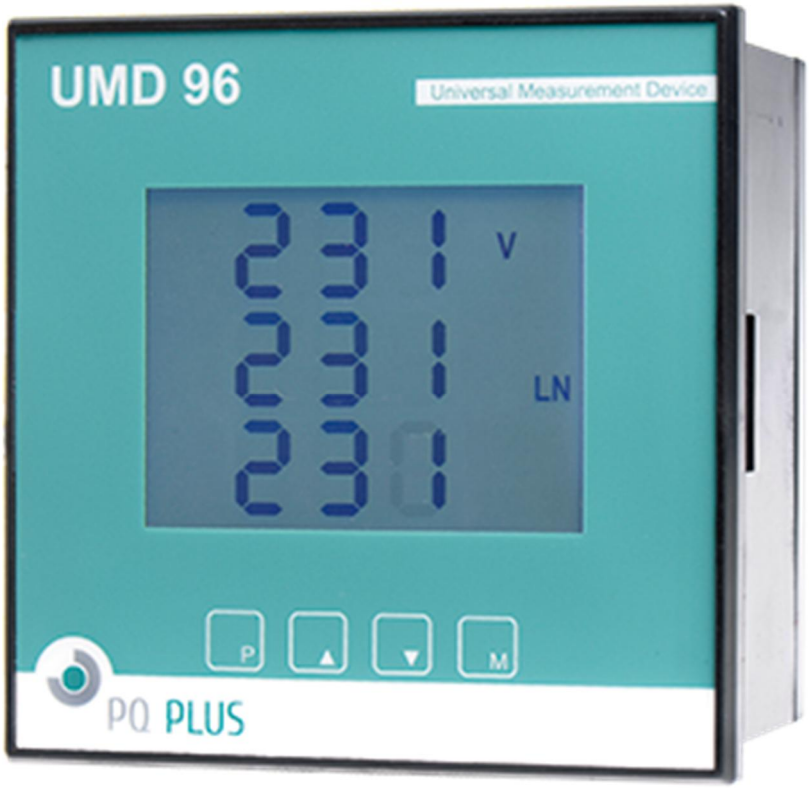
UMD 96

*Multifunctional Meter*

*Manual*

(FW 2.0.40, 6/2016)




# 1. Instrument Connection

## 1.1 Physical

The UMD 96 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 or the temperature value measured may be false.

## 1.2 Power Supply

The supply voltage (in range according technical specifications) connects to terminals AV1 (No. 9) and AV2 (10) via a disconnecting device (switch – see wiring diagram). It must be located at the instrument's proximity and easily accessible by the operator. The disconnecting device must be marked as such. A circuit breaker for nominal current of 1 amp makes a suitable disconnecting device, its function and working positions, however, must be clearly marked. A connection cable maximum cross section area is 2.5 mm$^2$.

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.

## 1.3 Measured Voltages

The phase voltages measured are connected to terminals L1 (12), L2 (13), L3 (14), the common terminal to connect to the neutral wire is identified as N (11; it stays free at delta- (3-D) and Aron- (A) connections). It is suitable to protect the voltage lines measured for example with 1A fuses. Measured voltages can also be connected via instrument voltage transformers.

A connection cable maximum cross section area is 2.5 mm$^2$.

## 1.4 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 current signals from 5A or 1A (or 0.1A for the „X/100mA" models) instrument current transformers must be connected to the terminal pairs I11, I12, I21, I22, I31, I32 (No. 1 ÷ 6). In the P.01 parameter (see below), set the CT-ratio.

The I2 terminals stay free in case of the Aron (A) connection.

A connection cable maximum cross section area is 2.5 mm$^2$.

# 2. Basic Operation

On connecting power supply the display shows all of the segments, then gradually screens with the instrument type and setting of basic parameters

1. line 1 : 133 - instrument type number
   line 2 : 5A - current input type
   line 3 : r1 - digital output type : relay (r), pulse (P), or none (n)
1. when connection of voltage via voltage transformers set (otherwise the screen is skipped) :

line 1 : UE - voltage transformer connected identification
line 2 : nominal primary voltage [kV]
line 3 : 0.1 nominal secondary voltage [kV]

2. line 1 : CE - current transformer/range specification
line 2 : nominal primary current [A]
line 3 : nominal secondary current [A]

3. line 1 : FU - nominal frequency and voltage
line 2 : nominal frequency
line 3 : nominal voltage

Then the instrument starts display actual measured values. Simultaneously, if the instrument has a communication line, it can be set and its measured values read via the communication link using a PC.

