Janitza electronics

Portable Measuring Device

MRG503LGF

Operating manual

Dok. Nr.: 1.027.014.0

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Contents

Issue Note

02.07.02	First edition
17.10.02	Accessories
06.11.02	Connection diagrams.Accessories

Safety notes

The following symbols are fixed to the MRG503LGF and are used within this manual:

Beware dangerous electrical voltage.

Attention! Read manual.
This symbol shall warn you about possible danger, which can occur while mounting, putting into service or the use of this product.

Protective wire connection.

Receipt control

In order to ensure a perfect and safe use of the device, a proper transport, expert storage, erection and mounting and careful usage and maintenance are required. When it may be supposed, that a safe operation is no longer possible, the device has to be put out of service and be protected against unintentional putting into service.
A safe operation can no longer be assumed, when the device
• shows visible damage,
• does not work in spite of intact net supply,
• has been exposed to disadvantageous conditions for a longer time (e.g. storage out of the allowed climate without adaption to the room climate, dew etc.) or transport use (e.g. falling from great height, even without visible damage).

Please test the contents of delivery for completion, before starting the installation of the device. All delivered options are listed on the delivery papers.

Attention!
This manual also describes options, which were not delivered and do not belong to the contents of delivery.

Delivery

Contents of delivery

Pcs.	Part no.	Description
1	5207404	Portable Universal Measuring Device MRG503LGF
3	0801902	Measuring cable, 1,0mm^2, black, 3m long
1	0801903	Measuring cable, 1,0mm2, blue, 3m long
3	1011510	Fuse clip, 4mm, black
1	1011511	Fuse clip, 4mm, blue
4	0508410	High-power fuse for fuse clip, 2A/250V
1	0802405	Zero modem cable, 9-pole
1	5100104	CD-ROM with standard software PSW basic
1		Manual MRG503LGF, English

Accessories

	Part no.	Description
	1505204	Flexible AC transformer, Type RR3030, range 30A, 300A, 3000A Voltage supply with 2 batteries , Mignon 1.5V by choice (Battery life expectance: typical 400 hours) *or external DC supply.* *Voltage supply for RR3030, for UK* *Voltage supply for RR3030, for Europe*
	1505205	Flexible AC transformer, Type ACF-3000AK, range 30A, 300A, 3000A Voltage supply with 2 batteries, 9V-Block (Life expectance >100 hours)
	1505206	Flexible AC transformer, Type STW Amprobe ACF1000, range 1000A Voltage supply with 2 batteries, Mignon 1,5V (Battery life expectance: typical 1000 hours)
	0801906	Safety measuring cable BNC / 4mm safety terminal, length 160cm, Silicon

Hints for usage

This device may be put into service and used by qualified personnel according to the safety regulations and instructions only. Please mind the additional legal and safety regulations for the respective application.
Qualified personnel are persons, familiar with erection, mounting, putting into service and usage of the product and having the qualifications such as:

• education or instruction / entitlement to switch, release, ground or characterize current circuits and devices according to the standards of safety techniques.
• education or instruction in the care and usage of suitable safety equipment according to the standards of safety techniques.

Hints for maintenance

Before delivery the device is tested in various safety checks and marked with a seal. If the device is opened, these checks must be repeated.
There is no guarantee for devices, which are opened out of the manufacturing works.

Repairing and calibration

Repairing and calibration work can be carried out in the manufacturing works only.

Front foil

The cleaning of the front foil must be done with a soft cloth using a common cleansing agent. Acid or acidic agents may not be used for cleaning.

Battery

The life expectance of the battery is 5 years minimum for a storage temperature of +45°C. The typical life expectance of the battery is about 8 to 10 years. The battery is plumbed and should be exchanged in the manufacturing works only.

Waste management

The UMG 503 can be disposed as electronical waste according to the legal regulations and recycled. Please note, that the input Lithium battery must be disposed separately.

Product description

Intended use

The MRG 503LGF is suited for fix mounting and the measurement of voltage, current, power etc. in low and medium voltage switchgear. The measurement is laid out for one phase and three phase systems with or without neutral conductor (three wire measurement).
Alternating voltages (50Hz/60Hz) up to 500VAC against ground can be connected directly.
The three voltage inputs are not separated galvanically and must be connected by external prefuses M2A to the measured voltage.
For voltage measurement up to 250V fuse clips with integrated high power fuse are available.
For the current measurement, AC transformers with a measuring signal of 5Veff maximum according to the Rogowski principle can be connected to the MRG503LGF.
The connection of the auxiliary voltage is carried out via the attached supply cable.

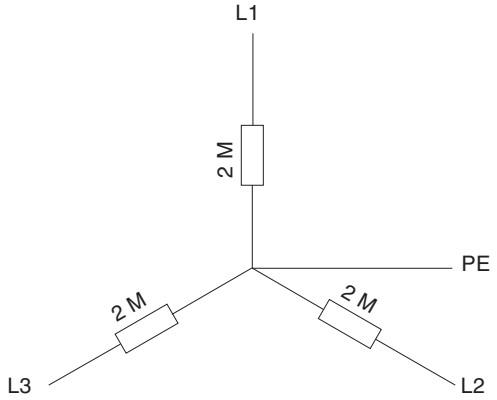
Attention!
The MRG 503LGF may only be operated, if the auxiliary voltage is supplied by a protective contact plug socket.

Assembly

The measuring device UMG503 is installed in a case. The measuring inputs for current and voltage as well as the power supply and RS232 interface are lead out of the case.
In the top of the case, a pouch is inserted for the documentation and the measuring cables. A compartement at the bottom serves for storing the flexible transformers, which do not belong to the contents of delivery and the 4 voltage clips.

Functional description

The electronical three phase measurement system determines and digitalizes the effective values of voltages and currents in 50/60 Hz networks.
Two random test measurements are carried out each second on all current and voltage measuring inputs. Signal interruptions, which are longer than 500ms are surely recognized. For each random test two periods are scanned. From those sampled values the microprocessor calculates the electrical magnitudes.
These measured values are indicated within the programmable display.
Highest values, lowest values and programming data can be saved in a battery buffered storage. Selected measured values will be saved with date and time in a ring buffer.



Diagr. Equivalent circuit diagram for voltage measurement

Attention!
Measurement in systems with pulse load is not possible, because no continuous scanning of the measuring signals is carried out.

Service

If you have problems, which are not described in this manual, please ask our technical support.
For further handling of your questions, please have the following at hand:

- Device description (see type plate),
- Serial number (see type plate),
- Software Release,
- Measurement and auxiliary voltage and
- Exact description of the problem.

You can contact us: Monday to Thursday between 07:00 and 15:00
and Friday between 07:00 and 12:00

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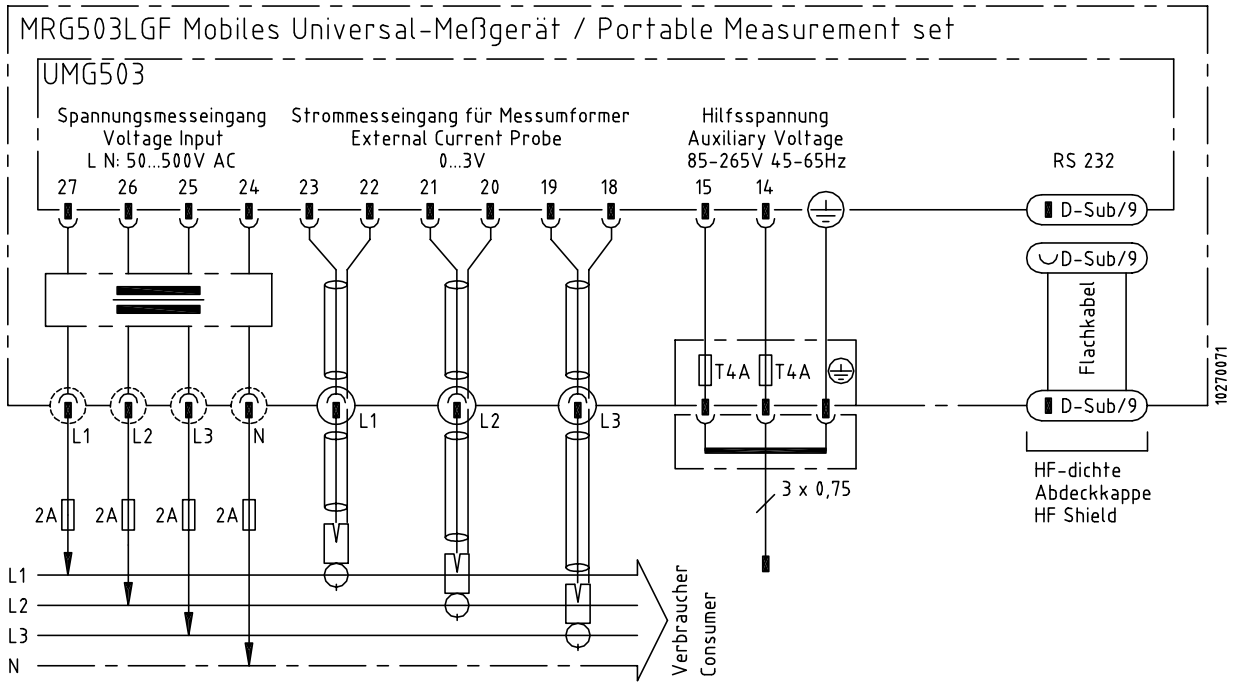
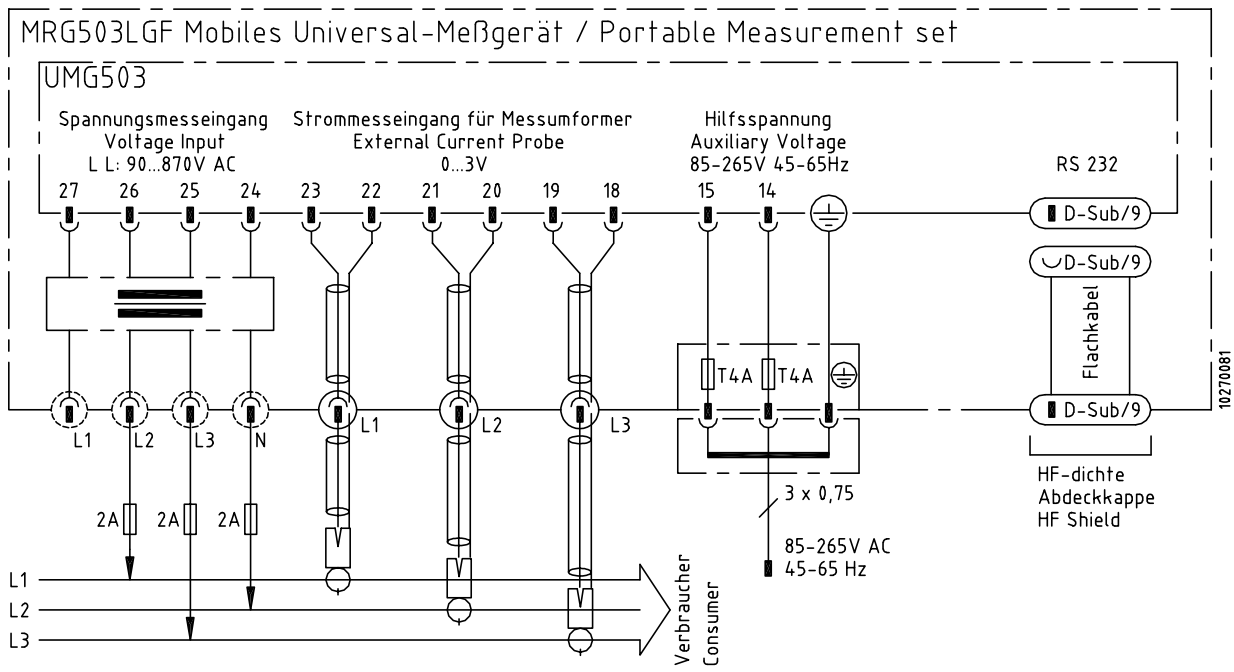


Diagr.: Four wire measurement with three transformers



Diagr.: Three wire measurement with three current transformers.

Putting into service

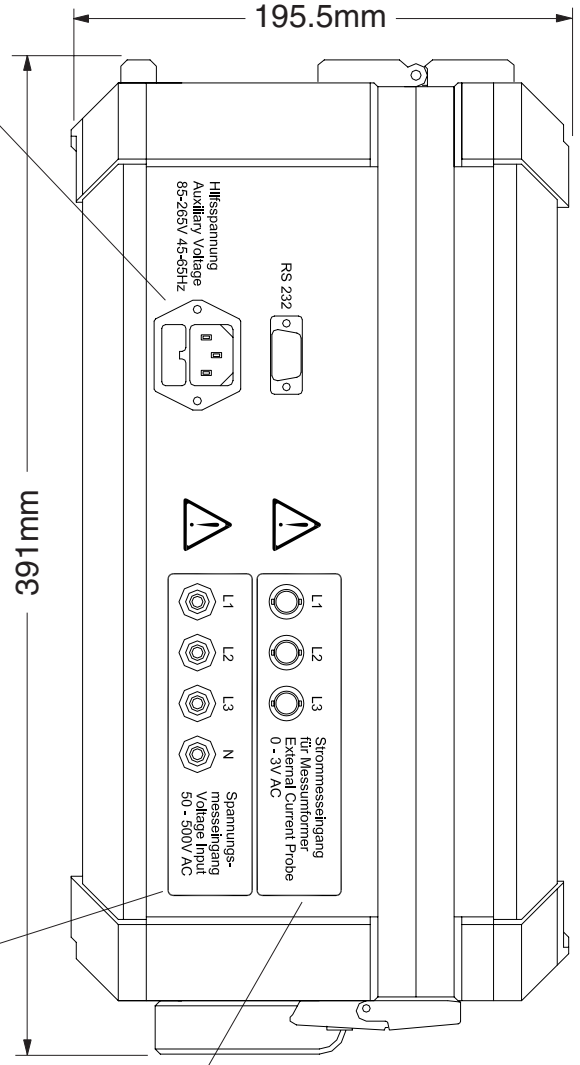
Auxiliary voltage

Auxiliary and measurement voltage are connected separately to the measurement device. The connection of the auxiliary voltage
230V +10%/-15%; 45-65Hz
is carried out via the included leads with protective plug.

Programming

To achieve the right current and voltage values, the current and voltage transformers must be programmed now at the MRG 503LGF.
For the voltage transformer setting is always the primary and secondary outer conductor voltage L-L to be set. In TN mains with voltage L against neutral of 230V and L-L of 400V, the manufacturer's settings of 400V/400V can be used.
The setting of the current transformers has to be carried out according to the set current range. Please mind the following table:

Range Current transformer	Setting at MRG503LGF
30A/3V	30A/3A
300A/3V	300A/3A
3000A/3V	3000A/3A
1000A/1V	1000A/1A



Diagr.: Side view of the case

Voltage

Measurement voltages up to 500VAC against ground can be connected to the measuring sleeves of the MRG 503LG. The measurement voltage is connected to the case via the included leads (1.0mm^2) and the fuse clip. Please check the voltage indication of the UMG503 using a Voltmeter.
In earthed networks (TN-Net and TT-Net) the connection diagram *four wire measurement* is used. In unearthed networks (IT-Net) the connection diagram *three wire measurement* is used.
If the device is connected according to the diagram *three wire measurement*, the software must be set to *three wire measurement* by the user as well.

Current Measurement

The current measurement may occur via transformers according the Rogowski principle only. The output voltage may not exceed 5Veff.

Attention!
Please mind the safety guidelines of the used transformer.

Diagr.: Transformer according to the Rogowski principle.

Measured values

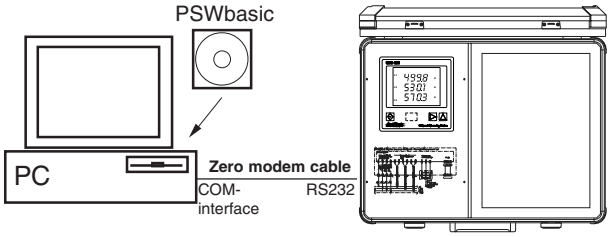
With the manufacturer's presettings current, voltage and power have the average of 15 minutes and are saved in the ring buffer of the MRG503LGF. Other averaging times and other measured values must be selected and set by the user. The selection of other mean values for the ring buffer and the changing of the averaging times is described in chapter "Programming" .

Synchronization

If the *real power EMAX* is measured and saved, it may be useful to synchronize the measurement period of the MRG 503LGF and the energy supplier. The synchronization can be carried out via the function keys of MRG 503LGF as described in chapter "EMAX monthly peak values".

Read data

If a measurement is connected, the ring buffer of the MRG503LGF is connected by a zero modem cable to PC, and can be read out. The necessary Software PSWbasic is in the contents of delivery.



Diagr.: Connection of PC to MRG 503LGF via zero modem cable.

Removal of errors

Faults	Possible reason	Remedy
Indication dark	External prefuse has released.	Replace prefuse.
	Internal prefuse has released.	The fuse cannot be changed by the user. Please send the device back to the manufacturing works
	Contrast setting too dark.	Change contrast settings in configuration menu.
	Device faulty.	Please send the device to the manufacturer for repair.
No current indication	Measurement voltage not connected	Connect measurement voltage.
Current too small	Current measurement in the wrong phase.	Check and correct connection.
	Current transformer factor programmed incorrectly.	Read current transformer ratio on current transformer and program correctly.
Wrong current	Current measurement in the wrong phase.	Check and correct connection.
	Current transformer factor programmed incorrectly.	Read current transformer ratio on current transformer and program correctly.
	Measuring range exceeded.	Install bigger current transformer.
	The peak current value on measuring input was exceeded caused by harmonics.	Install bigger current transformer. Attention: Please ensure, that the measuring inputs are not overloaded.
	The current on measuring input was underscored.	Install smaller current transformer.
Voltage L-N too small	Measurement in wrong phase.	Check and correct connection.
	Voltage transformer factor programmed incorrectly.	Read current transformer ratio on current transformer and program correctly. If the voltage is not measured via voltage transformer please program a voltage transformer ratio of 400/400.
	Voltage on measuring input out of measuring range.	Install smaller voltage transformer.
Voltage L-N incorrect	Measurement in wrong phase.	Check and correct connection.
	Voltage transformer factor programmed incorrectly.	Read current transformer ratio on current transformer and program correctly. If the voltage is not measured via voltage transformer please program a voltage transformer ratio of 400/400.
	Measured range exceeded.	Install bigger current transformer.
	The peak voltage value on measuring input was exceeded caused by harmonics.	Install bigger current transformer. Attention: Please ensure, that the measuring inputs are not overloaded.
Voltage L-L too small/ too big	Outer conductors exchanged.	Check and correct connection.
	N not connected.	Check and correct connection.
Phase shift ind /cap too small or big	Current path is assigned to the wrong voltage path.	Check and correct connection.

Faults	Possible reason	Remedy
Phase shift ind /cap too small or big	Current path is assigned to the wrong voltage path.	Check and correct connection.
Programmed data get lost	Battery empty.	Please send device to the manufacturer for exchanging the battery.
	The device has been exposed to electromagnetical interference bigger than the allowed by technical data.	External protection measure such as shielding, filtering, earthing or spatial separation.
Real power too small / too big	Current transformer factor programmed incorrectly.	Read current transformer ratio on current transformer and program correctly.
	Current path is assigned to the wrong voltage path.	Check and correct connection.
	Current on measuring input out of measuring range.	Install bigger or smaller current transformer. Attention: Please ensure, that the measuring inputs are not overloaded.
	Voltage transformer factor programmed incorrectly.	Read current transformer ratio on current transformer and program correctly. If the voltage is not measured via voltage transformer please program a voltage transformer ratio of 400/400.
	Current on measuring input out of measuring range.	Install bigger or smaller current transformer. Attention: Please ensure, that the measuring inputs are not overloaded.
Real power consumption / supply exchanged.	One current transformer at least exchanged.	Check and correct connection.
	Current path is assigned to the wrong voltage path.	Check and correct connection.
The time is indicated incorrectly.	The device has no automatical summer-/winter change over.	Correct time by hand.
"EEEE" in the display.	The measuring range of current was exceeded.	Check measuring current and insert a suitable current transformer.
age	The measuring range of voltage was exceeded.	Check measuring voltage and insert a suitable volt-transformer.
Duration of memory =38 s.	Not enough memory for all selected values.	Select more equal averaging times for the measured values.
Relay output, analogue output or pulse output do not react.	The outputs are not programmed	Program the outputs.
	The service protocol 04 is set	Select another protocol.
The device does not work correctly in spite of the above	Device out of order.	Please send the device to the manufacturer with an exact description of the failure.

Usage

Keys

The UMG503 is operated with three keys in the front plate.

= *Key 1*
= *Key 2*
= *Key 3*

In the various indications the keys have different meanings.

Edit

In configuration menu **CONF** and in programming menu **PRG** the settings in edit mode **EDIT** can be changed.
In edit mode **EDIT** the keys have the following meaning:

Key 1	Select cipher/number or leave edit mode.
Key 3	Change ciphers.
Key 2	Multiply the number with factor 10.

Special functions

Press and hold ***key 1*** for about ***2 seconds*** to return to the **first measured value window** of the measured value indication from each program part.
Hold ***key 2 or key 3*** for about ***2 seconds*** to return to the **previous measured value window**.

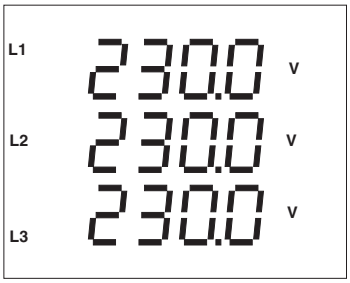
Main menu

After a net return the device always starts with the first programmed measured value indication. With *key 1* you change over between

the measured value indication,
the configuration menu **CONF** and
the programming menu **PROG**

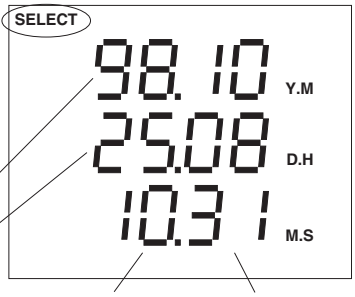
Measured value indication

Example: Voltages L1-N, L2-N, L3-N.



SELECT Mode

Indication of date and time information.

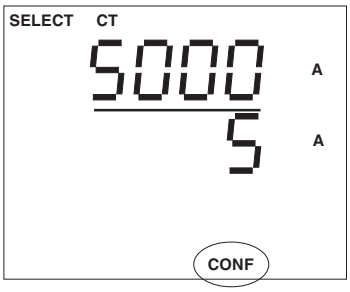


Year=98 Month=10
Day=25 Hour=08

Minute=10 Second=31

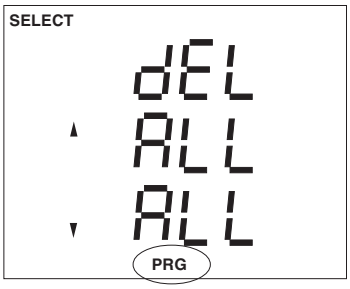
Configuration menu **CONF**

Example: Ratio current transformer.



Programming menu **PRG**

Delete all highest and lowest values.

