

Universal Measuring Device

UMG 503

Operating instructions

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Issue note	
04.11.1998	First edition.
26.11.1998	Completions.
09.12.1998	Page 22 „password=3846“, page 31 „Gvarh“, page 35 „housing depth“
03.03.1999	Completions.
26.03.1999	Connection diagram.
03.05.1999	cos(phi), event memory.
30.09.1999	Expansion of functions.
02.02.2000	Higher protocol for PROFIBUS.
22.02.2000	Indication of outer conductor voltage.
29.02.2000	Reset of measuring period.
08.02.2000	Delete work via serial interface.

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Generals

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.

In the attached delivery view (Doc. No.: 1.0160.066.x) for the UMG503 all options and variants are listed.

The operating instructions also describe those options, which are not delivered, and, therefore, do not belong to the contents of delivery.

Attention! All plugs, which belong to the contents of delivery, are plugged on the device! The 9pole D-Sub plug for RS232 interface does not belong to the contents of delivery.

The operating instructions also describe those options, which are not delivered and therefore do not belong to the contents of delivery!

Universal Measuring Device **UMG 503**

Product description

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 electric 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. Please note, that the internal clock of the UMG 503 has got no automatical summer/wintertime change over.

Note:

The device is conformed for year 2000 according to DP2000-1:1998 of BSI (British Standards Institution).

Intended use

The UMG 503 is suited for fix mounting and the measurement of voltage, current, harmonics (2nd to 20th), power etc. in low and medium voltage switchgear. For the operation of the UMG 503 a protective wire is required. The measurement is laid out for one phase and three phase systems with or without neutral conductor (three wire measurement). In networks without N conductor, the voltage measurement must be carried out via **voltage transformers**. If the measurement should be carried out via two voltage transformers only, the option "three wire measurement" is required.

Alternating voltages (50Hz/60Hz) up to 500VAC against ground and 870VAC between the outer conductors can be connected directly. The voltage measurement inputs are not separated galvanically and must be connected to the UMG 503 via external prefuses M2A.

The current measurement is carried out via a ..5A or ../1A current transformer. In networks with a voltage up to 150 VAC against ground currents up to 6 A can be connected to the UMG 503 directly and measured as well.

The connection of the auxiliary voltage, the measurement inputs etc. are on the rear side via all-insulated plug connectors.

The auxiliary voltage must be connected to the building installation via a separation (switch or power switch) and a 10 A overload protection.

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.

Attention!

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

Hints for maintenance

Attention!

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.

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Putting into service

The device should be put into service as follows:

- **Install the device.**

- **Connect auxiliary voltage Uh.**

The wiring for the auxiliary voltage must be suited for operating voltage up to 300VAC against ground. The size of the auxiliary voltage to be connected must be according to the details on type plate.

- program **current and voltage transformer.**

- Connect **measurement voltage** (max. 500VAC against ground) and check measured voltage indication.

Attention!

The wiring for the measurement voltage must be suitable for a voltage up to 500VAC against ground and 870VAC phase to phase.

Attention! For connection examples 5 and 6 the option "three wire measurement" is required. In networks without neutral conductor, voltage transformers are required and must be connected according to the respective diagram.

- Connect **measurement current** (max. 6A). Check measurement current indication. Short-circuit current transformer and check, whether the measurement current indication is zero Ampere.

Attention! None earthed current transformer clamps are dangerous to be touched.

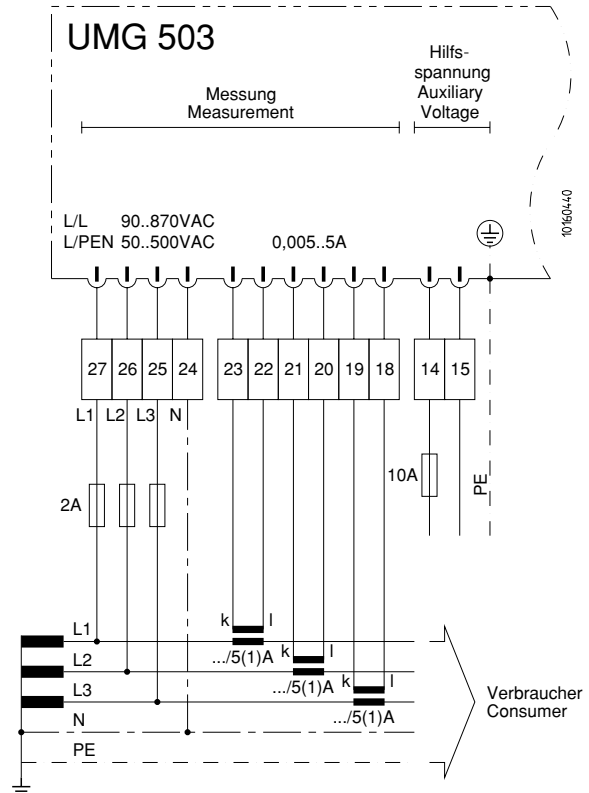
- Check **phase assignment.**

The assignment of outer conductor and current transformer is correct, if no voltage occurs between outer conductor and the respective current transformer (primary).

-Connect **interface** (RS485 2-wire). Please use an interface converter (RS485/RS232), when you connect it to the COM-interface of a PC.

Attention!

- A switch or power breaker must be provided for the auxiliary voltage within the installation.
- The switch must be installed near the device and must have an easy access for the user.
- The switch must be marked as a breaker for this device.
- Please ensure, that voltage and frequency match the type plate before connecting it to the auxiliary voltage!
- The device may be operated with earthed housing only!
- Conductors with single soldered wires are not suited for connection to screw clamps!
- The screw clamps may only be connected in dead condition.



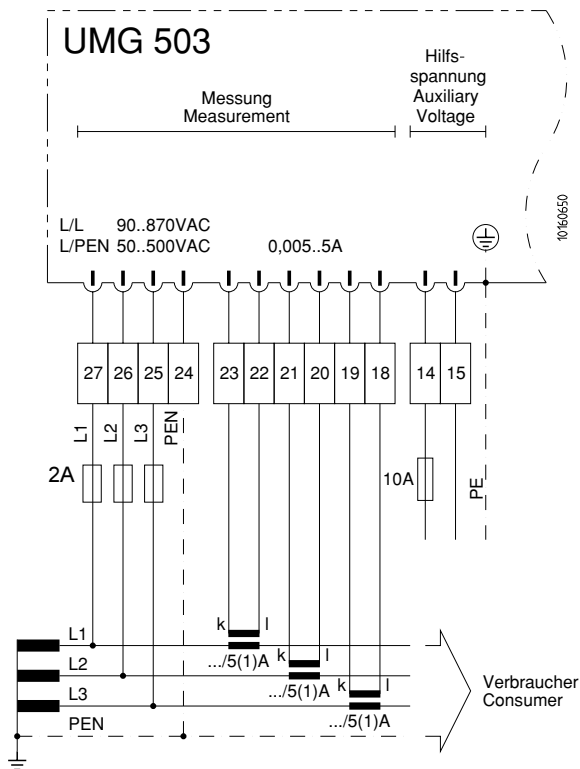
Connection example 1

Four wire measurement with three current transformers

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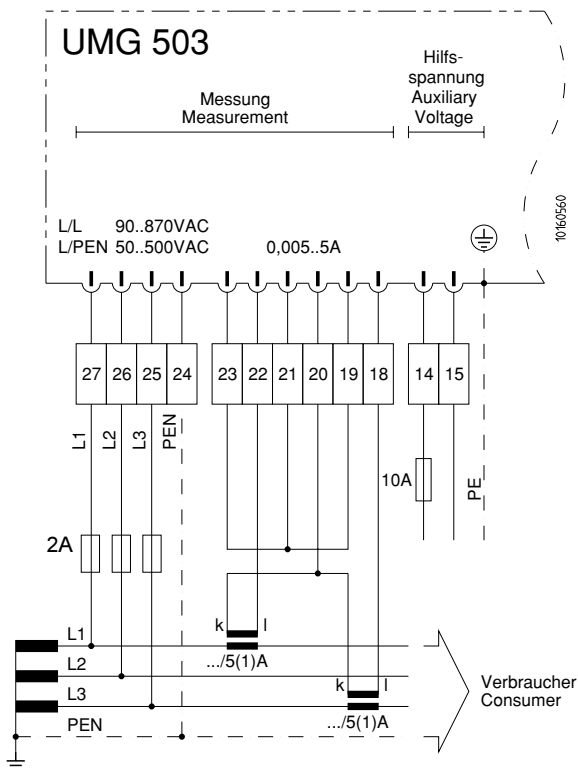
Connection example 2

Four wire measurement with three current transformers



Connection example 3

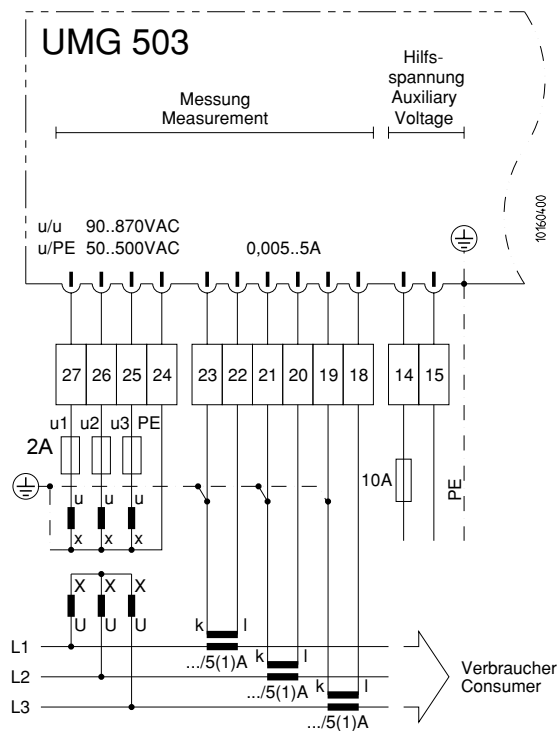
Four wire measurement with two current transformers



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Connection example 4

Three wire measurement with three voltage transformers and three current transformers

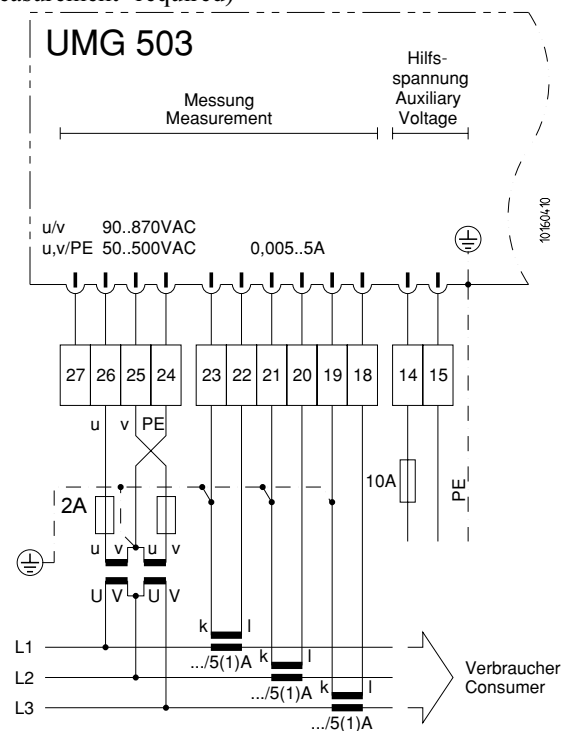


Attention!

In networks without neutral conductors, voltage transformers have to be used.

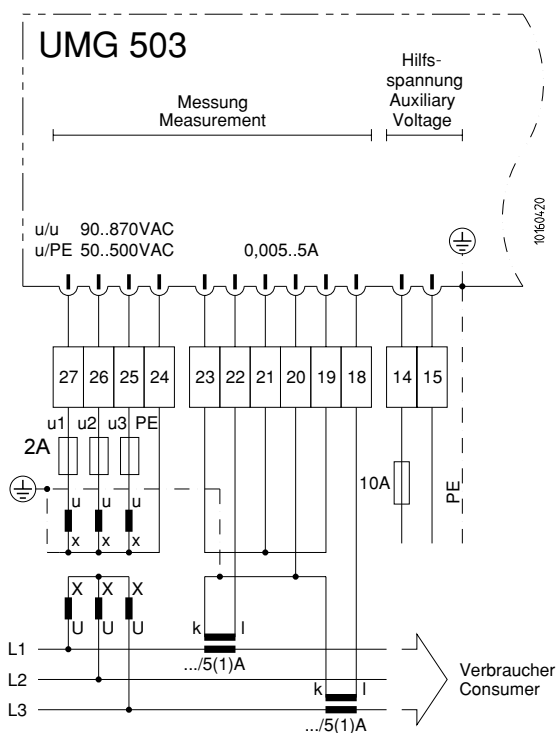
Connection example 6

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



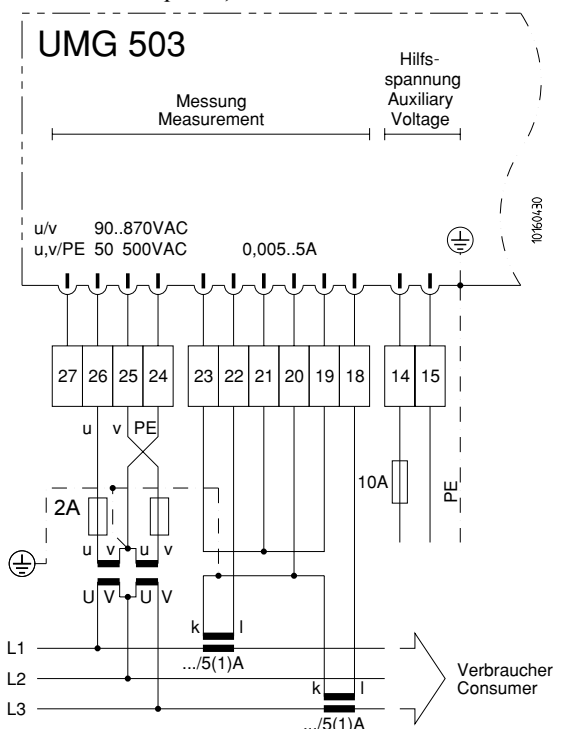
Connection example 5

Three wire measurement with three voltage transformers and two current transformers



Connection example 7

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






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Usage

Keys

The UMG503 is operated using the three keys within the front plate.

-  = Key 1
-  = Key 2
-  = Key 3

In the different indications these keys have various 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.

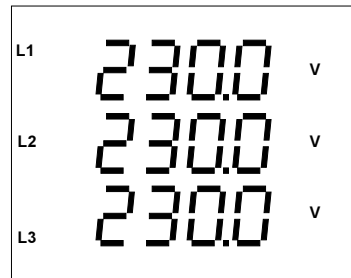
Main menu

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 **SELECT** mode,
- the configuration menu **CONF** and
- the programming menu **PRG**

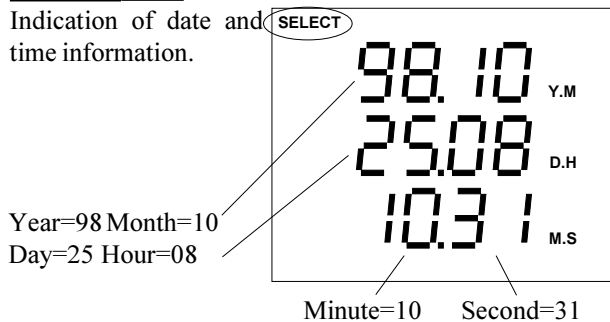
Measured value indication

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



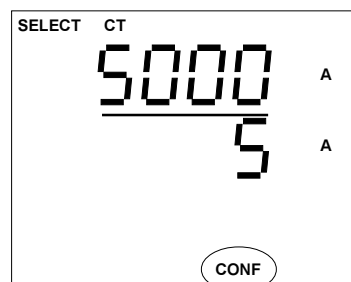
SELECT Mode

Indication of date and time information.