## 2.1 Setup

At this moment it is necessary to set *instrument parameters* that are essential for proper instrument measurement :

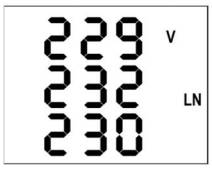
- CT ratio – parameter 01 (and its multiplier, optionally)
- type of connection – parameter 02 (wye, delta, Aron)
- mode of connection – parameter 04 (direct or via VT connection, VT ratio and multiplier, optionally)
- nominal frequency $f_{NOM}$ and nominal voltage $U_{NOM}$ – double parameter 05

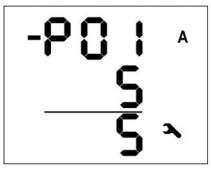
Usually, it is only necessary to adjust the CT ratio. Next example shows how to do it :

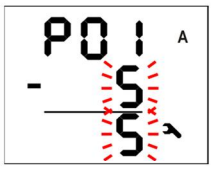
Assuming that the ratio of used CTs is 750/1 A. First off all, it is necessary to switch display from measured data branch (the ULN screen on the example below) to *the parameter branch* with the P button. The branch is indicated with the symbol . Parameter 01 appears – this parameter is the CT ratio and its default value is 5/5 A.

Now enter editing mode by pressing and holding the P until the value gets flashing.

As soon as the value flashes, release the P. Now you can change it. Increase primary value








by pressing of the ▲. If you keep it pressed two-speed autorepeat helps to reach target value quickly. Then use multiple pressing of ▲ and ▼ for fine setup.

To change the secondary value, simply press the M. The button serves as toggle switch between 5 and 1.

*CT Ratio Change Procedure Example*


Target CT value is prepared now and we can leave the edit mode with () pressing the P. The value is stored into the instrument memory and the flashing stops.

Now return to so called main parameter branch (see below) with next pressing the P and then you can scroll to other parameters with ▲ and ▼ and edit them in a similar way or you can return to the measured data branch with the M.

The summary of all instrument parameters is stated in the table below. Their description is stated in following chapters.

## 2.2 Measured Data

The instrument starts display actual measured values on power-up. The screen that was selected before the last powerdown is displayed. You can navigate through all of measured and evaluated values with ▲, ▼ and M buttons as shown on *the Measured Data Navigation Chart* below.

If phase values displayed, individual L1 / L2 / L3 - phase value is shown in the line 1 / 2 / 3. If a three-phase value is displayed, it is shown in the line 2 and the **Σ** symbol appears.

The quantities' meaning and evaluation formulas can be found in the appropriate chapter further below.

Most of data are arranged in four columns :

- Actual .... actual values, refreshed each 3 measurement cycles (30/36 mains cycles)
- Avg ..... average values per appropriate averaging period (see below)
- AvgMax ... maximum of the avg-value reached since the last clearing
- AvgMin .... minimum of the avg-value reached since the last clearing

You can scroll inside a column down and up with the and keys and move horizontally from a column to the next right one cyclically with the M key.

Exception : Only actual values of harmonics and electrical energy are available. These values are arranged in different way – see further below.

## 2.3 Average Values

Average values are processed according set averaging method and length of averaging window (individually for "U/I"-group and "P/Q/S"-group of quantities). Maximum and minimum values of them are registered into the instrument's memory. The maximums are displayed in the "AvgMax" column and they are identified with the ▲ symbol in the front of the value. Analogically, the minimums in the "AvgMin" column are identified with the ▼ symbol.

*Neither maximum nor minimum of cosφ values are evaluated due to special character of the quantity. Similarly, these extreme values are not evaluated at harmonics*

You can clear the "AvgMax"/"AvgMin" values. All of the maximums/minimums of appropriate quantity group are cleared simultaneously. To do it, follow next :

- navigate on corresponding AvgMax or AvgMin value
- press the M key until the value starts flashing
- with the ▲ or ▼ key, choose the option CLr
- then confirm by pressing the M

*The appropriate group ( U/I or P/Q/S ) of average maxs/mins is affected by single clearing only ! Each group must be cleared individually.*

*If the instrument is locked, the clearing is not possible.*

## 2.4 Full Spectrum Values P/Q/PF & Fundamental Harmonic Values Pfh / Qfh / cos φ

As standard, active and reactive powers (and therefore power factor) are evaluated from full spectrum of harmonic components of both voltage and current.

Sometimes (for example for power factor compensation system checking), it is useful to know fundamental harmonic part of these quantities too. Such quantities are marked Pfh, Qfh, cos φ.

As you can see on the navigation chart you can navigate from *the full spectrum values branch* with the M key further right into *the fundamental harmonic values branch* and vice versa. To distinguish actual displayed branch, the H symbol is displayed for the fundamental harmonic branch.

Exception : Actual values only of fundamental harmonic power factor – *the cos φ* – are evaluated (no average values available). Next, this fundamental harmonic power factor can be expressed not only as *cos φ*, but as *tan φ* or *φ* too, depending on setting of parameter 09.

## 2.5 Fundamental Harmonic Power Factor Formats *cosφ/tanφ/φ*

The fundamental harmonic power factor can be expressed not only as cos φ, but as tan φ or φ too, depending on setting of parameter 09.