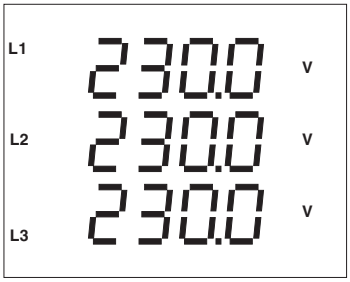


 ▲= Maximum or consumption ▼= Minimum or supply = Key 1 = Key 2 = Key 3

Measured value indication

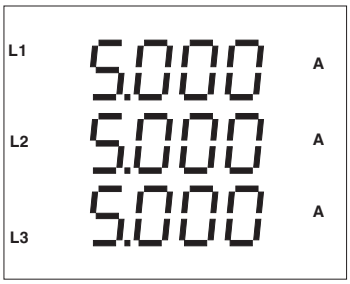
The display of the MRG 503LGF can indicate up to three measured values simultaneously.

Example: Voltages L1-N, L2-N, L3-N



With the keys 2 and 3 one can scroll through those measured value indications.

Using key 3 you scroll to the next measured value indication.
Example: Current in phase L1, L2 and L3



To keep the selection of the indicated measured values clear, only a certain part of all possible measured values is programmed for the display in delivery condition.
In the table "**Retrievable measured and calculated quantities**" all measured values, which can be called up, are listed. On the pages 32 to 33 the manufacturer's settings of the retrievable values are listed.
If other measured values should be indicated on the display of UMG503, they can be selected in the software **PSW basic,** which belongs to the contents of delivery, and transmitted via serial interface to the UMG 503.

After a net return the device always starts with the first programmed measured value indication.

Retrievable measured and calculated quantities

Measured quantity	Measured value L1	L2	L3	Sum	Mean value L1	L2	L3	Sum	Measured value Peak value	Lowest val.	Date and time
Voltage L-N, L-L	x	x	x		x	x	x		x	x	x
Current	x	x	x	x	x	x	x	x	x	x	x
Real power	x	x	x	x	x	x	x	x	x	x	x
Real power, 15min. mean value				x					x	x	x
Apparent power	x	x	x	x	x	x	x	x	x	x	x
Reactive power, cos(phi)	x	x	x	x	x	x	x	x	ind	cap	x
Frequency of voltage	x	x	x		x	x	x		x	x	x
Real work											
without reverse running stop				x						Starting/running time	
Consumption				x						Starting/running time	
Supply				x						Starting/running time	
Reactive work											
without reverse running stop				x						Starting/running time	
inductive				x						Starting/running time	
capacitive				x						Starting/running time	
Partial harm. content HDF, I/U	x	x	x		x	x	x		x	x	x
Total harmonic content THD, I/U	x	x	x		x	x	x		x	x	x

Measured value display (Manufacturer's settings)

Meas. val. voltage L1-N Meas. val. voltage L2-N Meas. val. voltage L3-N	Mean val. voltage L1-N Mean val. voltage L2-N Mean val. voltage L3-N	Peak val. voltage L1-N Peak val. voltage L2-N Peak val. voltage L3-N	Lowest value voltage L1-N Lowest value voltage L2-N Lowest value voltage L3-N
Meas. val. voltage L1-L2 Meas. val. voltage L2-L3 Meas. val. voltage L3-L1	Mean val. voltage L1-L2 Mean val. voltage L2-L3 Mean val. voltage L3-L1	Peak val. voltage L1-L2 Peak val. voltage L2-L3 Peak val. voltage L3-L1	Lowest value voltage L1-L2 Lowest value voltage L2-L3 Lowest value voltage L3-L1
Meas. val. current L1 Meas. val. current L2 Meas. val. current L3	Mean val. current L1 Mean val. current L2 Mean val. current L3	Peak val. current L1 Peak val. current L2 Peak val. current L3	Lowest val. current L1 Lowest val. current L2 Lowest val. current L3
Meas. val. real power L1 Meas. val. real power L2 Meas. val. real power L3	Mean val. real power L1 Mean val. real power L2 Mean val. real power L3	Peak val. real power L1 Peak val. real power L2 Peak val. real power L3	Lowest val. real power L1 Lowest val. real power L2 Lowest val. real power L3
Meas. val. app. power L1 Meas. val. app. power L2 Meas. val. app. power L3	Mean val. app. power L1 Mean val. app. power L2 Mean val. app. power L3	Peak val. app. power L1 Peak val. app. power L2 Peak val. app. power L3	Lowest val. app. power L1 Lowest val. app. power L2 Lowest val. app. power L3
Meas. val. react. power L1 Meas. val. react. power L2 Meas. val. react. power L3	Mean val. react. power L1 Mean val. react. power L2 Mean val. react. power L3	Peak val. react. power L1 Peak val. react. power L2 Peak val. react. power L3	Lowest val. react. power L1 Lowest val. react. power L2 Lowest val. react. power L3

▲= Maximum or consumption ▼= Minimum or supply = Key 1 = Key 2 = Key 3

Measured val. frequency L1 Measured val. frequency L2 Measured val. frequency L3	Mean val. frequency L1 Mean val. frequency L2 Mean val. frequency L3	Peak val. frequency L1 Peak val. frequency L2 Peak val. frequency L3	Lowest val. frequency L1 Lowest val. frequency L2 Lowest val. frequency L3
Measured val. cos(phi) L1 Measured val. cos(phi) L2 Measured val. cos(phi) L3	Mean val. cos(phi) L1 Mean val. cos(phi) L2 Mean val. cos(phi) L3	Peak val. cos(phi) L1 Peak val. cos(phi) L2 Peak val. cos(phi) L3	Lowest val. cos(phi) L1 Lowest val. cos(phi) L2 Lowest val. cos(phi) L3
Real energy consump. tariff 00	Real energy consump. tariff 01	Real energy consump. tariff 02	
Real energy supplied			
Inductive energy tariff 10	Inductive energy tariff 11	Inductive energy tariff 12	
Capacitive energy tariff 20	Capacitive energy tariff 21	Capacitive energy tariff 22	

Mean value harmonics I L1 Mean value harmonics I L2 Mean value harmonics I L3	Peak value harmonics I L1 Peak value harmonics I L2 Peak value harmonics I L3		
Mean value harmonics U L1 Mean value harmonics U L2 Mean value harmonics U L3	Peak value harmonics U L1 Peak value harmonics U L2 Peak value harmonics U L3		
Meas. val. sum real power Meas. val. sum react. power Meas. val. sum cos(phi)	Mean val. sum real power Mean val. sum react. power Mean val. sum cos(phi)	Lowest val. sum real power Lowest val. sum react. power Lowest val. sum cos(phi)	Peak val. sum real power Peak val. sum react. power Peak val. sum cos(phi)
Measured value sum current Mean value sum current Peak value sum current			
Measured value sum power 15 min	Lowest value sum power 15 min	Peak value sum power 15 min	
Date / time	Serial number	Software Release	

▲= Maximum or consumption ▼= Minimum or supply = Key 1 = Key 2 = Key 3

Calling up additional information

Additional information can be called up for the most indicated measured values:

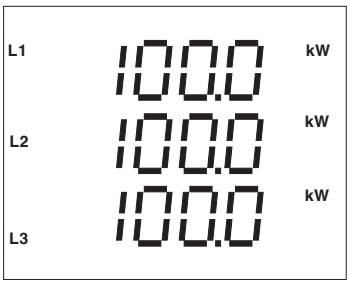
Date and time for the highest and lowest values
Averaging times for the measured values
Duration of energy determination.

Mean values

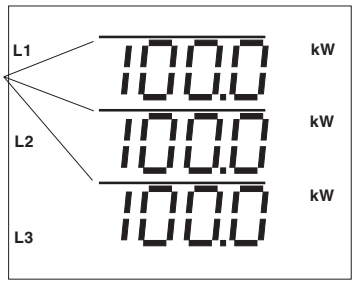
For each measured value except energy, also a mean value is calculated. The averaging time is programmable. Only mean values can be marked for storage within the ring buffer.
To call up maximum power value in L3, for example, please proceed like this:

Pressing **key 1** for about ***2 seconds,*** real work will be deleted and you return to the first programmed measured value window of the measured value indication!

Select the measured value indication of real power using *key* 3.

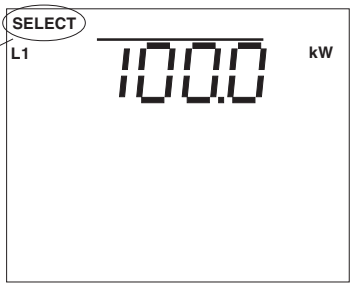


Carry on scrolling with key 2 to the mean values of real power.

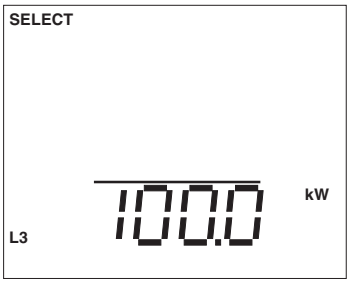


Go to select mode using *key* 1.
The symbol **SELECT** flashes.

Confirm with *key 2*.
The symbol **SELECT** is visible.

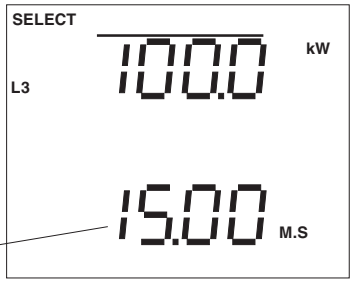


Select mean value of real power in L3 with *key 1*.



Call up additional information with *key 2* to indicate the averaging time for real power in L3.

Averaging time = 15 Minutes



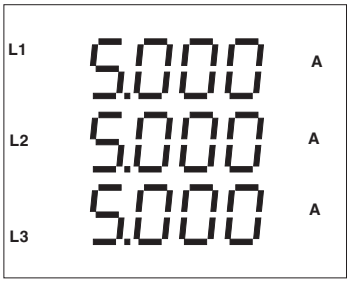
Lowest and peak values

For each lowest and peak value, the date and time of the appearance is saved. To call up maximum current value in L2, for example, please proceed like this::

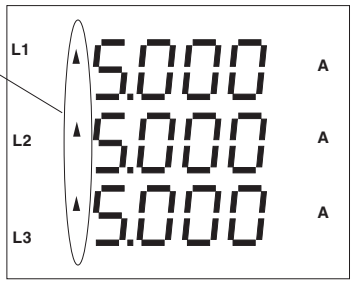
Pressing *key 1* for about ***2 seconds,*** real work will be deleted and you return to the first programmed measured value window of the measured value indication!

Attention!
After the return of the auxiliary voltage. all lowest values are deleted.

Select the measured value indication using *key* 3.

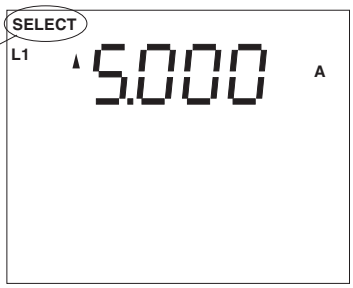


Scroll to the current peak values using *key* 2.

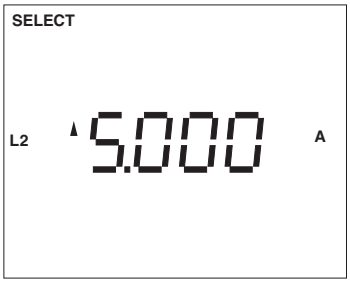


Select the select mode using *key* 1.
SELECT flashes.

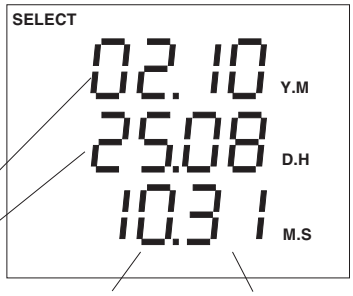
Confirm select mode using *key* 2.
SELECT is on.



Select peak value in L2 using *key* 1.



See additional information date and time for starting time of reactive energy using *key 2*.



Year=02 Month=10
Day=25 Hour=08

Minute=10 Second=31

Energy measurement

Starting time and running time for the following real and reactive energies are saved:

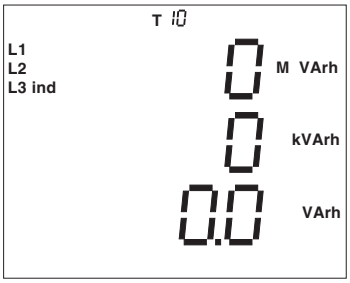
- Real energy without reverse running stop
- Real energy supply
- Real energy consumption (T00)
- Reactive energy without reverse running stop
- Reactive energy ind., (T10)
- Reactive energy cap., (T20)

Starting time and running time for energy meters, which are controlled by internal or external tariff changeovers, are not saved.

The call up of reactive energy ind. (T10), for example, is carried out as follows:

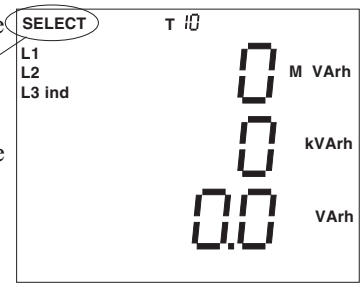
Pressing *key 1* for about ***2 seconds,*** real work will be deleted and you return to the first programmed measured value window of the measured value indication!

Scroll to measured value indication of reactive power using *key 3*.



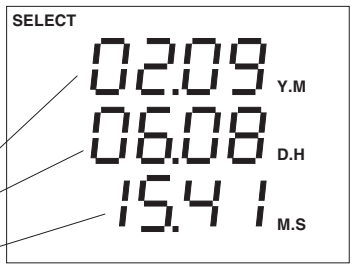
Select the select mode using *key* 1.
SELECT flashes.

Confirm select mode using *key* 2.
SELECT is on.

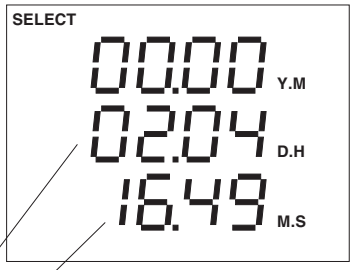


See additional information for starting time of reactive energy using *key 2*.

Year=02 Month=09
Day=06 Hour=08
Minute=15 Second=41



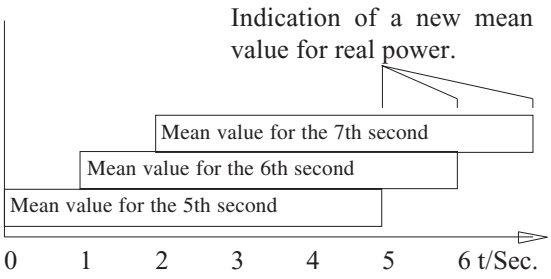
See additional information for running time of reactive energy using *key 2* again.



Day=02 hours=04
Minutes=15 Seconds=41

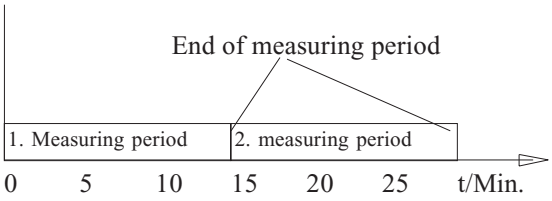
Real power EMAX

For the most measured values of the UMG503, a mean value of one second over the passed time is built. This passed duration is the programmed averaging time.



Diagr.: Mean value for real power over 5 seconds.

The real power is an exception. For the real power the mean value **real power EMAX** is build over a programmable measurement period additionally.
The measuring period for real power EMAX can be 5, 10, 15, 30 or 60 minutes.
The manufacturer's setting for the measuring period is 15 minutes.
The real power EMAX is calculated from the work within a certain period of time divided by the passed time of the period. The calculation is done each second, in order to ensure the indication of real power EMAX within the measurement period. For the comparison and storage of the EMAX monthly peak value only the real power, measured at the end of a period, is used.



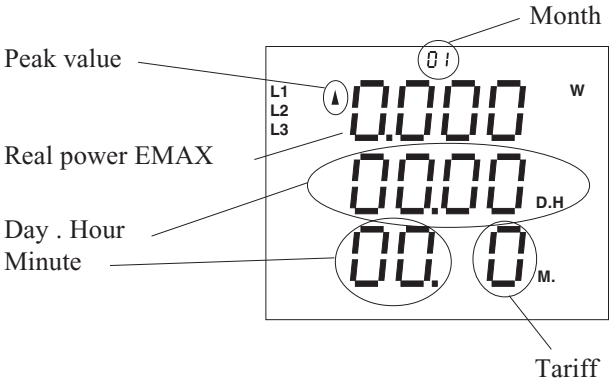
Diagr.: Calculation of mean value for real power EMAX over a measurement period of 15 minutes.

The tariff changeover is not only valid for real and reactive work meters but also for real power EMAX.

	Work meter				
		Programmable via			
		Time programs 1-4			
		Aux. input			
Real work cons.	T00	T01	T02	T03	T04
Reactive work ind.	T10	T11	T12	T13	T14
Reactive work cap.	T20	T21	T22	T23	T24

EMAX- monthly- peak values

All EMAX-monthly-peak values are saved for all tariffs each month. The old EMAX-monthly-peak values are overwritten at the beginning of a new year.
If the real power EMAX is configurated for the display software PSWbasic, real power EMAX can be indicated in the display of the UMG 503 as well.
The EMAX- monthly- peak values can be read out directly at the UMG503 and via the serial interface, with the software PSWbasic, for instance.



Attention!
Real power EMAX is calculated from the energy without reverse running stop.

Attention!
The real power EMAX is not indicated in the standard indications.

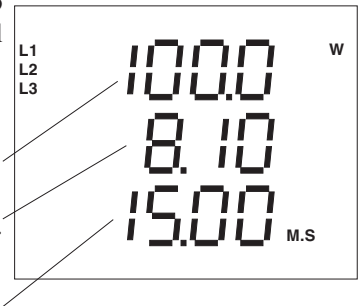
Reset of the measuring period

The reset of the measuring period deletes real power EMAX and starts a new period.
If no external reset is carried out within the programmed period, the reset is carried out by the internal clock.
If there are less than 30 seconds between two resets, the measuring period is reset and real power EMAX is deleted. The obsolete measured value is not saved in the maximum and minimum memory and **not** be deposited within the event memory, if programmed.

The measuring period for real power EMAX can be reset by the following means:
- automatically, after measuring period,
- internally, via keyboard,
- externally, with MODBUS protocol. (Table 5)

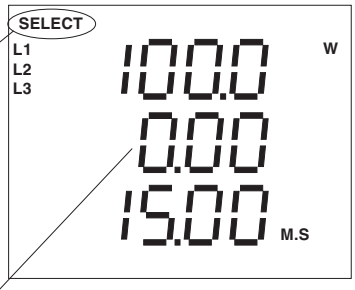
Reset of the measuring period by keyboard

With *key 3* you leaf to the indication of real power EMAX.



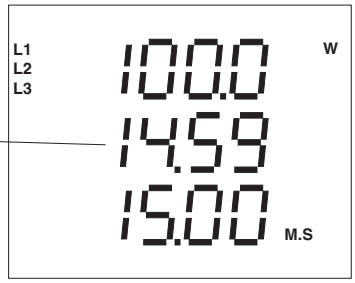
Real power EMAX (Example 100W).
Rest time of period (Example. 8Min. 10Seconds).
Measuring period (Example 15Minutes).

With *key1* go to Select-Mode.
The symbol **SELECT** flashes.
Confirm with *key 2* .
The symbol **SELECT** is visible.



Press *Key2* again. The rest time is deleted.

The symbol **SELECT** disappears.
The period for real power EMAX is started again.



Pressing **key *1*** for about ***2 seconds,*** real work will be deleted and you return to the first programmed measured value window of the measured value indication!

Current measurement without measuring voltage

In UMG503, the net frequency is determined from the measured voltage. The scanning frequency for current and voltage inputs is calculated from this net frequency.

If the measured voltage is missing, no net frequency and scanning frequency can be determined. Voltage and current and all depending values are not calculated and indicated by zero.
If the current should be measured without voltage measurement, the net frequency must be entered as a fix value at the UMG 503.
50Hz or 60 Hz can serve as fix frequencies.

Harmonics

Harmonics are integer multiples of the fundamental. The UMG503 measures the fundamental of voltage in the range of 45 to 65Hz. All harmonic voltages and currents are related to this fundamental. For heavily distorted voltages, the fundamental cannot be determined accurately. To be able to calculate the harmonics, a fix fundamental of 50Hz or 60Hz can be selected. Please see chapter "scanning frequency".
The UMG 503 can calculate harmonics up to the 20th.

Total harmonic distortion factor THD(f)

The calculated total harmonic distortion factor THD(f) represents the ratio between the harmonics and fundamental. The total harmonic distortion factor is given in %.
As it is related to the fundamental but not to the total value, it can be bigger than 100% theoretically.

THD(f) = Total Harmonic Distortion (fundamental)

Partial harmonics

In the further description, the single harmonics are described as partial harmonics.
The partial harmonics of current are given in Ampere and the partial harmonics of voltage are given in Volt.

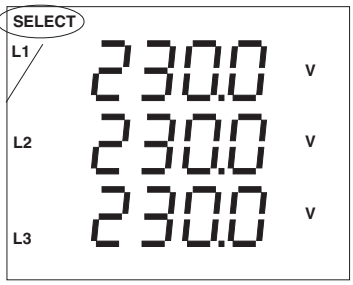
Programming

The following settings can be carried out in the menu **PRG**:

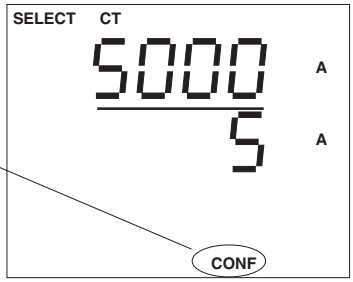
Delete real and reactive work,
Delete all highest and lowest values "dEL"
Select measured values for the **ring buffer** ,
Select averaging time for the measured values,
Delete single highest and lowest values,
Read out duration of storage of the ring buffer.

To reach the menu **PRG**, for example from the indication of voltage, please proceed like this:

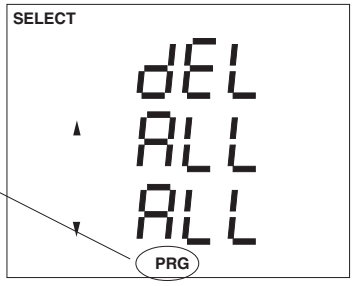
Confirm with *key 1*. In the measured value indication the text **SELECT** appears flashing.



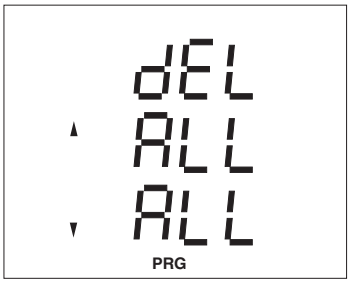
Confirm *key 1* again. Now you are in the menu **CONF**.



Confirm *key 1* again. Now you are in the menu **PRG**.



Confirm the selection of the menu **PRG** using *key 2*. The text **SELECT** disappears from the display.



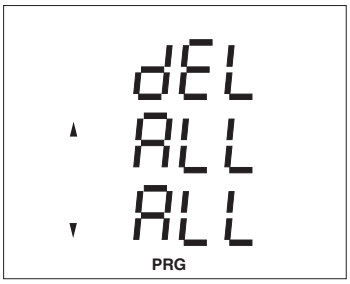
Delete real and reactive energy

Real and reactive energy can be deleted via the keys of the UMG503 or via the serial interface. Starting time and running time are actualized. If real energy is deleted, all corresponding tariffs are reset. If the reactive energy is deleted, also the counters of inductive and reactive energy are reset.

