Universal Measuring Device
UMG 96S 24V

Operating instructions
Brief instructions see last page

Max value,
HT/Imported supply — Mean value

- Programming mode
- Sum measurement
- Phase-to-phase
- Password
- Voltage transformer
- Current transformer
- Output 1
- Output 2

L1 cap▲ cos φ ind▼ PRG MkWh MkVArh

L2 cap▲ cos φ ind▼ Hz S L-L O—

L3 cap▲ cos φ ind▼ CTVT K1● K2●

UMG96S

Janitza Universal Measuring Device

Min value,
LT/Supply — Supply — Key 1 — Key 2

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Contents

Meaning of the symbols used

The symbols used in this instruction manual have the following meaning:

Warning, dangerous electric voltage.

This symbol is intended to warn you of possible hazards that can occur during installation, starting up and use.

Notes on Use

This device may only be deployed and used by qualified personnel in accordance with the safety instructions and regulations. When using the device, any additional legal and safety regulations required for the respective use must be observed. Qualified personnel are people who are familiar with the erection, assembly, putting into service and operation of the product and have the necessary qualifications for their work, e.g.

- training or instruction or authorisation to switch electric circuits and equipment on and off, isolate, earth and label them according to the safety standards.

- training or instruction according to the safety standards in the care and use of appropriate safety equipment.

⚠ **Important!**
If the device is not operated according to the instruction manual, protection is no longer ensured and the device can cause hazards.

Inspection on Receipt

Fault free and safe use of this device requires appropriate transport, proper storage, erection and assembly as well as careful operation and maintenance. If it can be assumed that safe operation is no longer possible, the device must be immediately taken out of service and secured against being accidentally started up.

The device must be unpacked and packed with the usual care, without the use of force and only using suitable tools. The devices must be visually inspected for perfect mechanical condition.

It can be assumed that safe operation is no longer possible if the device, e.g.

• has visible damage,

despite intact mains power supply no longer works,

has been exposed to unfavourable conditions (e.g. storage outside the permissible climatic limits without adjustment to the ambient climate, condensation, or similar) for a lengthy period or was exposed to unfavourable effects or loads during transport (e.g. fall from a large height even if there is no visible external damage, or similar).

Please check the scope of supply for completeness before you start installing the device.

Scope of supply
1 UMG96S,
2 fixing clips,
1 instruction manual,
1 PC software "GridVis" on CD.

⚠ The instruction manual also describes options, which have not been delivered and are therefore not part of the scope of supply.

Maintenance Instructions

The device is subjected to various safety checks before delivery and marked with a seal. If a device is opened, the safety checks must be repeated.

We cannot provide any warranty for devices not opened in the manufacturer's factory.

Repair and calibration

Maintenance and calibration work can only be carried out in the manufacturer's factory.

Front film

The front film can be cleaned with a soft cloth and standard household cleaning agent. Do not use acids and products containing acid for cleaning.

Battery

There is a lithium battery on the additional printed circuit board 1 (option). The life expectancy of the battery is at least 5 years, at a storage temperature of +45°C. The typical life expectancy of the battery is 8 to 10 years.

For safety reasons, the battery can only be replaced in the manufacturer's factory!

Disposal

The UMG96S can be reused or recycled as electronic scrap in accordance with the legal provisions. Please note that the lithium battery installed on the additional circuit board 1 (option) must be disposed of separately.

Service

Should questions arise, which are not described in this manual, please contact us directly.

We will need the following information to answer any questions:

- ***Device name (see rating plate),***
- ***Serial name (see rating plate),***
- ***Software release,***
- ***Measuring-circuit voltage,***
- ***Auxiliary voltage and***
- ***Precise description of the error.***

You can reach us:

Mon to Thurs	07:00 to 15:00 hrs
Fri	07:00 to 12:00 hrs

Janitza electronics GmbH
Vor dem Polstück 1
D-35633 Lahnau
Support: Tel. (0 64 41) 9642-22
Fax (0 64 41) 9642-30
e-mail: info@janitza.de
Internet: http://www.janitza.de

Product Description

Intended use

The UMG96S is intended for fixed, permanent and weather protected use in switchboards and for the measurement of voltage, current, power, etc. in low voltage switchgear. The measurement is designed for 3-phase systems with neutral conductor (TN and TT systems).

The UMG96S is available in 150V and 300V measuring-circuit versions. In the standard 300V version, measuring-circuit voltages (50Hz/60Hz) up to 300VAC can be directly connected to earth and 520VAC phase-to-phase and in the 150V special version measuring-circuit voltages (50Hz/60Hz) up to 150VAC can be connected to earth and 240VAC phase-to-phase.

The measuring and auxiliary voltages must be connected to the UMG96S via a disconnecting device (switch or power circuit breaker) and an overcurrent protective device (2-10A) in the building installation. The disconnecting device (switch or power circuit breaker) must be located close to the UMG96S and be easily accessible.

The measuring-circuit voltages and auxiliary voltage are connected on the rear of the UMG96S via shockproof spring-loaded terminals.

../5A and ../1A current transformers can be optionally connected to the current measurement inputs.

Important!
The **neutral conductor N** must always be connected.

Important!
Measurement of systems with **packet controls** is only conditionally possible, as there is no continuous scanning of the measurement signals.

Important!
The inputs and outputs and the serial interfaces must be **shielded**.

Functional principle

The three-phase electronic measuring system records and digitises the effective values of alternating voltages and alternating currents in 50Hz/60Hz systems.

../5A or ../1A current transformers can be optionally connected to the current measurement inputs. In systems with voltages up to 150VAC to earth, currents up to 5A can also be directly connected to the UMG96S.

Each second, one sample measurement each is taken at all current and voltage measurement inputs. Measurement signal interruptions lasting more than one second are reliably detected. 6 periods are scanned for each sample. The installed microprocessor calculates the electric variables from the scanned values. The measured values can be displayed in the measured value displays. The work and minimum and maximum valves are stored every 5 minutes in a non-volatile memory (EEPROM) and the programming data is stored there immediately.

The scanning frequency for all measurement inputs is calculated from the phase L1 system frequency. For a system frequency of 50Hz the scanning frequency is 2.5kHz and for a system frequency of 60Hz the scanning frequency is 3.0kHz. If the voltage in phase L1 is smaller than 50V, the UMG96S uses the last measured system frequency to calculate the scanning frequency.
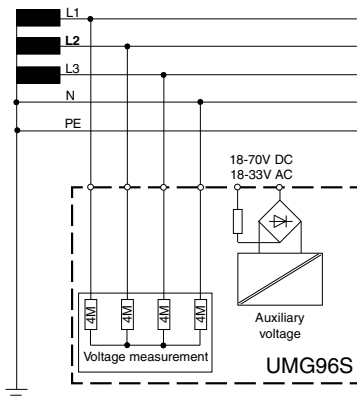
Fig. Block diagram of operating voltage generation and measuring-circuit voltage.

Device versions

The UMG96S is available in various design versions. In these the terminals 11, 12 and 13 at the UMG96S can be assigned a function specified by the customer.

Design version 1

Design version 1 contains the following functional groups:

Input/Output

    Pulse output 1
    (Wp=active power demand)
    Pulse output 2
    (Wq=reactive power demand)
    Digital output 1
    Digital output 2
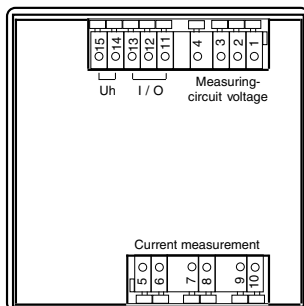
Design version 2
Design version 2 contains the following functional groups:
  RS232 (MODBUS RTU)
  Input/Output
      Pulse output 1
      (Wp=active power demand)
      Pulse output 2
      (Wq=reactive power demand)
      Digital output 1
      Digital output 2
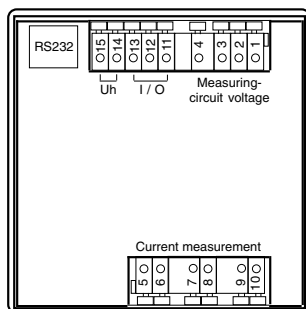
UMG96S
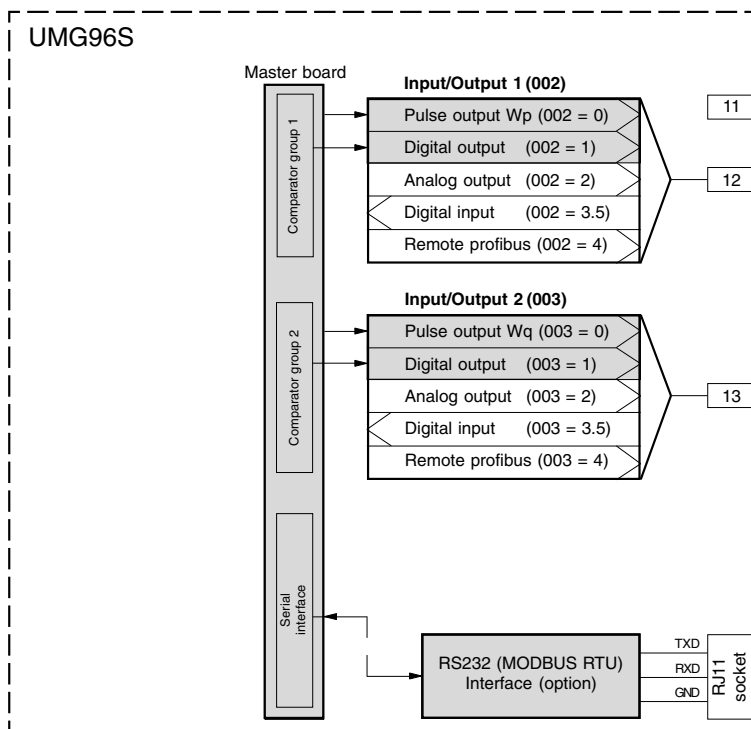
Design version 3
Design version 3 contains the following functional groups:

RS232 (MODBUS RTU)
Input/Output
    Pulse output 1
        (Wp=active power demand)
    Pulse output 2
        (Wq=reactive power demand)
    Digital output 1
    Digital output 2
    Clock with battery
    Data memory
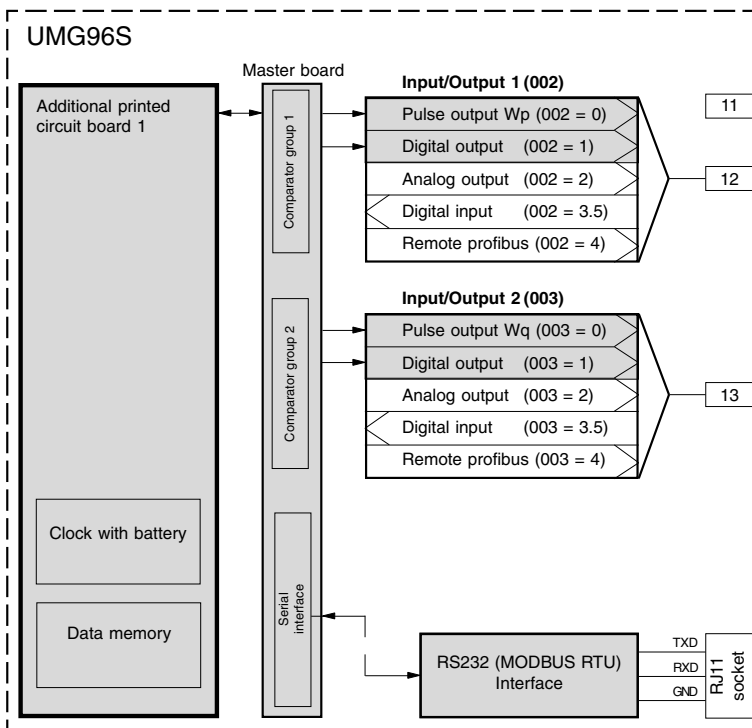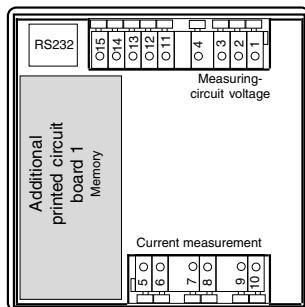
Design version 4
Design version 3 contains the following functional groups:
   RS232 (MODBUS RTU)
   Input/Output
      Pulse output 1
         (Wp=active power demand)
      Pulse output 2
         (Wq=reactive power demand)
      Digital output 1
      Digital output 2
      Analog output 1
      Analog output 2
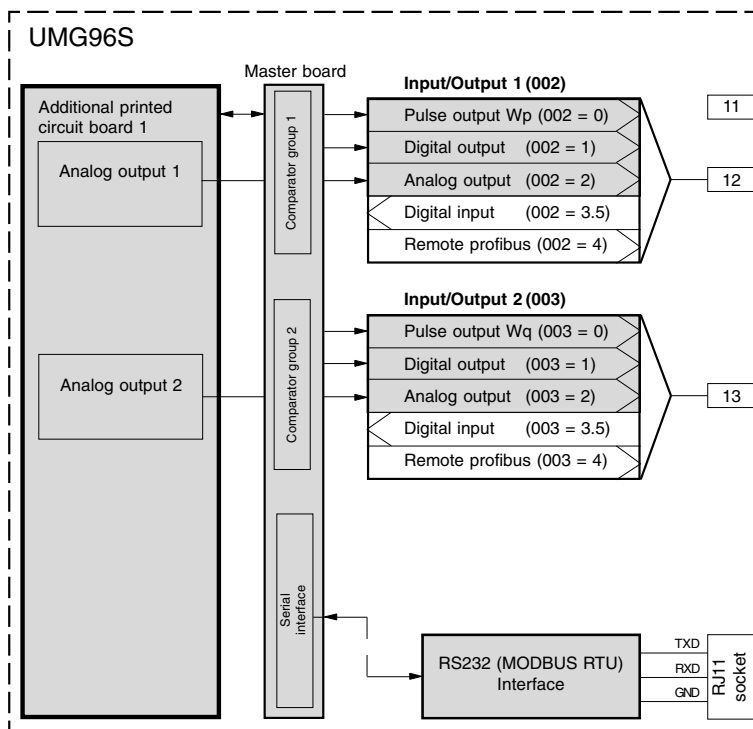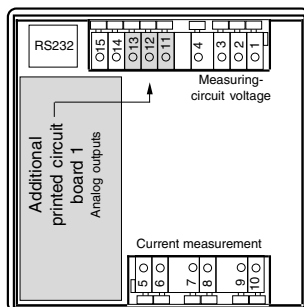
Design version 5
Design version 5 contains the following functional groups:
- RS232 (MODBUS RTU)
- Input/Output
  - Pulse output 1
    - (Wp=active power demand)
  - Pulse output 2
    - (Wq=reactive power demand)
  - Digital output 1
  - Digital output 2
  - Analog output 1
  - Analog output 2
  - Clock with battery
  - Data memory
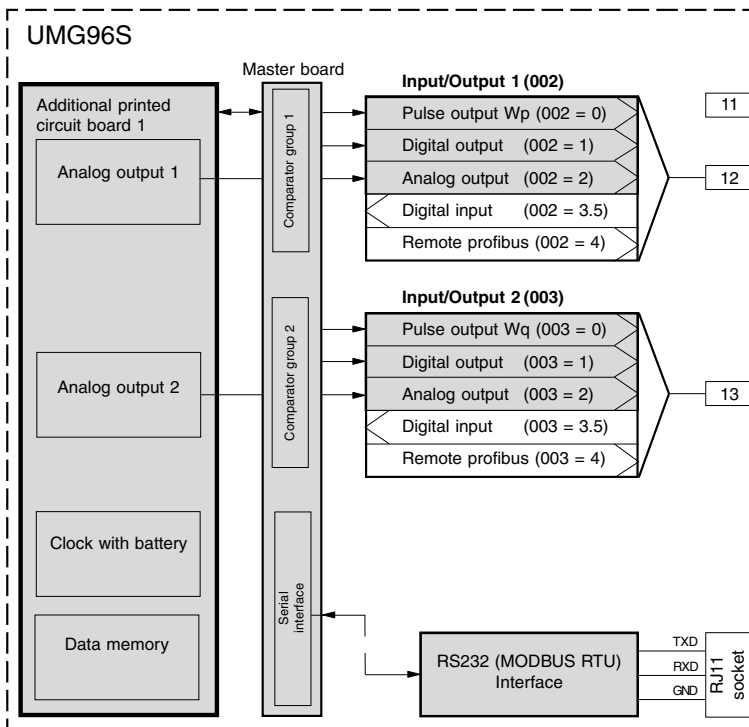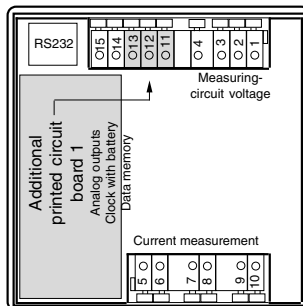
Design version 6
Design version 6 contains the following functional groups:
  RS232 (MODBUS RTU)
  Input/Output
    Pulse output 1
          (Wp=active power demand)
    Pulse output 2
          (Wq=reactive power demand)
    Digital output 1
    Digital output 2
    Digital input 1
    Digital input 2
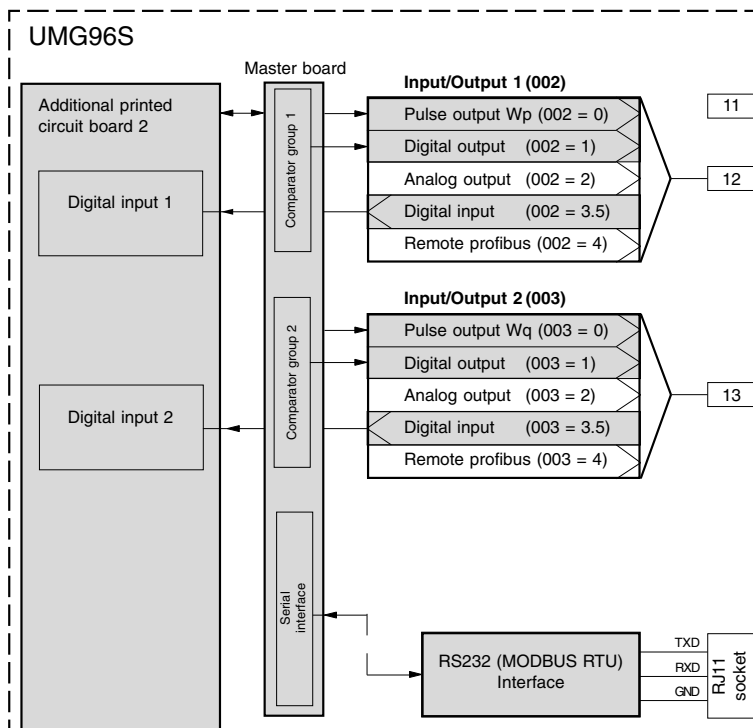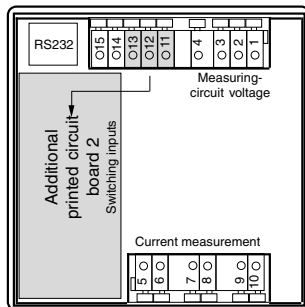
Design version 7
Design version 7 contains the following functional groups:
- RS232 (MODBUS RTU)
- Profibus DP
- Input/Output
  - Pulse output 1
    - (Wp=active power demand)
  - Pulse output 2
    - (Wq=reactive power demand)
  - Digital output 1
  - Digital output 2
  - Digital input 1
  - Digital input 2
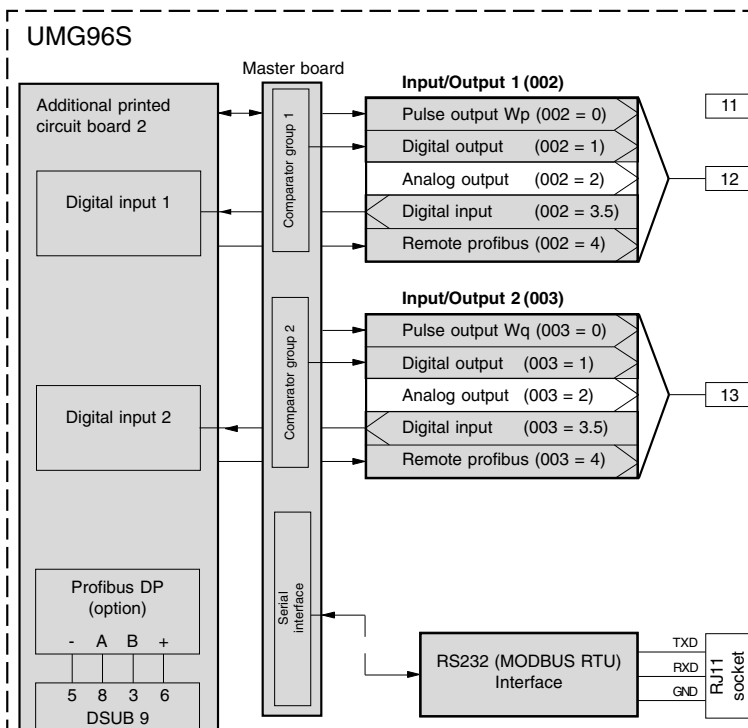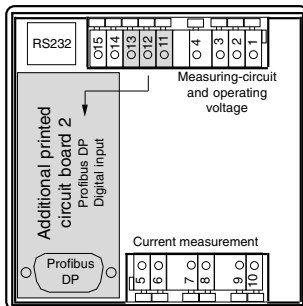
Installation Instructions

Installed position

The UMG96S is intended for permanent installation in low and medium voltage switchgear. It can be installed in any position.

