the password are provided in chap. „Setting the password:“ on page 39.

An additional protective measure consists of blocking the device for 15 minutes after incorrectly entering the password three times.

14.8 Measured value display tariff

NOTE

The UMG 96-PA^{MID} features software-controlled tariffs that are not **MID-compliant**.

For non-compliant tariffs, the following symbol appears in the *Tariff* screen of the MID device: ⚠

Tariff		UMG96PA-1005		
Tariff	Active E. [kWh]	Reactive E. [kVAh]	Apparent E. [kVAh]	
1	0	0	0	
2	0	10	10	
1 + 2	0	10	10	
Esc				

Fig. Display total (L1..L3) of the active, reactive and apparent energy on the MID device according to software-controlled tariff (not calibrated - ⚠).

14.9 Device acceptance report

During installation and work on the **MID device**, the person working on the device must ensure that a device acceptance report is obtained up or, if necessary, that entries are supplemented!

Before commissioning, check and, if necessary, correct:

- Current and voltage transformer ratios (see p. 73 and on the device under menu Configuration > Measurement).
- Time, date (see p. 73 and on the device under menu Configuration > System > Time).

The device acceptance report contains information on current and voltage transformer types and their settings (converter ratios, dates and times).

ATTENTION

The device acceptance report is a prerequisite for MID-compliant use of the measurement device.

If there is no acceptance report or only a faulty one is present for an MID-compliant measurement device, the measured values from the device can be declared invalid in case of doubt! Therefore please abide by the following:

- **Check the set transformer ratio and the time directly on the device and record them in the device acceptance protocol.**
- **The device stores correct data records only when the time is set!**
- **The device acceptance report must be kept in a safe, readily available place throughout the entire service life of the MID devices!**

15. Overview Measured Value Displays

Main menu (Overview)

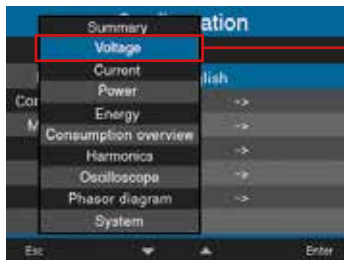


Line analysis (start screen)

Summary UMG96PA-1005			
	Voltage	Current	Power
L1-N	224V	0.03A	-0.00kW
L2-N	224V	0.03A	-0.00kW
L3-N	224V	0.03A	-0.00kW
L1..L3	50.01Hz	0.09A	-0.00kW
	Active E		Reactive E
L1..L3	NAN		NAN

Display of voltage L1, L2, L3-N; current L1, L2, L3; power L1, L2, L3 and active/apparent energy L1-L3

Main menu (Voltage)



Voltage L-N

Voltage UMG96PA-1005			
	Value	min	max
L1-N	223.3V	223.1V	225.6V
L2-N	223.2V	223.0V	225.6V
L3-N	223.3V	223.1V	225.7V

Display of voltage L1-N, L2-N, L3-N and their minimum / maximum values

Voltage L-L

Voltage UMG96PA-1005			
	Value	min	max
L1-L2	0.9V	0.0V	225.0V
L2-L3	1.0V	0.1V	224.9V
L1-L3	0.0V	0.0V	0.0V

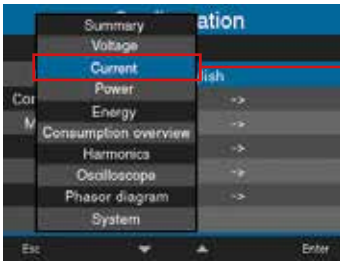
Display of voltage L1-L2, L2-L3, L1-L3 and their minimum / maximum values

Curve



Display of voltage curve of L1-N, L2-N, L3-N

Main menu (current)



Current

Current UMG96PA-1005			
	Value	Max. avg.	Maximum
L1	0.03 A	0.0 A	0.0 A
L2	0.03 A	0.0 A	0.0 A
L3	0.02 A	0.0 A	0.0 A

Display of current L1, L2, L3 and their minimum / maximum values

THD-I

THD-I UMG96PA-1005			
	Value	Minimum	Maximum
L1	16.19%	15.84%	16.43%
L2	16.19%	15.78%	16.46%
L3	16.23%	15.82%	16.41%

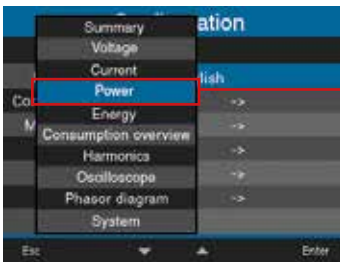
Display of distortion factors for current (THD-I) L1, L2, L3 and their minimum / maximum values

Curve



Display of current curve of L1, L2, L3

Main menu (power)



Total power

Power UMG96PA-1005			
	Value	Min.	Max.
P	-0.1 W	-0.1 W	0.1 W
Q	19.6 VAr	0.0 VAr	19.7 VAr
S	19.9 VA	0.1 VA	23.1 VA

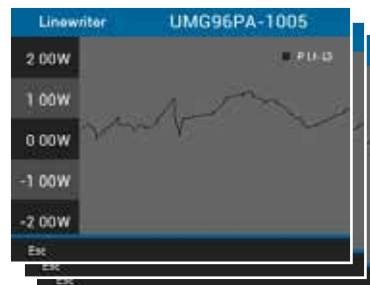
Display of the total (L1..L3) of the active, reactive and apparent power and their minimum / maximum values

Active / reactive / apparent power

Active Power UMG96PA-1005			
	Value	Minimum	Maximum
L1	-0.0 W	-0.0 W	0.5 W
L2	-0.0 W	-0.5 W	0.0 W
L3	-0.0 W	-0.0 W	0.0 W

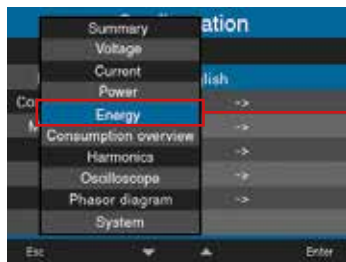
Display of power values (active, reactive or apparent power) L1-N, L2-N, L3-N and their minimum / maximum values

