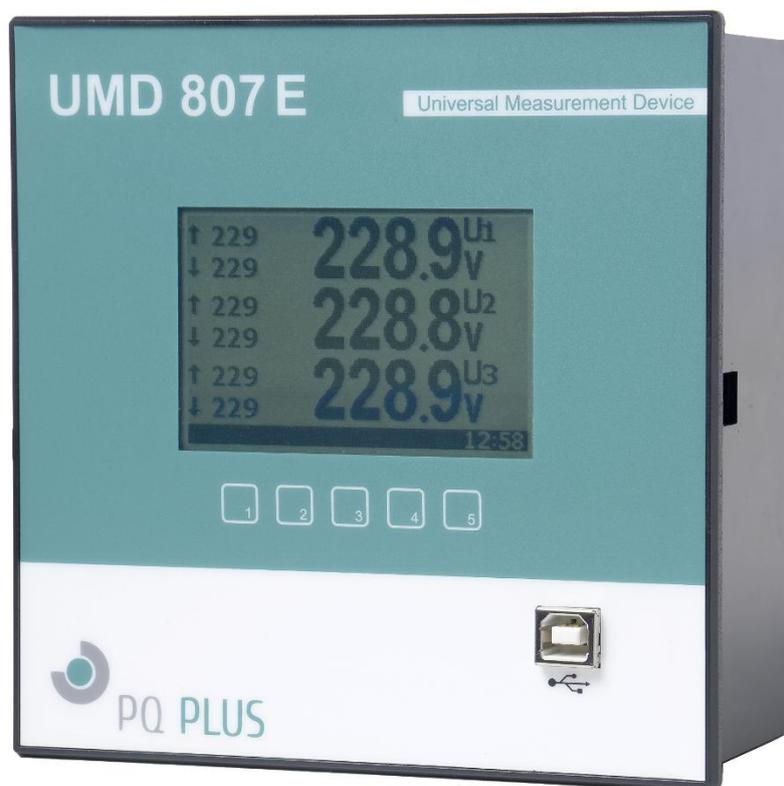


Operating Manual for

UMD 807

Firmware 2.0



Inhaltsverzeichnis

1.	Installation.....	3
1.1	Physical.....	3
1.2	Instrument Connection.....	3
1.1.1	Power Supply	3
1.1.2	Measured Voltages.....	3
1.1.3	Measured Currents.....	3
2.	Commissioning.....	4
2.1	Setup	4
2.1.1	Measured Electrical Quantities Installation Setup.....	4
3.	Detailed Description	5
3.1	Basic Functions	5
3.2	Manipulation and Setting	5
3.2.1	Data Area – Status Bar - Toolbar	6
3.2.2	Main Menu	6
4.	Inputs & Outputs.....	12
4.1	Connection of the I/O.....	12
4.1.1	RI1 Digital Input Connection	12
4.1.2	RO1÷RO4 Digital Outputs Connection	12
4.1.3	DI2÷DI5 (12÷24 VDC) Digital Inputs Connection	12
4.1.4	DO5÷DO8 (12÷24 VDC) Digital Outputs Connection.....	13
4.1.5	AAI1, AI2 Analog Inputs Connection	13
4.1.6	AO1, AO2 Analog Outputs Connection	13
4.1.7	Embedded 12 VDC Auxiliary Power Supply	13
4.1.8	External Temperature Sensor Connection	14
5.	Communication Links	14
5.1	Local Communication Link.....	14
5.2	Remote Communication Links	14
5.2.1	RS-485 Interface (COM)	14
5.2.2	Ethernet Interface (ETH).....	14
6.	Examples of Connections.....	15
7.	Technical Specifications.....	19
8.	Maintenance, Service	23

1. Installation

1.1 Physical

The instrument is built in a plastic box to be installed in a distribution board panel. The instrument's position must be fixed with locks.

Natural air circulation should be provided inside the distribution board cabinet, and in the instrument's neighbourhood, especially underneath the instrument, no other instrumentation that is source of heat should be installed.

1.1

1.2 Instrument Connection

1.1.1 Power Supply

The instrument requires an AC or DC voltage power supply as specified in technical parameters. The supply inputs are separated from other circuits of the instrument.

It is necessary to connect an auxiliary supply voltage in the range as declared in technical specifications table to the terminals **AV1** (No. 9, L) and **AV2** (No.10, N). In case of DC supply voltage the polarity of connection is generally free, but for maximum electromagnetic compatibility the grounded pole should be connected to the terminal **AV2**.

The supply voltage must be connected via a disconnecting device (switch - see installation diagram). It must be situated directly at the instrument and must be easily accessible by the operator. The disconnecting device must be labelled as the disconnecting device of the equipment. A C-character double circuit breaker at the nominal value of 1A may be used for the disconnecting device; however its function and position must be clearly marked (symbols „O" and „I" according to EN 61010 – 1). If one of the supply signals is neutral wire N (or PEN) usually a single breaker in the line branch is sufficient. If a switch and fuse is used, the T1A (delayed) type is recommended.

1.1.2 Measured Voltages

Connect measured voltages in wye (star), delta or Aron configuration to terminals **VOLTAGE / N** (No. 11), **U1** (No. 12), **U2** (No. 13), and **U3** (No. 14). The **N** terminal stays free at delta and Aron connections.

Phase rotating direction is free.

Types of connections are stated in the following table.

It is advisable to protect the supply leads by 1A safety fuses (F1A type, for example).

The type of voltage and currents connection must be entered in *Installation* parameters : the code shows the amount of connected phases, **3Y** means three-phase connection in wye (star), **3D** in delta. **3A** means Aron connection. For setup **1Y** the instrument measures phase L1 only and 3-phase values are simulated.

Tab. 2.1: Connection of the measured voltages – VOLTAGE group of terminals

Terminal VOLTAGE	Type of connection		
	wye-star (Y)	wye-star (Y)	wye-star (Y)
U ₁	L1-phase voltage	L1-phase voltage	L1-phase voltage
U ₂	L2-phase voltage	L2-phase voltage	L2-phase voltage
U ₃	L3-phase voltage	L3-phase voltage	L3-phase voltage
U _N	neutral wire voltage	neutral wire voltage	neutral wire voltage

In the case of indirect connection via the measuring voltage transformers, it is necessary to enter this matter (connection **Mode**) and the values of the VT ratios during the setup of the instrument.

The maximum cross section of the conductors to the terminal panels is 2.5 mm².

1.1.3 Measured Currents

The instruments are designed for indirect current measurement via external CTs only. Proper current signal polarity (S1 & S2 terminals) must be observed. You can check the polarity by the sign of phase active powers on the instrument display (in case of energy transfer direction is known, of course). The CT-ratio must be set. in *the Installation* group of parameters (see below). The I2 terminals stay free in case of the Aron (A) connection.



To get better precision when using overweighted CTs, you can apply more windings of measured wire through the transformer. Then you must set the multiplier parameter (see below). For standard connection with 1 winding, the multiplier must be set to 1.

The current signals from 5A or 1A (or 0.1A for the „X/100mA" models) instrument current transformers must be connected to the **CURRENT** connector terminal pairs **I11 – I12**, **I21 – I22**, **I31 – I32** (No. 1 ÷ 6).

A particular connector is provided with a screw lock to prevent an accidental pullout and possible unwanted disconnection of the current circuit.

A connection cable maximum cross section area is 2.5 mm².

2. Commissioning

2.1 Setup

When switching on the power supply, the instrument will display manufacturer's logo for short time and after that, one of actual data screen - for example the line-to-neutral voltages one - is displayed :



At this moment it is necessary to set *instrument parameters* that are essential for proper instrument measurement (so called *Installation* group):

- mode of connection (direct measuring or via metering voltage transformers)
- type of connection (star, delta, Aron)
- ratio of Cts, VTs and their multipliers (if used)
- nominal voltage U_{NOM} and nominal frequency f_{NOM}
- I_{NOM} , P_{NOM} (not mandatory, but recommended)

2.

2.1

2.1.1 Measured Electrical Quantities Installation Setup



For the proper data evaluation it is necessary to set all of the *Installation Setting* group parameters.