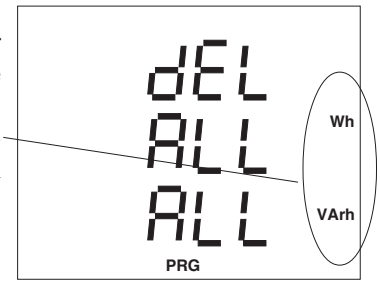
Deletion via keyboard

Please go to menu **PRG** (see chapter Programming).

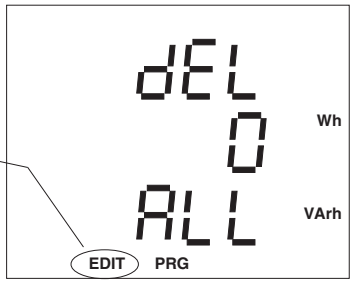
Confirm the selection of the menu **PRG** using *key* 2. The text **SELECT** disappears.



Pressing *key* 2 again, the delete menu for **real and reactive work** appears.
The arrows for minimum and maximum values disappear.



Select the work to be deleted by pressing *key 1*, for example real work.
The text **EDIT** appears and "**ALL**" flashes.
Confirming with *key 3,* a "0" flashes in the indication.



Pressing **key** for about ***2 seconds,*** real work will be deleted and you return to the first programmed measured value window of the measured value indication!

Deletion via serial interface

In address 5000, a 17 Bytes "internal control word" is deposited. One part of this "internal control word" is used for deletion of energy:

Byte 7 >0, deletion of real energy and
Byte 8 >0, deletion of reactive energy.

To overwrite a byte, you must

read the "internal control word",
overwrite byte7/8 with 1.

and rewrite the changed "internal control word" back to address 5000.

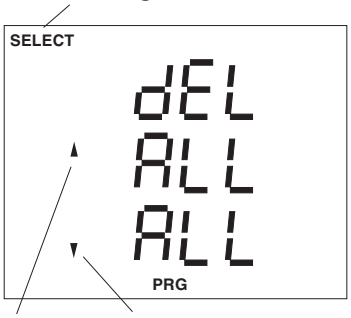
Attention!
Changing other bytes of the "internal control word" leads to malefunctions of the UMG503.

Delete highest and lowest values

Highest values are marked with an arrow upwards, the lowest with an arrow downwards.

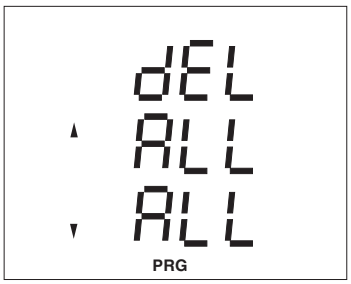
Text flashing

Change to menu **PRG** (see chapter programming). Using *key 2* you confirm the selection of menu **PRG** and the text **SELECT** disappears.



Maximum values Lowest values

Using *key 2* you confirm the selection of menu **PRG** and the text **SELECT** disappears.



There are two possibilities of deleting the highest and lowest values:

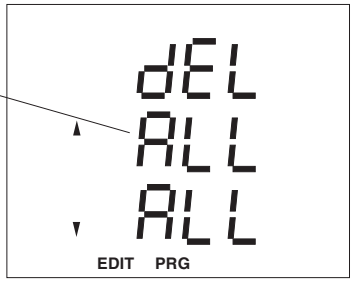
- Delete all minimum and maximum values,
- Delete minimum and maximum values separately.

The monthly peak values of the real power EMAX belong to the maximum values and are deleted together with them.

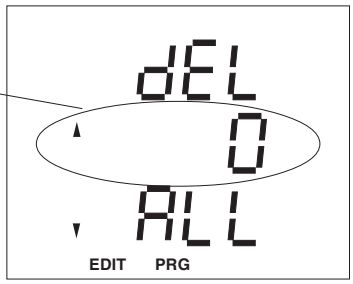
Attention!
After return of auxiliary voltage, all minimum values are deleted.

Delete all minimum and maximum values

If you want to delete all maximum values with *key 1,* the indication "ALL" flashes.



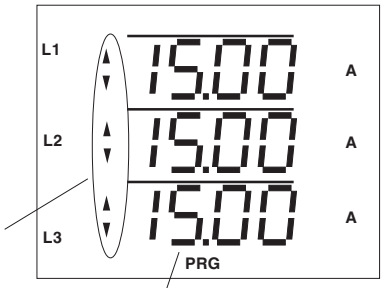
Using *key 3*, a "0" appears within the indication and all highest values are marked for deletion.
Pressing *key 1* again, you change to the indication of minimum values. Now the minimum values could be marked for deletion.



Pressing ***key*** for about ***2 seconds,*** the highest value is deleted and you return to the first measured value window of the measured value indication!

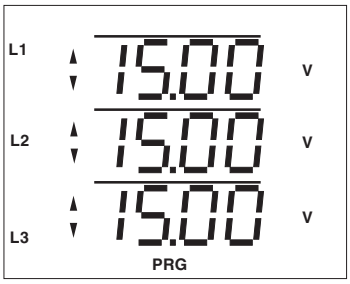
Delete minimum and maximum values separately

If you are in the menu **PRG** and you would like to delete the highest voltage values only, please proceed as follows:

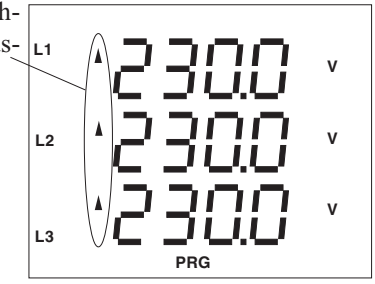


Averaging time =15 Minutes

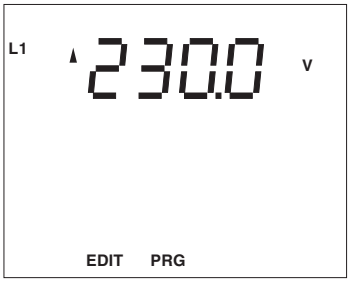
Now scroll to the measured value indication of the voltages by using *key 3*.



Now scroll to the highest values of voltage using *key 2*.



Pressing *key* 1, the highest value in phase L1 is indicated.
The text **EDIT** appears.



Pressing *key 1* again, the highest value in phase L2 is indicated.
If this highest value should be deleted, please press *key 3*.
The indicated value is set to 000.0 for a short duration and is overwritten by the next measured value.

Pressing the ***key*** for about ***2 seconds,*** you leave the **PRG** menu and return to the first measured value window of the measured value indication!

Ring buffer

For the most measured values a mean value is calculated (please see table "Measured and calculated values"). These mean values can be selected for storage in the ring buffer.
The mean values are marked with a horizontal bar on top of the measured value. The mean values, selected for storage in the ring buffer, can be called up in the menu **PRG** and are marked by the flashing of both of the arrow symbols.
Additionally, the following **energies** can be selected for storage in the memory:

- Real energy,
- Real energy consumption,
- Real energy supply,
- Reactive energy,
- Reactive energy inductive,
- Reactive energy capacitive.

Those energies with the various tariffs cannot be selected for storage in the ring buffer. For **energies,** the period between two savings is set to one hour.

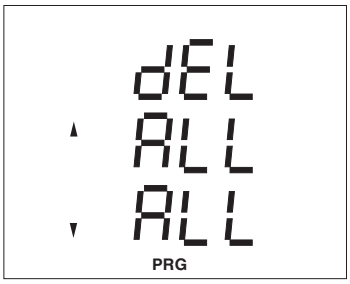
The more mean values are selected for storage in the ring buffer, the earlier the ring buffer is complete and will be overwritten. The period of storage for the ring buffer can be read out in the measured value indication.
The stored measured values can be read out of the ring buffer using the "programming- and reading out software **PSWbasic**" only.

Attention!
If the averaging time, the current transformer ratio, voltage transformer ratio, three wire or four wire measurement or the selection of the measured values stored in the ring buffer are changed, the contents of the ring buffer are deleted completely.

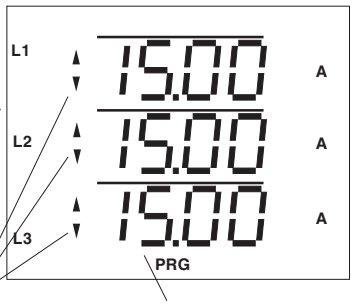
Select mean values

If you are in menu **PRG** and would like to save the mean value of voltage L2 within the ring buffer, please proceed as follows:

Confirm selection of the menu **PRG** using key 2, the text **SELECT** disappears.



Change over to mean value indication using *key 3*. In this example the programming of current in the three phases is indicated.

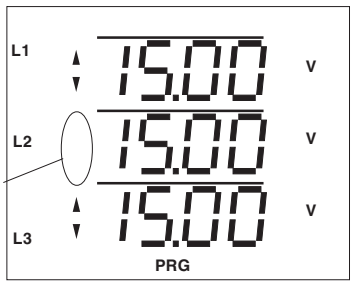


All three currents are programmed for storage in the ring buffer.

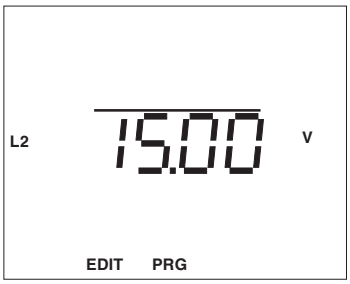
Averaging time=15Minutes.

Press *key 3* to leaf to the mean value indication of voltage.

Voltage L2 is not programmed for storage in the ring buffer.

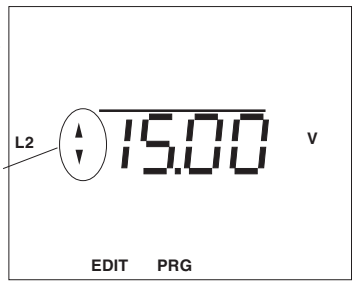


With *key 3* you select the voltage in phase L2.



Switch on or off the arrow symbols using *key 2*.

If the arrow symbols are switched on, this mean value is stored every 15 minutes in the ring buffer.



Program averaging time

An averaging time can be assigned to each mean value. All averaging times are programmed to 15 minutes, when the device leaves the factory.

Setting range

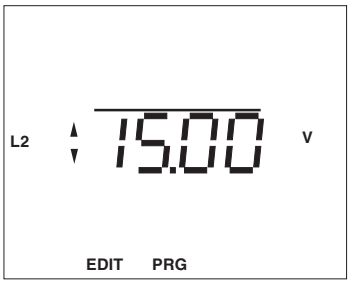
Description	Setting range
Averaging time	5, 10, 15, 30Sec., 1, 5, 10, 15, 30, 60Min.
Ring buffer	All measured values (See table "Measured and calculated quantities")

Settings

Description	Manufacturer's settings
Averaging time	All measured values 15.00 m.s.
Ring buffer	U1, U2, U3, I1, I2, I3, P1, P2, P3

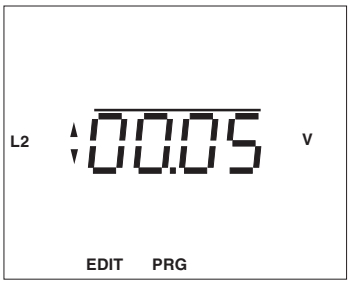
If the averaging time, for example, for voltage L2 should be changed to 5 seconds, please proceed as follows:

Select mean value as described in chapter "select mean value".



The averaging time is selectable from 5, 10, 15, 30 seconds, 1, 5, 10, 15, 30 and 60 minutes.

Select averaging time of 5 seconds using *key 3*.



Pressing ***key*** for about ***2 seconds,*** the highest value is deleted and you return to the first measured value window of the measured value indication!

Duration of the measurement period

The averaging time for *real power EMAX* is called measuring period.
Within the measuring period, the real work is measured and divided by the time passed by. As the result, the *real power EMAX* is indicated. When the measuring period is over, the added real work is deleted.
The measuring period for *real power EMAX* can be set to **5, 10, 15, 30 and 60 minutes**. The factory presetting is a measuring period of 15 minutes.

Attention!
If the averaging time, the current transformer, the voltage transformer, the three or four wire measurement or the measured value selection is changed, the ring buffer is deleted.

Memory

The memory of the UMG 503 is split into three areas: The event memory, the peak and lowest value storage and the ring buffer. The event memory and the ring buffer can be read out by PC only, using the programs **PSW503basic** or **PSWprofessional**. The read out data are available in ASCII-Format and the data from ring buffer additionally in binary format. With **PSWprofessional,** it is possible to create graphics.

In the **peak and lowest value storage**, the peak and lowest values of the measurement values are saved with date and time. All EMAX monthly peak values are saved for each months and all tariffs. The old EMAX monthly values are overwritten at the beginning of a new year.

In the **ring buffer** all measurement values, marked for storage, are saved. The configuration of the ring buffer is only possible with the option "Configuration UMG503".

In the **event memory** the following events can be saved with date and time:

- Deleting the event memory,
- Relay output 1 on/off,
- Relay output 2 on/off,
- Breakdown and return of the auxiliary voltage,
- Breakdown and return of the measurement voltage.

The breakdown of the measurement voltage will be recognized, when:
- The measurement voltage is smaller than 50% of the set primary voltage of the current transformer,
- and the breakdown lasts longer but 500ms.

Period of storage

The more mean values are marked for storage in the ring buffer, the shorter becomes the period of storage. With the factory's presettings

Mean values: U1, U2, U3, I1, I2, I3, P1, P2, P3

Averaging time: 15 minutes .

The mean values of about 1 year are saved in a device with 512kRAM. In devices with 128kRAM, this duration is about 3 months. If this period is over, the most ancient mean values are overwritten.

If various averaging times are assigned to the mean values to be stored, more room for storage can be required, and the period of storage can get much shorter.

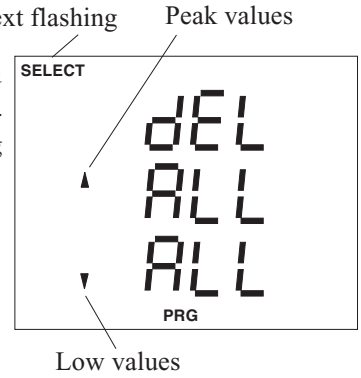
If only **38 seconds** are indicated for the period of storage, it cannot be granted any more, that the selected values are saved in the UMG 503. To enlarge the period of storage, you can remove some measured values with large periods or increase little periods of storage.

Attention!

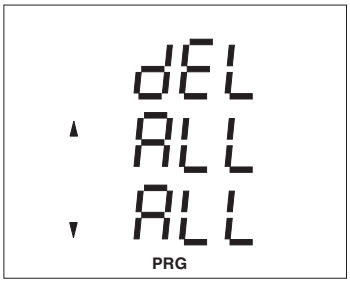
After the selection of the measured values to be saved, the actual **period of storage** must be checked! If the period of storage is below 38 seconds, it cannot be granted, that the selected values are saved in the UMG 503.

An estimate of the period of storage can be read out in menu **PRG**.

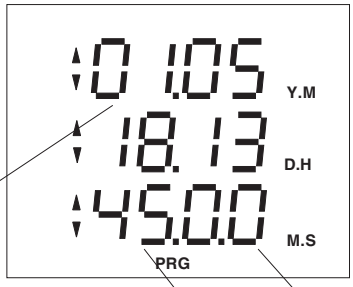
Selecting menu **PRG** (see chapter programming), the following indication appears first:



With *key 2* the selection of the menu **PRG** is confirmed, and the text **SELECT** disappears.



Scroll to the indication besides using *key 3* . Here, for example, the period of storage is estimated to more than one year.



1year, 5months, 18days, 13hours, 45minutes, 0seconds

Configuration

In configuration menu **CONF** the required settings are noted for operating the UMG503 (see also "Table of configuration data"). When the device is delivered, these settings are not protected and can be changed. An unintended change of the settings can be avoided using a password.

The following settings can be read out and changed:

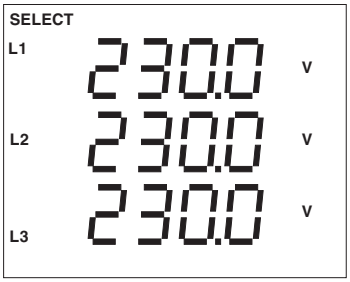
Current transformer
Voltage transformer
Interfaces
- RS485 interface (option)
- RS232 interface (option)
- Infrared interface (option)

Device address
Data storage
Limit group 1 (Option)
Limit group 2 (Option)
Three wire measurement (Option)
Net frequency
Measured value rotation
Analogue output (Option)
Pulse output (Option)
Event memory
Auxiliary input (Option)
Tariff change over, real work consumption
Tariff change over, reactive work inductive
Tariff change over, reactive work capacitive
Clock
- **Summer-/Winter time**

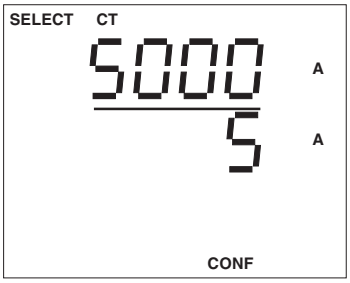
Software Release
Serial number
LCD contrast
Password

To jump from a measured value indication, in this example the indication of voltage, to the menu **CONF,** please proceed as follows:

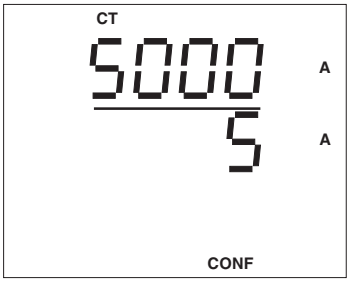
Press *key 1*.
The flashing text **SELECT** appears in the indication.



Press *key 1* again.
Now you are in the menu **CONF**.



Confirm the selection of the menu **CONF** using key *2*.
The text **SELECT** disappears.
Now you are in the menu **CONF,** and the settings of the current transformer are indicated.



Configuration data

Description	Indication	Setting range	Presettings
Current transformer, primary	**CT**	1A .. 999,9MA	"5000"A
Current transformer, secondary	**CT**	1A .. 5A	" 5" A
Voltage transformer, primary	**VT**	100V.. 99,99kV	" 400" V
Voltage transformer, secondary	**VT**	100V .. 500V	" 400" V
Serial interfaces		RS232	**RS232**
" 232"			
Transmission rate		9600bps, 19.2kbps, 38.4kbps	"38.4"
Protocol		oFF, 1, 2, 3, 4, 5, 6	"oFF"
Device address	**ADDR**	0 .. 255	" 1"
Data storage	"dAtA"	on, off	"on"
Relay outputs			
Number	"S. "	1, 2	" 1"
Limit	All values		"L1 0.000 A"
Minimum connection time	" . M.S"	1 .. 59 seconds	"00.01 M.S"
Exceeding	▲		
Underscoring	▼		
Three wire measurement (Option)	" nEt"	3L, 4L	"4 L"
Net frequency	"FrE "	Auto, 50Hz, 60Hz	"Auto"
Measured value rotation	"Pic "		
Rotation time		0 .. 9999 seconds	"0000"
Indication selection		All values	No values
Analogue output	"AnLo"	0/4-20mA	"4 20"
Measured value		All values except energy	Sum real power
Minimum value			"0000"
Maximum value			"0000"
Pulse output	"PuLS"		
Measured value		All reactive and real energy	**T**"00"
Pulse valence	0.000(W/var)h .. 99.99k(W/var)h		"0.000 Wh"
Event memory	"Prot"		
Devices with 128k RAM		0-2000 Events	0 Events
Devices with 512k RAM		0-9999 Events	1000 Events
Auxiliary input	"rSEt"	oFF = Not used. 1 = external reset of the 15 minutes mean value of power 2 = external tariff change over 3 = synchronization of internal clock	"oFF"

▲= Maximum or consumption ▼= Minimum or supply = Key 1 = Key 2 = Key 3

Configuration data

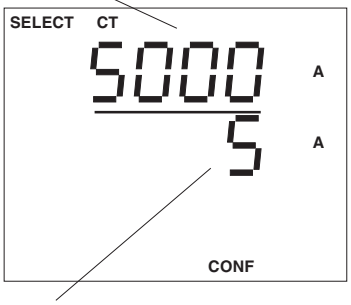
Description	Indication	Setting range	Presettings
Tariff times			
Work	**T**xx	0x = Real work, consumption 1x = Reactive work, capacitive 2x = Reactive work, induktive x = Tariff number 0 .. 4	"00"
Time number	"P. 0"	0 .. 9	" 0"
Starting time			
Days/hours		00.00 d.h .. 00.24 d.h.	"00.24 d.h."
minutes/seconds		00.00 m.s .. 59.00 m.s.	"00.00 m.s."
device addresse	**ADDR**	0 .. 255 0 .. 126 with option PROFIBUS DP	" 1"
Date and time			Date and time
Software release	"rEL"	4-digits	loaded software release
Serial number	"S. nr"	8-digits	serial number
LCD Contrast	"cont"	170 .. 230	185
Inner temperature	"88°"	2-digits	-
scanning frequency	"FrE"	Auto, 50Hz, 60Hz	"Auto"
User password	"PASS"	0000 .. 9999	"0000"

Current transformer

The ratio of the current transformer is set in configuration menu **CONF** . The secondary current can either be set to ../1A or ../5A.
If you are in configuration menu **CONF** , the current transformer ratio can be changed as follows:

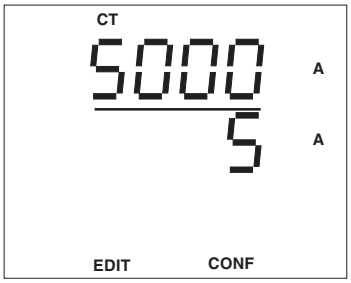
Primary current

Select:
Confirm the selection of the current transformer menu with *key 3*.
The text **SELECT** disappears.



Secondary current

Set:
Select the number to be changed using *key 1*. The selected number flashes. The text **EDIT** appears.
Change the selected number using *key 3*.
Multiply the number with a factor 10 with *key 2*.

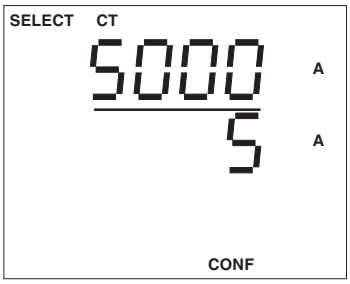


When the ratio of the current transformer is set, press *key 1* as often, as no digit is flashing any longer. **EDIT** disappears.
With *key 3* you move to the next menu. The ratio of the current transformer is saved.

Voltage transformer

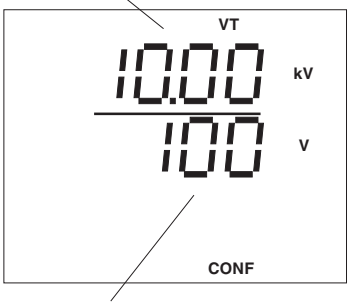
The ratio of the voltage transformer is set in configuration menu **CONF**. The secondary voltage can be set in the range of 100V up to 500V.
If you are in configuration menu **CONF,** change the ratio of the current transformer as follows:

Select
Confirm selection of current transformer menu with *key 3*.
The text **SELECT** disappears.



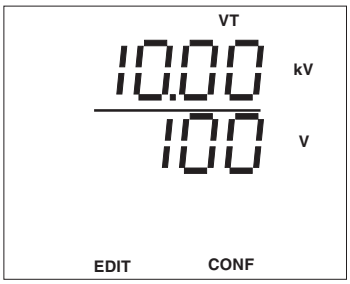
Primary voltage

Select
With *key 3* you move to the voltage transformer menu.



Secondary voltage

Set
Using *key 1* the number to be changed is selected. The selected number flashes. The text **EDIT** appears.
With *key 3* the selected number is changed.
Key 2 multiplies the number with a factor 10.