Curve active / reactive / apparent power



Display of the curve of active, reactive or apparent power (total L1..L3)

Main menu UMG 96-PA (energy)



Active energy

Active energy UMG96PA-1005	
Sum L1..L3	
Total	-0.0kWh
Consumed	0.0kWh
Delivered	0.0kWh

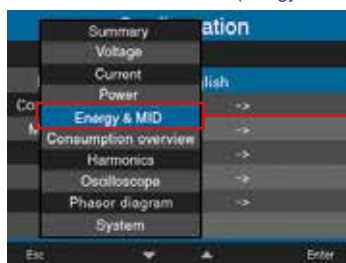
Display total (L1..L3) of the active energy (total/obtained/supplied)

Reactive energy

Reactive energy UMG96PA-1005	
Sum L1..L3	
Total	0.0kVarh
Inductive	0.0kVarh
Capacitive	0.0kVarh

Display total (L1..L3) of the reactive energy (total/inductive/capacitive)

Main menu UMG 96-PA^{MID} (energy & MID)



Apparent energy

Apparent energy UMG96PA-1005	
Sum L1..L3	
Total	0.0kVAh

Display total (L1..L3) of the apparent energy

Tariff

Tariff UMG96PA-1005			
Tariff	Active E. [kWh]	Reactive E. [kVAh]	Apparent E. [kVAh]
1	0	0	0
2	0	10	10
1 + 2	0	10	10

Display of the total (L1..L3) of the active, reactive and apparent energy by tariffs

MID active energy (only UMG 96-PA^{MID})

Active energy UMG 96-PA	
MID 2018	
Consumed	3.59 kWh
Delivered	0.12 kWh
50 Imp/kWh: 10000 Cl, B	

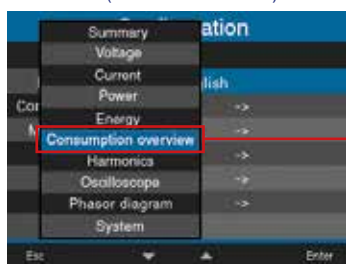
Display total (L1..L3) of the active energy according to MID

Tariff (UMG 96-PA^{MID}) - MID-non-compliant (Ⓢ)

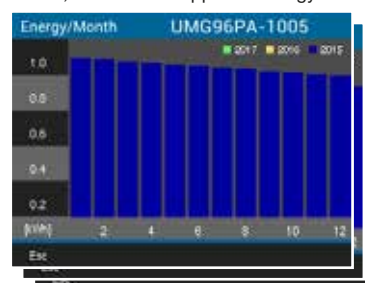
Tariff UMG96PA-1005			
Tariff (Ⓢ)	Active E. [kWh]	Reactive E. [kVAh]	Apparent E. [kVAh]
1	0	0	0
2	0	10	10
1 + 2	0	10	10

Display of the total (L1..L3) of the active, reactive and apparent energy on the MID device according to software-controlled tariff (not calibrated - Ⓢ).

Main menu (consumer overview)

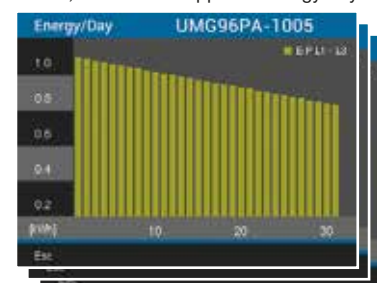


Active, reactive and apparent energy/month



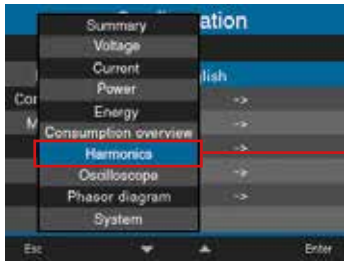
Display of active, reactive or apparent energy per month (of the last three years)

Active, reactive and apparent energy/day

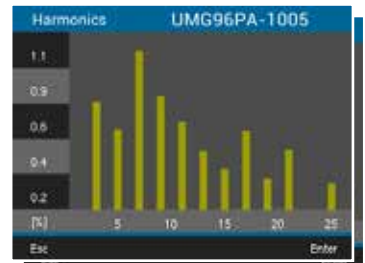


Display of active, reactive or apparent energy per day (of the current month)

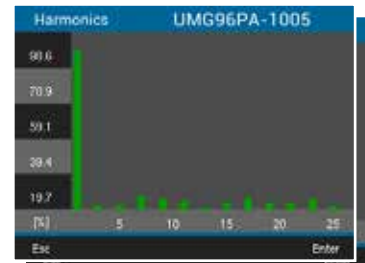
Main menu (harmonic)



Voltage L1 / L2 / L3



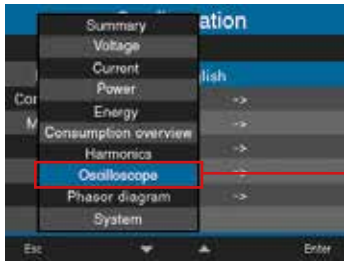
Current L1 / L2 / L3



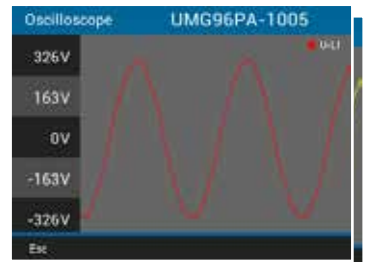
Display of active, reactive or apparent energy per month (of the last three years)

Display of active, reactive or apparent energy per day (of the current month)

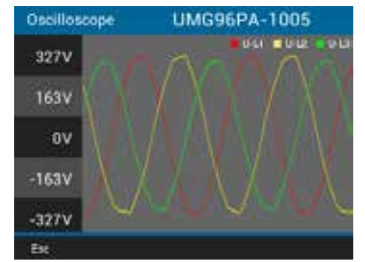
Main menu (oscilloscope)