Auxiliary voltage

The auxiliary voltage must be connected to the UMG96S via a disconnecting device (switch or power circuit breaker) and an overcurrent protective device (2-10A) in the building installation.

Measuring-circuit voltage

The measurement is designed for 3-phase systems with neutral conductor (TN and TT systems). The measuring-circuit and auxiliary voltages are connected on the rear of the UMG96S via shockproof spring-loaded terminals.

300V standard version
The measuring-current and operating voltage ranges **for devices without additional printed circuit boards and for devices with additional circuit board 1 (analog output) are:**

L-N	50 .. 300V
L-N	87 .. 520V

150V special version
The measuring-circuit and operating voltage ranges **are:**

L-N	25 .. 150V
L-N	40 .. 260V

- The wiring cables for the operating voltage must be suitable for rated voltages up to 300VAC to earth.

- The operating voltage must be secured with a fuse. The fuse must lie within the range of **2A to 10A**.
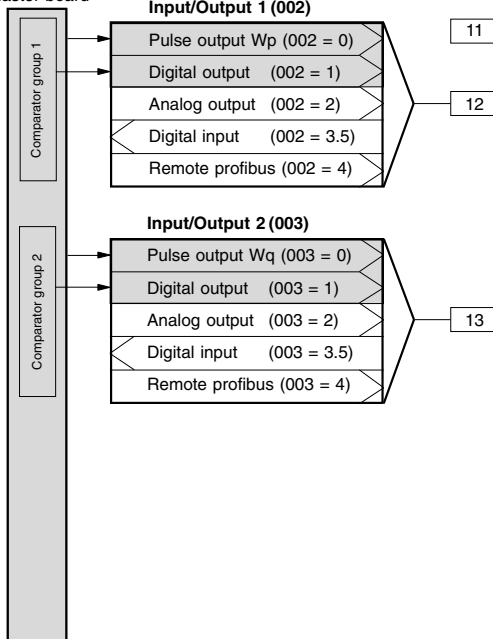
- The building installation must include a **switch** or **power circuit breaker** for the operating voltage.

- The **switch** must be installed **near** the device and be easily reachable by the user.

- The switch must be **labelled** as a **disconnecting device** for this device.

⚠ Important!
The limit values given in the technical specifications may not be exceeded, not even during testing and putting into service of the UMG96S.

⚠ Important!
Before the device is connected to the voltage for the first time, it must have been in the operating room for at least two hours in order for the temperature to adjust to the ambient conditions and to avoid moisture and condensation.

Current measurement

The current is optionally measured via a ../5A or ../1A current transformer. If, in addition to the UMG96S, the current has to be measured with a ampere meter, this must be connected in series with the UMG96S.

In systems with voltages up to 150VAC to earth, currents up to 5A can also be directly connected to the UMG96S and measured.
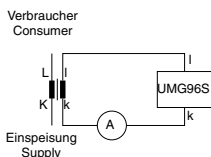
Summation current measurement

If the current is measured via two current transformers, the total transformation ratio of the current transformers must be programmed in the UMG96S.

Example: Summation current transformer
Each current measurement is taken via a current transformer with a transformation ratio of 1000/5A and a current transformer with a transformation ratio of 200/5A. The summation measurement is performed with a 5+5/5A summation transformer.
The UMG96S must then be set as follows:

Primary current: **1000A + 200A =** 1200A
Secondary current: 5A
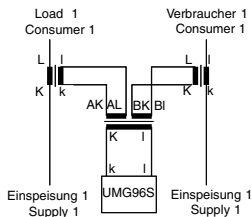
⚠ Important!
The secondary connections of the current transformer must be short-circuited to it first before the current supply leads to the device are disconnected!
If a testing switch is available, which automatically short circuits the current transformer's secondary leads, it is sufficient to place this in the „test" position, provided the short-circuiters have been tested first.

Serial interfaces

The various design versions of the UMG96S have up to two serial interfaces.
The serial interfaces are not isolated from each other.

⚠ The cables for serial data transfer must be shielded.

Inputs and outputs

In the various design versions (options) of the UMG96S, different functions can be assigned to the outputs.
For example, terminal 12 can be assigned to the pulse output function and terminal 13 the digital input function. Here it must be ensured that both electric circuits have a common imported supply via terminal 11 (+24V).
Only one function can ever be assigned to terminal 12 and terminal 13.

Input/Output 1

Pulse output Wp (002 = 0)	
Digital output (002 = 1)	11
Analog output (002 = 2)	
Digital input (002 = 3.5)	12
Remote profibus (002 = 4)	

Input/Output 2

Pulse output Wq (003 = 0)	
Digital output (003 = 1)	
Analog output (003 = 2)	13
Digital input (003 = 3.5)	
Remote profibus (003 = 4)	
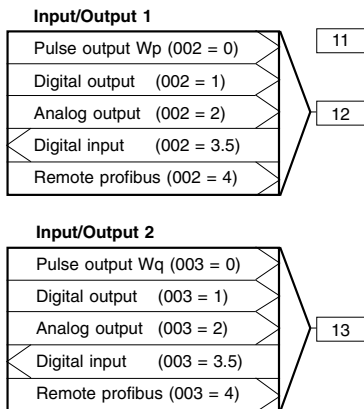
⚠ **Important!**
Pulse output 1 is **permanently** assigned to active power demand Wp.
Pulse output 2 is **permanently** assigned to reactive power demand Wq.

External Auxiliary voltage

230V AC
24V DC

0V 11
Digital input 1 5k 12 S1
Digital input 2 5k 13 S2

UMG96S
Digital inputs

Fig.: Connection example for the digital inputs.

230V AC
24V DC

External Auxiliary voltage

+24V= 11

max. 360 Ohm

Analog output 12 +

Digital output 13

1.5k
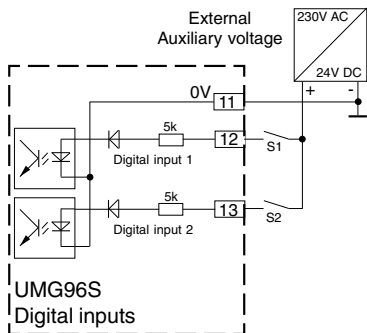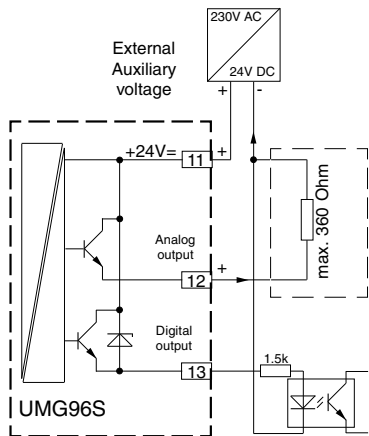
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Connection example: UMG96S with one analog output and one digital output.

External Auxiliary voltages

230V AC   230V AC
24V DC   24V DC

11

Digital**in**put 1 5k 12 S1

Digital**out**put 2 13

K1

UMG96S
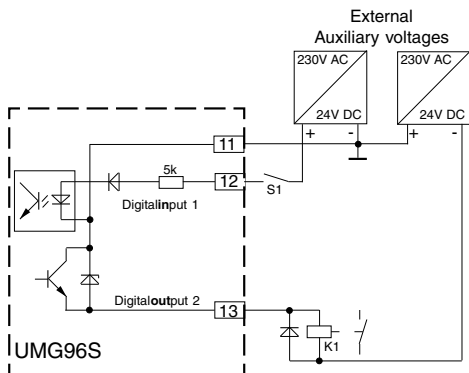
Fig.: Connection example for one digital input and one digital output.

Connection options
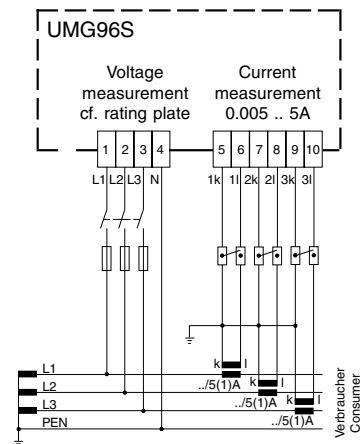
Fig.: Connection example 1
Four-wire measurement with three current transformers.
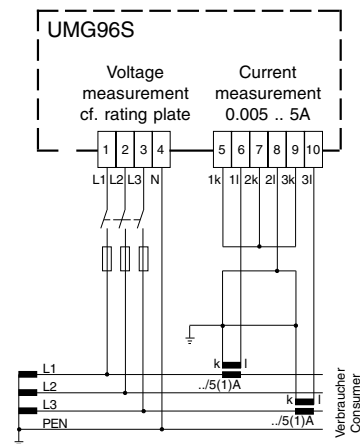
Fig.: Connection example 2
Four-wire measurement with two current transformers.
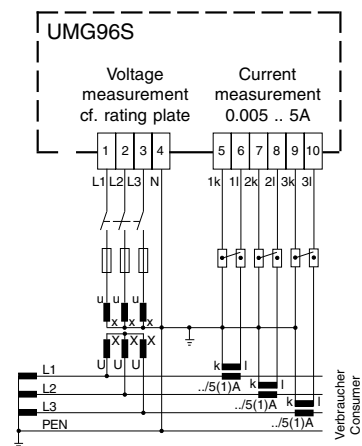
Fig.: Connection example 3
Measurement with three voltage transformers and three current transformers.
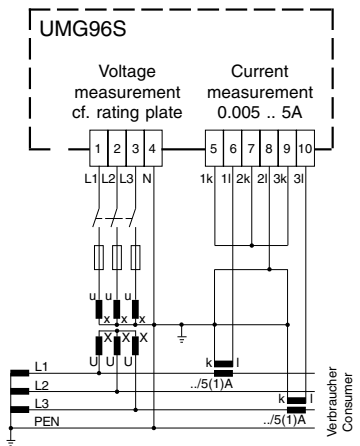
Fig.: Connection example 4
Measurement with three voltage transformers and two current transformers.
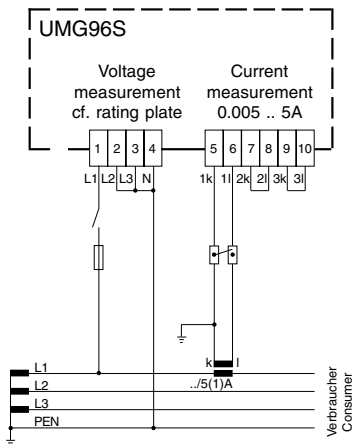
Fig.: Connection example 5
Single-phase measurement.
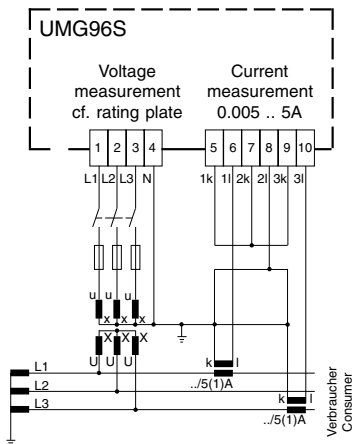
Fig.: Connection example 6
Intermediate voltage circuit measurement with three voltage transformers and two current transformers.
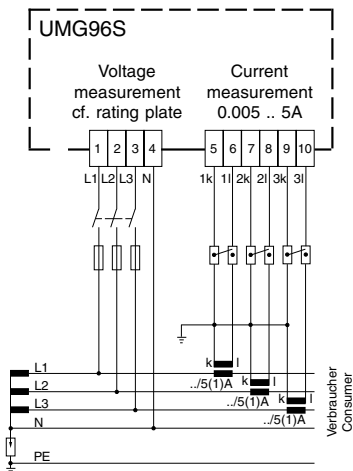
Fig.: Connection example 7
Measurement in the **IT system** via three current transformers.
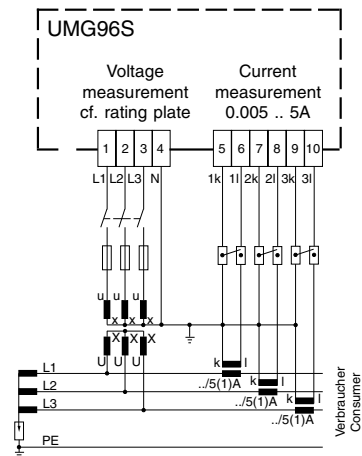
Fig.: Connection example 8
Measurement in the **IT system** with three voltage transformers and three current transformers.

Putting into Service

The UMG96S should be put into service as follows:

Installing the device

The UMG96S is intended for installation in low-voltage distributions in which the maximum overvoltages that occur are in overvoltage category III.

It can be installed in any position. The enclosed fixing brackets must be used to install the device in front panels or switchgear cabinet doors.
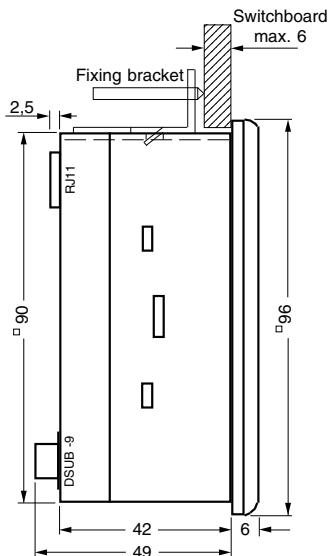
Applying the auxiliary voltage

The size of the auxiliary voltage is given on the rating plate. Auxiliary voltages which do not correspond to those given on the rating plate can result in malfunctions and destruction of the device.

After applying the auxiliary voltage, all segments appear in the display. Around two seconds later the UMG96S switches to the first measured value display.

If no display appears, check whether the auxiliary voltage is within the rated voltage range.

Auxiliary section dimensions: $92^{+0.8}$ x $92^{+0.8}$ mm
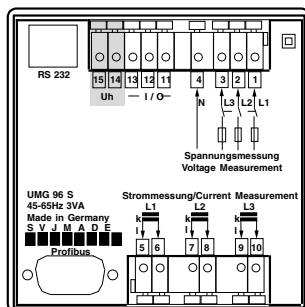
Applying the measuring-circuit voltage

The wiring cables for the measuring-circuit voltages to the UMG96S must be suitable for voltages up to 300V to earth and 520V phase-to-phase.
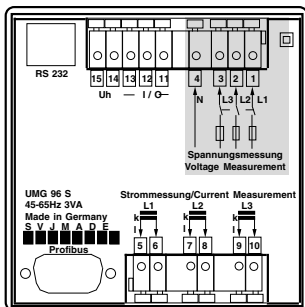
Programming the current and voltage transformers

A current transformer of 5/5A is set in the factory.

The pre-programmed voltage transformer ratio only has to be changed if voltage transformers are connected.

When connecting voltage transformers, note the measuring-circuit voltage given on the UMG96S's rating plate!

Applying the measuring current
The UMG96S is designed for the connection of ../1A and ../5A current transformers.
Only alternating currents, not direct currents, can be measured via the current measurement inputs.

⚠️ Current transformer terminals must be earthed on the secondary side.
Current transformers, which are not loaded on the secondary side can conduct dangerous contact voltages and therefore must be short-circuited.

Individually connect the current measurement inputs and compare the current displayed by the UMG96S with the applied current. Take into account that the current transformer ratio is set to 5/5A in the factory and may need adjusting to the current transformers used.

If the current converter is short-circuited on the secondary side, the UMG96S must display zero amperes in the corresponding phase conductor.

Taking into account the current transformer, the current displayed by the UMG96S must correspond to the input current.

Checking the phase assignment
The assignment of the phase conductor to the current transformer is correct if you short-circuit a current transformer on the secondary side and the current displayed by the UMG96S in the corresponding phase drops to 0A.
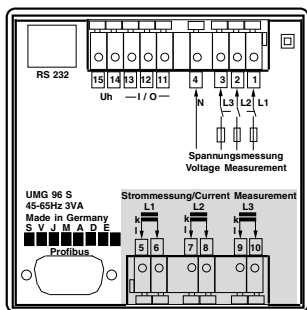
Checking the current direction

Short-circuit two current transformers on the secondary side. The active power displayed in the remaining phase of the UMG96S must now:

be positive (+) when active power is imported and

be negative (-) when active power is supplied (generator mode).

If no active power is displayed, the assignment of the voltages to the currents may be incorrect.

Checking the individual power outputs

If a current transformer is assigned to the wrong phase conductor, the corresponding power output will also be incorrectly measured and displayed.

Assignment of the phase conductor to the current transformer at the UMG96S is correct if there is no voltage between the phase conductor and the corresponding current transformer (primary).

The respective current transformers can be short-circuited on the secondary side to ensure a current conductor at the voltage measurement input is assigned to the correct current transformer. The apparent power displayed by the UMG96S must then be zero in this phase.

If the apparent power is correctly displayed but the active power is displayed with a "-" sign, the current transformer terminals are reversed or power is supplied to the power supply company.

Checking the summation power outputs

If all voltages, currents and power outputs are correctly displayed for the respective phase conductor, the summation power outputs measured by the UMG96S must also be correct. To confirm this, the summation power outputs measured by the UMG96S must be compared with the work of the active power and reactive power meters located in the incoming supply.

What to do in case of errors

Possible error	Cause	Remedy
Display dark.	Back-up fuse has triggered. Device defective.	Insert fuse. Send device to the manufacturer for repair.
Measured value display cannot be called up.	The measured value display has been deleted from the measured value selection.	Add the required measured value display to the measured value selection.
No current display.	Corresponding measuring-circuit voltage is not connected.	Connect the corresponding measuring-circuit voltage.
Current too small.	Current measurement in the wrong phase.	Check connection and correct if necessary.
Current wrong.	Current measurement in the wrong phase. Current transformer incorrectly programmed. Overrange.	Check connection and correct if necessary. Read out and program the current transformer transformation ratio at the current transformer. Install current transformer with a larger current transformer transformation ratio.
	The peak current value at the measurement input has been exceeded by current harmonics.	Install current transformer with a larger current transformer transformation ratio. Important! Ensure the measurement inputs are not overloaded. Install current transformer with a smaller current transformer transformation ratio.
	The current at the measurement input has been exceeded.	Check connection and correct if necessary. Read out and program the voltage transformer transformation ratio at the voltage transformer.
Voltage L-N wrong.	Measurement in the wrong phase. Voltage transformer incorrectly programmed.	Check connection and correct if necessary. Important! Ensure the measurement inputs are not overloaded.
Voltage L-L too small / too large.	Phase conductors reversed. N not connected.	Check connection and correct if necessary.