If the ratio of the voltage transformer is set, press *key 1* as often, as no number is flashing any longer. **EDIT** disappears.
With *key 3* you move to the next menu. The ratio of the voltage transformer will be saved.

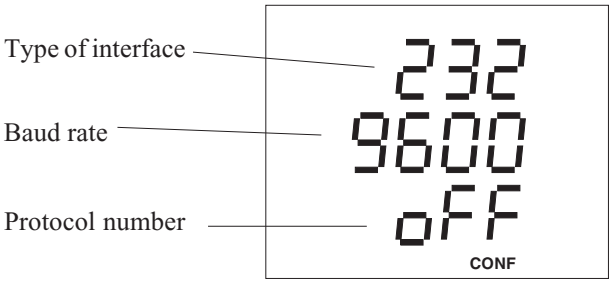
RS232 interface

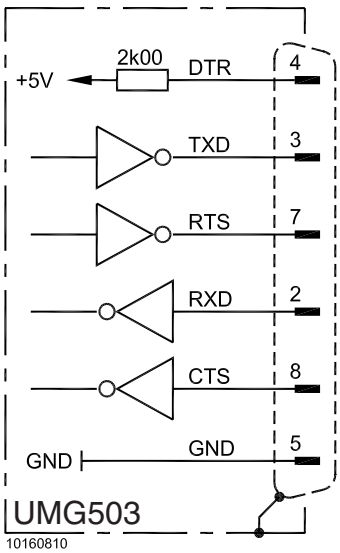
The RS232 interface is suited for transmission of data over a distance of 15m. The UMG 503 can be connected directly via this interface to the COM-port of PC or an external analogue modem.

The connection to PC must be carried out via a **zero modem cable**.

Transmission protocols RS232

off	no protocol, interface disconnected
1	-
2	Modbus RTU protocol
3	-
4	Service protocol
5	Modem
6	Modbus RTU (Master)*1)





Diagr. Connection diagram RS232

Modem

Via the RS232 interface, the UMG503 can be connected to an external analogue modem. The connection between UMG503 and the Modem is carried out via a "point to point" cable.

For modem operation, the transmission protocol 5 (modem) must be selected for the RS232 interface.

*1) The protocol 6 can run on one interface RS232 or RS485 only.

Device address

If several devices are connected via the **RS485 interface**, a master device (PC, PLC) can distinguish them by the device address only. Therefore each UMG 503 must have another device address.

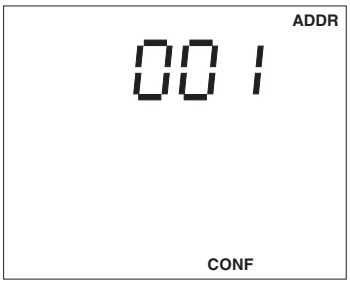
Device addresses can be given from 0 to 255.

The set device address can be called and changed in menu **CONF**. Please move to menu **CONF** (See chapter "configuration").

Select

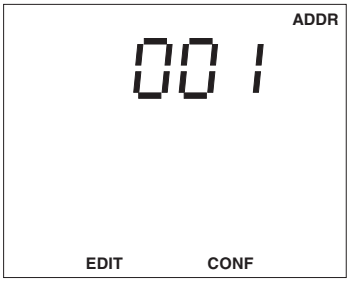
In menu **CONF** you move to indication of device address using *key 3*.

In this example the factory's presetting is indicated as "1".



Change

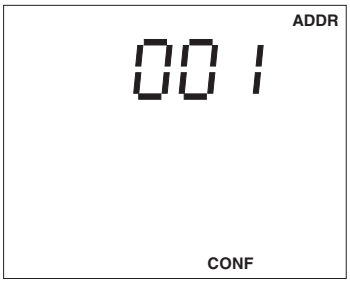
With *key 1* a number of the device address can be selected and be changed using *key 3*. The selected number is flashing.



Save

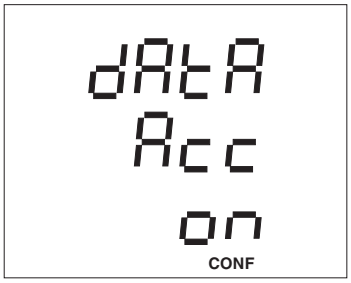
If you have set the desired device address, please use *key 1* as often as no digit is flashing any longer.

Pressing *key 2,* the text **EDIT**disappears**,** and the indicated device address will be saved.



Data recording

The memory of UMG 503 is devided into three areas: The event memory, the peak and lowest value storage and the ring buffer.



In the **peak and lowest value storage**, all peak and lowest values are saved with date and time.

In the **ring buffer** all measured values are deposited, as long as they are marked for storage.

In the **Event memory** all switchings of relay outputs and breakdown of supply voltage are saved.

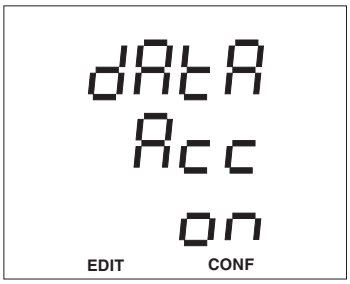
In delivery condition is

Data recording = **on**

and all memory areas can be written. If no data recording should be carried out, data recording must be **oFF**.

Select

In menu **CONF** scroll to display of data recording "**dAtA**".



Confirm selection with key 1.

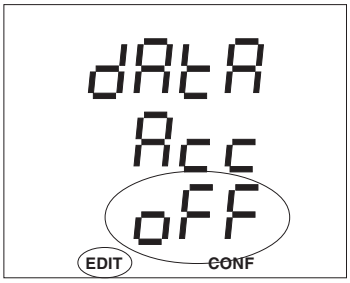
The text **EDIT** appears.

The set data recording is displayed and flashing.

In this example, data recording is **on**, which means, data are recorded.

Change

The set data recording is flashing.



Using key 1 you can change over between **on** and **oFF**.

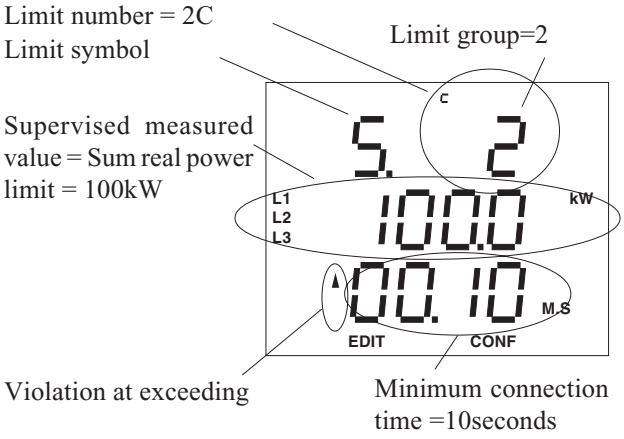
Confirming key 1, the text **EDIT** disappears.

Confirming key 3, you change to the programming of limits.

Pressing key 1 long, the programming is saved and you change back to the first measured value display.

Limits

6 limits of measured values can be programmed for supervision. Violations of these limits can be saved with date and time within the event buffer.



Limits can be positive (+) or negative (-). For positive limits (+) , the sign is not indicated.

The limits are divided into the limit groups **1**x and **2**x and have the following descriptions:

1A, 1B, 1C,
2A, 2B, 2C

The limits are assigned to two internal and 6 external relays.

Relay outputs inter.	Relay outputs external	Limits 1A	1B	1C	2A	2B	2C
K1		x	x	x			
K2					x	x	x
	DAK1	x					
	DAK2		x				
	DAK3			x			
	DAK4				x		
	DAK5					x	
	DAK6						x

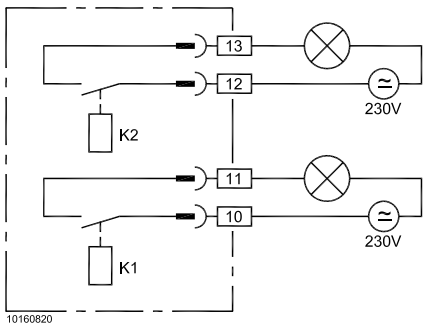
Kx = Relay output(internal)
DAKx = Digital output clamp (external)

Diagr. Assignment of the limits

Attention!
An event buffer must be reserved for the storage of limit violations.

Internal relay outputs (Option)

The limits 1A up to 2C are assigned to the relay outputs K1 and K2.
If one or more limits, which are assigned to an internal relay output, exceeded, the corresponding relay releases. To avoid too frequent switchings, a minimum connection time is programmable for each relay output.



Diagr. Connection example for internal relay outputs

Attention!
On the relay contacts K1 and K2, no touchable low voltage and life voltages may be used at the same time.
The wiring for the relay outputs must be suitable for voltage up to 300VAC against ground.

External relay outputs

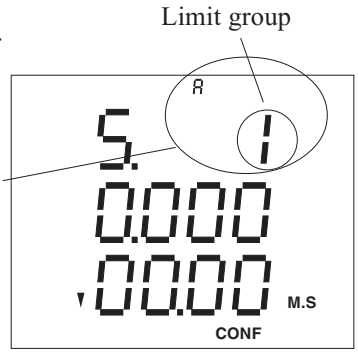
Additional relay outputs can be controlled via a bus coupling and digital output clamps of the company **WAGO**.
Each digital output clamp supervises one limit:

Digital output clamp DAK1 = Limit 1A
Digital output clamp DAK2 = Limit 1B
Digital output clamp DAK3 = Limit 1C
Digital output clamp DAK4 = Limit 2A
Digital output clamp DAK5 = Limit 2B
Digital output clamp DAK6 = Limit 2C

The connection of the UMG 503 to the bus coupling can be carried out via the RS232 or RS485 interface. Both devices, UMG503 and bus coupling, must have the same interface.

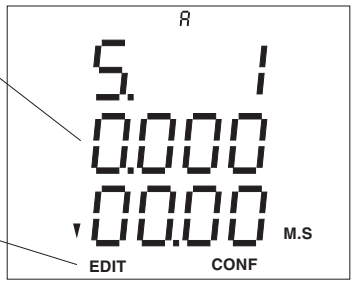
Assign limits

In menu **CONF** you leaf to the indication of the desired **limit group** using *key 3*.
The limit number here is indicated as **1A**.
Now change over between the limit numbers **1A, 1B and 1C** using *key 2*.



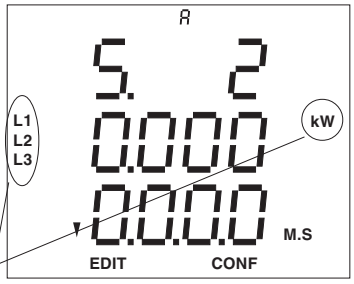
Assign measured value: Pressing*key 1,* the middle indication is flashing, and a **measured value** can be selected.

The text **EDIT** appears.



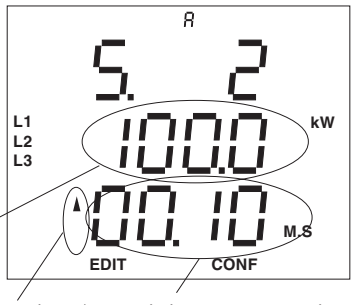
Pressing *key 2* and then *key 3* you leaf through the measured value indications.

A measured value can be selected using *key 1*. Please confirm with *key 2*.



If you have confirmed the selected measured value with *key 2*, the first number of the middle indication flashes.

With *key 1* you can change between the ciphers of the **limit**, the **minimum connection time** and the symbols for **underscoring / exceeding**.



Limit | Underscoring/ Exceeding | Minimum connection time

The selected numbers or symbols can be changed with the *keys 2 and 3* (see chapter **Edit**).
If the limit is set, please press *key 1* as often as no numbers flashing any longer. **EDIT** disappears.
With *key 3* you reach the next menu point. The **limit** is now saved.

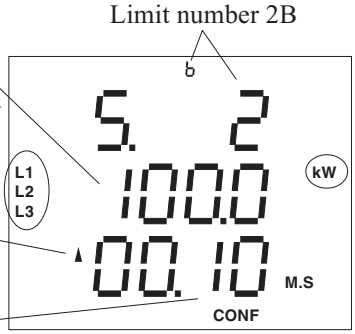
Example: Sum real power

Limit=100kW

Assigned measured value= Sum real power.

Switches at exceeding.

Minimum connection time= 10 seconds



Attention!
To be able to distinguish between the measured values "Sum real power" and "Real power EMAX", the phases for "Real power EMAX" are shown in the first line.

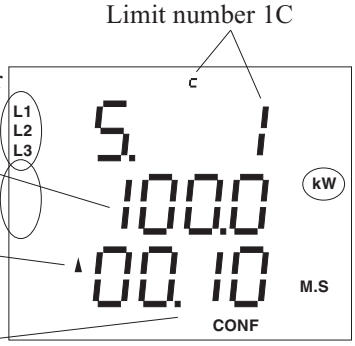
Example: Real power EMAX

Measured value= Sum "real power EMAX"

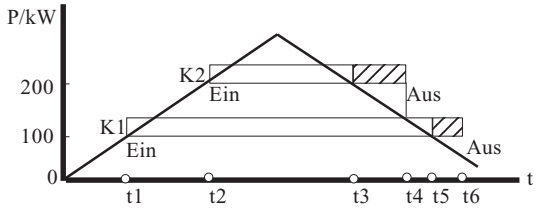
Limit =100kW

Switches, when exceeded.

Minimum connection time= 10 seconds



Example: Real power, sequence chart



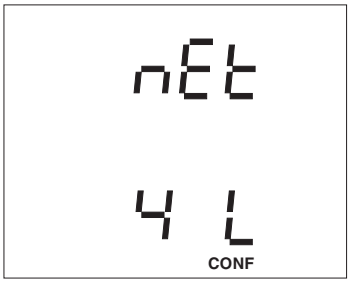
t1 100kW were exceeded, relay K1 attracts.
t2 200kW were exceeded, relay K2 attracts.
t3 200kW were underscored. The programmed minimum connection time for relay K2 is running.
t4 The minimum connection time is over and the relay K2 releases.
t5 100kW were underscored. The programmed minimum connection time for relay K1 is running.
t6 The minimum connection time is over, and relay K1 releases.

Three wire measurement

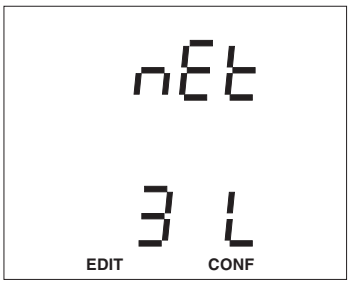
The UMG503 is suited for measurement in networks with or without neutral conductor. Networks with a neutral conductor are called four wire networks, without neutral conductor are called three wire networks.
The option "three wire measurement" is needed for the connection examples 5 and 6.

When option "three wire measurement" is released, you can select between three wire measurement "3L" and four wire measurement "4L" in menu **CONF**.

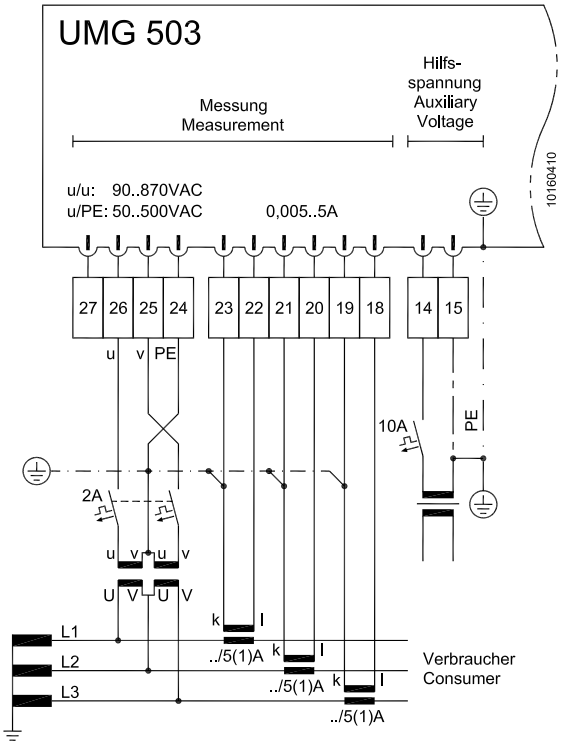
Select
In menu **CONF** you move to the indication of three or four wire measurement using *key 3*.
In this example the four wire measurement "4L" is activated.



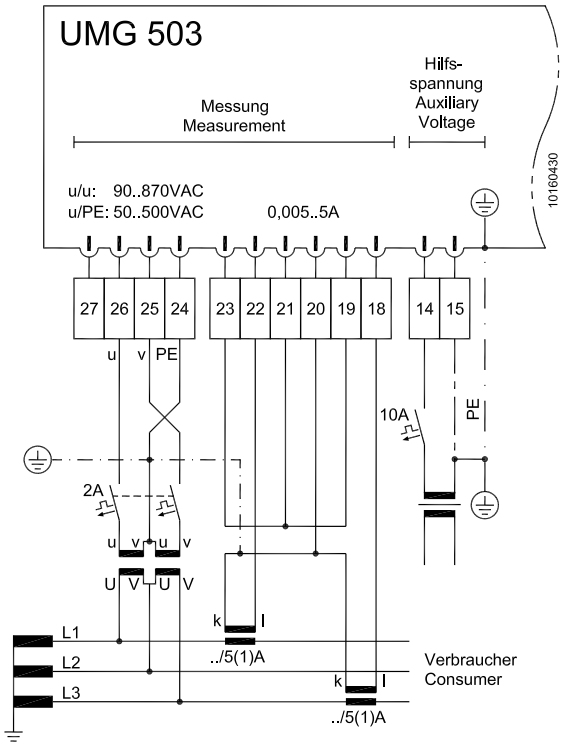
Change
With *key 1* can be switched between four wire (4 L) and three wire measurement (3 L).



Attention!
In networks without neutral conductor voltage transformers must be used!



Diagr: Three wire measurement with two voltage transformers and three current transformers. *(Option "Three wire measurement" required)*



Diagr: Three wire measurement with two voltage transformers and two current transformers.. *(Option "Three wire measurement" required)*

Net frequency

The net frequency is determined from the measuring voltage within the UMG 503. From this net frequency, the scanning frequency for current and voltage inputs are calculated.
For measurements with very distorted voltages, the frequency of the voltage fundamental cannot exactly be determined any longer. Voltage distortion occurs in measurements at consumers, which are driven with phase changing controllings.
For measuring voltage, which shows strong distortion, the corresponding stable net frequency should be set.
Distortion of the current does not affect the determination of the frequency.

If the measuring voltage is missing, no net frequency can be determined and no scanning frequency can be calculated. Voltage, Current and all resulting values are not calculated and indicated by zero.
If the current should be measured without measuring voltage, the net frequency should be set at UMG 503.

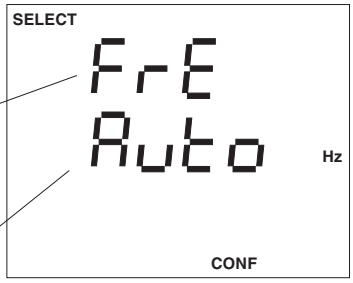
The determination of the scanning frequency can either be done automatically or programmed.

The following settings for the determination of the frequency are at your disposal:

"**Auto**"	Automatical frequency
"**50**"Hz	Stable frequency
"**60**"Hz	Stable frequency

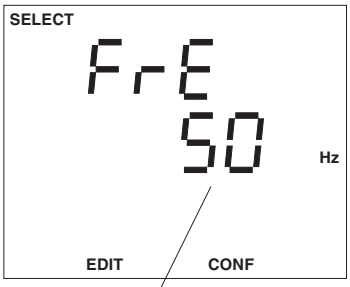
The proceeding for the determination of the frequency can be called up and changed in the menu **CONF**.

Select
In menu **CONF** you can leaf to the indication of the frequency determination using *key 3*.
In this example, the frequency is determined automatically.



Change
Using *key 1,* the determination of the frequency is selected, and the text "Auto" flashes. In the indication, the text **EDIT** appears.

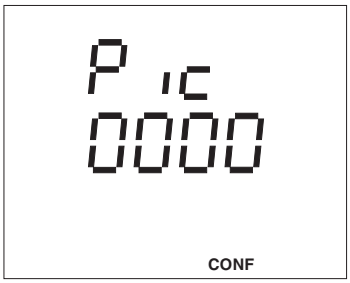
Using *key 3,* you can change over between the two methods of frequency determination.



In this example a fix frequency of **50Hz** is set.

Measured value rotation

All measured values are calculated two times per second and can be displayed.



Normally the selection and displaying of measured values is carried out via the keys 2 and 3. Additionally, there is the possibility of measured value rotation, which means to show selected measured values one after the other without keypress.
If no key is pressed for about 60 seconds, the measured value rotation becomes active, if programmed.

For the measured value rotation, all displays, which are retrievable by the key, are at your disposal.
The changing time for the displays can be set in the range of

0 .. 9999 seconds

To activate the measured value rotation, at least one measured value must be selected and the changing time must be programmed for more than 0 seconds.

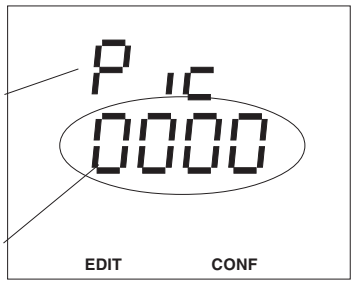
If a changing time is programmed with 0 seconds, there is no change of the display.

If the changing time is bigger than 0, but only one display has been selected, only this display is indicated.

Program changing times

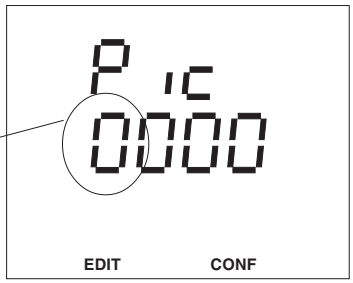
Select

Please scroll to display "changing time Pic" in menu **CONF** using key 3.



Confirm selection with key 1.
The text EDIT appears.
The set changing time is indicated and flashes.
In this example, a changing time of 0 seconds is indicated, which means the measured value rotation is not active.

Change



The set changing time is flashing.
Confirm selection with key 1.
The first digit of the changing time is flashing.
Now select the number to be changed with key 1.
If a number is flashing, it can be changed using key 3.
If all numbers of the changing time are flashing, you can change to the measured value selection with key 2.
If no number is flashing, you can change to the programming of the analogue output using key 3.

By a long press of key 1 you save programming and go back to the first measured value indication.

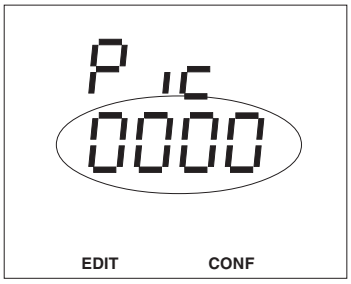
Program measured value selection

Select

Please scroll to display "changing time Pic" in menu **CONF** using key 3.

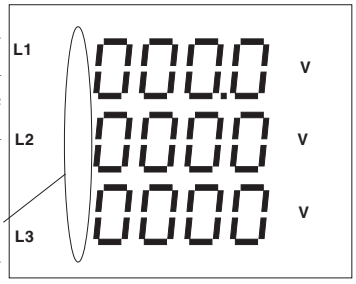
Confirm selection with key 1.

The text EDIT appears. The set changing time is indicated and flashes. In this example, a changing time of 0 seconds is indicated, which means the measured value rotation is not active.



Change to the measured value selection with key 2.

