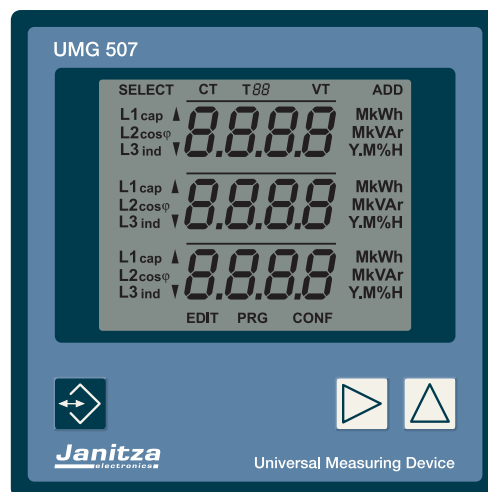


Universal Measuring Device

UMG507

Functional description

Profibus DP V0



Generals

The UMG507 supports the protocols Modbus RTU, Modbus TCP/IP, Modbus over TCP/IP (Modbus Gateway) or Profibus DP V0, depending in the version. This functional description is an addition to the manual and describes the configuration of the corresponding function step by step.

More functional descriptions can be found on the CD-ROM PSWbasic/professional. At present, the following functional descriptions are available:

- UMG507 used as remote data display for external Modbus slaves
- OPC Server Port 502
- OPC Server Port 8000 (Modbus Gateway Function)
- The webserver of UMG507
- Description of the storage of UMG507
- Description of Profibus with examples

Issue note:
18.11.2004

First edition / Wagner

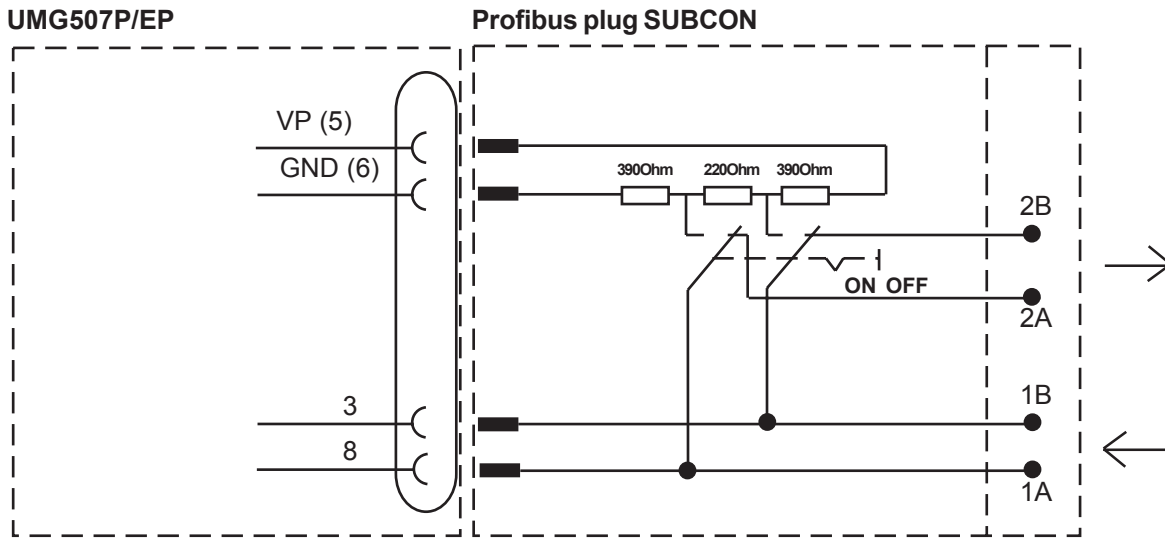
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Profibus

The certified Profibus instrument UMG507P/EP supports Profibus DP V0 up to 1,5Mbaud.

The Profibus connection of the UMG507 is carried out as 9 pole Sub Dplug ausgeführt. For connection, we recommend a 9 pole Profibus plug (Type: SUBCON-PLUS-ProfIB/AX/SC Manufacturer: Phoenix part no.: 27 44 38 0 or similar).



Connection of the bus wires:

Connect the incoming bus wire always to the inputs 1A/1B (even at the beginning on a bus system!) The further leading bus wire is always connected to the inputs 2A/2B. The terminal resistors will be activated by the switch at the beginning and end of the bus system. At the same time the connection inputs (2A/2B) for the further leading bus wire is disconnected.

Profibus Profile

The UMG507 supports 24 Profibus profiles at the moment, where 20 are user defined configurable via PSWbasic/professional. The assembly of the profiles is as follows:

Output range of the PLC

- | | |
|--------------------|------------------------------------|
| 1. Byte | Profile number (0 - 24) |
| 2. Byte | Profibus flag (7 ... 0) |
| 3 + 4. Byte(Short) | Analogue output 1 (Parameter 9000) |
| 4 + 5. Byte(Short) | Analogue output 2 (Parameter 9002) |

2. Byte

Bit
7 6 5 4 3 2 1 0

Profibus flag 8 Profibus flag 1

Internal functions are controlled by the Profibus flags (set outputs, synchronize clock, delete energy etc.)

Profibus Profile number + Offset 128 = Measured values „low before high byte“.