For outright specification of the quadrant, the power factor of the fundamental harmonic component is accompanied with two attributes :

- a sign ( + or - ), which indicates polarity of appropriate active power
- a symbol ∈ or ⊣, which indicates the power factor character

At the following figures there are examples of three-phase fundamental power factor presentations :

*Fundamental Harmonic Power Factor Formats*


- the left figure : **Σ**cos **φ** = 0.98 inductive (choke symbol displayed). Furthermore, active three phase power is being negative, therefore the leading "minus"-sign ( and the ⏎ symbol displayed )
- the middle figure : **Σ**tan **φ** = 0.20 inductive. Active three phase power is positive.
- the right figure : **Σφ** = 8 degrees inductive. Active three phase power is positive.


On the figure on the left, there is phase cos φ values example :

- cos φ1 = 0.97 inductive. L1-phase active power is currently negative (because of leading "minus"-sign)
- cos φ2 = 0.94 inductive ( L2-phase active power currently positive )
- cos φ3 = 0.99 capacitive ( L3-phase active power currently positive )

## 2.6 THDs and Harmonic Components

You can check actual values of both voltage and current THDs and harmonic components in appropriate rows (see *the Measured Data Navigation Chart* ).

When you scroll to one of this rows, THD values of all measured phases are displayed as default. Symbols THD - V - LN or THD - A indicate phase voltage or current THD values, respectively.

With the M key you can switch to harmonic components. The symbol H appears, indicating harmonic components (of voltage or current). Symbol % means that the values are expressed in percent of fundamental harmonic component. Order of harmonics just displayed flashes periodically in the display middle line – for example, string H03 means 3rd harmonics.

By repetitive pressing of the M key you can check other harmonics. Although the instrument evaluates all of the harmonic components up to 40th order internally, only odd components to 25th order can be viewed of its display (full spectrum od the harmonics is available via communication interface only).

## 2.7 Electricity Meter

Electricity meter comprises three-phase energy data and maximum tree-phase active power demand value. The values are situated in particular row.

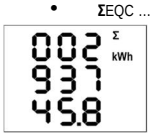
Depending on the parameter 08 setup, two electricity meter display modes can be chosen :

- "4E+Pmax" mode (default)
- "8E" mode

### *2.7.1 "4E+Pmax" Display Mode*

In this mode, first four windows contain three-phase energies of four-quadrants :

- **Σ**EP+ ... three-phase imported active energy, indicated with **Σ** - kWh (or MWh or kMWh = GWh)
- **Σ**EP- ... three-phase exported active energy, indicated with **Σ** - kWh and preceeding **–** sign
- **Σ**EQL ... three-phase inductive reactive energy, indicated with **Σ** - kVArh – L
- **Σ**EQC ... three-phase capacitive reactive energy, indicated with **Σ** - kVArh – C




Each value occupies all of three display lines, 8 digits before the decimal point and one after it. For the exaple at left, ΣEP+ = 293745.8 kWh.

The values are registered since the last clearing. To clear the energies, display any of them and then follow the same procedure as for max/min average values. All of the energies are cleared simultaneously ant start to count from zero again.

In the 5th window there is

- **Σ**$P_{avgmaxE}$ ... maximum of three-phase average active power (power demand), indicated with **Σ** - kW - ▲ and bar over the value

The value contains maximum of three-phase average active power since the last clearing. Averaging method and averaging period for this value can be set regardless of the method of standard average values, described above. The quantity is marked with the "E" letter to distinguish from the standard maximum average quantities.

Similarly as the energies, the value can be cleared independently.

*If the instrument is locked, clearing is not possible.*

*If the instrument is equipped with a communication interface, the values can be cleared remotely.*

### *2.7.2 "8E" Display Mode*

In this mode, reactive energies registered separately depending on actual three-phase active power (ΣP) sign are displayed ("six-quadrant " mode; such format can be convenient for renewable sources monitoring, for example) :

- **Σ**EP+ ... three-phase imported active energy, indicated with **Σ** - kWh (or MWh or kMWh = GWh)
- **Σ**EP- ... three-phase exported active energy, indicated with **Σ** - kWh and preceeding **–** sign
- **Σ**EQL+ ... three-phase inductive reactive energy registered during the ΣEP value was positive (import); indicated with **Σ** - kVArh – L
- **Σ**EQL- ... three-phase inductive reactive energy registered during the ΣEP value was negative (export); indicated with **Σ** - kVArh – L and preceeding **–** sign
- **Σ**EQC+ ... three-phase capacitive reactive energy registered during the ΣEP value was positive; indicated with **Σ** - kVArh – C
- **Σ**EQC- ... three-phase capacitive reactive energy registered during the ΣEP value was negative; indicated with **Σ** - kVArh – C and preceeding **–** sign

Furthermore, energies in VAh are available too :

- **Σ**ES+ ... three-phase apparent energy registered during the ΣEP value was positive; indicated with **Σ** - kVAh
- **Σ**ES- ... three-phase apparent energy registered during the ΣEP value was negative; indicated with **Σ** - kVAh and preceeding **–** sign

The three-phase active power demand $\Sigma P_{avgmaxE}$ is not displayed in this mode.