Possible error	Cause	Remedy
Phase shift ind/cap.	Current path is assigned to the wrong voltage path.	Check connection and correct if necessary.
Programming data is lost.	The device has been exposed to electromagnetic interferences, which are larger than those given in the technical specifications.	Improve external protective measures such as shielding, filtering, earthing and spatial separation.
Active power too small / too large.	Current transformer transformation ratio incorrectly programmed. Current path assigned to the wrong voltage path.	Read out and program current transformer. Check connection and correct if necessary.
Active power imported supply / supply reversed.	At least one current transformer connection is mixed up/reversed. Current path is assigned to the wrong voltage path.	Check connection and correct if necessary. Check connection and correct if necessary.
An output does not react.	The output has been incorrectly programmed. The output has been incorrectly connected.	Check programming and correct if necessary. Check connection and correct if necessary.
„**EEE**" in the display	Cf. error messages.	
Despite the measures above the device does not work.	Device defective.	Send device to the manufacturer for checking with a precise description of the error.

Error Messages

The UMG96S displays three different error messages in the display:
- Warnings**,**
- fatal errors **and**
- Overranges**.**

In the event of warnings and fatal errors the error message is represented by the symbol "EEE" for an error message and an error number.

Symbol for an error message
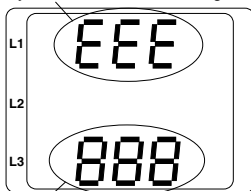
Error number

The three-digit error number is made up of the error description and one or several causes of the error, if the UMG96S is able to determine these.

Symbol for an error message
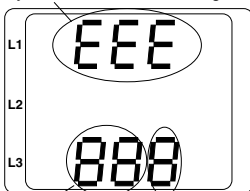
Cause of error   Error description

Example: Error number 911
The UMG96S displays the error number **911**.
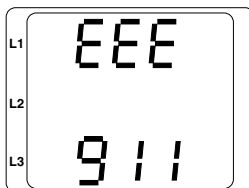
The error number is made up of the fatal error **910** and the internal cause of the error 0x0**1**.
In this example an error occurred when reading out the calibration from the EEPROM. The device must be sent to the manufacturer for checking.

Warnings

Warnings are less serious errors and can be acknowledged using Key 1 or Key 2. The recording and display of measured values continues. These errors are displayed again after each voltage recovery. The device should be sent to the manufacturer for checking.

Error	Error description
100	Error while writing the programming data.
110	Error while writing the counter.
120	Error while writing the maximum values.
220	Error while reading the counter.
230	Error while reading the maximum values.
300	Clock error.
310	Unable to find data memory.
400	Unable to find Profibus.
500	No voltage larger than 50V with a fundamental frequency found within the range of 45 to 65Hz in phase L1.

Fatal errors

The device must be sent to the manufacturer for checking.

Error	Error description
800	Error while writing a block.
810	Error while writing the calibration.
900	Error while reading a block.
910	Error while reading the calibration.

Internal causes of errors

In some cases the UMG96S can determine the cause of an internal error and then report it with the following error code. The device must be sent to the manufacturer for checking.

Error	Cause of error
0x01	EEPROM does not reply.
0x02	Address range exceeded.
0x04	Checksum error.
0x08	Error in the internal I2C bus.

Overrange

Overranges are displayed as long as they exist and cannot be acknowledged. An overrange exists if at least one of the three voltage or current measurement inputs lies outside their specified measuring range.

The phase in which the overrange has occurred is selected using the "upward" arrows. The "V" and "A" symbols indicate whether the overrange occurred in the current or in the voltage path.

A = current path
V = voltage path
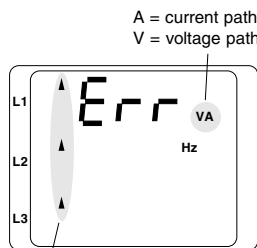
Overrange
in phase L1/L2/L3

Important!
Voltages and currents that lie outside the permissible measuring range can destroy the device.

Operation and Display

The UMG96S is operated using the Keys 1 and 2. Measured values and programming data are shown on a liquid crystal display. A differentiation is made between

> display mode and
> Programming mode

. By entering a password, you can prevent the programming data from being accidentally changed.

Display mode

In display mode you can use the Keys 1 and 2 to page between the programmed measured value displays. In the factory, all the measured value displays listed in Profile 1 can be called up. Up to three measured values are displayed in each measured value display. Measured value paging enables selected measured value displays to be alternately displayed after an adjustable change time.

Programming mode

The settings required for operation of the UMG96S can be displayed and changed in programming mode. If you simultaneously press Keys 1 and 2 for around 1 second, programming mode opens via a password query. In a user password has not been programmed, the first programming menu opens directly. Programming mode is denoted in the display by the text "PRG".

You can now use Key 2 to switch between the following programming menus:

> - Current transformer,
> - Voltage transformer,
> - Parameter list.

If you are in programming mode and have not pressed a key for approximately 60 seconds or simultaneously press Keys 1 and 2 for around 1 second, the UMG96S returns to display mode.

Programming mode

Key 1   Key 2
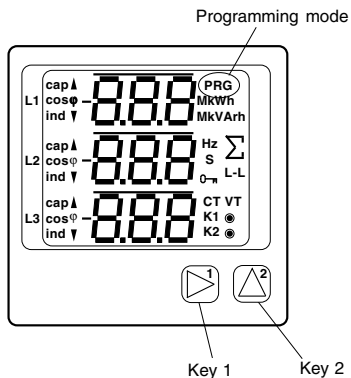
Key functions

	Display mode	Password	Programming mode
Change mode	simultaneously $\triangleright^1$ $\triangle^2$ $- - \to$ **8.8.8** simultaneously $\longleftarrow$ $\triangleright^1$ $\triangle^2$		
Page	long $\triangle^2$ ↑ Measured values / short ↓ Measured values / Measured values ← long $\triangleright^1$ short → Measured values		long $\triangle^2$ ↑ Programming menu / short ↓ Programming menu / Programming menu
Programming			Programming menu $\triangleright^1$ Confirm selection / **8** $\triangle^2$ short Digit +1 / long Digit -1 / **8.8.8** flashes $\triangle^2$ short Value *10 (decimal point to the right) / $\triangle^2$ long Value /10 (decimal point to the left)

Parameters and Measured Values

All parameters required to operate the UMG96S, e.g. the current transformer data, and all measured values are stored in a list. Each parameter and each measured value has a 3-digit address. You can access the contents of most addresses via the serial interfaces and the keys on the UMG96S.

Selected measured values are summarised in measured value display profiles and can be displayed in display mode using Keys 1 and 2.

Auf die meisten Paramter kann im Programier-Modus zuggriffen werden. Some parameters, e.g. the software release, can only be read. The current measured value display profile, the current display change profile and the date and time can only be read and changed via the RS232 interface.

Current and voltage transformers

The primary and secondary values for the current and voltage transformers cannot be directly entered in the parameter list.
Current and voltage transformers are programmed as described in the Quick Reference Instructions on the last page of the instruction manual. The programmed values are then in the parameter list and can be read out.

Parameter display at the UMG96S
In this example the value „0001" is shown as being the contents of address „000" in the display of the UMG96S. Here the UMG96S has device address 1.
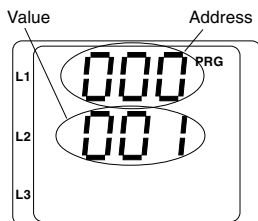
Measured value display at the UMG96S
In this example the voltages L to N are each displayed with 230V in the display of the UMG96S. The transistor outputs K1 and K2 are conductive and a current can flow.
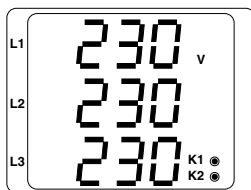
⚠ **Important!**
The adjustable parameters are not subjected to a plausibility check.

Programming parameters

Simultaneously press both keys for around 1 second.

If a user password has been programmed the password query appears with "000".

The first digit of the user password flashes and can be changed using Key 2. If you press Key 2 the next digit is selected and flashes.

If the correct number combination has been entered or a user password was not programmed, programming mode opens.

In programming mode, the programming menu for the current transformer appears first.

Press Key 2 to open the programming menu for the voltage transformer and to then page through the parameter list.

The parameters for the current and voltage transformer values can only be read at the UMG96S.
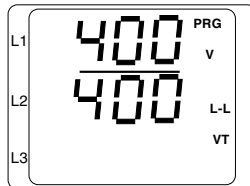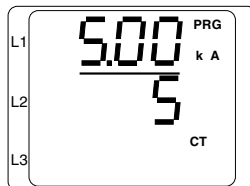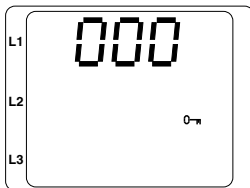
Changing parameters in the parameter list.
Confirm the selection using Key 1.
The last selected address is displayed with the corresponding value.
The first line of the address flashes.

Select address.
Press Key 1 to select a digit in the address and use Key 2 to change it.

Change value.
The required address is set.
Press Key 1 to select a digit in the value and use Key 2 to change it.

Quit programming
Simultaneously press both keys for around 1 second.

Address
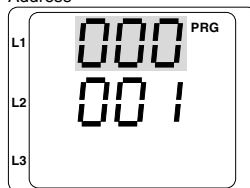
Value

Mean values

Mean values for the measured current and power output values are formed over an adjustable period of time. The mean values are denoted by a horizontal line above the measured value.

Current averaging time (Add 057)

The averaging times for the mean power output values and the mean current values are programmed separately. From a list of 7 preset default averaging times ..

Number	Averaging time/seconds
0	5 (factory default setting)
1	10
2	30
3	60
4	300
5	480
6	900

Power averaging time (Add 058)

The averaging times for the mean power output values and the mean current values are programmed separately.

Number	Averaging time/seconds
0	5 (factory default setting)
1	10
2	30
3	60
4	300
5	480
6	900

Averaging method

The exponential averaging method used reaches at least 95% of the measured value after the set averaging time.

$$\text{Mean} = \text{Mean} - 1 + (\text{Measured} - \text{Mean} - 1) / N$$

Mean = displayed mean value
Measured = measured value
n = consecutive measured value number
N = Number of measured values to
    be averaged.

Min and max values

All the measured values are measured and calculated once a second. Min and max values are determined for most of the measured values.

The min value is the smallest measured value determined since the last deletion. The max value is the largest measured value determined since the last deletion. All min and max values are compared with the corresponding measured values and are overwritten in the event of under or over values.

Every 5 minutes, the min and max values are stored in an EEPROM without the date and time. This means, in the event of an auxiliary voltage failure, only the min and max values of the last 5 minutes can be lost.

Delete min and max values (Add 008)

If "001" is written in address 008, all min and max values are simultaneously deleted.

One exception is the max value of the mean current value. The max value of the mean current value can also be directly deleted in the display menu by pressing Key 2 for a long time.

System frequency (Add 063)

In the UMG96S the system frequency is determined from the measuring-circuit voltage of phase L1. The scanning frequency for the current and voltage inputs is then calculated from the system frequency.

In the event of measurements with severely distorted voltages, the frequency of the fundamental voltage component can no longer be determined with sufficient accuracy. Voltage distortions occur e.g. during measurements in consumers, which are operated with a generalised phase control.

The corresponding system frequency should be specified as a fixed value for measuring-circuit voltages with severe distortions. Current distortions do not affect the frequency determination.

If the measuring-circuit voltage is missing, it is not possible to determine the system frequency and therefore neither can a scanning frequency be calculated. The acknowledgeable error message "500" appears. Voltage, current and all other resulting values are not calculated and are displayed as zero.

If the current is to be measured, even without a measuring-circuit voltage, the system frequency must be preselected as a fixed frequency at the UMG96S.

Determination of the system frequency can optionally be determined automatically or be programmed as a permanent, fixed value. The following settings are available for determination of the system frequency:

  0 - Automatic frequency determination
  1 - Fixed frequency default value of 50Hz
  2 - Fixed frequency default value of 60Hz

Active power demand

The UMG96S has four work meters. Three active power demand counters and one reactive power demand counters.

Add	Name
416	Total active power demand (without return block)
418	Total reactive power demand (inductive)
422	Total active power demand (imported or HT)
424	Total active power demand (supply or LT)

The **active power demand counters** at Add 422 and Add 424 can either record incoming supply and supply or HT and LT.

The switchover between incoming supply/supply and HT/LT is achieved via one of the digital inputs (option). In the default factory setting the active power demand counters record the imported and the delivered active power.

If one of the digital inputs is programmed for HT/LT switchover, the active power demand counters no longer record the imported and delivered active power, but instead the active power demand during the HT (high tariff) and LT (low tariff) time. The HT/LT switchover takes place via Address 071.

Add 071 = 0 => Active power demand counter **LT** active.

Add 071 = 1 => Active power demand counter **HT** active.
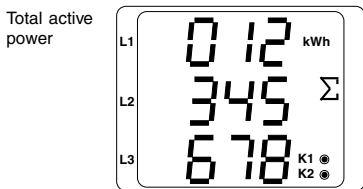
Total active power

The active power demand displayed in this example is: 12 345 678 kWh

Total active power HT/Imported supply
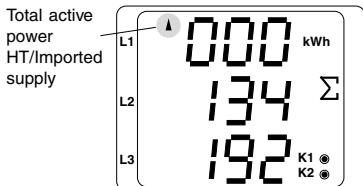
The active power demand displayed in this example is: 134 192 kWh

Current transformer (Add 600)

Current transformers with a secondary current of either 1A or 5A can be optionally connected to the UMG96S.

A current transformer of 5A/5A is programmed in the factory. In programming mode, the current transformer setting is denoted by the symbol "**CT**".

Example: Summation current transformer

Each current measurement is taken via a current transformer with a transformation ratio of 1000/5A and a current transformer with a transformation ratio of 200/5A. The summation measurement is performed with a 5+5/5A summation transformer.

The UMG96S must then be programmed with the following values:

Primary current:	1000A + 200A = **1200A**
Secondary current:	**5A**

Programming

In programming mode, use Key 2 to page to the current transformer setting. Use Key 1 to confirm the selection.

The first digit of the primary current flashes and can be changed using Key 2. If you press Key 1, the next digit is selected and flashes.

If the whole number flashes, the decimal point can be shifted.

Briefly press Key 2 - The decimal point is shifted to the right.

Press Key 2 for an extended time - The decimal point is shifted to the left.

If none of the digits are flashing any more, use Key 2 to switch to the display of the voltage transformer.

Current transformer, primary (600)

Primary current in kA

Current transformer, secondary (601)

Symbol for the current transformer ratio
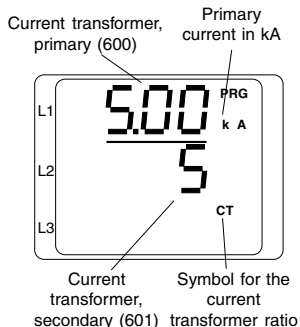
Voltage transformer (Add 602)
The voltage **phase conductor to phase conductor (L-L)** is given as the secondary and primary voltage in the display of the UMG96S. The transformation ratio is calculated from the programmable primary and secondary voltages.
A transformation ratio of one is set in the factory.
300V standard version: 400V/400V (148..520V)
150V special version: 100V/100V (85..260V)

In the 300V standard version, voltage transformers can be connected with the **secondary voltage** within the range 148V to 520V.

In programming mode, the voltage transformer setting is denoted by the symbol "**VT**".

Programming
In programming mode, use Key 2 to page to the voltage transformer setting. Use Key 1 to confirm the selection.

The first digit of the primary voltage flashes and can be changed using Key 2. If you press Key 1, the next digit is selected and flashes.
If the whole number flashes, the decimal point can be shifted.
If none of the digits are flashing any more, use Key 2 to switch to display and programming of the outputs.

Primary voltage in kV
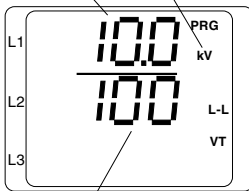
Secondary voltage in volts

Voltage transformer, primary (Add 602)

Voltage transformer,
secondary (Add 603)

Phase-to-phase

Symbol for the voltage
transformer ratio

Harmonics (Add 221)

Harmonics (harmonic components) are the integer multiple of a fundamental component. The UMG96S measures the fundamental component of the voltage within the range 45 to 65Hz. The harmonics of the voltages and currents calculated are then related to this fundamental component. If the voltages are severely distorted it is no longer possible to determine the fundamental component with sufficient accuracy. In order to nevertheless be able to calculate harmonics, a fixed fundamental frequency of 50Hz or 60Hz can be selected. Cf. also the „Scanning frequency" chapter.

The UMG96S calculates harmonics up to 15 times the fundamental component.

Partial harmonic component (Add 221)

In the rest of the manual, the individual harmonic components are called partial harmonic components.

The partial harmonic components for the currents are given in amperes and the partial harmonic components of the voltages in volts.

Number of the harmonic

Phase L3

Current harmonic
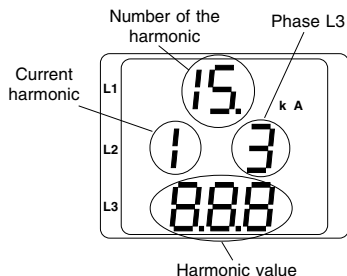
Harmonic value

In this example the 15th harmonic of the current in phase L3 is displayed.

Total harmonic distortion THD (Add 269)

The total harmonic distortion calculated in the UMG96S for current and voltage gives the ratio of the effective value of the distortion magnitude to the effective effective value of the periodic quantity. The total harmonic distortion is given in the UMG96S as a percentage.

Total harmonic distortion of the current THDI:

$$THD_I = \frac{\sqrt{I^2 - I_1^2}}{I} \times 100\%$$

Total harmonic distortion of the voltage THDU:

$$THD_U = \frac{\sqrt{U^2 - U_1^2}}{U} \times 100\%$$

Voltage, Phase L3-N
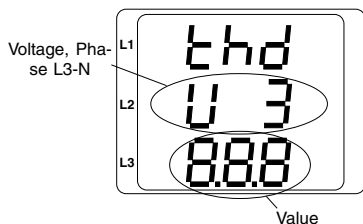
Value

In this example, the distortion factor or total harmonic distortion **THD** of the voltage from phase L3 is displayed.

Measured value paging

All the measured values are calculated once a second and can be called up in the measured value displays. Two methods are available for calling up the measured value displays:
- Automatically alternating representation of selected measured value displays, denoted here as measured value paging.
- Selecting a measured value display from a preselected display profile using the Keys 1 and 2.

Both methods are available simultaneously. Measured value paging is active if at least one measured value display and a change time larger than 0 seconds are programmed.
If a key is pressed, you can page through the measured value displays of the selected display profile. If neither of the keys is pressed for around 60 seconds, the device switches to measured value paging and the measured values of the display change profile selected from the programmed measured value displays are displayed one after the other.

Change time (Add 059)

Adjustment range: 0 .. 60 seconds
If 0 seconds is set, there is no change between the measured value displays selected for measured value paging.
The change time applies to all display change profiles.

Display change profiles (Add 061)

Adjustment range: 0 .. 3
0 - display change profile No. 0, pre-assigned.
1 - display change profile No. 1, pre-assigned.
2 - display change profile No. 2, pre-assigned.
3 - display change profile No. 3, customer specific. Can only be programmed using GridVis.

Display change profile No. 0
(cf. also Page 86 to 89)

A	B	C	D	E	F	G	H			
01	x		x	x						
02	x		x	x						
03	x	x	x	x						
04	x	x	x	x						
05	x	x	x							
06	x	x	x	x						
07	x	x	x							
08	x	x	x							
09	x	x	x							
10	x	x	x							
11	x	x	x							
12	x	x	x							
13	x	x	x							
14	x	x	x							
15	x									
16	x	x								
17	x									
18	x	x	x							
19	x									
20	x	x	x	x	x	x	x	x		
21	x	x	x	x	x	x	x	x	x	x
22	x	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x	x	x	x	x
24	x	x	x	x	x	x	x	x	x	x
25	x	x	x	x	x	x	x	x	x	x
26	x	x	x	x	x	x	x	x	x	x
27	x	x	x	x	x	x	x	x	x	x
28	x	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x	x
31	x	x	x	x	x	x	x	x	x	x
32	x	x	x	x	x	x	x	x	x	x

In the overview of the measured value displays, „A01" corresponds to the measured values of voltages L-N.

