LUMEL
EVERYTHING COUNTS

# RAIL MOUNTED POWER NETWORK METER

# N43


# USER'S MANUAL

CE

# CONTENTS

# 1. APPLICATION

The N43 meter,assembled on a rail, is a programmable digital instrument designed for the measurement of 3-phase, 3 or 4-wire power network parameters in balanced or unbalanced systems. The measured values are displayed on a dedicated LCD display. The meter enables control and optimization of the power electronic devices, systems and industrial installations.

The meter can be used for measuring: RMS of voltage and current, active, reactive and apparent power, active and reactive energy, power factors, frequency,THD and averaged values P Demand - „power guard”, S Demand, I Demand /15, 30 or 60 minutes/. Voltages and currents are multiplied by given voltage and current ratios of the measuring transformers /for indirect connections/. Power and energy indications take into account all programmed ratio values. The value of each measured value can be transmitted to the master system via the RS-485 interface. Three relay outputs signal the overflow of the chosen quantity, and the pulse output can be used for the consumption check of 3-phase active energy.

There is a galvanic separation between following units of the meter:

- supply,
- voltage and current inputs,
- RS-485,
- USB,
- pulse output OC,
- alarm outputs.

# 2. METER SET

Complete set of the meter includes:

- N43 Meter..... 1 pc
- user’s manual..... 1 pc
- CD ..... 1 pc

# 3. BASIC REQUIREMENTS, OPERATIONAL SAFETY

In terms of operational safety it meets the requirements of the EN 61010-1 standard.

**Comments concerning safety:**

- The meter should be installed and connected only by a qualified personnel. All relevant safety measures should be observed during installation.
- Always check the connections before turning the meter on.
- Prior to taking the meter housing off, always turn the supply off and disconnect the measuring circuits.
- Removal of the meter housing during the warranty period voids the warranty.
- This meter conforms to all requirements of the electromagnetic compatibility in the industrial environment.
- The building installation should have a switch or a circuit--breaker installed. This switch should be located near the device, easy accessible by the operator and suitably marked.

# 4. INSTALLATION

The meter is designed for installation in modular distribution boards on a 35 mm rail. The meter housing is made of plastic.

Housing dimensions: 105 x 110 x 60 mm. There are screw terminal strips on the outer side of the meter which enable the connection of external wires with diameter up to 5.3 mm2 /indirect measurement/ and up to 16 $mm^2$ /direct measurement/.

The meters should not be installed on the rail in direct contact with other devices that emit heat (e.g. other N43 meters). There must be a minimum 5 mm spacing between devices in order to enable heat transfer from a housing to the environment. Otherwise, the ambient temperature of a meter working in direct contact with other devices can exceed the operating temperature specified in rated operating conditions.

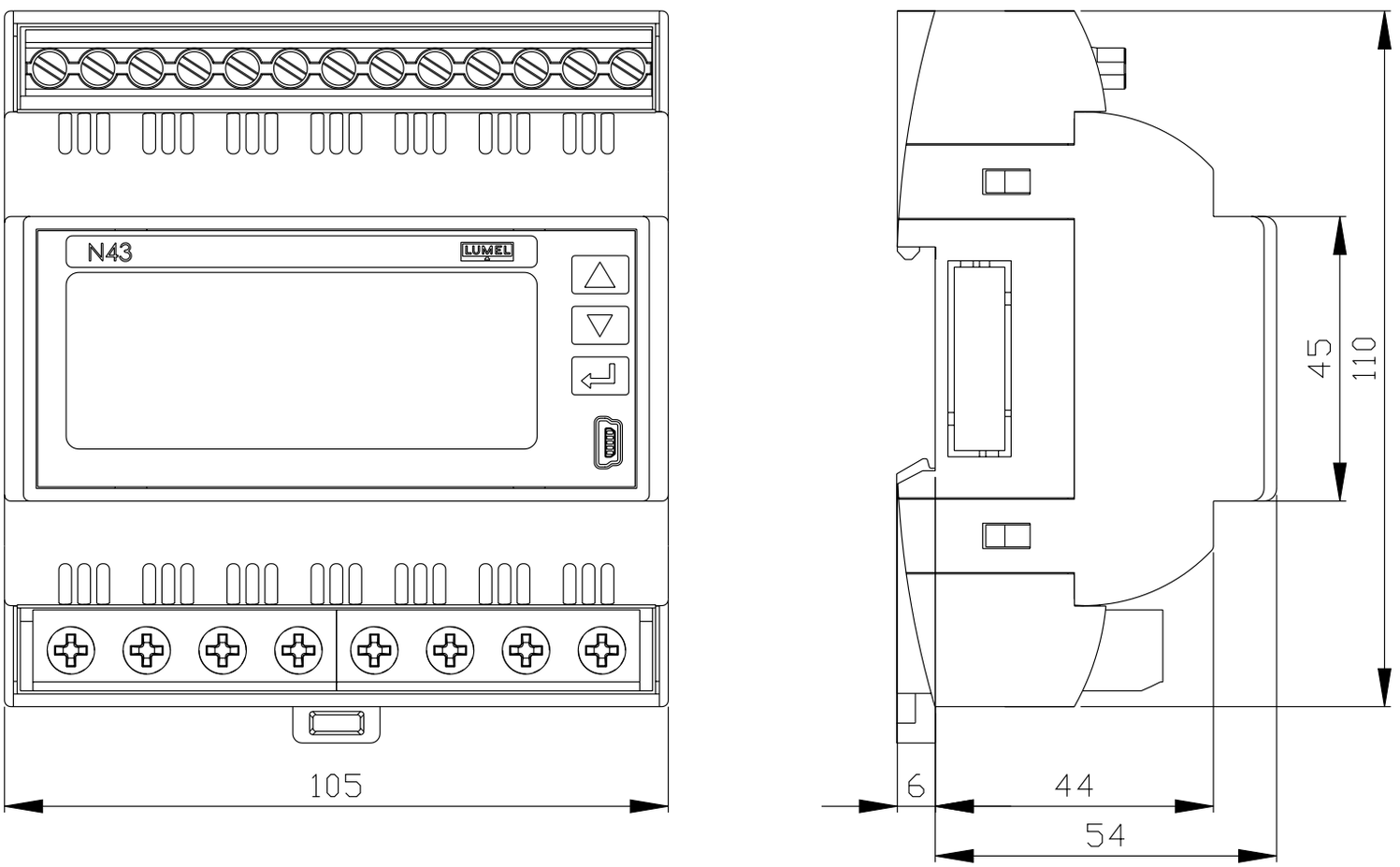



***Fig. 1. Meter dimensions***

# 5. METER DESCRIPTION

## 5.1 Current inputs

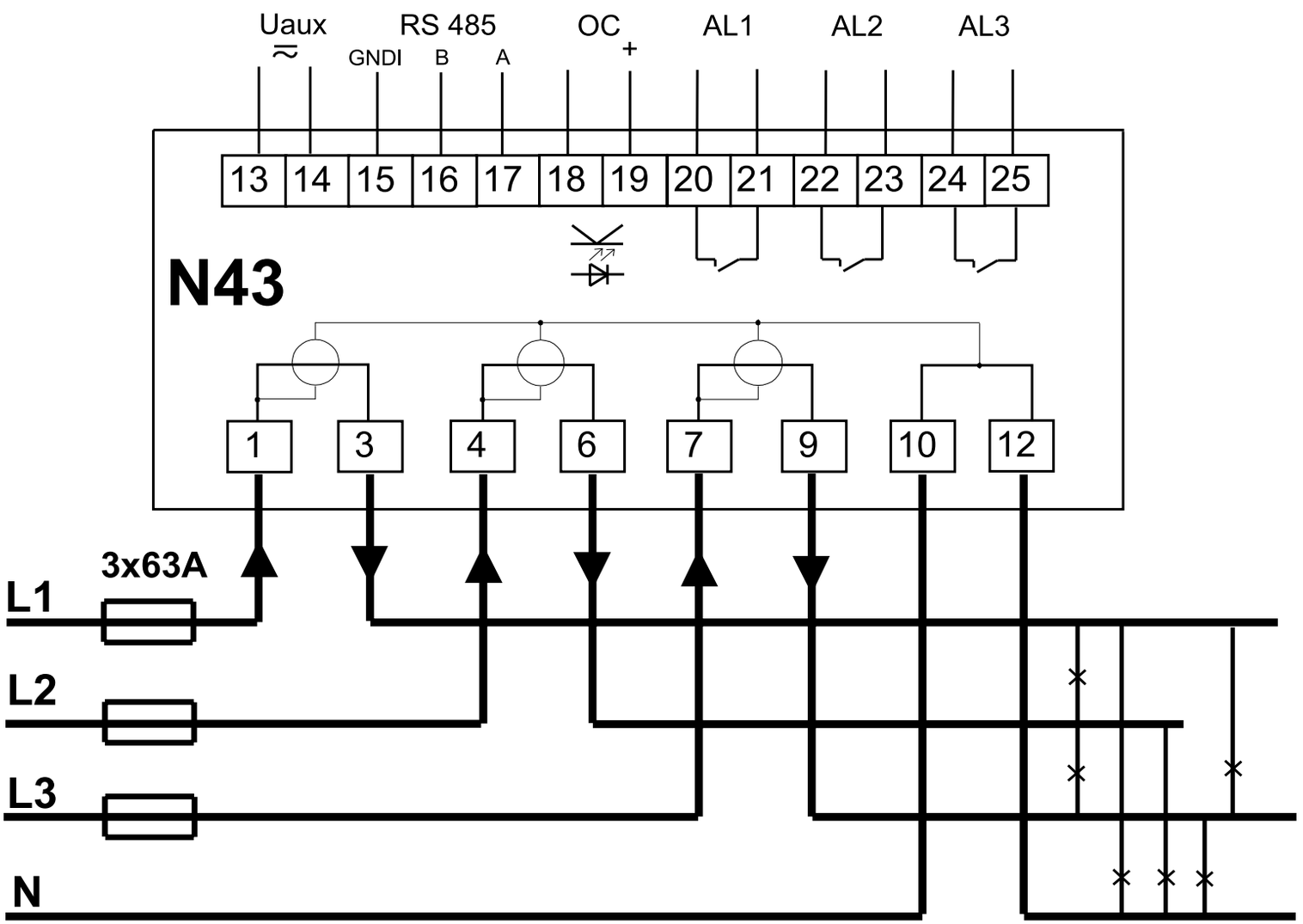
All current inputs are galvanically isolated (internal current transformers). The meter is adapted for direct connections /up to 63 A/ or to work with external measuring current transformers /version 1 A/5 A /. Displayed current values and derivative quantities are automatically converted in relation to the introduced external current transformer ratio.

## 5.2 Voltage inputs

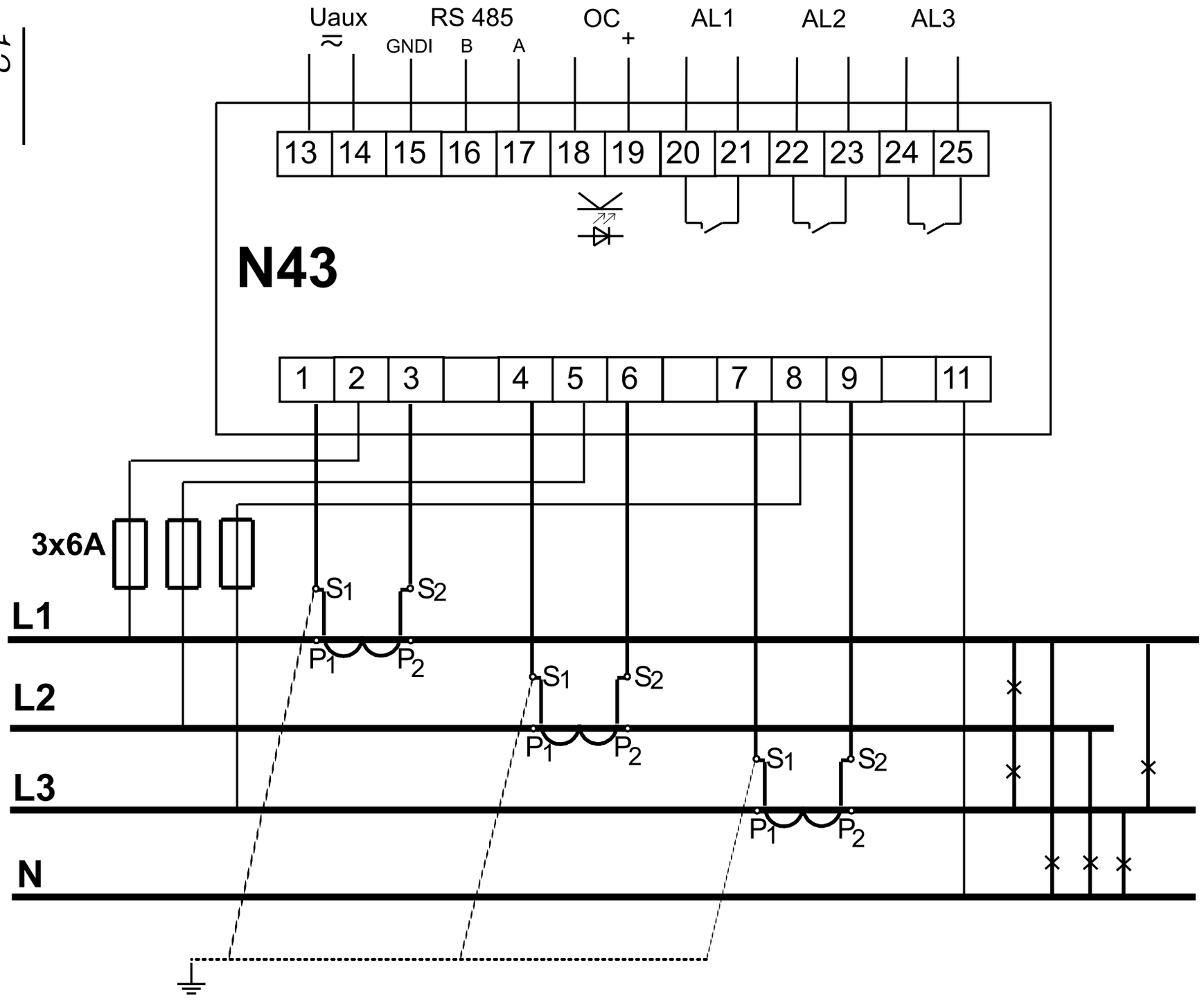
Quantities on voltage inputs are automatically converted acc. to the introduced ratio of the external voltage transformer. Voltage inputs are specified in the order as either 3 x 57.7/100 V, 3 x 230/400 V or 3 x 290/500 V.