Voltage L1 / L2 / L3



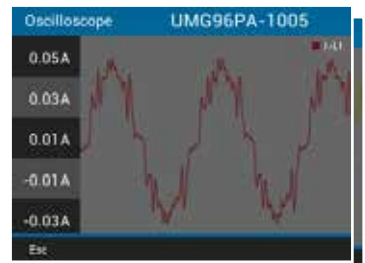
Voltage L1..L3



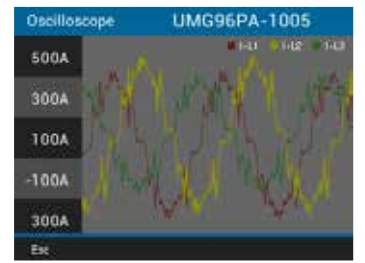
Display oscillogram of voltage L1, L2 or L3

Display oscillogram of voltages L1, L2 and L3

Current L1 / L2 / L3



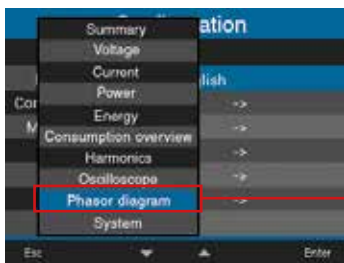
Current L1..L3



Display oscillogram of currents L1, L2 or L3

Display oscillogram of current L1, L2 and L3

Main menu (pointer diagram)

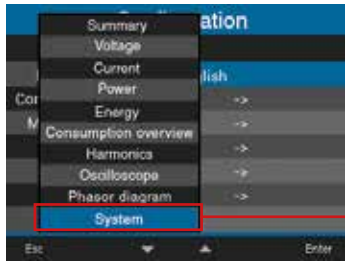


Pointer diagram



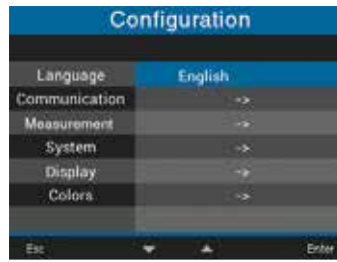
Display of voltages and current in pointer diagram

Main menu (system)



Note: More information on configuration can be found in chapter "Operation" and "Configuration".

Configuration



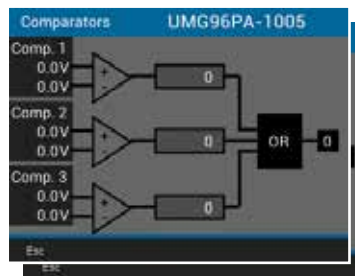
Submenu device configuration

Overview COM ports

System UMG96PA-1005			
Port	RX	TX	Error
RS485	0	0	0
I/O	Nr. 1	Nr. 2	Nr. 3
Digital In	0	0	0
Digital Out	0	0	0
Analog Out	0mA		

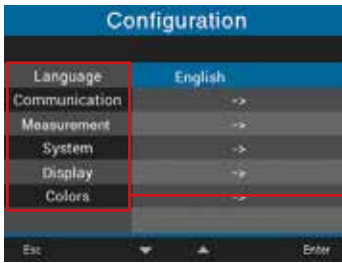
Display of received (RX), transmitted (TX) and faulty data packages
Switching current analog-output

Comparator 1 / Comparator 2



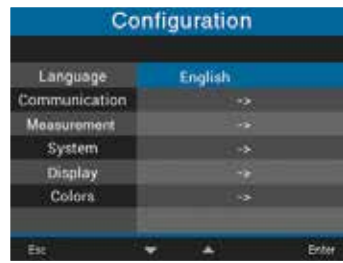
Display of limit value, actual value, comparator duration, logic and status

Submenu (system / configuration)



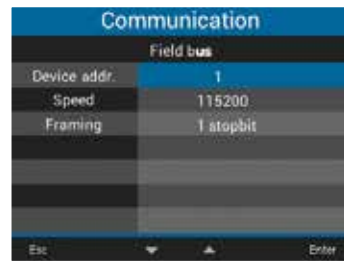
Note: More information on configuration can be found in chapter "Operation" and "Configuration".

Language



Settings of the device language

Communication



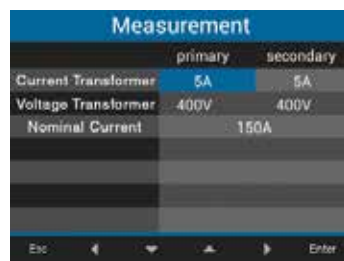
Settings relating to parameters, device addresses, baud rate and data frame

Measurement (frequency)



Settings for rated frequency

Measurement L1..L3



Settings of the current and voltage transformer ratios and of the rated current

System



Display of device data, password assignment and option to reset the device

System (reset)



Display of device data, password assignment and option to reset the device

Display



Display settings

Colors



Color settings of the graphics

16. Service and maintenance

The device is subject to various safety tests prior to delivery and marked with a seal. If a device is opened, the safety tests must be repeated. A warranty is only assumed for unopened devices.

16.1 Repair and calibration

Repair and calibration of the device may only be carried out by the manufacturer.

The manufacturer recommends having a calibration of the device performed by the manufacturer itself or by an accredited laboratory at 5-year intervals. The calibration validity period of the UMG 96-PA^{MID} is based on the applicable national law.



WARNING

Warning against impermissible manipulations or improper use of the device.

Opening, dismantling or impermissible manipulation of the device, which exceeds the specified mechanical, electrical or other operating limits, can result in property damage or injuries up to death.

- **Only electrically qualified personnel may work on the devices and their components, assemblies, systems and circuits!**
- **Always use your device or components as described in the associated documentation.**
- **Send the device back to the manufacturer in the event of visible damage, and also for repair and calibration!**

16.2 Front film and display

Observe the following during the care and cleaning of the front film and display

NOTE

Property damage due to incorrect care and cleaning of the device.