- **Connection Mode** determines if voltage signals are connected directly or if voltage transformers are used.
- **Connection Type** needs to be set according network configuration – wye (or star, **Y**) or delta (**D**, if neutral voltage potential not connected). Usually, all of three phases are connected so choose **3-Y** or **3-D**. For Aron connection set **3-A**. For single-phase connection, set **1-Y**.
- **CT-** ratios must be specified, in case of “**via VT**” connection mode **VT**-ratios too.
- The VT-ratios must be set in form *Nominal primary voltage / Nominal secondary voltage* . For higher primary voltage values *the U-multiplier* must be used too.
- CT ratios can be set in form either .../ 5A or .../ 1A.
- **I- and U-Multiplier** - You can modify the CT- / VT-ratio with this parameter. For example, to get better precision when using overweighted CTs, you can apply more windings of measured wire through the transformer. Then you must set the multiplier. For example, for 2 windings applied, set the multiplier to $1/2 = 0.5$.
- For standard connection with 1 winding, the multiplier must be set to 1.
- **Nominal Frequency** f_{NOM} - the parameter must be set in compliance with the measurement network nominal frequency to either 50 or 60 Hz, optionally to „DC-500“ (= *Fixscan* mode).
- **Nominal Voltage** U_{NOM} , **Nominal Current** I_{NOM} , **Nominal Power** P_{NOM} - For the presentation of quantities in percent of nominal value, alarms operation, voltage events detection and other functions it is necessary to enter also the nominal (primary) voltage U_{NOM} , nominal current I_{NOM} and nominal apparent three-phase power (input power) of the connected load P_{NOM} (in units of kVA) Although the correct setup has no effect on measuring operation of the instrument, it is strongly recommended to set at least the U_{NOM} correctly.

Correct setting of the I_{NOM} and the P_{NOM} is not critical, it influences percentage representation of powers and currents and statistical processing of measuring in the software only. If measured network node rating is not defined, we recommend to set their values, for example, to the nominal power of source transformer or to the maximum supposed power estimated according current transformers ratio, etc.

The U_{NOM} is displayed in form of phase/line voltage.

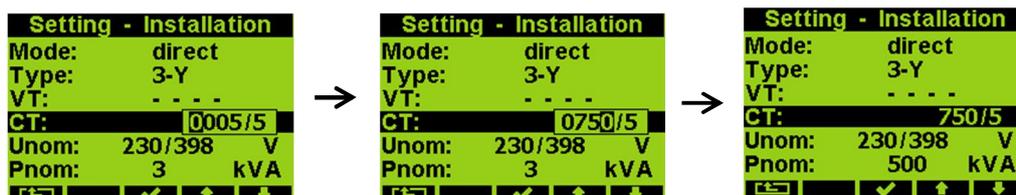
Setup Example

Following example explains how to adjust the CT ratio:

Assuming that the conversion of used CT for inputs of current L1 to L3 is 750/5 A. To edit the parameters, press the **MENU** button, navigate to the **Menu-Settings** with the buttons **▶** and **◀** and then choose it with the **✓** button. In the **Setting** window choose **Setting-Installation** option. The **Setting-Installation** window appears:



In the window navigate down to the current transformer ratio parameter (CT) and choose with the **✓** button.



Now you can type new value of the parameter : with the **▶** button you can move from a digit to another one and to set each digit to target value using the **▲** and **▼** buttons. At the end press the **✓** button and the parameter is set.

You can set other parameters in the same way.

After all of the parameters correctly set, return back to the power factor control screen with the **⏪** (escape) button and confirm saving of changes with the **✓**-button.

Now you can browse through displayed actual values in the right part of the screen with **▲** and **▼** buttons and check if they correspond with reality.



For proper CT connection checking, you can use phasor diagram screen.

After measured quantities checked, other parameters (of RTC, averaging, remote communication etc.) can be set .

3. Detailed Description

3.1 Basic Functions

The instruments evaluate all of usual electric quantities like line-to-line and phase voltages, currents, active, reactive and apparent powers, power factors, voltage and current THDs and harmonic components, active and reactive energy, average power maximums, frequency etc. Furthermore, temperature is measured with built-in sensor. Optionally, the second temperature can be measured with an external Pt100 sensor at appropriate instrument models.

The instruments are fitted with inputs for connection of three voltage signals, three current signals (for connection of external CTs with either 5/1 AAC or 0.1 AAC nominal secondary signal) and separate AC/DC power supply input. They can be used in both low and high voltage power grids.

The instruments feature three-rate tariff electricity meter with four-quadrant counters for both active and reactive energies and maximum average active power (maximum demand) registration. Advanced models store all results for actual and last month too and a separate archive dedicated for automated meter readings can record actual status in preselected intervals.

The instruments are equipped with battery backedup real-time circuit (RTC) and high capacity „Flash“ type memory for measured data and events recording.

The USB 2.0 communication link can be used for the instrument adjusting and recorded data transfer. For remote access, optional RS-485 or Ethernet communication interface is available. The instruments with Ethernet interface have embedded webserver.

Basic specifications of the instrument can be set up by using the inbuilt keyboard and the display. With the ENVIS program supplied as standard you can, via any of communication link, adjust the instrument and transfer recorded data. In addition to the instrument adjustment, ENVIS program allows you to display, view and archive the measured courses in the graphic form, as well as a number of other features.

3.2 Manipulation and Setting

3.

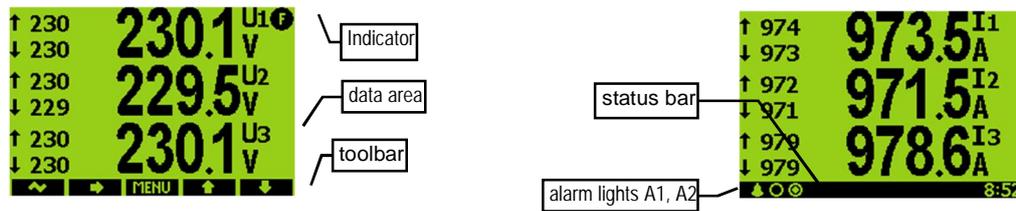
3.1

3.2

3.2.1 Data Area – Status Bar - Toolbar

Instrument's screen consists of two parts : a *data area* and a *status bar / toolbar area*.

Fig. 4.1: Data Area, Data Area, Status Bar, Toolbar



After instrument's startup the status bar appears below data area as default. The status bar contains following information:

- ... A1 and A2 alarm lights. After the bell icon, two targets represent actual state of the lights; the first one – A1 – is switched off on the example, the A2 is just switched on. This information appears only when either A1 or A2 function is set in the I/O management setup (see below).
- ... local time (hours : minutes)
- As soon as any button is pressed, a toolbar replaces the status bar. The toolbar determines function of individual buttons and changes dynamically by a context. If no manipulation with buttons for a longer period the toolbar is replaced with the status bar.
- In special cases a flashing indicator can appear at upper right corner of the data area. It indicates following cases :
 - ... Frequency measurement not yet finished or out of range. In such cases measured signals are scanned according preset nominal frequency f_{NOM} and measured values can be incorrect. Check f_{NOM} parameter setting.
 - ... At least one of voltage or current input overloaded
 - ... Remote communication in progress. This indicator is suppressed approx. 10 seconds after any button pushing.

3.2.2 Main Menu

Fig. 4.2: Main Menu



By pressing the **MENU** button, a *Main menu* window appears. With the **▶** and **◀** buttons you can browse through the menu and select a desired action with the **✓** button or return back using the **↶** (escape) button.

Although all other buttons but the **MENU** button are context dependent and variable, the **MENU** button is accessible from nearly every window which helps to quick orientation. Excluding the PFC block icon, the menu options consist of:

-  Actual data group (all of measured data in both numeric and graphic form)
-  Daily and weekly graphs of main quantities
-  Electricity meter data group (electric energy and maximum demand values)
-  Instrument setting (presetable parameters)
-  Instrument lock
-  Information (instrument type & serial number, memory usage state etc.)

3.2.1

3.2.2

Actual Data Group



Actual values in numeric form appear when Actual data group is selected as default. Navigation through the actual values branch is intuitive using the navigation buttons. For detailed description of the actual values presentation see chapter Display Actual Values Evaluation and Aggregation further below.