## 5.3 Connection diagrams

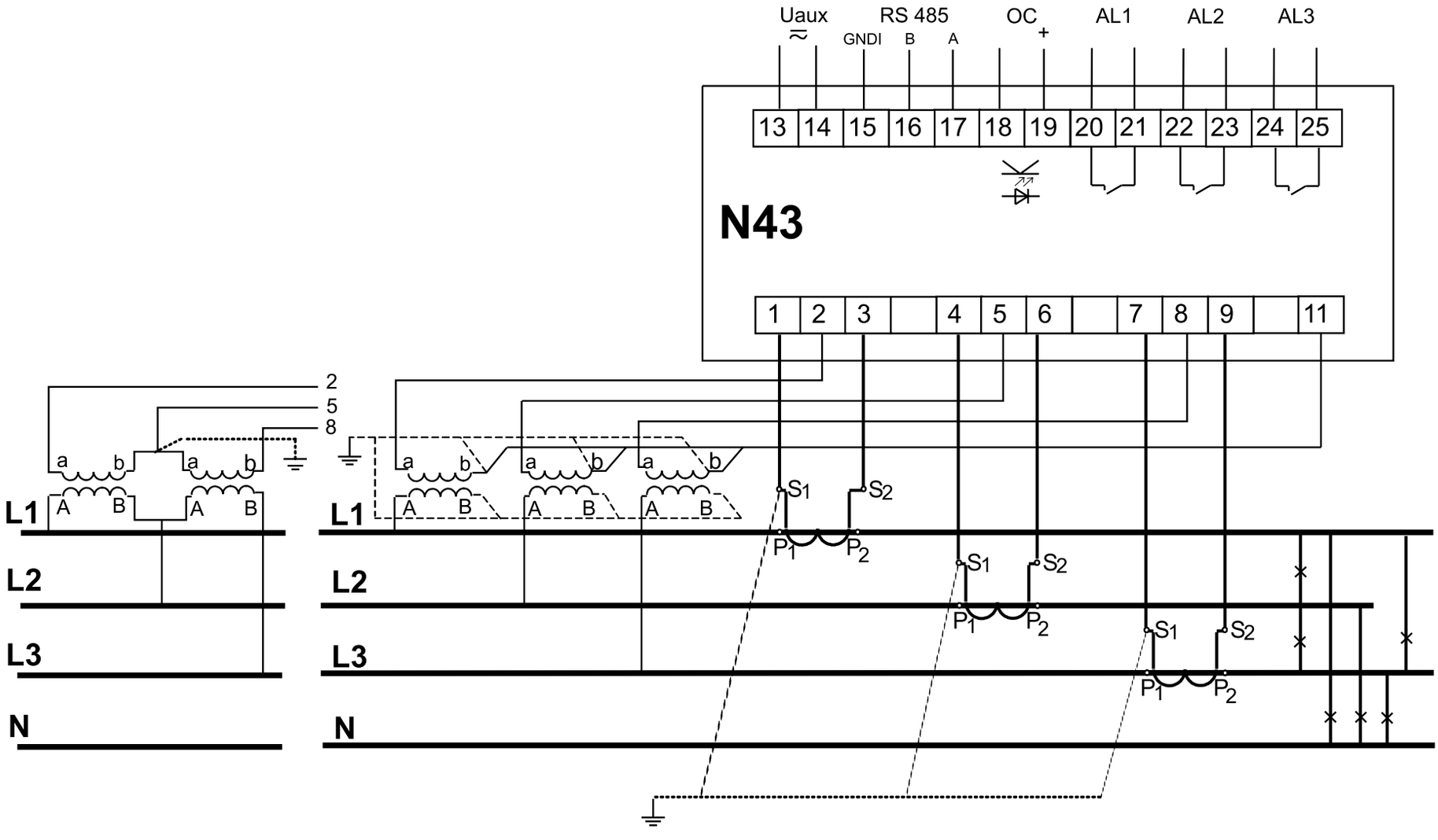
a) Meter connection diagrams in the 3-phase 4-wire network




Direct measurement in 4-wire network

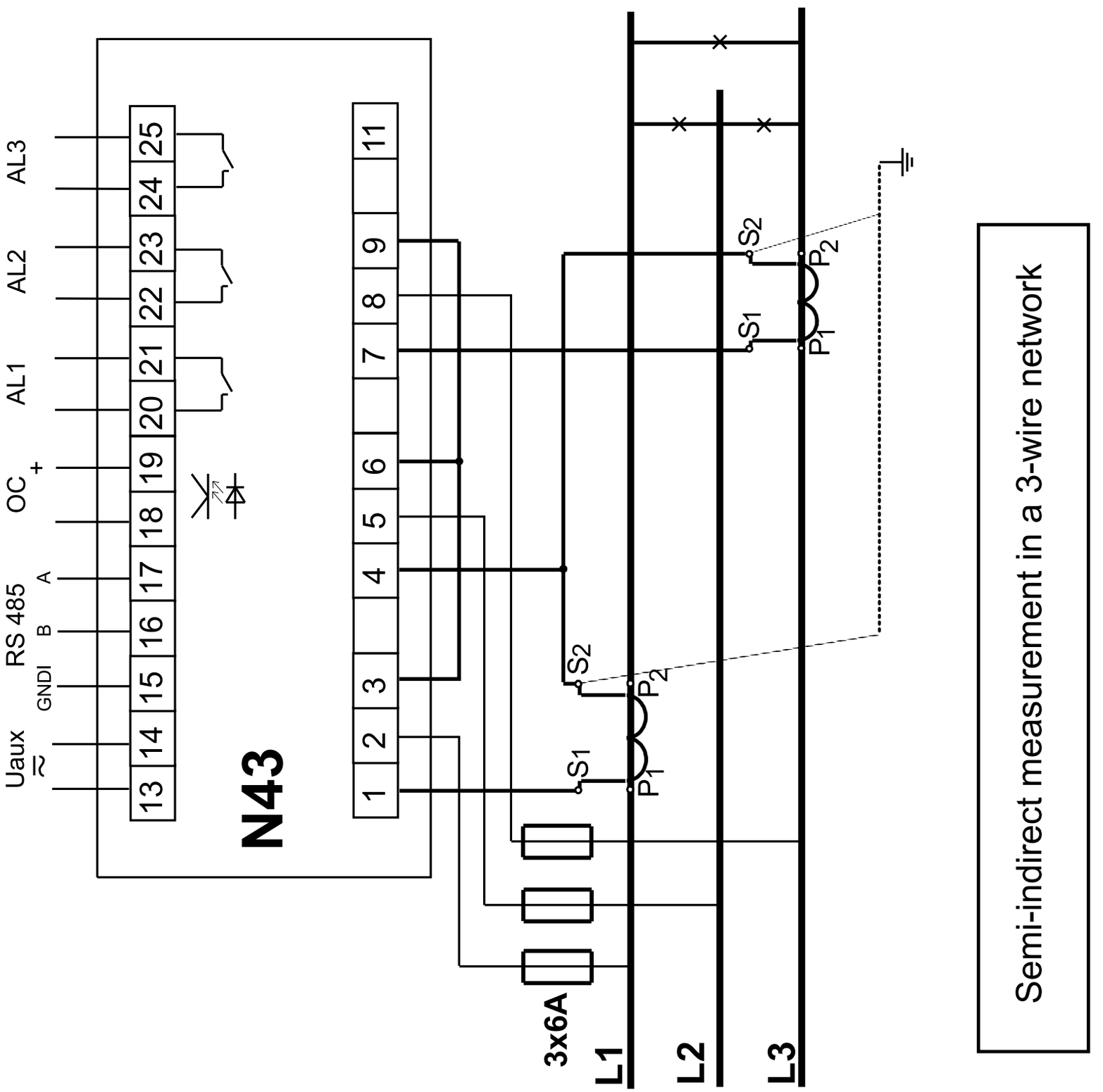


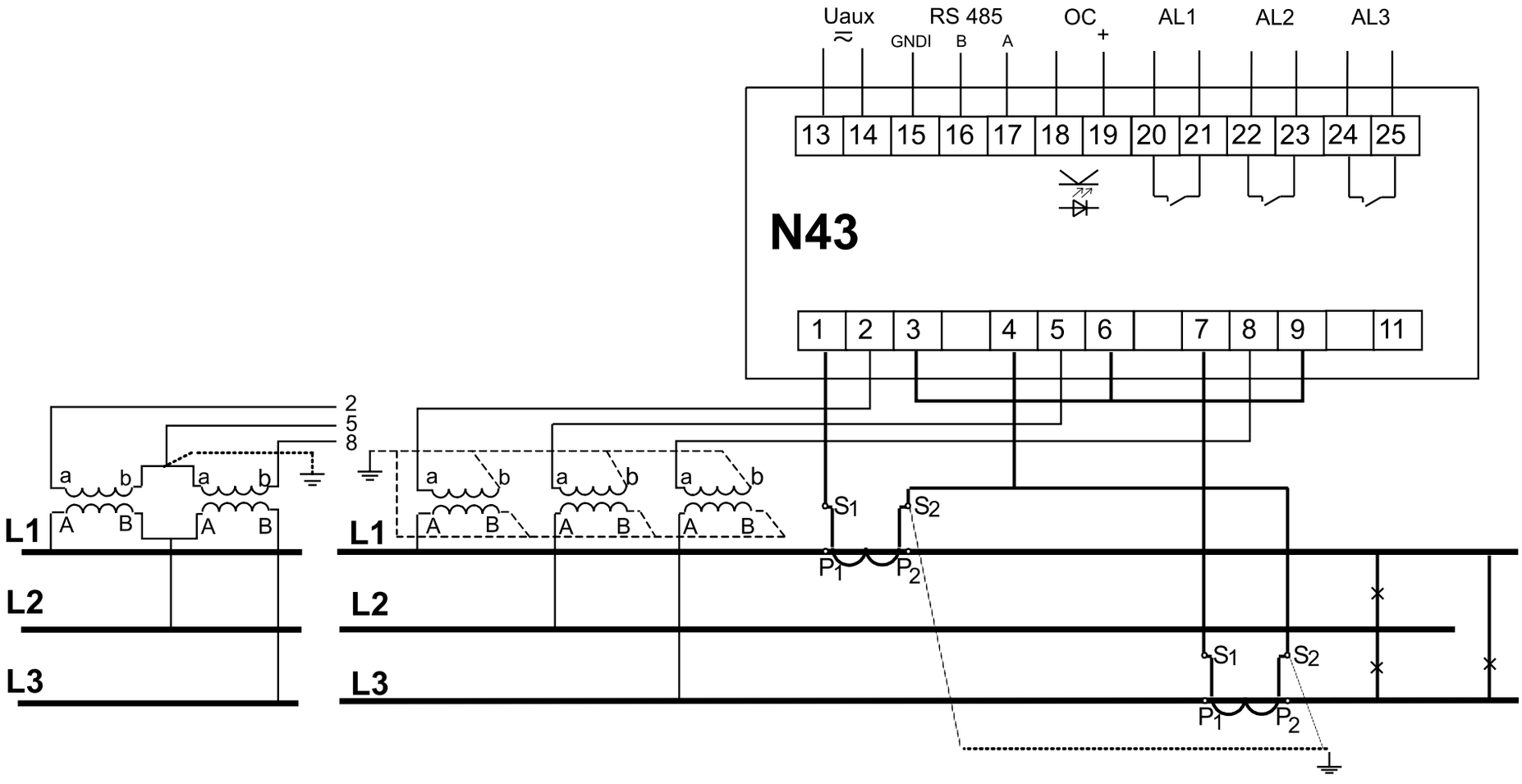

Semi-indirect measurement in 4-wire network




Indirect measurement with the use of 3 current transformers and 2 or 3 voltage transformers in a 4-wire network