Display change profile No. 1
(cf. also Page 86 to 89)

A	B	C	D	E	F	G	H		
01	x		x	x					
02	x		x	x					
03	x	x	x	x					
04	x	x	x	x					
05	x	x	x						
06	x	x	x	x					
07	x	x	x						
08	x	x	x						
09	x	x	x						
10	x	x	x						
11	x	x	x						
12	x	x	x						
13	x	x	x						
14	x	x	x						
15	x								
16	x	x							
17	x								
18	x	x	x						
19	x								
20	x	x	x	x	x	x	x	x	
21	x	x	x	x	x	x	x	x	x
22	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x	x	x	x
24	x	x	x	x	x	x	x	x	x
25	x	x	x	x	x	x	x	x	x
26	x	x	x	x	x	x	x	x	x
27	x	x	x	x	x	x	x	x	x
28	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x
31	x	x	x	x	x	x	x	x	x
32	x	x	x	x	x	x	x	x	x

Display change profile No. 2
(cf. also Page 86 to 89)

A	B	C	D	E	F	G	H		
01	x		x	x					
02	x		x	x					
03	x	x	x	x					
04	x	x	x	x					
05	x	x	x						
06	x	x	x	x					
07	x	x	x						
08	x	x	x						
09	x	x	x						
10	x	x	x						
11	x	x	x						
12	x	x	x						
13	x	x	x						
14	x	x	x						
15	x								
16	x	x							
17	x								
18	x	x	x						
19	x								
20	x	x	x	x	x	x	x	x	
21	x	x	x	x	x	x	x	x	x
22	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x	x	x	x
24	x	x	x	x	x	x	x	x	x
25	x	x	x	x	x	x	x	x	x
26	x	x	x	x	x	x	x	x	x
27	x	x	x	x	x	x	x	x	x
28	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x
31	x	x	x	x	x	x	x	x	x
32	x	x	x	x	x	x	x	x	x

Display change profile No. 3 (Add 605)
The customer-specific display change profile No.3 can only be configured using the PC software **GridVis** and not directly at the UMG96S. This requires a connection between UMG96S and PC via a serial interface (RS232 or RS485).

Format
Format of the display change profile:
STRING
  Byte 1 = row 1,
      Bit1 =1st measured value table,
      Bit2 = 2nd measured value table,
      ...
      Bit8 = 8th measured value table,
  Byte 2 = row 2,
      Bit1 = 1st measured value table,
      Bit2 = 2nd measured value table,
      ...
      Bit8 = 8th measured value table,
...
  Byte 32 = row 32,
      Bit1 = 1st measured value table,
      Bit2 = 2nd measured value table,
      ....
      Bit8 = 8th measured value table,

Display change profile No. 3
(customer-specific, can only be set via PC!)

A	B	C	D	E	F	G	H		
01	x		x	x					
02	x		x	x					
03	x	x	x	x					
04	x	x	x	x					
05	x	x	x						
06	x	x	x	x					
07	x	x	x						
08	x	x	x						
09	x	x	x						
10	x	x	x						
11	x	x	x						
12	x	x	x						
13	x	x	x						
14	x	x	x						
15	x								
16	x	x							
17	x								
18	x	x	x						
19	x								
20	x	x	x	x	x	x	x	x	
21	x	x	x	x	x	x	x	x	x
22	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x	x	x	x
24	x	x	x	x	x	x	x	x	x
25	x	x	x	x	x	x	x	x	x
26	x	x	x	x	x	x	x	x	x
27	x	x	x	x	x	x	x	x	x
28	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x
31	x	x	x	x	x	x	x	x	x
32	x	x	x	x	x	x	x	x	x

Measured value displays

After a system recovery, the UMG96S displays the first measured value table from the current displays profile. In order to keep selection of the measured values to be displayed manageable and clear, only part of the measured values available are pre-programmed in the factory for calling up in the measured value display. If other measured values are required in the display of the UMG96S, another displays profile can be selected.

In the overview of the measured value displays, „A01" corresponds to the measured values of voltages L-N.

Displays profile No. 0
(cf. also Page 86 to 89)

Displays profile (Add 060)

Adjustment range: 0 .. 3
- 0 - displays profile No. 0, fixed pre-assigned default.
- 1 - displays profile No. 1, fixed pre-assigned default.
- 2 - displays profile No. 2, fixed pre-assigned default.
- 3 - displays profile No. 3, customer-specific.

The UMG96S is supplied by the factory with the displays profile 1. The customer-specific displays profile No. 3 can only be programmed using the PC software GridVis.

Displays profile No. 1
(cf. also Page 86 to 89)

A	B	C	D	E	F	G	H		
01	x		x	x					
02	x		x	x					
03	x	x	x	x					
04	x	x	x	x					
05	x	x	x						
06	x	x	x	x					
07	x	x	x						
08	x	x	x						
09	x	x	x						
10	x	x	x						
11	x	x	x						
12	x	x	x						
13	x	x	x						
14	x	x	x						
15	x								
16	x	x							
17	x								
18	x	x	x						
19	x								
20	x	x	x	x	x	x	x	x	
21	x	x	x	x	x	x	x	x	x
22	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x	x	x	x
24	x	x	x	x	x	x	x	x	x
25	x	x	x	x	x	x	x	x	x
26	x	x	x	x	x	x	x	x	x
27	x	x	x	x	x	x	x	x	x
28	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x
31	x	x	x	x	x	x	x	x	x
32	x	x	x	x	x	x	x	x	x

Displays profile No. 1

A	B	C	D	E	F	G	H		
01	x		x	x					
02	x		x	x					
03	x	x	x	x					
04	x	x	x	x					
05	x	x	x						
06	x	x	x	x					
07	x	x	x						
08	x	x	x						
09	x	x	x						
10	x	x	x						
11	x	x	x						
12	x	x	x						
13	x	x	x						
14	x	x	x						
15	x								
16	x	x							
17	x								
18	x	x	x						
19	x								
20	x	x	x	x	x	x	x	x	
21	x	x	x	x	x	x	x	x	x
22	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x	x	x	x
24	x	x	x	x	x	x	x	x	x
25	x	x	x	x	x	x	x	x	x
26	x	x	x	x	x	x	x	x	x
27	x	x	x	x	x	x	x	x	x
28	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x
31	x	x	x	x	x	x	x	x	x
32	x	x	x	x	x	x	x	x	x

Displays profile No. 2
(cf. also Page 86 to 89)

A	B	C	D	E	F	G	H		
01	x		x	x					
02	x		x	x					
03	x	x	x	x					
04	x	x	x	x					
05	x	x	x						
06	x	x	x	x					
07	x	x	x						
08	x	x	x						
09	x	x	x						
10	x	x	x						
11	x	x	x						
12	x	x	x						
13	x	x	x						
14	x	x	x						
15	x								
16	x	x							
17	x								
18	x	x	x						
19	x								
20	x	x	x	x	x	x	x	x	
21	x	x	x	x	x	x	x	x	x
22	x	x	x	x	x	x	x	x	x
23	x	x	x	x	x	x	x	x	x
24	x	x	x	x	x	x	x	x	x
25	x	x	x	x	x	x	x	x	x
26	x	x	x	x	x	x	x	x	x
27	x	x	x	x	x	x	x	x	x
28	x	x	x	x	x	x	x	x	x
29	x	x	x	x	x	x	x	x	x
30	x	x	x	x	x	x	x	x	x
31	x	x	x	x	x	x	x	x	x
32	x	x	x	x	x	x	x	x	x

Measured value displays profile (Add 604)
The customer-specific measured value displays profile No. 3 can only be configured using the PC software GridVis and not directly at the UMG96S. This requires a connection between UMG96S and PC via a serial interface (RS232).

Format of the measured value displays profile:
STRING
  Byte 1 = row 1,
      Bit1 = 1st measured value table,
      Bit2 = 2nd measured value table,
      ....
      Bit8 = 8th measured value table,
  Byte 2 = row 2,
      Bit1 = 1st measured value table,
      Bit2 = 2nd measured value table,
      ....
      Bit8 = 8th measured value table,
  ....
  Byte 32 = row 2,
      Bit1 = 1st measured value table,
      Bit2 = 2nd measured value table,
      ....
      Bit8 = 8th measured value table,

User password (Add 011)

A user password can be programmed to make it difficult for the programming data to be accidentally changed. It is only possible to switch to the subsequent programming menus after the correct user password has been entered.

A default user password is not pre-assigned in the factory. In this case the password menu is skipped and the current transformer menu opens immediately.

If a user password has been programmed the password menu appears with the display "000". The first digit of the user password flashes and can be changed using Key 2. If you press Key 1, the next digit is selected and flashes.

The programming menu for the current transformer only opens if the correct number combination has been entered.

If an altered user password is no longer remembered, the device must be sent to the manufacturer.

Delete work (Add 009)

The UMG96S has four work meters. Three active power demand counters and one reactive power demand counters.

Add	Name
416	Total active power demand (without return block)
418	Total reactive power demand (inductive)
422	Total active power demand (imported or HT)
424	Total active power demand (supply or LT)

The work meters can only be deleted jointly. To delete the contents of the work meters, „001" must be written in the Address 009.

Phase sequence (Add 277)

The phase sequence of the voltages and the frequency of phase L1 are shown in a display. The phase sequence indicates the phase sequence in three-phase systems. A "right rotating field" usually exists.

In the UMG96S the phase sequence is tested and displayed at the voltage measurement inputs. A movement of the character string in a clockwise direction means a "right rotating field" and a movement in an anti-clockwise direction means a "left rotating field".

The rotating field direction (phase sequence) is only determined if the measuring-circuit and operating voltage inputs have been fully connected. If a phase is missing or if two equal phases are connected, the phase sequence is not determined and the character string is in the display.

LCD contrast (Add 012)

The preferred viewing direction for the LCD display is from „below". The LCD contrast of the LCD display can be adjusted by the user. The contrast can be adjusted within the range from 0 to 7 in steps of 1. The contrast is set to 3 in the factory.

    0 = characters very dark
    7 = characters very bright

In order to obtain an optimum contrast over the whole operating temperature range, the internal temperature of the device is measured and the contrast is automatically corrected. This correction is not displayed in the contrast setting .

System frequency
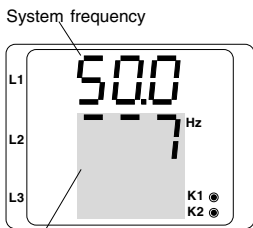
Phase sequence display

System frequency
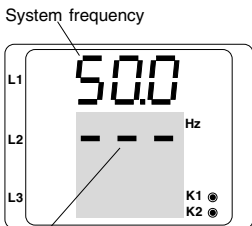
Unable to determine phase sequence

Time recording
The UMG96S records the operating hours of the UMG96S and the total running time of each comparator. The time is measured with a resolution of 0.1h and is displayed in hours.
The times are denoted with the digits 0 to 6 for query via the measured value displays:
0 = Operating hours meter (Add 394)
1 = Total running time, comparat. 1A (Add 396)
2 = Total running time, comparat. 2A (Add 398)
3 = Total running time, comparat. 1A (Add 400)
4 = Total running time, comparat. 2A (Add 402)
5 = Total running time, comparat. 1A (Add 404)
6 = Total running time, comparat. 2A (Add 406)

Maximum 99999.9 h (=11.4 years) can be shown in the measured value display.

Operating hours meter
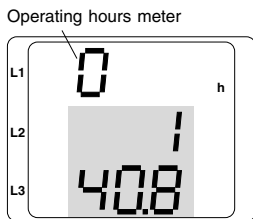
Example:
Operating hours meter measured value display
*The UMG96S displays the number **140.8h** in the operating hours meter. This equates to 140 hours and 80 industrial minutes.*
100 industrial minutes equal 60 minutes.
In this example the 80 industrial minutes therefore equal 48 minutes.

Operating hours meter (Add 394)
The operating hours meter measures the time during which the UMG96S records and displays measured values. The operating hours meter cannot be reset.

Total comparator running time
The total running time of a comparator is the sum of all the times during which a limit violation existed in the comparator result. The total running time of each comparator can be individually reset.

Serial number (Add 911)
The serial number displayed by the UMG96S has 6 digits and is part of the serial number displayed on the rating plate.
The serial number cannot be changed.
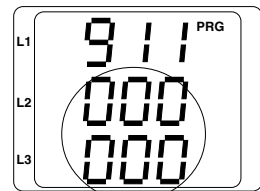
Displayed serial number

XX00-0000

Serial number on the rating plate

Software release (Add 913)

The software for the UMG96S is continuously improved and enhanced. The software status in the device is denoted with a 3-digit number, the software release. The user cannot change the software release.

Hardware configuration (Add 914)

The options available in the UMG96S can be queried via the address 914. One bit is set for each available option. This results in a binary value which is displayed as a decimal number by the UMG96S.

Option		Name
Hex	Binary	
0x01	0000 0001	Memory (EEPROM)
0x02	0000 0010	Clock
0x04	0000 0100	Analog output 1/2
0x08	0000 1000	Digital output or
		Pulse output 1/2
0x10	0001 0000	Digital input 1/2
0x20	0010 0000	Profibus
0x40	0100 0000	RS232
0x80	1000 0000	RS485

Example 1

The UMG96S displays the decimal value **96** at Address 914.

96 = 0x60 = 0110 0000

Profibus option
RS232 option

Address = 914

Value = **96**
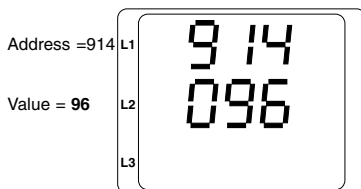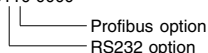
Example 2

The UMG96S displays the decimal value **248** at Address 914.

248 = 0xf8 = 1111 1000

Digital output 1/2
Digital input 1/2
Profibus
RS232
RS485
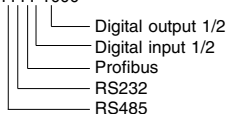
Serial interfaces

The various design versions of the UMG96S have up to three serial interfaces.

    Profibus DP
    RS232

The serial interfaces are not isolated from each other. The profibus interface can be run simultaneously with the RS232 interface.

Modem mode (Add 070)

An analog modem can be connected to the UMG96S via the RS232 interface. In order for the UMG96S to be able to transmit data via an analog modem, the address 070 must be assigned the value 1.

Address 070 = 0 => Modem mode = No
Address 070 = 1 => Modem mode = Yes

The RS232 interface is connected with the analog modem by a modem cable (option). The modem cable, Product No. 08.01.503, is not included in the scope of supply of the RS232 interface (option).
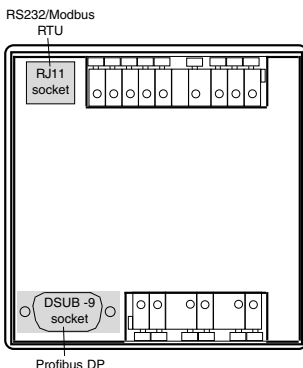
Fig. Back of the UMG96S.

Device address (Add 000)

If several devices are connected to each other via profibus interface, a master device (PC, programmable controller) can only differentiate between these devices by means of their device address. Therefore, each UMG96S within a system must have a different device address. Device addresses within the range 0 to 255 can be set.

Profibus only uses device addresses within the range 0 to 126.

Baud rate (Add 001)

A common baud rate can be set for the RS232 and RS485 interfaces.

Baud rate   : 9.6, 19.2 and 38.4kBit/s
Data bits   : 8
Parity   : none
Stop bits (UMG96S) : 2
Stop bits (external) : 1 or 2

MODBUS RTU

The data from the parameter and measured value list can be accessed via the MODBUS RTU protocol.

Transmission parameters
RTU mode with CRC check.

Functions realised
Read holding register, function 03
Preset multiple registers, function 16

The byte order is high byte before low byte.

⚠ **Important!**
Maximum 120 bytes only can be read out into a block!

Example: Reading out the voltage L1-N
The voltage L1-N is stored in the measured value list under the address 200. The voltage L1-N is stored in INT format.
The device address of the UMG96S is assumed to be address = 01 here.

The „Query Message" is then as follows:

Name	Hex	Note
Device address	01	UMG96S, Address = 1
Function	03	„Read Holding Reg."
Start add Hi	00	0200dec = 00C8hex
Start add Lo	C8	
No. of val. Hi	00	2dec = 0002hex
No. of val. Lo	02	
Error check	-	

The „response" of the UMG96S may then look like this:

Name	Hex	Note
Device address	01	UMG96S, Address = 1
Function	03	
Byte counter	06	
Data	00	**00**hex = 00dec
Data	E6	**E6**hex = 230dec
Error check (CRC)	-	

The voltage L1-N read back from address 0200 is 230V.

RS232 interface

The achievable distance between two RS232 devices depends on the cable used and the baud rate. As a guideline measurement, for a transmission rate of 9600 baud the distance should not exceed 15m to 30m.

The permissible ohmic load must be larger than 3 kOhm and the capacitive load caused by the transmission cable must be smaller than 2500 pF.

With the PC cable for the RS232 interface (2m) (optionally available) the maximum baud rate is 38,4kBit/s.

UMG96S

Master board

Comparator group 1

Input/Output 1 (002)

Pulse output Wp (002 = 0)

Digital output (002 = 1)

Analog output (002 = 2)

Digital input (002 = 3.5)

Remote profibus (002 = 4)

11

12

Comparator group 2

Input/Output 2 (003)

Pulse output Wq (003 = 0)

Digital output (003 = 1)

Analog output (003 = 2)

Digital input (003 = 3.5)

Remote profibus (003 = 4)

13

Serial interface

RS232 (MODBUS RTU) Interface

TXD

RXD

GND

RJ11 socket

Connection examples
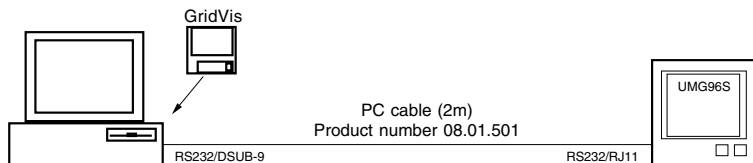
Fig. Connect the UMG96S with a PC via a PC cable.
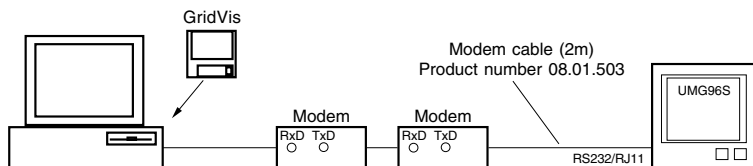
Fig. Connect UMG96S with a PC via modem.

PC cable
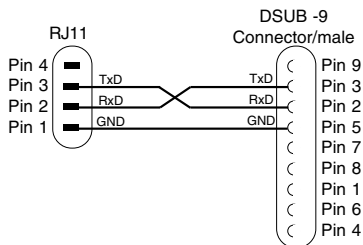
Fig. PC cable, Product No. 08.01.501 (2m)

Modem cable
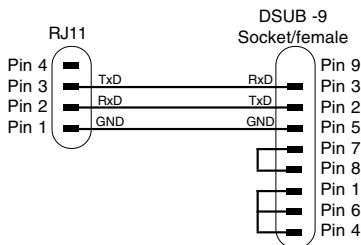
Fig. Modem cable, Product No. 08.01.503 (2m)

Profibus DP

The UMG96S has a 9-pin SubD socket in the rear panel. A RS485 interface with which the profibus DP protocol is operated is wired to the socket. Up to 32 subscribers can be connected to the RS485 interface in the bus structure. A repeater must be connected between these in order to connect more subscribers.

The baud rate is automatically determined between the bus - subscribers and does not have to be set at the UMG96S.

Device master file
The device master file for the UMG96S is called „U96S0781.GSD".