(Example: Profile No.3 (Measured values „high before low byte“) + Offset 128

= Profile No. 131 (measured values „low before high byte“)

Input range PLC

- | | |
|-----------|---|
| 1. Byte | Feedback of profile number |
| 2. Byte | Trigger status
(Short interruptions) |
| 3. Byte | Status of digital inputs |
| 4. Byte | Status of digital outputs |
| 5. Byte | Contents of Profile |
| ... | ... |
| ... | ... |
| 124. Byte | |

2. Byte (Trigger status). Follow-up time: 10sec

Bit
6 5 4 3 2 1 0

Overcurrent L1/L2/L3
U-L3N overvoltage
U-L2N overvoltage
U-L1N overvoltage
U-L3N overvoltage
U-L2N overvoltage
U-L1N overvoltage

4. Byte

Bit
5 4 3 2 1 0

Digital output 6 Digital output 1

3. Byte

Bit
5 4 3 2 1 0

Digital output 6 Digital output 1

The following four profiles are unchangeable set in the manufacturer's settings:

Profile 0 (high before low byte)

Format : Float 4 Byte	unit
Reactive power Phase: L1	var
Reactive power Phase: L2	var
Reactive power Phase: L3	var
Apparent power Phase: L1	VA
Apparent power Phase: L2	VA
Apparent power Phase: L3	VA
Frequency Phase: L1	Hz
Voltage Phase: L1	V
Voltage Phase: L2	V
Voltage Phase: L3	V
Current Phase: L1	A
Current Phase: L2	A
Current Phase: L3	A
Real power Phase: L1	W
Real power Phase: L2	W
Real power Phase: L3	W
Cos-phi Phase: L1	-
Cos-phi Phase: L2	-
Cos-phi Phase: L3	-
Current THD Phase: L1	%
Current THD Phase: L2	%
Current THD Phase: L3	%
Voltage mean * THD Phase: L1	%
Voltage mean * THD Phase: L2	%
Voltage mean * THD Phase: L3	%

Profile 1 (high before low byte)

Format : Float 4 Byte	unit
Voltage Phase: L1	V
Voltage Phase: L2	V
Voltage Phase: L3	V
Current Phase: L1	A
Current Phase: L2	A
Current Phase: L3	A
Real power Phase: L1	W
Real power Phase: L2	W
Real power Phase: L3	W
Cos-phi Phase: L1	-
Cos-phi Phase: L2	-
Cos-phi Phase: L3	-
Frequency Phase: L1	Hz
Real power, sum	W
Reactive power, sum	var
Cos-phi, Sum	-
Current in neutral	A
Real energy, cons. (T0)	Wh
Reactive energy ind. (T0)	varh
Current THD Phase: L1	%
Current THD Phase: L2	%
Current THD Phase: L3	%
Voltage mean * THD Phase: L1	%
Voltage mean * THD Phase: L2	%
Voltage mean * THD Phase: L3	%
Voltage LL Phase: L12	V
Voltage LL Phase: L23	V
Voltage LL Phase: L31	V

Profile 2 (high before low byte)

Format : Float 4 Byte	unit
Real power, sum	W
Reactive power, sum	var
Apparent power, sum	VA
Cos-phi, Sum	-
Current in neutral	A
Real energy, cons. (T0)	Wh
Real energy, cons. (T1)	Wh
Real energy, cons. (T2)	Wh
Reactive energy ind. (T0)	varh
Reactive energy ind. (T1)	varh
Reactive energy cap. (T2)	varh
Real energy without rev. (T0)	Wh
Reactive energy without rev. (T0)	varh

Profile 3 (high before low byte)

Format : Float 4 Byte	unit
Real energy Bezug (T0)	Wh
Real energy supply (T0)	Wh
Real energy without rev. (T0)	Wh
Reactive energy ind. (T0)	varh
Reactive energy cap. (T0)	varh

*mean = mean value

GSD file

The GSD file is a device specific file, in which the transmission parameters and the kind of measured data between the Profibus master and slave are determined. The Profibus slave in this case is the UMG507P/EP and the Profibus master, for example, a PLC.

The GSD file of the UMG507P/EP can be found on the CD-ROM PSWbasic/professional or in the Download area on our homepage (www.janitza.de).

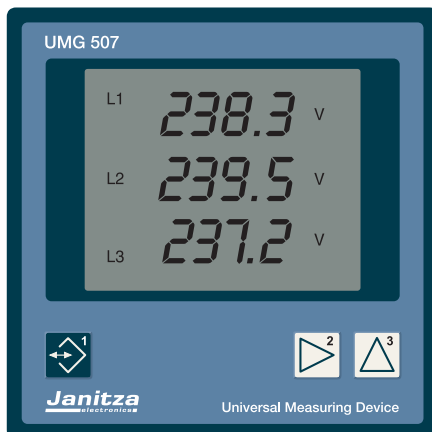
The GSD file of the UMG507P/EP supports the following modules:

"STD: 16 Word In, 1 Byte Out"	"STD: 16 Word In, 2 Byte Out"	"STD: 16 Word In, 6 Byte Out"
"STD: 24 Word In, 1 Byte Out"	"STD: 24 Word In, 2 Byte Out"	"STD: 24 Word In, 6 Byte Out"
"STD: 32 Word In, 1 Byte Out"	"STD: 32 Word In, 2 Byte Out"	"STD: 32 Word In, 6 Byte Out"
"STD: 48 Word In, 1 Byte Out"	"STD: 48 Word In, 2 Byte Out"	"STD: 48 Word In, 6 Byte Out"
"STD: 64 Word In, 1 Byte Out"	"STD: 64 Word In, 2 Byte Out"	"STD: 64 Word In, 6 Byte Out"
"STD: 128 Word In, 1 Byte Out"	"STD: 128 Word In, 2 Byte Out"	"STD: 128 Word In, 6 Byte Out"

Device address

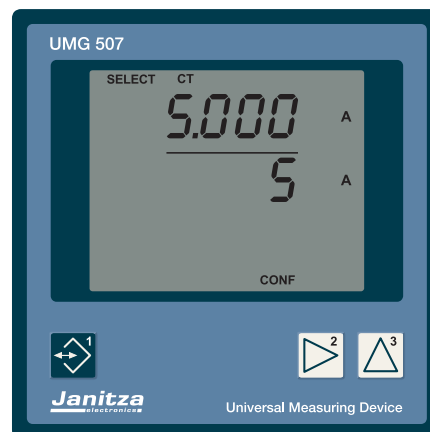
If several devices are connected via the Profibus interface, the master (PC or PLC) can tell one instrument from the other by their device address only. Within one network, each device UMG 507 must have its own device address. Profibus supports device addresses in the range of 0...126. The device addresses are set at the instrument as follows:

Display voltage measurement



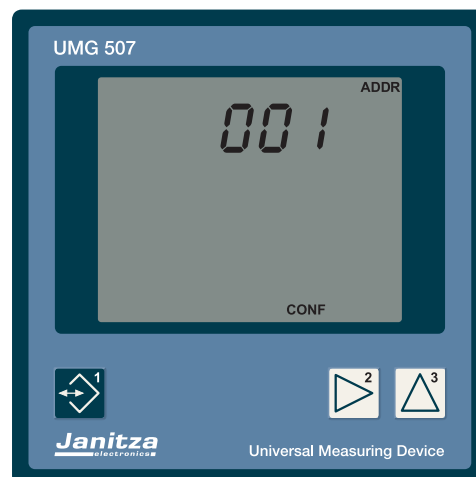
Confirm key „1“ two times

Display current transformer

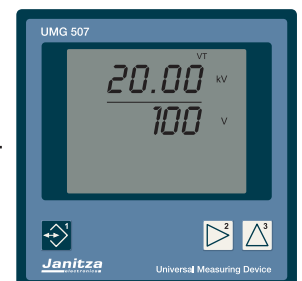


Select flashes. With key „2“ cancel selection. Confirm key „3“ three times to call up display „device address“.

Using key „1“ you select the first digit of the device address, which can be changed with key „3“. The selected digit flashes. When the desired device address is set, confirm key „1“ until no digit flashes anymore. By long pressing of key „1“ you leave configuration menu.



Display device address



Display voltage transformer

Protocol setting

The RS485 interface of the UMG507P/EP is suitable for transmission of data over a distance up to 1200m. Up to 31 UMG507P/EP and a master (PC/PLC) can be connected. The RS485 interface of UMG507P/EP supports several protocols, which can be selected directly at the device.

Transmission protocols RS485

- 0 = Modbus RTU Slave
- 1 = Modbus RTU Master
- 2 = Profibus DPV0

Baud rates Modbus RTU

- 9.6 kBit/s
- 38.4 kBit/s
- 115.2 kBit/s

Baud rates Profibus DP V0

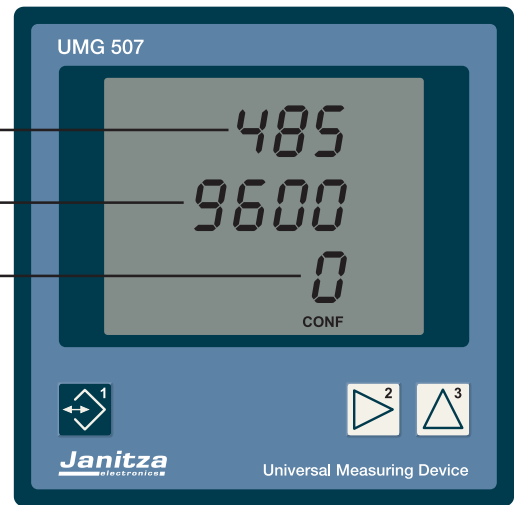
- 9.6 kBit/s
- 19.2 kBit/s
- 45.45 kBit/s
- 93.75 kBit/s
- 187.5 kBit/s
- 500 kBit/s
- 1.5 Mbit/s

Display RS485 interface

Interface type

Baud rate

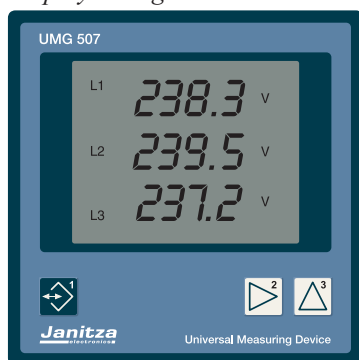
Protocol



Setting of the RS485 interface for Profibus

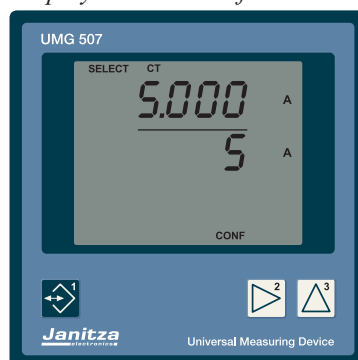
After selection of protocol no. 2, the baud rate is set to automatic mode. The baud rate is determined by the Profibus master .

Display voltage measurement



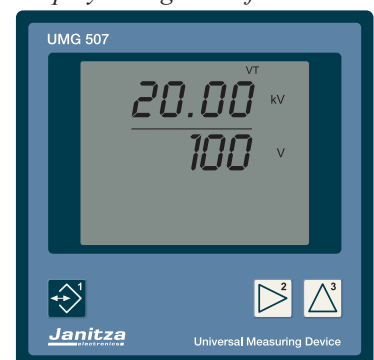
Confirm key 1 twice

Display current transformer

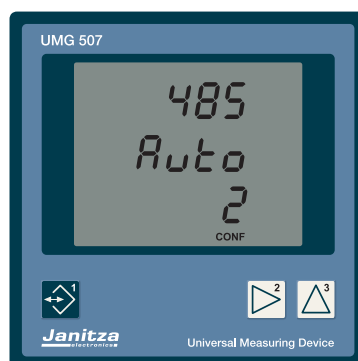


Select flashes. With key „2“ cancel selection. Confirm key „4“ three times to call up display „RS485“.

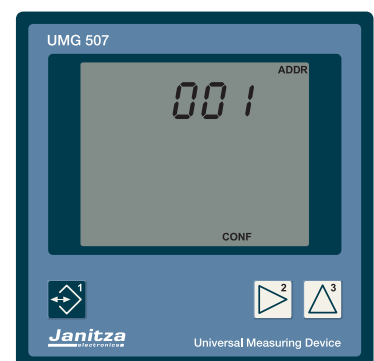
Display voltage transformer



With key „1“ select the third line, and change to protocol 2 by key „3“. The selected digit flashes. When the desired protocol is set, confirm key „1“ until no digit flashes anymore. By long pressing of key „1“ you leave configuration menu.