# b) Meter connection diagrams in the 3-phase 3-wire network






Direct measurement with the use of 2 current transformers and 2 or 3 voltage transformers in a 3-wire network

***Fig 2. Meter connection diagrams in a network: a) 3-phase 4-wire, b) 3-phase 3-wire***

# 6. N43 PROGRAMMING

## 6.1 Front panel

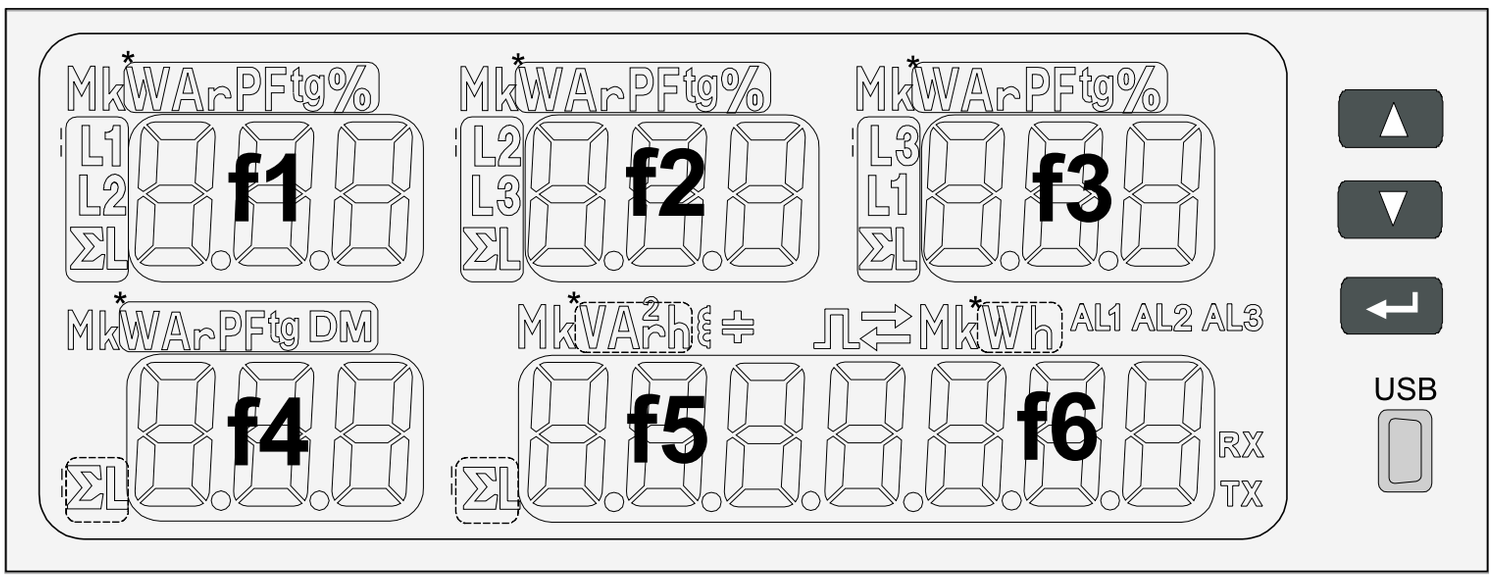
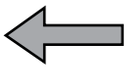
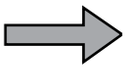
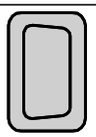
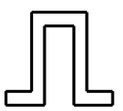



***Fig. 3. Front panel***

# Front panel description:

| | | | |
|---|---|---|---|
|  | increase value button and right displacement |  | active energy export |
|  | decrease value button and left displacement |  | active energy import |
|  | confirm button (ENTER) |  | symbol of energy / reactive inductive power |
|  | USB socket |  | symbol of energy / reactive capacity power |
| **f1...f6** | 6 field 3-digit displays for readout and setting, fields **f5** and **f6** can create one 7-digit field |  | symbol of pulse output |
| * | units of the displayed values | AL1 AL2 AL3 | symbols of alarms activation |
|  | indication of displayed phase |  | kilo = $10^3$ |
| | |  | Mega = $10^6$ |

## 6.2 Power-on messages

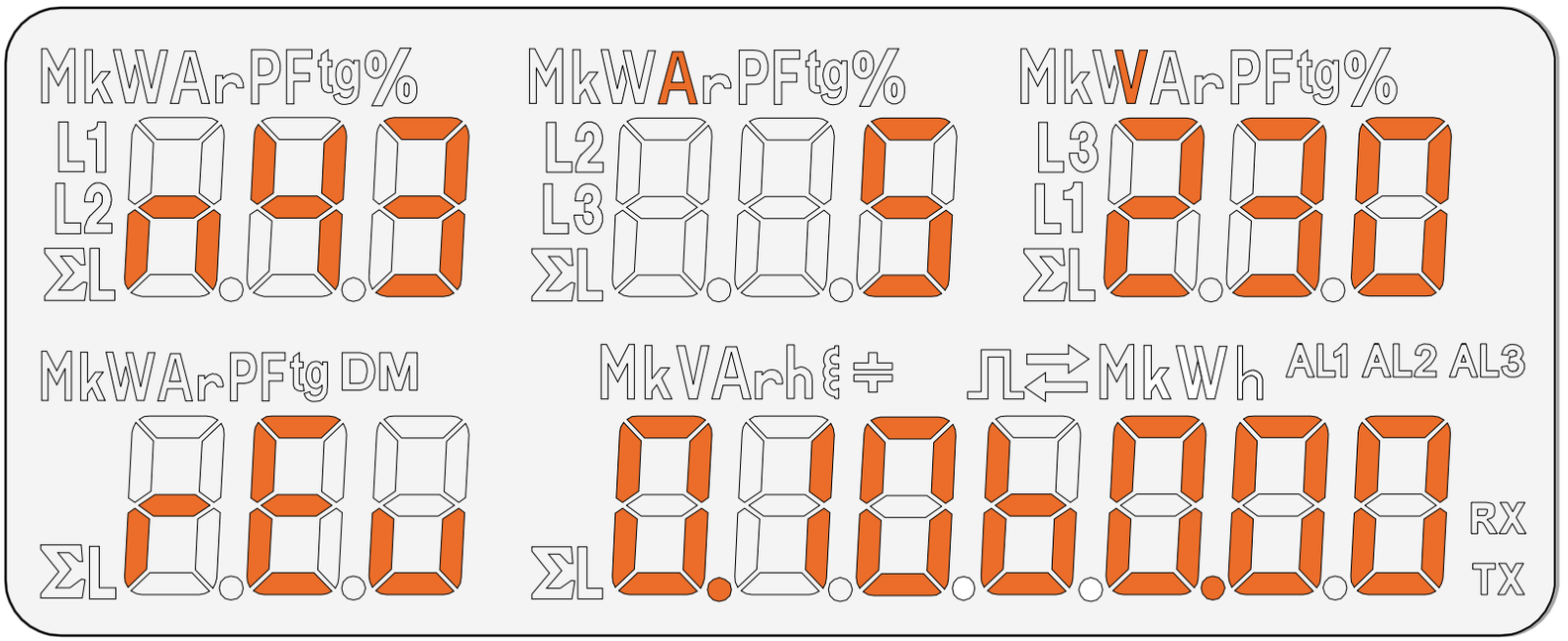



***Fig. 4. Message after starting the meter***

After switching the supply on, the meter performs a display test and displays the N43 meter name, build and current software as well as bootloader version.

where: n43 – meter type, 5A 230V – version
rEu revision
0.10 program version number
b0.00 bootloader version number

# 6.3 Operating modes

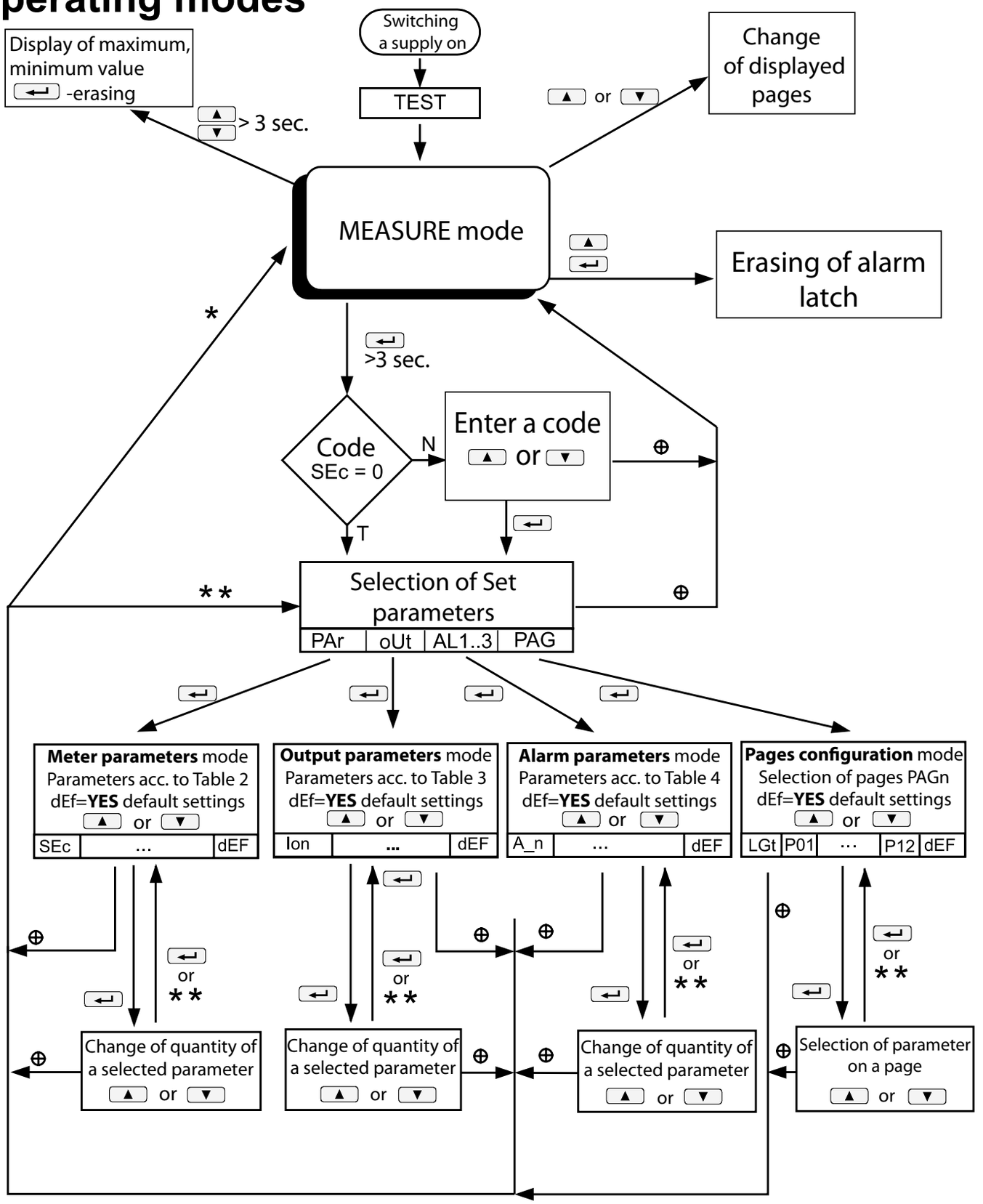



*Fig. 5. N43 meter operating modes*

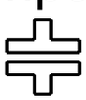
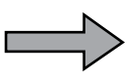
⊕ means: * or **

* >15 sec.

** simultaneous pressure of the buttons

## 6.4 MEASURE Mode

In **Measure** mode the values are displayed according to the pages that are preset at the factory or configured by the user in Pages Programming **PAG**.
Changing the page is done by pressing the ▲ or ▼.
The sequence of displayed pages is according to a table created in PAG mode.
Entry into monitoring of maximum and minimum values mode occurs when pressing at the same time the buttons ▲ and ▼ for at least 3 seconds. Erasing maximum and minimum values is done by pressing the button ↵ while monitoring their value.Alarms are active if they were allocated. Note that the alarms do not need to be associated with quantities displayed on the page because the change of a page would result in action on two-state outputs.
Erasing alarm signalization latch / if it was set in the Alarm parameters mode **AIn** / is done by pressing the buttons ▲ ▼.