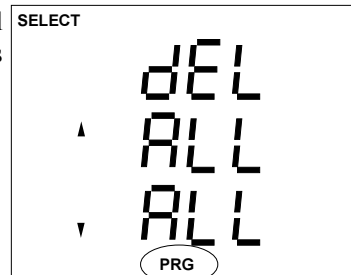
Configuration menu CONF

Example: Ratio current transformer



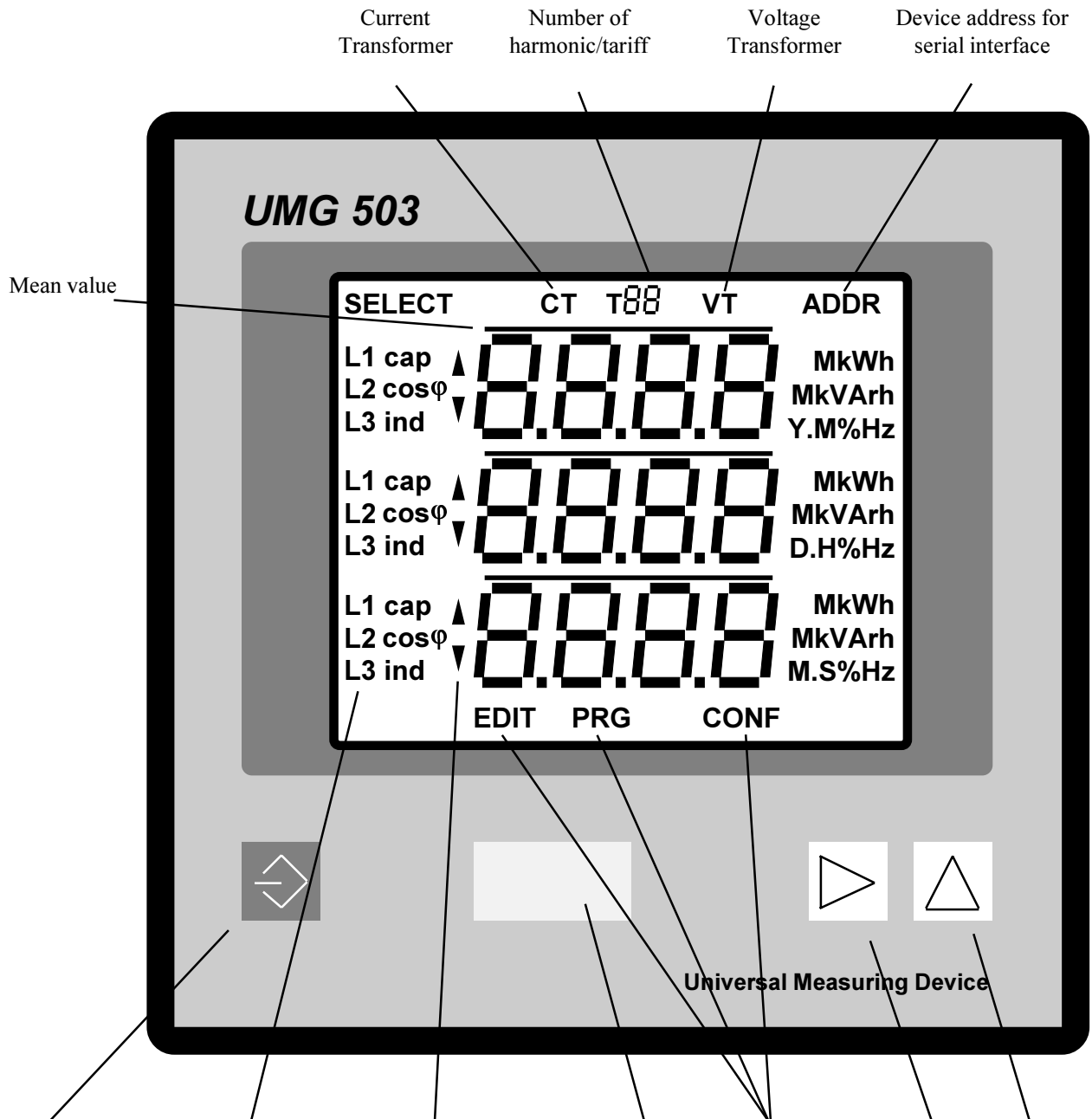
Programming menu PRG

Example: Delete all highest and lowest values



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Front view



Key 1 Indicated phase,
 -Outer conductor against N,
 -Outer conductor against outer conductor,
 -Sum measurement

▲ Highest values,
 ▼ Lowest values,
 ▲ Mark for the selected measured values for ring buffer,
 ▲ Consumption,
 ▼ Supply.

Infrared interface

Indication of operating mode

Key 2

Key 3

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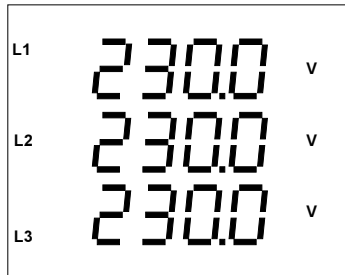
Measured value indication

The quantities to be measured as described in table "measured and calculated quantities" can be called up in the measured value indication. With the producer's presettings, only a part of all possible measured values is indicated.

The measured value indications can be arranged with the additional program **PSW503**, which belongs to the contents of delivery, on a PC individually and transmitted to the UMG 503 via the serial interface.

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

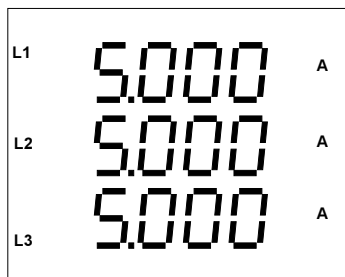
Example: Voltages L1-N, L2-N, L3-N



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

Using key 3 you leaf to the next measured value indication.

Example: Current in phase L1, L2 and L3



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 work determination.

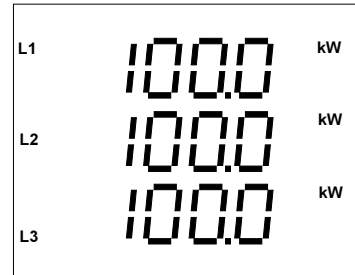
Mean values

For each measured value, except work, a mean value is calculated. The averaging time is programmable. Only mean values can be marked for storage within the ring buffer.

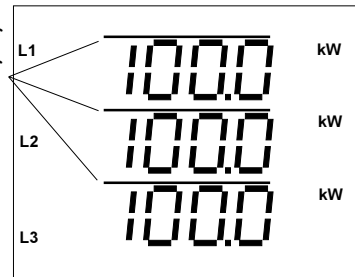
The calling up - in the example for the power maximum value in phase L3 - is carried out as follows:

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

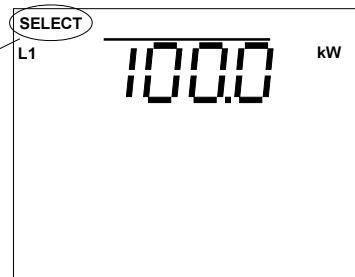
Using *key 3* you leaf to the measured value indication of the real power.



Pressing *key 2* you leaf to the **mean values** of real power.

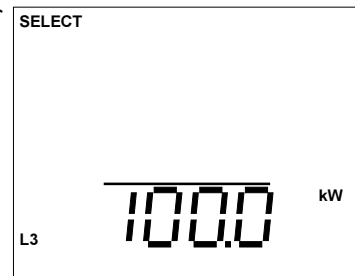


Select the **SELECT** mode using *key 1*.

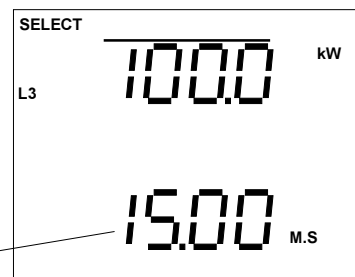


Confirm with *key 2*. The symbol **SELECT** is on.

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



Call up the **averaging time** for the real power in phase L3 as an additional information using *key 2*.



Averaging time = 15 Minutes

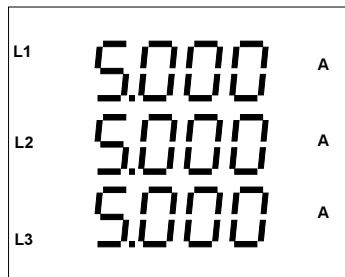
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Minimum and maximum values

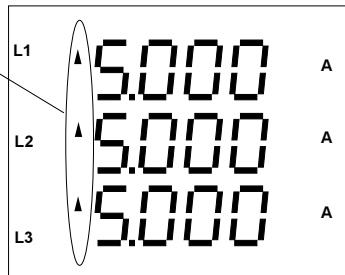
For each minimum and maximum value, the first appearance is saved with date and time. The interrogation, for current maximum value in L2 for instance, is carried out as follows:

Press *key 1* for about 2 seconds and you return to the first measured value window of the measured value indication from each program part.

Move to the measured value indication of the current using *key 3*.



Go to the maximum values of current using *key 2*.



Chose the Select mode with *key 1*. The symbol **SELECT** flashes.



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

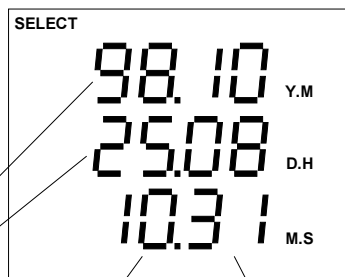


Select the maximum current value in L2 using *key 1*.



Call up additional information date and time for the maximum value of current using *key 2*.

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



Minute=10 Second=31

Work determination

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

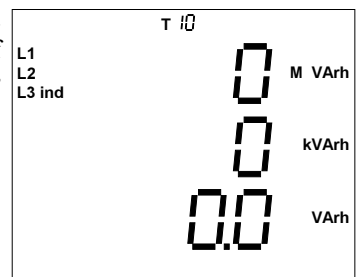
- Real work without reverse running stop
- Real work supply ▼
- Real work consumption (T00) ▲
- Reactive work without reverse running stop
- Reactive work ind., (T10)
- Reactive work cap., (T20)

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

The interrogation, for reactive work ind (T10) for instance, can be carried out as follows:

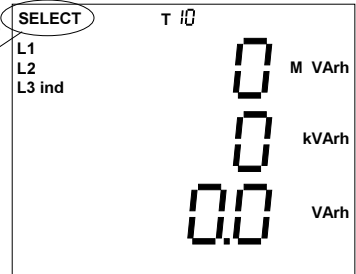
Press *key 1* for about 2 seconds and you return to the first measured value window of the measured value indication from each program part.

Move to the measured value indication of reactive work using *key 3*.



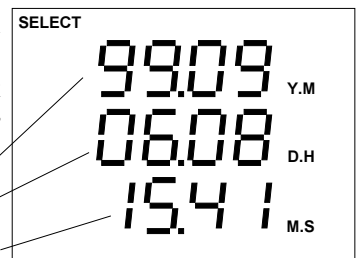
Go to select mode using *key 1*.

The symbol **SELECT** is flashing. Confirm with *key 2*. The symbol **SELECT** is on.

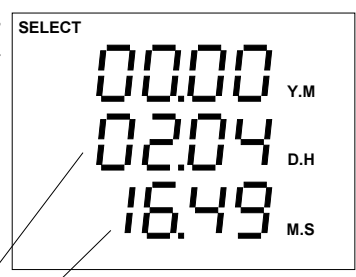


Call up the additional information starting time for reactive work measurement using *key 2*.

Year=99 Month=09
Day=06 Hour=08
Minute=15 Seconds=41



Confirm again with *key 2*. The running time for reactive work measurement is indicated.

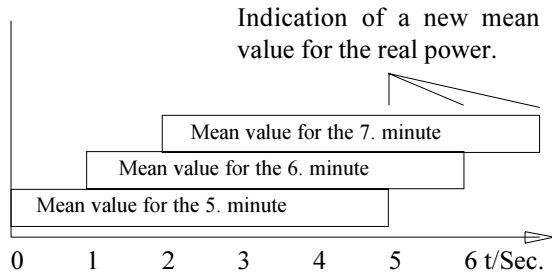


Days=02 Hours=04
Minutes=15 Seconds=41

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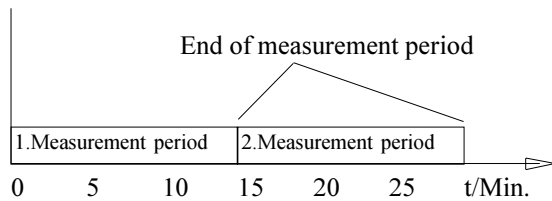
Real power EMAX

For the most measured values a mean value is build over the last passed period of time within the UMG 503 each second. This passed period of time is the programmable 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 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 consump.	T00	T01	T02	T03	T04
Reactive work ind.	T10	T11	T12	T13	T14
Reactive work cap.	T20	T21	T22	T23	T24
Real power EMAX	00	01	02	03	04

Attention!

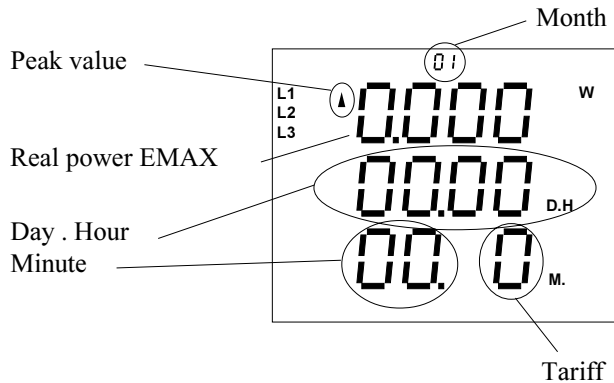
The real power EMAX is not indicated in the standard indications.

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 configured for the display software PSW503, 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 PSW503, for instance.



Universal Measuring Device UMG 503

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.

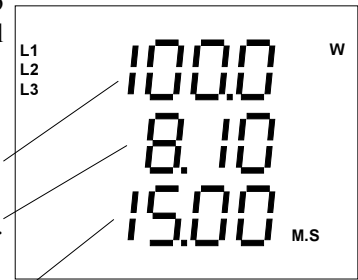
The measuring period for real power EMAX can be reset by the following means:

- automatically, after measuring period,
- internally, via keyboard,
- internally, via auxiliary input (Option),
- externally, via connected WAGO- Modules,
- externally, via PROFIBUS DP Protocol,
- externally, via MODBUS Protocol. (Table 5)

Reset of the measuring period by keyboard

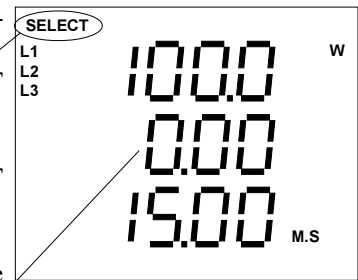
With *key 3* you leaf to the indication of real power EMAX.

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

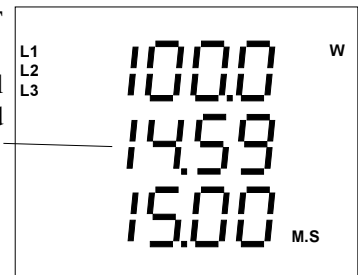


With *key 1* go to Select-Mode. The symbol **SELECT** flashes. Confirm with *key 2*. The symbol **SELECT** is visible.

Press *Key 2* 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!

Universal Measuring Device UMG 503

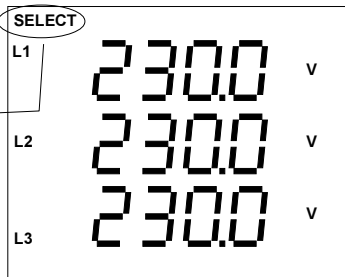
Programming

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

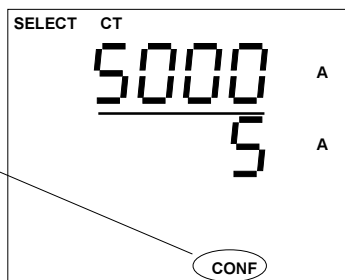
- Delete real and reactive work,**
- Delete all highest and lowest values "dEL"**
- Select measured values for the **ring buffer**,
- Select averaging time** for the measured values,
- Delete single highest and lowest values,**
- Read out duration of storage** of the ring buffer.

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

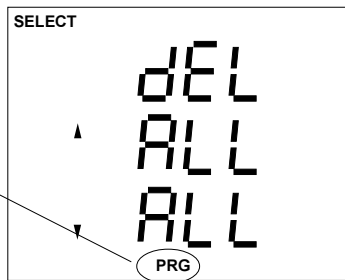
Confirm with **key 1**.
In the measured value indication the text **SELECT** appears flashing.



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.



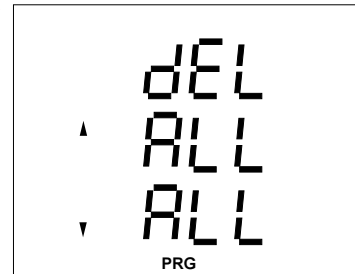
Delete real and reactive work

Real and reactive work can be deleted separately via keyboard or serial interface. Starting time and running time will be actualized.

Delete via keyboard

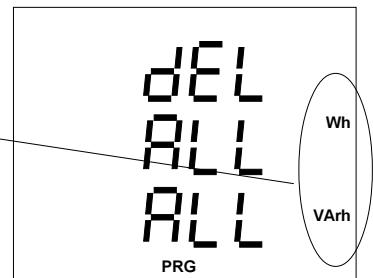
Please go to menu **PRG** (See chapter programming).

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.

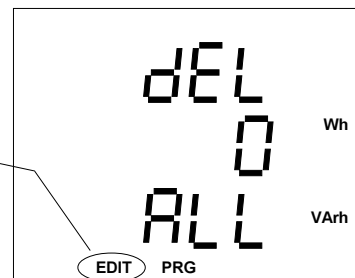
The arrows for minimum and maximum values disappear.



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

Delete via serial interface

In address 5000 a 17Byte large control word is deposited. A part of this control word is used for deletion of work:

Byte 7 > 0, delete real work

and

Byte 8 > 0, delete reactive work.

In order to overwrite a Byte, first read control word,

overwrite Byte 7/8 with e.g. 1

and rewrite the changed control word to address 5000.