Display RS485 interface

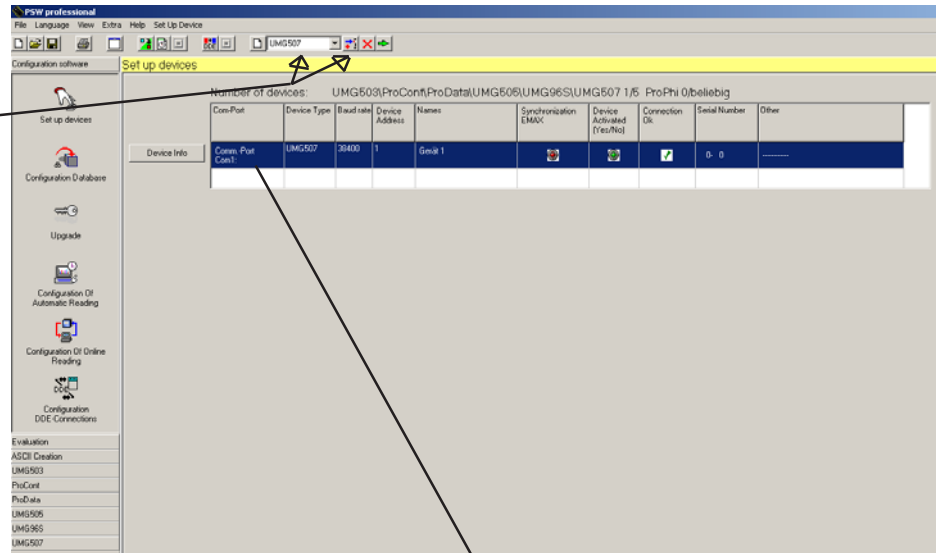


Display device address

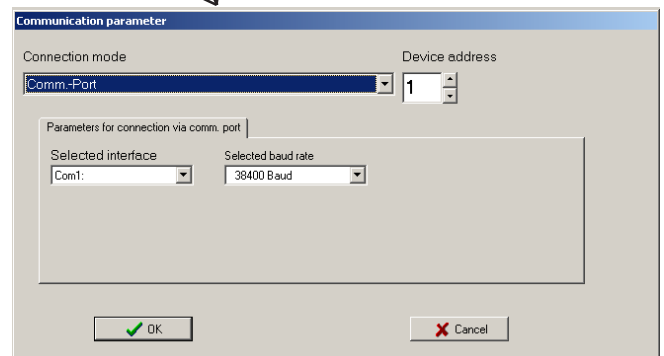
Creating new profiles

The UMG507P/EP has four defined Profibus profiles. While using the delivered configuration program PSWbasic/professional, new profiles can be created in the program part UMG507 „Configuration of profiles for Profibus“. The measured values, which must be transmitted are selected and marked within the instrument. Install the software PSWbasic/professional on your PC. After starting the software go to menu „Configuration Software“, „Define measuring devices“. Connect the delivered RS232 interface cable to the RS 232 interface of the UMG507 and define the device within the software.

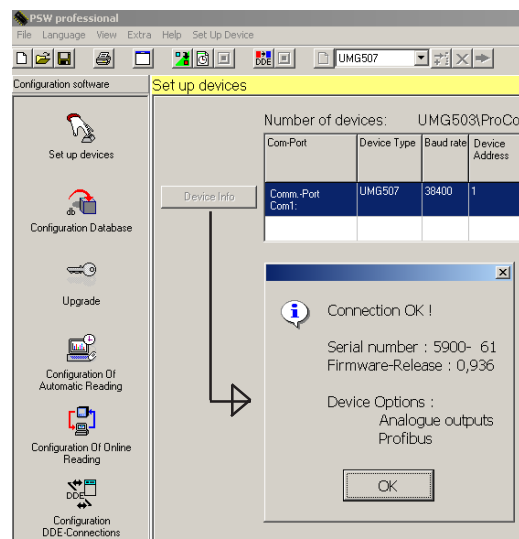
Select the device type UMG507 in the Drop Down field. Press function „add measuring device“.



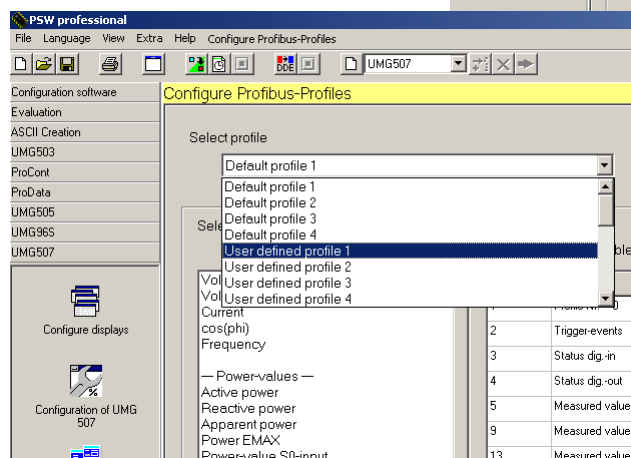
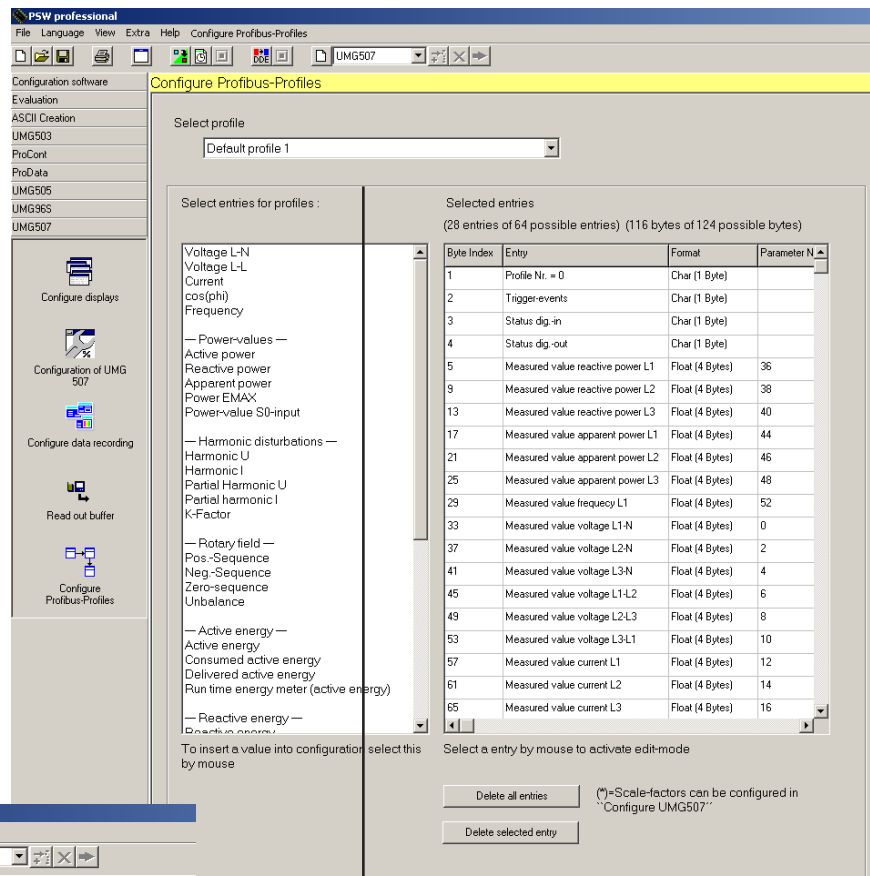
Check the Com-Port settings next. Press Com-Port within the measuring device list. In the manufacturer's settings, the configuration is as follows: Device address = 1, Baud rate = 38400, Protocol = 0. If the device address was not changed, the settings can be used unchanged.