⚠ **Important!**
The RS232 interface and the profibus interface are not isolated from each other.
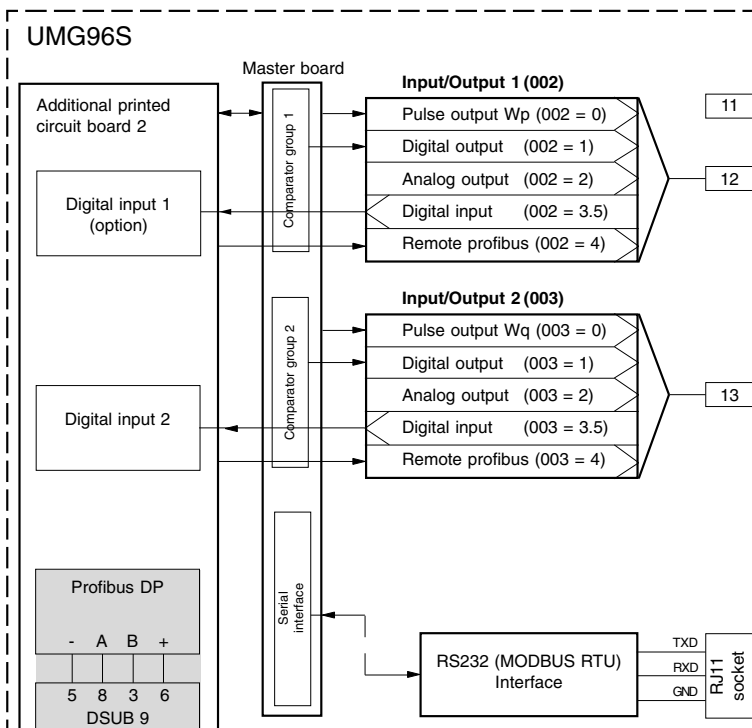
Cable length

The maximum permissible cable length depends on the type of cable and the transmission rate level. The length of the cable is measured between the bus driver of the first device and the bus driver of the last device.

We recommend you only use shielded cables which conform to the standard EN50170-2 cable type A. This type of cable is offered by all leading cable manufacturers.

Permissible cable lengths if using cable type A.

Transmission rate [kBit/s]	9.6	19.2	45.45	93.75	187.5	500	1500
Cable length [m]	1200	1200	1200	1200	1000	400	200

Terminating resistances

Each bus segment must be terminated at the end with terminating resistances. The terminating resistances are already contained in the connectors of some manufacturers and can be optionally cut in.

Fig. Bus connection for Profibus DP

⚠ **Important!**
If the supplying voltage for the terminating resistances is taken from the UMG96S, the profibus is short-circuited, if the UMG96S no longer receives an adequate voltage supply.
Communication on the profibus collapses.
To prevent this, the terminating resistances must be added to the +5V and GND independently of the device.

Profibus profiles

Very many measured values are available in the UMG96S for further processing. In order to keep the amount of data to be transferred via the profibus low, only a selection of the possible measured values are transferred from the UMG96S. Selected measured values are summarised in 16 different profiles. It is not possible to program customer-specific profiles. *The profiles are called profile number 1 to 16.*

If a specific profile is required from the profibus master, the required profile number is written in the 1st byte of the output area of the programmable controller. The UMG96S supplies the current profile number and the conditions of the three comparators in the first 2 bytes in the input area of the programmable controller. This is followed by the profile content.

If all the measured values of a profile are not required, it is also possible to fetch only the initial measured values from a profile.

The two outputs of the UMG96S can be set via the 2nd byte from the output area of the programmable controller. Here the values mean the following:

Output 1 = Input/Output 1 = Terminal 12
Output 2 = Input/Output 2 = Terminal 13

Profile formats

The measured values in the 14 profiles are in integer format and can be called up in floating decimal point format. In addition, the formats can be delivered with „high before low bytes" or „low before high bytes".

Measured values in integer format (2 or 4 bytes) do not contain any current and voltage transformer ratios. Measured values in floating decimal point format (4Byte) already contain the current and voltage transformer ratios.

Profibus profile No.	Format
1..14 1..14 + 31	Integer format Floating formats (4 bytes)

Table: Measured values „low before high bytes"

Profibus profile No.	Format
1..14 + 128 1..14 + 31 + 128	Integer format Floating formats (4 bytes)

Table: Measured values „high before low bytes"
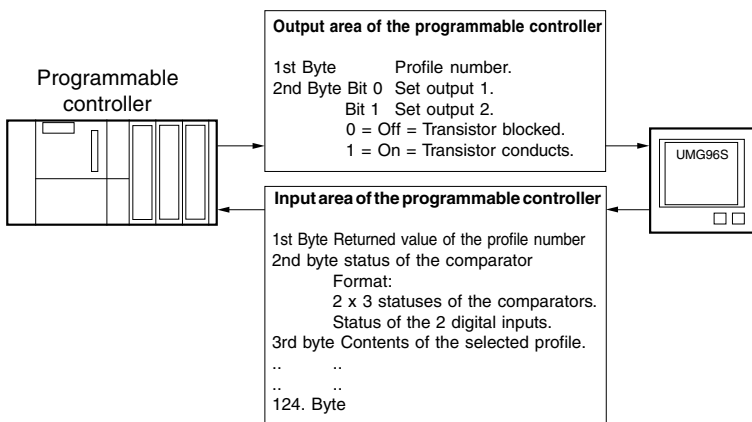
Fig. Data transfer programmable controller - UMG96S.

„Profibus profiles" lists, integer format

Profibus profile No. 1

Value	Bytes
Q1	2
Q2	2
Q3	2
S1	2
S2	2
S3	2
Frequency	2
Uln L1	2
Uln L2	2
Uln L3	2
UL1-L2	2
UL2-L3	2
UL1-L3	2
IL1	2
IL2	2
IL3	2
P1	2
P2	2
P3	2
Cos-phi L1	2
Cos-phi L2	2
Cos-phi L3	2
thd_u_L1	2
thd_u_L2	2
thd_u_L3	2
tdh_i_L1	2
thd_i_L2	2
thd_i_L3	2
Total	**56**bytes

Profibus profile No. 2

Value	Bytes
Uln L1	2
Uln L2	2
Uln L3	2
UL1-L2	2
UL2-L3	2
UL1-L3	2
IL1	2
IL2	2
IL3	2
P1	2
P2	2
P3	2
Cos-phi L1	2
Cos-phi L2	2
Cos-phi L3	2
Frequency	2
P_total	2
Q_total	2
S_total	2
Cos_phi_total	2
I_total	2
Active power demand (416)	4
Reactive power demand	4
thd_u_L1	2
thd_u_L2	2
thd_u_L3	2
tdh_i_L1	2
thd_i_L2	2
thd_i_L3	2
Total	62 bytes

Profibus profile No. 3

Value	Bytes
eeprom_timer	4
Comp_timer_1	4
Comp_timer_2	4
Comp_timer_3	4
Comp_timer_4	4
Comp_timer_5	4
Comp_timer_6	4
Total	28 bytes

Profibus profile No. 4

Value	Bytes
I_with_L1	2
I_with_L2	2
I_with_L2	2
P_with_L1	2
P_with_L2	2
P_with_L3	2
Q_with_L1	2
Q_with_L2	2
Q_with_L3	2
S_with_L1	2
S_with_L2	2
S_with_L3	2
P_total_with	2
Q_total_with	2
I_total_with	2
S_total_with	2
phi_total_with	2
Total	34 bytes

Profibus profile No. 5

Value	Bytes
P_total	2
Q_total	2
S_total	2
Cos_phi_total	2
I_total	2
Active power dem. (422)	4
Active power dem. (424)	4
Reactive power dem.	4
Active power dem. (416)	4
Total	26 bytes

Profibus profile No. 6

Value	Bytes
ct_prim	2
ct_sec	2
vt_prim	2
vt_sec	2
rotating field	2
eeprom_timer	4
Comp_timer_1	4
Comp_timer_2	4
Comp_timer_3	4
Comp_timer_4	4
Comp_timer_5	4
Comp_timer_6	4
Total	38 bytes

Profibus profile No.7

Value	Bytes
Active power dem. (422)	4
Active power dem. (424)	4
Active power dem. (416)	4
Reactive power demand	4
eeprom_timer	4
Total	20 bytes

Important!
The units and resolution of the measured values are given in the measured value list.

Important!
In the profibus profile **No. 32** (float format), each measured value is transferred with 4 bytes.

Important!
In the profibus profile **No. 33**, the measured values active power demand, reactive power demand, P_total, Q_total and S_total are transferred smaller by a factor of 10.

Profibus profile No. 8		Profibus profile No. 9		Profibus profile No. 10		Profibus profile No. 11	
Value	Bytes	Value	Bytes	Value	Bytes	Value	Bytes
thd_i_L1	2	thd_u_L1	2	tdh_i_L1	2	dft_i_9_L1	2
thd_i_L2	2	thd_u_L2	2	thd_i_L2	2	dft_i_9_L2	2
thd_i_L3	2	thd_u_L3	2	thd_i_L3	2	dft_i_9_L3	2
dft_i_1_L1	2	dft_u_1_L1	2	thd_u_L1	2	dft_u_9_L1	2
dft_i_1_L2	2	dft_u_1_L2	2	thd_u_L2	2	dft_u_9_L2	2
dft_i_1_L3	2	dft_u_1_L3	2	thd_u_L3	2	dft_u_9_L3	2
dft_i_3_L1	2	dft_u_3_L1	2	dft_i_3_L1	2	dft_i_11_L1	2
dft_i_3_L2	2	dft_u_3_L2	2	dft_i_3_L2	2	dft_i_11_L2	2
dft_i_3_L3	2	dft_u_3_L3	2	dft_i_3_L3	2	dft_i_11_L3	2
dft_i_5_L1	2	dft_u_5_L1	2	dft_u_3_L1	2	dft_u_11_L1	2
dft_i_5_L2	2	dft_u_5_L2	2	dft_u_3_L2	2	dft_u_11_L2	2
dft_i_5_L3	2	dft_u_5_L3	2	dft_u_3_L3	2	dft_u_11_L3	2
dft_i_7_L1	2	dft_u_7_L1	2	dft_i_5_L1	2	dft_i_13_L1	2
dft_i_7_L2	2	dft_u_7_L2	2	dft_i_5_L2	2	dft_i_13_L2	2
dft_i_7_L3	2	dft_u_7_L3	2	dft_i_5_L3	2	dft_i_13_L3	2
dft_i_9_L1	2	dft_u_9_L1	2	dft_u_5_L1	2	dft_u_13_L1	2
dft_i_9_L2	2	dft_u_9_L2	2	dft_u_5_L2	2	dft_u_13_L2	2
dft_i_9_L3	2	dft_u_9_L3	2	dft_u_5_L3	2	dft_u_13_L3	2
dft_i_11_L1	2	dft_u_11_L1	2	dft_i_7_L1	2	dft_i_15_L1	2
dft_i_11_L2	2	dft_u_11_L2	2	dft_i_7_L2	2	dft_i_15_L2	2
dft_i_11_L3	2	dft_u_11_L3	2	dft_i_7_L3	2	dft_i_15_L3	2
dft_i_13_L1	2	dft_u_13_L1	2	dft_u_7_L1	2	dft_u_15_L1	2
dft_i_13_L2	2	dft_u_13_L2	2	dft_u_7_L2	2	dft_u_15_L2	2
dft_i_13_L3	2	dft_u_13_L3	2	dft_u_7_L3	2	dft_u_15_L3	2
dft_i_15_L1	2	dft_u_15_L1	2	**Total** 48 bytes		**Total** 48 bytes	
dft_i_15_L2	2	dft_u_15_L2	2				
dft_i_15_L3	2	dft_u_15_L3	2				
Total 54 bytes		**Total** 54 bytes					

Profibus profile No. 12		Profibus profile No. 13		Profibus profile No. 14	
Value	Bytes	Value	Bytes	Value	Bytes
P_total_max	2	thd_i_L1_max	2	thd_u_L1_max	2
P_total_max_with	2	thd_i_L2_max	2	thd_u_L2_max	2
I_total_max	2	thd_i_L3_max	2	thd_u_L3_max	2
I_total_max_with	2	dft_i_1_L1_max	2	dft_u_1_L1_max	2
phi_total_max	2	dft_i_1_L2_max	2	dft_u_1_L2_max	2
S_total_max	2	dft_i_1_L3_max	2	dft_u_1_L3_max	2
Q_total_max	2	dft_i_3_L1_ma	2	dft_u_3_L1_max	2
Uln L1_max	2	dft_i_3_L2_ma	2	dft_u_3_L2_max	2
Uln L2_max	2	dft_i_3_L3_ma	2	dft_u_3_L3_max	2
Uln L1_max	2	dft_i_5_L1_ma	2	dft_u_5_L1_max	2
Uln L1_min	2	dft_i_5_L2_ma	2	dft_u_5_L2_max	2
Uln L2_min	2	dft_i_5_L3_ma	2	dft_u_5_L3_max	2
Uln L2_min	2	dft_i_7_L1_ma	2	dft_u_7_L1_max	2
UL1-L2_max	2	dft_i_7_L2_ma	2	dft_u_7_L2_max	2
UL2-L3_max	2	dft_i_7_L3_ma	2	dft_u_7_L3_max	2
UL1-L3_max	2	dft_i_9_L1_max	2	dft_u_9_L1_max	2
UL1-L2_min	2	dft_i_9_L2_max	2	dft_u_9_L2_max	2
UL2-L3_min	2	dft_i_9_L3_max	2	dft_u_9_L3_max	2
UL1-L3_min	2	dft_i_11_L1_max	2	dft_u_11_L1_max	2
IL1_max	2	dft_i_11_L2_max	2	dft_u_11_L2_max	2
IL2_max	2	dft_i_11_L3_max	2	dft_u_11_L3_max	2
IL3_max	2	dft_i_13_L1_max	2	dft_u_13_L1_max	2
P1_max	2	dft_i_13_L2_max	2	dft_u_13_L2_max	2
P2_max	2	dft_i_13_L3_max	2	dft_u_13_L3_max	2
P3_max	2	dft_i_15_L1_max	2	dft_u_15_L1_max	2
Q1_max	2	dft_i_15_L2_max	2	dft_u_15_L2_max	2
Q2_max	2	dft_i_15_L3_max	2	dft_u_15_L3_max	2
Q3_max	2	**Total** 54 bytes		**Total** 54 bytes	
S1_max	2				
S2_max	2				
S3_max	2				
Total 62 bytes					

Inputs and outputs

The terminals 12 and 13 at the UMG96S can be optionally assigned the following functions:

- 0 = Pulse output,
- 1 = Digital output,
- 2 = Analog output (option),
- 3 = Digital input (option),
- 4 = Profibus remote output (option),
- 5 = HT/LT switchover via a Digital input (option),
- 6 = Synchronisation of storage of memory profile 1 via a Digital input (option).

The required function (0..6) is written in the address 002 corresponding to terminal 12 or address 003 corresponding to terminal 13.
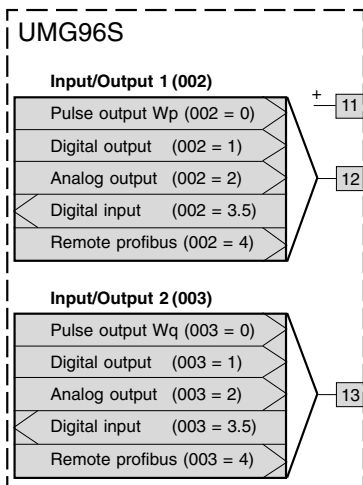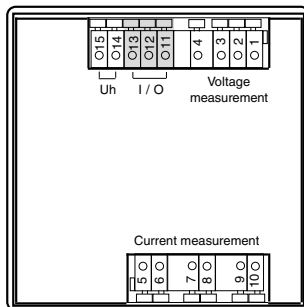
It is not possible to simultaneously use different functions on one terminal. It is possible to simultaneously use different functions on different terminals. In this case is must be ensured that the common imported supply for terminals 12 and 13 is applied to terminal 11(+).

Possible input and output combinations:
- a) 2 digital outputs,
- b) 2 digital inputs,
- c) 2 analog outputs,
- d) 1 digital output and 1 analog output,
- e) 1 digital output and 1 digital input.

UMG96S

Input/Output 1 (002)

Pulse output Wp (002 = 0)

Digital output (002 = 1)

Analog output (002 = 2)

Digital input (002 = 3.5)

Remote profibus (002 = 4)

+ 11

12

Input/Output 2 (003)

Pulse output Wq (003 = 0)

Digital output (003 = 1)

Analog output (003 = 2)

Digital input (003 = 3.5)

Remote profibus (003 = 4)

13

Status displays

The status of the switching inputs and outputs is denoted in the UMG96S's display by circular symbols.
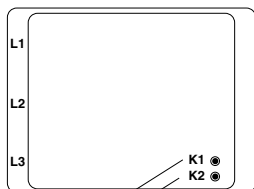
Status at terminal 12
Status at terminal 13

Statuses at the digital input:

- ○ A maximum voltage of 2V is applied.
- ◉ A voltage larger than 20V is applied.

The status of the digital input is not defined for voltages within the range from 2V to 20V.

Statuses of a digital output:

- ○ A current <1mA can flow.
- ◉ A current of up to 5mA can flow.

Pulse output

Each digital output can be used as a pulse output. Pulse output 1 can only output the active power demand Wp and pulse output 2 can only output the reactive power demand Wq.

The pulse value of both pulse outputs can be separately set via the parameter addresses 004 and 006.

The minimum pulse length applies to both pulse outputs and can be set using the parameter address 010.

The pulses collected within a second are output with the programmed pulse length and a maximum frequency of 10Hz.

If the measured work (power demand) exceeds the set pulse value, so that the maximum frequency of the pulse output is exceeded, the remaining pulses are temporarily stored and are output later. Temporarily stored pulses are lost by a mains failure.
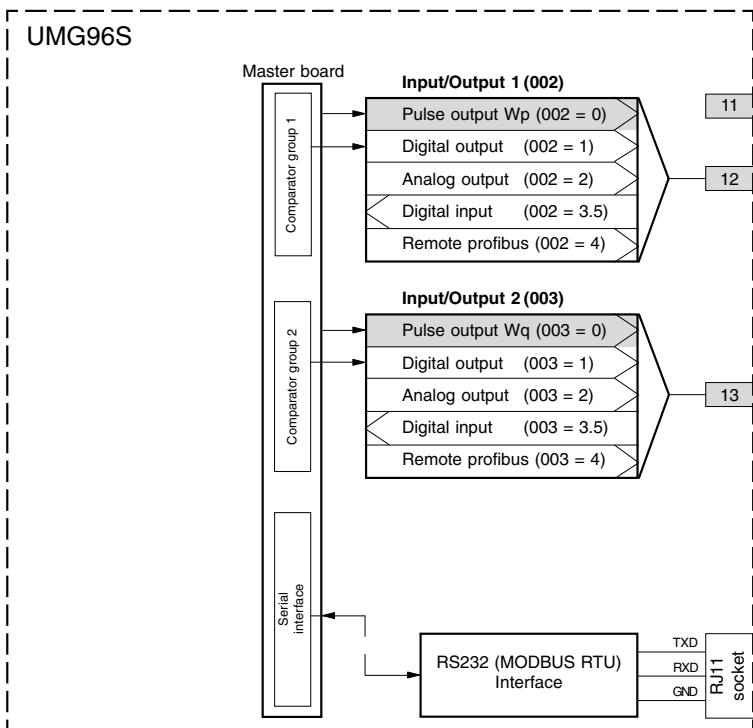
Minimum pulse length (Add 010)

The minimum pulse length can be adjusted in 10ms steps within a range from 50ms up to 1000ms. The shortest interpulse period equals the programmed minimum pulse length.

For a minimum pulse length of 50ms, the maximum pulse frequency is 10Hz. If fewer pulses have to be output the interpulse period is lengthened. The pre-programmed minimum pulse length, e.g. 50ms remains constant.
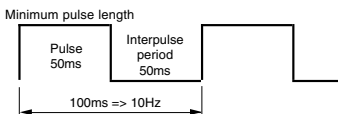
Fig. Maximum pulse frequency for a minimum pulse length of 50ms.
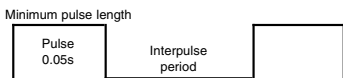
Fig. Pulse frequency <10Hz for a minimum pulse length of 50ms.

Pulse value

The pulse value denotes how much work (power demand - Wh or kvarh) a pulse equals.

$$\text{Impulswertigkeit} = \frac{\text{Arbeit}}{\text{max. Impulsfrequenz} * 3600s}$$

Impulswertigkeit in Wh pro Impuls
Arbeit in Wh
Maximale Impulsfrequenz in Hz

The pulse value must not be confused with the meter constant. The meter constant is given in

Meter constant = revolutions per kWh

.

The relationship between pulse value and meter constant can be seen in the following equations:

Meter constant = 1 / pulse value
Pulse value = 1 / meter constant

⚠ **Important!**
The pulse intervals are **not** proportional to the power output.