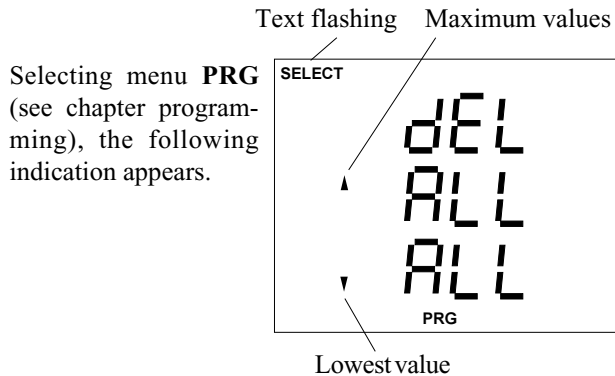
Attention!

Changing the control Byte incorrectly can lead to malfunctions of the UMG 503.

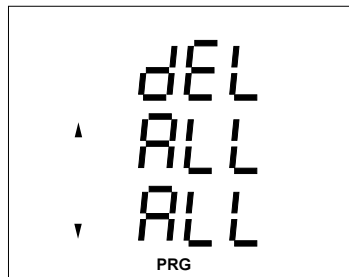
Universal Measuring Device UMG 503

Delete highest and lowest values

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

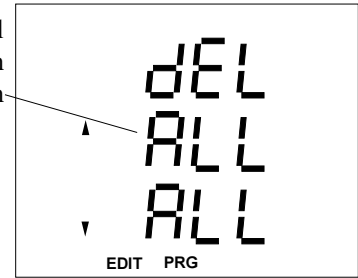


Using *key 2* you confirm the selection of menu **PRG** and the text **SELECT** disappears.



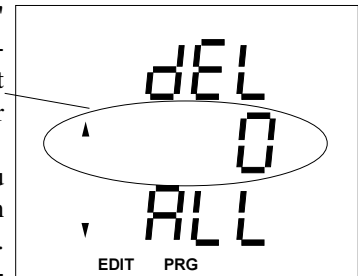
Delete all minimum and maximum values

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.



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.

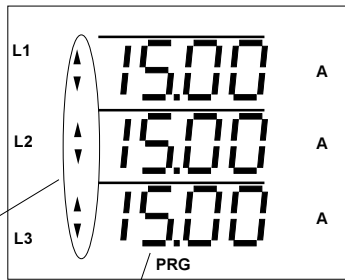
Pressing *key*  for about **2 seconds**, the highest value is deleted and you return to the first measured value window of the measured value indication!

Universal Measuring Device UMG 503

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:

Change to the measured value indication using *key 3*. In this example the programming of the current in the three phases is shown. All three currents are programmed for the ring buffer.



Averaging time = 15 Minutes

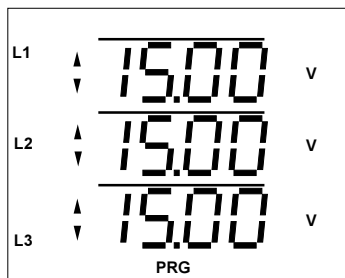
Pressing *key 1* again, the highest value in phase L2 is indicated.


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.

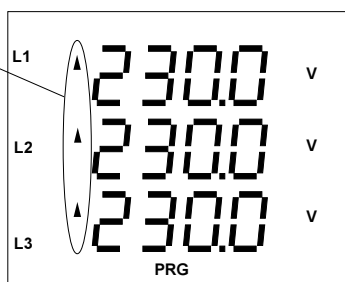


Now leaf to the measured value indication of the voltages by using *key 3*.

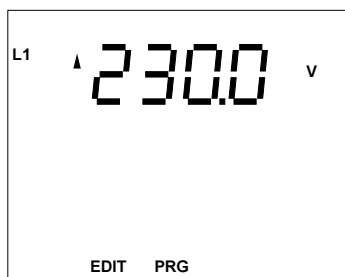


Pressing the *key*  for about **2 seconds**, you leave the **PRG** menu and return to the first measured value window of the measured value indication!

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



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



Universal Measuring Device UMG 503

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 work,
- Real work consumption, ▲
- Real work supply, ▼
- Reactive work,
- Reactive work inductive,
- Reactive work 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 **PSW503**" only.

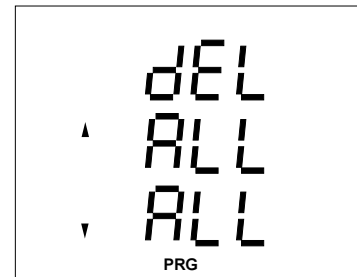
Attention!

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.

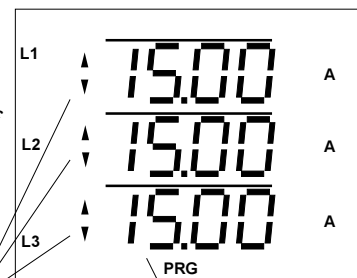
Select mean values

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.



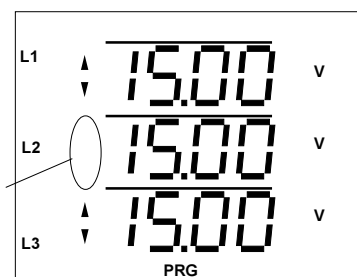
Change over to mean value indication using key 3. In this example the programming of current in the three phases is indicated.



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.

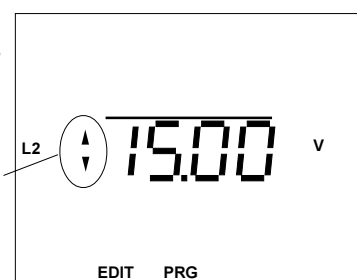


Voltage L2 is not programmed for storage in the ring buffer.

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.

Universal Measuring Device UMG 503

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")

Presettings

Description	Presettings
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. Apart from the peak and lowest value storage, those memories can only be read out with a PC. The read out data are available in ASCII format.

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.

Universal Measuring Device UMG 503

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.

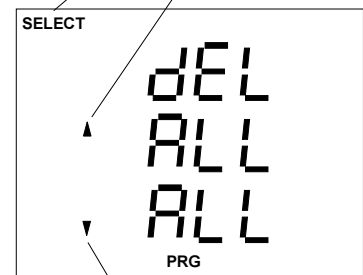
If only **38 seconds** are indicated for the period of storage, it cannot be granted any more, that the selected values are saved in the UMG 503. To enlarge the period of storage, you can remove some measured values with large periods or increase little periods of storage.

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**.

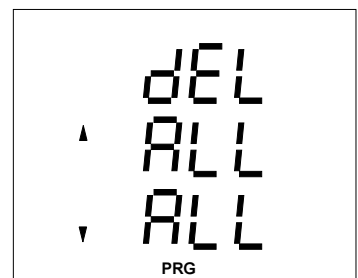
Text flashing Peak values



Lowest values

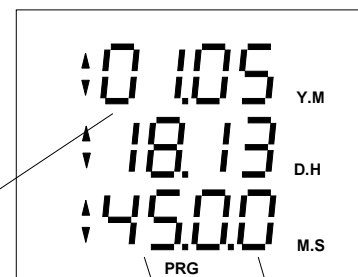
Selecting menu **PRG** (see chapter programming), the following indication appears first:

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



Leaf to the indication besides using *key 3*.

Here, for example, the period of storage is estimated at more than one year.



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

Universal Measuring Device **UMG 503**

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

Limit group 1 (Option)

Limit group 2 (Option)

Three wire measurement (Option)

Scanning frequency

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

Software Release

Serial number

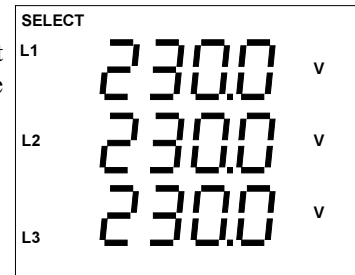
LCD contrast

Password

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

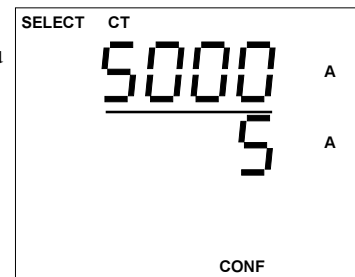
Press *key 1*.

The flashing text **SELECT** appears in the indication.



Press *key 1* again.

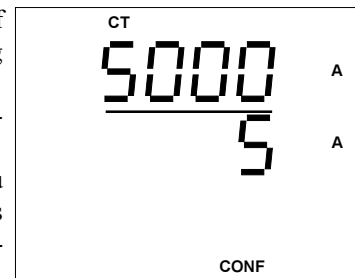
Now you are in the menu **CONF**.



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.



Universal Measuring Device UMG 503

Current transformer

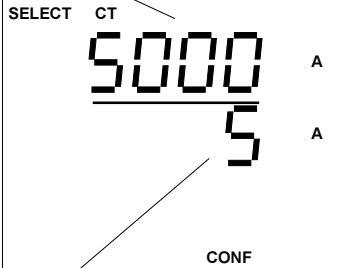
The ratio of the current transformer is set in configuration menu **CONF**. The secondary current can either be set to $..1A$ or $..5A$.

If you are in configuration menu **CONF**, the current transformer ratio can be changed as follows:

Primary current

Select:

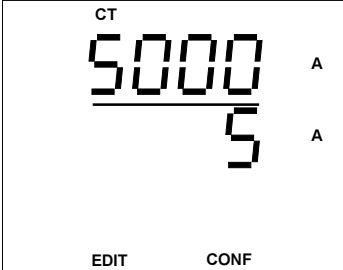
Confirm the selection of the current transformer menu with *key 3*. The text **SELECT** disappears.



Secondary current

Set:

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



When the ratio of the current transformer is set, press *key 1* as often, as no cipher is flashing any longer. **EDIT** disappears.

With *key 3* you move to the next menu. The ratio of the current transformer is saved.

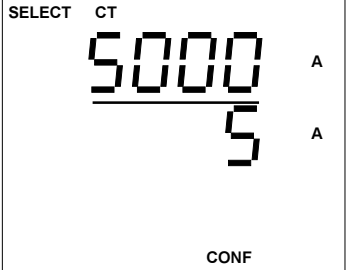
Voltage transformer

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

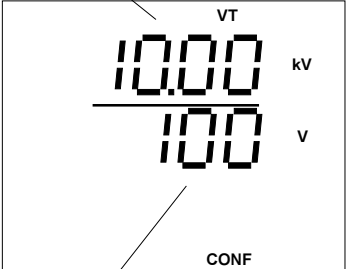
Confirm selection of current transformer menu with *key 3*. The text **SELECT** disappears.



Primary voltage

Select

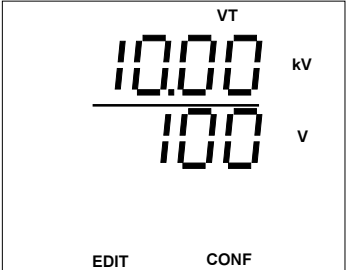
With *key 3* you move to the voltage transformer menu.



Secondary voltage

Set

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



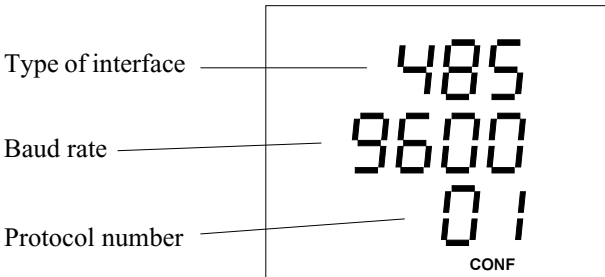
If the ratio of the voltage transformer is set, press *key 1* as often, as no cipher is flashing any longer. **EDIT** disappears. With *key 3* you move to the next menu. The ratio of the voltage transformer will be saved.

Universal Measuring Device UMG 503

RS485 interface (Option)

The RS485 interface is suited for transmission of data over a distance of 1200 m. Up to 31 UMG503 and a master (PC or SPS) can be connected.

As PCs usually only have a RS232 interface, a suitable interface converter must be connected between UMG 503 and PC. The distance between interface converter and PC may be 4 m at maximum. The distance between UMG 503 and interface converter may be 1200 m at maximum.



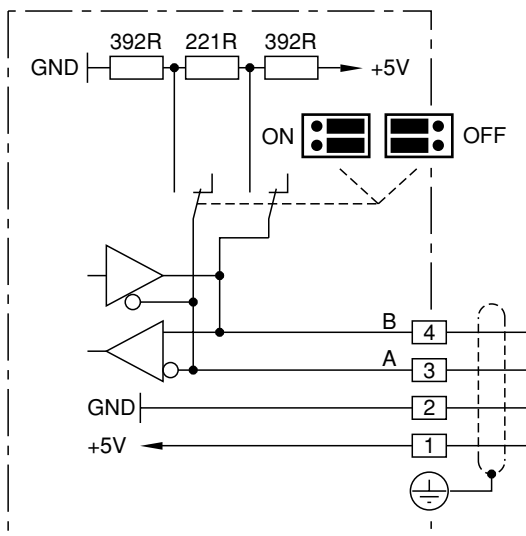
Transmission protocol RS485

The following protocols can be selected:

- off no protocol, interface disconnected
- 1 Standard Protocol
- 2 Modbus Protocol
- 3 UMG 500A Emulation
- 4 Service Protocol
- 5 PROFIBUS DP (Slave), (Option)
- 6 Modbus RTU (Master)*¹⁾

Terminal resistance

If the device is connected to the end of a bus cable, the bus cable must be terminated by terminal resistances. The required terminal resistances are integrated within the device and are activated in condition ON.



Diagr. Connection diagram RS485

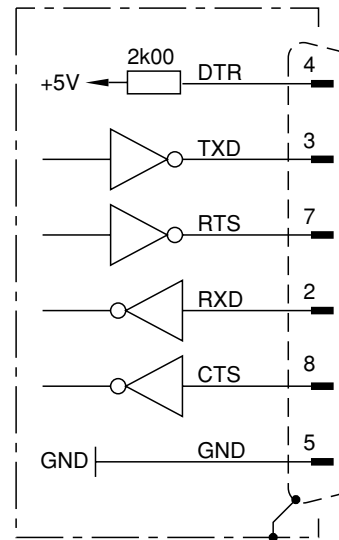
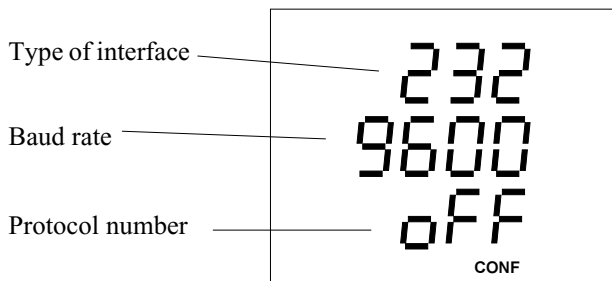
RS232 interface (Option)

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 Standard protocol
- 2 Modbus RTU protocol
- 3 UMG 500A Emulation
- 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.

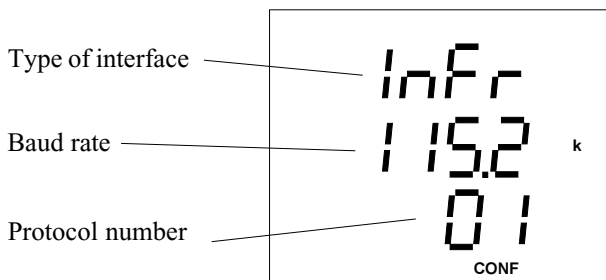
*¹⁾ The protocol 6 can run on one interface RS232 or RS485 only.

Universal Measuring Device UMG 503

Infrared interface (Option)

The UMG503 receives infrared signals within a distance of 1 m and an angle of $\pm 15^\circ$.

The infrared interface is using the Modbus protocol.



Attention!

Via infrared interface the ring buffer can be read out only. The programming of measured value indications is not possible.

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.

Attention!

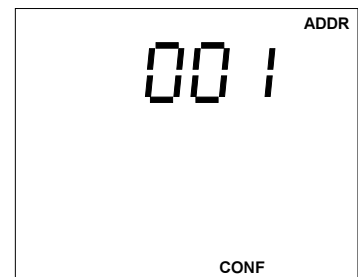
With **PROFIBUS DP** protocol device addresses from 0 to 126 are managed.

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

Select

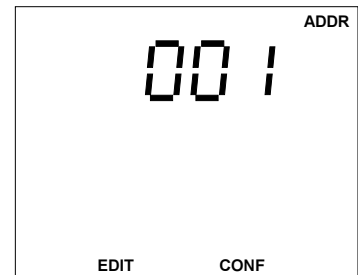
In menu **CONF** you move to indication of device address using *key* 3.

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



Change

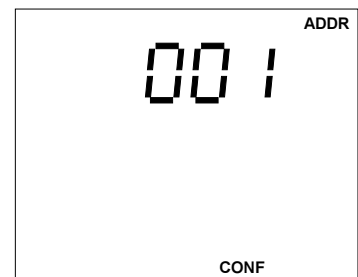
With *key* 1 a cipher of the device address can be selected and be changed using *key* 3. The selected number is flashing.