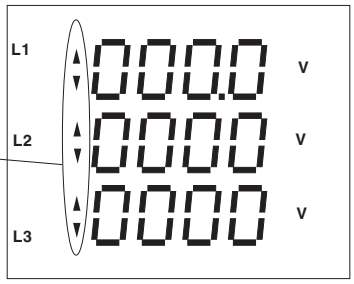
In this example, the measured value indication for voltage L against N appears. The measured value indication has not been programmed for the measured value rotation yet.



Pressing key 1 shortly, the measured value indication becomes active for the measured value rotation.

Pressing key 1 again shortly, the display becomes inactive again.

Pressing key 1 longer, you change back to the programming of changing time. The number 1 of changing time is flashing.



By a long press of key 1 you save programming and go back to the first measured value indication.

▲= Maximum or consumption ▼= Minimum or supply = Key 1 = Key 2 = Key 3

Analogue output

All measured values except real and reactive work, can be given out as a current via the analogue output. One internal and six external analogue outputs can be programmed at maximum.

The external analogue outputs are controlled via a bus coupling and analogue output clamps of the company **WAGO**. The connection of the UMG 503 to the bus coupling is carried out via the RS232 or RS485 interface. Both devices, UMG503 and bus coupling, must be connected to each other via the same interface. Each analogue output can be assigned to

one measured value,
one scale starting value and
one scale end value

Only the **internal** analogue output in the UMG 503 can be switched between

0-20mA and
4-20mA

additionally. For the **external** analogue outputs analogue output clamps with the signal types

0-20mA,
4-20mA and
+-10V

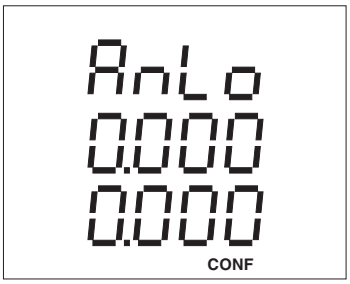
are available.

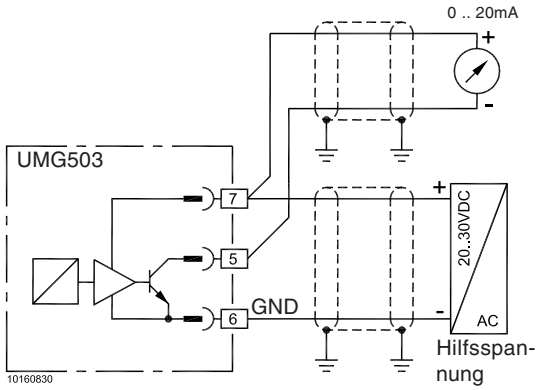
Attention!
The internal **analogue output** can be used only, if the option "analogue output" is released.

Internal analogue output (Option)

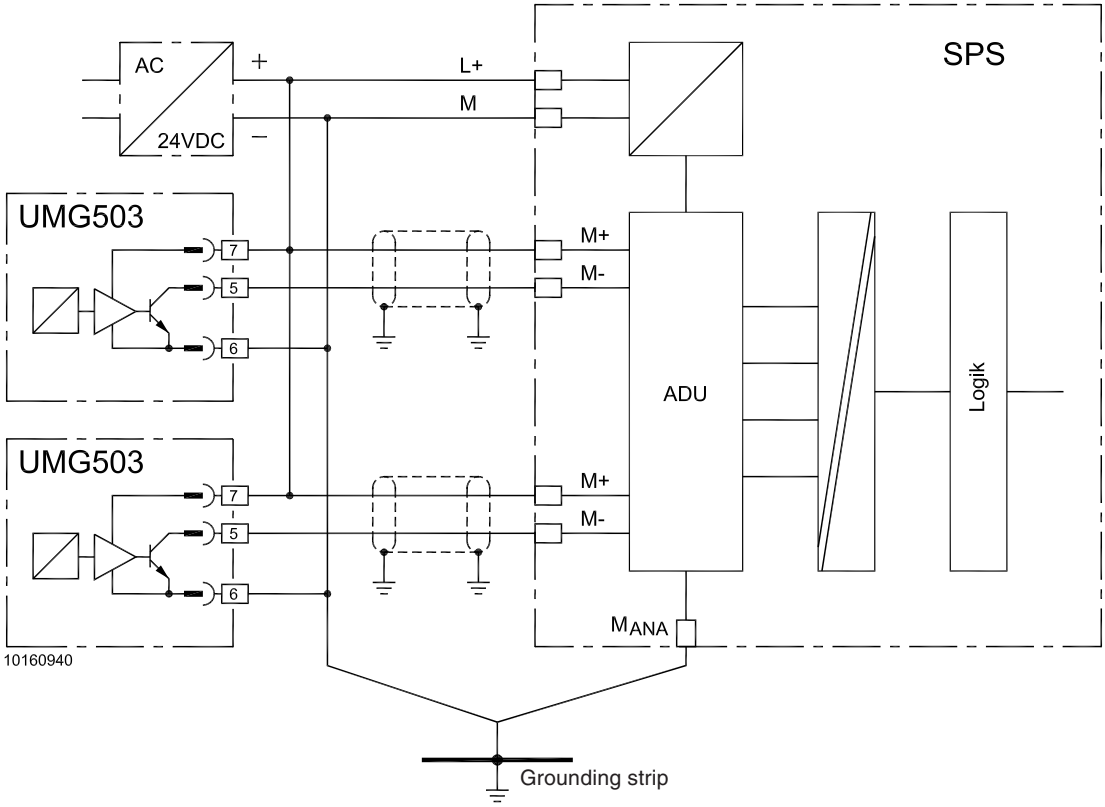
For the operation of the internal analogue output an external auxiliary voltage from 20V up to 30V DC is required. The connectable maximum load is 500Ohm. If the analogue output is loaded with a higher resistance, the output range (20mA) is limited.

internal analogue output





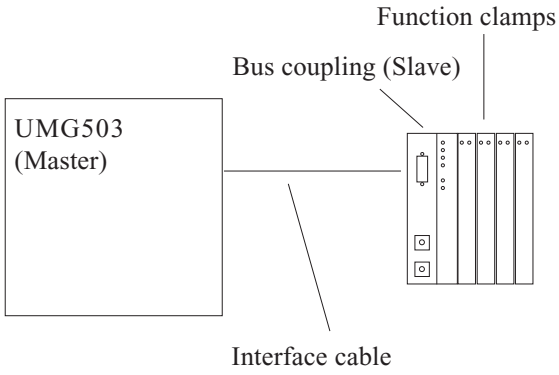
Diagr. Connection example, internal analogue output



Diagr.: Connection example for 2 UMG503 with analogue outputs to a PLC-analogue input module.

External analogue outputs

The external analogue outputs are controlled via a bus coupling and analogue output clamps of the company **WAGO**. The connection between UMG 503 and bus coupling can be carried out via RS232 or RS485 interface. Both devices, UMG 503 and bus coupling, must be connected with the same interface.



Attention!
For the transmission via RS232, only "point to point" connection with a maximum distance of 5m can be achieved.
The RS485 allows a bus length of maximum 1200m.

The following external analogue output clamps of the company **WAGO** can be controlled by the UMG 503:

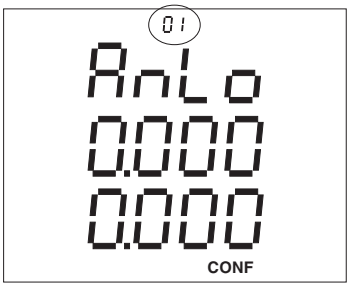
Part no. WAGO	Number of outputs	Signal type
750-550	2	0 .. 10V
750-552	2	0 .. 20mA
750-554	2	4 .. 20mA
750-556	2	+- 10V

Transmission protocol

The MODBUS RTU protocol is used as transmission protocol between the UMG 503 and the bus coupling of the company **WAGO**. The UMG 503 becomes the master and the bus coupling becomes the slave.
In the UMG 503 the protocol "06" (Modbus RTU Master) must be set.

Indication in the configuration menu
External analogue outputs are indicated with the numbers 01 up to 06 in the UMG 503. The numbers correspond to the sequence of the analogue output clamps connected to the bus coupling.
The menu "external analogue output" can only be called up, if the protocol number"06" (Modbus RTU Master) is set at the UMG 503.

External analogue output number = 01



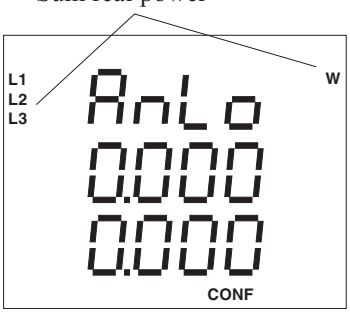
If you are in the menu **CONF**, leaf to the indication of the external analogue outputs using *key 3*.
Analogue output number 01 is indicated.

Please leaf to the analogue outputs 02 up to 06 using *key 2* .

Assign measured value
All measured values, which are configurated for the measured value indication, except real and reactive energy, can be given out of the analogue outputs. From the measured value tables, the desired measured value, "sum real power", for instance, are chosen and assigned to the analogue output.

Please scroll to the display analogue output in menu **CONF**.
Text "**AnLo**" flashes.
Now a measured value table can be selected with *key 2*. The measured value table for voltage appears.
Now you can select a measured value table with *key 3*.
Select a measured value *key 1* from the measured value table and confirm with *key 2*.

Sum real power

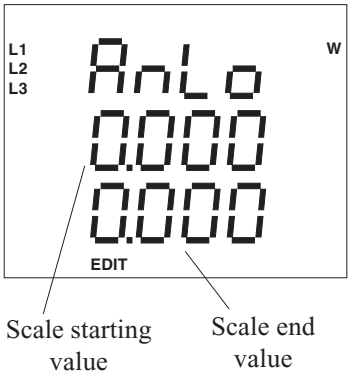


The text "**AnLo**" does not flash anymore and the selected value is indicated.

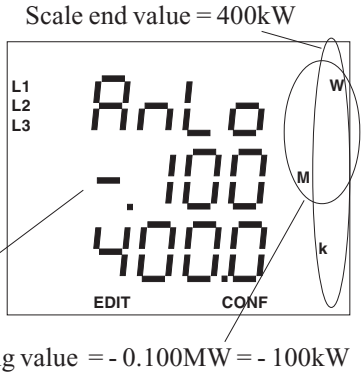
Scale starting value and scale end value

The scale starting value and the scale end value can be set in the indication range of the corresponding measured value

The text "**AnLo**" flashes. Press *key 1*.
The text **EDIT** appears and the first number of the scale starting value is flashing.
By further pressing of the *key* 1, each cipher of the scale starting value or the scale end value can be selected.



With *key 3,* the flashing cipher can be changed.
With *key 2* the decimal point is moved.



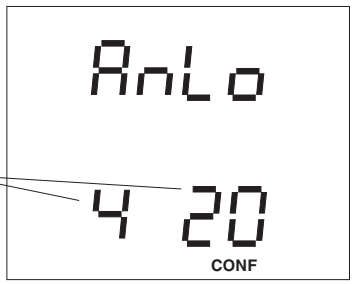
In the first digit of the scale starting and scale end value, the sign "-" can be set. The sign appears after the number "9".

After selecting the last cipher of the scale end value the text **EDIT** disappears. Now change to the next menu using *key 3*.

Set output range

The output range for the external analogue outputs cannot be programmed, as it is fixed for the used type of the function clamps.
The output range of the internal analogue output of the UMG 503 can programmed to 0 .. 20mA or 4 .. 20mA. In delivery condition, the analogue output is preset to 4 .. 20mA.

The text "**AnLo**" is flashing. Pressing *key2*, the output range is indicated in "mA".
Output range (4..20mA / 0..20mA)



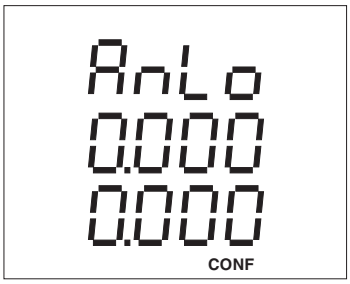
Select the output range with *key 1*. The text **EDIT** appears.

Pressing *key 3* you select the output range from 0 to 20mA.

Programming

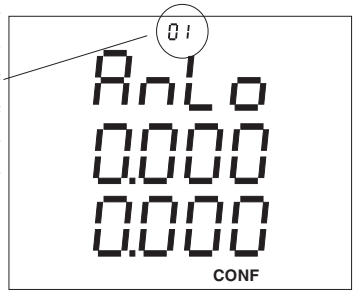
The external analogue outputs can only be indicated and programmed, when the protocol "06" (Modbus RTU Master) is set at the UMG 503. The programming of the internal and external analogue output is very similar except some small exceptions.

If you are in the menu **CONF**, you leaf to the indication of the internal analogue output using *key 3*.
With *key 1,* the selected analogue output is confirmed and can be programmed. The text "**AnLo**" is flashing.



If the protocol "06" (Modbus RTU Master) is selected, the first external analogue output "01" is indicated besides the internal analogue output. Otherwise the indication of the menu for the pulse output appears.

To display the other external analogue outputs "02" up to "06", please press *key 2*. Confirm the selected analogue output with *key 1* and program it. The text" **AnLo**" flashes.

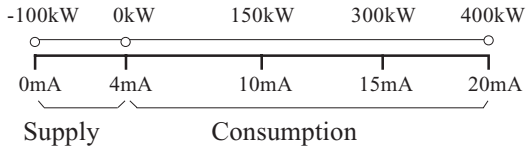


Example: Sum real power

On the internal analogue output of the UMG 503 the sum of real power shall be given out as a current. As a generator shall be switched on sometimes, the delivered real power shall be retrieved as well. Real power supplied is indicated by a "-" before the real power value.
The following settings are required:

Output range	= 0 .. 20mA
Measured value	= Sum real power
Scale start value	= -100kW (Delivery to energy supplier)
Scale end value	= 400kW (Consumption)

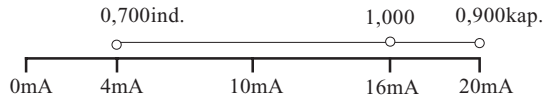
With the selected settings, a power range of 100kW + 400kW = 500kW is covered. So is 500kW = 20mA.
1mA corresponds to 500kW/20 = 25kW.
If no real power is supplied or consumed, a current of 4mA is flowing.
If real power is supplied, a current smaller but 4mA is flowing.



Example: cos(phi)

output range	= 4 .. 20mA
Scale start value	= 0.700inductive
Scale end value	= 0.900capacitive

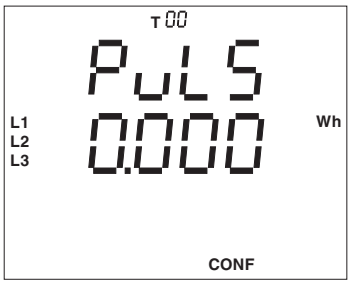
So the scale range is devided from 0, 400 to 16mA, and cos(phi)1.000 corresponds to 16mA.



Pulse output (Option)

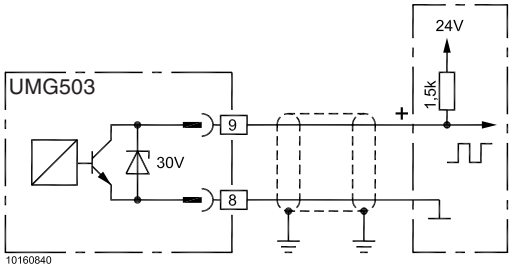
Corresponding to the mechanical energy meters, the UMG 503 has a pulse output as well. At the pulse output, the energy of real and reactive energy meters can be given out. The minimum pulse duration is 50 ms and the maximum frequency is 10Hz.
If more than one pulse per second is given out by the pulse output, the pulse gap is not proportional to the power anymore. If less than one pulse per second is given out by the pulse output, the pulse gap is proportional to the power. The inaccuracy of the pulse gap is +- 10ms.

Display example for the pulse output:



Attention!
When the pulse output is assigned to **real energy meter without reverse running stop**, pulses are given out for consumption and supply.
If the pulse output is assigned to the **reactive energy meter without reverse running stop**, pulses are given out for inductive and capacitive load.

If the measured work exceeds the set pulse valency, so that the maximum for the pulse output is exceeded, the rest of the pulses are saved and given out later. Up to 32000 pulses are saved in the pulse memory.



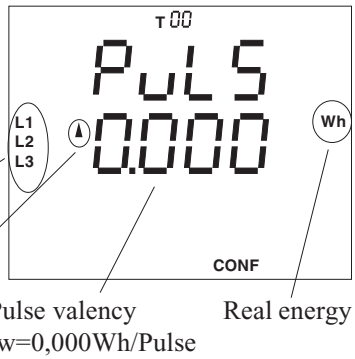
Diagr.: Connection example for pulse output

Assign energy

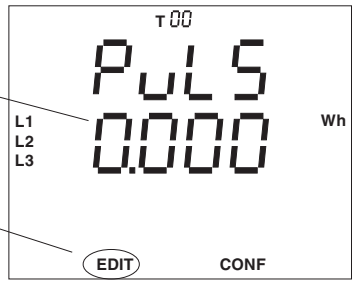
Various measured values can be assigned to the pulse output of the UMG 503

Without reverse running stop	
Consumption	T00, T01, T02, T03, T04
Supply	T00, T01, T02, T03, T04
Reactive energy	
Without reverse running stop	
inductive (ind)	T00, T01, T02, T03, T04
capacitive (cap)	T00, T01, T02, T03, T04

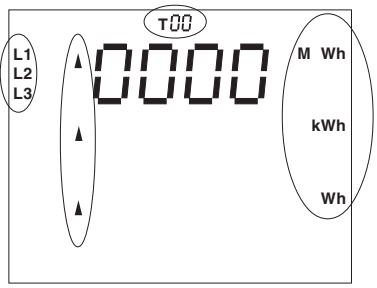
Scroll to the indication of the pulse output in menu **CONF** with *key 3*.



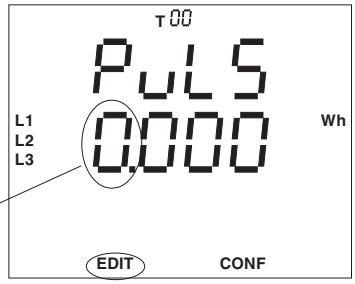
Confirm the selection using *key 1*.
The middle indication is flashing and the text **EDIT** appears.



Switch to the measured value selection pressing *key 2* .
The picture in the margin appears.
With *key 2* and *key 3* the desired energy can be assigned to the **pulse output**.



Confirm selection with *key 1*.
The text **EDIT** appears.
With *key 2* change into the edit mode.
The first number is flashing.



To leave the menu, press *key 1* so often until the text **EDIT** disappears. Pressing *key 3* you switch to the next menu.

Set pulse valency

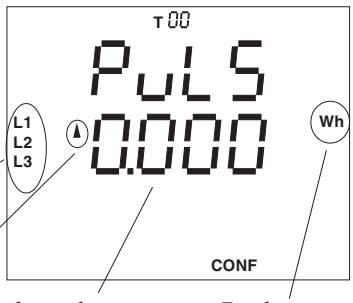
The pulses from the UMG 503 can be assigned to certain work. The energy per pulse is given as pulse valency Iw in Wh/puls.

Iw =energy/pulse

The pulse valency must not be confused with a meter constant. The meter constant is given in revolutions per kWh.
The connection between pulse valency and meter constant can be seen in the following correlations:

meter constant = 1/pulse valency
pulse valency = 1/meter constant

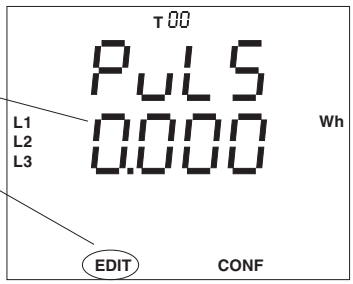
In the menu **CONF** scroll to indication of the pulse output with *key 3*.



Sum | Consumption | Pulse valency Iw=0,000Wh/pulse | Real energy

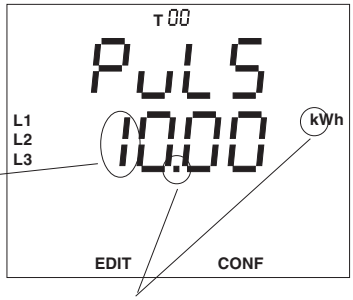
Confirm selection with *key 1*.
The middle indication flashes and the text **EDIT** appears.

Press *key 1* again, and the first digit flashes.



Using *key 1,* you switch to the next digit.

With *key 3* the number will be changed.
With *key 2,* the decimal point is moved.



Change with *key 2* .

To leave the menu, press *key 1* so often until the text **EDIT** disappears. Pressing *key 3* you switch to the next menu.

Example: Pulse valency
The pulse valency Iw should be destined for a three phase network with connected consumers of maximum P=400kW.
In one hour, a maximum work A of:

A = P * t (t = 1Stunde)
A = 400kW *1h
A = 400kWh can be consumed.

This means a pulse valency Iw of

Iw = A/pulse
Iw = 400kWh/pulse
Iw = 400kW

This means, that the pulse valency Iw must be set equal or higher than 400kW at the UMG 503.

Example: Maximum power
A pulse collecting device can only manage a pulse valency of 9999Wh/pulse.
What power can be transmitted at maximum?

Iw = A/pulse

The work A can be calculated with:

A = Iw * pulse
A = 9999Wh/pulss * pulse
A = 9999Wh

This means a pulse valency Iw of

Iw = A/pulse
Iw = 9999Wh/pulse,

which must be set at the UMG 503.

Event memory

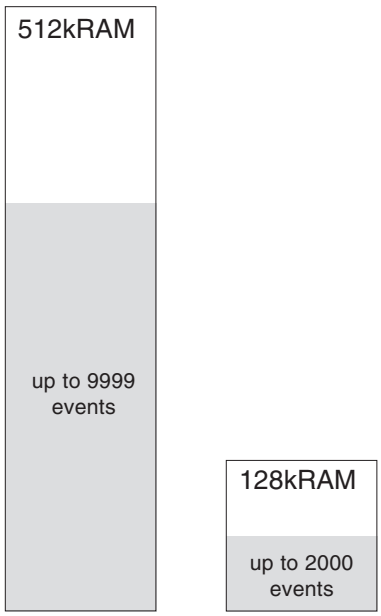
The following events can be saved in the event memory with date and time:

- Deletion of the event memory,
- Relay outputs 1A, 1B, 1C on/off,
- Relay outputs 2A, 2B, 2C on/off,
- Auxiliary input on/off,
- Breakdown and return of the auxiliary voltage,
- Breakdown and return of the measurement voltage,
- Reset of real power EMAX,
- Synchronization of the internal clock,
- Tariff change over 1/2.

The event memory can be read out with PC and the programming and reading out software **PSWbasic**.
A breakdown of the measurement voltage is recognized, if:
- the measurement voltage is smaller than 50% of the set primary voltage of the voltage transformer
- and the breakdown lasts longer but 500ms without interruption.

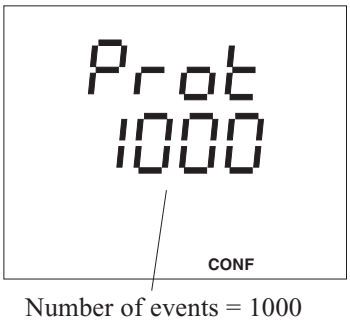
In the device a memory is available, which is divided into the ring buffer and the event memory. The dimension of the event memory can be programmed to determine the number of events, that can be saved in the memory. If the number is set to "0", the whole memory is available for the ring buffer.
If the number of events is changed, the contents of the event memory and ring buffer are deleted.
The dimension of the memory for event memory and ring buffer is depending on the RAM of the UMG 503.