Test transmission by clicking function „Device info“. Only for the devices UMG507P and UMG507EP the option Profibus is available. The other device types do not support Profibus, and it is not possible to release Profibus after sales.

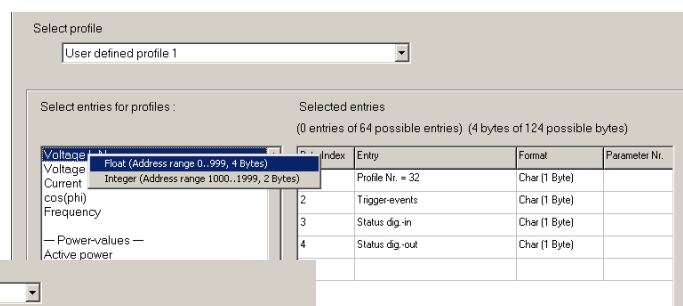


Open the menu „Configure Profiles for Profibus“ in menu UMG507. The first four profiles are not changeable.



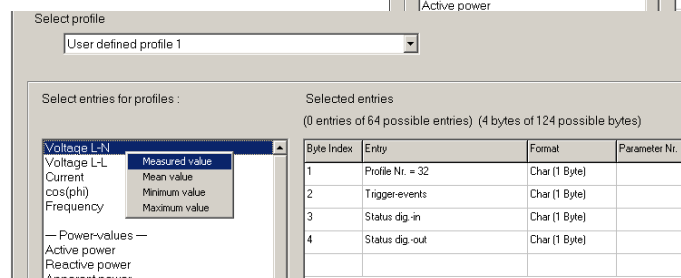
20 user defined profiles can be created. Select the profile „user defined 1“ from the list.

On the right side the possible measured values can be found. After the selection of a measured value, please select the data format, floating point format or integer format.

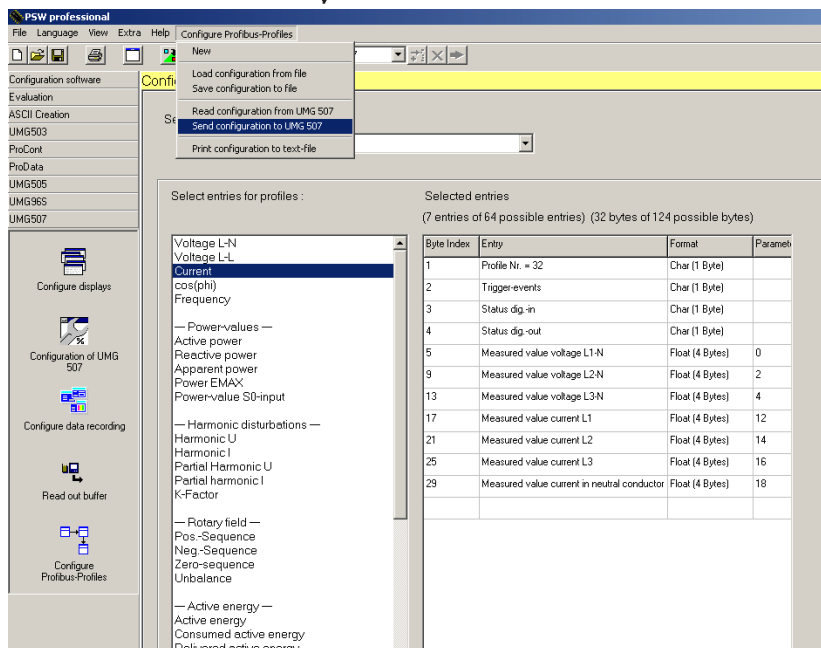
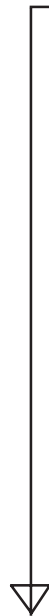
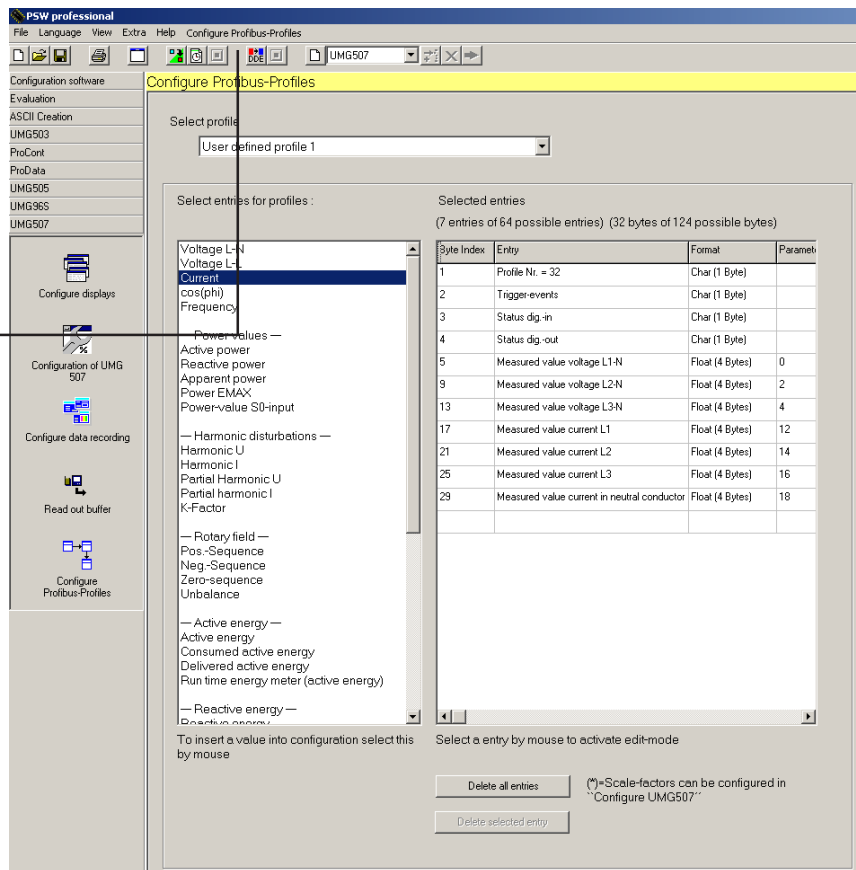