All the values are identified with a quantity name and a quantity unit. An U/I/P/Q summary window is an exception – the quantity unit is not displayed (only a k / M / G multiplier is). At the last column, which is marked 3p , values of following quantities are displayed :

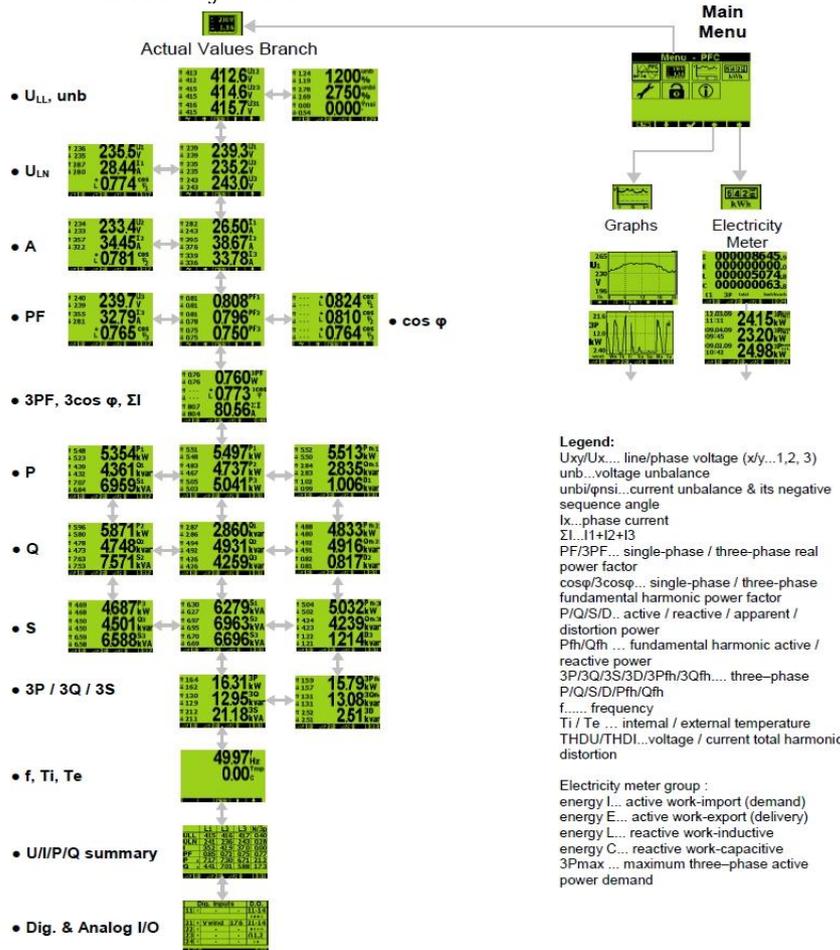
Fig. 4.3 : Actual Data Summary Window

	L1	L2	L3	N/3p
U _{LL}	415	416	417	0.40
U _{LN}	241	236	243	0.28
I	352	42.9	370	0.00
PF	0.85	0.72	0.75	0.77
P _k	7.17	7.30	6.71	21.2
Q _k	4.41	7.01	5.88	17.3
/ 110 / 210 / 45: 0 / 13:31				

Tab. 4.1: Summary Window 3p Column Quantities

row	3p column quantity
U _{LL}	unb _U - voltage unbalance
U _{LN}	-
I	$\Sigma I - I1+I2+I3$
PF	3PF – three-phase power factor
P	3P – three-phase active power
Q	3Q – three-phase reactive power
row	3p column quantity

Fig. 4.4 : Meter Actual Data Navigation Chart



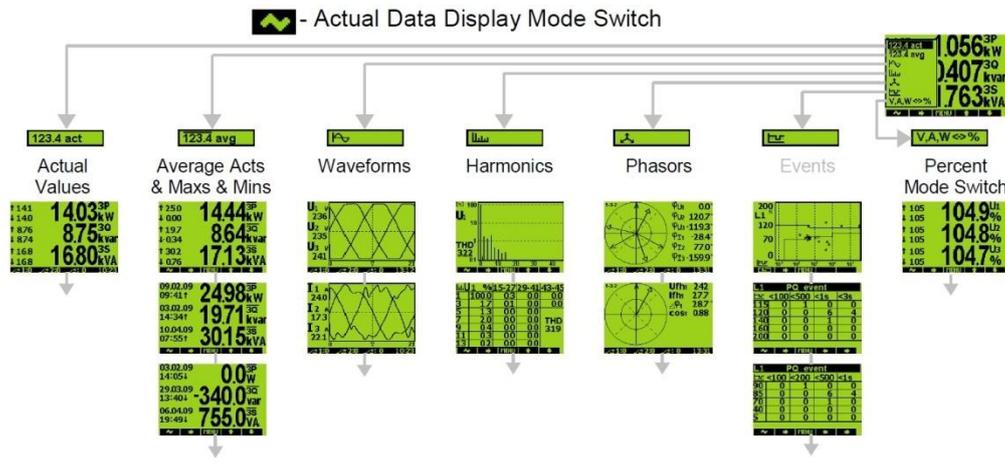
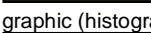


Fig. 4.5 : Actual Data Display Mode Switch



The actual data group comprises other actual data presentations that are accessible with the  button - so called *actual data display mode switch*. When pressed, a pull up menu rolls over the display temporary. By multiple pressing of the button a desired actual data subgroup can be selected and displayed:

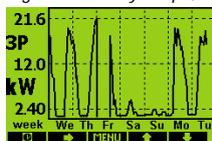
-  Actual values – values of all measured quantities in numeric format.
-  Average values – average values of main measured quantities including their maximums & minimums. For detailed description see chapter *Display Average Values Evaluation and Aggregation* further below.
-  Waveforms – actual wave shapes of all measured voltages and currents.
-  Harmonics – actual harmonic components of all voltage and current signals in both numeric and graphic (histogram) formats. For detailed description see chapter *Harmonics and THD Presentation*.
-  Phasors – diagrams of voltage and current fundamental harmonic phasors. A phase sequence can be checked here too (indicated as 1-2-3 or 1-3-2).

With the last option of the display mode switch – **V,A,W↔%** – voltage, current and power quantities expression can be switched between basic units and percent relative to preset nominal voltage U_{NOM} and nominal power P_{NOM} .

Daily and Weekly Graphs

This option is supported by instrument models equipped with RTC & additional memory only.

Fig. 4.6 : Weekly Graph, Daily Graph



A one-week history of main measured quantities (such as voltages, currents, powers and power factors) is registered in the instrument's memory cyclic buffer. Individual courses can be displayed for rough check (for detailed check at a PC a main archive is intended, see appropriate chapters further below).



With the  button, either whole week or specified day of the passed week can be selected – on the graph, the day is identified with its shortcut (Mo = Monday, for example). With the  button desired group of quantities can be selected. For listing through the selected group, use the  and  buttons.

- 1.
- 2.
- 3.
- 3.1
- 3.2
- 3.2.1
- 3.2.2
- 3.2.2.1
- 3.2.2.2

Electricity Meter Data Group



The electricity meter group comprises registered electric energy and maximum active power demand values. For detailed explanation see chapter *Energy Data Presentation in the Operating Manual*.

Instrument Setting



In dieser Gruppe können die meisten voreinstellbaren Parameter angezeigt und bearbeitet werden. Auf andere Parameter kann ausschließlich über die Kommunikationsanschlüsse von einem PC zugegriffen werden, auf dem das EnVis-Programm installiert ist.

Wenn ein Einstellungsbildschirm angezeigt wird, schaltet das Messgerät automatisch auf den Ist-Datenbildschirm zurück, wenn innerhalb von ca. 1 Minute keine Eingaben über die Schaltflächen erfolgt sind.

In den folgenden Kapiteln wird die Bedeutung der einzelnen Parametergruppen erläutert.

Display Setting



- **Contrast** ... LCD display contrast in range 0÷100 %
- **Backlight** ... LCD display backlight can be set as permanently on (**on**) or to auto-off mode (**auto**), in which it is switched off automatically during approx. 2 minutes if no button is pressed to decrease the instrument power dissipation.
- **Language** ... Except the basic English version, other national versions can be selected
- **Display refresh cycle** ... Actual values refresh period. For details see chapter *Display Actual Values Evaluation and Aggregation in the Operating Manual*.
- **Display Resolution** ... Actual data format can be set to 3 or 4 significant figures (exception : not applicable for electric energy values).

Installation Setting



All parameters of this group are explained in chapter *Measured Electrical Quantities Installation Setup*. above (the *Commissioning* part).

Clock Setting



This setting is relevant for instrument models equipped with a real time circuit (RTC).