## 2.8 Instrument State Symbols

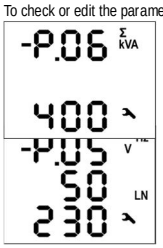
Except of measured data, the instrument indicates following states with dedicated symbols :

- ..... Export of three-phase active power. Displayed when the **Σ**P value is negative.
- ... A1(top) and A2 (bottom) alarm lights off / on. See output setup below.
- ..... I1 digital input state is active.
- ..... Instrument parameters are displayed.

## 2.9 Instrument Parameters

For proper operation in particular conditions, the instrument must be set. The instrument setup is determined using parameters, for example the current transformer [CT] conversion, type of measured voltage connection (direct connection or via a voltage transformer [VT] and its ratio), and connection configuration (wye / delta / Aron). Overview of all the parameters is listed in the table below.

To check or edit the parameters, press the **P** key. As default, parameter group 01 is displayed and symbol (wrench) indicates, that setup data are displayed now.




The parameters are arranged in groups, numbered from 00 up. The number of group is displayed in the first line in format - P.nn . (with preceding dash). You can browse through the parameter groups with the ▲ or ▼ keys.

If one parameter only in the group, its value is in the bottom line as shown at the example (nominal power 400 kVA).

If two parameters in the group, usually the first of them is displayed in the 2nd line and the second in the 3rd line ( nominal frequency 50 Hz and nominal voltage 230 V).

To edit a particular parameter, scroll to its group. Then press and hold the **P** until the value gets flashing. Now release the key and set target value with the ▲ or ▼, or the **M** key for some of parameters. You can use autorepeat function by keeping one of the arrow keys pressed too. Finally, press the **P** and the value is stored into the memory.

If more parameters in the group, the first one is chosen when entering editing mode for the first time. If you want to modify the second parameter only, simply cancel editing of the first parameter without any change and reenter the editing again – now the second parameter is chosen.

To return back to measured values display, simply press the **M** key.

| # | parameter group | range | default | comment |
|---|---|---|---|---|
| 00 | lock | LOC / OPN | OPN | see Instrument Setup Locking / Unlocking |
| 01 | CT – ratio, multiplier<br>screen 1 : row 2 : nominal primary current<br>row 3 : nom. secondary current<br>(for models "X/100mA","X/333mV" fixed)<br>screen 2 : MUL – current multiplier | <br><br>primary : 1A ÷ 10 kA<br>sec. : 5A / 1A (0.1A)<br>(0.1 A, 0.333 V)<br>0.001 ÷ 999 | 5 / 5 A<br><br><br><br>1 | secondary current selection with the **M** key<br>par. placed in side branch if the current multiplier different from 1 the ▲ / ▼ flashes |
| 02 | connection type | 3Y / 3D / 3A | 3Y | |
| 04 | conn. mode: direct (---) or VT–ratio, mult.<br>screen 1 : row 2 : primary U [ kV ]<br>row 3 : secondary U [ kV ]<br>screen 2 : MUL – voltage multiplier | <br>0.001 ÷ 65 kV<br>0.001 ÷ 0.999 kV<br>0.001 ÷ 999 | direct<br>(- - -)<br><br>1 | parameters placed in side branch<br>if the voltage multiplier different from 1 the ▲ / ▼ flashes |
| 05 | fNOM, UNOM<br>row 2 : fNOM [ Hz ]<br>row 3 : UNOM [ V / kV ] | <br>50 / 60 Hz<br>50 V ÷ 1MV | <br>50<br>230 | UNOM value depends on connection mode :<br>- direct : line-to-neutral<br>- via VT : line-to-line |
| 06 | ΣPNOM [ kVA / MVA ] | 1 kVA ÷ 999 MVA | - | |
| 07 | averaging period<br>row 2 : for U/I group<br>row 3 : for P/Q/S group | <br>0.01 ÷ 60<br>(1 sec÷ 60 mins) | <br>1 min<br>15 min | floating window type averaging method applied as default; thermal method indicated with symbol ▲ |