Save

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

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



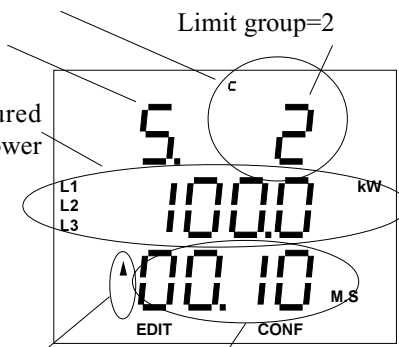
Universal Measuring Device UMG 503

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.

Limit number = 2C
Limit symbol

Supervised measured value = Sum real power limit = 100kW



Violation at exceeding

Minimum connection time = 10seconds

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

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

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

Relay outputs	Limits							
	inter.	external	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

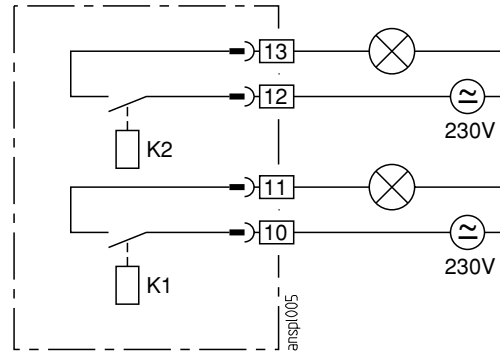
Attention!

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!

Touchable voltages and voltages danger to touch must not be used on the relay contacts at the same time.

Attention!

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.

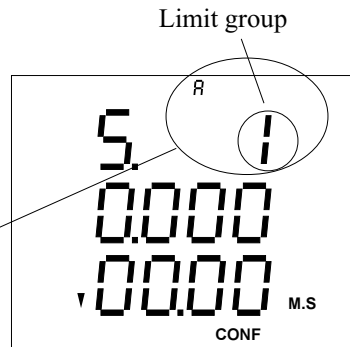
Universal Measuring Device UMG 503

Assign limits

In menu **CONF** you leaf to the indication of the desired **limit group** using *key 3*.

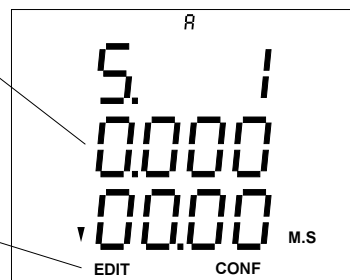
The limit number here is indicated as **1A**.

Now change over between the limit numbers **1A, 1B and 1C** using *key 2*.



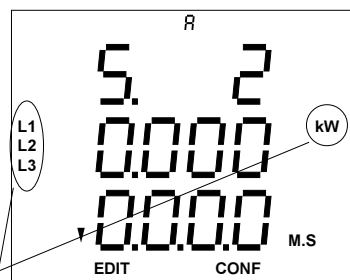
Assign measured value: Pressing *key 1*, the middle indication is flashing, and a **measured value** can be selected.

The text **EDIT** appears.



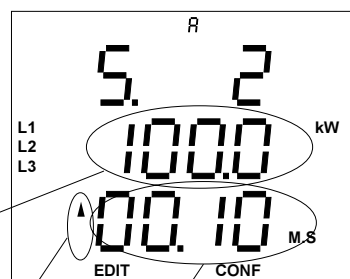
Pressing *key 2* and then *key 3* you leaf through the measured value indications.

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 cipher 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 ciphers 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 cipher is flashing any longer. **EDIT** disappears.

With *key 3* you reach the next menu point. The **limit** is now saved.

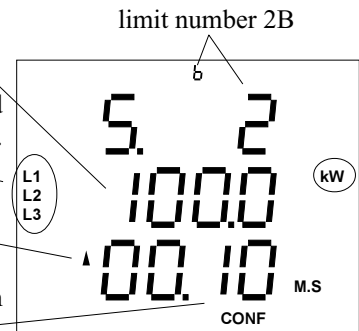
Example: Sum real power

Limit=100kW

Assigned measured value= Sum real power.

Switched 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.

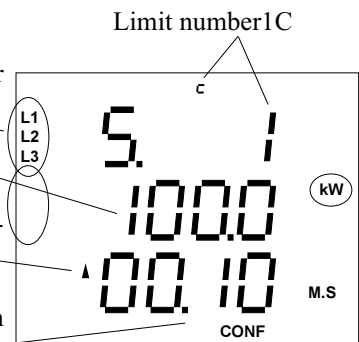
Example: Real power EMAX

Measured value= Sum "real power EMAX"

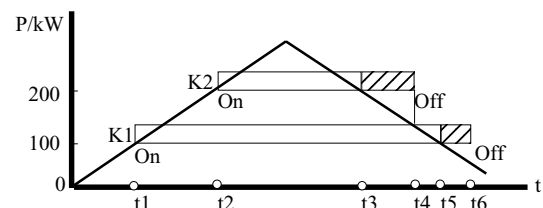
Limit =100kW

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.

Universal Measuring Device UMG 503

Three wire measurement (Option)

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.

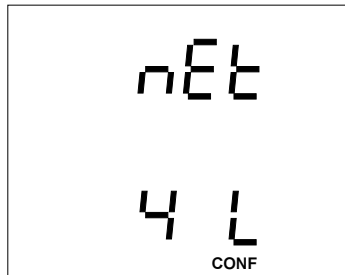
The option "three wire measurement" is needed for the connection examples 5 and 6.

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

Select

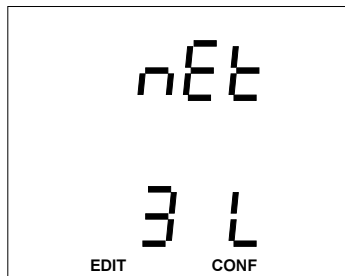
In menu CONF you move to the indication of three or four wire measurement using key 3.

In this example the four wire measurement "4L" is activated.



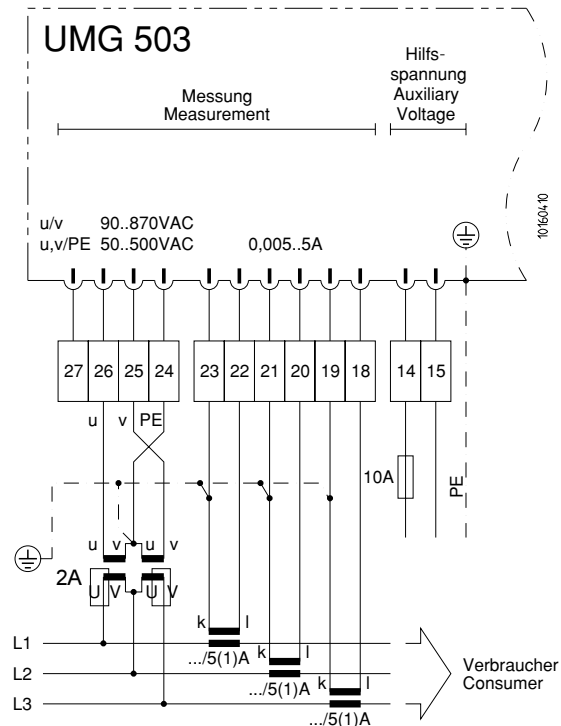
Change

With key 1 can be switched between four wire (4L) 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.

Universal Measuring Device UMG 503

Scanning frequency

The scanning frequency within the UMG 503 is calculated from the frequency of the voltage fundamental. 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.

Distortion of the current does not affect the determination of the frequency.

The determination of the scanning frequency can either be done automatically or programmed. For voltages, which are very distorted, the frequency of the fundamental should be programmed.

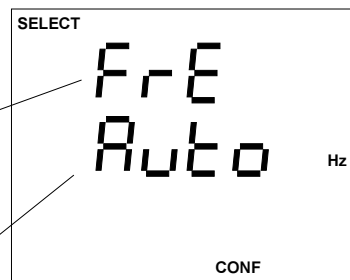
The following settings for the determination of the frequency are at your disposal:

- "Auto" Automatical frequency
- "50"Hz Fix frequency
- "60"Hz Fix frequency

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

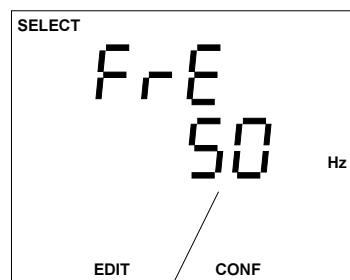
Select

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.

Universal Measuring Device UMG 503

Analogue output (option)

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

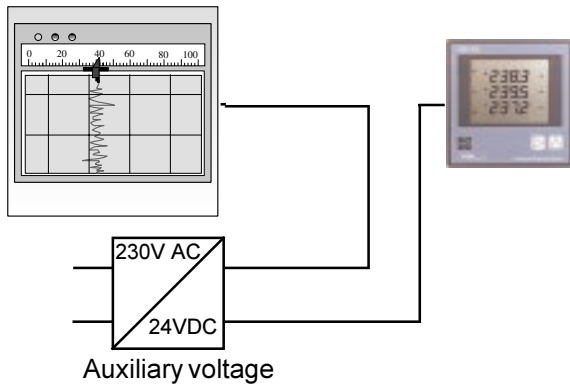
Only the **internal** analogue output in the UMG 503 can be switched between

- 0-20mA and
- 4-20mA

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

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

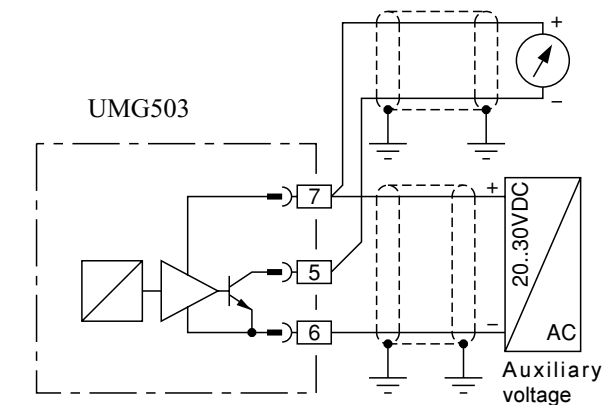
are available.



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

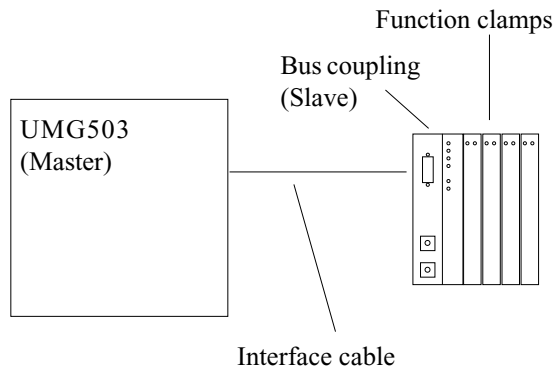
Attention!

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

Universal Measuring Device UMG 503

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:

Item code 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.

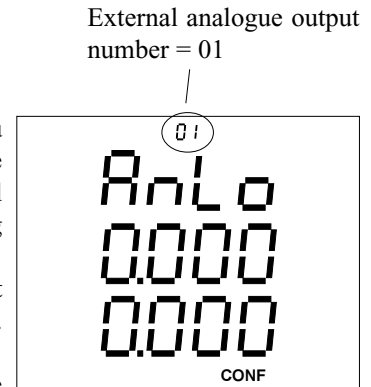
In the UMG 503 the protocol "06" (Modbus RTU Master) must be set.

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.

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.



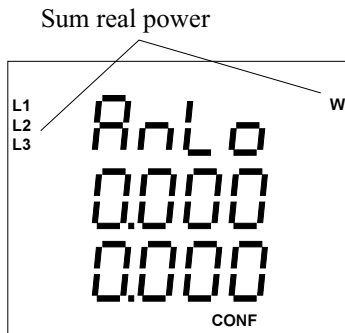
Please leaf to the analogue outputs 02 up to 06 using *key 2*.

Universal Measuring Device UMG 503

Assign measured value

All measured values, which are configured for the measured value indication, except real and reactive work, 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.

Text "AnLo" flashes.
Now a measured value table can be selected with *key 3*.
Select a measured value from the measured value table with *key 1* and confirm with *key 2*. The text "AnLo" does not flash anymore and the selected value is indicated.

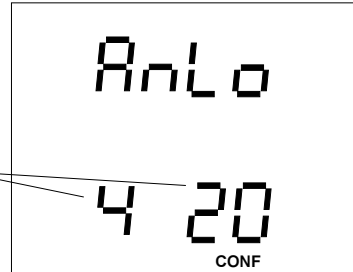


Set output range

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 be programmed to 0 .. 20mA or 4 .. 20mA. In delivery condition, the analogue output is preset to 4 .. 20mA.

The text "AnLo" is flashing. Pressing *key 2*, the output range is indicated in "mA".



Output range (4..20mA / 0..20mA)

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

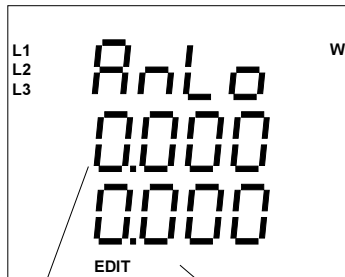


Pressing *key 3* you select the output range from 0 to 20mA.

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

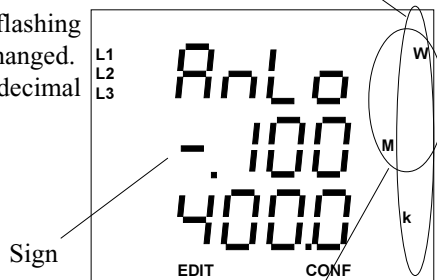
The text "AnLo" flashes.
Press *key 1*.
The text **EDIT** appears and the first cipher of the scale starting value is flashing.
By further pressing of the *key 1*, each cipher of the scale starting value or the scale end value can be selected.



Scale starting value Scale end value

Scale end value = 400kW

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



Scale starting value = - 0.100MW = - 100kW

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

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

Universal Measuring Device UMG 503

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.

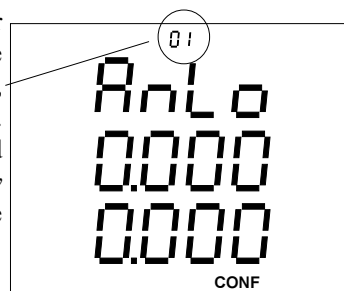
If you are in the menu **CONF**, you leaf to the indication of the internal analogue output using *key 3*.

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:

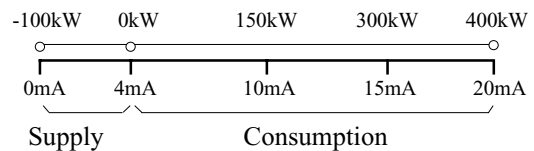
- Output range = 0 .. 20mA
- Measured value = Sum real power
- Scale start value = -100kW (Delivery to energy supplier)
- Scale end value = 400kW (Consumption)

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.

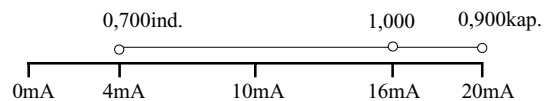
If real power is supplied, a current smaller but 4mA is flowing.



Example: cos(phi)

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

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

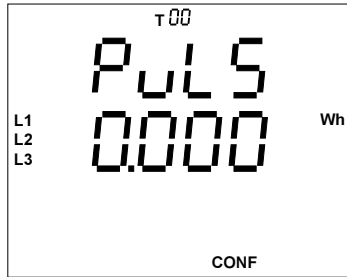


Universal Measuring Device UMG 503

Pulse output (Option)

Corresponding to the mechanical energy meters, the UMG 503 has a pulse output as well. At the pulse output, the work of real and reactive energy meters can be given out. The minimum pulse duration is 50 ms and the maximum frequency is 10Hz.

Display example for the pulse output:

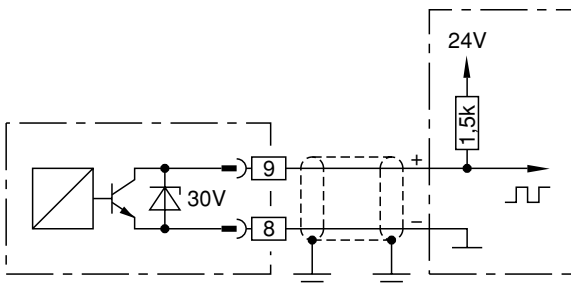


Attention!

When the pulse output is assigned to **real work meter without reverse running stop**, pulses are given out for consumption and supply.

If the pulse output is assigned to the **reactive work 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 work

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

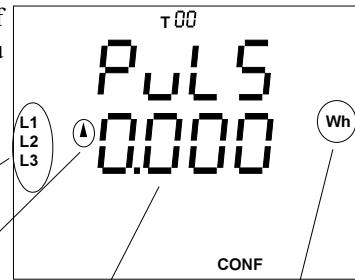
Reactive work

Without reverse running stop

inductive (ind) T00, T01, T02, T03, T04

capacitive (cap) T00, T01, T02, T03, T04

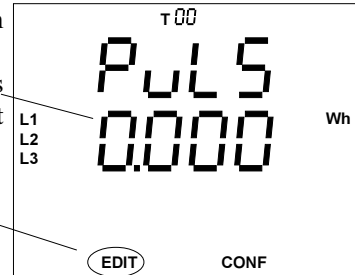
Leaf to the indication of the pulse output in menu CONF with key 3.