Event memory	Memory 128k RAM	512k RAM
Setting range	0 - 2000	0 - 9999
Presettings	0	1000



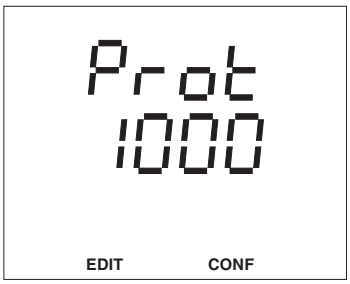
The number of events, that should be saved, can be displayed and changed in the menu **CONF**.

Display
Scroll to the indication of the event memory in menu **CONF** using *key 3*.
In the example, the number is set to 1000.



Number of events = 1000

Change
The digit to be changed can now be selected with *key 1* and be changed with *key 3*. The symbol "**EDIT**" appears and the selected number is flashing.

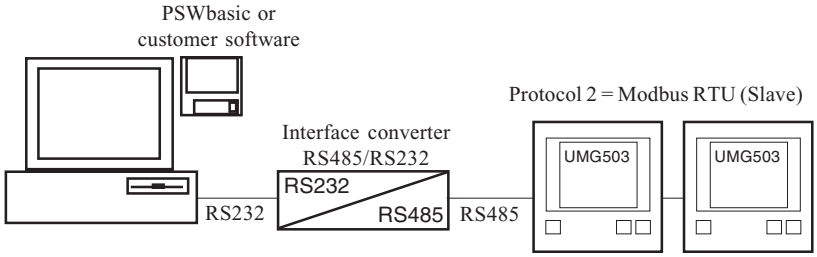


Serial interfaces

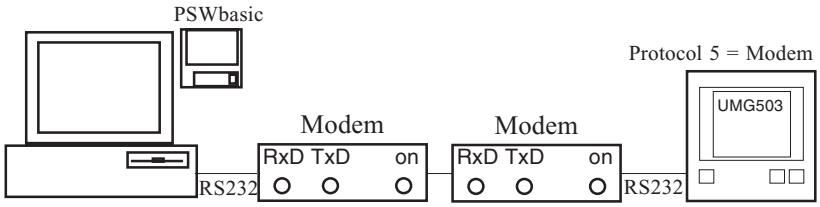
The UMG503 is available with the serial interfaces RS232, RS485 and Infrared. In the basical edition, at least one interface RS485 or RS232 is at your disposal. The interfaces can be used at the same time, even with different protocols. Please note, that not all combinations of interfaces and protocols are allowed.

UMG503 - RS485/RS232 - PC

For the connection to PC an interface converter from RS485 to RS232 must be used.
The maximum distance for RS485 is 1200m and for RS232 about 5m.

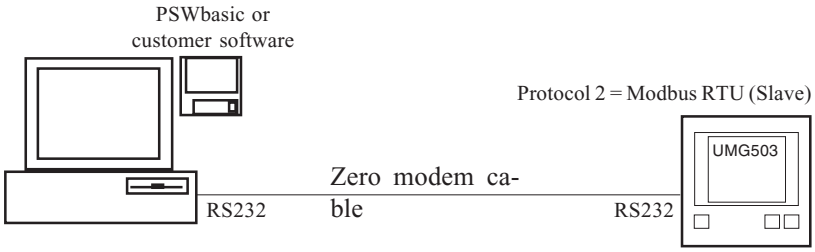


UMG503 - Modem - PC



UMG503 - RS232- PC

Direct connection to PC via **zero modem cable**.
The maximum distance between PC and UMG503 can be 10m at maximum.

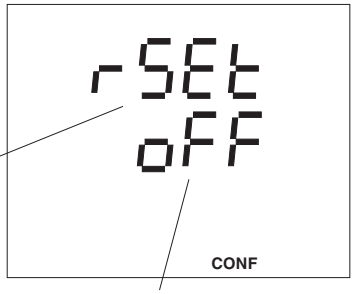


Programming

The external digital inputs can only be indicated and programmed, if the protocol "06" (Modbus RTU Master) is set at the UMG503.
The functions
- Reset real power EMAX,
- Tariff changeover and
- Synchronization of internal clock

can be programmed as mentioned in the diagram.

Select
In menu **CONF** move to the indication of auxiliary input using *key 3*

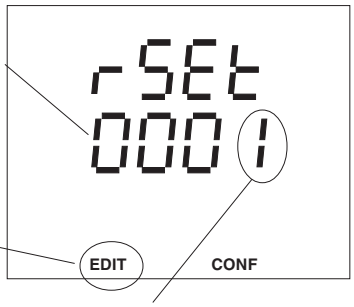


Symbol text for the auxiliary input

Set function = oFF
The tariff changeover is carried out by the internal time program "z".

Change
Confirm with *key 1*.
The set function appears and can be changed with *key 3*.

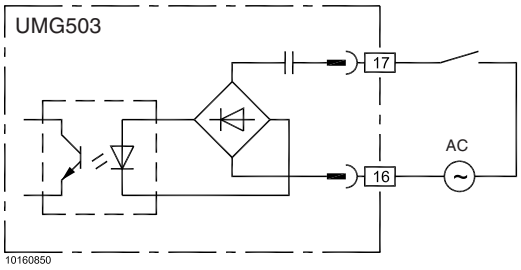
The text **EDIT** appears.



On the internal auxiliary input, only the tariff changeover is active.

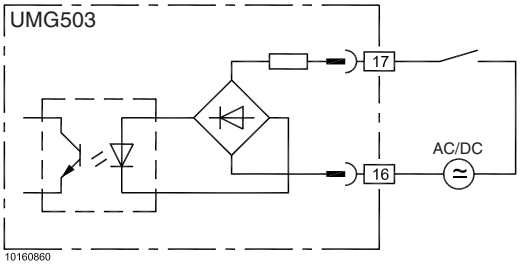
If the function for the auxiliary input is set, press *key 1* as often as no digit is flashing any longer. **EDIT** disappears. .
With *key 3* you move to the next menu point. The function is stored.

For devices with the auxiliary voltage of "85 .. 265VAC, 120 .. 370VDC" the auxiliary input is activated with an **alternating voltage** of 85 .. 265VAC .



Diagr.: Auxiliary voltage for alternating voltage only

For devices with an auxiliary voltage of "15 .. 55VAC, 20 .. 80VDC" the auxiliary input is activated with an **alternating voltage** of 15 .. 55VAC or a **direct current voltage** of 20 .. 80VDC.
For devices with an auxiliary voltage of "40.. 115VAC, 55.. 165VDC" the auxiliary input is activated with an **alternating voltage** of 40.. 115VAC or a **direct current voltage** of 55.. 165VDC.



Diagr.: Auxiliary for direct current and alternating voltage

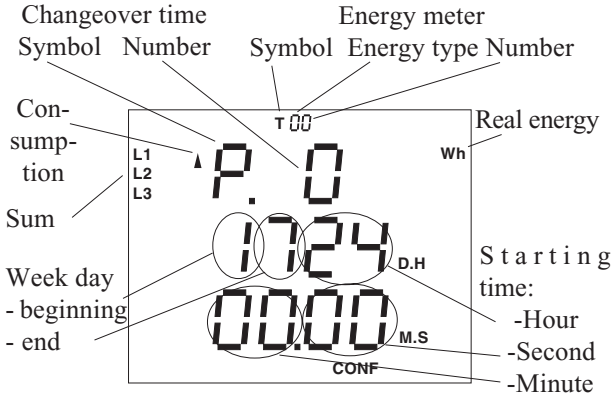
Attention!
The wiring for the auxiliary input must be suitable for voltages up to 300VAC against ground.

Tariff change over

For energy measurement, which should be carried out in certain periods, four tariffs are available:

- T01 .. T04 Real energy consumption and real power EMAX,
- T11 .. T14 Reactive energy, inductive and
- T21 .. T24 Reactive energy, capacitive.

The tariff changeover is carried out internally via a time program or externally via the auxiliary input. To each of the three tariff groups T0x, T1x and T2x 10 changeover times can be assigned.
Work meter Tx0 is not programmable.



	Energy meter				
		Controlled via			
		Internal time program			
		Auxiliary input			
Real energy					
Without reverse running stop	*T50*				
Consumption, real power EMAX	T00	T01	T02	T03	T04
Supply	*T30*				
Reactive energy					
Without reverse running stop	*T40*				
inductive	T10	T11	T12	T13	T14
capacitive	T20	T21	T22	T23	T24

External tariff change over (option)

The first two work meters can be changed over via the auxiliary input.
When the contact is open, work meter Tx2 is active. When there is voltage on the auxiliary input, work meter Tx1 is active.
When the auxiliary input is programmed for tariff change over, only the work meters Tx3 and Tx4 can be controlled via the time program.

Attention!
The energy meters (Tariffs) cannot be deleted individually. If reactive or real energy is deleted, all corresponding energy meters (tariffs) are deleted.

Internal tariff changeover

The internal tariff changeover is carried out via time programs. When the auxiliary input is programmed for tariff changeover, only the work meters Tx3 und Tx4 can be controlled via time program.
The time program can be programmed by PC or directly at UMG 503.

Assignment of the week days:

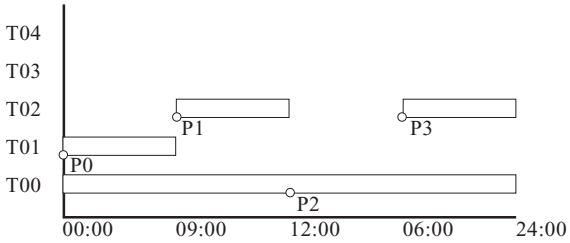
1 - Monday
2 - Tuesday
3 - Wednesday
4 - Thursday
5 - Friday
6 - Saturday
7 - Sunday

For each three selectable work up to 10 changeover times can be programmed. In the changeover time the starting time is determined for the corresponding work meter in

Week day, beginning/end and
Hours/Minute

If energy measurement (P3) does not follow energy measurement (P1), the changeover time for the end of energy measurement must be laid out to tariff zone Tx0, which is not programmable. In the example, this is changeover time "P2".

If the starting time is set to **"24h 00:00"**, the corresponding energy meter is not activated.

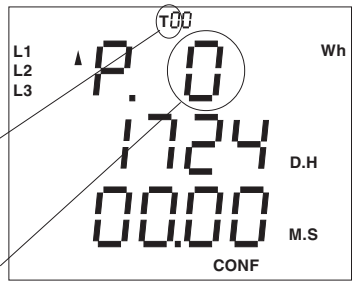


Diagr. Energy meter T0x, real energy consumption

Programming

In menu **CONF** move to the indication of work meters using *key 3*. Here consumed real work was selected.

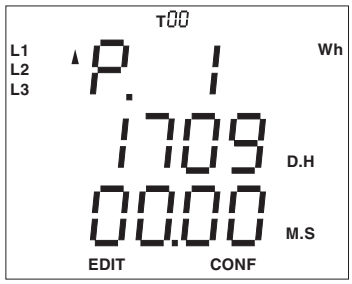
With *key 2* you can select the number (0-9) of the changeover time.



Pressing *key 1,* you can select the number and the text **EDIT** appears.
Changeable Values:

Week day beginning
Week day end
Start time - Hour
Start time - Minute
Start time - Second

The selected numbers can be changed using the keys *2* and *3* (see chapter **Edit**).



If the changeover times are set, press *key 1* as often as no number is flashing any longer. **EDIT** disappears.
With *key 3* you move to the next menu point. The time program is saved.

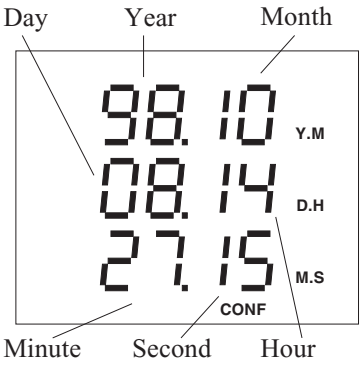
▲= Maximum or consumption ▼= Minimum or supply = Key 1 = Key 2 = Key 3

Clock

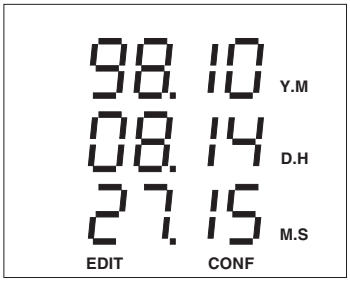
Date and time are needed as time information for highest and lowest value and storage of measured values in the ring buffer.
Date and time are set to the Middle European summer time.

Date and time can be called up and changed in menu **CONF**. Therefore please change to menu **CONF** (See chapter "configuration").

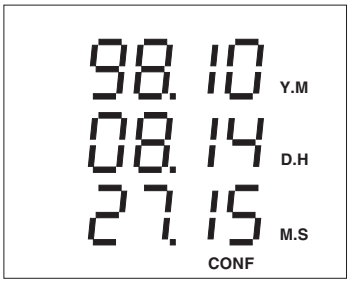
Select
In menu **CONF** move to the indication of date and time with *key 3*.
In this example the date is 10.08.1998 and the time is 14:27:15.



Change
With *key 1* a digit can be selected and changed with *key 3*.
The selected number is flashing.
The text "**EDIT**" appears. Date and time stop.



Save
When you have set the actual date and time, please press *key 1* as often as no number is flashing any longer.
Pressing *key 2,* the text **EDIT**disappears and date and time run with their new settings.



Comment:
The device is Year 2000 concurring according to DP2000-1:1998 of BSI (British Standards Institution).

Summer-/Wintertime changeover

The UMG503 can carry out an automatical summer and wintertime changeover. The following possibilities are available:

oFF - No summer and winter time changeover.
on - Your own changeover times
Eu - Listed changeover times

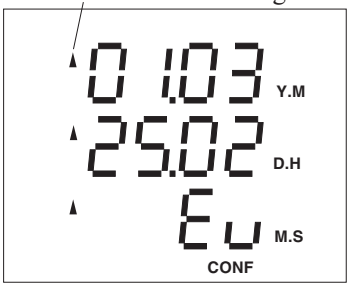
At the date, which is marked by an arrow downwards, time leaps back from 03:00 to 02:00.
At the date, which is marked by an arrow upwards, time leaps forward from 02:00 to 03:00.

Your own changeover times
If summer-/winter changeover is "on", both changeover times can be entered individually. The changeover times within the list are not valid.

Listed changeover times
In UMG503 a list of changeover times up to year 2020 is deposited. In this list, the last weekend in March and the last weekend in October of each year has been respected. If summer-/wintertime is set to "Eu", the changeover times of this list are used.

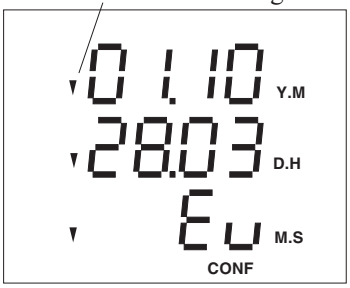
Select
In menu **CONF** you can scroll to the display of date and time using key 3 and then with key *2* to the summer time changeover.
In this example, the date 25.03.2001 is indicated.

Summer time changeover



Pressing key *2 again,* the time for winter changeover is indicated.

Winter time changeover

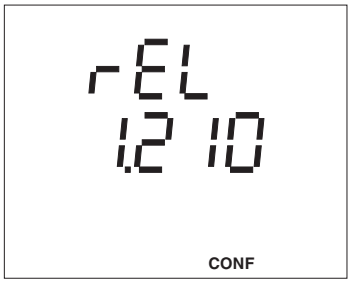


Software Release

The software within the device is improved and expanded continuously. Therefore the condition of software is marked by the software release. The software release cannot be changed.

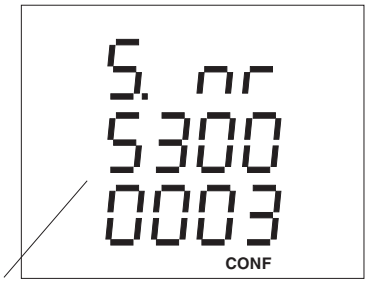
The software release can be called up in menu **CONF.** Please move to the menu **CONF** (See chapter "configuration").

Select
In menu **CONF** move to the indication of the software release using *key 3*.
In this case the software release is indicated 1.210.



Serial number

Each device has its own 8 digit serial number, which cannot be changed by user.
For certain device variants the user can release functions (options) later on. In that case the serial number is needed in the manufacturing works.
For each device passwords are deposited in the manufacturing company for releasing certain functions (options).



Example:
Serial number = 5300 0003

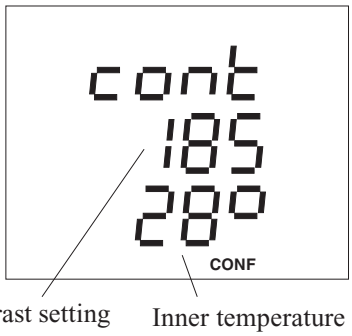
LCD contrast

The best view for the LCD display is "from below". The contrast of the LCD display can be adapted by the user. The contrast setting is possible in the range of 170 to 230 in 5 point steps.

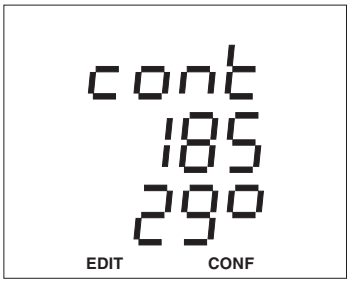
230 = very light
170 = very dark

In order to reach the optimum contrast for the whole operating temperature range, the **inner temperature** is measured within the device, and the **contrast setting** is corrected automatically. This correction will not be indicated in the *contrast settings* indication.

Selection
In menu **CONF** move to indication of LCD contrast using *key 3*.
In this case the inner temperature is 28°C and the contrast setting is 185.



Change
With *key 1* the contrast setting is selected, and the number is flashing.
In the indication the text **EDIT** appears.
Increase the contrast setting in 5 point steps using *key 3*.
If 230 is exceeded, the value jumps back to 170.



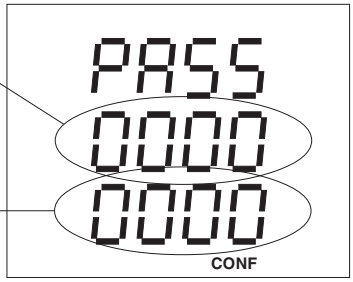
Password

Certain functions are protected by a user password. There are three types of passwords:

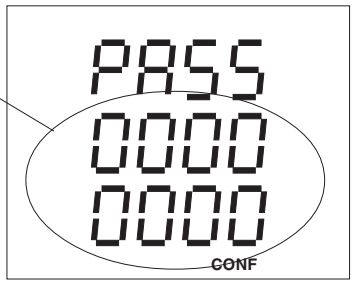
Clearance password (8-digits)
User password (4-digits)
Master password (4-digits)

User password or Master password

Function



Clearance password



Clearance password

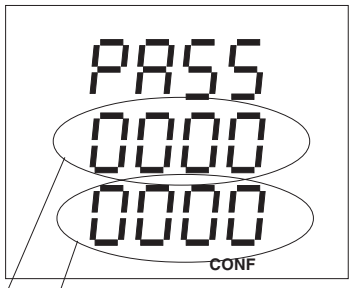
In the various device variants functions are available as an option. These function expansions can be released in the manufacturing works, when ordering.
When later a functional expansion shall be released by the user, a clearance password is needed with 8 digits. This password is deposited in the manufacturing works.

Functional expansions (options), that can be released, are:

Relay outputs
Impuls output
Analogue output
RS232 interface
Auxiliary input
Infra red interface
Three wire measurement
PROFIBUS DP (Slave)

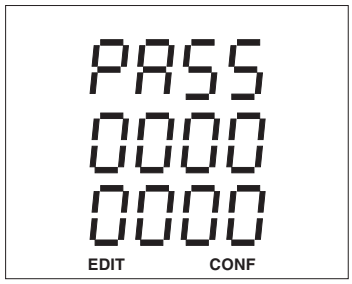
To release a functional expansion via the clearance password, please proceed as follows:

Select
In menu **CONF** you move to the indication of the password with *key 3*.
In the basic setting a 0000 0000 is indicated.



Clearance password "0000 0000"

Input
With *key 1* you select the digit to be changed. The text **EDIT** appears within the display.
With *key 3* you change the selected digit.



Save
When the password is put in, please confirm *key 1* as often as no digit is flashing any longer and confirm with *key 2*.
When the password is accepted, the password is deleted and 0000 0000 appears in the indication.
Now the released functional expansion can be called up in the programming or configuration menu.

User password

With the four digit user password the user can protect the programmed data and configuration against unintentional change. The programming and configuration will nevertheless be displayed.
In delivery condition the user password is "0000".
If the user cannot remember the user password, it can be changed with the master password only.
The protection of the user password is not available for access to data within the UMG503 via the serial interfaces.

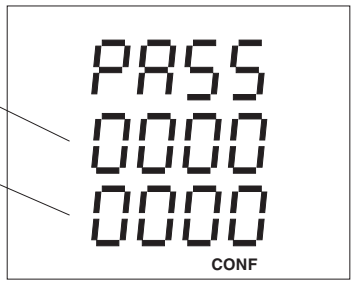
There are four functions for the user password at your disposal:

Function	Description
1	Lock programming and configuration
2	Admit programming and configuration.
3	Input user password
4	Delete user password.

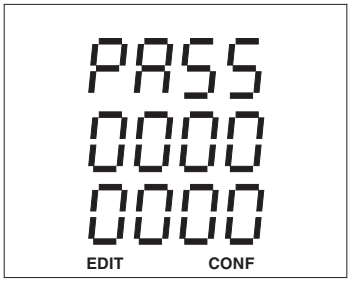
To activate a function, the user password and the desired function must be put in the password menu.
A new user password can be put in, when it was deleted with function 4 by putting in the old user password. A deleted password is indicated with "0000".

User password or master password

Function



Input
Select the digit to be changed using *key 1*.
The text **EDIT** is flashing in the indi-cation. The selected digit is flashing.
Change the selected number using *key 3*.



Save
When you have put in the password and function, press *key 1* as often as no digit is flashing any longer and confirm with *key 2*.

Master password

The four digit master password is needed for service purpose only and it is not announced to the user.

Function	Description
0004	Delete user password
3846	software update
7645	Restore delivery conditions of the device.

After calling function "0004" the user password is reset to delivery condition:
User password = "0000".
Now programming can be allowed with user password "0000" and configuration with function "0002".

The input of the master password is done just like the input of the user password.

Transmission protocols

For the connection of the UMG 503 to existing field bus systems, two transmission protocols are at your disposal:

- PROFIBUS DP (Slave)
- Modbus RTU (Master and Slave)

The following protocols can be operate via **RS485** interface:

off	no protocol, interface is not active.
1	Reserved
2	Modbus RTU (Slave)
3	-
4	Service protocol
5	PROFIBUS DP (Slave), (Option)
6	Modbus RTU (Master)*1)

The following protocols can be operate via **RS232** interface:

off	no protocol, interface is not active.
1	Reserved
2	Modbus RTU (Slave)
3	-
4	Service protocol
5	Modem
6	Modbus RTU (Master)*1)

Service protocol

The service protocol is used for calibration and testing purpose in the manufacturing works only.

Modem

For the connection of the UMG 503 to a modem, the protocol "modem" must be set at the UMG 503.
Operation of the UMG 503 via modem is only safe with modems tested by the producer.

*1) Protocol 6 can run only on one interface, RS232 or RS485, at the same time.

Modbus RTU

With Modbus RTU protocol all addresses of the following tables can be retrieved.