When reactive power or energy is displayed, this indication is accompanied by a symbol of the inductive load  or capacity load  .
When active energy is displayed, this indication is accompanied by a symbol of  active energy export or  active energy import.

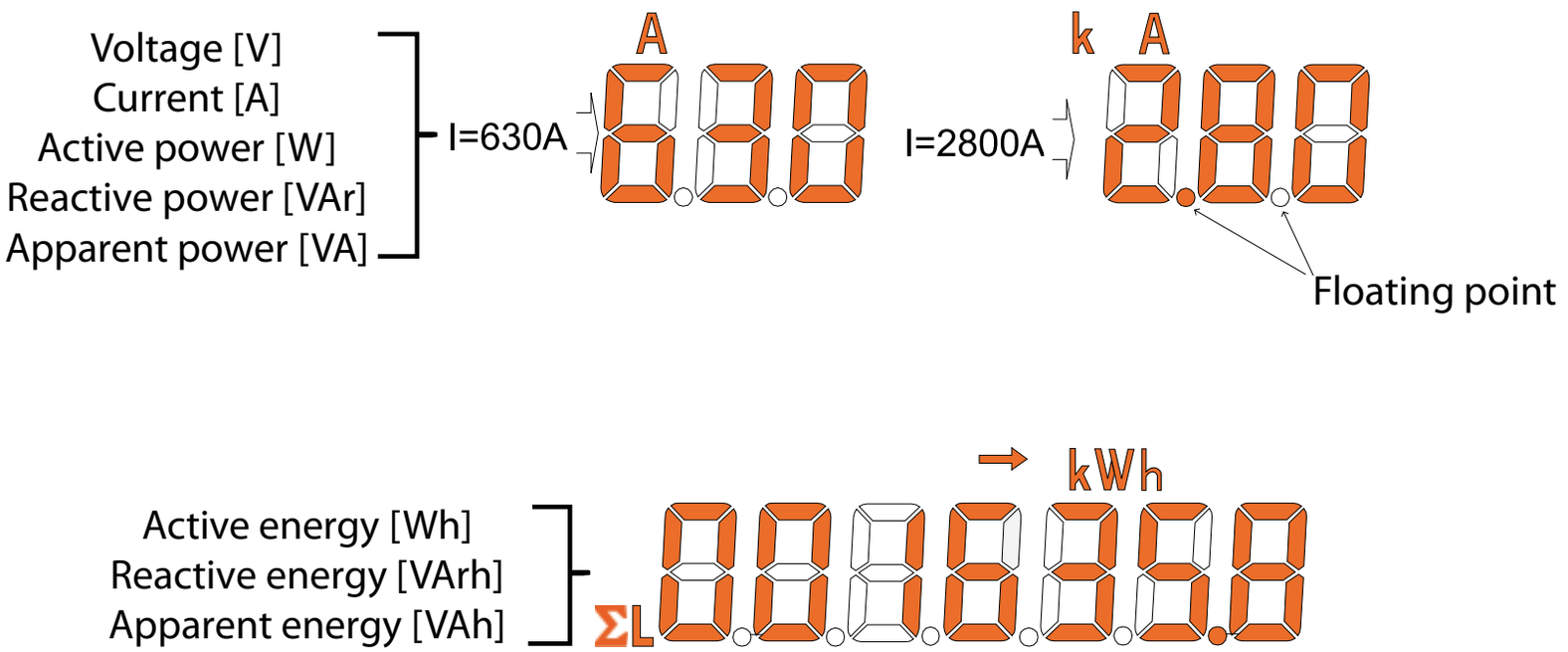



***Fig 6. Formats of displayed values.***

Exceeding of the upper or lower indication range is signaled on the display by upper horizontal lines. For measurement of the averaged values (P Demand, S Demand, I Demand) single measurements are carried out with one second quantum, however, visualized every 15 seconds. Averaging time to choose from: 15, 30 or 60 minutes. After the meter is turned on or after the averaged values are reset, the first value will be calculated in 15 seconds after turning meter on or resetting. Until all samples of the averaged values are acquired, the values are calculated from already measured samples.

Current value in the neutral wire $I_{(N)}$ calculated from phase current vectors is available in the registry 7544 of the serial interface.
The alarm switching on is signaled by the lighting of the AIn inscription (n= 1..3). The end of alarm duration at the alarm signalization latch switched on, is indicated by the pulsation of the AIn inscription (n= 1..3).

Selection of the monitored value:

Table 1

| No. of par. | Quantity name | Marking | Unit | Signaling | 3Ph / 4W | 3Ph / 3W | Available display fields |
|---|---|---|---|---|---|---|---|
| 00 | no quantity - blanked display | oFF | | | √ | √ | **f1,f2,f3,f4,f5,f6** |
| 01 | L1 phase voltage | U 1 | (k)V | L1 | √ | x | **f1** |
| 02 | L1 phase wire current | I 1 | (k)A | L1 | √ | √ | **f1** |
| 03 | L1 phase active power | P 1 | (M,k)W | L1 | √ | x | **f1** |
| 04 | L1 phase reactive power | q 1 | (M,k)VAr | L1 | √ | x | **f1** |
| 05 | L1 phase apparent power | S 1 | (M,k)VA | L1 | √ | x | **f1** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 06 | L1 phase active power factor (PF1=P1/S1) | PF 1 | PF | L1 | √ | x | **f1** |
| 07 | tgφ factor of L1 phase (tg1=Q1/P1) | tG 1 | tg | L1 | √ | x | **f1** |
| 08 | L1 phase voltage THD | tHdU 1 | V% | L1 | √ | x | **f1** |
| 09 | L1 phase current THD | tHdI 1 | A% | L1 | √ | x | **f1** |
| 10 | L2 phase voltage | U2 | (k)V | L2 | √ | x | **f2** |
| 11 | L2 phase wire current | I 2 | (k)A | L2 | √ | √ | **f2** |
| 12 | L2 phase active power | P2 | (M,k)W | L2 | √ | x | **f2** |
| 13 | L2 phase reactive power | Q2 | (M,k)VAr | L2 | √ | X | **f2** |
| 14 | L2 phase apparent power | S2 | (M,k)VA | L2 | √ | X | **f2** |
| 15 | L2 phase active power factor (PF2=P2/S2) | PF2 | PF | L2 | √ | X | **f2** |
| 16 | tgφ factor of L2 phase (tg2=Q2/P2) | tG2 | tg | L2 | √ | X | **f2** |
| 17 | L2 phase voltage THD | tHdU2 | V% | L2 | √ | X | **f2** |
| 18 | L2 phase current THD | tHdI 2 | A% | L2 | √ | X | **f2** |
| 19 | L3 phase voltage | U3 | (k)V | L3 | √ | X | **f3** |
| 20 | L3 phase wire current | I 3 | (k)A | L3 | √ | √ | **f3** |
| 21 | L3 phase active power | P3 | (M,k)W | L3 | √ | X | **f3** |
| 22 | L3 phase reactive power | Q3 | (M,k)VAr | L3 | √ | X | **f3** |
| 23 | L3 phase apparent power | S3 | (M,k)VA | L3 | √ | X | **f3** |
| 24 | L3 phase active power factor (PF3=P3/S3) | PF3 | PF | L3 | √ | X | **f3** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 25 | tgφ factor of L3 phase (tg3=Q3/P3) | tG3 | tg | L3 | √ | X | **f3** |
| 26 | L3 phase voltage THD | tHdU3 | V% | L3 | √ | X | **f3** |
| 27 | L3 phase current THD | tHdI 3 | A% | L3 | √ | X | **f3** |
| 28 | 3-phase mean current* | I S | (k)A | ΣL | √ | √ | **f1,f2,f3,f4,f5** |
| 29 | 3-phase active power | P | (M,k)W | ΣL | √ | √ | **f1,f2,f3,f4,f6** |
| 30 | 3-phase reactive power | q | (M,k)VAr | ΣL | √ | √ | **f1,f2,f3,f4,f5** |
| 31 | 3-phase apparent power | S | (M,k)VA | ΣL | √ | √ | **f1,f2,f3,f4,f5** |
| 32 | 3-phase active power factor (PF=P/S) | PF | PF | ΣL | √ | √ | **f1,f2,f3,f4** |
| 33 | tgφ factor 3 phases mean (tg=Q/P) | tG | tg | ΣL | √ | √ | **f1,f2,f3,f4** |
| 34 | Frequency | F | F | ΣL | √ | √ | **f4** |
| 35 | Phase-to-phase voltage L1-L2 | U 12 | (k)V | L1 L2 | √ | √ | **f1** |
| 36 | Phase-to-phase voltage L2-L3 | U23 | (k)V | L2 L3 | √ | √ | **f2** |
| 37 | Phase-to-phase voltage L3-L1 | U3 1 | (k)V | L3 L1 | √ | √ | **f3** |
| 38 | Mean phase-to-phase voltage * | U 123 | (k)V | ΣL | √ | √ | **f1,f2,f3,f4,f5** |
| 39 | Active power averaged (P Demand )* | PdE | (M,k)W | ΣL DM | √ | √ | **f4** |
| 40 | Reactive power averaged (S Demand )* | SdE | (M,k)VA | ΣL DM | √ | √ | **f4** |
| 41 | Current averaged (I Demand) * | I dE | (k)A | ΣL DM | √ | √ | **f4** |
| 42 | Active 3-phase input energy | EnP | (M,k)Wh | ΣL → | √ | √ | **f5-f6** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 43 | Active 3-phase output energy | EnP | (M,k)Wh | ΣL | √ | √ | **f5-f6** |
| 44 | Reactive 3-phase inductive energy | En9 | (M,k)VArh | ΣL | √ | √ | **f5-f6** |
| 45 | Reactive 3-phase capacity energy | En9 | (M,k)VArh | ΣL | √ | √ | **f5-f6** |
| 46 | 3-phase apparent energy | En5 | (M,k)VAh | ΣL | √ | √ | **f5-f6** |
| 47 | Time – hours, minutes, seconds | hoUr | | | √ | √ | **f5-f6** |