- **Date & Time** ... Local date and time.
- **Time Zone** ... The time zone should be set according location of an instrument during installation. Correct setting is essential for proper local time interpretation.
- **Daylight Saving** ... This option controls automatic winter/summer local time switching.
- **Time Synchronization** ... As the built-in real time circuit has limited accuracy while free running, with this option it is possible to keep the RTC time in synchronism with an external precise time source. The RTC can be synchronized by:
 - Pulse Per Second / Minute (PPS / PPM) ... A digital input is used for time synchronization from an external source at this case. The instrument sets the RTC to the nearest second or minute as soon as a synchronization pulse is detected. Second-, Minute-, quarter-hour- or hour- synchronization pulses are accepted.
 - NMEA Message ... If an instrument is equipped with the RS-232 or RS-485 remote communication interface an external (usually GPS-based) time receiver can be connected to. The receiver must be set to transmit the "ZDA"- or "RMC "-message (NMEA 0183 protocol). The communication interface must be set appropriately (usually 4800 Bd, 8 bits, 1 stopbit).
 - NTP Server ... The option can be used if an instrument is equipped with the Ethernet communication link and a NTP-server is available in the network.
 - Network Frequency ... For this option, the nominal frequency f_{NOM} parameter must be set properly. Otherwise the synchronization will not work.



Warning : When editing clock parameters, it must be taken into account that internal data archives are affected : when changing the date or time, **all archives are cleared!**

Average Values Processing Setting



In this parameter group average values processing for both of *U/I*-group and *P/Q/S*-group of measured quantities can be set. Detailed explanation can be found in the chapter *Average Values Evaluation* further below.

Remote Communication Setting



Communication parameters for various interface types differ from each other:

COM (RS-485) interface:

- Communication Address
- Communication Rate ... Communication rate in Bauds (Bd).
- Data Bits ... Set to 8 for KMB protocol; when parity bit is used (Modbus, usually) set to 9
- Parity ... Set to 8 for KMB protocol; for Modbus, usually set to 9
- Stop Bits ... Set (usually) to 1

Ethernet-interface:

- DHCP ... activation of dynamic IP-address allocation.
- IP Address ... Internet protocol address.
- Subnet Mask ... Subnet mask.
- Default Gateway ... Default gateway.
- KMB-port ... Communication port used for KMB protocol communication.
- Web-port ... Communication port used for webserver communication.
- Modbus-port ... Communication port used for Modbus protocol communication.

Embedded Electricity Meter Setting



In this group parameters concerning electric energy registration and maximum active power demand processing can be set. For detailed parameter description see full-scale *Operating Manual*.

Instrument Lock



Three levels of locking to allow protection against unauthorized access are implemented. The active protection level is symbolized in *the main* menu by three different states of the **Lock** icon:



- **Unlocked** – anyone with physical access to the instrument can freely set-up and configure all parameters in the instrument, clear archives and other persistent data or reset counters. In this state anyone can also lock the instrument.



- **User Locked** – fixed *user password* (PIN) is required if the instrument configuration is changed or there is a request to clear any of the data.



- **Admin Locked** – user defined *admin password* (PIN) is required if the instrument configuration is changed or there is a request to clear any of the data.

Locking

If the instrument is unlocked, you can lock it to either user or admin mode. To lock the instrument into the user locked mode, simply switch in the **Menu-Lock** window the lock from ✖ to ✔. Then escape from the window with the  button and confirm saving of changed state.



To lock the instrument into the admin locked state, press the buttons  and ▼ simultaneously in the **Menu -> Lock** window. Then normally hidden admin password option appears. Choose it and type the new admin password code – the value must be different from 0000. Then escape from the **Menu-Lock** window with the  button and confirm saving of changed state. The admin locked state is indicated with the "A"-character inside the lock icon.



Store the admin password code at the secure place to be able to unlock the instrument later in case the code is forgotten!

Unlocking from the User Locked State

To unlock the instrument, switch in **Menu -> Lock** the lock state back from ✔ to ✖ by entering user password. The value of this password is fixed and equal to the last four digits of the serial number of the instrument. This serial number can be found in device display under **Menu -> Info -> Serial number**.

Then escape from the **Lock** window with the  button and confirm saving of changed state.

Entsperren aus dem Admin-gespernten Zustand

To unlock the instrument, switch in **Menu -> Lock** the lock state back from ✓ to ✖ by entering correct admin password. Then escape from the **Menu-Lock** window with the  button and confirm saving of changed state.

Note, that such unlocking is temporary and the instrument will switch to the admin locked state automatically approx. 15 minutes after last pressing of any button. To avoid this you need to set the admin password code to value 0000 (in the same way as the locking as described above). Only after that the instrument state changes to permanently unlocked state.

Note : In case the admin password is lost, ask manufacturer for alternate unlock code via manufacturer's website at www.PQ-Plus.de

Instrument Information



The instrument identification and actual status are listed in this group. The information are split up to three windows that can be browsed through with the ► button.

Info – General Window

- **Instrument Model & Serial Number** ... Instrument hardware model & serial No.
- **Instrument Hardware, Firmware & Bootloader Versions** ... Instrument hardware & firmware specification.
- **Object Number** ... Measured node specification (preset by ENVIS program for data identification).
- **Vbatt** ... backup battery voltage (if equipped).
- **Error Code** ... Indicates some instrument's hardware or setting problem. At normal state equals to 0. In case of detection of any error it contains a number created as the sum of binary weights of the errors. The following table provides overview of them and recommended action:

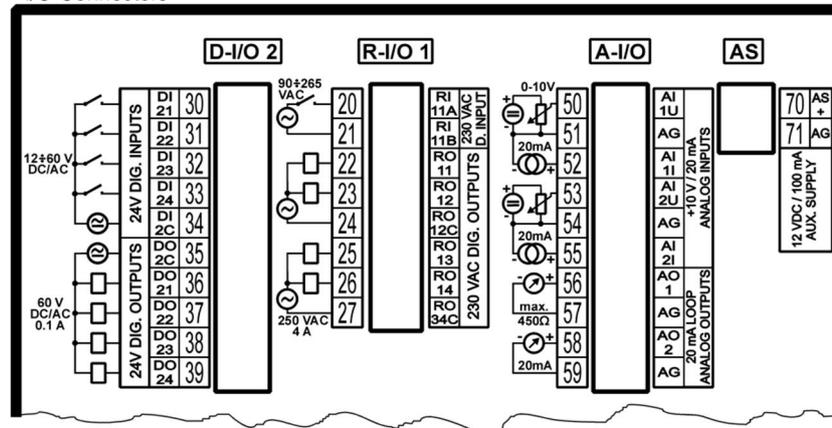
Tab 4.2 : Instrument Errors

Error No. (weight)	Error	Action
1	RAM memory error	set the instrument (optimally with the ENVIS program, if possible) to the <i>default setting</i> ; if the error appears again send the instrument to a service organization for repair
2	instrument setup error	set the instrument (optimally with the ENVIS program, if possible) to the <i>default setting</i> ; if the error appears again send the instrument to a service organization for repair
4	calibration error	the instrument must be recalibrated – send to a service organization
8	wireless communication module error (Wifi/Zigbee)	send to a service organization
16	RTC error	in <i>the time setup window</i> (or better with the ENVIS program, if possible), set actual date&time; if the error appears again, check built-in backup battery; otherwise send the instrument to a service organization for repair
128	archive data error	clear all of the archives with the ENVIS program; if the error appears again send the instrument to a service organization for repair
256	FLASH memory error	send to a service organization

4. Inputs & Outputs

Instruments can be equipped with various combinations of inputs and outputs (see manufactured models marking below).

Fig. 5.1 : UMD 807 – I/O Connectors



Assortment of inputs and outputs is :

- 1 100 ÷ 250 VAC digital input – marked as **RI1**
- 4 250 VAC digital outputs (relays) – **RO1 ÷ RO4**
- 4 12 ÷ 24 VDC digital inputs – **DI2 ÷ DI5**
- 4 12 ÷ 24 VDC digital outputs (solid state) – **DO5 ÷ DO8**
- 2 0 ÷ 10 VDC / 0 ÷ 20 mADC analog inputs – **AI1 ÷ AI2**
- 2 0 ÷ 20 mADC analog outputs – **AO1 ÷ AO2**
- 1 Pt100 temperature sensor input (optional) – **TE**

Furthermore, all of instrument models feature two “alarm” lights **A1** and **A2** for indication of various states, that can be considered as other special digital outputs. Function of these lights can be set in the same way as at standard digital outputs. All of the inputs and outputs are isolated from the instrument's internal circuitry.

4.1 Connection of the I/O

A connection cable maximum cross section area is 2.5 mm².