Table 1a	Measured values (floating point format)
Table 1b	Measured values (floating point format)
Table 2	Energy (floating point format)
Table 3a	Time information for min. and maximum values and system time
Table 3b	Time information for min. and maximum values and time of summer/ winter changeover
Table 4	Avaraging times of mean values
Table 5	Internal control word
Table 6a	Measured values, integer format
Table 6b	Mean values, integer format
Table 6c	Maximum values, integer format
Table 6d	Minimum values, integer format
Table 7	Energy, integer format
Table 8	Scale of measured values, which are called up in integer format
Table 9	In- and outputs
Table 10	EMAX-peak values

Transmission mode

RTU- Mode with CRC-Check.

Transmission parameters

Baud rate

RS232	: 9.6,19.2 and 38.4
RS485	: 9.6,19.2, 38.4, 57.6 and 115.2
Data bits	: 8
Parity	: none
Stop bits	: 2

Realized functions

Read Holding Register, function 03
Preset Single Register, function 06
Preset Multiple Registers, function 16

Data formats

The data are in the following formats at your disposal:

char:	1 Byte (0 .. 255)
word:	2 Byte (- 32 768 .. + 32 767)
long:	4 Byte (- 2 147 483 648 .. + 2 147 483 647)

The sequence of the bytes is high before low byte.

Example: Reading of system time

The system time is deposited under address 3000 in table 1. The system time is deposited in 6 bytes with year, months, day, hours, minutes and second in the format "char" = 0..255. The device address of the UMG 503 is determined as address = 01.

The "Query Message" looks as follows:

Description	Hex	Comment
Device address	01	UMG503, Address = 1
Function	03	"Read Holding Register"
Start address Hi	0B	3000dez = 0BB8hex
Start address Lo	B8	
No. of values Hi	00	6dez = 0006hex
no. of values Lo	06	
Error Check	-	

The "Response" of UMG503 can look as follows:

Description	Hex	Comment
Device address	01	UMG503, Address = 1
Function	03	
Byte Counter	06	
Data	00	Year = **00**$_{hex}$ = 00$_{dez}$ = 20**00**$_{dez}$
Data	0A	Month = 0A$_{hex}$ = 10$_{dez}$ = Oct.
Data	0C	Day = 0C$_{hex}$ = 12$_{dez}$
Data	0F	Hour = 0F$_{hex}$ = 15$_{dez}$
Data	1E	Minute = 1E$_{hex}$ = 30$_{dez}$
Data	0A	Second = 0A$_{hex}$ = 10$_{dez}$
Error Check (CRC)	-	

Example: Measured values in integer format
The UMG503 and PLC are set for "Higher protocol". There is a current transformer of 500A/5A and a voltage transformer of 400V/400V.
The currents in L1, L2, L3 and the sum of real power should be transmitted in integer format.

Read out scale
The scale of the measured values depends on the set current and voltage transformer ratios, which are set at UMG 503, and must only be read after a change of those ratios

The scales of the measured values can be found in table 3.

Scale	Address
Currents	9100
Power	9102

Within the PLC the output range with control words (4-5) must be overwritten for the scale and afterwards with the control word (3) for the request number.
Control word 1 = In- and outputs "**0000**" (Example)
Control word 2 = In- and outputs "**0000**" (Example)
Control word 4 = Scale "**9100**" (Currents)
Control word 5 = Scale "**9102**" (Power)
Control word 3 = Request number "**1**" (Example)
Control word 6..32 free

After that, the following scales are available in the input range of PLC:

Control word	Measured value	Contents
1	Request number	1
2	Scale, Currents	0 (*1)
3	Scale, Powers	3 (*1000)
4..28	not defined	

Read measured values
The measured values in integer format can be found in table 4. The following addresses can be found in table 4.

Measured value	Address	
Current L1	8000	A
Current L2	8001	A
Current L3	8002	A
Real power, Sum	8024	W

Control word 1 = In- and outputs "**0000**" (Example)
Control word 2 = In- and outputs "**0000**" (Example)
Control word 4 = Measured value address "**8000**" (Current in L1)
Control word 5 = Measured value address "**8001**" (Current in L2)
Control word 6 = Measured value address "**8002**" (Current in L3)
Control word 7 = Measured value address "**8024**" (Real power sum.)
Control word 3 = Request number "**2**" (Example)
Control words 8..32 free

After that the following measured values are available in the input range of the PLC:

Control word	Measured value	Contents (Example)
1	Request number	2
2	Current L1	100 (A)
3	Current L2	120 (A)
4	Current L3	140 (A)
5	Real power, Sum.	82800 (W)
6..28	not defined	

Example: Measured values in foating point format
The UMG 503 and the PLC are suited for "higher protocol". A current transformer of 200A/5A and a voltage transformer of 400V/400V have been set.
Real energy consumption and reactive power inductive should be transmitted in floating point format and voltage in L1, L2 and L3 against earth in integer format.

Read scale
The scale of the measured values depends on the set current and voltage transformer ratios only und must only be read after changing those ratios.
The scale for voltage measured values can be found in table 3.

Scale	Address
Voltage	9101

Within the PLC, the output range must be overwritten with control word 4 for the scales of voltage and with control word (3) for the request number.
Control word 1 = In- and outputs "**0000**" (Example)
Control word 2 = In- and outputs "**0000**" (Example)
Control word 4 = Scale "**9101**" (Voltage)
Control word 3 = Request number "**3**" (Example)
Control words 5..32 free

After that, the following scales are available for voltage in the input range of PLC:

Control word	Measured value	Contents
1	Request number	3
2	Scale, voltage	0 (*1)
3..28	not defined	

Read measured values
The measured values in floating point format can be found in table 2. The following addresses can be read in the tables 2 and 3:

Measured value	Address	Contents (Example)	
Voltage L1-N	8003	230	(V)
Voltage L2-N	8004	225	(V)
Voltage L3-N	8005	235	(V)
Real energy cons.	2000	60444	(Wh)
React. energy ind.	2020	23501	(varh)

In the PLC the output range must be overwritten with the control words (4-7) for the measured value addresses and afterwards with control word (3) for the request number.
Control word 1 = In- and outputs "**0000**" (Example)
Control word 2 = In- and outputs "**0000**" (Example)
Control word 4 = Measured value address "**8003**" (Voltage L1-N)
Control word 5 = Measured value address "**8004**" (Voltage L2-N)
Control word 6 = Measured value address "**8005**" (Voltage L3-N)
Control word 7 = Measured value address "**2000**" (Real energy, consumption)
Control word 8..10 = free
Control word 11 = Measured value address"**2020**" (Reactive energy ind.)
Control word 12..14 = free
Control word 3 = request number "**4**" (Example)
Control words 15..32 = free

After that the following measured values are available in the input range of the PLC:

Control word	Measured value	Contents (Example)	
1	Request number	4	
2	Voltage L1-N	230	(V)
3	Voltage L2-N	225	(V)
4	Voltage L3-N	235	(V)
5..8	Real energy cons.	604,44(Wh)	
9..12	Reac. energy ind.	235,01(varh)	
13..28	not defined		

The voltages each are transmitted in one word (2 Byte) and real and reactive energy each in 4 words (8Byte). Therefore real and reactive energy need 4 control words each and the measured value of reactive energy is deposited from control word 9.

Tables

Overview

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Table 1b	Measured values, floating point format
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Table 6c	Maximum values, integer format
Table 6d	Minimum values, integer format
Table 7	Energy, integer format
Table 8	Scale of measured values, which are retrieved in integer format.
Table 9	Inputs and outputs
Table 10	EMAX peak values

Data formats

The data are available in the following formats:

char	: 1 Byte (0 .. 255)
word	: 2 Byte (- 32 768 .. + 32 767)
long	: 4 Byte (- 2 147 483 648 .. + 2 147 483 647)
float	: 4 Byte (IEEE754)
double	: 8 Byte (IEEE754)

The sequence of the bytes is high before low byte.

Table 1a

Measured values in floating point format

Description	Index DPV1	Address(dez) DPV0/MODB.	r/w[1]	Type	Unit	Comment
Current	64	1000	r	meas. val.[2]	A	L1, L2, L3
Voltage N-L	65	1012	r	meas. val.[2]	V	L1, L2, L3
Voltage L-L	66	1024	r	meas. val.[2]	V	L1-L2, L2-L3, L1-L3
Real power	67	1036	r	meas. val.[2]	W	Sign -=Supply, +=Consumption
Apparent power	68	1048	r	meas. val.[2]	VA	L1, L2, L3
Reactive power	69	1060	r	meas. val.[2]	var	Sign -=cap, +=ind
cos(phi)	70	1072	r	meas. val.[2]		Sign -=cap, +=ind
Frequency	71	1084	r	meas. val.[2]	Hz	L1, L2, L3
Real power, sum	72	1096	r	sum[3]	W	Sign -=Supply, +=Consumption
Apparent power, sum		1100	r	sum[3]	VA	
Reactive power, sum		1104	r	sum[3]	var	Sign -=cap, +=ind
cos(phi), sum	73	1108	r	sum[3]		Sign -=cap, +=ind
Total harmonic distortion _U						
Measured value		1112	r	float[3]	%	L1, L2, L3
Maximum value		1115	r	float[3]	%	L1, L2, L3
Total harmonic distortion _I						
Measured value		1118	r	float[3]	%	L1, L2, L3
	74	1120				
Maximum value		1121	r	float[3]	%	L1, L2, L3
Partial harmonics _U						
Maximum value		1124	r	float[20][3]	V	Partial harmonics 1-20; L1, L2, L3
	75	1132				
	..	..				
	79	1180				
Partial harmonics _U						
Measured value		1184	r	float[20][3]	V	Partial harmonics 1-20; L1, L2, L3
	80	1192				
	..	..				
	84	1240				
Partial harmonic _I						
Maximum value		1244	r	float[20][3]	A	Partial harmonics 1-20; L1, L2, L3
	85	1252				
	..	..				
	89	1300				
Partial harmonic _I						
Measured value		1304	r	float[20][3]	A	Partial harmonic 1-20; L1, L2, L3
	90	1312				
	..	..				
	94	1360				
Real power EMAX		1365	r	float	W	Sign -=Supply, +=Consumption
	95	1372				
	96	1384				

[1] r/w = read/write
[2] measured value {float: measured value[L1-L3], mean value[L1-L3], lowest value[L1-L3], peak value[L1-L3]}
[3] sum {float: measured value, mean value, lowest value, peak value}

Table 1b

Measured values in floating point format

Description	Index DPV1	Address(dez) DPV0/MODB.	r/w1)	Type	Unit	Comment
Total harmonic distortion _U						
Mean value		1390	r	float[3]	%	L1, L2, L3
Total harmonic distortion _I						
Mean value		1393	r	float[3]	%	L1, L2, L3
	97	1396				
Partial harmonics _U						
Minimum value		1400	r	float[20][3]	V	Partial harmonic 1-20; L1, L2, L3
	98	1408				
	..	..				
	102	1456				
Partial harmonics _I						
Minimum value		1460	r	float[20][3]	A	Partial harmonic 1-20; L1, L2, L3
	103	1468				
	..	..				
	107	1516				
Partial harmonics _U						
Mean value		1520	r	float[20][3]	V	Partial harmonic 1-20; L1, L2, L3
	108	1528				
	..	..				
	112	1576				
Partial harmonics _I						
Mean value		1580	r	float[20][3]	A	Partial harmonic 1-20; L1, L2, L3
	113	1588				
	..	..				
	117	1636				
Total harmonic distortion _U						
Minimum value		1640	r	float[3]	%	L1, L2, L3
Total harmonic distortion _I						
Minimum value		1643	r	float[3]	%	L1, L2, L3
Current, N		1646	r	float	A	
	118	1648				
	119	1660				
Maximum of current mean value		1663	r	float[3]	A	L1, L2, L3

Table 2

Energy in floating point format

Description	Index DPV1	Address(dez) DPV0/MODB.	r/w1)	Type	Unit	Comment
Real energy, Consumption	220	2000	r	double[4]	Wh	Energy, Tariff1, Tariff2, Tariff3, Tariff4
Reactive energy, inductive	221	2010	r	double[4]	varh	Energy, Tariff1, Tariff2, Tariff3, Tariff4
Reactive energy, capacitive	222	2020	r	double[4]	varh	Energy, Tariff1, Tariff2, Tariff3, Tariff4
Real energy, supply	223	2030	r	double[4]	Wh	Energy, Tariff1, Tariff2, Tariff3, Tariff4
Reactive energy without rev. running stop	224	2040	r	double[4]	varh	Energy, Tariff1, Tariff2, Tariff3, Tariff4
Real energy without rev. running stop	225	2050	r	double[4]	Wh	Energy, Tariff1, Tariff2, Tariff3, Tariff4

Table 3a

Time information for minimum and maximum values and system time

Description	Index DPV1	Address(dez) DPV0/MODB.	Type	Comment	
System time	230	3000	char	System time	
Current L1, L2, L3	128	3001	char[2][3]	Min. value, Max. value;	L1, L2, L3
Voltage N-L	129	3007	char[2][3]	Min. value, Max. value;	L1, L2, L3
Voltage L-L	130	3013	char[2][3]	Min. value, Max. value;	L1, L2, L3
Real power	131	3019	char[2][3]	Min. value, Max. value;	L1, L2, L3
Apparent power	132	3025	char[2][3]	Min. value, Max. value;	L1, L2, L3
Reactive power	133	3031	char[2][3]	Min. value, Max. value;	L1, L2, L3
cos(phi)	134	3037	char[2][3]	Min. value, Max. value;	L1, L2, L3
Frequency	135	3043	char[2][3]	Min. value, Max. value;	L1, L2, L3
Real power, sum	136	3049	char[2]	Min. value, Max. value;	
Apparent power, sum		3051	char[2]	Min. value, Max. value;	
Reactive power, sum		3053	char[2]	Min. value, Max. value;	
cos(phi), sum	137	3055	char[2]	Min. value, Max. value;	
Total harmonic distortion _U					
Maximum value		3057	char[3]	L1, L2, L3	
Total harmonic distortion _I					
Maximum value		3060	char[3]	L1, L2, L3	
	138	3061			
Partial harmonics _U					
Maximum value		3063	char[20][3]	Partial harmonics 1-20; L1, L2, L3	
	139	3067			
	..	..			
	148	3121			
Partial harmonics _I					
Maximum value		3123	char[20][3]	Partial harmonics 1-20; L1, L2, L3	
	149	3127			
	..	..			
	158	3181			
free	159	3187			
free		3188			
free		3189			
Real energy, starting time consumption		3190	char	Starting time of energy measurement	
Reactive energy, starting time inductive		3191	char	Starting time of energy measurement	
Reactive energy, starting time capacitive		3192	char	Starting time of energy measurement	
Real energy, starting time supply	160	3193	char	Starting time of energy measurement	
Reactive energy, starting time without reverse running stop		3194	char	Starting time of energy measurement	
Real energy, starting time without reverse running stop		3195	char	Starting time of energy measurement	
free		3196			
..		..			
free		3198			
free	161	3199			

Format of time information: {char: year, month, day, hour, minute, second} Year: 00 .. 99 = 2000 .. 2099

Table 3b

Time information for minimum and maximum values and system time

Description	Index DPV1	Address(dez) DPV0/MODB.	Type	Comment
free	162	3205		
Partial harmonics _U				
Minimum value		3210	char[20][3]	Partial harmonics 1-20; L1, L2, L3
	163	3211		
	..	..		
	172	3265		
Partial harmonics _U				
Minimum value		3270	char[20][3]	Partial harmonic 1-20; L1, L2, L3
	173	3271		
	..	..		
	182	3325		
free	183	3331		
free		3332		
Total harmonic distortion _I				
Minimum value		3333	char[3]	L1, L2, L3
Current, N		3336	char[2]	Minimum value, Maximum value
	184	3337		
Real power EMAX		3338	char[2]	Minimum value, maximum value
Current mean value (L1, L2, L3)		3340	char[2][3]	Min. and maximum value; L1, L2, L3
Time changeover		3343	char[2]	Summer time, winter time

Format of time information: {char: Year, month, day, hours, minute, second} Year: 00 .. 99 = 2000 .. 2099

Table 4

Averaging times of the mean values.
The averaging times cannot be retrieved via Profibus DP V1.

Description	Index DPV1	Address(dez) DPV0/MODB.	Type	Comment
Current		4000	char[3]	L1, L2, L3
Voltage N-L		4003	char[3]	L1, L2, L3
Voltage L-L		4006	char[3]	L1-L2, L2-L3, L1-L3
Real power		4009	char[3]	L1, L2, L3
Apparent power		4012	char[3]	L1, L2, L3
Reactive power		4015	char[3]	L1, L2, L3
cos(phi)		4018	char[3]	L1, L2, L3
Frequency		4021	char[3]	L1, L2, L3
Real power, sum		4024	char	
Real power EMAX		4156	char	5=5, 6=10, 7=15, 8=30, 9=60Minutes
Apparent power, sum		4025	char	
Reactive power, sum		4026	char	
cos(phi), sum		4027	char	
Current, N		4028	char	
Total harmonic distortion _U		4150	char[3]	L1, L2, L3
Total harmonic distortion _I		4153	char[3]	L1, L2, L3
Partial harmonics _U		4030	char[20][3]	Partial harmonics 1-20; L1, L2, L3
Partial harmonics _I		4090	char[20][3]	Partial harmonics 1-20; L1, L2, L3

Format of time information: {char: Year, month, day, hour, minute, second} Year: 00 .. 99 = 2000 .. 2099

Table 5

Internal control word

Description	Address(dez)	r/w[1]	Format		Comment
Internal control word	5000	r/w	char[17]	Byte 0	Only internal use.
				Byte 1	Only internal use.
				Byte 2	**Delete minimum value. (Byte > 0)**
				Byte 3	**Delete maximum value. (Byte > 0)**
				Byte 4	Only internal use.
				Byte 5	Only internal use.
				Byte 6	**Delete real energy. (Byte > 0)**
				Byte 7	**Delete reactive energy. (Byte > 0)**
				Byte 8	Only internal use.
				Byte 9	Only internal use.
				Byte 10	Only internal use.
				Byte 11	Only internal use.
				Byte 12	Only internal use.
				Byte 13	Only internal use.
				Byte 14	Only internal use.
				Byte 15	Only internal use.
				Byte 16	Only internal use.

To change a byte of the "internal control word", the "internal control word" must be read, and the changed word must be written back to address 5000.

Attention!
If the bytes with the comment **"Only internal use"** are changed, this may lead to a faulty operation of UMG 503!

[1] r/w = read/write

Table 6a

Measured values in integer format

Measured values	Index DPV1	Address(dez) DPV0/MODB.	r/w[1]	Format	Unit	Comment
Current	4	8000	r	word[3]	A	L1, L2, L3
Voltage		8003	r	word[3]	V	N-L1, N-L2, N-L3
Voltage		8006	r	word[3]	V	L1-L2, L2-L3, L1-L3
Real power[2]		8009	r	word[3]	W	L1, L2, L3
Apparent power	5	8012	r	word[3]	VA	L1, L2, L3
Reactive power[3]		8015	r	word[3]	var	L1, L2, L3
cos(phi)[3]		8018	r	word[3]		L1, L2, L3
Frequency		8021	r	word[3]	Hz	L1, L2, L3
Real power, sum[2]	6	8024	r	word	W	
Apparent power, sum		8025	r	word	VA	
Reactive power, sum[3]		8026	r	word	var	
cos(phi), sum[3]		8027	r	word		
Current, N		8028	r	word	A	Current in neutral conductor
Partial harmonics _U		8030	r	word[20][3]	V	Partial harm. 1-20; L1, L2, L3
	7	8036				
	..	..				
	11	8084				
Partial harmonics _I		8090	r	word[20][3]	A	Partial harm. 1-20; L1, L2, L3
	12	8096				
	..	..				
	16	8144				
Total harmonic distortion_U		8150	r	word[3]	‰	L1, L2, L3
Total harmonic distortion _I		8153	r	word[3]	‰	L1, L2, L3
Real power EMAX, sum[2]	17	8156	r	word	W	

Table 6b

Mean values in integer format

Mean values	Index	Address(dez)	r/w[1]	Format	Unit	Comment
Current		8157	r	word[3]	A	L1, L2, L3
Voltage		8160	r	word[3]	V	N-L1, N-L2, N-L3
Voltage		8163	r	word[3]	V	L1-L2, L2-L3, L1-L3
Real power[2]		8166	r	word[3]	W	L1, L2, L3
	18	8168				
Apparent power		8169	r	word[3]	VA	L1, L2, L3
Reactive power[3]		8172	r	word[3]	var	L1, L2, L3
cos(phi)[3]		8175	r	word[3]		L1, L2, L3
Frequency		8178	r	word[3]	Hz	L1, L2, L3
	19	8180				
Real power, sum[2]		8181	r	word	W	
Apparent power, sum		8182	r	word	VA	
Reactive power, sum[3]		8183	r	word	var	
cos(phi), sum[3]		8184	r	word		
Current, N		8185	r	word	A	Current in neutral conductor
Partial harmonics _U		8187	r	word[20][3]	V	Partial harm. -20; L1, L2, L3
	20	8192				
	..	..				
	24	8240				
Partial harmonics _I		8247	r	word[20][3]	A	Partial harm. 1-20; L1, L2, L3
	25	8252				
	..	..				
	29	8300				
Total harmonic distortion _U		8307	r	word[3]	‰	L1, L2, L3
Total harmonic distortion _I		8310	r	word[3]	‰	L1, L2, L3

[1] r/w = read/write
[2] Sign - = Supply, + = Consumption
[3] Sign - = cap, + = ind

Table 6c

Maximum values in integer format

Maximum values	Index	Address(dez)	r/w[1]	Format	Unit	Comment
Current		8314	r	word[3]	A	L1, L2, L3
Voltage		8317	r	word[3]	V	N-L1, N-L2, N-L3
Voltage		8320	r	word[3]	V	L1-L2, L2-L3, L1-L3
Real power[2]		8323	r	word[3]	W	L1, L2, L3
Apparent power		8326	r	word[3]	VA	L1, L2, L3
Reactive power[3]		8329	r	word[3]	var	L1, L2, L3
cos(phi)[3]		8332	r	word[3]		L1, L2, L3
Frequency		8335	r	word[3]	Hz	L1, L2, L3
Real power, sum[2]		8338	r	word	W	
Apparent power, sum		8339	r	word	VA	
Reactive power, sum[3]		8340	r	word	var	
cos(phi), sum[3]		8341	r	word		
Current, N		8342	r	word	A	Current in neutral conductor
Partial harmonics _U		8344	r	word[20][3]	V	Partial harm. 1-20; L1, L2, L3
Partial harmonics _I		8404	r	word[20][3]	A	Partial harm. 1-20; L1, L2, L3
Total harmonic distortion _U		8464	r	word[3]	‰	L1, L2, L3
Total harmonic distortion _I		8467	r	word[3]	‰	L1, L2, L3
Real power EMAX, sum[2]		8470	r	word	W	
Current mean value		8663	r	word[3]	A	L1, L2, L3

Table 6d

Minimum values in integer format

Minimum values	Index	Address(dez)	r/w[1]	Format	Unit	Comment
Current		8471	r	word[3]	A	L1, L2, L3
Voltage		8474	r	word[3]	V	N-L1, N-L2, N-L3
Voltage		8477	r	word[3]	V	L1-L2, L2-L3, L1-L3
Real power[2]		8480	r	word[3]	W	L1, L2, L3
Apparent power		8483	r	word[3]	VA	L1, L2, L3
Reactive power[3]		8486	r	word[3]	var	L1, L2, L3
cos(phi)[3]		8489	r	word[3]		L1, L2, L3
Frequency		8492	r	word[3]	Hz	L1, L2, L3
Real power, sum[2]		8495	r	word	W	
Apparent power, sum		8496	r	word	VA	
Reactive power, sum[3]		8497	r	word	var	
cos(phi), sum[3]		8498	r	word		
Current, N		8499	r	word	A	Current in neutral conductor
Partial harmonics _U		8501	r	word[20][3]	V	Partial harm. 1-20; L1, L2, L3
Partial harmonics _I		8561	r	word[20][3]	A	Partial harm. 1-20; L1, L2, L3
Total harmonic distortion _U		8621	r	word[3]	‰	L1, L2, L3
Total harmonic distortion _I		8624	r	word[3]	‰	L1, L2, L3
Real power EMAX, sum[2]		8627	r	word	W	

[1] r/w = read/write
[2] Sign - = Supply, + = Consumption
[3] Sign - = cap, + = ind

Table 7

Energy in integer format

Energy Index	Address(dez)	r/w[1]	Format	Unit	Comment
Real energy, consumption ▲	9000	r	long	Wh	Scale see address 9102
Real energy, supply ▼	9001	r	long	Wh	Scale see address 9102
Real energy without rev. running stop	9002	r	long	Wh	Scale see address 9102
Reactive energy, capacitive	9003	r	long	varh	Scale see address 9102
Reactive energy, inductive	9004	r	long	varh	Scale see address 9102
React. energy without rev. running stop	9005	r	long	varh	Scale see address 9102

[1] r/w = read/write

Table 8

Scale of measured values, which can be retrieved in integer format.