The use of water or other solvents, such as e.g. denatured alcohol, acids, acidic agents, for the front film or the display can damage or destroy the device during the cleaning. Water can e.g. penetrate the device housing and destroy the device.

- **Clean the device, front film or the display with a soft cloth.**
- **For severe soiling, use a cloth moistened with clear water.**
- **Clean the front film and the display, e.g. fingerprints, with a special LCD cleaner and a lint-free cloth.**
- **Do not use any acids or acidic agents to clean the devices.**

16.3 Service

In case of any questions which are not described in this manual, please contact the manufacture. We require the following information to handle your inquiries:

- Device designation (see rating plate)
- Serial number (see nameplate)
- Software release (see system display)
- Measured voltage and supply voltage
- Exact error description.

16.4 Device adjustment

The devices are adjusted prior to delivery by the manufacturer. When adhering to the ambient conditions, a readjustment is not necessary.

16.5 Firmware update

For a firmware update, connect your device to a computer and access it through the GridVis® software.

- Open the firmware update assistant by clicking on "Update device" in the menu "Extras".
- Select your update file and execute the update.

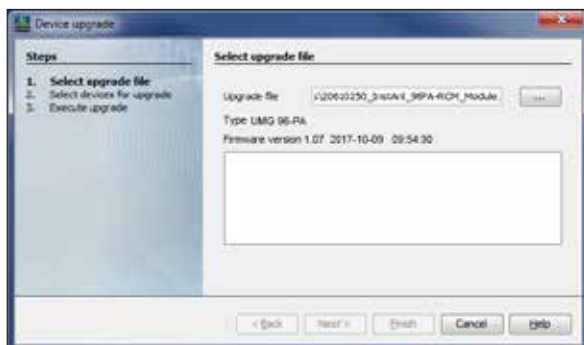


Fig. Updating the devices firmware in the GridVis® software

NOTE

A firmware update is excluded for the **UMG 96-PA^{MID}**!

16.6 Clock/battery

The internal clock is fed from the supply voltage. If the supply voltage fails, the clock is supplied by the battery. The clock supplies the date and time information for recordings, minimum and maximum values, for example.

NOTE

The device:

- **Saves correct data records only when the time is set!**
- **Sets the time to the factory setting when the supply voltage is disconnected and the battery is simultaneously spent or after the battery is changed, meaning it is therefore considered "not set."**

At a storage temperature of +45°C, the service life of the battery is at least five years. Typical battery service life is eight to ten year.

The battery is replaced through a battery insert on the bottom of the device. When replacing the battery, observe the correct battery type and polarity (positive pole showing toward the rear of the device; negative pole showing towards the front of the device)!

If necessary, check and correct the device settings after replacing the batteries, e.g.:

- Current, voltage transformer ratios.
- Time date.



CAUTION

Risk of injury due to electric voltage!

Dangerous voltages can cause severe injuries or death.

Therefore, please observe the following:

- **Disconnect the system from the power supply before starting work.**

NOTE

Grease or dirt on the contact surfaces creates transmission resistance which decreases the service life of the battery. Only hold the battery on the edges.

NOTE

Ensure correct battery type and polarity when replacing the battery!

17. Procedure in the event of errors

Possible error	Cause	Remedy
No display	External fuse for the power supply voltage has tripped.	Replace fuse.
No current display	Measured voltage is not connected.	Connect the measured voltage.
	Measurement current is not connected.	Connect measurement current.
Current displayed is too large or too small.	Current measurement in the wrong phase.	Check connection and correct if necessary.
	Current transformer factor is incorrectly programmed.	Read out and program the current transformer transformation ratio at the current transformer.
	The current peak at the measurement input has been exceeded by current harmonics.	Install current transformer with a larger CT ratio.
	The current at the measurement input was not achieved.	Install current transformer with a smaller current transformer ratio.
Voltage displayed is too small or too large.	Measurement in the wrong phase.	Check connection and correct if necessary.
	Voltage transformer incorrectly programmed.	Read out and program the voltage transformer ratio at the voltage transformer.
Voltage displayed is too small.	Measurement range exceeded.	Install voltage transformers.
	The peak voltage value at the measurement input has been exceeded by harmonic components.	Attention! Ensure the measured inputs are not overloaded.
Phase shift ind/cap.	Current path is assigned to the wrong voltage circuit.	Check connection and correct if necessary.
Active power consumption / export is reversed.	At least one current transformer connection is reversed.	Check connection and correct if necessary.
	A current path is assigned to the wrong voltage circuit.	Check connection and correct if necessary.
Active power is too small or too large.	The programmed current transformer ratio is incorrect.	Read out and program the current transformer transformation ratio at the current transformer
	The current path is assigned to the wrong voltage circuit.	Check connection and correct if necessary.
	The programmed voltage transformer ratio is incorrect.	Read out and program the voltage transformer ratio at the voltage transformer.
An input/output is not responding.	The input/output was incorrectly programmed.	Check programming and correct if necessary.
	The input/output was incorrectly connected.	Check connection and correct if necessary.
Screen "Exceeded measuring range"	The measuring range has been exceeded	Check connection and correct if necessary. Correct the current/voltage transformer ratio.
No connection to the device.	RS485 - Incorrect device address - Different bus speeds (baud rate) and / or data frame - Incorrect protocol. - Termination missing.	- Correct device address. - Correct speed (baud rate). - Correct data frame. - Correct protocol. - Connect bus with termination resistor.
Device still does not work despite the above measures.	Device defective.	Send the device to the manufacturer for inspection and testing.