4.

4.1

4.1.1 RI1 Digital Input Connection

The input is designed for signal of nominal voltage in range of 100 ÷ 230 VAC („power input“). Connect the signal to terminals DI1A (No. 20) and DI1B (21, see connection examples in appropriate chapter) of the D-I/O1 connector. The input is isolated from all of other instrument circuitry. For the input activation, voltage of declared level must lead on the input.

4.1.2 RO1÷RO4 Digital Outputs Connection

Each pair of relays shares common pole connected separately to the R-I/O connector terminal. These common poles are isolated each from other.

Tab. 5.1 : RO1 ÷ RO4 Digital Outputs Connection

terminal No.	signal
22	RO1 ... RO1 relay NO contact
23	RO2 ... RO2 relay NO contact
24	ROC12 ... RO1 & RO2 relays common pole
25	RO3 ... RO3 relay NO contact
26	RO4 ... RO4 relay NO contact
27	ROC34 ... RO3 & RO4 relays common pole

4.1.3 DI2÷DI5 (12÷24 VDC) Digital Inputs Connection

The inputs are determined for monitoring of 12 ÷ 24 VDC nominal voltage signals („signal inputs“). If you need to connect a voltage signal of magnitude exceeding maximum allowed voltage, external limiting resistor of appropriate rating must be used. Polarity of input signal is free.

Connect the input signals to the D-I/O connector according the table below. All of the four signals have common pole, that is isolated from all of other instrument circuitry.

Tab. 5.2 : DI2 ÷ DI5 Digital Inputs Connection

terminal No.	signal
30	DI2 input
31	DI3 input
32	DI4 input
33	DI5 input
34	DIC ... DI2 ÷ DI5 inputs common pole

4.1.4 DO5÷DO8 (12÷24 VDC) Digital Outputs Connection

These outputs are solid state type. They can switch small voltage signals only, usually of 12 ÷ 24 V nominal voltage. The outputs are bipolar, thus both DC voltage (of free polarity) and AC voltage signals can be driven. Connect the output signals to the D-I/O connector according to the table below. All of the four signals have common pole, that is isolated from all of other instrument circuitry.

Tab. 5.3 : DO5 ÷ DO8 Digital Outputs Connection

terminal No.	signal
35	DOC ... DO5 ÷ DO8 outputs common pole
36	DO5 output
37	DO6 output
38	DO7 output
39	DO8 output

4.1.5 AA11, AI2 Analog Inputs Connection

Two analog signals can be monitored. Character of the signal can be :

- 0 ÷ 20 mADC
- or 0 ÷ 10 VDC

The inputs have common pole marked AG. The pole is internally connected with both common pole of analog outputs AO1, AO2 and negative pole of embedded 12 V DC auxiliary power supply . Connect input signals to the A-I/O connector according to its character as described in the table below.

Tab. 5.4 : AI1, AI2 Analog Inputs Connection

terminal No.	signal
50	AI1U ... 0 ÷ 10V character AI1 signal positive pole (if AI1 signal character is 0 ÷ 20mA this terminal must stay free)
51	AG ... AI1, AI2 signals common negative pole
52	AI1I ... 0 ÷ 20mA character AI1 signal positive pole (if AI1 signal character is 0 ÷ 10V this terminal must stay free)
53	AI2U ... 0 ÷ 10V character AI2 signal positive pole (if AI2 signal character is 0 ÷ 20mA this terminal must stay free)
54	AG ... AI1, AI2 signals common negative pole
55	AI2I ... 0 ÷ 20mA character AI2 signal positive pole (if AI2 signal character is 0 ÷ 10V this terminal must stay free)

4.1.6 AO1, AO2 Analog Outputs Connection

The AO1 and AO2 analog outputs of 20 mA current loop character can be used for any measured quantity actual value transmission.

The outputs have common pole marked AG. The pole is internally connected with both common pole of analog inputs AI1, AI2 and negative pole of embedded 12 V DC auxiliary power supply .

Connect input signals to the A-I/O as described in the table below.

Tab. 5.5 : AO1, AO2 Analog Outputs Connection

terminal No.	signal
56	AO1 ... AO1 output positive pole
57	AG ... AO1, AO2 signals common negative pole
58	AO2 ... AO2 output positive pole
59	AG ... AO1, AO2 signals common negative pole

The AO1, AO2 output signals are powered by embedded 12 VDC auxiliary power supply. When connected to other instruments maximum allowed input impedance must be observed (see technical specifications).

4.1.7 Embedded 12 VDC Auxiliary Power Supply

The supply can be used for passive contacts of sensors connection. Outputs of the supply are at the AS connector : positive pole at terminal AS+ (No. 70) and negative pole at terminal AG (71). The AG pole is internally connected with common poles of analog inputs AI and outputs AO.

Maximum load current is given in technical specifications.

4.1.8 External Temperature Sensor Connection

Some models are equipped with the *EXT. TEMP* external temperature sensor connector for measurement of external temperature.

The input is designed for three-wire connection to a resistive temperature Pt100-type sensor. Connect the sensor to the terminals No. 44 (*TA*), 45 (*TB*) and 46 (*G*) according example drawing below.

In case of two-wire connection, connect the sensor to the terminals *TA* and *TB* and short-circuit the *TB* terminal with the *G* terminal. Note that the sensor cable loop impedance must be as low as possible (each 0.39 Ohms means additional measurement error of 1 °C).

The *G* signal is internally connected to the *GND* signal of the RS-485 remote communication link.

The temperature sensor can be ordered as the instrument's optional accessory.

5. Communication Links

5.1 Local Communication Link

Instruments can be equipped with a serial interface USB 2.0, on the front panel. Using this interface, adjusting the parameters of the instrument and the transmission of data into a portable computer can be accomplished. It requires to interconnect the instrument with the PC using the appropriate communication cable (type USB-A, see optional accessory list).

Considering the fact that the instruments can be also equipped with a remote communication link, the described communication link is called *Local*.

5.2 Remote Communication Links

5.

5.1

5.2

5.2.1 RS-485 Interface (COM)

Up to 32 instruments at a maximum distance of 1,200 metres can be connected to this interface. Used signals : **A** , **B** , **G** , and optionally **A2** , **B2** , **G2** .

Each instrument must have a different communication address within the range of 1 to 253 preset during the installation.

Tab. 5.1 : RS-485 Remote Communication Links Wiring

COM1 interface		COM2 interface	
signal	terminal No.	signal	terminal No.
A	41	A2	44
B	42	B2	45
G	43	G2	46

Both of the links are insulated both from the instrument internal circuitry and mutually too, terminals No. 43 and 46 *are not connected internally* !

5.2.2 Ethernet Interface (ETH)

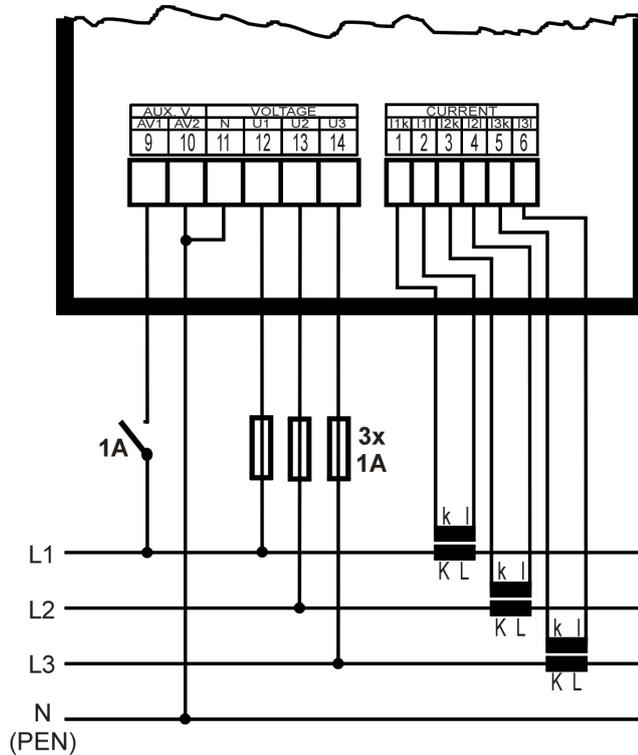
Using this interface the instruments can be connected directly to the local computer network (LAN). Instruments with this interface are equipped with a corresponding connector RJ- 45 with eight signals (in accordance with ISO 8877), a physical layer corresponds to 100 BASE-T.