Sum Consumption Pulse valency Real work
Iw=0,000Wh/Pulse

Confirm the selection using key 1.

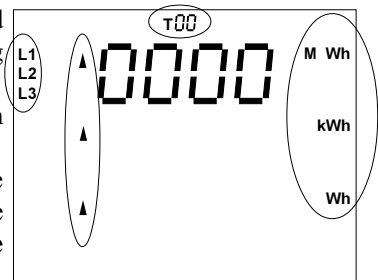
The middle indication is flashing and the text EDIT appears.



Switch to the measured value selection pressing key 2.

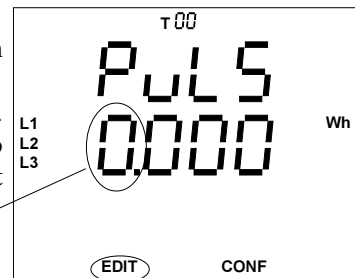
The picture in the margin appears.

With key 2 and key 3 the desired work 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 cipher 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.

Universal Measuring Device UMG 503

Set pulse valency

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

$$I_w = \text{work/pulse}$$

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:

$$\text{meter constant} = 1/\text{pulse valency}$$

$$\text{pulse valency} = 1/\text{meter constant}$$

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:

$$A = P * t \quad (t = 1 \text{ Stunde})$$

$$A = 400 \text{ kW} * 1 \text{ h}$$

$$\underline{A = 400 \text{ kWh}}$$
 can be consumed.

This means a pulse valency Iw of

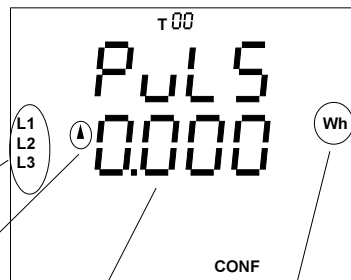
$$I_w = A/\text{pulse}$$

$$I_w = 400 \text{ kWh/pulse}$$

$$\underline{I_w = 400 \text{ kW}}$$

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

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



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

Example: Maximum power

A pulse collecting device can only manage a pulse valency of 9999Wh/pulse.

What power can be transmitted at maximum?

$$I_w = A/\text{pulse}$$

The work A can be calculated with:

$$A = I_w * \text{pulse}$$

$$A = 9999 \text{ Wh/pulss} * \text{pulse}$$

$$\underline{A = 9999 \text{ Wh}}$$

This means a pulse valency Iw of

$$I_w = A/\text{pulse}$$

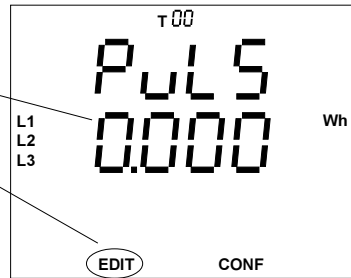
$$\underline{I_w = 9999 \text{ Wh/pulse}}$$

which must be set at the UMG 503.

Confirm selection with key 1.

The middle indication flashes and the text EDIT appears.

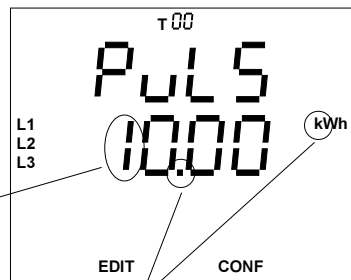
Press key 1 again, and the first cipher flashes.



Using key 1, you switch to the next cipher.

With key 3 the cipher 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.

Universal Measuring Device 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 **PSW503**.

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.

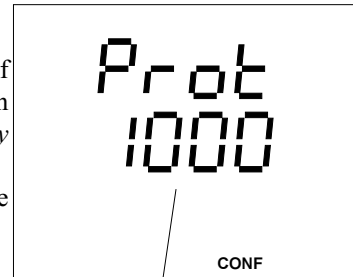
The number of events, that should be saved, can be displayed and changed in the menu **CONF**.

Anzeigen

Display

Leaf to the indication of the event memory in menu **CONF** using *key 3*.

In the example, the number is set to 1000.



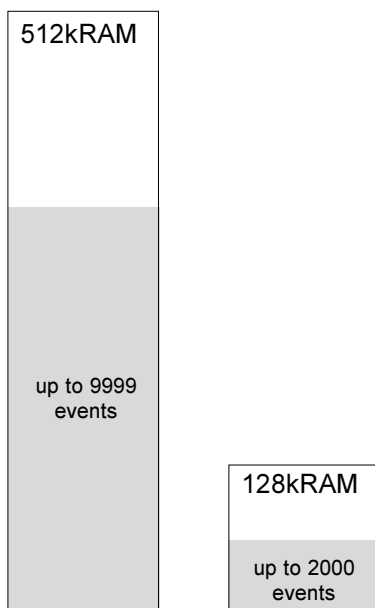
Anzahl der Ereignisse = 1000

Change

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



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



Universal Measuring Device **UMG 503**

Universal Measuring Device UMG 503

Internal auxiliary input (Option)

The functions

- Reset real power EMAX,
- Tariff change over and
- Synchronizing the internal clock

Can be controlled by the internal auxiliary input (option) and external digital inputs of the **WAGO I/O System**.

Changes of condition of each auxiliary input are saved in the event memors with date and time. The storage of the changes of condition cannot be given up!

The assignment of the functions to the inputs is laid out by the ciphers 1 to 6. If the internal auxiliary input (option) and the external digital inputs are not used, "oFF" appears in the indication. The producer's presetting is "oFF".

The following assignment is possible:

Function	oFF	Auxiliary inputs					
		internal				extern.	
		1	2	3	4	5	6
Reset real power EMAX	-	-	-	i	i	e1	e1
Tariff change over	z	i	z	z	z	e2	e2
Synchron. of the int. clock	-	-	i	-	i	i	e3

- = Locked
- z = Via internal time program
- i = Internal auxiliary input
- e1 = external "digital input 1"
- e2 = external "digital input 2"
- e3 = external "digital input 3"

The assignment 5 and 6 cannot be programmed not before the assignment of a serial interface of the UMG 503 to **protocol "06"** (Modbus RTU Master) .

Reset of real power EMAX

If an external reset occurs within the 15 minutes period, the EMAX real power is deleted and a new period is started. If no external reset occurs within the programmed measuring period, the reset is done by the internal clock. If there are less than 30 seconds between two resets, the measurement period is reset and the EMAX real power is deleted. The former measured value is not used for highest nor lowest value storage and not saved in the ring buffer although programmed.

Tariff change over

The tariff change over can be carried out externally via the auxiliary input or internally via programmed switching times. If the tariff change over is carried out via the auxiliary input, the change over is carried out by the tariff meters Tx1 and Tx2.

If there is no voltage at the auxiliary input, tariff meter **Tx1** is active. If there is voltage at the auxiliary input, tariff meter **Tx2** is active.

Synchronization of the internal clock

Inaccuracies of the internal clock can be corrected via the keys on UMG 503 or via the auxiliary input.

If a voltage is connected to the auxiliary input, the clock within the UMG 503 will be set to the next full hour.

Universal Measuring Device UMG 503

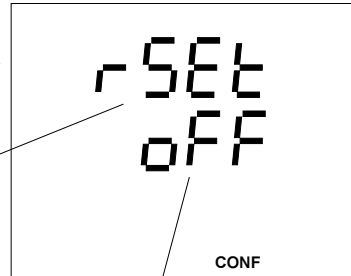
Programming

The external digital inputs can only be indicated and programmed, if the protocol "06" (Modbus RTU Master) is set at the UMG503.

Select

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

Symbol text for the auxiliary input



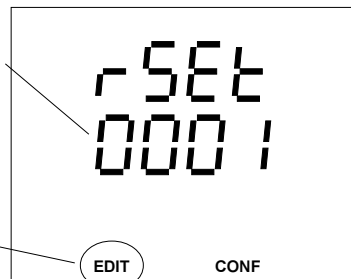
Set function= oFF

Change

Confirm with *key 1*.

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

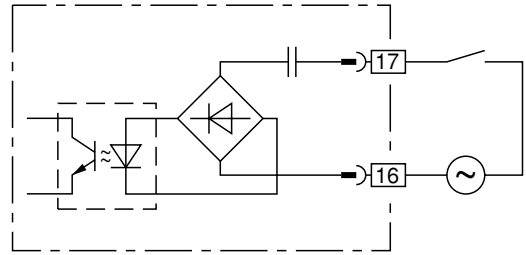
The text **EDIT** appears.



If the function for the auxiliary input is set, press *key 1* as often as no cipher is flashing any longer. **EDIT** disappears.

With *key 3* you move to the next menu point. The function is stored.

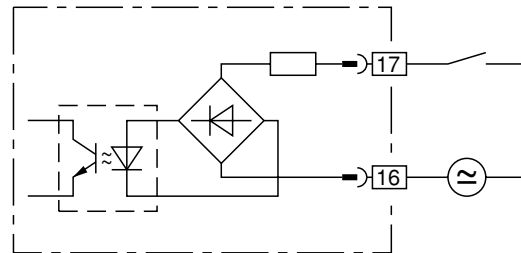
For devices with the auxiliary voltage of "85 .. 265VAC, 120 .. 370VDC" the auxiliary input is activated with an **alternating voltage** of 85 .. 265VAC .



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.

Universal Measuring Device UMG 503

Tariff change over

For tariff change over the following work meters can be used:

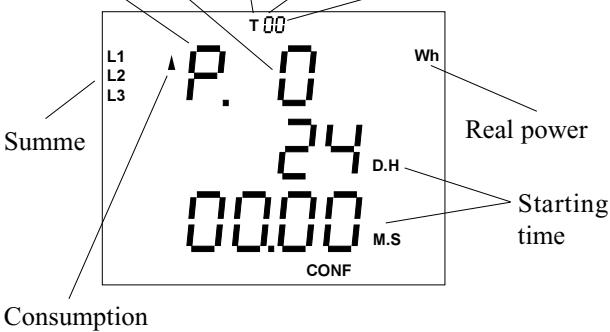
- T0x Real work, consumption ▲,
- T1x Reactive work, inductive,
- T2x Reactive work, capacitive.
- 0x Real power EMAX.

For each work meter Txx four additional work meters Tx1 to Tx4 can be programmed. Tariff change over can be controlled via the external auxiliary input or an internal time program.

	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
Real work EMAX .	00	01	02	03	04

The first two work meters of the four programmable work meters (Tx1 and Tx2) can be changed over by the auxiliary input. The work meters Tx0 are not programmable.

Time of change over Symbol Number Work meter Symbol Work type Number of time program



External tariff change over (option)

The first two work meters can be changed over via the auxiliary input.

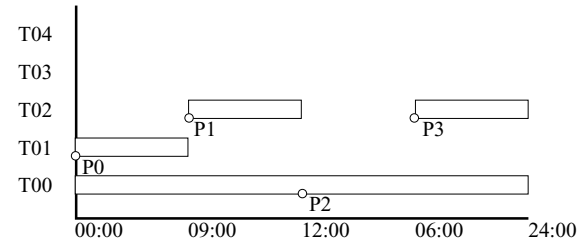
When the contact is open, work meter Tx2 is active. When there is voltage on the auxiliary input, work meter Tx1 is active.

When the auxiliary input is programmed for tariff change over, only the work meters Tx3 and Tx4 can be controlled via the time program.

Internal tariff change over

The internal tariff change over is carried out via time programs. When the auxiliary input is programmed for tariff change over, only the work meters Tx3 und Tx4 can be controlled via time program.

Example: Real work consumption



For each three selectable work up to 10 change over times can be programmed. In the change over time the starting time is determined for the corresponding work meter in hours and minutes.

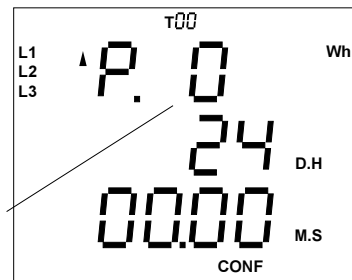
If the change over time does not follow the other, the next change over time is given to the not programmed tariff zone Tx0.

In the example it is change over time "P2".

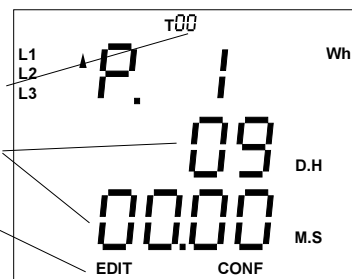
Programming

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 change over time.



Pressing key 1, you can select the ciphers of the number of the time program or change over time to be changed. The text EDIT appears.



The selected ciphers can be changed using the keys 2 and 3 (See chapter Edit).

If the change over times are set, press key 1 as often as no cipher is flashing any longer. EDIT disappears.

With key 3 you move to the next menu point. The change over time is stored.

Universal Measuring Device UMG 503

Clock

Date and time are set to the Middle European summer time. There is no automatical change over from summer to winter time.

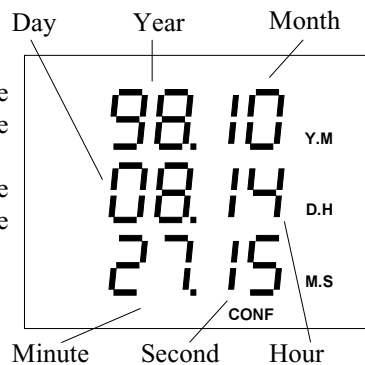
Date and time are needed as time information for highest and lowest value and storage of measured values in the ring buffer.

Date and time 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.



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.

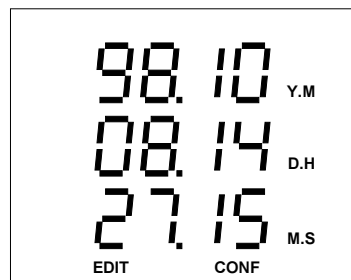


Change

With *key 1* a cipher can be selected and changed with *key 3*.

The selected cipher is flashing.

The text "**EDIT**" appears. Date and time stop.



Serial number

Each device has its own 8 digit serial number, which cannot be changed by user.

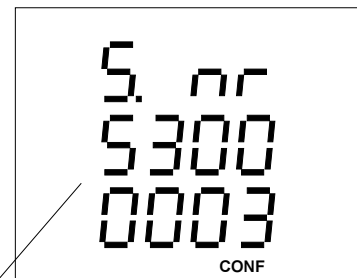
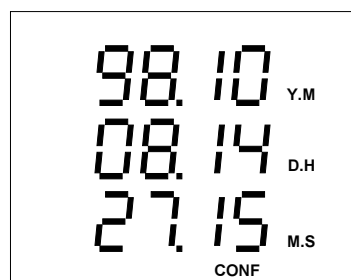
For certain device variants the user can release functions (options) later on. In that case the serial number is needed in the manufacturing works.

For each device passwords are deposited in the manufacturing company for releasing certain functions (options).

Save

When you have set the actual date and time, please press *key 1* as often as no cipher is flashing any longer.

Pressing *key 2*, the text **EDIT** disappears and date and time run with their new settings.



Example:

Serial number = 5300 0003

Comment:

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

Universal Measuring Device UMG 503

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

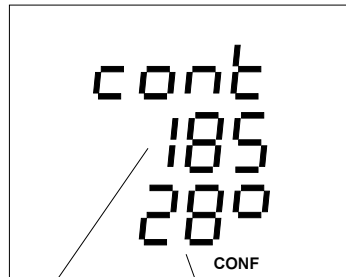
170 = very dark

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.



Contrast setting

Inner temperature

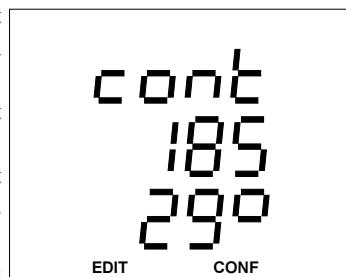
Change

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.



Universal Measuring Device UMG 503

Password

Certain functions are protected by a user's 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 ciphers. This password is deposited in the manufacturing works.

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

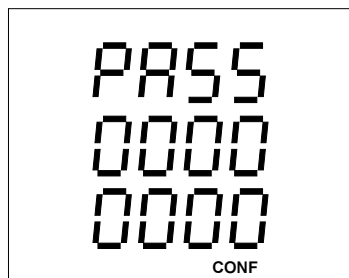
- Relay outputs
- Impuls output
- Analogue output
- RS232 interface
- Auxiliary input
- Infra red interface
- Three wire measurement
- PROFIBUS DP (Slave)

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.



Input

With *key 1* you select the cipher to be changed. The text **EDIT** appears within the indication. With *key 3* you change the selected cipher.



Save

When the password is put in, please confirm *key 1* as often as no cipher 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. 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:

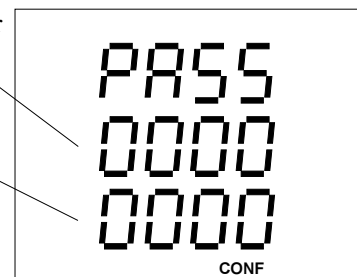
Function	Description
1	Lock programming and configuration
2	Admit programming and configuration.
3	Input user password
4	Delete user password.