18. Technical data

General information	
Net weight (with attached connectors)	Approx. 250 g
Packaging weight (including accessories)	Approx. 500 g
Battery	Type Lithium CR2032, 3 V (approval according to UL 1642)
Service life of the background lighting	40000 h (background lighting is reduced to approx. 50% for this period)

Transport and storage	
The following information applies to devices that are transported or stored in the original packaging.	
Free fall	1 m
Temperature	-25 °C to +70 °C
Relative humidity (non-condensing)	0 to 90% RH

Ambient conditions during operation	
Use the device in a weather-protected, stationary application. Protection class II in accordance with IEC 60536 (VDE 0106, Part 1).	
Measurement temperature range	-10 °C .. +55 °C
Relative humidity (non-condensing)	0 to 75 % RH
Operating altitude	0 .. 2000 m above sea level
Pollution degree	2
Installation position	discretionary
Ventilation	No external ventilation required.
Protection against foreign bodies and water - Front - Rear - Front side with sealing	IP40 i.a.w. EN60529 IP20 i.a.w. EN60529 IP54 according to EN60529 (required for the MID device!)

Supply voltage		
230 V option	Nominal range	AC 90 V - 277 V (50/60 Hz) or DC 90 V - 250 V, 300 V CATIII
	Power consumption	max. 4.5 VA / 2 W
24 V option *	Nominal range	AC 24 V - 90 V (50/60Hz) or DC 24 V - 90 V, 150 V CATIII
	Power consumption	max. 4.5 VA / 2 W
Operating range	+-10% of nominal range	
Internal fuse, not interchangeable	Type T1A / 250 VDC / 277 VAC according to IEC 60127	
Recommended overcurrent protection device for the line protection (approval according to UL)	230 V option: 6 - 16 A (Char. B) 24 V option: 1 - 6 A (Char. B)	

* The 24 V option applies only to the UMG 96-PA!

Recommendation for the maximum number of devices on one circuit breaker:

230 V option: Circuit breaker B6A: 4 devices max. / circuit breaker B16A: 11 devices max.

24 V option: Circuit breaker B6A: 3 devices max. / circuit breaker B16A: 9 devices max.

Voltage measurement	
Three-phase 4-conductor systems with rated voltages up to	417 V / 720 V (+-10%) according to IEC 347 V / 600 V (+-10%) according to UL
Single-phase 2-conductor systems with rated voltages up to	480 V (+-10%)
Overvoltage category	600 V CAT III
Measurement voltage surge	6 kV
Fuse for the voltage measurement	1 - 10 A (with IEC/UL approval)
Measuring range L-N	0 ¹⁾ .. 600 V _{rms} (max. overvoltage 800 V _{rms})
Measuring range L-L	0 ¹⁾ .. 1040 V _{rms} (max. overvoltage 1350 V _{rms})
Resolution	0.01 V
Crest factor	2.45 (related to the measurement range)
Impedance	3 MΩ/phase
Power consumption	Approx. 0.1 VA
Sampling frequency	8.33 KHz
Frequency of the fundamental oscillation - Resolution	45 Hz .. 65 Hz 0.01 Hz

1) The device only calculates measured values if voltage L1-N is greater than 20 V_{eff} (4-conductor measurement) or voltage L1-L2 is greater than 34 V_{eff} (3-conductor measurement) at voltage measurement input V1.

Current measurement	
Rated current	5 A
Metering range	0.005 .. 6 A _{rms}
Crest factor (based on the rated current)	2 (related to 6 A _{rms})
Overvoltage category	300 V CAT II
Measurement voltage surge	2 kV
Power consumption	approx. 0.2 VA (R _i =5 mΩ)
Overload for 1 sec.	60 A (sinusoidal)
Resolution	0.1 mA (display 0.01 A)
Sampling frequency	8.33 kHz

Serial interface	
RS485 - Modbus RTU/slave	9.6 kbps, 19.2 kbps, 38.4 kbps, 57.6 kbps, 115.2 kbps

Digital outputs	
3 digital outputs, semiconductor relays, not short-circuit proof.	
Switching voltage	Max. 33 V AC, 40 V DC
Switching current	max. 50 mA _{eff} AC/DC
Response time	Approx. 200 ms
Pulse output	max. 50 Hz (energy pulse)

The digital output 1 (terminal 21/22) of the **UMG 96-PA^{MID}** assigns the measured value active energy (obtained/supplied)!

Digital inputs	
3 digital inputs, semiconductor relays, not short-circuit proof.	
Maximum counter frequency	20 Hz
Input signal present	18 V .. 28 V DC (typical 4 mA)
Input signal not present	0 .. 5 V DC, current less than 0.5 mA

Line length (digital inputs/outputs)	
Up to 30 m	Unshielded
Greater than 30 m	Shielded

Analog Output	
External power supply	Max. 33 V
Current	0 .. 20 mA
Update time	1 s
Load	max. 300 Ω
Resolution	10 Bit

Terminal connection capacity (supply voltage)	
Connectable conductors. Only one conductor can be connected per terminal.	
Single core, multi-core, fine-stranded	0.08 - 4.0 mm ² , AWG 28-12
Terminal pins, core end sheath	0.2 - 2.5 mm ²
Tightening torque	0.4 - 0.5 Nm
Stripping length	7 mm

Terminal connection capacity (voltage measurement)	
Connectable conductors. Only one conductor can be connected per terminal.	
Single core, multi-core, fine-stranded	0.08 - 4.0 mm ² , AWG 28-12
Terminal pins, core end sheath	0.2 - 2.5 mm ²
Tightening torque	0.4 - 0.5 Nm
Stripping length	7 mm

Terminal connection capacity (current measurement)	
Connectable conductors. Only one conductor can be connected per terminal.	
Single core, multi-core, fine-stranded	0.2 - 2.5 mm ² , AWG 26-12
Terminal pins, core end sheath	0.2 - 2.5 mm ²
Tightening torque	0.4 - 0.5 Nm
Stripping length	7 mm

Terminal connection capacity (serial interface)	
Single core, multi-core, fine-stranded	0.2 - 1.5 mm ² , AWG 28-16
Terminal pins, core end sheath	0.2 - 1.5 mm ²
Tightening torque	0.2 - 0.25 Nm
Stripping length	7 mm