... At disposal:

- Measured value
- Mean value
- Minimum value
- Maximum value

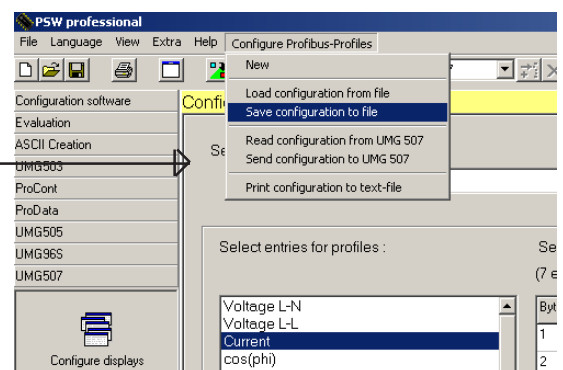


For each user defined profile up to 64 entries are possible. The parameter number provides the internal register address (see address list UMG507).

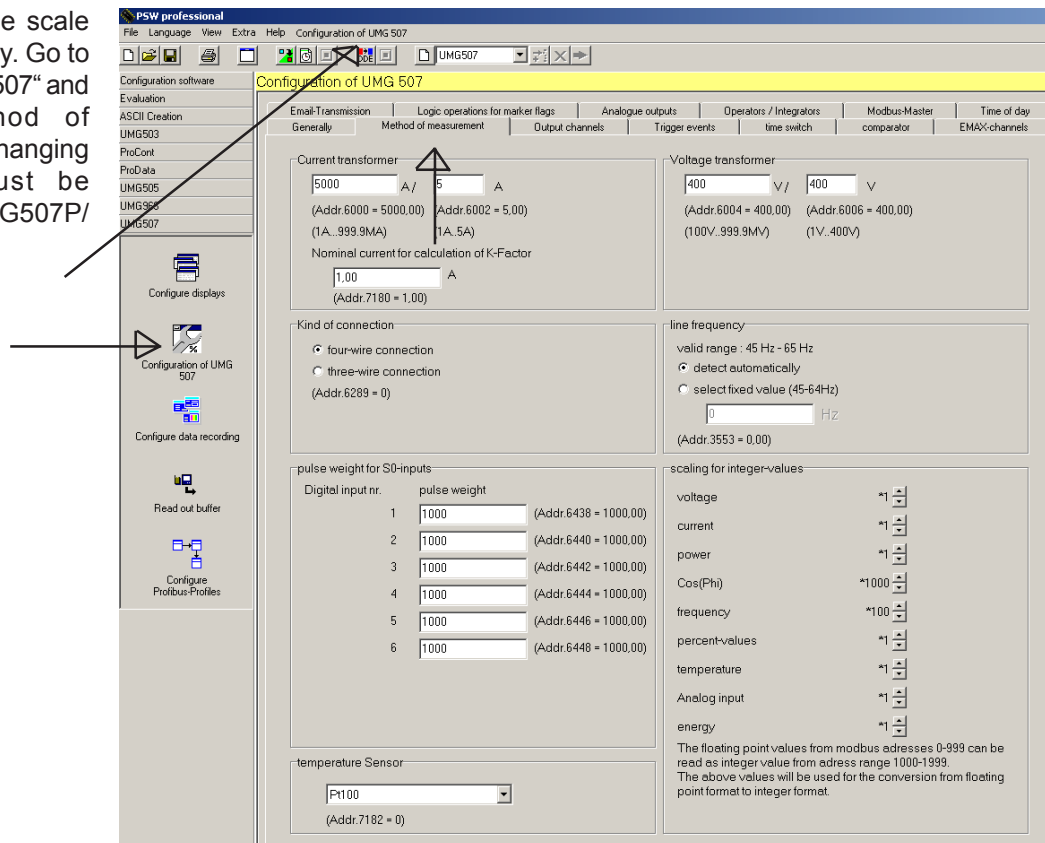


Transmit the profile to the UMG507P/EP.

Save the profile in a file and transmit it to the device (Send configuration to UMG507).



For integer values, the scale must be set additionally. Go to menu „Configure UMG507“ and enter panel „Method of measurement“. After changing the scaling, it must be transmitted to the UMG507P/EP as well.



The solution or scaling must be chosen in a way, that the range of the integer format (e.g. - 32768 to 32767) is not exceeded. Furthermore it must be selected in a way the solution is as high as possible. Apart from the energy values (in kWh, kvarh) the measured values are transmitted in their basic units (V,W,VA etc.).