Each instrument must have a different IP- address, preset during the installation. The address can be set from the instrument panel or you can use the ENVIS-DAQ program. For detection of actual IP-address you can use *the Locator* function.

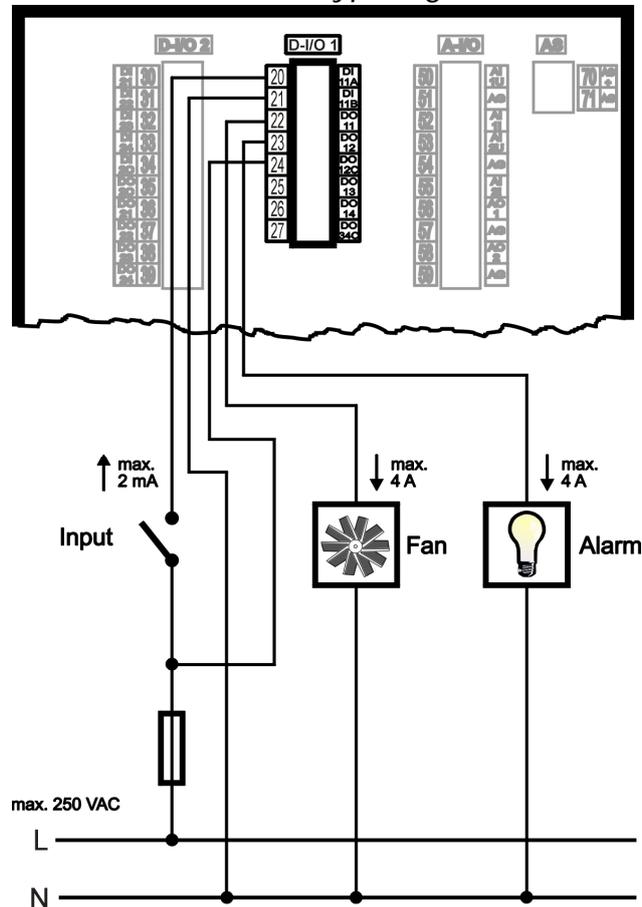
Furthermore, you can set the DHCP function for dynamic IP-address allocation.

6. Examples of Connections

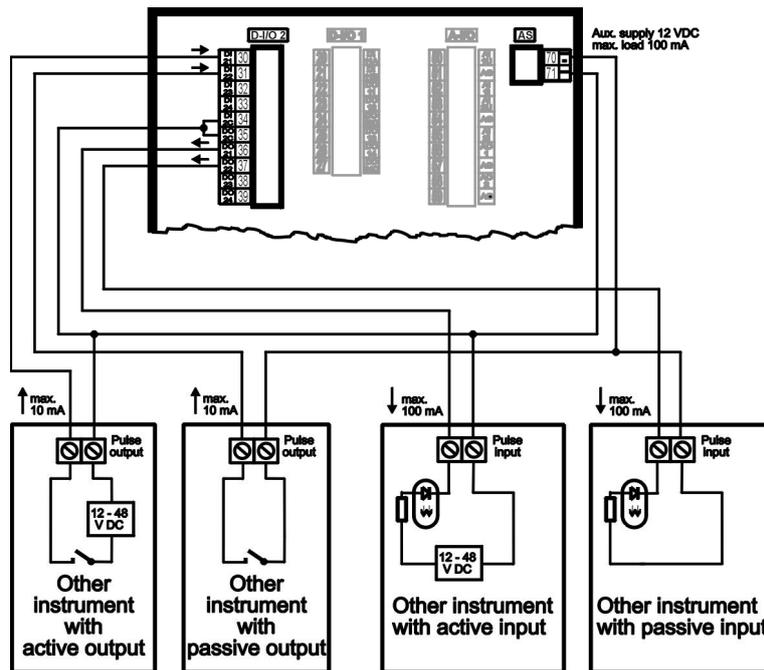
UMD 807 230 X/5A – CTs with 5A Secondary Nominal Current
TN-Network, Direct Star ("3Y") Connection



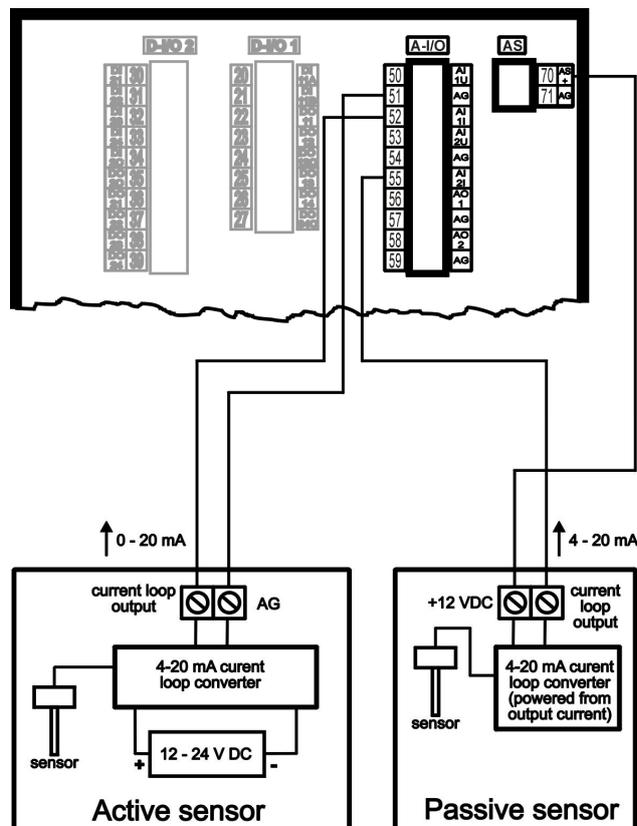
UMD 807 ... 230 V AC Type Digital I/O Connection Example



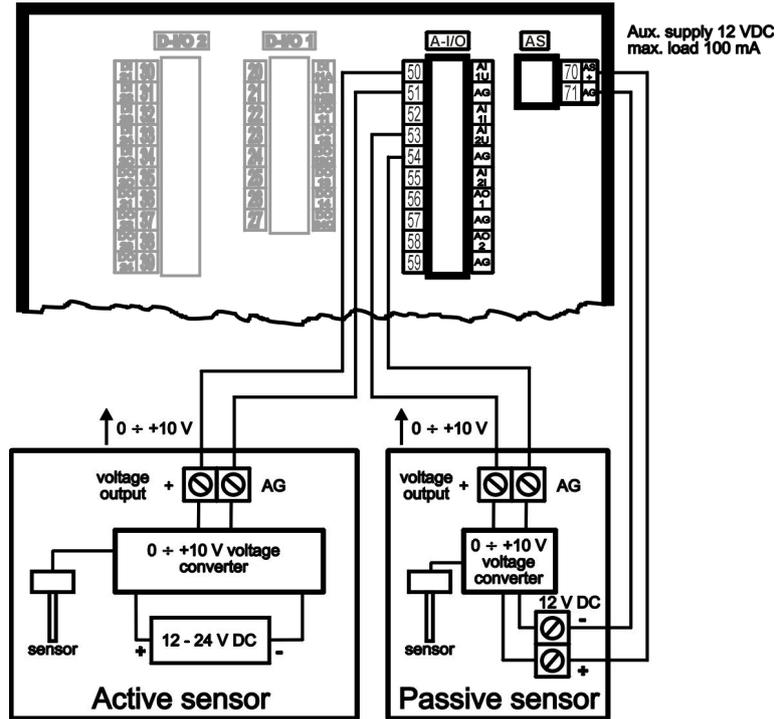
UMD 807 ... 12/24 V DC Type Digital I/O Connection Example