⚠ **Important!**
As the active power demand counter operates with a **return block**, pulses are only output during the imported supply of electrical power.
As the reactive power demand counter operates with a **return block**, pulses are only output during an inductive load.

The UMG96S is to measure measure the active power demand in a sub-distribution and forwarded to a data collector via the pulse output. The sub-distribution supplies consumers which together require a maximum 400kW active power. The data collector can record pulse frequencies up to 50Hz.

The **pulse output**, the **minimum pulse length** and the **pulse value** must be programmed at the UMG96S.

External Operating voltage
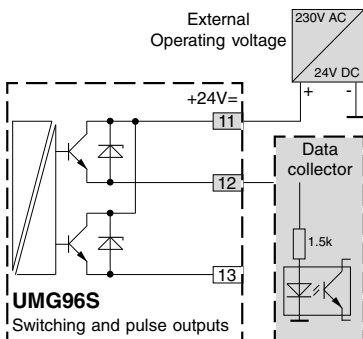
Fig.: Connection example for wiring terminals 11 to 13 as pulse output.

1.) Select pulse output
Assign terminal 12 the pulse output function.
Input/Output 1 Add 002=0
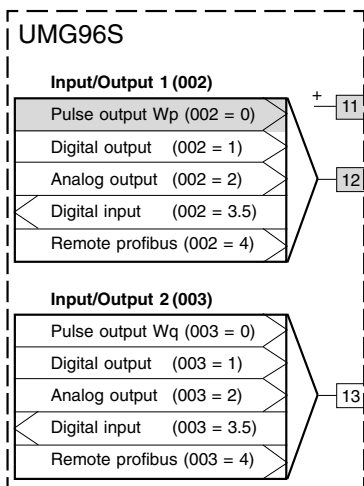
2.) Specify minimum pulse length
The UMG96S can output meter pulses with a frequency of up to 10Hz.
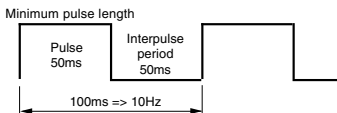
Fig. Maximum pulse frequency for a minimum pulse length of 50ms.

In this example the data collector can record meter pulses with frequencies of up to 50Hz. The minimum pulse length of the UMG96S is set to 50ms.

Minimum pulse length Add 010 = 50

3.) Determining the pulse value

The maximum work (power demand), which can be imported in an hour is:

Work = active power demand * time

Work = 400kW *1h

Work = 400kWh

If a pulse value of 400kWh per pulse is set, at full load the UMG96S supplies one pulse. This equates to a pulse frequency of

= 1 pulse/h

= 1 pulse/36000 sec.

= 1/3600 Hz

= 0.00028 Hz

This pulse value produces very few pulses. It is not possible to observe the work within the minutes range.

But the UMG96S can supply up to 10 pulses per second (10Hz) and the data collector can record 50 pulses per second (50Hz). One possible solution is that the UMG96S supplies pulses with a frequency of 10Hz at 400kW, or for safety not until 500kW.

= 500kWh   Work in one hour

= 500kWh / 3600

= 0.14kWh

= 140Wh   Work in one second

= 140Wh / 10

= 14Wh   Work in 1/10 seconds

I.e., if 10 pulses per second are output by the UMG96S with a pulse value of 14Wh, this equates to 500kW of work in one hour.

$$Impulswertigkeit = \frac{Arbeit}{max. \; Impulsfrequenz \; * \; 3600s}$$

Impulswertigkeit in Wh pro Impuls

Arbeit in Wh

Maximale Impulsfrequenz in Hz

$$Impulswertigkeit = \frac{500000Wh}{10Hz \; * \; 3600s}$$

Impulswertigkeit = 14Wh/Impuls

Pulse value Add 004 = 14

Digital output

Two digital outputs can be assigned to terminals 12 and 13 of the UMG96S. The value 001 must be written to the parameter address 002 for digital output 1 and 001 to parameter address 003 for digital output 2.

The result of limit value monitoring (388, 392) is then output at the corresponding digital output.

UMG96S

Master board

Input/Output 1 (002)

Comparator group 1

Pulse output Wp (002 = 0)
Digital output (002 = 1)
Analog output (002 = 2)
Digital input (002 = 3.5)
Remote profibus (002 = 4)

11
12

Input/Output 2 (003)

Comparator group 2

Pulse output Wq (003 = 0)
Digital output (003 = 1)
Analog output (003 = 2)
Digital input (003 = 3.5)
Remote profibus (003 = 4)

13

Serial interface

RS232 (MODBUS RTU) Interface

TXD
RXD
GND

RJ11 socket

Example: Current monitoring in the N
If the current in the N is greater than 100A for 60 seconds, digital output 1 should cut in for at least 2 minutes.

The following programming steps have to be undertaken:

1st Comparator
We select comparator group 1 for the limit value monitoring, as it is the only one to affect digital output 1. As only one limit value is monitored we select Comparator A and program it as follows:

The address of the measured value of comparator A to be monitored.
    Add 015 = 278 (current in the N)
The measured values for the comparators B and C are filled with 0.
    Add 020 = 0 (The comparator is inactive)
    Add 025 = 0 (The comparator is inactive)

The limit value to be observed.
    Add 013 = 100 (100A)

For a minimum on-time of 2 minutes, the digital output 1 is to remain connected in the event of the limit value being exceeded.
    Add 016 = 120 seconds

For the lead time of 60 seconds, overrange should at least be applied.
    Add 064 = 60 seconds

The operator for the comparison between the measured value and limit value.
    Add 017 = 0 (corresponds to >=)

2. Inputs and outputs
Terminal 12 is assigned the function digital output 1.
    Add 002 = 1 (digital output)

Result
If the current in the N is greater than 100A for more than 60 seconds, digital output 1 cuts in for at least 2 minutes. The relay K1 picks up.
If the memory profile 4 is selected for storing in the data memory (option), the comparator results are saved with the date and time from address 500.
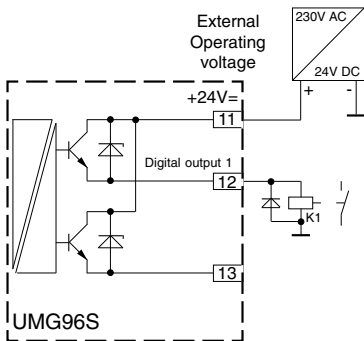
Fig.: Connection example for digital output 1.

Limit value monitoring

Two comparator groups, each with 3 comparators, are available for monitoring limit values. The results of comparators A, B and C can be AND or OR gated and the result can optionally be inverted. The whole Boolean result of comparator group 1 can be assigned to digital output 1 and the whole Boolean result of comparator group 2 can be assigned to digital output 2.

⚠ **Important!**
Only the first three digits of a parameter can be set at the UMG96S.
All the digits of a parameter can be adjusted using the *GridVis*.
Due to the measuring accuracy of the UMG96S, only the first **3 digits** of a parameter are **relevant**.
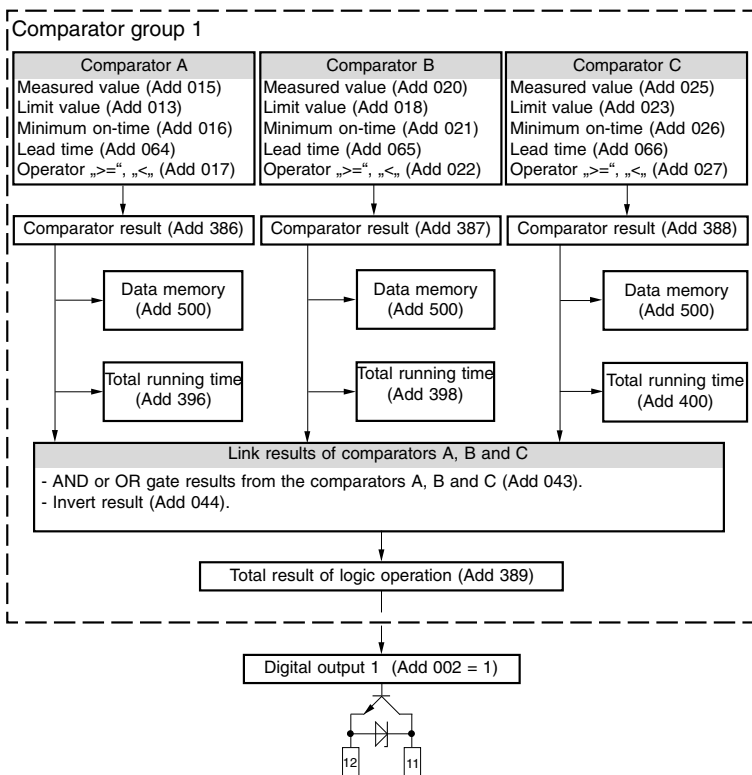
Fig. Limit value monitoring with digital output 1.

Measured value (Add 015)

The measured address contains the address of the measured value to be monitored. The following values can be assigned to the measured value:

000 = the comparator is inactive.
001 = the comparator result can be written by external (Modbus RTU).
200 .. *400* = Measured values from the measured value list.

Limit value (Add 018)

The limit value contains a constant of the type LONG. The limit value is compared with the corresponding measured value.

Minimum on-time (Add 016)

The result of logic operation (Boolean result) (Add 389) is retained for the duration of the minimum on-time. The minimum on-time can be assigned times within the range of 1 to 900 seconds.

Lead time (Add 064)

A limit violation must exist for at least the duration of the lead time, only then is the comparator result changed.

The lead time can be assigned times within the range of 1 to 900 seconds.
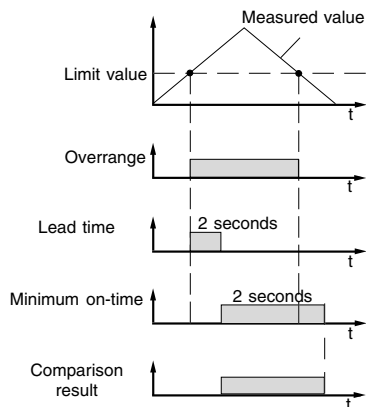
Fig. Example, limit violation.

Operator (Add 017)

Two operators are available for comparing the measured value and limit value.

Operator = 0 **corresponds to** greater than or equal (>=)

Operator = 1 **corresponds to** smaller (<)

Comparator result (Add 386)

The result of the comparison between the measured value and limit value is in the comparator result.

Here the values mean the following:

0 = No limit violation exists.
1 = A limit violation exists.

Data memory (Add 500)

Changes to comparator results can be stored in the data memory (option), if Profile 4 has been activated for data recording (Add 056).

Total running time (Add 396)

The sum of all times for which a limit violation existed in the comparator result.

Gate (Add 044)

AND or OR gate the results of the comparators A, B and C.

Invert result (Add 046)

The gating result (Add 046) can be inverted or not inverted.

Total result of logic operation (Add 389)

The gated comparator results of comparators A, B and C are in the total result of logic operation.

Analog output

The UMG96S with the additional printed circuit board 1 has 2 analog outputs. Each analog output can output a current of 4-20mA. An external 24VDC power supply unit is required for its operation.

Four parameters must be programmed for one analog output.

Input/Output (Add 002, 003)

Connect the analog output to the terminals of the UMG96S.

Measured value (Add 047, 052)

The measured value which is to be output at the analog output.

Scale start value (Add 050, 054)

The scale start value equals the measured value at which the minimum current of 4mA is to flow.

Scale end value (Add 048, 053)

The scale end value (full-scale value) equals the measured value at which the maximum current of 20mA is to flow.
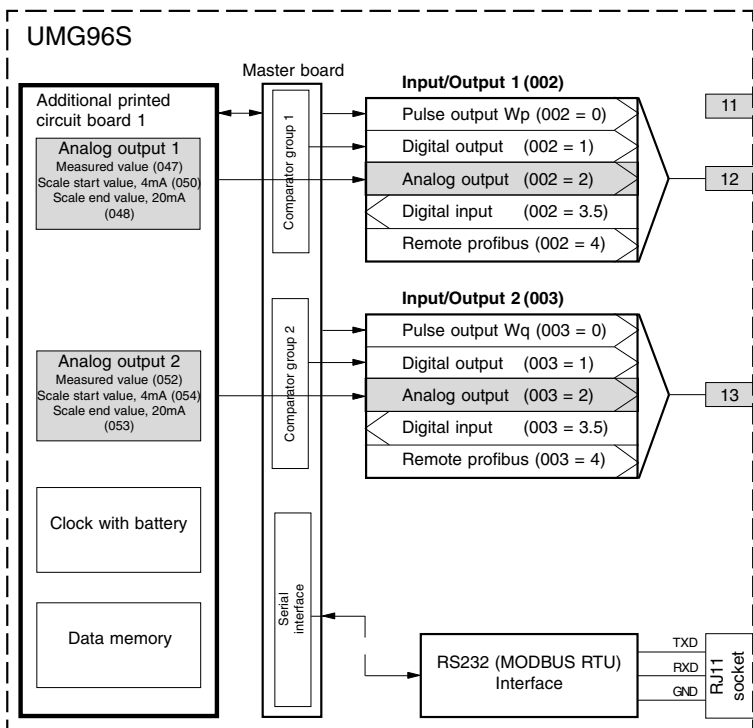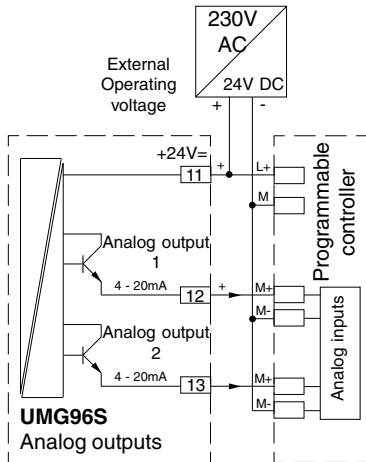
Fig. Connection of the analog outputs to a programmable controller.
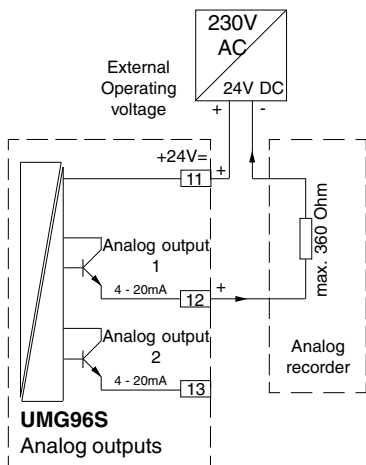
Fig. Connection of an analog output to an analog recorder.

Digital input

The UMG96S with the additional printed circuit board 2 has 2 digital inputs. An external 24VDC power supply unit is required for operation of the digital inputs.

A digital input (Add 002, Add 003) can be assigned one of 2 functions:

3 = Monitor status of the digital input.

5 = HT/LT switchover.

Status of the digital inputs

If a digital input is assigned the function „3", the status of the digital inputs can be queried via the addresses 420 and 421 .

If a voltage is applied to a digital input, a 1 is written in the address (420/421). If no voltage is applied, a 0.

UMG96S

Master board

Input/Output 1 (002)

Additional printed circuit board 2

Comparator group 1

Pulse output Wp (002 = 0)	11
Digital output (002 = 1)	
Analog output (002 = 2)	12
Digital input (002 = 3.5)	
Remote profibus (002 = 4)	

Digital input 1

Input/Output 2 (003)

Comparator group 2

Pulse output Wq (003 = 0)	
Digital output (003 = 1)	
Analog output (003 = 2)	13
Digital input (003 = 3.5)	
Remote profibus (003 = 4)	

Digital input 2

Serial interface

Profibus DP

- A B +

5 8 3 6

DSUB 9

RS232 (MODBUS RTU) Interface

TXD
RXD
GND

RJ11 socket

HT/LT switchover (Add 071)

If a digital input is assigned the function „5", this digital input can be used to switch between the active power demand meter (kWh register) HT and the active power demand meter (kWh register) LT. If no voltage is applied at the digital input, a 0 is written in address 071. If a voltage is applied at the digital input, a 1 is written in address 071.

Add 071 = 0 => Active power demand counter
                     LT active.
Add 071 = 1 => Active power demand counter
                     HT active.
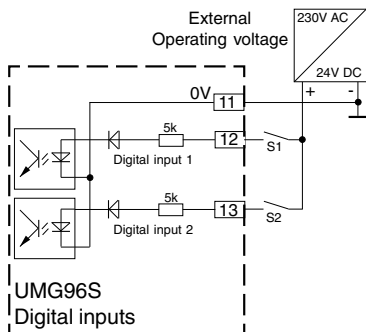
Fig.: Connection example for the digital inputs.

Memory

In the UMG96S, one EEPROM memory is always available for the configuration data and min and max values. In addition, a data memory (FLASH memory) is available as an option for storing measured values and results. Both memories do not require a battery for buffering data.

Data memory
Measured values and results can be stored in the data memory with time and date. If the data memory is full, the oldest data blocks are overwritten. The data memory begins from address 500. A maximum of 32768 data blocks, each with 18 bytes, can be stored in the data memory. Following a system/mains failure (L1, L2 and L3 fail simultaneously), the data saved during the last 45 seconds can be lost.

Data block
1 block consists of:

    2 byte data record number
    4 byte time stamp
    10 byte data string
    1 byte profile number
    1 byte error information

Time stamp
The number of seconds from 1.1.1970 until the time of storage is stored in the time stamp.

Data string
The data for one of the 4 possible profiles is stored in the data string. A data string may contain several measured values. The current and voltage transformer ratios are not taken into account in the stored measured values.

Profile number
The profile number contains the storage profile, which is stored in the data string.

Error information
If the storage of the data in the memory was interrupted by a system failure (L1, L2 and L3 fail simultaneously), this is stored in the error information.

Byte = 0 The data is o.k.
Byte <> 0 The stored data is wrong.

Data recording (056)
The measured values and results available to choose from for storage are summarised in 4 pre-defined memory profiles. Each of these 4 memory profiles can be selected for storage individually or together with other memory profiles.

Cont. of the Add 056	profile number			
	1	2	3	4
0				
1	x			
2		x		
3	x	x		
4			x	
5	x		x	
6		x	x	
7	x	x	x	
8				x
9	x			x
10		x		x
11	x	x		x
12			x	x
13	x		x	x
14		x	x	x
15	x	x	x	x

After the system is restored and the set averaging time has expired, the selected memory profiles are stored in the data memory.

The time at which memory profile 1 is saved can also be synchronised via a digital input (option). If the input signal changes from 0 to 1, memory profile 1 is saved. The time until the next save is determined by the averaging time P.

Memory profile 1

The mean power output values are summarised in memory profile 1:

Mean value P in L1
Mean value P in L2
Mean value P in L3
Mean value Q total
Mean value S total

The data in memory profile 1 is always saved after the averaging time P has expired.

Memory profile 2

The mean current values are summarised in memory profile 2:

Mean value I in L1
Mean value I in L2
Mean value I in L3
Mean value I in the N
Mean value CosPhi total

The data in memory profile 2 is always saved after the averaging time I has expired.

Memory profile 3

The work counters are summarised in memory profile 3:

Active power demand (imported supply)
Reactive power demand (inductive)

The contents of the work meter is saved once an hour.

Memory profile 4

All limit value results are summarised in memory profile 4.

Profile 4

The comparator results are summarised in profile 4:

Comparator 1 (Bit 1)
Comparator 2 (Bit 2)
Comparator 3 (Bit 3)
Comparator 4 (Bit 4)
Comparator 5 (Bit 5)
Comparator 6 (Bit 6)

Each change to one of the 6 comparator outputs is stored in the corresponding bits 1 to 6 of a byte. The first byte is for the time stamp. Each other byte describes the statuses of the comparator one second later. Byte 10 therefore contains the statuses of the comparator outputs at the time time stamp + 10 seconds.

Tables

Parameter list

The parameter list contains all the settings required for correct operation of the UMG96S, e.g. current transformer and device address. The values in the parameter list can be written and read. Data and time in address 700 are an exception and can only be written. The date and time in seconds since 1.1.1970 can be read in address 410 of the measured value list.

Measured value list

The measured value list contains the measured and calculated measured values, status data of the inputs and outputs and logged values for reading out.