* available minimum and maximum values on the display and interface registers

## 6.5 Parameter Settings

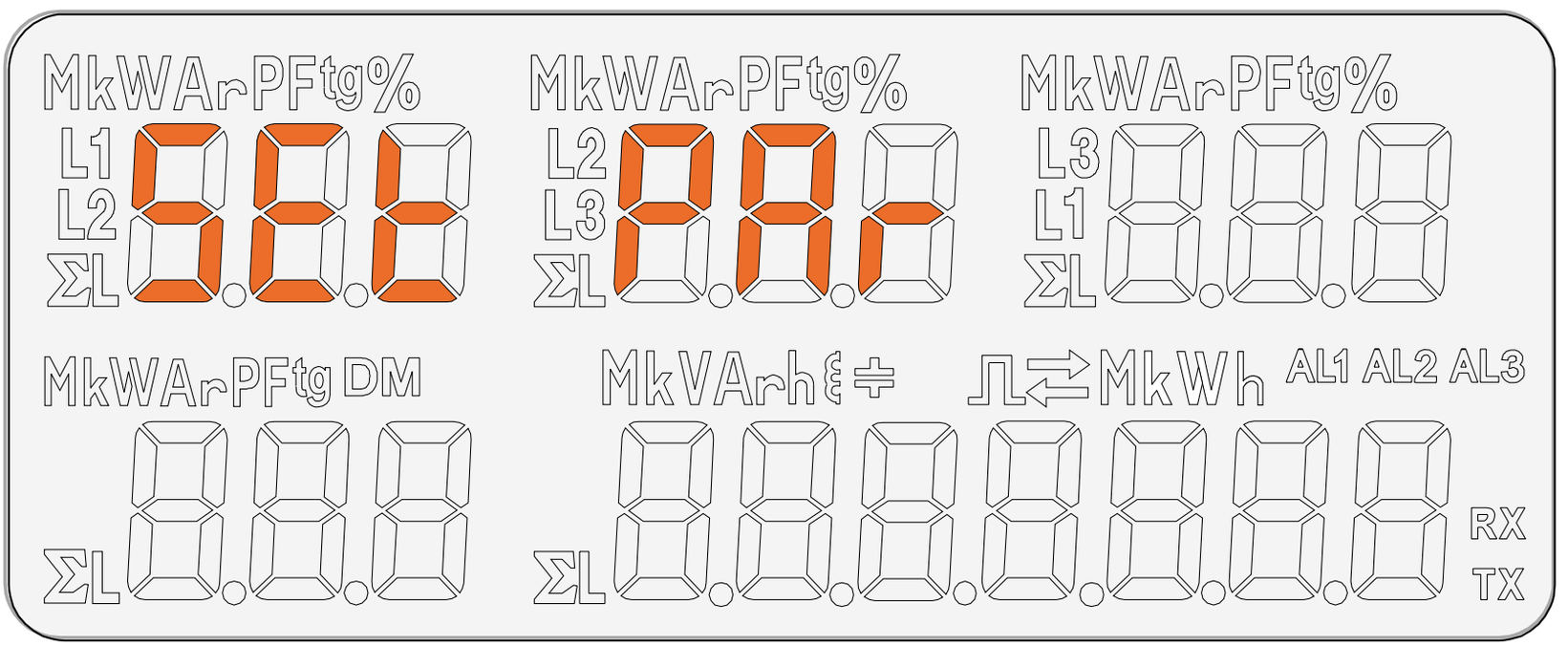



***Fig 7. Setup menu***

Programming mode is enabled by pressing and holding  button for about 3 seconds. To enable the programming user must enter a correct access code. If there is no such a code or after entering a correct code the program transits into the programming option. The message **SEt** (in the first field) and first parameter group **PAr** are displayed.
If the wrong access code is entered, only monitoring of the parameters is possible without possibility of changing them. Err cod is displayed and then rE Ad Par.
Free eCon software can also be used for configuration of the N43 meters, it is available on the website www.lumel.com.pl.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| PAr<br>Meter parameters | SEc<br>Access code | con<br>Type of system - connection | rnI<br>Input current range | trI<br>Current ratio | trU<br>Voltage ratio | dIt<br>Averaging time | SYn<br>Averaging synchronization with the real-time | EnO<br>Energy counters erasing | AuO<br>Erasing averaged parameters | dEF<br>Default settings |
| oUt<br>Outputs parameters | Ion<br>No. of impulses | Adr<br>MODBUS Network Address | trb<br>Transmission mode | bAU<br>Baud rate | t.H<br>Hour, minute | dEF<br>Default settings | | | | |
| AL 1<br>:<br>AL3<br>Alarm parameters | A.n<br>Quantity on the alarm outputs (tab. 5 of UM) | A.t<br>Alarm type | AoF<br>Lower value of the input range | Aon<br>Upper value of the input range | Atn<br>Time delay of switching on | AtF<br>Time delay of switching off | A.b<br>Alarm re--activation lock | A.S<br>Alarm signalization latch | dEF<br>Default settings | |
| PAG<br>Pages configuration | LGt<br>Display panel illumination | P01<br>Quantity on next fields of the page 1 | ... | P12<br>Quantity on next fields of the page 12 | dEF<br>Manufacturer's pages | | | | | |

***Fig. 8. Programming matrix***

### 6.5.1 Setting of Meter Parameters

After entering the **SEt** procedure select with the button ▲ or ▼ mode **Par** and press ↵.
Buttons ▲ ▼ set the requested values. The active position is signaled by the cursor. The set value can be accepted by the button ↵ . Exit from the **SEt** procedure follows after pressing simultaneously the buttons ▲ ▼ or waiting approx. 15 seconds.

Table 2

| Item | Parameter name | Marking | Range | Notes/ description | Manufacturer value |
|---|---|---|---|---|---|
| 1 | Access code entry | SEc | 0..30000 | 0 – no code | 0 |
| 2 | Type of connection | con | 3PH-4<br>3PH-3 | 3PH-4 – 3-phase, 4-wire<br>3PH-3 – 3-phase, 3-wire | 3PH-4 |
| 3 | Input current range | rn1 | 1A, 5A<br>or 63A | Input range: 1A or 5A (for version **In** 1A/5A) or 63A (for version **In** 63A) | 5 A |

| | | | | | |
|---|---|---|---|---|---|
| 4 | Current transformer ratio | trI | 1 .. 10000 | | 1 |
| 5 | Voltage transformer ratio | trU | 0,1…4000,0 | | 1,0 |
| 6 | Averaging time /Demand integration time/ | dIt | t_15, t_30, t_60 | Averaging time of active power P Demand, apparent power S Demand, current I Demand t_15, t_30, t_60 | t_15 |
| 7 | Averaging synchro-nization with the real-time clock | Syn | | on/oFF | oFF |
| 8 | Energy counters erasing | EnD | no,En P, En q, En S, En ALL | no – no activity, En P – erase active energy, En q – erase reactive energy, En S – erase apparent energy, En ALL – erase all energies | no |
| 9 | Erasing averaged parameters | AUD | | YES/no | no |
| 10 | Default settings | dEF | no, YES | reverting to default (factory) group settings **Par** | no |

The automatic erasing of the energy is done with a change of voltage or current ratio.
During the acceptation the value insertion possibility in the range is checked. If the set value falls outside the allowable range, the meter remains in parameter setting mode and the value is set to the highest possible value (when entered value is too high) or lowest possible value (when it is too low).

### 6.5.2 Setting of Output Parameters

In the options, select the **oUt** mode and confirm your choice by pressing the button ↵.

Table 3

| Item | Parameter name | Designation | Range | Notes/ description | Manufacturer value |
|---|---|---|---|---|---|
| 1 | Number of impulses of OC output | I on | 100 ..20000 | number of impulses/ 1kWh | 1000 |
| 2 | MODBUS Network Address | Adr | 1…247 | | 1 |
| 3 | Transmission mode | trb | r8n2, r8E1, r8o1, r8n1 | | 8n2 |
| 4 | Baud rate | bAU | 4.8 k, 9.6 k, 19.2 k, 38.4 k | | 9.6 k |
| 5 | Hour, minute | t_H | 0,00.. 23,59 | | 00.00 |
| 6 | Default settings | dEF | no, yES | reverting to default (factory) group settings **Par** | n |

### 6.5.3 Setting of alarm parameters

In the options select the **ALn** mode and confirm your choice by pressing the button ↵

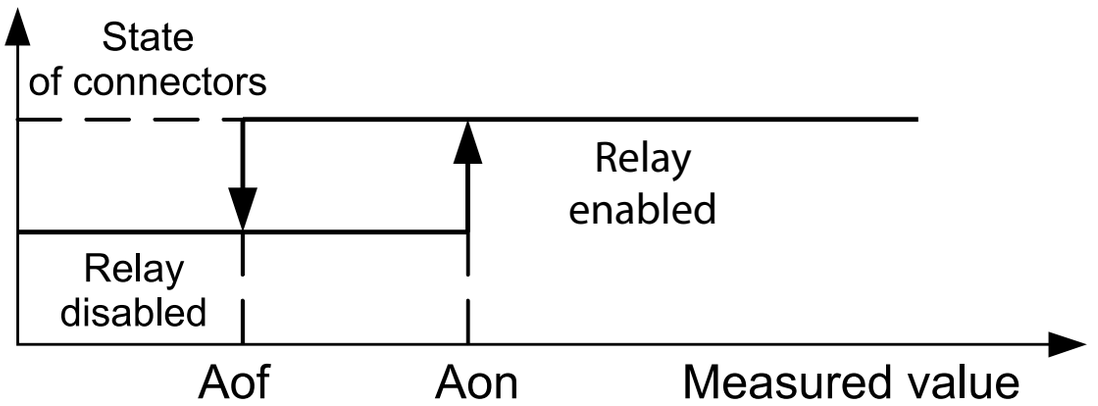
Table 4

| Item | Parameter name | Designation | Range | Notes/ description | Manufacturer value |
|---|---|---|---|---|---|
| 1 | Quantity on the alarm output | A_n | 0..42 | code as in Tab. 5 | AL1=U123<br>AL2=IS<br>AL3=P |
| 2 | Alarm type | A_t | n-on, n-oFF, on,oFF, H-on, H-oFF, | Fig. 9 | n-on |
| 3 | Lower value of the input range | AoF | -144.0…144.0 | in % of the rated quantity value | 90.0 |
| 4 | Upper value of the input range | Aon | -144.0…144.0 | in % of the rated quantity value | 110.0 |
| 5 | Time delay of the switch on reaction | Atn | 0 … 3600 | in seconds | 0 |
| 6 | Time delay of the switch off reaction | AtF | 0 … 3600 | in seconds | 0 |

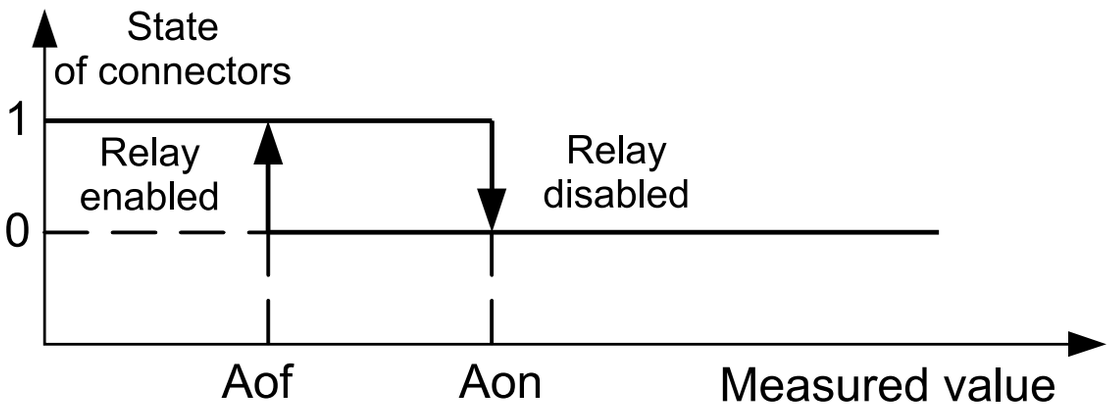
| | | | | | |
|---|---|---|---|---|---|
| 7 | Alarm re-activation lock | A_b | 0 … 3600 | in seconds | 0 |
| 8 | Alarm signalization latch | A_S | on, oFF | When alarm signalization latch function is enabled and the alarm state ends, alarm symbol is not turned off but begins to flash. Alarm symbol flashes until it is turned off by pressing the buttons ▲ ↵ (> 3 sec). This function refers only to the alarm signalization, so the relay contacts will operate without a latch according to the selected alarm type. | oFF |
| 9 | Default settings | dEF | no, yES | restoring default (factory) group settings **PAr** | no |

Entering the value Aon lower than AoF switches the alarm off.

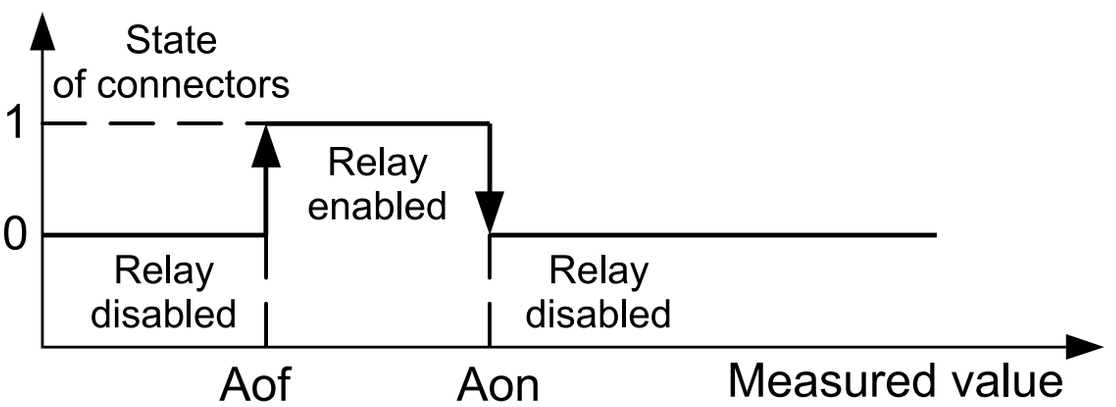
a) **n-on**




b) **n-oFF**




c) **On**



d) **OFF**

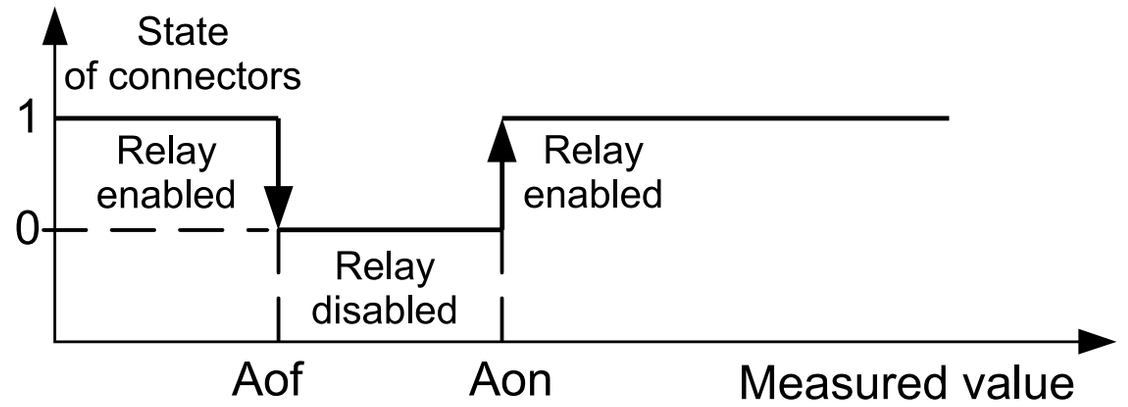



***Fig. 9. Alarm types: a)n-on, b) n-oFF, c) On, d) OFF.***

Remaining types of the alarm:

- H-on – always enabled;
- H-oFF – always disabled.