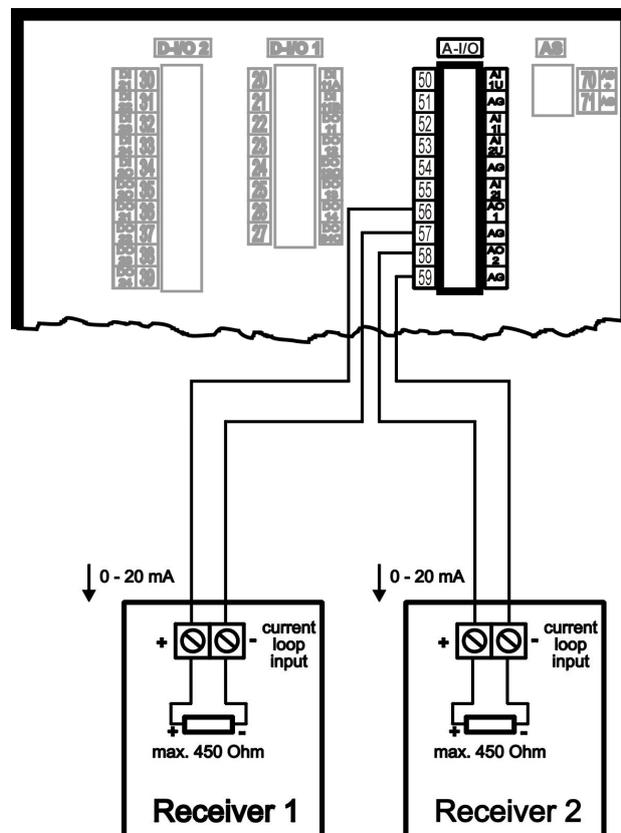
UMD 807 ... 0 ÷ 20 mA Analog Inputs Connection Example



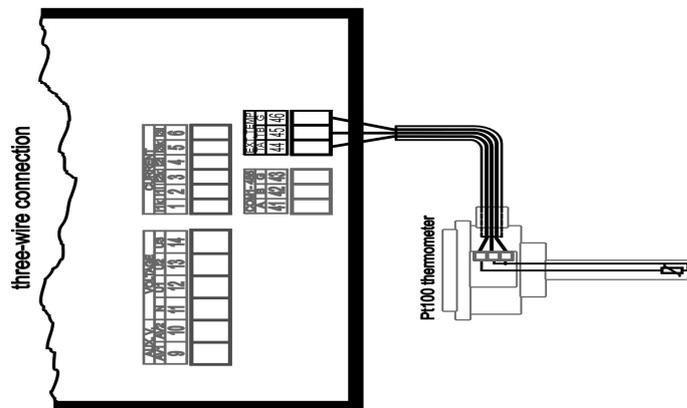
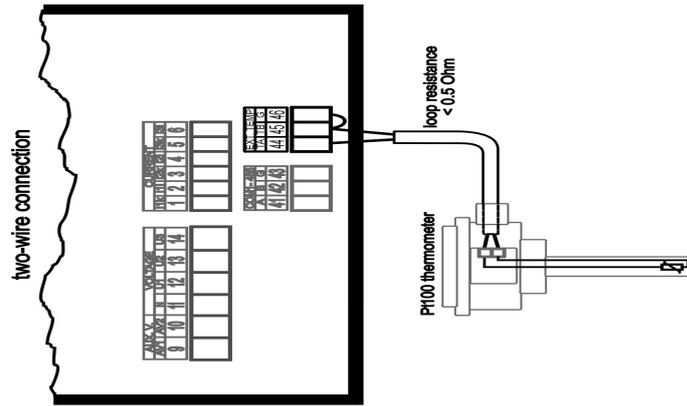
UMD 807 ... 0 ÷ 10 V Analog Inputs Connection Example



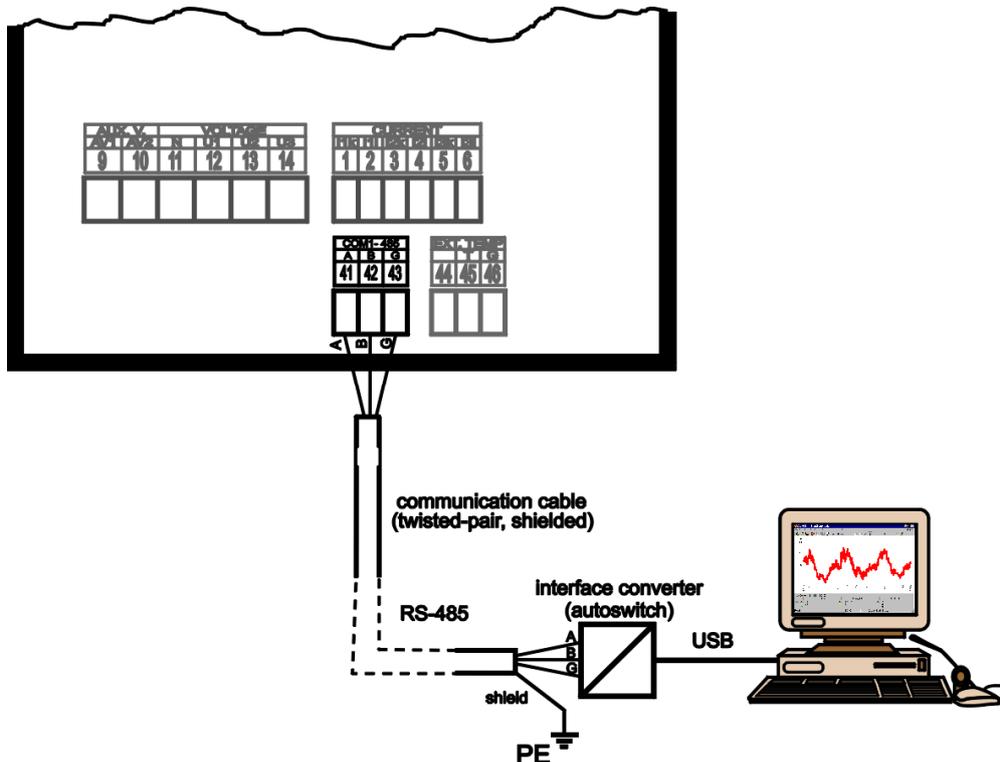
UMD 807 ... 0 ÷ 20 mA Analog Outputs Connection Example



UMD 807 ... Pt100 Temperature Sensor Connection



UMD 807 ... 4 Remote RS485 Communication Link Connection



7. Technical Specifications

Measured Quantities - Voltage			
Frequency			
f_{NOM} - nominal frequency	50 / 60 Hz		
measuring range	40 ÷ 70 Hz		
measuring uncertainty	± 10 mHz		
Voltage			
model	„100“ option	„230“ option	„400“ standart
UNOM (UDIN) – rated voltage (phase-to-neutral, UL-N)	57.7 ÷ 125 VAC	180 ÷ 250 VAC	300 ÷ 415 VAC
measuring range UL-N	3 ÷ 190 VAC	6 ÷ 375 VAC	10 ÷ 625 VAC
measuring range UL-L	5 ÷ 330 VAC	8 ÷ 660 VAC	20 ÷ 1090 VAC
measuring uncertainty ($t_A=23\pm 2^\circ\text{C}$)	+/- 0.05 % of rdg +/- 0.02 % of rng		
temperature drift	+/- 0.03 % of rdg +/- 0.01 % of rng / 10 °C		
measurement category	150V CAT IV	300V CAT III	300V CAT III 600V CATII
permanent overload	300 VAC	600 VAC	1000 VAC
peak overload (UL-N / 1 sec.)	600 VAC	1200 VAC	2000 VAC
burden power, impedance	< 0.013 VA $R_i = 1.8 \text{ M}\Omega$	< 0.025 VA $R_i = 3.6 \text{ M}\Omega$	< 0.05 VA $R_i = 6 \text{ M}\Omega$
Voltage Unbalance			
measuring range	0 ÷ 10 %		
measuring uncertainty	± 0.3		
Harmonics & Interharmonics (up to 50th order)			
reference conditions	other harmonics up to 200 % of class 3 acc. to IEC 61000-2-4 ed.2		
measuring range	10 ÷ 100 % of class 3 acc. to IEC 61000-2-4 ed.2		
measuring uncertainty	twice the levels of class II acc. to IEC 61000-4-7 ed.2		
THDU			
measuring range	0 ÷ 20 %		
measuring uncertainty	± 0.5		