Formats

CHAR	= 1 byte
INT	= 2 bytes; (high before low byte)
LONG	= 4 bytes; (high before low byte)
STRING1	= 32 byte; Byte 1=row 1, Bit1=1st meas. value table, Bit2=2nd meas.valuet able...
	Byte 2=row 2, Bit1=1st meas. value table, Bit2=2nd meas. value table...
STRING2	= 6 bytes; hour,minute,second,day,month,year
FDATA	= 2 bytes; data record number
	4 bytes; time since 1.1.1970
	10 bytes; data string
	1 byte; profile number
	1 byte; error information

Display of CosPhi in the UMG96S

	Capacitive	1,00		inductive
Measured value display	0.00cap	1,00	1,00	0.00ind
Measured value list and data memory	-100	0	0	+100
Analog outputs and switching contacts	-1	-100	+100	+0

⚠ Important!
For several parameters, only the PC software *GridVis* can utilise the maximum adjustment range. Only values up to 999999 can be set at the UMG96S.

Parameter list

Add	Name	Adjustm. range	Type	Units	Default
000	UMG96S Device address	1 .. 255	CHAR	-	1
001	Baud rate (RS232 and RS485)	0 .. 2	CHAR [1]	kbps	0
002	Input/Output 1, type	0 .. 5	CHAR [2]	-	0
003	Input/Output 2, type	0 .. 5	CHAR [2]	-	0
004	Pulse value, digital output 1	0 .. 100000	PULSE	Wh	1.00[5]
006	Pulse value, digital output 2	0 .. 100000	PULSE	varh	1.00[5]
008	Delete min and max values	0 .. 1	CHAR	-	0
009	Delete work	0 .. 1	CHAR	-	0
010	Minimum pulse length, digital output 1/2	5 .. 99	CHAR [3]	ms	5=50ms
011	User password	0 .. 999	INT	-	000
012	LCD contrast	0 .. 7	CHAR	-	3
013	Comparator 1A, limit value	-999999999 .. 999999999	LONG		0
015	Comparator 1A, measured value	0 .. 999	INT [6]		000
016	Comparator 1A, minimum on-time	1 .. 899	INT	Sec.	1
017	Comparator 1A, operator	0, 1	CHAR [4]		0
018	Comparator 1B, limit value	-999999999 .. 999999999	LONG		
020	Comparator 1B, measured value	0 .. 999	INT [6]		
021	Comparator 1B, minimum on-time	1 .. 899	INT	Sec.	1
022	Comparator 1B, operator	0, 1	CHAR [4]		0
023	Comparator 1C, limit value	-999999999 .. 999999999	LONG		
025	Comparator 1C, measured value	0 .. 999	INT [6]		
026	Comparator 1C, minimum on-time	1 .. 899	INT	Sec.	1
027	Comparator 1C, operator	0, 1	CHAR [4]		0
028	Comparator 2A, limit value	-999999999 .. 999999999	LONG		
030	Comparator 2A, measured value	0 .. 999	INT [6]		
031	Comparator 2A, minimum on-time	1 .. 899	INT	Sec.	1
032	Comparator 2A, operator	0, 1	CHAR [4]		0
033	Comparator 2B, limit value	-999999999 .. 999999999	LONG		
035	Comparator 2B, measured value	0 .. 999	INT [6]		
036	Comparator 2B, minimum on-time	1 .. 899	INT	Sec.	1
037	Comparator 2B, do not invert/invert	0, 1	CHAR [4]		0
038	Comparator 2C, limit value	-999999999 .. 999999999	LONG		

⚠ Important!
For several parameters, only the PC software *GridVis* can utilise the maximum adjustment range. Only values up to 999999 can be set at the UMG96S.

1) 0 = 9.6kBit/s; 1 = 19.2kBit/s; 2 = 38.4kBit/s
2) 0 = Pulse output , 1 = digital output , 2 = analog output, 3 = digital input,
   4 = Profibus remote output, 5 = HT/LT switchover via a digital input.
3) minimum pulse length = set value * 10 [ms]
4) 0 = greater or equal to, 1 = smaller
5) When reading out /writing, 100 = 1.00
6) 0 = Comparator is not used, 1 = remote, 200-424 = measured values

Parameter list Part 2

Add	Name	Adjust.. range	Type	Units	Default
040	Comparator 2C, measured value	0 .. 999	INT 6)		
041	Comparator 2C, minimum on-time	1 .. 899	INT	Sec.	1
042	Comparator 2C, operator	0, 1	CHAR 4)		0
043	Gate the results of the comp. (0,1,2)	0, 1	CHAR 1)	-	0
044	Invert result of logic oper. comp (0,1,2).	0, 1	CHAR 2)	-	0
045	Gate the results of the comp. (3,4,5)	0, 1	CHAR 1)	-	0
046	Invert result of logic oper. comp (3,4,5).	0, 1	CHAR 2)	-	0
047	Measured value for analog output 1	0 .. 999	INT		0
048	Analog output 1, 20mA	-999999999 .. 999999999	LONG		0
050	Analog output 1, 4mA	-999999999 .. 999999999	LONG		0
052	Measured value for analog output 2	0 .. 999	INT		0
053	Analog output 2, 20mA	-999999999 .. 999999999	LONG		0
055	Analog output 2, 4mA	-999999999 .. 999999999	LONG		0
056	Data recording	0 .. 15	CHAR	-	0
057	Averaging time, for I	0 .. 6	CHAR 3)	-	0
058	Averaging time, for P	0 .. 6	CHAR 3)	-	0
059	Change time	0 .. 60	CHAR	Sec.	0
060	Display profile	0 .. 3	CHAR	-	0
	0 .. 2 = Pre-assigned displays profiles				
	3 = Freely selectable displays profiles				
061	Display change profile	0 .. 3	CHAR	-	0
	0 .. 2 = Pre-assigned display change profiles				
	3 = Freely selectable display change profiles				
062	Interface selection	0, 1, 2	CHAR	-	0
	0 = Autom interface recognition				
	1 = RS232				
063	System frequency	0, 1, 2	CHAR	-	0
	0 = System frequency from phase L1				
	1 = 50Hz				
	2 = 60Hz				
064	Comparator 1A, lead time	1 .. 899	INT	Sec.	0
065	Comparator 1B, lead time	1 .. 899	INT	Sec.	0
066	Comparator 1C, lead time	1 .. 899	INT	Sec.	0
067	Comparator 2A, lead time	1 .. 899	INT	Sec.	0
068	Comparator 2B, lead time	1 .. 899	INT	Sec.	0
069	Comparator 2C, lead time	1 .. 899	INT	Sec.	0
070	Modem mode (0 = no, 1 = yes)	0, 1	CHAR	-	0
071	HT/LT switchover, (0 = HT, 1 = LT)	0, 1	CHAR	-	0

1) 0 = OR, 1 = AND
2) 0 = do not invert, 1 = invert
3) 0 = 5 sec, 1 = 10 sec, 2 = 30 sec, 3 = 60 sec, 4 = 300 sec, 5 = 480 sec, 6 = 900 sec

Parameter list Part 3

Add	Name	Adjust. range	Type	Units	Default
600	Current transformer, primary3)	1 .. 10000	INT	A	5
601	Current transformer, secondary3)	1 .. 5	INT	A	5
602	Voltage transformer, primary3)	100 .. 60000	INT	V	4001)
603	Voltage transformer, secondary3)	100 .. 400	INT	V	4001)
604	Measured value displays profile, current	2)	STRING1	-	-
605	Display change profile, current	2)	STRING1	-	-
700	Date and time	2)	STRING1	-	-
701	Clock option, yes=1, no= 0	read only	CHAR	-	-
702	Ring buffer store, data rec. num., read add	read only	INT	-	-
703	Ring buffer store option, yes=1, no= 0	read only	CHAR	-	-
800	Write in EEPROM	0 .. 4	CHAR	-	0
	Bit 1 = 1, write calibration data.				
	Bit 2 = 1, write programming data.				
	Bit 4 = 1, write counter.				
	Bit 8 = 1, write min - max values.				
911	Serial number	read only	LONG	-	######
913	Software release	read only	INT	-	###
914	Hardware configuration	read only	INT	-	###

⚠️ Important!
For several parameters, only the PC software *GridVis* can utilise the maximum adjustment range. Only values up to 999999 can be set at the UMG96S.

1) In the 300V standard version: 400V; In the 150V special version: 100V.
2) These values can only be read and written using the PC software GridVis.
3) The parameters for the current and voltage transformer values can only be read at the UMG96S.

Measured value list

Add	Name	Type	Units	Resolution
200	Voltage L1-N	INT	V	0.1
201	Voltage L2-N	INT	V	0.1
202	Voltage L3-N	INT	V	0.1
203	Voltage L1-L2	INT	V	0.1
204	Voltage L2-L3	INT	V	0.1
205	Voltage L3-L1	INT	V	0.1
206	Current in L1	INT	mA	1
207	Current in L2	INT	mA	1
208	Current in L3	INT	mA	1
209	Active power demand L1	INT	W	0.1
210	Active power demand L2	INT	W	0.1
211	Active power demand L3	INT	W	0.1
212	Reactive power demand L1	INT	W	0.1
213	Reactive power demand L2	INT	W	0.1
214	Reactive power demand L3	INT	W	0.1
215	Apparent power L1	INT	W	0.1
216	Apparent power L2	INT	W	0.1
217	Apparent power L3	INT	W	0.1
218	CosinePhi in L1	PHI	-	0.01
219	CosinePhi in L2	PHI	-	0.01
220	CosinePhi in L3	PHI	-	0.01
221	1st harmonic U L1-N	INT	V	0.1
222	3rd harmonic U L1-N	INT	V	0.1
223	5th harmonic U L1-N	INT	V	0.1
224	7th harmonic U L1-N	INT	V	0.1
225	9th harmonic U L1-N	INT	V	0.1
226	11th harmonic U L1-N	INT	V	0.1
227	13th harmonic U L1-N	INT	V	0.1
228	15th harmonic U L1-N	INT	V	0.1
229	1st harmonic U L2-N	INT	V	0.1
230	3rd harmonic U L2-N	INT	V	0.1
231	5th harmonic U L2-N	INT	V	0.1
232	7th harmonic U L2-N	INT	V	0.1
233	9th harmonic U L2-N	INT	V	0.1
234	11th harmonic U L2-N	INT	V	0.1
235	13th harmonic U L2-N	INT	V	0.1
236	15th harmonic U L2-N	INT	V	0.1
237	1st harmonic U L3-N	INT	V	0.1
238	3rd harmonic U L3-N	INT	V	0.1
239	5th harmonic U L3-N	INT	V	0.1
240	7th harmonic U L3-N	INT	V	0.1
241	9th harmonic U L3-N	INT	V	0.1
242	11th harmonic U L3-N	INT	V	0.1
243	13th harmonic U L3-N	INT	V	0.1
244	15th harmonic U L3-N	INT	V	0.1
245	1st harmonic I L1	INT	mA	1
246	3rd harmonic I L1	INT	mA	1
247	5th harmonic I L1	INT	mA	1
248	7th harmonic I L1	INT	mA	1

Measured value list Part 2

Add	Name	Type	Units	Resolution
249	9th harmonic I L1	INT	mA	1
250	11th harmonic I L1	INT	mA	1
251	13th harmonic I L1	INT	mA	1
252	15th harmonic I L1	INT	mA	1
253	1st harmonic I L2	INT	mA	1
254	3rd harmonic I L2	INT	mA	1
255	5th harmonic I L2	INT	mA	1
256	7th harmonic I L2	INT	mA	1
257	9th harmonic I L2	INT	mA	1
258	11th harmonic I L2	INT	mA	1
259	13th harmonic I L2	INT	mA	1
260	15th harmonic I L2	INT	mA	1
261	1st harmonic I L3	INT	mA	1
262	3rd harmonic I L3	INT	mA	1
263	5th harmonic I L3	INT	mA	1
264	7th harmonic I L3	INT	mA	1
265	9th harmonic I L3	INT	mA	1
266	11th harmonic I L3	INT	mA	1
267	13th harmonic I L3	INT	mA	1
268	15th harmonic I L3	INT	mA	1
269	THD U L1	INT	%	0.1
270	THD U L2	INT	%	0.1
271	THD U L3	INT	%	0.1
272	THD I L1	INT	%	0.1
273	THD I L2	INT	%	0.1
274	THD I L3	INT	%	0.1
275	Frequency L1	INT	Hz	0,01
276	CosinePhi, total	INT	0.01	-
277	Phase sequence	INT[1]	-	-
278	Current in the N	INT	mA	1
279	Total active power demand	INT	W	1
280	Total reactive power demand	INT	var	1
281	Total apparent power	INT	VA	1
282	Mean value I in L1	INT	mA	1
283	Mean value I in L2	INT	mA	1
284	Mean value I in L3	INT	mA	1
285	Mean value P in L1	INT	W	0.1
286	Mean value P in L2	INT	W	0.1
287	Mean value P in L3	INT	W	0.1
288	Mean value Q in L1	INT	var	0.1
289	Mean value Q in L2	INT	var	0.1
290	Mean value Q in L3	INT	var	0.1
291	Mean value S in L1	INT	VA	0.1
292	Mean value S in L2	INT	VA	0.1
293	Mean value S in L3	INT	VA	0.1
294	Mean value I in N	INT	mA	1
295	Mean value P, total	INT	W	1
296	Mean value Q, total	INT	var	1

1) 0 = no phase sequence identified, 1 = right phase sequence, -1 = left phase sequence

Measured value list Part 3

Add	Name	Type	Units	Resolution
297	Mean value S, total	INT	VA	1
298	Max value I, total	INT	mA	1
299	Max value, P mean value, total	INT	W	1
300	Max value I mean value, total	INT	mA	1
301	Max value, P total	INT	W	1
302	Max value, Q total	INT	var	1
303	Max value, S total	INT	VA	1
304	Max value, CosPhi total	INT	-	0,01
305	Min value, U L1-N	INT	V	0.1
306	Min value, U L2-N	INT	V	0.1
307	Min value, U L3-N	INT	V	0.1
308	Max value, U L1-N	INT	V	0.1
309	Max value, U L2-N	INT	V	0.1
310	Max value, U L3-N	INT	-	0.1
311	Min value, U L1-L2	INT	V	0.1
312	Min value, U L2-L3	INT	V	0.1
313	Min value, U L3-L1	INT	V	0.1
314	Max value, U L1-L2	INT	V	0.1
315	Max value, U L2-L3	INT	V	0.1
316	Max value, U L3-L1	INT	V	0.1
317	Max value, I L1	INT	mA	1
318	Max value, I L2	INT	mA	1
319	Max value, I L3	INT	mA	1
320	Max value, I L1 mean value	INT	mA	1
321	Max value, I L2 mean value	INT	mA	1
322	Max value, I L3 mean value	INT	mA	1
323	Max value, P L1	INT	W	0.1
324	Max value, P L2	INT	W	0.1
325	Max value, P L3	INT	W	0.1
326	Max value, Q L1	INT	var	0.1
327	Max value, Q L2	INT	var	0.1
328	Max value, Q L3	INT	var	0.1
329	Max value, S L1	INT	VA	0.1
330	Max value, S L2	INT	VA	0.1
331	Max value, S L3	INT	VA	0.1
332	Max value, 1st harmonic U L1-N	INT	V	0.1
333	Max value, 3rd harmonic U L1-N	INT	V	0.1
334	Max value, 5th harmonic U L1-N	INT	V	0.1
335	Max value, 7th harmonic U L1-N	INT	V	0.1
336	Max value, 0th harmonic U L1-N	INT	V	0.1
337	Max value, 11th harmonic U L1-N	INT	V	0.1
338	Max value, 13th harmonic U L1-N	INT	V	0.1
339	Max value, 15th harmonic U L1-N	INT	V	0.1
340	Max value, 1st harmonic U L2-N	INT	V	0.1
341	Max value, 3rd harmonic U L2-N	INT	V	0.1
342	Max value, 5th harmonic U L2-N	INT	V	0.1
343	Max value, 7th harmonic U L2-N	INT	-	0.1
344	Max value, 0th harmonic U L2-N	INT	V	0.1

Measured value list Part 4

Add	Name	Type	Units	Resolution
345	Max value, 11th harmonic U L2-N	INT	V	0.1
346	Max value, 13th harmonic U L2-N	INT	V	0.1
347	Max value, 15th harmonic U L2-N	INT	V	0.1
348	Max value, 1st harmonic U L3-N	INT	V	0.1
349	Max value, 3rd harmonic U L3-N	INT	V	0.1
350	Max value, 5th harmonic U L3-N	INT	V	0.1
351	Max value, 7th harmonic U L3-N	INT	V	0.1
352	Max value, 0th harmonic U L3-N	INT	V	0.1
353	Max value, 11th harmonic U L3-N	INT	V	0.1
354	Max value, 13th harmonic U L3-N	INT	V	0.1
355	Max value, 15th harmonic U L3-N	INT	V	0.1
356	Max value, 1st harmonic I L1	INT	mA	1
357	Max value, 3rd harmonic I L1	INT	mA	1
358	Max value, 5th harmonic I L1	INT	mA	1
359	Max value, 7th harmonic I L1	INT	mA	1
360	Max value, 9th harmonic I L1	INT	mA	1
361	Max value, 11th harmonic I L1	INT	mA	1
362	Max value, 13th harmonic I L1	INT	mA	1
363	Max value, 15th harmonic I L1	INT	mA	1
364	Max value, 1st harmonic I L2	INT	mA	1
365	Max value, 3rd harmonic I L2	INT	mA	1
366	Max value, 5th harmonic I L2	INT	mA	1
367	Max value, 7th harmonic I L2	INT	mA	1
368	Max value, 9th harmonic I L2	INT	mA	1
369	Max value, 11th harmonic I L2	INT	mA	1
370	Max value, 13th harmonic I L2	INT	mA	1
371	Max value, 15th harmonic I L2	INT	mA	1
372	Max value, 1st harmonic I L3	INT	mA	1
373	Max value, 3rd harmonic I L3	INT	mA	1
374	Max value, 5th harmonic I L3	INT	mA	1
375	Max value, 7th harmonic I L3	INT	mA	1
376	Max value, 9th harmonic I L3	INT	mA	1
377	Max value, 11th harmonic I L3	INT	mA	1
378	Max value, 13th harmonic I L3	INT	mA	1
379	Max value, 15th harmonic I L3	INT	mA	1
380	Max value, total harmonic distortion U L1	INT	%	0.1
381	Max value, total harmonic distortion U L2	INT	%	0.1
382	Max value, total harmonic distortion U L3	INT	%	0.1
383	Max value, total harmonic distortion I L1	INT	%	0.1
384	Max value, total harmonic distortion I L2	INT	%	0.1
385	Max value, total harmonic distortion I L3	INT	%	0.1

⚠ The min and max values are saved without the date and time!

Measured value list Part 5

Add	Name	Type	Units	Resolution
386	Comparator result 1A	CHAR	-	0/1
387	Comparator result 1B	CHAR	-	0/1
388	Comparator result 1C	CHAR	-	0/1
389	Total result of logic operation, comparator group 1	CHAR	-	0/1
390	Comparator result 2A	CHAR	-	0/1
391	Comparator result 2B	CHAR	-	0/1
392	Comparator result 2C	CHAR	-	0/1
393	Total result of logic operation, comparator group 2	CHAR	-	0/1
394	Operating hours meter	LONG	Sec.	0.1h
396	Total running time, comparator 1A	LONG	Sec.	1
398	Total running time, comparator 1B	LONG	Sec.	1
400	Total running time, comparator 1C	LONG	Sec.	1
402	Total running time, comparator 2A	LONG	Sec.	1
404	Total running time, comparator 2B	LONG	Sec.	1
406	Total running time, comparator 2C	LONG	Sec.	1
408	Temperature in the device	INT	[°C]	1
409	Internal operating voltage	INT	V	10mV
410	Time since 1.1.1970	LONG	Sec.	1
412	Mean value, CosPhi, total	PHI1)	-	0.01
413	Overrange	CHAR	-	
	Bit 1: Overrange of 6.5 Aeff in phase L1			
	Bit 2: Overrange of 6.5 Aeff in phase L2			
	Bit 3: Overrange of 6.5 Aeff in phase L3			
	Bit 4: Not used			
	Bit 5: Overrange of 300 Veff in phase L1			
	Bit 6: Overrange of 300 Veff in phase L2			
	Bit 7: Overrange of 300 Veff in phase L3			
	Bit 8: Not used			
414	Analog output 0 (4-20mA)	INT	A	10uA
415	Analog output 1 (4-20mA)	INT	A	10uA
416	Total active power demand Wp, without return block	LONG	Wh	-
418	Total reactive power demand Wq, inductive	LONG	varh	-
420	Status, digital input 1	CHAR	-	0/1
421	Status, digital input 2	CHAR	-	0/1
422	Total active power demand Wp, imported supply or HT	LONG	Wh	-
424	Total active power demand Wp, supply or LT	LONG	Wh	-

1) PHI = 2 bytes: -100(cap) .. +100(ind); high before low bytes.