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 cipher to be changed using *key 1*. The text **EDIT** is flashing in the indication. The selected cipher is flashing. Change the selected cipher using *key 3*.



Save

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

If the password was accepted, the password is deleted and 0000 0000 appears in the indication.

Universal Measuring Device UMG 503

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.

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

Universal Measuring Device UMG 503

Transmission protocols

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

- Standard protocol (Janitza electronic)
- 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 UMG 500A Emulation
- 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 UMG 500A Emulation
- 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.

UMG500A Emulation

If devices of the types UMG500A and UMG503 are driven together with the PC software AWS485, the protocol "UMG500A Emulation" must be selected at the UMG 503. The UMG 503 is indicated as an UMG 500A within the software AWS485.

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.

Modbus RTU

With Modbus RTU protocol all addresses of the tables (1-5) can be retrieved.

- Table 1 - Time information
- Table 2 - Measured values (floating point format)
- Table 3 - Scale of the measuring values of table 4
- Table 4 - Measured values (Integer format)
- Table 5 - Control of in- and outputs

Transmission mode

RTU- Mode with CRC-Check.

Transmission parameters

Baud rate	: 9600,19200 und 38400
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
word	: 2 Byte
long	: 4 Byte

The sequence of the bytes is high before low byte.

*¹⁾ Das Protokoll 6 kann nur auf einer der Schnittstellen, RS232 oder RS485, laufen.

Universal Measuring Device UMG 503

PROFIBUS DP (Option)

The UMG 503 corresponds to the field bus norm PROFIBUS DP, DIN E 19245 part 3. The device is listed by the PROFIBUS user organisation e.V. with the following entries:

Device description : UMG 503
Ident-Number : 044C HEX
GSD : U503044C.GSD

For transmission of measured values with the PROFIBUS DP protocol integer formats are used by the UMG 503 such as char, int and word.

GSD file

The GSD file is a file specific for the device, in which the transmission parameters and the kind of measuring data between PROFIBUS Master and the PROFIBUS Slave are laid. The PROFIBUS Slave here is the UMG 503 and the PROFIBUS Master is a PLC, for instance.

The UMG 503 provides the measured values agreed in the GSD-file from table 6, and the PLC retrieves the data cyclically. Depending on the format of the values to be transmitted, at minimum 7 measured values and **at maximum 21 measured values** can be transmitted.

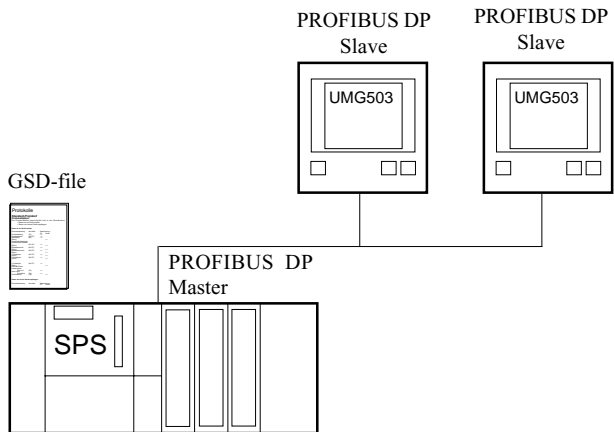
If more measured values are required, a GSD file must be created, that determines a 32 word large output range and a 28 words large input range. In the output range, the PLC can deposit the desired measured value addresses and retrieve the corresponding measured values within the input range. If the addresses in the output range are not changed further, the UMG 503 delivers new measured values continuously to the input range of PLC.

This method of retrieving measuring data is depicted as "higher protocol" in the following description.

Create a GSD file

The program PSW 503 belongs to the contents of delivery for the device and includes the module "PROFIBUS configuration". Measured values and in- and outputs can be selected for transmission to PLC with that module.

As a result of the configuration, a GSD file for the PLC is created and programming data for the UMG 503 as well.



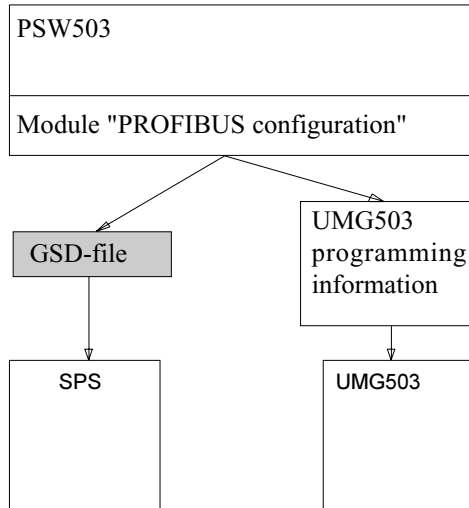
Diagr. Two UMG 503 and one PLC at PROFIBUS DP

Universal Measuring Device **UMG 503**

To bind in a GSD file

The binding of the GSD file in a program is carried out by the customer. It is very different from application to application.

Instructions for binding in a UMG 503 in a Siemens SPS S7 (CPU 315-2DP) can be downloaded from the internet page "<http://www.janitza.de>".



Diagr. Create GSD file

Universal Measuring Device UMG 503

Higher protocol

Independent on the format of the measured values to be transmitted, up to 21 measured values can be transmitted from UMG 503 to PLC by PROFIBUS DP protocol.

To call up more measured values from UMG 503, a "higher protocol" must be used. With the software PSW503, which belongs to the contents of delivery, a GSD-file is created. In this GSD-file a 32 words large output range and a 28 words large input range is determined. In the output range, the PLC can save the desired measured value addresses in the control words 4 to 32 and in the input range, the corresponding measured values can be retrieved in the control words 2 to 28. A control word consists of 2 Byte.

For controlling purpose, a number is sent by each request for new measured values. The requested measured values are written to the input range, when the PLC replies the request number. Please note, that the request number must be written to the measured value addresses into the output range before, as thereby it is ensured, that the read measured values correspond to the new measured value addresses.

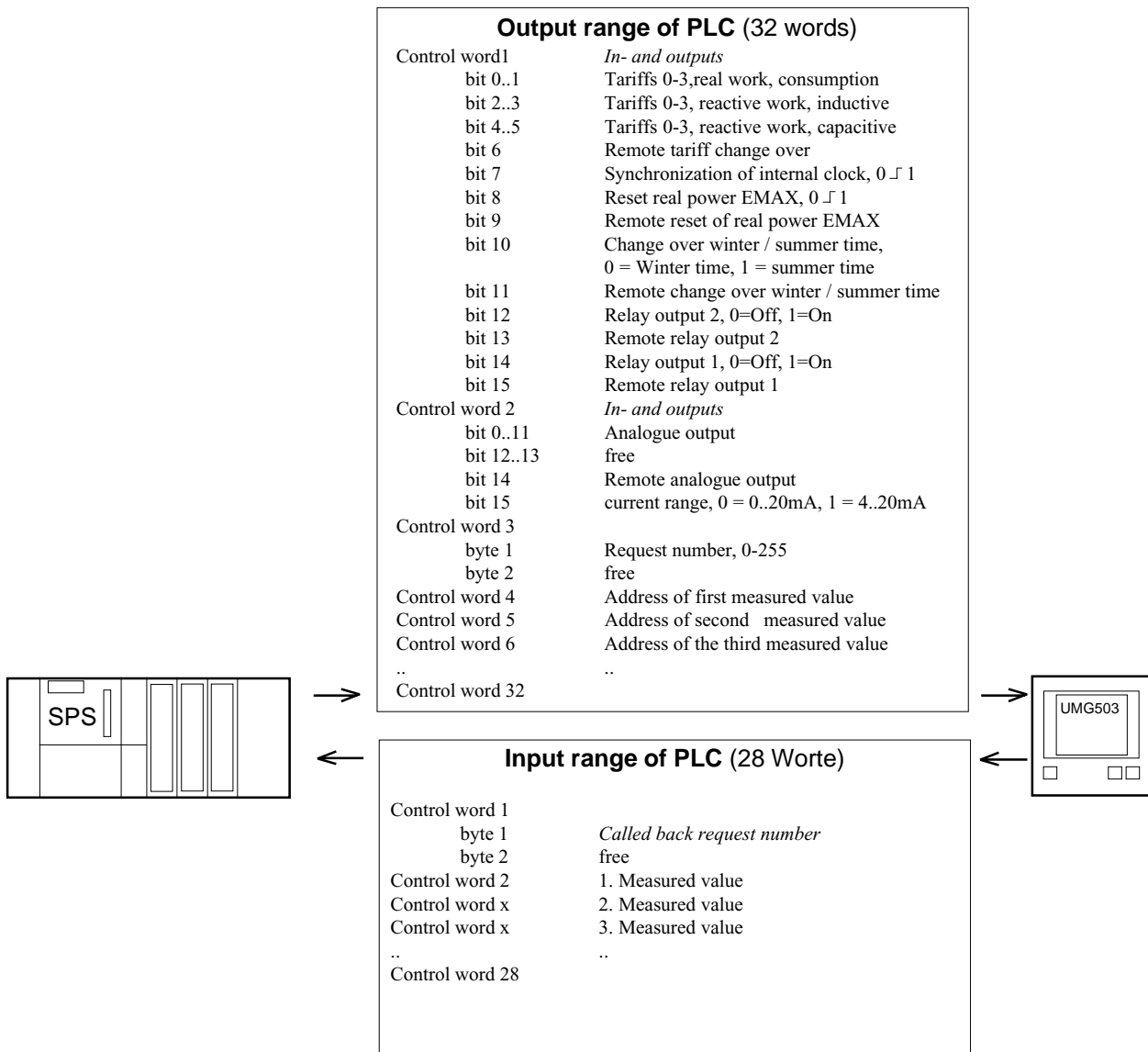
All measured values of:

Table 1 - Addresses 3xxx (time information),

Table 2 - measured value in floating point format and

Table 4 - measured values in integer format

can be called up with the higher protocol. The measured values from table 4 are scaled by the addresses in table 3. The output and input range can be read out and overwritten by the control words 1 and 2 from PLC. With the "Remote bits" an output is selected for controlling by the PLC. The scaling of the measured values depends on the ratios for current and voltage transformer set at UMG 503 and must be read by changing the ratios only.



Diagr. Data transmission with higher protocol

Universal Measuring Device UMG 503

Configuration of the UMG 503

The following requirements are necessary for operation of the UMG 503 at Profibus:

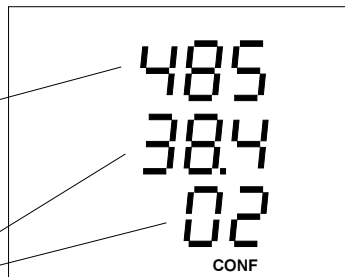
- A RS485 interface,
 - The device address,
 - The protocol "05" = PROFIBUS DP,
 - The number of words for "Words input",
 - The number of words for "Words output" and
 - The number of words for "Byte Usr_Prm" have to be set.
- The baud rate is destined automatically between master (PLC) and slave (UMG 503). The setting of the device address is described in chapter "device address".

Creating the GSD-file, the following programming information for the UMG 503 was generated:

- Number of words for "Words input",
- Number of words for "Words output" and
- Number of words for "Byte Usr_Prm" and now they can be programmed at the UMG 503.

Leaf to the indication of the **RS485 interface** in menu **CONF** using *key 3*.

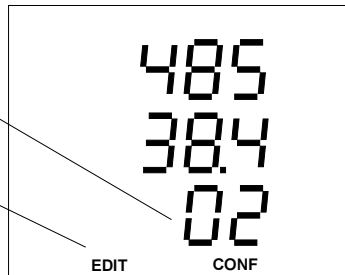
Producer's presetting:
Baudrate = 38,4kbps
Protocol = 02



Protocol

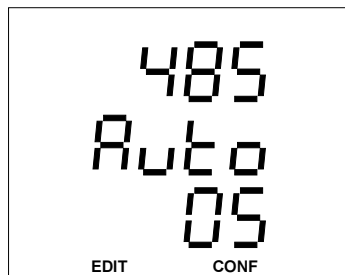
Confirm twice with *key 1*, and the lower indication is flashing. The text **EDIT** appears.

Now the protocol can be changed.

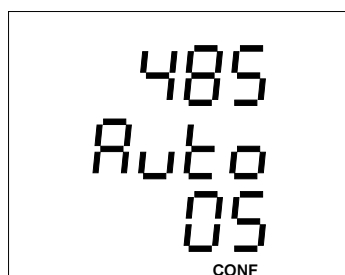


Select protocol "05" pressing *key 3*.

The baudrate "Auto" is indicated automatically and cannot be changed.



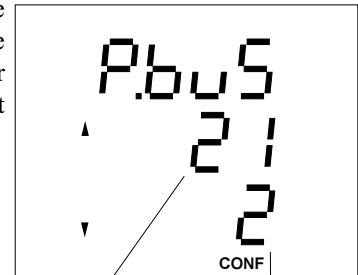
Confirm *key 1* again and the text **EDIT** disappears.



If you are in the menu in the indication "P.buS", the settings for "Words input" and "Words output" can be changed.

Words input and Words output

With *key 2* you reach the first page of the indication "**P.buS**" for the input and output buffer.

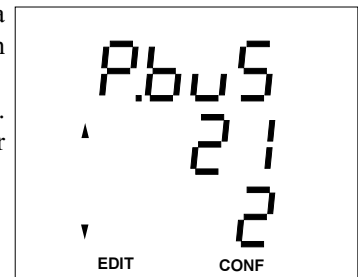


"Words input" = 21Byte (Example)
"Words output" = 2Byte (Example)

Change

With *key 1* you select a cipher and change it with *key 3*.

The text **EDIT** appears. The selected cipher flashes



If you have changed the selected cipher, press *key 1* as often as no cipher is flashing any longer.

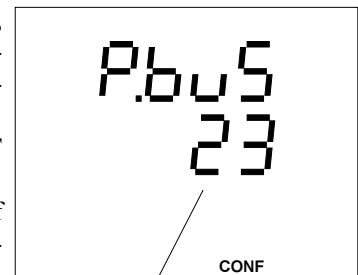
With *key 3* you change to the second page of "**P.buS**" indication with the number of words for "Byte Usr_Prm".

Byte Usr_Prm

Confirming *key 2* again, and you reach the second page of the indication "**P.buS**".

The text **EDIT** disappears.

On this page the size of the User-Parameter-buffer is indicated.

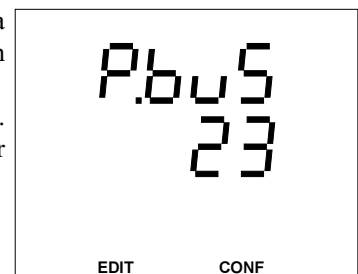


Byte Usr_Prm = 23Byte

Change

With *key 1* you select a cipher and change it with *key 3*.

The text **EDIT** appears. The selected cipher flashes.



If you have changed the selected cipher, press *key 1* as often as no cipher is flashing any longer. Change to the next menu using *key 3*.

Universal Measuring Device UMG 503

Example: Measured values in integer format

The UMG 503 and PLC are suited for the "higher protocol". A current transformer of 500A/5A and a voltage transformer of 400V/400V has been set. The currents L1, L2, L3 and sum of real power must be transmitted in integer format.

Read scale

The scale of the measured values depends on the set transformer ratios only and must only be read after a change of those transformer ratios.

The scales of the measured values are described in table 3.

Scale	Address
Current	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 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

In the PLC the output range with the control words (4-7) for the measured value addresses must be overwritten and afterwards control word (3) for request number.

Control word 1 = 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	

Universal Measuring Device UMG 503

Example: Measured values in floating 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 work 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 and must only be read after changing those ratios.

The scale for voltage measured values can be found in table 3.