| | | | | |
|---|---|---|---|---|
| 08 | avg period for ΣPavgmaxE, El-meter d. mode<br>line 2 : averaging period for ΣPavgmaxE,<br>line 3 : Electricity meter display mode | 0.01 ÷ 60<br>(1 sec÷ 60 mins)<br>“4E+Pmax” / “8E” | 15 min<br>“4E+ Pmax” | floating window type averaging method applied |
| 09 | fund. harmonic PF display format | cos / tan / fi | cos | |
| 10 | backlight | AUT / ON | ON | AUT-mode : the backlight is switched off automatically after app. 5 mins if no key is pressed |
| 11 | output setup<br>row 2 : output O1<br>row 3 : output O2<br><br>standard type : “-O-”<br><br><br><br>pulse type : pulses / kWh(kvarh)<br>control energy symbol :<br>• none … ΣEP+<br>• - … ΣEP-<br>• ∈ … ΣEQL<br>• ⋕ … ΣEQC | “ - - -” = off<br><br><br><br>“-O-” = standard output<br><br><br>0.001 ÷ 999000 = pulse output | - - -<br>( off ) | control energy selection with the M key<br>Standard type output can be set via communication line only, not from instrument panel. Symbol ▲ indicates different setup of the alarm light A1 from the O1 and the A2 from the O2<br>If pulse type output set from instrument panel, the A1 and the A2 alarm lights are set identically as the O1 and the O2, respectively. |
| 15<br>(16) | communication interface 1 (and 2, opt.)<br>for RS-485 (M-Bus) :<br>screen 1: row 2 : address<br>row 3 : rate [ kBd ]<br>screen 2: Prt (protocol) – databits & parity<br>for Ethernet:<br>screen 1 : DHCP<br>screen 2÷5 : IP1÷ IP4 (IP)<br>screen 6÷9 : MA1÷ MA4 (Subnet Mask)<br>screen 10÷13 : Gt1÷ Gt4 (Gateway) | <br><br>1 ÷ 255<br>2.4 ÷ 460 (2.4 ÷ 9.6)<br>8 / 9-n / 9-E / 9-0<br><br>ON / OFF<br>0 ÷ 255<br>0 ÷ 255<br>0 ÷ 255 | <br><br>1<br>9.6 (2.4)<br>8 (9-E)<br><br>OFF<br>10.0.0.1<br>255.255.255.0<br>10.0.0.138 | parameters placed in side branch |
| 19 | instrument status (read only)<br>row 2 : failure specification<br>row 3 : serial no. & instr. version (scroll) | <br>0 ÷ 255<br>- | <br>0<br>- | r. 2 : 0 = failure-free<br>r. 3 : S...serial no.<br>F... firmware version<br>b...bootloader version<br>H...hardware version |

## 2.10 Instrument Setup Locking / Unlocking

When shipped, parameter editing is unlocked, that means :

- all of the parameters can be edited
- standard average maximums / minimums, electricity meter energies ΣEP+, ΣEP-, etc., and electricity meter maximum power demand $\Sigma P_{avgmaxE}$ can be cleared

After being put in operation, such operations can be locked (=disabled) to protect the instrument against unauthorized changes. Then operator can only check measured values and parameters, but cannot change anything, excluding special parameter No. 00, that serves as the instrument lock. It has one of two values :

LOC ..... instrument is locked
OPn ..... instrument is unlocked (open)

If the instrument is locked, you can unlock it using the following procedure, which is similar to editing of other parameters:

1. Press the P key and scroll to parameter group 00 with arrow keys – value LOC is displayed.
2. Press the P and hold it down until the value is replaced with flashing number between 000 and 999. As an example, you can imagine flashing 345 is displayed.
3. Press the following sequence: ▼ ▲ ▼ ▲. The value changes gradually to 344, 345, 346, 345 so the same value is shown at the end as at the beginning.
4. Press the P. The flashing number is replaced with OPn, indicating unlocked state.

The digit shown while entering the unlocking keypress sequence is random and it is not important for correct unlocking (it is there only to confuse). Only the sequence of keys pressed is important and must be followed exactly.

The instrument can be locked in a way analogous to unlocking but it is necessary to press any keypress sequence that is different from the unlocking sequence noted above.

## 2.11 Display Contrast

Although the display contrast is temperature compensated, there can be sometimes necessary to tune it slightly. To do it, press keys ▲ and ▼ simultaneously and keep pressed. Then message CON appears in the first line and the contrast value in the second one.

Now, if the display too light, keep the ▼ pressed and increase with repetitive pressing of the ▲ key.

Likewise, if too dark, keep the ▲ and adjust with the ▼ key. Finally, release the keys and new contrast is set.

*

## 2.12 Digital Outputs & Input


Instruments can be optionally equipped with a combination of outputs and inputs. Following inputs & outputs are available :

- two digital outputs – *relay* ( electromechanical, R ) or *impulse* (solid-state, I )
- one digital input

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.

The behaviour of digital outputs can be programmed according to requirements as :

- *transmitting electricity meter impulse output mode*
- *standard output mode* , e.g. as a simple two-position controller or a defined status indicator
- *remote controlled output mode* ( by an external application via a communication link )

The digital input I1 state is indicated with the symbol and can be used for state monitoring via a communication link.

### *2.12.1 Ouputs & Input Connection*

Digital inputs & outputs are connected to terminals on a rear panel of an instrument according to the following table. A connection cable maximum cross section area is 1.5 mm².

*Connection of Digital Outputs & Input*

| pin No. | signal |
|---|---|
| 15, 16 | O1A, O1B ... digital output O1 |
| 17, 18 | O2A, O2B ... digital output O2 |
| 19, 20 | I1A, I1B ..... digital input I1 |

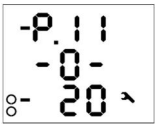
All of digital outputs and input are *isolated not only from instrument internal circuits but mutually too*. Connected signals magnitude must correspond with the I/O technical specifications. The signal polarity is free.A connection cable maximum cross section area is 2.5 mm².