Terminal connection capacity (digital inputs and outputs, analog output)	
Single core, multi-core, fine stranded	0.2 - 1.5 mm ² , AWG 28-16
Terminal pins, core end sheath	0.2 - 1.5 mm ²
Tightening torque	0.2 - 0.25 Nm
Stripping length	7 mm

Technical data according to MID	
Voltage measurement	230/400 V ¹⁾
Three-phase 4-conductor systems with rated voltages up to	
Current measurement (measurement range)	0.002 ... 6 A
Frequency range	45-65 Hz
Reference frequency	50 Hz
Accuracy class	B
Pulse value S0 (pulse constant)	10,000 pulses/kWh ²⁾
Electromagnetic ambient conditions	Class E2 (MID 2014/32/EU)
Mechanical ambient conditions	Class M1 (MID 2014/32/EU)

1) Voltage measurement without measuring transducers only possible up to 300 V.

2) The pulse value S0 is automatically adjusted to the set voltage transformer ratio. The current pulse value S0 appears in the *active energy* measured value indication (see chap. „14.3 Measured value display active energy“ on page 64).

19. Function characteristics

Function	Symbol	Accuracy class	Metering range	Display range
Total active power	P	0.5 ⁵⁾ (IEC61557-12)	0 W .. 12.6 kW	0 W .. 999 GW *
Total reactive power	QA, Qv	1 (IEC61557-12)	0 var .. 16.6 kvar	0 var .. 999 Gvar *
Total apparent power	SA, Sv	0.5 ⁵⁾ (IEC61557-12)	0 VA .. 12.6 kVA	0 VA .. 999 GVA *
Total active energy	Ea	0.2 ⁵⁾ (IEC61557-12) 0.2S ⁵⁾ (IEC62053-22)	0 Wh .. 999 GWh	0 Wh .. 999 GWh *
Total reactive energy	ErA, ErV	1 (IEC61557-12)	0 varh .. 999 Gvarh	0 varh .. 999 Gvarh *
Total apparent energy	EapA, EapV	0.5 ⁵⁾⁶⁾ (IEC61557-12)	0 VAh .. 999 GVAh	0 VAh .. 999 GVAh *
Frequency	f	0.05 (IEC61557-12)	45 Hz .. 65 Hz	45.00 Hz .. 65.00 Hz
Phase current	I	0.2 (IEC61557-12)	0 Arms .. 7 Arms	0 A .. 999 kA
Calculated neutral conductor current	INc	1.0 (IEC61557-12)	0.03 A .. 25 A	0.03 A .. 999 kA
Voltage	U L-N	0.2 (IEC61557-12)	10 Vrms .. 600 Vrms	0 V .. 999 kV
Voltage	U L-L	0.2 (IEC61557-12)	18 Vrms .. 1040 Vrms	0 V .. 999 kV
Power factor	PFA, PFV	0.5 (IEC61557-12)	0.00 .. 1.00	0.00 .. 1.00
Short-term flicker, long-term flicker	Pst, Plt	-	-	-
Voltage dips (L-N)	Udip	-	-	-
Voltage swells (L-N)	Uswl	-	-	-
Transient voltage swells	Utr	-	-	-
Voltage interruptions	Uint	-	-	-
Voltage unbalance (L-N) ¹⁾	Unba	-	-	-
Voltage unbalance (L-N) ²⁾	Unb	-	-	-
Voltage harmonics	Uh	Cl. 1 (IEC61000-4-7)	1 .. 25 (odd)	0 V .. 999 kV
THD of the voltage ³⁾	THDu	1.0 (IEC61557-12)	0 % .. 999 %	0 % .. 999 %
THD of the voltage ⁴⁾	THD-Ru	-	-	-
Current harmonics	Ih	Cl. 1 (IEC61000-4-7)	1 .. 25 (odd)	0 A .. 999 kA
THD of the current ³⁾	THDi	1.0 (IEC61557-12)	0 % .. 999 %	0 % .. 999 %
THD of the current ⁴⁾	THD-Ri	-	-	-
Mains signal voltage	MSV	-	-	-

1) In relation to the amplitude.

2) In relation to the phase and amplitude.

3) In relation to the power frequency.

4) In relation to the effective value.

5) Accuracy class 0.2/0.2S with ../5A transformer.

6) Accuracy class 0.5/0.5S with ../1A transformer.

* When the max. total energy value is reached, the display reverts back to 0 W.