Skcale	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 work consump.	2000	60444 (Wh)
Reactive work induct.	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 power, consumption)

Control word 8..10 = free

Control word 11 = Measured value address "2020"
(Reactive power 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 power consumption	604,44(Wh)
9..12	Reactive power inductive	235,01(varh)
13..28	not defined	

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

Universal Measuring Device UMG 503

Table 1, Time information

Description	Address	Type	Comment
System time	3000	struct	
Current	3001	struct[2][3]	
Voltage N-L	3007	struct[2][3]	
Voltage L-L	3013	struct[2][3]	
Real power	3019	struct[2][3]	
Apparent power	3025	struct[2][3]	
Reactive power	3031	struct[2][3]	
cos(phi)	3037	struct[2][3]	
Frequency	3043	struct[2][3]	
Current, Sum	3336	struct[2]	
Real power, Sum	3049	struct[2]	
Apparent power, Sum	3051	struct[2]	
Reactive power, Sum	3053	struct[2]	
cos(phi), Sum	3055	struct[2]	
Total harmonic dist. factor _U			
Peak value	3057	struct[3]	
Lowest value	3330	struct[3]	
Total harmonic dist. factor _I			
Peak value	3060	struct[3]	
Lowest value	3333	struct[3]	
Partial harmonic _U			
Peak value	3063	struct[20][3]	
Lowest value	3210	struct[20][3]	
Partial harmonic _I			
Peak value	3123	struct[20][3]	
Lowest value	3270	struct[20][3]	
Real work, Starting time			
Without reverse run. stop	3195	struct	
Consumption	3190	struct	
Supply	3193	struct	
Reactive work, Starting time			
Without reverse run. stop	3194	struct	
capacitive	3192	struct	
induktive	3191	struct	
Current	4000	struct[3]	Averaging time
Voltage N-L	4003	struct[3]	Averaging time
Voltage L-L	4006	struct[3]	Averaging time, 1=L1-L2, 2=L2-L3, 3=L1-L3
Real power	4009	struct[3]	Averaging time
Apparent power	4012	struct[3]	Averaging time
Reactive power	4015	struct[3]	Averaging time
cos(phi)	4018	struct[3]	Averaging time
Frequency	4021	struct[3]	Averaging time
Real power, Sum	4024	char	Averaging time
Real power EMAX	4156	char	Averaging time EMAX ¹⁾
Apparent power, Sum	4025	char	Averaging time
Reactive power, Sum	4026	char	Averaging time
cos(phi), Sum	4027	char	Averaging time
Current, Sum	4028	char	Averaging time
Total harm. dist. factor _U	4150	struct[3]	Averaging time
Total harm. dist. factor _I	4153	struct[3]	Averaging time
Partial harmonic distortion _U	4030	struct[20][3]	Averaging time
Partial harmonic distortion _I	4090	struct[20][3]	Averaging time Harmonic number 1-20

struct {char: Year, Month, Day, Hours, Minutes, Seconds} Year 0-99
 struct[3] {char: 0=5Sec, 1=10Sec, 2=15Sec., 3=30Sec., 4=1Min., 5=5Min., 6=10Min., 7=15Min., 8=30Min., 9=60Min.}

¹⁾Averaging time EMAX {char: 5=5Min, 6=10Min, 7=15Min, 8=30Min, 9=60Min.}

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Table 2, Measured values (floating point format)

Description	Address	Type	Unit	Comment
Current	1000	struct(Measured value)	A	
Current, N	1646	float	A	
Voltage N-L	1012	struct(Measured value)	V	
Voltage L-L	1024	struct(Measured value)	V	1=L1-L2, 2=L2-L3, 3=L1-L3
Real power	1036	struct(Measured value)	W	Sign -=Supply, +=Consumption
Apparent power	1048	struct(Measured value)	VA	
Reactive power	1060	struct(Measured value)	var	Sign -=cap, +=ind
cos(phi)	1072	struct(Measured value)		Sign -=cap, +=ind
Frequency	1084	struct(Measured value)	Hz	
Real power, Sum	1096	struct(Sum)	W	Sign -=Supply, +=Consumption
Apparent power, Sum	1100	struct(Sum)	VA	
Reactive power, Sum	1104	struct(Sum)	var	Sign -=cap, +=ind
cos(phi), Sum	1108	struct(Sum)		Sign -=cap, +=ind
Total harm. dist. factor _U				
Measured value	1112	struct(THD)		%
Peak value	1115	struct(THD)		%
Lowest value	1640	struct(THD)		%
Mean value	1390	struct(THD)		%
Total harm. dist. factor _I				
Measured value	1118	struct(THD)		%
Peak value	1121	struct(THD)		%
Lowest value	1643	struct(THD)		%
Mean value	1393	struct(THD)		%
Partial harm. dist. _U				
Measured value	1184	struct[20](DFT)	V	
Peak value	1124	struct[20](DFT)	V	
Lowest value	1400	struct[20](DFT)	V	
Mean value	1520	struct[20](DFT)	V	
Partial harm. dist. _I				
Measured value	1304	struct[20](DFT)	A	
Peak value	1244	struct[20](DFT)	A	
Lowest value	1460	struct[20](DFT)	A	
Mean value	1580	struct[20](DFT)	A	
Real power EMAX	1365	struct(Sum)	W	Without mean value. Sign -=Supply, +=Consumption
Real work				
Without reverse run. stop	2050	double	Wh	
Consumption	2000	double	Wh	
Supply	2030	double	Wh	
Reactive work				
Without reverse run. stop	2040	double	varh	
capacitive	2020	double	varh	
inductive	2010	double	varh	

struct(Measured value) {float: Actual value[L1-L3], Mean value[L1-L3], Lowest value[L1-L3], Peak value[L1-L3]}
 struct(Sum) {float: Measured value, Mean value, Lowest value, peak value}
 struct(THD) {float: Value[L1-L3]}
 struct[20](DFT) {float: Value[L1-L3]} Harmonic number 1-20

Data formats

The data are in the following formats at your disposal:

char : 1 Byte
 word : 2 Byte
 long : 4 Byte
 float : 4 Byte (IEEE754)
 double : 8 Byte (IEEE754)

The sequence of the bytes is high before low byte.

Universal Measuring Device UMG 503

Table 3, Scale of the measured values

Within the UMG 503 almost all measured values are available in floating point format (Table 2). For the transmission of measured values the floating point values are recalculated in integer format by the UMG 503, such as char, int and word (Table 4).

To lose no digits after decimal point, the value, that should be transmitted, is scaled. The opening value from UMG 503 is calculated as follows:

$$\text{Measured value} = \text{Transmitted value} * \text{Factor}$$

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:

Value	Address	Format	Possible scale
Current	9100	word	-3 .. 6
Voltage	9101	word	-3 .. 6
Power	9102	word	-3 .. 6
cos(phi)	9103	word	-3
Frequency	9104	word	-2
THD	9105	word	-3

The scale of work is fixed by the scale of power

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

Example

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:

$$\begin{aligned} \text{Measured value} &= \text{Transmitted value} * \text{Factor} \\ \text{Measured value} &= 2301 * 1/10 \\ \text{Measured value} &= 230,1\text{V} \end{aligned}$$

The measured voltage is 230,1V.

Universal Measuring Device **UMG 503**

Table 4, Measured values (Integer format)

Description	Addresses of values				Format	Unit	Comment
	Meas.-	Mean-	Max-	Min-			
Current in L1, L2, L3	8000	8157	8314	8471	word	A	
Voltage N-L1,-L2,-L3	8003	8160	8317	8474	word	V	
Voltage L1-L2, L2-L3, L1-L3	8006	8163	8320	8477	word	V	Outer conductor voltage
Real power in L1, L2, L3	8009	8166	8323	8480	word	W	Sign. -=Supply., +=Cons.
Apparent power in L1, L2, L3	8012	8169	8326	8483	word	VA	
Reactive power in L1, L2, L3	8015	8172	8329	8486	word	var	Sign -=cap, +=ind
cos(phi) in L1, L2, L3	8018	8175	8332	8489	word		Sign -=cap, +=ind
Frequency in L1, L2, L3	8021	8178	8335	8492	word	Hz	
Real power, sum	8024	8181	8338	8495	word	W	Sign. -=Supply., +=Cons.
Apparent power, sum	8025	8182	8339	8496	word	VA	
Reactive power, sum	8026	8183	8340	8497	word	var	Sign -=cap, +=ind
cos(phi), sum	8027	8184	8341	8498	word		Sign -=cap, +=ind
Current, sum	8028	8185	8342	8499	word	A	Current in neutral cond.
Partial harmonic _U No. 1-20 in L1, L2, L3	8030	8187	8344	8501	word	V	
Partial harmonic _I No. 1-20 in L1, L2, L3	8090	8247	8404	8561	word	A	
Distortion factor _U in L1, L2, L3	8150	8307	8464	8621	word	%	
Distortion factor _I in L1, L2, L3	8153	8310	8467	8624	word	%	
Real power EMAX, sum	8156	8313	8470	8627	word	W	Sign. -=Supply, +=Cons.

Description	Address	Format	Unit	Comment
Real work,consumption ▲	9000	long	kWh	
Real work, supply ▼	9001	long	kWh	
Real work, without reverse running stop	9002	long	kWh	
Reactive work, capacitive	9003	long	kvarh	
Reactive work, inductive	9004	long	kvarh	
Reactive work, without reverse run. stop	9005	long	kvarh	

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Table 5, 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 time=0, Summer time=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 power consumption			
			r	Bit 2..3	Tariff reactive work Ind.			
			r	Bit 4..5	Tariff reactive work 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

Universal Measuring Device **UMG 503**

PSW503

The programming and reading out software PSW503 always belongs to the extent of delivery of the UMG 503. The software can be installed on PCs with the operating systems WIN95, WIN98 or NT4.0, and offers you the following possibilities:

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

For the **release** of the option "Configure the UMG 503", a release code must be entered in the info field of the programming and reading out software **PSW503**. The release code can be bought at the manufacturer.

Required hard and software

Software

A PC with Windows® 95/98/NT4 is required for running the Software PSW 503. Please note, that the used Windows version should be the latest issue. When this manual was printed, the following issues were actual:

- Windows® 95a (=Windows 95 with Service-Pack1) or
- Windows® 95b
- Windows® 98
- Windows® NT4.0 with Service-Pack3

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 100MHz or higher
- 16 MByte RAM(for Windos® NT 32MByte)
- About 5MB free memory on harddisk for the program **PSW503**
- Color monitor with a solution of 640x480 or 800x600 dots and 265 colours.
- 1MB PCI graphic board.
- The PSW503 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.

Attention!

The ring buffer can always be read out, but the configuration of the ring buffer is only possible with the option "Configuration of UMG 503".

Configuration of UMG 503 (Option)

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".

Universal Measuring Device UMG 503

Connection UMG 503 - PC

Different interfaces are at your disposal, depending on the version of the UMG 503. Each UMG 503 has got only one RS232 or RS485.

The connection between the UMG 503 and the PC can be carried out via

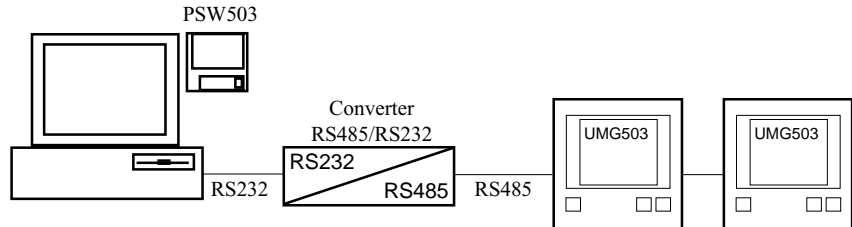
- RS232 or
- RS485 or
- Infrared interface

of the UMG 503.

UMG 503 with RS485 interface.

For the connection to PC an interface converter RS485 to RS232 is required.

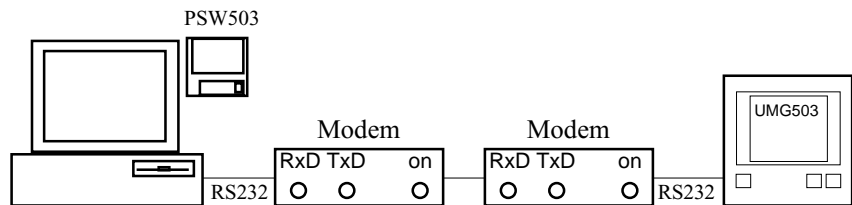
The maximum distance between PC and UMG 503 may be 1200m.



UMG 503 with RS232 interface.

Connection to PC via **modem**.

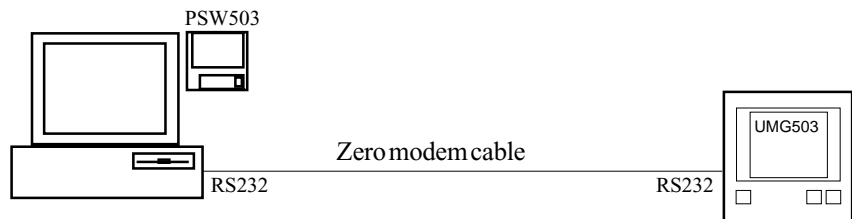
For transmission via **modem** the transmission protocol 5 must be selected at the UMG 503.



UMG 503 with RS232 interface.

Direct connection to PC via zero modem cable.

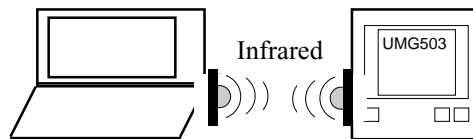
The maximum distance between PC and UMG 503 may be 10m.



UMG 503 with infrared interface.

The PC must have an infrared interface as well.

The maximum distance between PC and UMG 503 may be 1m.



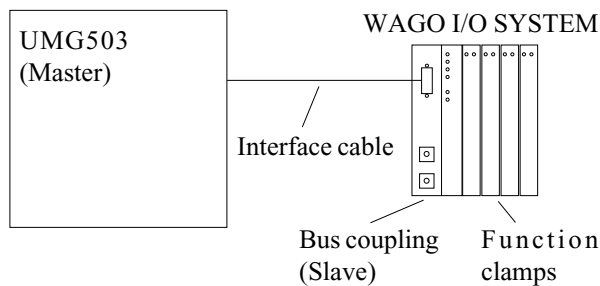
Attention!

Only the ring buffer can be read out via infrared interface. The programming of measured value indications is not possible.

Universal Measuring Device **UMG 503**

WAGO I/O SYSTEM

A simple expansion of the inputs and outputs of the UMG 503 is possible with the WAGO I/O SYSTEM. The UMG 503 is connected to the bus coupling via an interface cable. The **Modbus RTU** protocol is used for transmission of data. Function clamps such as analogue outputs, and digital inputs and outputs can be connected to the bus coupling.



Attention!

Please not the corresponding installation instructions for the **WAGO I/O SYSTEM**.

Installation instructions

The connection of the UMG 503 to the bus coupling can be carried out via RS232 or RS485 interface. The WAGO Bus coupling has always the address 1.

For operation with the WAGO bus coupling, protocol number "06" must be set at the UMG 503 (**Modbus RTU** Master). Please note, that protocol "06" cannot be operated on both interfaces of the UMG 503 at the same time.

All existing analogue function modules must be programmed at the UMG 503. Only the last clamp of the analogue module does not have to be programmed.

The analogue clamps must be plugged to the bus coupling at first, and the digital clamps afterwards.

Function clamps

Function clamps, which can be used with the WAGO Modbus coupling:

Digital inputs

750-400	2-chanel digital input 24V; 3,0ms
750-405	2-chanel digital input 230V AC
750-415	4-chanel digital input 24V AC/DC

Digital outputs

750-501	2 outputs, 24V, 0,5A
750-502	2 outputs, 24V, 2A
750-504	4 outputs,
750-516	4 outputs, 24V
750-519	4 outputs, 5V
750-509	2 outputs, 230V, Solid State
750-512	2 NO, Relay, potential bound.
750-513	2 NO, Relay, potential free
750-514	2 Change over switch, Relay,

potential free

750-517	2 Change over switch, Relay, potential free
---------	---

Analogue outputs

750-550	2-chanel analogue output 0-10V
750-552	2-chanel analogue output 0-20mA
750-554	2-chanel analogue output 4-20mA
750-556	2-chanel analogue output +-10V

As the Siemens data format is not supported by the UMG 503, the function clamps

750-580	0-10V	and
750-584	4-20mA	

cannot be used.

Universal Measuring Device UMG 503

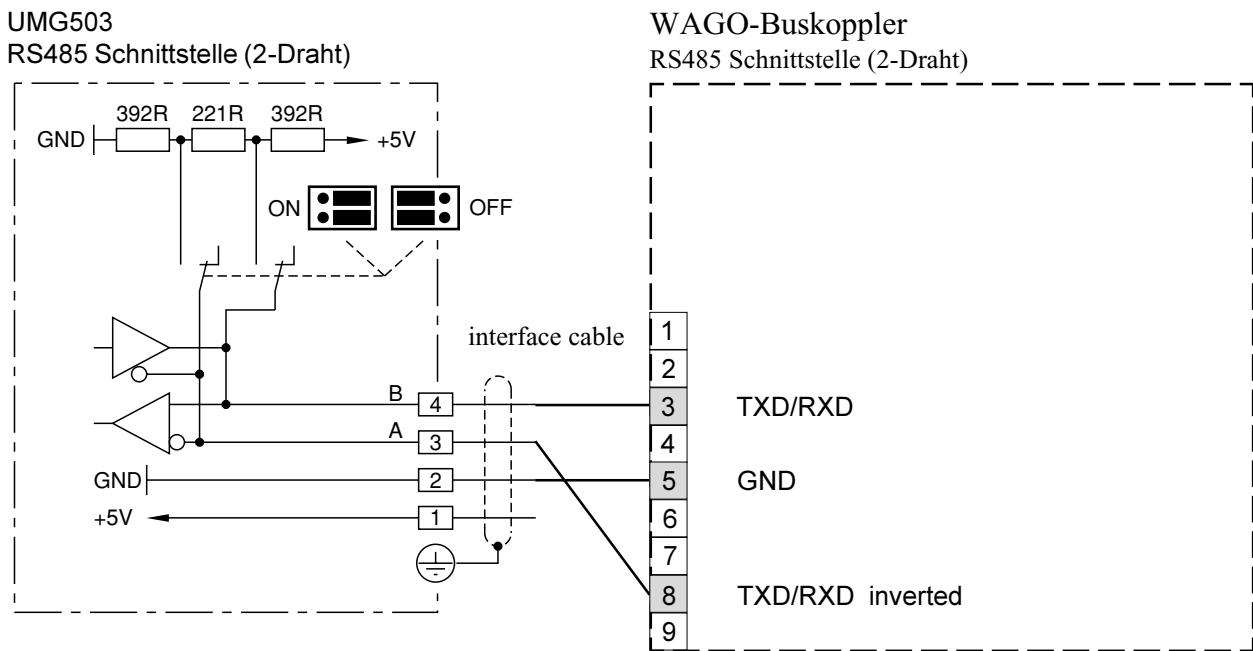
Bus coupling

The UMG 503 can call up
 6 analogue outputs,
 6 digital outputs and
 3 digital inputs

via the WAGO bus coupling at maximum. The following bus couplings can be operated with a UMG 503 of the same transmission mode and Modbus RTU protocol.