The data formats in integer format are as follows:

Apart from energy, all measured values in format WORD (2Byte) : -32768 to + 32767

Energy values in format LONG (4Byte): -2147483648 to + 2147483647

Some examples:

Example real power:

With a current transformer ratio of 200/5A and a voltage transformer ratio of 400V/400V the maximum sum real power can be 240kW. The transmitted value at a scale factor of „1“ would be 240.000. As the integer range is exceeded by far, the scale should be set to „/10“. Using this scale, the UMG507P/EP would transmit 24.000 as a maximum, which is within the integer range and provides the best solution. The measured value is calculated:

Measured value = Transmitted value * scale factor

Example voltage:

Value at display = 230,3V; Scale = *1 ;

Transmitted value in PLC = 230

Value at display = 230,3V; Scale = *10 ;

Transmitted value in PLC = 2303

Example Cos-phi:

Value at display = 0,995; Scale= *1 ;

Transmitted value in PLC = 0

Value at display = 0,90; Scale = *1000 ;

Transmitted value in PLC = 995

Example Frequency:

Value at display = 50.03; Scale = *1 ;

Transmitted value in PLC = 50

Value at display = 50.03; Scale = *100 ;

Transmitted value in PLC = 5003

Example real energy:

The energy is always transmitted with the unit kWh. Using the format LONG at scale *1, the transmission value is limited to 2147 GWh. But the display range of UMG507 is up to 9999GWh. The scale factor depends on the power of the panel. For small to bigger panels, a scale factor of 1 can be selected, as 2147 GWh are usually big enough. For very large panels, a scale factor of 10 should be selected. This results in a solution of 10kW. The maximum measured value would be 21474 GWh

There is the alternative to reset energy over a Profibus flag while reaching the limit of 2147 GWh.

The configuration at the PLC (e.g. S7) is done as follows:

Install GSD file:

In the hardware configuration in menu point „Extras Install new GSD“ the GSD file is imported. After installing the GSD file the catalogue must be actualized.

Insert a measuring device into the DP master system:

Go to the folder Profibus DP in the hardware catalogue. Under field devices „Others“ the UMG 507P/EP, installed by the GSD file can be found. Mark a module, for example „STD: 24 Word In, 2 Byte Out“ in the catalogue and drag it with a pressed mousekey into the DP master system. The software asks for the address of the instrument. Set the address, which was programmed at UMG507P/EP before. Please note, that the addresses may not be given twice.

Hint regarding the module: It is not vital to read out the complete profile. If only the first measured values of a profile with e.g. 64 Word are required, a smaller module with e.g. 16 Word can be selected.

Make table of variables (VAT)

For testing communication, please make a table of variables. Move to the respective menu in the project overview. After calling up the variable table, the operands must be assigned. The assignment results from the address range, which was automatically given in the hardware configuration.

1. example floating point format:

Automatically given E-address range for UMG507E/EP with device address 1: 256 ... 307

Selected profile: 1 (Fix profile)

The structure is as follows:

Operand	Symbol	Status format	Status value	Control value
<i>Input:</i>				
PAB 256	—	DEZ	1	// Profile number
PAB 257	—	BIN	2#0000_0000	// Profibus flag
PAW 258	—	DEZ		// Analogue output 1
PAW 260	—	DEZ		// Analogue output 2
<i>Output:</i>				
PEB 256	—		1	//Feedback Profile number
PEB 257	—		#0000_0000	//Trigger status. 10sec follow-up
time				
PEB 258	—		#0000_0000	//Status of digital inputs
PEB 259	—		#0000_0000	//Status of digital outputs
PED 260	—	Float	230.3456	// Voltage L1
PED 264	—	Float	231.5655	// Voltage L2
PED 268	—	Float	231.5655	// Voltage L3
PED 272	—	Float	23.9834	// Current L1
PED 276	—	Float	24.7894	// Current L2
PED 280	—	Float	23.8944	// Current L3
etc.				

2. Example integer format

Automatically given E-address range for UMG507E/EP with device address 1: 256 ... 307

Selected profile: 32 (user defined profile 1) selected format integer

The structure is as follows:

Operand	Symbol	Status format	Status value	Control value
<i>Input:</i>				
PAB 256	—	DEZ	32	// Profile number
PAB 257	—	BIN	2#0000_0000	// Profibus flag
PAW 258	—	DEZ		// Analogue output 1
PAW 260	—	DEZ		// Analogue output 2
<i>Output:</i>				
PEB 256	—		32	//Feedback profile number
PEB 257	—		#0000_0000	//Trigger status
PEB 258	—		#0000_0000	//Status of digital inputs
PEB 259	—		#0000_0000	//Status of digital inputs
PEW 260	—	DEZ	2315	// Voltage L1
PEW 262	—	DEZ	2301	// Voltage L2
PEW 264	—	DEZ	2321	// Voltage L3
PEW 266	—	DEZ	25	// Current L1
PEW 268	—	DEZ	26	// Current L2
PEW 270	—	DEZ	24	// Current L3

etc.

The scale results from the scale setting.

Profibus flag:

Via Profibus flags internal target action can be released, which means, the PLC for instance controls directly via internal functions of the UMG507P/EP.

The programming is done in PSWbasic/professional in window „Output channels“.

The following actions are possible:

- Set a digital output.
 - Send Email (only possible at UMG507EP).
 - Start / stop second timer.
 - Start / stop integrator (integrates any measured value over time).
 - Tariff changeover of energy meter (real / reactive energy).
 - Maximum demand control, target value changeover.
 - Saving a parameter in the parameter memory.
 - Synchronize internal clock on next full hour.
 - Reset measuring period (Maximum demand controller).
 - Reset real and reactive energy.
 - Reset the minimum and maximum values (e.g.current, voltage etc.)
- Furthermore, the Profibus flags can be used in the logical combinations.