### *2.12.2 Outputs Setup*

Digital outputs ( including alarm lights ) function can be set either as *standard output* or as electricity meter *impulse output*.

The O1 / O2 output function can be checked in parameter group 11. Possible setup options are :

- ---.. the output O1/2 is disabled
- -0-.. the output O1/2 is set to standard output mode (detailed setup available using the ENVIS program via a communication line only)
- nnn... the output O1/2 is set to impulse output mode with nnn pulses per kWh; the control quantity is ΣEP+ (no symbol shown). Other control quantities options according accompanying symbol :
  - - ... ΣEP-
  - ∈ ... ΣEQL
  - ⊣ ... ΣEQC




Example :

Output O1 : set to standard output mode (details via communication link only)

Output O2 : set to pulse mode, 20 pulses/kWh of energy ΣEP-

The standard output function can be used at instruments equipped with communication link only – it can be adjusted only via connected PC using ENVIS program ( see ENVIS program manual ). The impulse output function can be set simply from the instrument panel too.

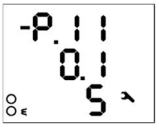
The alarm lights A1, A2 setup is not displayed, it is available via a communication line only. You can only check if the setup is the same as corresponding O1/O2 setup or not. If any of signal lights A1, A2 is set, the outlines of both lights appear on the display. They stay hidden when function of both lights is disabled.

### *2.12.3 Impulse Output Mode*

Any of digital outputs or alarm lights can be set as transmitting electricity meter. The frequency of generated impulses can be set depending on values of measured electric energy by the embedded electricity meter unit.

*You can set to impulse output mode not only the I-type (solid-state) outputs, but the R-type (electromechanical relay) outputs too. But note lifetime of electromechanical relays, they have limited number of switchings.*

The outputs O1/2 can be set to impulse output mode both manually from the instrument panel and remotely via a communication line. The manual setup is available in parameter group 11. After entering editation, set edited parameter (range 0.001÷999) with arrow keys and select desired energy with the M key.




Example :

Output O1 : 0.1 pulses/kWh = 1 pulse / 10 kWh, energy ΣEP+ (no additional symbol)

Output O2 : 5 pulses/kvarh , energy ΣEQL (due to symbol ∈ )

*By setting any of the O1/02 outputs from the instrument panel, corresponding alarm light A1/A2 is set in the same way automatically too. Then the O1/O2 activity can be checked by the A1/A2 lights on the instrument display. Separate setup of the lights is available using the ENVIS program via a communication line only. If any of lights is set different from corresponding O1/O2 output the symbol ▲ preceeding appropriate setup appears.*

*Even if an instrument is equipped with neither any digital output nor any communication line, you can set impulse function of alarm lights A1, A2 by setting the O1/O2 outputs.*

After the impulse function mode is set, every 200 milliseconds the instrument executes evaluation of the measured electric energy. If the increment of recorded electric power is higher or equal to the quantity of power per one impulse, the instrument will transmit one or two impulses. The mentioned description shows that the fluency of impulse transmission is +/- 200 ms.

The impulse duty cycle is 50/50 ms (compliant with so-called SO-output definition), maximum frequency is 10 impulses per second.

## 2.13 Communication Interface

Monitoring the currently measured values and the instrument setup can using a remote computer connected to the instrument via a communication link. Such operation allows you to use all the setup options of the instrument, which it is not possible from the panel of the instrument.

Following chapters describe instrument communication links from the hardware point of view only. The detailed description of ENVIS program can be found in the program manual.

### *2.13.1 RS-485 Interface (COM)*

The link is isolated from other circuits of the instrument. Use terminals A+ (No. 28), B- (29) and G (30). For instrument models with two links, the second link is connected as follows : A2+ (No. 31), B2- (32) and G2 (33).

Both of the links are insulated both from the instrument internal circuitry and mutually too, terminals No. 30 and 33 *are not connected internally* !

Standard setup for this interface is address 1, communication rate 9600 Bd and 8 bits protocol.

### *2.13.2 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.

### *2.13.3 M-Bus Interface (M-BUS)*

The interface is insulated from other instrument circuitry. Used signals are : M+ (No. 28), M- (29).

Standard setup for this interface is address 1, communication rate 2400 Bd and 9 bits with even parity protocol. Secondary address is BCD-coded instrument serial number.