<u>Example no 1 of alarm setting:</u>

Set alarm **n-on** type for monitored quantity P – 3-phase active power,

Version: 5 A; 3 x 230/400 V. Setting the alarm on after exceeding 3800 W, switching the alarm off after power drops to 3100 W.

**Calculations:** rated 3-phase active power: P = 3 x 230 V x 5 A = 3450 W

3450 W – 100 %  3450 W – 100 %

3800 W – Aon %  3100 W – AoF %

In conclusion:  Aon = 110.0 %  AoF = 90.0 %

Set: Monitored quantity: P; Alarm type: n-on, Aon 110.0, AoF 90.0.

Selection of quantities on the alarm outputs:

Table 5

| Item/ value in the register 4014, 4022, 4030 | Dis-played element | Quantity type | Value needed for calcula-tions of percentage of the alarm values (100 %) |
|---|---|---|---|
| 00 | oFF | no quantity /alarm disabled/ | none |
| 01 | U_1 | L1 phase voltage | Un [V] * |
| 02 | I_1 | L1 phase wire current | In [A] * |
| 03 | P_1 | L1 phase active power | Un x In x cos(0°) [W] * |
| 04 | q_1 | L1 phase reactive power | Un x In x sin(90°) [VAr] * |
| 05 | S_1 | L1 phase apparent power | Un x In [VA] * |
| 06 | PF1 | L1 phase power factor (PF) | 1 |
| 07 | tg1 | tgφ factor of L1 phase | 1 |
| 08 | THDU1 | L1 phase voltage THD | 100,00% |
| 09 | THDI1 | L1 phase current THD | 100,00% |

| | | | |
|---|---|---|---|
| 10 | U_2 | L2 phase voltage | Un [V] * |
| 11 | I_2 | L2 phase wire current | In [A] * |
| 12 | P_2 | L2 phase active power | Un x In x cos(0°) [W] * |
| 13 | q_2 | L2 phase reactive power | Un x In x sin(90°) [VAr] * |
| 14 | S_2 | L2 phase apparent power | Un x In [VA] * |
| 15 | PF2 | L2 phase power factor (PF) | 1 |
| 16 | tg2 | tgφ factor of L2 phase | 1 |
| 17 | THDU2 | L2 phase voltage THD | 100.00% |
| 18 | THDI2 | L2 phase current THD | 100.00% |
| 19 | U_3 | L3 phase voltage | Un [V] * |
| 20 | I_3 | L3 phase wire current | In [A] * |
| 21 | P_3 | L3 phase active power | Un x In x cos(0°) [W] * |
| 22 | q_3 | L3 phase reactive power | Un x In x sin(90°) [VAr] * |
| 23 | S_3 | L3 phase apparent power | Un x In [VA] * |
| 24 | PF3 | L3 phase power factor (PF) | 1 |
| 25 | tg3 | tgφ factor of L3 phase | 1 |
| 26 | THDU3 | L3 phase voltage THD | 100.00% |

| | | | |
|---|---|---|---|
| 27 | THDI3 | L3 phase current THD | 100.00% |
| 28 | U_A | mean 3-phase voltage | Un [V] * |
| 29 | I_A | mean 3-phase current | In [A] * |
| 30 | P | 3-phase active power (P1+P2+P3) | 3 x Un x In x cos(0°) [W] * |
| 31 | q | 3-phase reactive power (Q1+Q2+Q3) | 3 x Un x In x sin(90°) [VAr] * |
| 32 | S | 3-phase apparent power (S1+S2+S3) | 3x Un x In [VA] * |
| 33 | PF_A | 3-phase power factor (PF) | 1 |
| 34 | tg_A | tgφ factor of 3 phases | 1 |
| 35 | FrEq | frequency | 100 [Hz] |
| 36 | U12 | phase-to-phase voltage L1-L2 | √3 Un [V] * |
| 37 | U23 | phase-to-phase voltage L2-L3 | √3 Un [V] * |
| 38 | U31 | phase-to-phase voltage L3-L1 | √3 Un [V] * |
| 39 | U123 | mean phase-to-phase voltage | √3 Un [V] * |
| 40 | Pdt | active power averaged (P Demand )* | 3 x Un x In x cos(0°) [W] * |
| 41 | Sdt | reactive power averaged (S Demand )* | 3 x Un x In [VA] * |
| 42 | Idt | current averaged (I Demand) * | In [A] * |

* Un, In - rated values of voltages and currents

### 6.5.4 Pages configuration mode

For the meter 1...12 user pages can be programmed or selected from 12 manufacturer's default pages. The monitored values are shown in Table 1.
In the options, select the **PAG** mode and confirm your choice by pressing the button ↵.
Buttons ▲ ▼ allow to select the page number to edit, to accept press the button ↵. Buttons ▲ ▼ allow to select the config mode, to accept press the button ↵ . The cursor (blinking ---) will move to the first field **f1**. Buttons ▲ ▼ allow to select the fields f1-f6. Confirm a field selection by pressing the button ↵. Selection of the monitored value in a selected field can be done by pressing the buttons ▲ ▼ and confirmed by pressing the button ↵.
After setting required quantities in the fields f1-f6 make, confirm it and save the pages with the selected quantities by pressing for (approx. 3 sec.) the button ↵ .

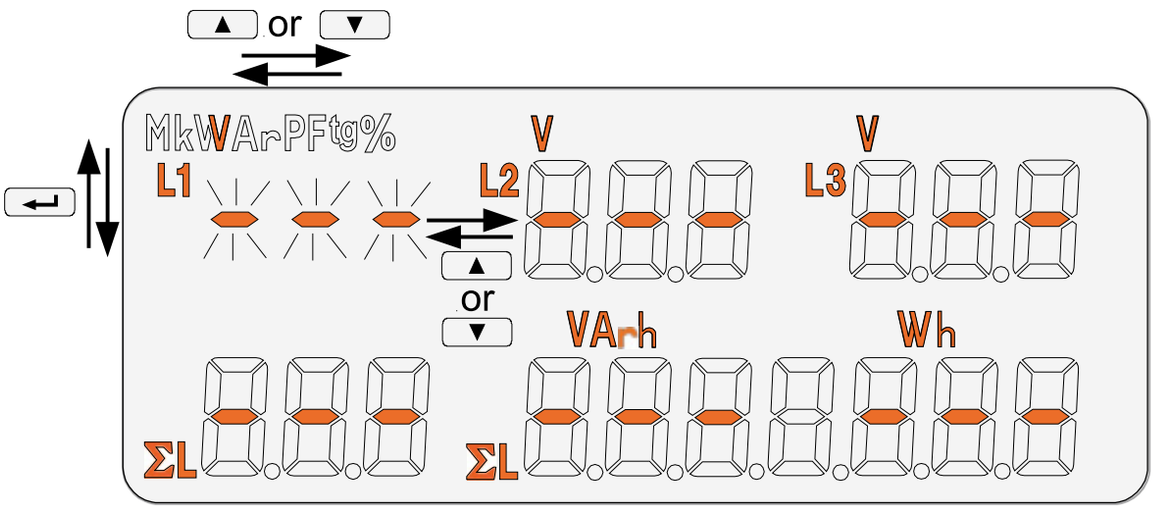



***Fig.10 A display in pages configuration mode.***

## Pages programming

Table 6

| Item | Parameter name | Desig-nation | Range | Notes/description | Manu-facturer value |
|---|---|---|---|---|---|
| 1 | Display panel illumi-nation | LCt | oFF,1…60, on | oFF – off, on – on,<br>1..60 – illumination time (in seconds) from pressing the button | on |
| 2 | Page 1 | P01 | oFF, on, config | oFF– disabled,<br>on – enabled,<br>config – editing a selected page | on |
| 3 | Page 2 | P02 | oFF, on, config | oFF– disabled,<br>on – enabled,<br>config – editing a selected page | on |
| 4 | Page 3 | P03 | oFF, on, config | oFF– disabled,<br>on – enabled,<br>config – editing a selected page | on |
| 5 | Page 4 | P04 | oFF, on, config | oFF– disabled,<br>on – enabled,<br>config – editing a selected page | on |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Page 5 | P05 | oFF, on, config | oFF– disabled, on – enabled, config – editing a selected page | on |
| 7 | Page 6 | P06 | oFF, on, config | oFF– disabled, on – enabled, config – editing a selected page | on |
| 8 | Page 7 | P07 | oFF, on, config | oFF– disabled, on – enabled, config – editing a selected page | on |
| 9 | Page 8 | P08 | oFF, on, config | oFF– disabled, on – enabled, config – editing a selected page | on |
| 10 | Page 9 | P09 | oFF, on, config | oFF– disabled, on – enabled, config – editing a selected page | on |
| 11 | Page 10 | P 10 | oFF, on, config | oFF– disabled, on – enabled, config – editing a selected page | on |
| 12 | Page 11 | P 11 | oFF, on, config | oFF– disabled, on – enabled, config – editing a selected page | on |
| 13 | Page 12 | P 12 | oFF, on, config | oFF– disabled, on – enabled, config – editing a selected page | on |

Manufacturer settings are shown below:

**P01**

| | | |
|---|---|---|
| U1 V | U2 V | U3 V |
| F | 9 VAr | P W |

**P02**

| | | |
|---|---|---|
| U12 V | U23 V | U31 V |
| U123 V | 9 VAr | P W |

**P03**

| | | |
|---|---|---|
| I1 A | I2 A | I3 A |
| I5 A | 9 VAr | P W |

**P04**

| | | |
|---|---|---|
| P1 W | P2 W | P3 W |
| PF | 9 VAr | P W |

**P05**

| | | |
|---|---|---|
| 91 VAr | P2 VAr | P3 VAr |
| t6 | 9 VAr | P W |

**P06**

| | | |
|---|---|---|
| S1 VA | S2 VA | S3 VA |
| S VA | EnS kVAh | |

**P07**

| | | |
|---|---|---|
| PF1 | PF2 | PF3 |
| PF | EnP kWh → | |

**P08**

| | | |
|---|---|---|
| t61 | t62 | t63 |
| t6 | EnP kWh ← | |

**P09**

| | | |
|---|---|---|
| tHdU1 % | thdU2 % | thdU3 % |
| F | En9 kVArh | |

**P10**

| | | |
|---|---|---|
| thdI1 % | thdI2 % | thdI3 |
| Pdi W | En9 kVArh | |

**P11**

| | | |
|---|---|---|
| P W | 9 VAr | S VA |
| SdΠ VA | EnP kWh → | |

**P12**

| | | |
|---|---|---|
| P W | 9 VAr | 9 VA |
| IdΠ A | hh_ΠΠ_SS | |

Visualization of the manufacturer’s page **P02**:

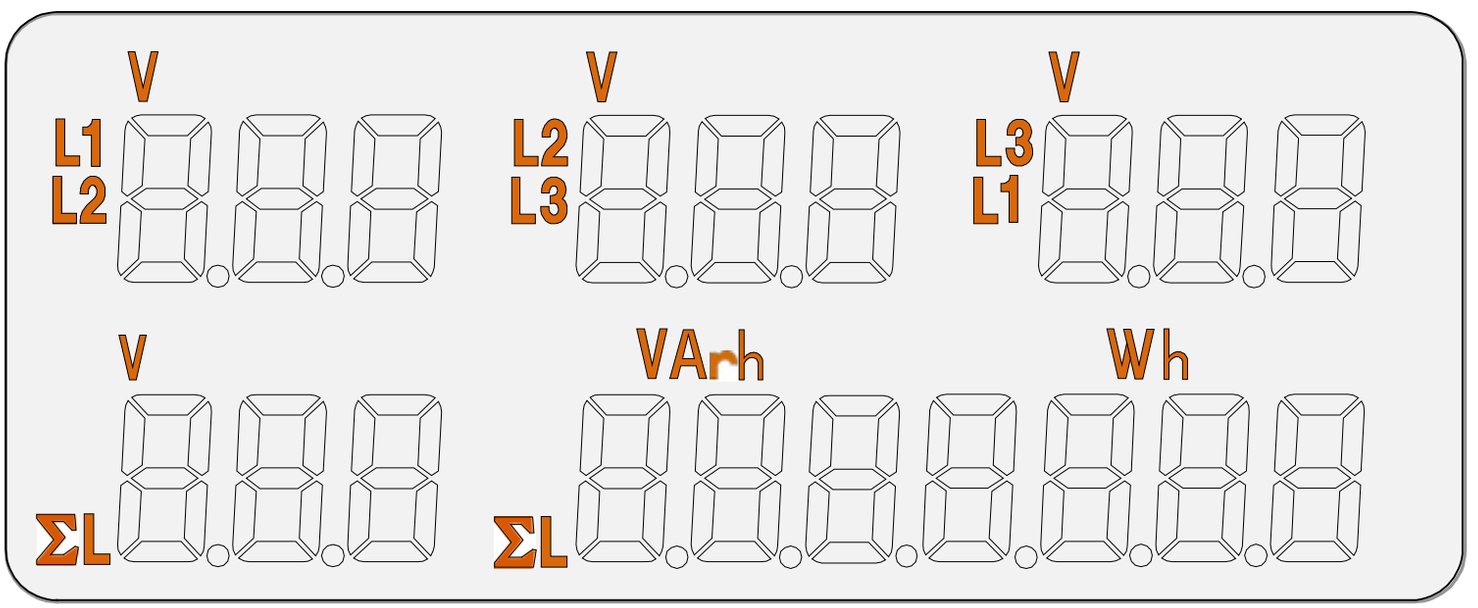



***Fig.11 Visualization of the manufacturer’s page P02***

# 7. SOFTWARE UPGRADE

A feature implemented in the N43 meters enables to upgrade firmware using a PC with eCon software installed. Free eCon software and the update files are available at www.lumel.com.pl. Updating can be done directly via USB or RS485 interface using RS485 to USB converter, e.g.: PD10 converter.