Measured values	Index	$Address_{dez}$	r/w[1)]	Format	Possible scale
Current	200	9100	r	word	-3 .. 6
Voltage	201	9101	r	word	-3 .. 6
Power	202	9102	r	word	-3 .. 6
cos(phi)	203	9103	r	word	-3
Frequency	204	9104	r	word	-2
THD	205	9105	r	word	-3

In UMG503 almost all measured values are available in floating point format (Table 2). For the transmission of measured values, the floating format values are changed into integer formats by UMG 503, such as char, int and word (Table 4).
In order not to lose a digit after decimal point, the transmitted value is scaled. The transmission value is calculated as follows:

Measured value = Transmission value * Factor

The scales of the measured values are calculated from UMG 503 out of current and voltage transformer ratio. Here the minimum definition of the transmitted value of 0,1% is strived for.

The scales of the UMG 503 can be retrieved under the following addresses:

10 scale factors are at your disposal:

Scale	**Factor**
-3	/1000
-2	/100
-1	/10
0	* 1
1	* 10
2	* 100
3	* 1 000
4	* 10 000
5	* 100 000
6	* 1000 000

The scale of energy is fixed by the scale of power

Example: Scale
Transmitted value UMG 503 = 2301
Programmed scale = -1
Which voltage is measured by the UMG 503?

From the scale table, you can read the factor =/10 for scale=-1:

Measured value = Transmitted value * **Factor**
Measured value = 2301 * 1/10
Measured value = 230,1V

The measured voltage is 230,1V.

[1)] r/w = read/write

Table 9

In and outputs

A remote Bit is assigned to each in- or output, that can be controlled externally. If this remote Bit=0, the in- or output is controlled by the UMG 503 only. If the remote Bit=1, the in- or output is controlled externally.

Description	Address	Format	r/w[1]		Comment
Inputs	0048	word[3]			
			r/w	Bit 0	Change over summer time (Winter=0, Summer=1)
			r/w	Bit 1	Remote, change over summer time
			r/w	Bit 2	Relay output 2
			r/w	Bit 3	Remote Bit, Relay output 2
			r/w	Bit 4	Relay output 1
			r/w	Bit 5	Remote Bit, Relay output 1
				Bit 6..15	Free
			r/w	Bit 0	Remote Bit, Tariffs
			r	Bit 1	Synchronize of the internal clock
				Bit 2..3	Free
			r/w	Bit 4	Reset of real power EMAX
			r/w	Bit 5	Remote Bit, Reset of real power EMAX
				Bit 6..15	Free
			r	Bit 0..1	Tariff real energy consumption
			r	Bit 2..3	Tariff reactive energy Ind.
			r	Bit 4..5	Tariff reactive energy cap.
				Bit 6..15	Free
Outputs	0032	word[3]			
			r	Bit 0	Measuring range of voltage in L1 exceeded
			r	Bit 1	Measuring range of voltage in L2 exceeded
			r	Bit 2	Measuring range of voltage in L3 exceeded
			r	Bit 3	Measuring range of voltage in L1 underscored
			r	Bit 4	Measuring range of voltage in L2 underscored
			r	Bit 5	Measuring range of voltage in L3 underscored
				Bit 6..15	Free
			r	Bit 0	Measuring range of current in L1 exceeded
			r	Bit 1	Measuring range of current in L2 exceeded
			r	Bit 2	Measuring range of current in L3 exceeded
			r	Bit 3	Measuring range of current in L1 underscored
			r	Bit 4	Measuring range of current in L2 underscored
			r	Bit 5	Measuring range of current in L3 underscored
				Bit 6..15	Free
			r	Bit 0..2	Watchdogcounter
			r	Bit 3	Auxiliary input
				Bit 4..15	Free

[1] r/w = read/write

Table 10

EMAX-Peak values

Description	Address(dez)	r/w[1]	Type	Comment
Real power EMAX				
Peak value	16000	r	float [Tariff] [Month]	Measured value in Watt
Date				
Year	16500	r	char [Month]	The month of the year, in which...
Day	16600	r	char [Tariff] [Monat]	The day of the month, in which the peak value appeared
Time				
Hour	16700	r	char [Tariff] [Month]	
Minute	16800	r	char [Tariff] [Month]	

Year = 0 .. 99 00 .. 99 = 2000 .. 2099
Tariff = 0 .. 4 0 = T00, 1 = T01, ..
Month = 0 .. 11 0 = January, 1 = February, ..

For each month, a peak value is saved for each tariff. After one year, this peak value will be overwritten.

[1] r/w = read/write

PSWbasic

The programming and reading out software PSWbasic always belongs to the extent of delivery of the UMG 503. The software can be installed on PCs with the operating systems WIN98,WIN98ME, NT4.0 or WIN2000, and offers the following possibilities:

- Configuration of the measured value indications,
- Read out the ring buffer,
- Create a GSD file,
- Configure the UMG503.

Required hard and software

Software

A PC with Windows® 98/2000/NT4 is required for running the Software PSWbasic. Please note, that the used Windows version should be the latest issue. When this manual was printed, the following issues were actual:

- Windows® 98
- Windows® 98ME
- Windows® NT4.0 mit Service-Pack3
- Windows® 2000

The service packs contain corrections of Windows faults. They can be obtained from Microsoft or downloaded from Microsoft™-Side in the internet.

Hardware

- PC Pentium 200MHz or higher
- 32 MByte RAM(for Windows® NT 32MByte)
- About 5MB free memory on harddisk for the program **PSWbasic**
- Color monitor with a solution of 640x480 or 800x600 dots and 265 colours.
- 1MB PCI graphic board.
- The PSWbasic must be installed on harddisk.
- CD-ROM drive.
- Parallel printer interface.
- Modem and/or serial interface (Com1/2..).

Functions

Configure measured value indications

Only a part of all possible measured values is indicated in the producers presettings. This part of the program makes possible:

- Read out the actual configuration of the measured value indications of the UMG 503.
- Load the configuration of the measured value indications from PC.
- Destine the kind and sequence of the measured values.
- Transmit the configuration of the measured value indications to the UMG 503.
- Save the configuration of the measured value indications on PC.

Memory

The memory of the UMG 503 is divided into three areas:

the event memory,
the minimum and maximum memory and
the ring buffer.

Only the contents of the minimum and maximum memory can be read out directly at the UMG 503. The event memory and the ring buffer must be read out by PC.

Configuration of UMG 503

A simple configuration of the UMG 503 can be carried out directly at the device via the three keys and display. A configuration of the UMG 503 from PC is possible with the option "Configuration of UMG 503". Configurations can be saved and printed out at PC.

Additionally, an expanded configuration of the ring buffer is possible. The selection of six memory areas makes possible a better usage of the ring buffer. Each memory area can be assigned to one mean value. The recording is done either within or out of the destined area, which is limited by two selectable limits.

Only those mean values are saved in the ring buffer, which are within the memory area.

Create GSD file

Devices with PROFIBUS protocol need a GSD file. The GSD file is a file which is specific for the device, in which the transmission parameters, the kind of measurement data are agreed between the PROFIBUS master and the PROFIBUS Slave.

With this module, measured values and inputs and outputs can be selected for transmission to the PLC.

As a result of the configuration, a GSD file is created for the PLC and programming data are generated for the UMG 503. The programming data for the UMG 503 are deposited as a text at the beginning of the GSD file. The programming data must be entered in the UMG 503 under "input buffer", "output buffer" und "User-Parameter-buffer".

Indicating range and accuracy

Quantity	Indicating range	Measuring range for Scale factor=1	Measuring accuracy
Voltage			
L-N	0,0V .. 999,9 MV	50 .. 500 V	+-0,2% Mr
L-L	0,0V .. 999,9 MV	80 .. 870 V	+-0,2% Mr
Current	0,000 .. 9999 A	0,005 .. 5 A	+-0,2% Mr
Current in N	0,000 .. 9999 A	0,060 .. 15 A	+-0,6% Mr
Frequency (of voltage)	45,00 .. 65,00 Hz	45,00 .. 65,00 Hz	+-0,1% Mv
Power			
Real power, consump.	0,00W .. 9999 MW	0,05 W .. 2,5 kW	+-0,5% Mr
Real power, supply	-0,00W .. -999 MW	0,05 W .. 2,5 kW	+-0,5% Mr
Apparent power	0,00VA .. 9999 MVA	0,05 VA .. 2,5 kVA	+-0,5% Mr
Reactive power	0,00VAr.. 9999 MVAr	0,05 kvar .. 2,5 kvar	+-0,5% Mr
Energy (max. 10 digits)			
Real energy, without rev. running stop	0,0 Wh .. 9999 GWh	0,05 Ws .. 9999 MWh	1)
Real energy, consump.	0,0 Wh .. 9999 GWh	0,05 Ws .. 9999 MWh	1)
Real energy, supply	0,0 Wh .. 9999 GWh	0,05 Ws .. 9999 MWh	1)
Reactive energy	0,0 vars .. 9999 Gvarh	0,05 vars .. 9999 Mvarh	1)
Total harmonic content THD(f)			
Current	0,0 .. 100 %	0,0 .. 100 %	+-0,5% Mr
Voltage	0,0 .. 100 %	0,0 .. 100 %	+-0,5% Mr
Partial harmonic content			
Current (1. - 20.)	0,000 .. 9999 A	0,005 A .. 5A (1A)	+-0,5% Mr
Voltage (1. - 20.)	0,0V .. 99,99 kV	0,000 V .. 9999 V	+-0,5% Mr
cos(Phi)	0,00ind .. 1,00 .. 0,00cap.	0,00ind .. 1,00 .. 0,00cap.	2)

The specifications presuppose the following conditions:

Yearly calibration
Warm up 10 minutes
Ambient temperature of 18 .. 28°C.

In the range of -10..18°C and 28..55°C an additional error of +-0,2% Mv per K must be considered.

Used abbreviations:

Mr = of measuring range
Mv = of measured value
ind = inductive
kap = capacitive

1) The measuring accuracy corresponds to the measuring accuracy of power.
2) If the measured apparent power in the range of 1% .. 100% of measuring range, cos(phi) is displayed with an accuracy of +-1% of 1.000.

Technical Data

Ambient conditions
- Overvoltage class : CATII
- Pollution degree : 2
- Operating temperature : -10°C .. +50°C
- Storage temperature : -20°C .. +60°C
- humidity class : 15% to 95% (without dew)

Auxiliary voltage Uh : 85V .. 265V
- Power consumption : max. 9VA

Measuring inputs
- Rated pulse voltage : 6kV
- Signal frequency : 45Hz .. 1200Hz

Current measurement
- Voltage, proportional to current : 0 .. 5Veff

Voltage measurement
- max. 600VAC against ground
- Overvoltage class : CAT III
- Pollution degree : 2
- Power consumption : ca. 0,4 VA
- Maximum fuse : M2A
- Measuring range L-N : 50 .. 500V AC
- Measuring range L-L : 80 .. 870V AC
- Frequency of fundamental : 45Hz .. 65Hz

Testing voltage
- Voltage measuring inputs against housing and RS232 : 5550V AC
- Current measuring inputs against housing and RS232 : 5550V AC
- Auxiliary voltage against housing and RS232 : 1350V AC
- Auxiliary voltage against voltage measuring inputs : 1350V AC
- Auxiliary voltage against current measuring inputs : 1350V AC

Measurement
- Rate : 2 measurements / s
- Actualization of display : 1 time per second

Weight
- case (without current transformers): 7,7kg
- Current transformers : 0,6kg each

Mounting position :Random

Operating height : 0 .. 2000m over NN

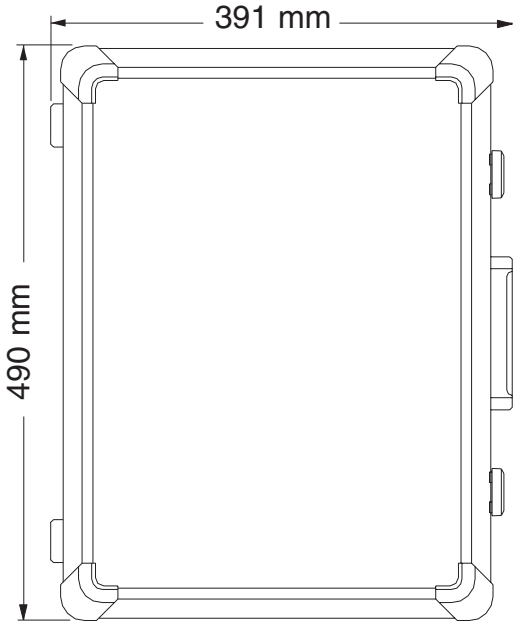
Accuracy of the internal clock : +- 1 minute/month

Interference resistance (industrial areas)
- : EN55082-2:1995
- : IEC 1000-4-,3,10V/m
- : IEC 1000-4-4, 2kV
- : IEC 1000-4-2, 8kV

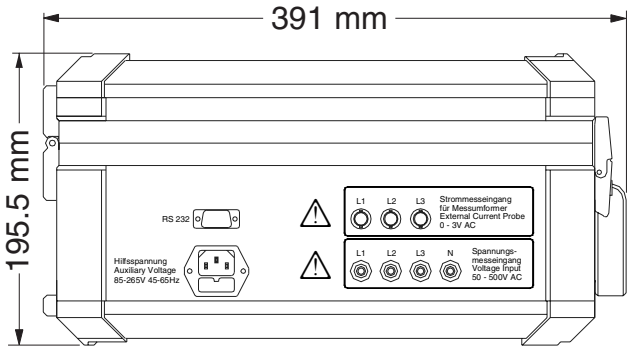
Spurious radiation (residential areas)
- : EN55011 10.1997

Safety guidelines : EN61010-1 03.1994 + A2 05.1996
- : IEC 1010-1

Top view

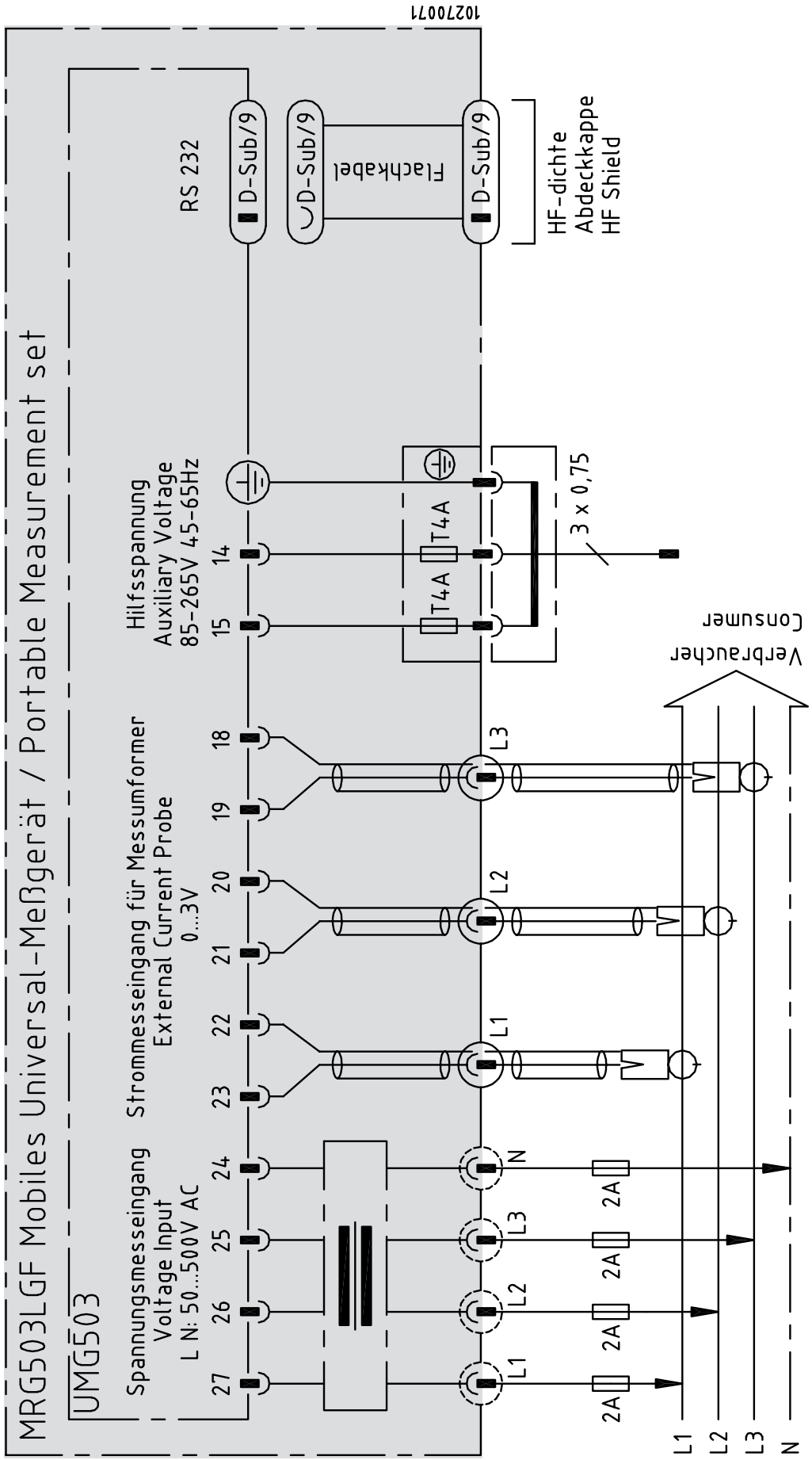


Side view



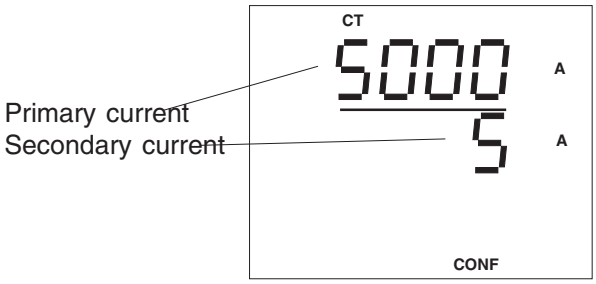
 ▲= Maximum or consumption ▼= Minimum or supply = Key 1 = Key 2 = Key 3

Connection diagram



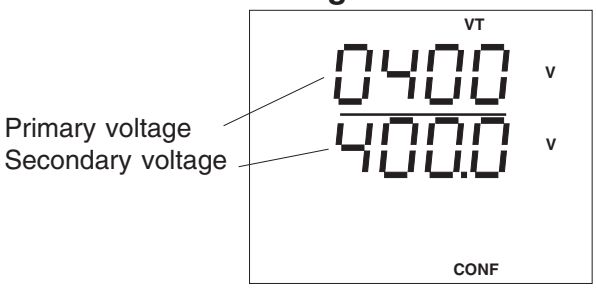
Brief instructions

Current tranformer



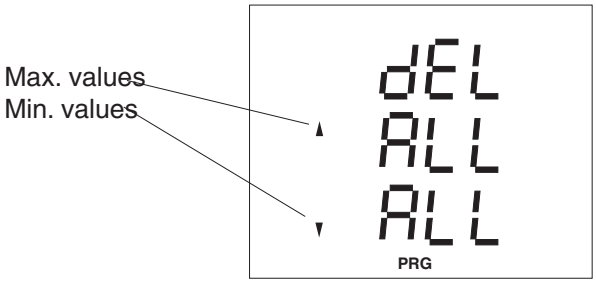
	2 x	Select programming menu
▷	1 x	Select current transformer
		Select digit
△		Change digit
▷		Move decimal point
	2 Sek.	Save and go to measured value indication.

Voltage transformer



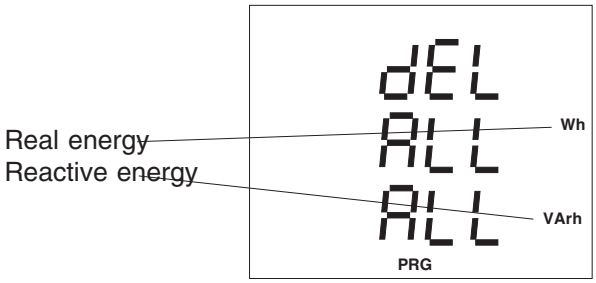
	2 x	Select programming menu
▷	1 x	Confirm selection.
△	1 x	Select voltage transformer.
		Select digit.
△		Select digit.
▷		Move decimal point.
	2 Sek.	Save and go to measured value indication.

Delete min./max. values



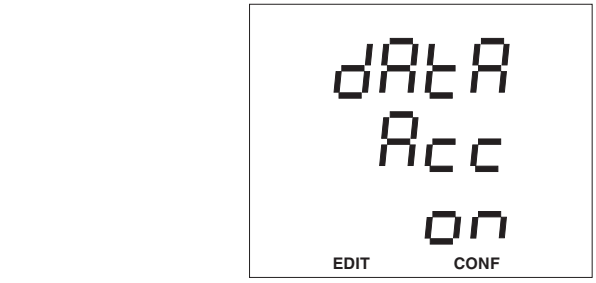
	3 x	Select programming menu. The text "Select" flashes.
▷	1 x	Confirm selection.
	1 x	Select max. values.
△	1 x	Delete max. values. "0" flashes.
	1 x	Select min. values.
△	1 x	Delete min. values. "0" flashes.
	1 x	Confirm.
	2 Sek.	Save and go to measured value indication.

Delete Energy



	3 x	Select programming menu. The text "Select" flashes.
▷	2 x	Scroll to selection.
	1 x	Select real energy.
△	1 x	Delete real energy. "0" flashes.
	1 x	Select reactive energy.
△	1 x	Delete react. energy. "0" flashes.
	1 x	Confirm.
	2 Sek.	Save and go to measured value indication.

Data acquisition start = "on" / stop = "oFF"



	2 x	Select programming menu.
▷	1 x	Confirm selection.
△	4 x	Select data acquisition.
	1 x	Confirm.
△		change "on"/"oFF".
	2 Sek.	Save and go to measured value indication.

▲= Maximum or consumption ▼= Minimum or supply

= Key 1 ▷ = Key 2 △ = Key 3