19.1 Modbus address list of the frequently required measured values:

Address	Format	RD/WR	Variable	Unit	Remark
19000	float	RD	_ULN[0]	V	Voltage L1-N
19002	float	RD	_ULN[1]	V	Voltage L2-N
19004	float	RD	_ULN[2]	V	Voltage L3-N
19006	float	RD	_ULL[0]	V	Voltage L1-L2
19008	float	RD	_ULL[1]	V	Voltage L2-L3
19010	float	RD	_ULL[2]	V	Voltage L3-L1
19012	float	RD	_ILN[0]	A	Apparent current, L1
19014	float	RD	_ILN[1]	A	Apparent current, L2
19016	float	RD	_ILN[2]	A	Apparent current, L3
19018	float	RD	_I_SUM3	A	Total; IN=I1+I2+I3
19020	float	RD	_PLN[0]	W	Active power L1
19022	float	RD	_PLN[1]	W	Active power L2
19024	float	RD	_PLN[2]	W	Active power L3
19026	float	RD	_P_SUM3	W	Total; Psum3=P1+P2+P3
19028	float	RD	_SLN[0]	VA	Apparent power L1
19030	float	RD	_SLN[1]	VA	Apparent power L2
19032	float	RD	_SLN[2]	VA	Apparent power L3
19034	float	RD	_S_SUM3	VA	Total; Ssum3=S1+S2+S3
19036	float	RD	_QLN[0]	var	Reactive power (power frequency) L1
19038	float	RD	_QLN[1]	var	Reactive power (power frequency) L2
19040	float	RD	_QLN[2]	var	Reactive power (power frequency) L3s
19042	float	RD	_Q_SUM3	var	Total; Qsum3=Q1+Q2+Q3
19044	float	RD	_COS_PHI[0]		Fund. power factor, CosPhi; UL1 IL1
19046	float	RD	_COS_PHI[1]		Fund. power factor, CosPhi; UL2 IL2
19048	float	RD	_COS_PHI[2]		Fund. power factor, CosPhi; UL3 IL3
19050	float	RD	_FREQ	Hz	Frequency
19052	float	RD	_PHASE_SEQ		Rotation field; 1=right, 0=none, -1=left
19054*	float	RD	_WH_V[0]	Wh	Active energy L1, obtained
19056*	float	RD	_WH_V[1]	Wh	Active energy L2, obtained
19058*	float	RD	_WH_V[2]	Wh	Active energy L3, obtained
19060	float	RD	_WH_V_HT_SUML13	Wh	Active energy L1..L3
19062	float	RD	_WH_V[0]	Wh	Active energy L1, obtained
19064	float	RD	_WH_V[1]	Wh	Active energy L2, obtained
19066	float	RD	_WH_V[2]	Wh	Active energy L3, obtained
19068	float	RD	_WH_V_HT_SUML13	Wh	Active energy L1..L3, obtained, tariff 1
19070	float	RD	_WH_Z[0]	Wh	Active energy L1, supplied
19072	float	RD	_WH_Z[1]	Wh	Active energy L2, supplied
19074	float	RD	_WH_Z[2]	Wh	Active energy L3, supplied
19076	float	RD	_WH_Z_SUML13	Wh	Active energy L1..L3, supplied
19078	float	RD	_WH_S[0]	VAh	Apparent energy L1
19080	float	RD	_WH_S[1]	VAh	Apparent energy L2
19082	float	RD	_WH_S[2]	VAh	Apparent energy L3
19084	float	RD	_WH_S_SUML13	VAh	Apparent energy L1..L3
19086*	float	RD	_IQH[0]	varh	Reactive energy, inductive, L1
19088*	float	RD	_IQH[1]	varh	Reactive energy, inductive, L2
19090*	float	RD	_IQH[2]	varh	Reactive energy, inductive, L3
19092	float	RD	_IQH_SUML13	varh	Reactive energy L1..L3
19094	float	RD	_IQH[0]	varh	Reactive energy, inductive, L1

* The assignment of the highlighted device addresses does not correspond to the assignment of other devices in the UMG series.

Address	Format	RD/WR	Variable	Unit	Remark
19096	float	RD	_IQH[1]	varh	Reactive energy, inductive, L2
19098	float	RD	_IQH[2]	varh	Reactive energy, inductive, L3
19100	float	RD	_IQH_SUML13	varh	Reactive energy L1..L3, ind.
19102	float	RD	_CQH[0]	varh	Reactive energy, capacitive, L1
19104	float	RD	_CQH[1]	varh	Reactive energy, capacitive, L2
19106	float	RD	_CQH[2]	varh	Reactive energy, capacitive, L3
19108	float	RD	_CQH_SUML13	varh	Reactive energy L1..L3, cap.
19110	float	RD	_THD_ULN[0]	%	Harmonic, THD,U L1-N
19112	float	RD	_THD_ULN[1]	%	Harmonic, THD,U L2-N
19114	float	RD	_THD_ULN[2]	%	Harmonic, THD,U L3-N
19116	float	RD	_THD_ILN[0]	%	Harmonic, THD,I L1
19118	float	RD	_THD_ILN[1]	%	Harmonic, THD,I L2
19120	float	RD	_THD_ILN[2]	%	Harmonic, THD,I L3

19.2 Number formats

Type	Size	Minimum	Maximum
short	16 bit	-2 ¹⁵	2 ¹⁵ -1
ushort	16 bit	0	2 ¹⁶ -1
int	32 bit	-2 ³¹	2 ³¹ -1
uint	32 bit	0	2 ³² -1
float	32 bit	IEEE 754	IEEE 754

NOTE

Note on saving measured values and configuration data:

Since the following measured values are saved in a non-volatile memory every 5 minutes, the recording may **be interrupted for a maximum of 5 minutes** in case the operating voltage fails:

- Comparator timer
- S0 counter statuses
- Min. / Max. / mean values (without the date and time)
- Energy values

Configuration data is saved immediately.

A detailed Modbus address and parameter list can be found at www.janitza.de

19.3 Dimensional drawings

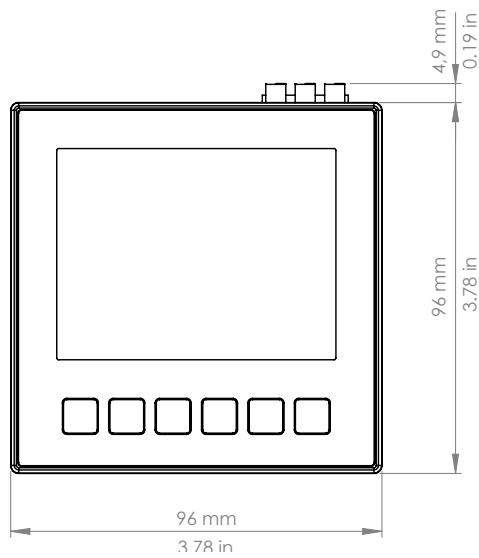
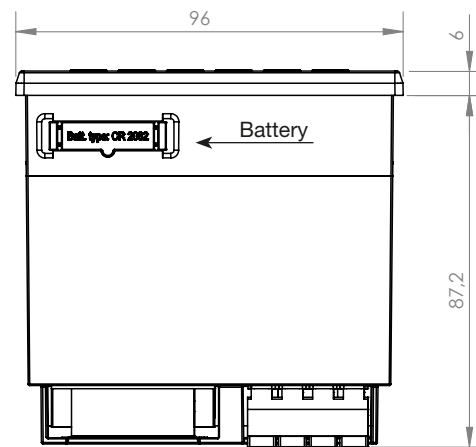