a) b)

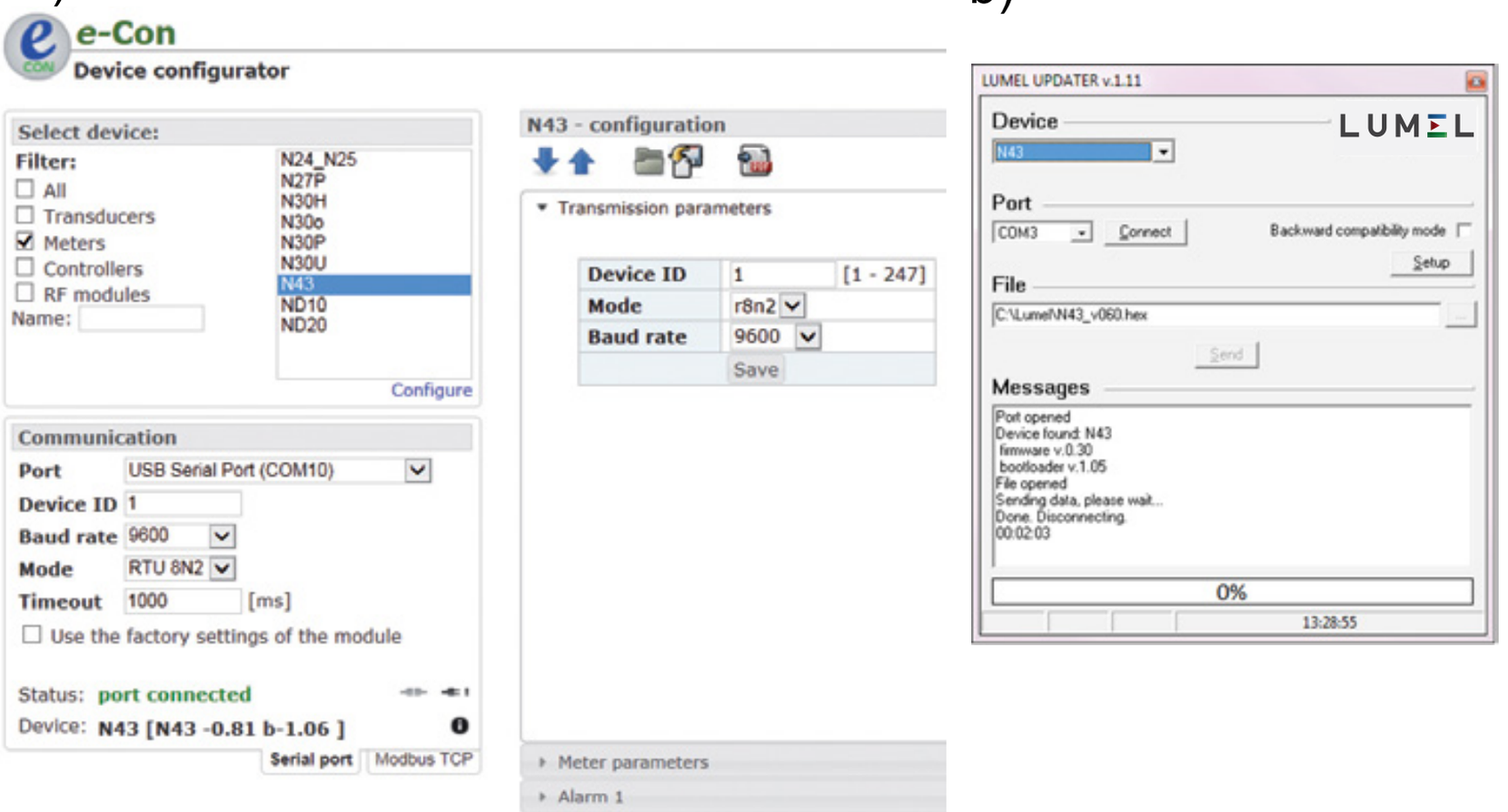



***Fig. 12. Program window view: a) eCon, b) software updates***

**Caution!** Software update automatically resets meter settings to manufacturer settings, so it is recommended to save meter settings using eCon software before upgrading.

After launching eCon software, set in the settings required serial port, baud rate, mode and address of the meter. Next, select the N43 meter and click *Config*. Click the down arrow icon to read all of the settings then the disk icon to save the settings to a file (required to restore the settings later). After selecting the option *Update firmware* (in the upper right corner of the screen) the window *Lumel Updater* will be opened (*LU*) – Fig. 12 b. press *Connect*. The *Messages* information window displays information concerning upgrade process. If the port is opened correctly, a *Port opened* message appears. Upgrade mode may be entered using either of the two methods: remotely via *LU* (using eCon settings – address, mode, baud rate, COM port) and by turning a meter on while pressing the button  (while entering bootloader mode using a button, an update is done via USB interface only – baud rate 9600, RTU8N2, address 1). The display will show the bootloader version, while the LU program displays the message *Device found* and the name and version of the connected device. Click the ... button and browse to the meter upgrade file. If the file is opened correctly, a *File*

*opened* message is displayed. Press the *Send* button. When upgrade is successfully completed, the meter begins normal operation while the information window displays *Done* message and upgrade elapsed time. The next update can only be done via a USB interface in case of a failed upgrade. After the *LU* window is closed, go to parameter group *Restoring manufacturer settings*, select the option and press the button *Apply*. Then press the folder icon to open a previously saved settings file and press the up arrow icon to save the settings in the meter. Current software version can be checked by reading the welcome message when switching the meter on.

Caution! Turning meter supply off during upgrade process may result in permanent damage!

# 8. SERIAL INTERFACES

## 8.1 RS-485 INTERFACE – list of parameters

The implemented protocol is compliant with the PI-MBUS-300 Rev G specification of Modicon. List of N43 meter serial interface parameters:

- identifier 0xCF
- meter address 1..247
- baud rate 4.8, 9.6, 19.2, 38.4 kbit/s,
- operating mode Modbus RTU,
- transmission mode 8N2, 8E1, 8O1, 8N1,
- max. response time 600 ms.
- max. no. of registers read in a single query
  - 41 4-byte registers,
  - 82 2-byte registers,
- implemented functions 03, 04, 06, 16, 17,
  - 03, 04 register readout,
  - 06 single register writing,
  - 16 writing of n registers,
  - 17 device identification.

Manufacturer's settings: address 1, baud rate 9.6 kbit/s, mode RTU 8N2,

## 8.2 USB INTERFACE – list of parameters

USB interface is dedicated only to the configuration of meter parameters.

- identifier 0xCF
- meter address 1
- baud rate 9.6 kbit/s,
- operating mode Modbus RTU,
- transmission mode 8N2
- max. response time 800 ms.
- max. no. of registers read in a single query
  - 41 4-byte registers,
  - 82 2-byte registers,
- implemented functions 03, 04, 06, 16, 17,
  - 03, 04 register readout,
  - 06 single register writing,
  - 16 writing of n registers,
  - 17 device identification.

## 8.3 Examples of registers' readout and write

### Readout of n-registers (code 03h)

**Example 1.** Readout of two 16-bit integer registers, starting with the register address 0FA0h (4000) - register values 10, 100.

**Request:**

| Device address | Fun-ction | Register address | | Number of registers | | CRC checksum |
|---|---|---|---|---|---|---|
| | | B1 | B0 | B1 | B0 | |
| 01 | 03 | 0F | A0 | 00 | 02 | C7 3D |

**Response:**

| Device ad-dress | Funcion | Number of bytes | Value from the register 0FA0 (4000) | | Value from the register 0FA1 (4001) | | CRC check-sum |
|---|---|---|---|---|---|---|---|
| | | | B1 | B0 | B1 | B0 | |
| 01 | 03 | 04 | 00 | 0A | 00 | 64 | E4 6F |

**Example 2.** Readout of two 32-bit float registers as a combination of two 16-bit registers, starting with the register address 1B58h (7000) - register values 10, 100.

**Request:**

| Device address | Fun-ction | Register address | | Number of registers | | CRC chceck-sum |
|---|---|---|---|---|---|---|
| | | B1 | B0 | B1 | B0 | |
| 01 | 03 | 1B | 58 | 00 | 04 | C3 3E |

**Response:**

| Device address | Function | Number of bytes | Value from the register 1B58 (7000) | | Value from the register 1B59 (7001) | | Value from the register 1B5A (7002) | | Value from the register 1B5B (7003) | | CRC chce-ck-sum |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | B3 | B2 | B1 | B0 | B3 | B2 | B1 | B0 | |
| 01 | 03 | 08 | 41 | 20 | 00 | 00 | 42 | C8 | 00 | 00 | E4 6F |

**Example 3.** Readout of two 32-bit float registers as a combination of two 16-bit registers, starting with the register address 1770h (6000) - register values 10, 100.

**Request:**

| Device address | Fun-ction | Register address | | Number of registers | | CRC chceck-sum |
|---|---|---|---|---|---|---|
| | | B1 | B0 | B1 | B0 | |
| 01 | 03 | 17 | 70 | 00 | 04 | 4066 |

**Response:**

| Device address | Function | Number of bytes | Value from the register 1770h (6000) | | Value from the register 1770h (6000) | | Value from the register 1772h (6002) | | Value from the register 1772h (6002) | | CRC chce-ck-sum |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | B1 | B0 | B3 | B2 | B1 | B0 | B3 | B2 | |
| 01 | 03 | 08 | 00 | 00 | 41 | 20 | 00 | 00 | 42 | C8 | E4 6F |

**Example 4.** Readout of two 32-bit float registers, starting with the register address 1D4Ch (7500) - register values 10, 100.

**Request:**

| Device address | Function | Register address | | Number of registers | | CRC chceck-sum |
|---|---|---|---|---|---|---|
| | | B1 | B0 | B1 | B0 | |
| 01 | 03 | 1D | 4C | 00 | 02 | 03 B0 |

**Response:**

| Device address | Function | Number of bytes | Value from the register 1D4C (7500) | | | | Value from the register 1D4D (7501) | | | | CRC chce-ck-sum |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | B3 | B2 | B1 | B0 | B3 | B2 | B1 | B0 | |
| 01 | 03 | 08 | 41 | 20 | 00 | 00 | 42 | C8 | 00 | 00 | E4 6F |

**Example 5.** Writing the value 543 (0x021F) to the register 4000 (0x0FA0)

**Request:**

| Device address | Function | Register address | | Number of registers | | CRC chceck-sum |
|---|---|---|---|---|---|---|
| | | B1 | B0 | B1 | B0 | |
| 01 | 06 | 0F | A0 | 02 | 1F | CA 54 |

**Response:**

| Device address | Fun-ction | Register address | | Number of registers | | CRC chceck-sum |
|---|---|---|---|---|---|---|
| | | B1 | B0 | B1 | B0 | |
| 01 | 06 | 0F | A0 | 02 | 1F | CA 54 |

**Writing to n-registers (code 10h)**

**Example 6.** Writing two registers starting with the register address 0FA3h (4003). Writing the values 20, 2000.

**Request:**

| Device address | Function | Address reg.Hi | Adrdess reg.Lo | No. of registers Hi | Number of registers Lo | Number of bytes | Value for the registers 0FA3 (4003) | | Value for the registers 0FA4 (4004) | | CRC chce-cksum |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | B1 | B0 | B1 | B0 | |
| 01 | 10 | 0F | A3 | 00 | 02 | 04 | 00 | 14 | 07 | D0 | BB 9A |

**Response:**

| Device address | Fun-ction | Register address | | Number of registers | | CRC chceck-sum |
|---|---|---|---|---|---|---|
| | | B1 | B0 | B1 | B0 | |
| 01 | 10 | 0F | A3 | 00 | 02 | B2 FE |

## Device identification report (code 11h)

**Example 7.** Device identification.

**Request:**

| Device address | Function | CRC chcecksum |
|---|---|---|
| 01 | 11 | C0 2C |

**Response:**

| Device address | Function | Number of bytes | Identifier | Device status | Information field of the device software version (e.g. „-1.00 b-1.06” - N43 device with software version 1.00 and bootloader version 1.06) | CRC chceck-sum |
|---|---|---|---|---|---|---|
| 01 | 11 | 19 | CF | FF | 4E 34 33 20 2D 31 2E 30 30 20 20 20 20 20 20 62 2D 31 2E 30 36 20 | E0 24 |

## 8.4 Map of N43 meter registers

In the N43 meter, data are placed in 16 and 32-bit registers. Process variables and meter parameters are placed in the address area of registers in a way depended on the variable value type. Bits in 16-bit registers are numbered from the youngest to the oldest (b0-b15). 32-bit registers include numbers of float type in IEEE-754 standard. Sequence of 3210 bytes – the oldest is transmitted as the first.