Description	Transmission mode	common baudrates
750-312	RS485	9600, 19200
750-315	RS485	9600, 19200, 38400, 115200
750-314	RS232	9600, 19200
750-316	RS232	9600, 19200, 38400

If the UMG 503 is connected to the bus coupling via **RS232 interface**, a "1 to 1 cable" must be used. Connections via **RS485 interface** are carried out according to the diagram below.



Diagr: Connection between UMG 503 and WAGO-Bus coupling via RS485 (2-wire)

Universal Measuring Device **UMG 503**

Universal Measuring Device UMG 503

Tables

Measured value indications

The indication of the UMG 503 can indicate three measured values simultaneously. To keep the selection of measured values clear, only a part of the available measured values is programmed for calling them up in the display, when the device leaves the manufacturing works.

On the following pages, the manufacturer's presettings of readable measured values are mentioned.


If other measured values are desired for the indication of the UMG 503, they can be selected with the software PSW 503 (disk or CD-ROM) via PC.

Universal Measuring Device UMG 503

Manufacturer's presettings

	▶	▶	▶	
	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	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	Peak val. react. power L1 Peak val. react. power L2 Peak val. react. power L3

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<p>Measured val. frequency L1</p> <p>Measured val. frequency L2</p> <p>Measured val. frequency L3</p>	<p>Mean val. frequency L1</p> <p>Mean val. frequency L2</p> <p>Mean val. frequency L3</p>	<p>Peak val. frequency L1</p> <p>Peak val. frequency L2</p> <p>Peak val. frequency L3</p>	<p>Lowest val. frequency L1</p> <p>Lowest val. frequency L2</p> <p>Lowest val. frequency L3</p>
			
<p>Measured val. cos(phi) L1</p> <p>Measured val. cos(phi) L2</p> <p>Measured val. cos(phi) L3</p>	<p>Mean val. cos(phi) L1</p> <p>Mean val. cos(phi) L2</p> <p>Mean val. cos(phi) L3</p>	<p>Peak val. cos(phi) L1</p> <p>Peak val. cos(phi) L2</p> <p>Peak val. cos(phi) L3</p>	<p>Lowest val. cos(phi) L1</p> <p>Lowest val. cos(phi) L2</p> <p>Lowest val. cos(phi) L3</p>
			
<p>Real work consump. tariff00</p>	<p>Real work consump. tariff01</p>	<p>Real work consump. tariff02</p>	
			
<p>Real work supplied</p>			
			
<p>Ind. reactive work tariff 10</p>	<p>Ind. reactive work tariff 11</p>	<p>Ind. reactive work tariff 12</p>	
			
<p>Cap. reactive work tariff 20</p>	<p>Cap. reactive work tariff 21</p>	<p>Cap. reactive work tariff 22</p>	
			

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△	▶	▶	▶
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	

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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		RS485, RS232, Infrared	
RS485	" 485"		
Baud rate		9.6, 19.2, 38.4, 57.6 ¹⁾ , 115.2kbps ¹⁾	"38.4"
Protocol		oFF, 1, 2, 3, 4, 5, 6	"2"
RS232	" 232"		
Baud rate		9600bps, 19.2kbps, 38.4kbps	"38.4"
Protocol		oFF, 1, 2, 3, 4, 5, 6	"oFF"
Infrarot	"InFr"		
Baud rate		9600bps, 19.2kbps, 38.4kbps ²⁾ , 57.6kbps ²⁾ , 115.2kbps ²⁾	"19.2"
Protocol		oFF, 1	"oFF"
Relay outputs			
Number	"S. "	1, 2	" 1"
Limit		All measured values	"L1 0.000 A"
Minimum connection time	" . M.S"	1 .. 59 Seconds	"00.01 M.S"
Exceeding	▲		▲
Underscoring	▼		
Analogue output	"AnLo"	0/4-20mA	"4 20"
Measured value		All measured values except work	Summe Real power
Minimum value			"0000"
Maximum value			"0000"
Pulse output	"PuLS"		
Measured value		All reactive and real works	T "00"
Pulse valency		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 = Auxiliary input not used 1 = external reset of the 15 minutes power mean value. 2 = External tariff change over 3 = Synchronize internal clock	"oFF"
Tariff times			
Work	Txx	0x = Real work, consumption 1x = Reactive work, capacitive 2x = Reactive work, induktive	"00"
Time number		x = Tariff number 0 .. 4	
Starting time	"P. 0"	0 .. 9	" 0"
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"

1) These baud rates are not available in the version UMG503LS.

2) These baud rates are not available with any PC

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Retrievable measured and calculated quantities

Measured quantity	Measured value				Mean value				Measured value		Date and time
	L1	L2	L3	Sum	L1	L2	L3	Sum	Peak value	Lowest val.	
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

Indicating range and accuracy

Quantity	Indicating range	Measuring range for Scale factor=1	Measuring accuracy
Voltage			
L-N	0,0 .. 9999 V .. 99,99 kV	50 .. 500 V	+/-0,2% Mr
L-L	0,0 .. 9999 V .. 99,99 kV	80 .. 870 V	+/-0,2% Mr
Current	0,000 .. 9999 A	0,005 .. 5 A	+/-0,2% Mr
Current, sum	0,000...9999 A	0,060 .. 15 A	+/-0,6% Mr
Frequency (of voltage)	45,00 .. 65,00 Hz	45,00 .. 65,00 Hz	+/-0,2% 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
Work (max. 10 digits)			
Real work,			
without rev. running stop	0,0 Wh .. 9999 GWh	0,05 Ws .. 9999 MWh	+/-0,5% Mr
Real work, consump. ▲	0,0 Wh .. 9999 GWh	0,05 Ws .. 9999 MWh	+/-0,5% Mr
Real work, supply ▼	-0,0 Wh .. -999 GWh	-0,05 Ws .. -999 MWh	+/-0,5% Mr
Reactive work	0,0 varh .. 9999 Gvarh	-0,05 vars .. 9999 Mvarh	+/-0,5% Mr
Total harmonic content THD			
Current	0,0 .. 100 %	0,0 .. 100 %	+/-0,5% Mr
Voltage	0,0 .. 100 %	0,0 .. 100 %	+/-0,5% Mr
Partial harmonic content HDF			
Current	0,000 .. 9999 A	0,005 A .. 5A (1A)	+/-0,5% Mr
Voltage	0,0V .. 99,99 kV	0,000 V .. 9999 V	+/-0,5% Mr

The harmonic waves are measured from the 2nd to the 20th harmonic. The percentual values correspond to the set secondary voltage.

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

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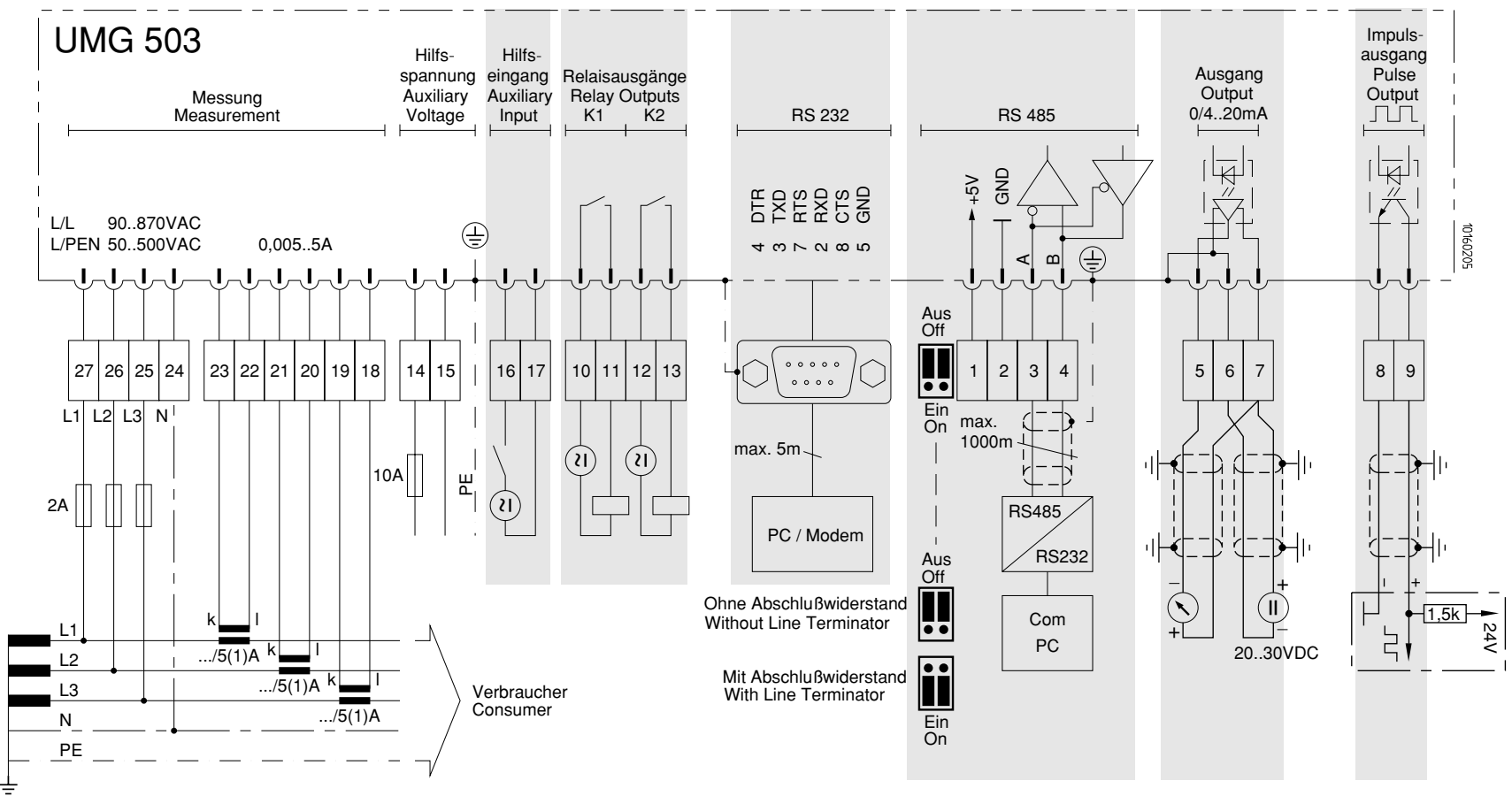
Removal of errors

Faults	Possible reason	Remedy
Indication dark	External prefuse has released. Internal prefuse has released.	Replace prefuse. The fuse cannot be changed by the user. Please send the device back to the manufacturing works
No current indication	Contrast setting too dark. Device faulty. Measurement voltage not connected	Change contrast settings in configuration menu. Please send the device to the manufacturer for repair. Connect measurement voltage.
Current too small	Current measurement in the wrong phase. Current transformer factor programmed incorrectly.	Check and correct connection. Read current transformer ratio on current transformer and program correctly.
Wrong current	Current measurement in the wrong phase. Current transformer factor programmed incorrectly. Measuring range exceeded. The peak current value on measuring input was exceeded caused by harmonics. The current on measuring input was underscored.	Check and correct connection. Read current transformer ratio on current transformer and program correctly. Install bigger current transformer. Install bigger current transformer. Attention: Please ensure, that the measuring inputs are not overloaded. Install smaller current transformer.
Voltage L-N too small	Measurement in wrong phase. Voltage transformer factor programmed incorrectly. Voltage on measuring input out of measuring range.	Check and correct connection. 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. Install smaller voltage transformer.
Voltage L-N incorrect	Measurement in wrong phase. Voltage transformer factor programmed incorrectly. Measured range exceeded. The peak voltage value on measuring input was exceeded caused by harmonics.	Check and correct connection. 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. Install bigger current transformer. Install bigger current transformer. Attention: Please ensure, that the measuring inputs are not overloaded.
Voltage L-L too small/ too big	Outer conductors exchanged. N not connected.	Check and correct connection. Check and correct connection.
Phase shift ind /cap too small or big Programmed data get lost	Current path is assigned to the wrong voltage path. Battery empty. The device has been exposed to electromagnetical interference bigger than the allowed by technical data.	Check and correct connection. Please send device to the manufacturer for exchanging the battery. External protection measure such as shielding, filtering, earthing or spatial separation.

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Faults	Possible reason	Remedy
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.
Real power consumption / supply exchanged.	Voltage transformer factor programmed incorrectly.	Attention: Please ensure, that the measuring inputs are not overloaded. 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.
	One current transformer at least exchanged.	Attention: Please ensure, that the measuring inputs are not overloaded. Check and correct connection.
The time is indicated incorrectly.	Current path is assigned to the wrong voltage path.	Check and correct connection.
	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.
Duration of memory =38 s.	The measuring range of voltage was exceeded.	Check measuring voltage and insert a suitable voltage transformer.
	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.

Connection example "4 wire measurement"



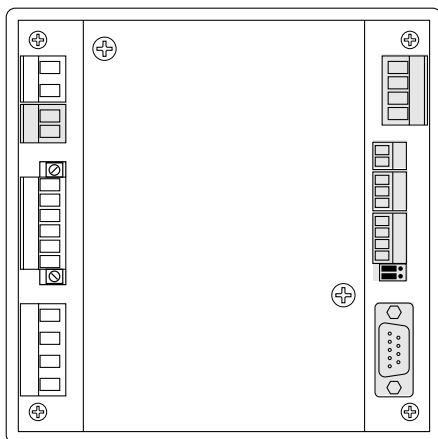
The grey marked connections are available as options.

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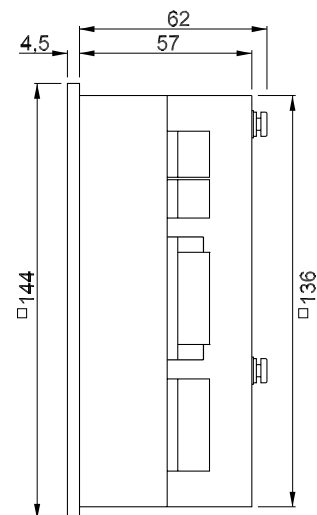
Technical Data

Ambient conditions		Measurement	
Overvoltage class	: CATIII	Measuring rate	: 2 measurements/sec.
Pollution degree	: 2	Actualization	
Operating temperature	: -10°C .. +50°C	Display	: 1 time per second
Storage temperature	: -20°C .. +60°C	Analogue output	: < 500ms
humidity class	: 15% to 95% without dew)	Relay outputs	: < 500ms
Auxiliary voltage Uh		Auxiliary input (Option)	
Prefuse	: see type plate	Current consumption	: ca. 2,5mA .. 10mA
Power consumption	: max. 9VA	Analogue output (Option)	
Measuring inputs		Definition	: 12Bit
Rated pulse voltage	: 6kV	Load	: max. 500Ohm
Signal frequency	: 45Hz .. 1200Hz	External auxiliary voltage	: 20V.. 30VDC/50mA
Current measurement		Impulse output (Option)	
Power consumption	: ca. 0,2 VA	S0 interface according to DIN 43864	
Rated current for ..5A(1A) : 5A(1A)		Switching frequency	: max. 10Hz
Min. working current : 5mA		Switching current	: max. 30mA
Limiting current : 6A		External auxiliary voltage	: 20V .. 30VDC
Voltage measurement		Relay outputs (Option)	
max. 500VAC against ground		Switching voltage	: max. 250VAC
Power consumption	: ca. 0,1 VA	Switching power	: max. 1000W
Maximum prefuse	: M2A	Weight	: 1kg
Measuring range L-N	: 50 .. 500V AC 2,3.. 23 VAC (option)	Location	: any
Measuring range L-L	: 90 .. 870V AC 4 .. 40V AC (option)	Operating height	: 0 .. 2000m over NN
Frequency of fundamental	: 45Hz .. 65Hz	Accuracy of the internal clock	: +- 1 minute/month
Protection class		Interference resistance (industrial areas)	
Front	: IP50 acc. to IEC 529		: EN55082-2:1995
Front with seal (Option)	: IP54 acc. to IEC 529		: IEC 1000-4-3, 10V/m
Back side	: IP20 acc. to IEC 529		: IEC 1000-4-4, 2kV
Plug screw connection	: IP20 acc. to IEC 529	Spurious radiation (residential areas)	: IEC 1000-4-2, 8kV
		Safety guidelines	: EN55011 10.1997
			: EN61010-1 03.1994 + A2 05.1996
			: IEC 1010-1

Back side



Side view



The grey marked connections are available as options.
All dimensions are given in mm.