Fig. Front view



1) View from below

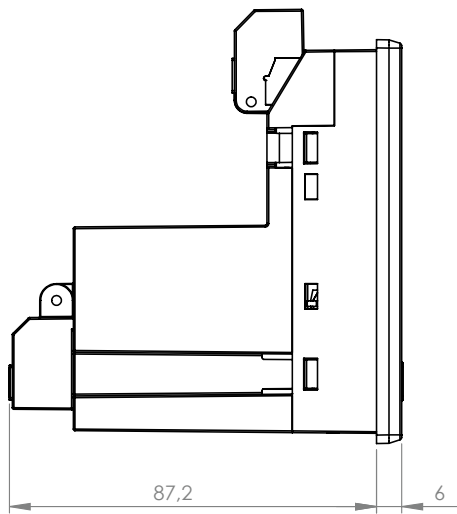


Fig. Side view

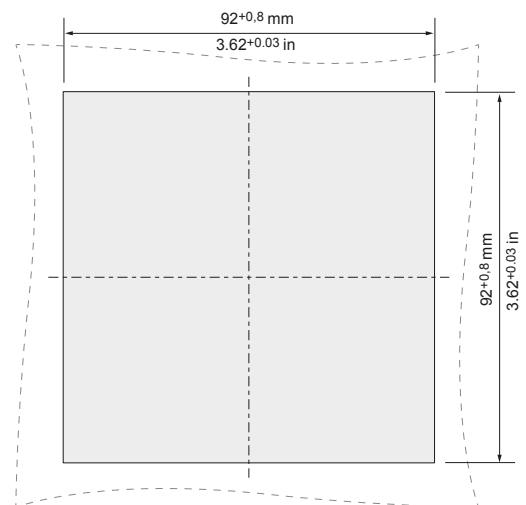
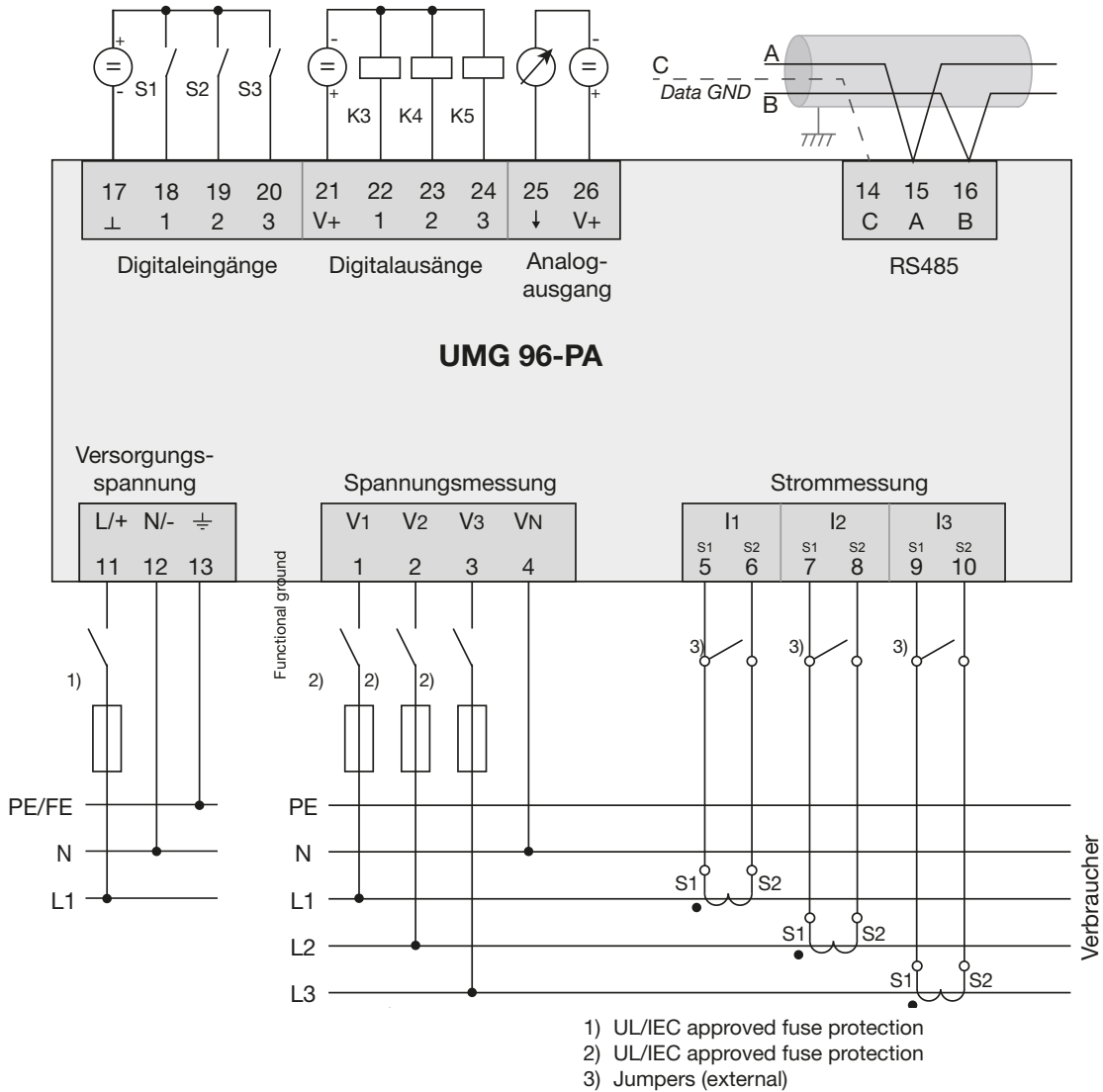


Fig. Cut-out size

19.4 Connection example 1



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