Technical Specifications

| Measured Quantities | | | |
|---|---|---|---|
| Frequency | | | |
| fNOM– nominal frequency | 50 / 60 Hz | | |
| measuring range | 40 ÷ 70 Hz | | |
| Voltage | | | |
| model | „100“ | „230“ | „400“ |
| UNOM (UDIN) – (UL-N) | 57.7 ÷ 125 VAC | 180 ÷ 250 VAC | 300 ÷ 415 VAC |
| measuring range (UL-N) | 3 ÷ 150 VAC | 6 ÷ 300 VAC | 10 ÷ 500 VAC |
| measuring range (UL-L) | 5 ÷ 260 VAC | 10 ÷ 520 VAC | 20 ÷ 865 VAC |
| measuring uncertainty (tA=23±2°C) | +/- 0.05 % od rdg +/- 0.02 % of rng | | |
| measurement category | 150V CAT IV | 300V CAT III | 300V CAT III<br>600V CATII |
| permanent overload | 300 VAC ( UL–N ) | 600 VAC ( UL–N ) | 1000 VAC ( UL–N ) |
| peak overload (UL–N / 1 sec.) | 400 VAC | 800 VAC | 1500 VAC |
| burden power,<br>impedance | < 0.013 VA<br>Ri = 1.8 MΩ | < 0.025 VA<br>Ri = 3.6 MΩ | < 0.05 VA<br>Ri = 6 MΩ |

| Current | | |
|---|---|---|
| model | „X/100mA“ | „X/5A“ |
| INOM (IB) – rated current | 0.1 AAC | 1 / 5 AAC |
| measuring range | 0.001 ÷ 0.39 AAC | 0.005 ÷ 7 AAC |
| measuring uncertainty (tA=23±2°C) | +/- 0.05 % of rdg +/- 0.02 % of rng | |
| measurement category | 150V CAT III | 150V CAT III |
| permanent overload (IEC 258) | 1 AAC | 7.5 AAC |
| peak overload - for 1 second, max. repetition frequency > 5 minutes | 10 AAC | 70 AAC |
| burden power ( impedance) | < 0.01 VA ( Ri < 40 mΩ) | < 0.5 VA ( Ri < 10 mΩ) |

| Temperature (internal temperature sensor) | |
|---|---|
| measuring range | - 40 ÷ 80°C |
| measurement uncertainty | ± 2 ºC |

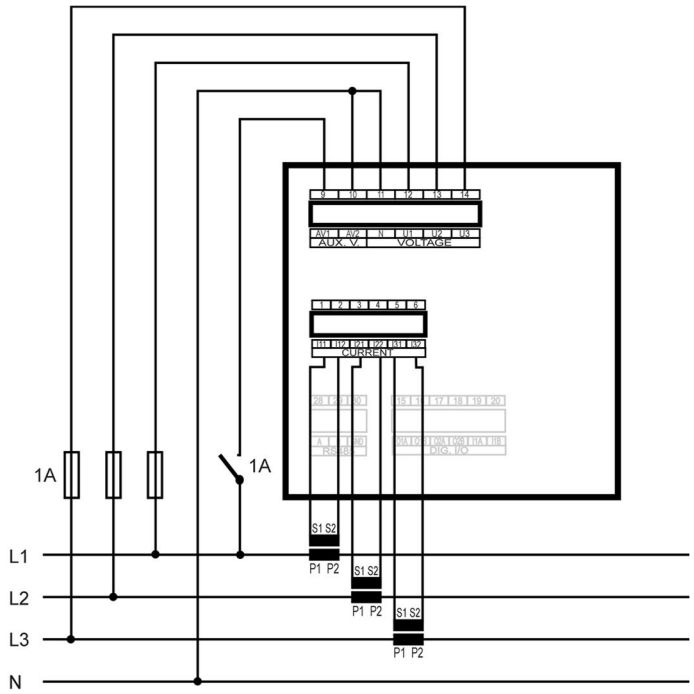
| Auxiliary Voltage | | | |
|---|---|---|---|
| model | „U“ | „L“ | „S“ |
| range | 85 ÷ 275 VAC / 40 ÷ 100 Hz<br>80 ÷ 350 VDC | 20 ÷ 50 VAC / 40 ÷ 100 Hz<br>20 ÷ 75 VDC | 10 ÷ 26 VAC / 40 ÷ 100 Hz<br>10 ÷ 36 VDC |
| power | 8 VA / 3 W | | |
| overvoltage cat. | III | | |
| pollution degree | 2 | | |
| connection | isolated, polarity free | | |

| Digital Outputs & Digital Inputs | | |
|---|---|---|
| „R“-Type Outputs (relay) | | |
| type | N.O. contact | |
| load rating | 250 VAC / 30 VDC, 4 A | |
| „I“- and “V”- Type Outputs (solid state, opto-MOS) | | |
| | “RR/RI/II” Models | “V” Models |
| typ | Opto-MOS, bipolar | Opto-MOS, unipolar |
| load rating | 60 VAC / 100 VDC, 100 mA | |
| dynamic param. (pulse output) :<br>- pulse duration<br>- gap duration<br>- maximum frequency | S0 - compatible<br>50 ms<br>>= 50 ms<br>10 Hz | |
| Digital Inputs | | |
| | “RR/RI/II” Models | “V” Models |
| type | optoisolated, bipolar | optoisolated, unipolar |
| maximum voltage | 100 VDC / / 60 VAC | 35 VDC |
| voltage for “logical “ 0 / 1 | < 3 VDC / > 10 VDC | < 3 VDC / > 10 VDC |
| input current | 1 mA @ 10V / 5 mA @ 24V / 10 mA @ 48V | 3 mA @ 10V / 13 mA @ 24V / 20 mA @ 35V |
| dynamic par. (pulse counter) :<br>- pulse/gap duration<br>- maximum frequency | >= 50 / 50 ms<br>10 Hz | >= 0.5 / 0.5 ms<br>1 kHz |