Measured Quantities – Current			
model	„X/5A“	„X/100mA“ - option	„X/333mV“ option
INOM (IB) – rated current	1 / 5 AAC	0.1 AAC	1 @ 333mV
measuring range	0.005 ÷ 7 AAC	0.001 ÷ 0.39 AAC	0.002 ÷ 0.5 VAC
meas. uncertainty ($t_A=23\pm 2^\circ\text{C}$)	+/- 0.05 % of rdg +/- 0.02 % of rng		
temperature drift	+/- 0.03 % of rdg +/- 0.01 % of rng / 10 °C		
measurement category	150V CAT III	150V CAT III	undefined
permanent overload	7.5 AAC	1 AAC	15 VAC
peak overload - for 1 second, max. repetition frequency > 5 minutes	70 AAC	10 AAC	15 VAC
burden power (impedance)	< 0.5 VA ($R_i < 10 \text{ m}\Omega$)	< 0.01 VA ($R_i < 40 \text{ m}\Omega$)	< 3 uVA ($R_i > 100\text{k}\Omega$)
Current Unbalance			
measuring range	0 ÷ 100 %		
measuring uncertainty	± 1 % of rdg or ± 0.5		
Harmonics & Interharmonics (up to 50th order)			
reference conditions	other harm. up to 1000 % of class 3 acc. to IEC 61000-2-4 ed.2		
measuring range	500 % of class 3 acc. to IEC 61000-2-4 ed.2		
measuring uncertainty	$I_h \leq 10\% \text{ INOM} : \pm 1\% \text{ INOM}$ $I_h > 10\% \text{ INOM} : \pm 1\% \text{ of rdg}$		
THDI			
measuring range	0 ÷ 200 %		
measuring uncertainty	THDI ≤ 100% : ± 0.6 THDI > 100% : ± 0.6 % of rdg		

Measured Quantities - Temperature	
TI - (internal sensor, measured value affected by the instrument power dissipation)	
measuring range	- 40 ÷ 80 °C
measurement uncertainty	± 2 °C
TE – External Pt100 Temperature Sensor Input (optional, alternatively with communication interface COM2)	
measuring range	- 50 ÷ 150 °
measurement uncertainty	± 2 °C (three-wire connection)

Measured Quantities – Power, Power Factor, Energy	
Active / Reactive Power, Power Factor (PF), cos φ (PNOM = UNOM x INOM)	
reference conditions "A" : ambient temperature (tA) U, I for active power, PF, cos φ for reactive power	23 ± 2 °C U = 80 ÷ 120 % UNOM, I = 1 ÷ 120 % INOM PF = 1.00 PF = 0.00
act. / react. power uncertainty	± 0.5 % of rdg ± 0.005 % PNOM
PF & cos φ uncertainty	± 0.005
reference conditions "B" : ambient temperature (tA) U, I for active power, PF, cos φ for reactive power	23 ± 2 °C U = 80 ÷ 120 % UNOM, I = 1 ÷ 120 % INOM PF ≤ 0.87 PF ≤ 0.87
act. / react. power uncertainty	± 1 % of rdg ± 0.01 % PNOM
PF & cos φ uncertainty	± 0.005
temperature drift of powers	+/- 0.05 % of rdg +/- 0.02 % PNOM / 10 °C
Energy	
measuring range	corresponds to U & I measuring ranges 4 quadrant energy counters for both active and reactive energies
active energy uncertainty	class 0.5S acc. to EN 62053 – 22
reactive energy uncertainty	class 1S acc. to EN 62053 – 24

Instrument Auxiliary Power Supply Voltage	
aux. voltage range AC: f=40÷100 Hz; DC	75 ÷ 500 VAC 90 ÷ 600 VDC
power	20 VA / 8 W
overvoltage cat. voltage up to 300 VAC voltage over 300 VAC	III II
pollution degree	2
connection	isolated, polarity free

+12 VDC Auxiliary Power Supply for I/O	
connection	isolated (connected with analog I/O common pole)
output voltage	11.5 ÷ 13 VDC
	100 mADC
short-circuit max. duration	5 seconds

„230 VAC“ Digital I/O	
RO11 ÷ 14 Outputs (relays)	
type	N.O. contact
load rating	250 VAC / 30 VDC, 4 A
RI11 Input	
type	optoisolated
maximum voltage	265 VAC (460 VAC for overvoltage cat. II)
voltage for "logical 0/1"	<= 30 VAC / >= 90 VAC
burden power (impedance)	< 0.4 VA (Ri = 200 kΩ)
dynamic par. (pulse counter) : - pulse/gap duration - maximum frequency	>= 50 / 50 ms 10 Hz

„12 ÷ 24 VDC“ Digital I/O	
DO21 ÷ 24 Outputs (solid state)	
type	Opto-MOS, bipolar
load rating	60 VAC / 100 VDC, 100 mA
dynamic param. (pulse output) : - pulse duration - gap duration - maximum frequency	S0 - compatible 50 ms >= 50 ms 10 Hz
DI21 ÷ 24 Digital Inputs	
type	optoisolated, bipolar
maximum voltage	35 VDC
voltage for "logical 0/1"	< 3 VDC / > 10 VDC
burden power (impedance)	< 0.7 VA (Ri > 1.7 kΩ)
input current	3 mA @ 10V / 13 mA @ 24V / 20 mA @ 35V
dynamic par. (pulse counter) : - pulse/gap duration - maximum frequency	>= 0.5 / 0.5 ms 1 kHz

AI1, AI2 Analog Inputs	
type	current (20mA) or voltage (10V) isolated from internal circuitry, common pole AG connected internally with the AO1÷2 analog outputs common pole and neg. pole of aux. 12 VDC power supply
„20 mA“ type inputs (term. AI1I, AI2I) : measuring range impedance	0 ÷ 24 mA 120 Ω
„10 V“ type inputs (term. AI1U, AI2U) : measuring range impedance	0 ÷ 12 V 20 kΩ
measuring uncertainty	± 0.5 % of range

AO1, AO2 Analog Outputs	
type	current (20mA) isolated from internal circuitry, common pole AG connected internally with the AI1÷2 analog inputs common pole and negative pole of auxiliary 12 VDC power supply
output current range	0 ÷ 22 mA
maximum load impedance	450 Ω
output signal uncertainty	± 1 % of range

Other Specifications	
operational temperature :	- 20 to 60°C
storage temperature	- 40 to 80°C
operational and storage humidity	< 95 % - non-condensable environment
EMC – immunity	EN 61000 – 4 - 2 (4kV / 8kV) ; EN 61000 – 4 - 3 (10 V/m up to 1 GHz) ; EN 61000 – 4 - 4 (2 kV) ; EN 61000 – 4 - 5 (2 kV) ; EN 61000 – 4 - 6 (3 V) ; EN 61000 – 4 - 11 (5 periods)
EMC – emissions	EN 55011, class A EN 55022, class A (not for home use)
RTC – accuracy – backup battery capacity	+/- 2 seconds per day > 5 years (without supply voltage applied)
local communication port	USB 2.0
remote comm. port No. 1 (option)	RS-485 / 2400÷460800 Bd / protocols KMB, Modbus-RTU or Ethernet 100 Base-T / DHCP, webserver, Modbus-TCP
remote comm. port No. 2 (option, alt. with external temp. sensor input)	RS-485 / 2400÷460800 Bd / protocols KMB, Modbus-RTU
display	backlit LCD, graphic, 240 x 160 pixels
protection class front panel / back panel	IP 40 (IP 54 with cover sheeting) / IP 20
dimensions front panel built-in depth installation cutout	144 x 144 mm 80 mm 138 ⁺¹ x 138 ⁺¹ mm
mass	max. 0.8 kg

8. Maintenance, Service

The UMD 807 instruments do not require any maintenance in their operation. For reliable operation it is only necessary to meet the operating conditions specified and not expose the instrument to violent handling and contact with water or chemicals which could cause mechanical damage.

In selected models, the built-in CR2450 lithium cell can backup the memory and real time circuit for more than 5 years without power supply, at average temperature 20°C and load current in the instrument less than 10 µA. If the cell is empty, it is necessary to ship the instrument to the manufacturer for battery replacement.

In the case of failure or a breakdown of the product, you should contact the supplier at their address:

PQ PLUS GmbH
Hagenauer Straße 6
91094 Langensendelbach
info@pq-plus.de
09133-60640-0

The product must be in proper packaging to prevent damage during transit. A description of the problem or its symptoms must be delivered together with the product.

If a warranty repair is claimed, the warranty certificate must be sent in. In case of an out-of-warranty repair you have to enclose an order for the repair.

Warranty Certificate

Warranty period of 24 months from the date of purchase is provided for the instrument, however, no longer than 30 months from the day of dispatch from the manufacturer. Problems in the warranty period, provably because of faulty workmanship, design or inconvenient material, will be repaired free of charge by the manufacturer or an authorized servicing organization.

The warranty ceases even within the warranty period if the user makes unauthorized modifications or changes to the instrument, connects it to out-of-range quantities, if the instrument is damaged due to ineligible or improper handling by the user, or when it is operated in contradiction with the technical specifications presented.