Trigger status:

The status feedback of the trigger events (short interruptions) lay in the input range of the PLC on Byte 2 with a fixed follow-up time of 10 sec. which means, after a short interruption, for example of voltage in phase 1, the status Bit of the event is left on high level for the duration of the event, but at least 10 seconds. The reaction time is <200ms. The programming of the trigger event is done with PSWbasic/professional in window „Trigger events“. The overcurrent events are „OR“ combined on the same Bit.

Analogue outputs:

The internal analogue outputs of the UMG507P/EP can be controlled via Profibus as well. The range of 0 to 65535 can be assigned to 0 (4) to 20mA via PSWbasic/professional. The internal parameters 9000 or 9002 are used.

Example 2: Trigger status (short interruptions)

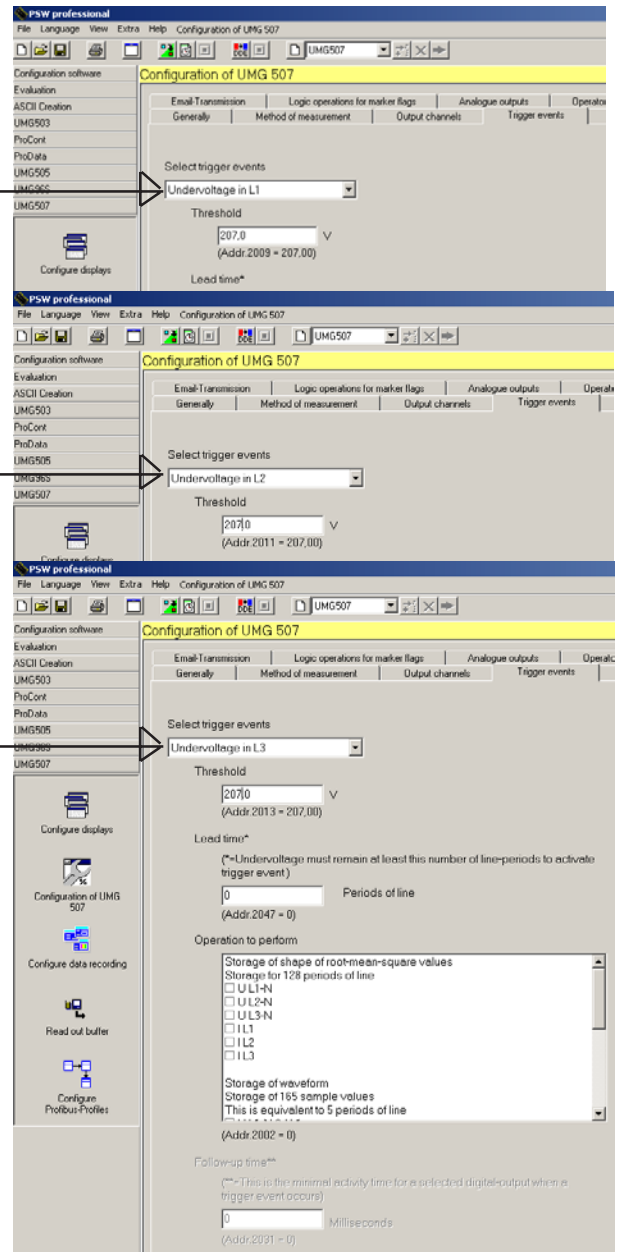
The voltage in the phases L1,L2,L3 shall be supervised regarding low voltage. At violations of the limits the result shall be visualized over Profibus. At first, install a UMG 507 P/EP in software PSW/basic/professional as written in chapter „Create new profiles“. Change into menu „Configure UMG507“ into window „Trigger events“.

Select the corresponding phase in the Drop Down Field and set the limit for low voltage. Transmit the programming to the device.

Low voltage L1

Low voltage L2

Low voltage L3



In the input range of the second Byte BIT0 to BIT2 the status can be read. The follow-up time is 10 seconds.

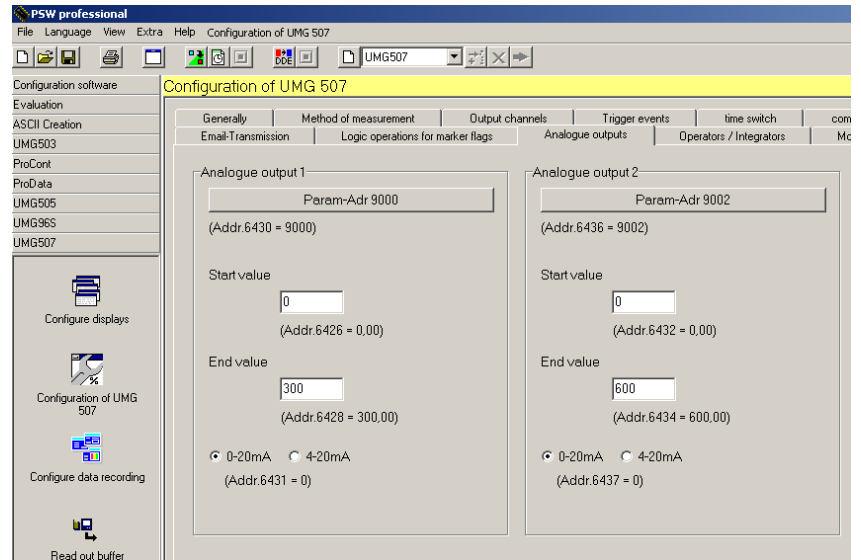
2. Byte (Trigger status). Follow-up time: 10sec

Bit 0	U-L1N Low voltage
1	U-L2N Low voltage
2	U-L3N Low voltage
3	U-L1N Low voltage
4	U-L2N Low voltage
5	U-L3N Low voltage
6	Overcurrent L1/L2/L3

Example 3: Analogue output

The control of the analogue output is carried out via the 3. and 4. or 4. and 5 Byte in the output range. Die Daten werden fest auf die Parameter 9000 bzw. 9002 geschrieben.

Configure the analogue output of the UMG507P/EP to the parameters 9000 or 9002 and set the scale for the scale starting value and scale end value.



In the above mentioned example, the scale starting value for the analogue output was set to 0 and the scale end value was set to 300. A decimal e.g. of 150 on the 3. and 4. Byte in the output range results in an output of 10mA.