Measured value list Part 6

Add	Name	Type	Units	Resolution
500	Data memory data record	FDATA	-	-
501	Data memory data record	FDATA	-	-
502	Data memory data record	FDATA	-	-
503	Data memory data record	FDATA	-	-
504	Data memory data record	FDATA	-	-
505	Data memory data record	FDATA	-	-
	500-505 Decrement when reading out the data memory pointer 702			
506	Data memory data record	FDATA	-	-
510	Function	INT		
	0000h = Write current data memory address in address 702			
	A55Ah = Delete data memory			
	5AA5h = Assign device with the factory pre-set default settings.			
520	Measured value displays	STRING		
521	Measured value displays, display value paging	STRING		

Measured value displays, overview

△ A	▷ B	▷ C	▷ D
A01 Measured values L1-N voltage L2-N voltage L3-N voltage		**C01** Max values L1-N voltage L2-N voltage L3-N voltage	**D01** Min values L1-N voltage L2-N voltage L3-N voltage
A02 Measured values L1-L2 voltage L2-L3 voltage L3-L1 voltage		**C02** Max values L1-L2 voltage L2-L3 voltage L3-L1 voltage	**D02** Min values L1-L2 voltage L2-L3 voltage L3-L1 voltage
A03 Measured values L1 current L2 current L3 current	**B03** Mean values L1 current L2 current L3 current	**C03** Max values L1 current L2 current L3 current	**D03** Max values (mean value) L1 current L2 current L3 current
A04 Measured value Total Current in the N	**B04** Mean value Total Current in the N	**C04** Max value Total measured value Current in the N	**D04** Max values Total mean value Current in the N
A05 Measured values L1 Active power demand L2 Active power demand L3 Active power demand	**B05** Mean value L1 Active power demand L2 Active power demand L3 Active power demand	**C05** Max values L1 Active power demand L2 Active power demand L3 Active power demand	
A06 Measured value Total Active power demand	**B06** Mean value Total Active power demand	**C06** Max value Total Active power demand	**D06** Max value Total Mean value active power demand
A07 Measured values L1 Apparent power L2 Apparent power L3 Apparent power	**B07** Mean values L1 Apparent power L2 Apparent power L3 Apparent power	**C07** Max values L1 Apparent power L2 Apparent power L3 Apparent power	
A08 Measured value Total Apparent power	**B08** Mean value Total Apparent power	**C08** Max value Total Apparent power	
A09 Measured values L1 React. power demand L2 React. power demand L3 React. power demand	**B09** Mean values L1 React. power demand L2 React. power demand L3 React. power demand	**C09** Max values (ind) L1 React. power demand L2 React. power demand L3 React. power demand	

A10	▷	B10	▷	C10	▷

A10
Measured value
Total reactive po-
wer demand

B10
Mean value
Total reactive po-
wer demand

C10
Max value (ind)
Total reactive po-
wer demand

A11
Measured value
Distortion factor THD
U L1

B11
Measured value
Distortion factor THD
U L2

C11
Measured value
Distortion factor THD
U L3

A12
Measured value
Distortion factor THD
I L1

B12
Measured value
Distortion factor THD
I L2

C12
Measured value
Distortion factor THD
I L3

A13
Max value
Distortion factor THD
U L1

B13
Max value
Distortion factor THD
U L2

C13
Max value
Distortion factor THD
U L3

A14
Max value
Distortion factor THD
I L1

B14
Max value
Distortion factor THD
I L2

C14
Max value
Distortion factor THD
I L3

A15
Measured value
L1 cos(phi)
L2 cos(phi)
L3 cos(phi)

A16
Measured value
Total cos(phi)

B16
Mean value
Total cos(phi)

A17
Measured value
Frequency L1
Rotating field
display

A18
Measured value
Total active power
(without return block)

B18
Measured value
Total active power
demand
(imported supply or HT)

C18
Measured value
Total active power
demand
(supply or LT)

△ | A19 | ▷ | ▷ | ▷

A19
Meas. value (ind)
Total
Reactive power
demand

△ | **A20**
Operating hours
meter 1

B20
Comparator 1
Total running time

• • •

G20
Comparator 6
Total running time

△ | **A21**
Measured value
1st harmonic
U L1

B21
Measured value
3rd harmonic
U L1

• • •

H21
Measured value
15th harmonic
U L1

△ | **A22**
Measured value
1st harmonic
U L2

B22
Measured value
3rd harmonic
U L2

• • •

H22
Measured value
15th harmonic
U L2

△ | **A23**
Measured value
1st harmonic
U L3

B23
Measured value
3rd harmonic
U L3

• • •

H23
Measured value
15th harmonic
U L3

△ | **A24**
Measured value
1st harmonic
I L1

B24
Measured value
3rd harmonic
I L1

• • •

H24
Measured value
15th harmonic
I L1

△ | **A25**
Measured value
1st harmonic
I L2

B25
Measured value
3rd harmonic
I L2

• • •

H25
Measured value
15th harmonic
I L2

△ | **A26**
Measured value
1st harmonic
I L3

B26
Measured value
3rd harmonic
I L3

• • •

H26
Measured value
15th harmonic
I L3

░ These menus are not displayed with the factory preset default setting.

△ A27	▷ B27	▷	▷ H27
Max value 1st harmonic U L1	Max value 3rd harmonic U L1	• • •	Max value 15th harmonic U L1

△ A28	B28		H28
Max value 1st harmonic U L2	Max value 3rd harmonic U L2	• • •	Max value 15th harmonic U L2

△ A29	B29		H29
Max value 1st harmonic U L3	Max value 3rd harmonic U L3	• • •	Max value 15th harmonic U L3

△ A30	B30		H30
Max value 1st harmonic I L1	Max value 3rd harmonic I L1	• • •	Max value 15th harmonic I L1

△ A31	B31		H31
Max value 1st harmonic I L2	Max value 3rd harmonic I L2	• • •	Max value 15th harmonic I L2

△ A32	B32		H32
Max value 1st harmonic I L3	Max value 3rd harmonic I L3	• • •	Max value 15th harmonic I L3

These menus are not displayed with the factory preset default setting.

Display Ranges and Accuracy

Measured variables	Display range	Measured range 1)	Measuring accuracy3)
Voltage L-N			
300V standard version	0 .. 34kV	50 .. 300V	+-0.5% vMb
150V special version	0 .. 17kV	25 .. 150V	+-0.5% vMb
Voltage L-L			
300V standard version	0 .. 60kV	87 .. 520V	+-1.0% vMb
150V special version	0 .. 30kV	40 .. 260V	+-1.0% vMb
Current	0.01 .. 60.0kA	0.01 .. 6A	+-0.5% vMb
Current in the N	0.01 .. 180.0kA	0.01 .. 18A	+-1.5% vMb
Active power dem., per phase	0.1W .. 99.9MW	0.1W .. 1.8kW	+-1.0% vMb
Apparent power, per phase	0.1VA .. 99.9MVA	0.1VA .. 1.8kVA	+-1.0% vMb
Reac. pow. dem., (Q0) per phase	0.1var .. 99.9Mvar	0.1var .. 1.8kvar	+-1.0% vMb
Active power demand, total	1W .. 99.9MW	1W .. 5.4kW	+-1.0% vMb
Apparent power, total	1VA .. 99.9MVA	1VA .. 5.4kVA	+-1.0% vMb
Reac. power dem. (Q0), total	1var .. 99.9Mvar	1var .. 5.4kvar	+-1.0% vMb
Harmonics U, 1-15	0 .. 34kV	0.1V. 300.0V	+-2.0% vMb
Harmonics I, 1-15	0.01 .. 60.0kA	1mA. 6000mA	+-2.0% vMb
THD U , I	0.1% .. 100.0%		+-2.0% vMb
cos(phi)	0.00i .. 1.00 .. 0.00k	0.00i ..1.00.. 0.00k	+- 1degree
Frequency (of the voltage)	45.0 .. 65.0Hz	45.0 .. 65.0Hz	+-0.1% vMw
Reac. power demand Wq, ind.	0 .. 999.999.999kvarh4)		Class 12) (../5A) Class 22) (../1A)
Active pow. dem. Wp, imp. supply	0 .. 999.999.999kWh4)		Class 12) (../5A) Class 22) (../1A)
Operating hours meter	0 .. 999 999 999h		+-2minutes/day

The specifications require annual recalibration and a warm up time of 10 minutes.

Abbreviations used:

      vMb   = of the measuring range

   vMw   = of the measured valued

1) Measuring range with scaling factor = 1, (current transformer = 5/5A, 1/1A)

2), Accuracy class to DIN EN61036:2001-01, VDE0418 Part 7, IEC61036:1996 + A1:2000

3) An additional error of +-0.5‰ v.Mw. per K must be taken into account within the range of -10..18°C and 28..55°C.

4) The maximum display range of the active and reactive power demand depends on the transformer transformation ratio v = vi * vu.

vi = Current transformer transformation ratio.

vu = Voltage transformer transformation ratio.

Example: 200/5A -> vi = 40

                  1000/100V -> vu = 10

                  v = vi * vu

                  v = 40 *10

                  <u>v = 400</u>
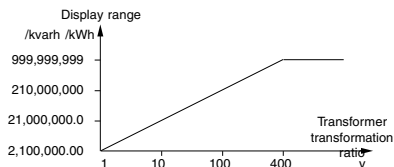
Technical Specifications

Weight	: 250g
Calorific value	: 2.2MJ (610Wh)

Ambient conditions

Overvoltage category	: CATIII
Degree of soiling	: 2
Protection class	: II = without protective conductor
Operating temperature range	: -10°C. +55°C
Storage temperature range	: -20°C. +70°C
Relative air humidity	: 15% to 95% without condensation
Degree of protection	
Front	: IP40 according to EN60529
Front with seal (option)	: IP42 according to EN60529
Rear	: IP20 according to EN60529
Installed position	: any
Operating altitude	: 0 .. 2000m above sea level

Declaration of conformity

The UMG96S fulfils the safety requirements of the:
Directive 89/336/EEC in conjunction with **DIN EN61326 (2002-03)** and the
Directives 73/23/EEC and **93/68/EEC** in conjunction with **EN 61010-1** (2002-08)

Safety requirements

Safety requirements for electrical instrumentation, control and laboratory equipment
                            : EN61010-1 08:2002, IEC 61010-1:2001

EMC requirements

                            : DIN EN61326:2002-03

Emitted interference

Basic device	: DIN EN61326:2002-03, Table 4 Class B, (residential area)
Basic device with option 1	: DIN EN61326:2002-03, Table 4 Class B, (residential area)
Basic device with option 2	: DIN EN61326:2002-03, Table 4 Class A, (industrial area)

Interference immunity (industrial area)

Housing	: electrostatic discharge, IEC61000-4-2 (4kV/8kV)
	: electromagnetic fields, IEC61000-4-3 (10V/m)
Measuring and operating voltage: Voltage dips, IEC61000-4-11 (0.5 periods)	
	: Bursts, IEC61000-4-4 (2kV)
	: Surge voltages, IEC61000-4-5 (1kV)
	: Conducted HF signals, IEC61000-4-6 (3V)
Inputs and outputs, interfaces	
	: Bursts, IEC61000-4-4 (1kV)
	: Surge voltages, IEC61000-4-5 (1kV)

Test voltages (type testing)

300V standard version
      Measuring-circuit voltage to
      serial interfaces, inputs and outputs   :3700V AC
      Current measurement inputs to
      serial interfaces, inputs and outputs   :2300V AC
      The serial interfaces are not **isolated from each other!**
150V special version
      Measuring-circuit voltage to
      serial interfaces, inputs and outputs   :2300V AC
      Current measurement inputs to
      serial interfaces, inputs and outputs   :2300V AC
      The serial interfaces are not **isolated from each other!**

Inputs and outputs

Digital outputs
      Type   : NPN transistor
      Closed-circuit current   : < 1mA
      Operating current   : max. 50 mA (not short-circuit proof!)
      Operating voltage   : 5 .. 24V DC, max. 27V DC
      Switching frequency   as pulse output   : 10Hz (50ms pulse length)
Digital inputs (option)
      Current input   : max. 5mA
      Input signal applied   : >20V DC, max. 27V DC
      Input signal not applied   : <2V DC
Analog outputs (option)
      Resolution   : 8Bit
      Accuracy   : +- 1.5% vMb.
      Load impedance   : max. 300 Ohm
      Reaction time   : 1,5 seconds
      Operating voltage, external   : 20V..27VDC
          Residual ripple   : max. 2V, 50Hz

vMb = of the measuring range.

Auxiliary voltage

Voltage range	:18V .. 60V DC, 18V .. 30V AC 50/60Hz
Power input	:max. 1.4W, max. 2.6VA
Back-up fuse	: 2A. 10A (medium time lag)

Measurement

Measuring rate	**: 1 measurement/sec.**
Impulse voltage withstand level	**: 4kV**
Signal frequency	**: 45Hz. 1000Hz**
Voltage measurement	
Frequency of the fundamental component	: 45Hz. 65Hz
Power input	: approx 0.1VA
Impedance	: 4MOhm per phase
300V **standard version**	**: max. 300V AC to earth**
Measuring range L-N	: 50 .. 300V AC
Measuring range L-L	: 87 .. 520V AC
150V **special version**	**: max. 150V AC to earth**
Measuring range L-N	: 25 .. 150V AC
Measuring range L-L	: 40 .. 260V AC
Current measurement	**: max. 150VAC to earth**
Power input	: approx 0.2 VA
Rated current at ../5A (../1A)	: 5A (1A)
Threshold current	: 5mA
Limit current at ../1A	: 1,2A (sinusoidal)
Limit current at ../5A	: 6A (sinusoidal)
Overload	: 150A for 2 sec.

Serial interfaces

RS232, RJ11 socket (option)	
Protocol	: MODBUS RTU
Transmission rates	: 9.6, 19.2, 38.4kBit/s
RS485, DSUB-9 (option)	
Protocol	: Profibus DP (V0)
Transmission rates	: 9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500kBit/s

Connectable conductors

Solid core, multi-core, flexible core	: 0.08 - 2.5mm2
Pin-end connector, wire end ferrules	: 1.5mm2
Per terminal connection, only one conductor may be connected!	

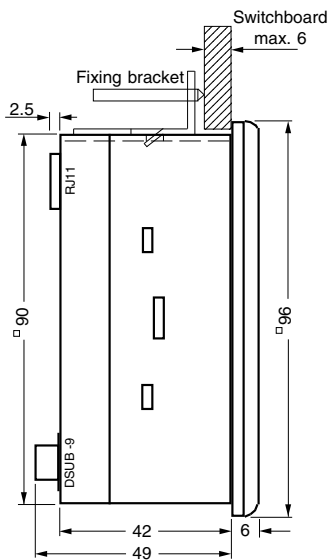* The smallest operating voltage for devices with the Profibus option is 140V AC.

Dimensioned drawings

Auxiliary section dimensions: $92^{+0.8}$ x $92^{+0.8}$ mm

Rear
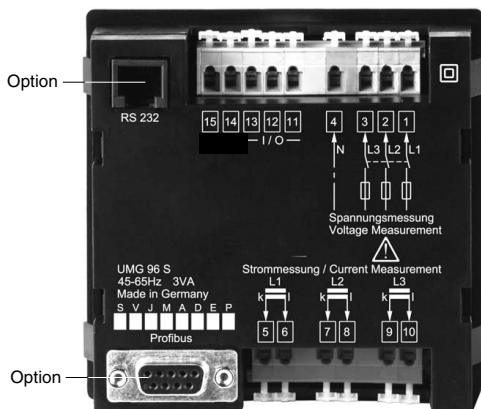
Side view

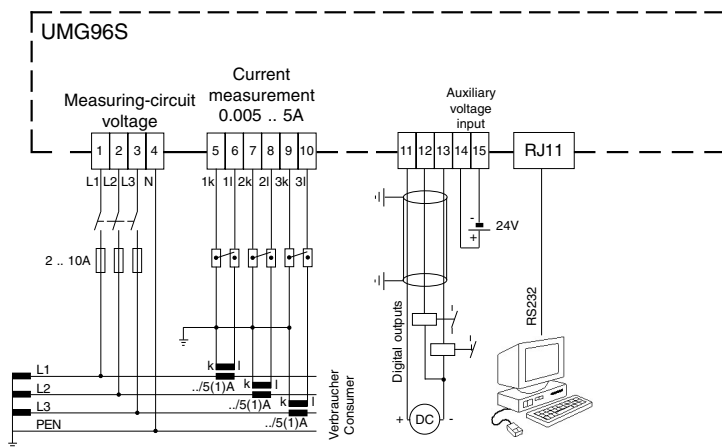All dimensions in mm

Connection examples

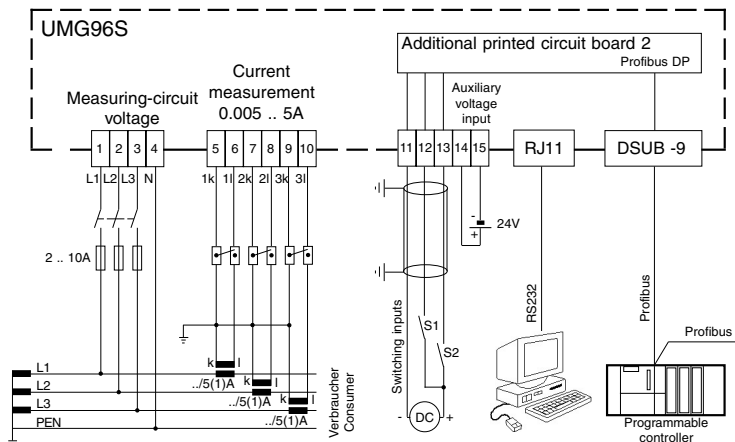*Fig. UMG96S with RS232 and digital outputs.*

Fig. UMG96S with switching inputs, RS232 and Profibus.

# Quick Reference Instructions

Changing the current transformer

Switching to programming mode

If you are in display mode and press Keys 1 and 2 for around one second, you switch to programming mode.

The symbols for programming mode **PRG** and for the current transformer CT appear.

Use Key 1 to confirm the selection.

The first line of the primary current flashes.

Programming mode
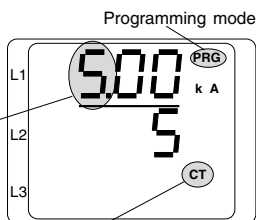
Current transformer symbol

Change primary current

Use Key 2 to change the flashing digit.

Use Key 1 to select the next digit to be changed.

The digit selected for changing flashes.

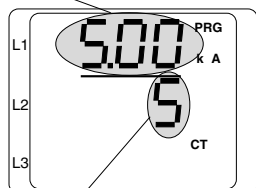If the whole number flashes, the decimal point can be shifted.

Change secondary current

Only 1A or 5A can be set as the secondary current.

Use Key 1 to select the secondary current.

Use Key 2 to change the flashing digit.

Quit programming mode

Simultaneously press both keys for around 1 second.

The current transformer setting is saved and you return to display mode.

Primary current

Secondary current
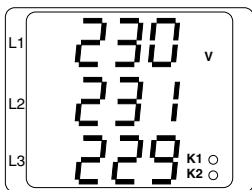
Calling up the measured values

Switching to display mode

If you are in programming mode and simultaneously press Keys 1 and 2 for around one second, you switch to display mode.

The **PRG** symbol for programming mode is not in the display and the first measured value display appears, e.g. for the voltage.

Key 2

Press Key 2 to page between the various measured value displays for current, voltage, power output, etc.

Key 1

Use Key 1 to page between the mean values, max values, etc. for the measured value.