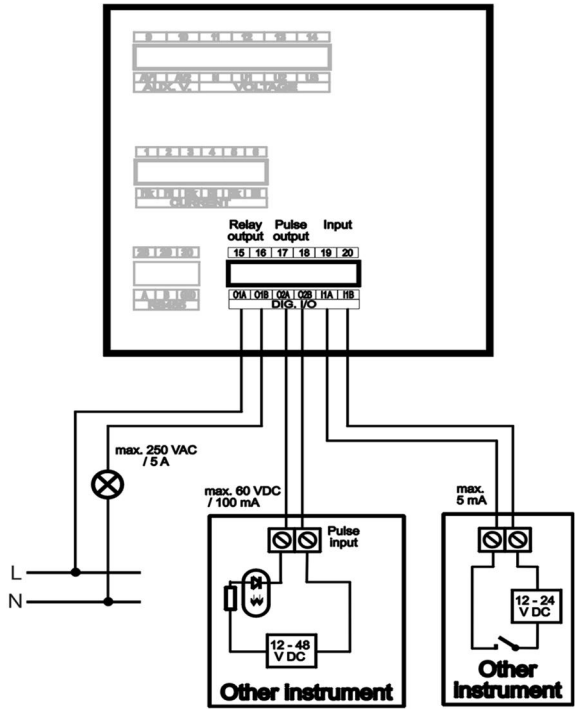
| Other Specifications | |
|---|---|
| operational temperature | - 20 to 60°C |
| storage temperature | - 40 to 80°C |

| | | |
|---|---|---|
| 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 );<br>EN 61000 – 4 - 4 ( 2 kV ); EN 61000 – 4 - 5 ( 2 kV );<br>EN 61000 – 4 - 6 ( 3 V ); EN 61000 – 4 - 11 ( 5 periods ) |
| EMC – emissions | | EN 55011, class A<br>EN 55022, class A (not for home use ) |
| remote communication port (option) | | RS-485 / 2400÷460800 Bd / protocols PQ PLUS, Modbus-RTU or<br>Ethernet 10 Base-T / DHCP, webserver, Modbus-TCP or<br>M-Bus (max. 9600 Bd) |
| display | | Segment LCD FSTN with backlit |
| protection class : | front panel<br>back panel | IP 40 ( IP 54 with cover sheeting )<br>IP 20 |
| dimensions : | front panel<br>built-in depth<br>installation cutout | 96 x 96 mm<br>80 mm<br>$92^{+1}$ x $92^{+1}$ mm |
| mass | | max. 0.3 kg |

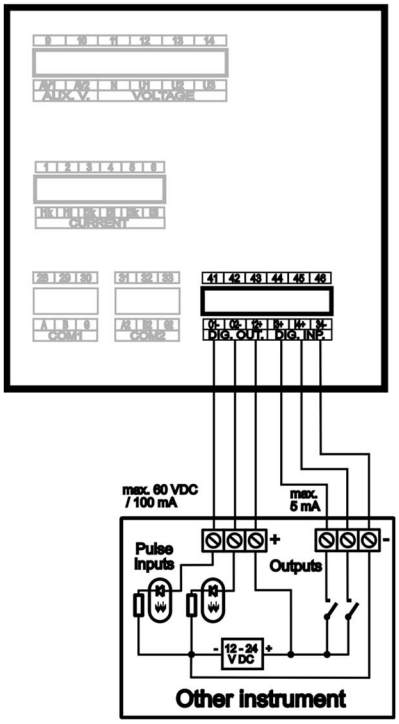
*UMD 96 U 230 X/5A Typical Installation*
*TN-Network, Direct Star (“3Y”) Connection*



*UMD 96 ... RI – Digital I/O Connection Example*



*UMD 96 ... V – Digital I/O Connection Example*




## Maintenance, Service

UMD 96 instruments do not require any maintenance. For reliable operation you only have to comply with the operating conditions specified and prevent mechanical damage to the instrument.

In the event of the product's breakdown, you have to return it to the supplier at their address.

The product must be packed properly to prevent damage in transit. Description of the problem or its symptoms must be sent along with the product. If warranty repair is claimed, the warranty certificate must be sent in too. If after-warranty repair is requested, a written order must be included.

## Warranty Certificate

Warranty period of 24 months from the date of purchase, however no later than within 30 months from the dispatch date from manufacturer's warehouse, is provided for the instrument. Problems in the warranty period, evidently caused by poor workmanship, design or inconvenient material, will be repaired free of charge by the manufacturer or an authorized servicing organization.

The warranty becomes void 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 in out-of-specs impacts or from improper handling or if it has been operated in conflict with the technical specifications.