Table 7

| Address range | Value type | Description |
|---|---|---|
| 4000 – 4066 | Integer (16 bits) | Value set in the 16-bit register. Registers for meter configuration. Register description is presented in Table 6. Write and readout registers. |
| 4300 - 4386 | Integer (16 bits) | Value set in the 16-bit register. Registers for displayed pages configuration. Register description is presented in Table 7. Write and readout registers. |
| 6000 – 6129 | Float (2x16 bits) | Value is set in the two following 16-bit registers. These registers contain the same data as 32-bit registers from 7500 – 7564 range. Readout registers. Bit sequence (1-0-3-2). |

| | | |
|---|---|---|
| 7000 – 7129 | Float (2x16 bits) | Value is set in the two following 16-bit registers. These registers contain the same data as 32-bit registers from 7500 – 7564 range. Readout registers. Bit sequence (3-2-1-0) |
| 7500 – 7564 | Float (32 bits) | Value set in the 32-bit register. Register description is presented in Table 8. Readout registers. |

Table 8

| Register address | Operations | Range | Description | Default |
|---|---|---|---|---|
| 4000 | RW | 0…30000 | Protection - password | 0 |
| 4001 | RW | 0 | reserved | 0 |
| 4002 | RW | 0 | reserved | 0 |
| 4003 | RW | 0 .. 1 | Type of connection<br>0 - 3Ph/4W<br>1 - 3Ph/3W | 0 |

| | | | | |
|---|---|---|---|---|
| 4004 | RW | 0,1 | Input range: 1 A or 5 A:<br>0 - 1 A, 1 - 5 A (for version **In** 1A/5A);<br>63A: 0 – 63A, 1 -63A (for version **In** 63A); | 1 |
| 4005 | RW | 1...10000 | Current transformer ratio | 1 |
| 4006 | RW | 1...40000 | Voltage transformer ratio *10 | 10 |
| 4007 | RW | 0...2 | Averaging time of active power, apparent power and current<br>0 – 15, 1- 30, 2- 60 minutes | 0 |
| 4008 | RW | 0.1 | Synchronization with real-time clock:<br>0 - no synchronization<br>1 - synchronization with clock | 1 |
| 4009 | RW | | reserved | |
| 4010 | RW | 0…4 | Energy counters erasing<br>0 – no changes, 1- erase active energies, 2 – erase reactive energies, 3 – erase apparent energies, 4 – erase all energies | 0 |

| | | | | |
|---|---|---|---|---|
| 4011 | RW | 0.1 | Erasing averaged parameters P Demand, S Demand, I Demand | 0 |
| 4012 | RW | 0.1 | Min, max erasing | 0 |
| 4013 | RW | 0.1 | Erasing alarm signalization latch | 0 |
| 4014 | RW | 0.1..42 | Alarm output 1 - value on output (code as in Table 5) | 38 |
| 4015 | RW | 0...5 | Alarm output 1 - type:<br>0 – n-on, 1– n-oFF, 2 – on,<br>3 – oFF, 4 – H-on, 5 – H-oFF | 0 |
| 4016 | RW | -1440..0..1440 [‰] | Alarm output 1 - lower value of the alarm switch of the rated input range | 900 |
| 4017 | RW | -1440..0..1440 [‰] | Alarm output 1 - upper value of the alarm switch of the rated input range | 1100 |
| 4018 | RW | 3600 s | Alarm output 1 - activation delay | 0 |
| 4019 | RW | 3600 s | Alarm output 1 - alarm deactivation delay | 0 |
| 4020 | RW | 3600 s | Alarm output 1 - re-activation lock | 0 |

| | | | | |
|---|---|---|---|---|
| 4021 | RW | 0,1 | Alarm 1 signalization latch | 0 |
| 4022 | RW | 0.1..42 | Alarm output 2 - value on output (code as in Table 5) | 28 |
| 4023 | RW | 0..5 | Alarm output 2 - type:<br>0 – n-on, 1– n-oFF, 2 – on,<br>3 – oFF, 4 – H-on, 5 – H-oFF | 0 |
| 4024 | RW | -1440..0..1440 [$^{o}/_{oo}$] | Alarm output 2 - lower value of the alarm switch of the rated input range | 900 |
| 4025 | RW | -1440..0..1440 [$^{o}/_{oo}$] | Alarm output 2 - upper value of the alarm switch of the rated input range | 1100 |
| 4026 | RW | 3600 s | Alarm output 2 - activation delay | 0 |
| 4027 | RW | 3600 s | Alarm output 2 - alarm deactivation delay | 0 |
| 4028 | RW | 3600 s | Alarm output 2 - re-activation lock | 0 |
| 4029 | RW | 0,1 | Alarm 2 signalization latch | 0 |
| 4030 | RW | 0.1..42 | Alarm output 3 - value on output (code as in Table 5) | 29 |

| | | | | |
|---|---|---|---|---|
| 4031 | RW | 0..5 | Alarm output 3 - type: 0 – n-on, 1– n-oFF, 2 – on, 3 – oFF, 4 – H-on, 5 – H-oFF | 0 |
| 4032 | RW | -1440..0..1440[‰] | Alarm output 3 - lower value of the alarm switch of the rated input range | 900 |
| 4033 | RW | -1440..0..1440 [‰] | Alarm output 3 - upper value of the alarm switch of the rated input range | 1100 |
| 4034 | RW | 3600 s | Alarm output 3 - activation delay | 0 |
| 4035 | RW | 3600 s | Alarm output 3 - alarm deacti-vation delay | 0 |
| 4036 | RW | 3600 s | Alarm output 3 - re-activation lock | 0 |
| 4037 | RW | 0.1 | Alarm 3 signalization latch | 0 |
| 4038 | RW | 100…20000 | No. of impulses for the impulse output | 1000 |
| 4039 | RW | 1..247 | MODBUS Network Address | 1 |
| 4040 | RW | 0..3 | Transmission mode: 0->8n2, 1->8e1, 2->8o1, 3->8n1 | 0 |
| 4041 | RW | 0..3 | Baud rate: 0->4800, 1->9600, 2->19200, 3->38400 | 1 |

| | | | | |
|---|---|---|---|---|
| 4042 | RW | 0,1 | Upgrade change of transmis-sion parameters | 0 |
| 4043 | RW | 0,1 | Standard parameters save (complete with resetting ener-gy as well as min, max and mean power to 0) | 0 |
| 4044 | RW | | reserved | - |
| 4045 | RW | 0...2359 | Hour *100 + Minutes | 0 |
| 4046 | RW | | reserved | - |
| 4047 | RW | | reserved | - |
| 4048 | R | 0..152 | Consumed active energy, two older bytes | 0 |
| 4049 | R | 0..65535 | Consumed active energy, two younger bytes | 0 |
| 4050 | R | 0..152 | Released active energy, two older bytes | 0 |
| 4051 | R | 0..65535 | Released active energy, two younger bytes | 0 |
| 4052 | R | 0..152 | Reactive inductive energy, two older bytes | 0 |
| 4053 | R | 0..65535 | Reactive inductive energy, two younger bytes | 0 |

| | | | | |
|---|---|---|---|---|
| 4054 | R | 0..152 | Reactive capacity energy, two older bytes | 0 |
| 4055 | R | 0..65535 | Reactive capacity energy, two younger bytes | 0 |
| 4056 | R | 0..152 | Apparent energy, two older bytes | 0 |
| 4057 | R | 0..65535 | Apparent energy, two younger bytes | 0 |
| 4058 | R | 0..65535 | Status Register 1 – see description below | 0 |
| 4059 | R | 0..65535 | Status Register 2 – see description below | 0 |
| 4060 | R | | reserved | 0 |
| 4061 | R | 0..65535 | Serial number two older bytes | - |
| 4062 | R | 0..65535 | Serial number two younger bytes | - |
| 4063 | R | 0..65535 | Software version (*100) | - |
| 4064 | R | | reserved | 0 |
| 4065 | R | | reserved | 0 |
| 4066 | R | | reserved | 0 |

Energy is made available in hundreds of watt-hours (var-hours) in double 16-bit register, and for this reason, one must divide them by 10 when calculating values of particular energy from registers, e.g.:

Consumed active energy = (reg. value 4038 x 65536 + reg. value 4039) / 10 [kWh]

Released active energy = (reg. value 4040 x 65536 + reg. value 4041) / 10 [kWh]

Reactive inductive energy = (reg. value 4042 x 65536 + reg. value 4043) / 10 [kVarh]

Reactive capacity energy = (reg. value 4044 x 65536 + reg. value 4045) / 10 [kVarh]

Status register of a device (address 4058, R):
Bit 15 – „1” – non-volatile memory damage
Bit 14 – „1” – no calibration or calibration error
Bit 13 – „1” – parameters value error
Bit 12 – „1” – energy value error
Bit 11 – „1” – phase sequence error
Bit 10 – „0” – current range 1 / 5 A~
„1” – current range 63 A~

| Bit 9 | Bit 8 | voltage range |
|---|---|---|
| 0 | 0 | 57.7 V~ |
| 0 | 1 | 230 V~ |
| 1 | 0 | 290 V~ |
| 1 | 1 | reserved |

Bit 7 – „1” – averaging interval has not ended
Bit 6 – „1” – frequency for THD calculation outside ranges:
48 – 52 for 50 Hz,
58 – 62 for 60 Hz
Bit 5 – „1” – voltage too low for measurement of freq.
Bit 4 – „1” – L3 phase voltage too low
Bit 3 – „1” – L2 phase voltage too low
Bit 2 – „1” – L1 phase voltage too low
Bit 1 – „1” – spent battery of RTC
Bit 0 – „1” – reactive 3-phase capacitive energy

Status Register 2 – alarms (address 4059, R):
Bity 15 ... 7 - reserved

Bit 6 – „1” – alarm 3 signalization
Bit 5 – „1” – alarm 2 signalization
Bit 4 – „1” – alarm 1 signalization
Bit 2 – „1” – alarm 3 activated
Bit 1 – „1” – alarm 2 activated
Bit 0 – „1” – alarm 1 activated

Table 9

| Register address | Operations | Range | Description | Default |
|---|---|---|---|---|
| 4300 | RW | 0…61 | Display panel illumination: 0 – off, 1-60 – illumination time in seconds from pressing the button, 61 – always on | 61 |
| 4301 | RW | 0 .. 60 | Time of automatic switch 0...60s 0 – off | 0 |

| | | | | |
|---|---|---|---|---|
| 4302 | RW | 0...0x0FFF | Enabling page display<br>Bit0 – page 1, Bit1<br>– page 2, ... | 0x0FFF |
| 4303 | RW | 0, 01..09, 28..33, 35, 38 | Page 1 display 1 | 01 |
| 4304 | RW | 0, 10..18, 28..33, 36, 38 | Page 1 display 2 | 10 |
| 4305 | RW | 0,19..33, 37, 38 | Page 1 display 3 | 19 |
| 4306 | RW | 0, 28..34, 38..41 | Page 1 display 4 | 34 |
| 4307 | RW | 0, 42 .. 45 | Page 1 display 5-6 | 0 |
| 4308 | RW | 0, 28, 30, 31, 38 | Page 1 display 5 | 30 |
| 4309 | RW | 0, 29 | Page 1 display 6 | 29 |
| 4310 | RW | 0, 01..09, 28..33, 35, 38 | Page 2 display 1 | 35 |
| 4311 | RW | 0, 10..18, 28..33, 36, 38 | Page 2 display 2 | 36 |
| 4312 | RW | 0,19..33, 37, 38 | Page 2 display 3 | 37 |
| 4313 | RW | 0, 28..34, 38..41 | Page 2 display 4 | 38 |
| 4314 | RW | 0, 42 .. 45 | Page 2 display 5-6 | 0 |
| 4315 | RW | 0, 28, 30, 31, 38 | Page 2 display 5 | 30 |

| | | | | |
|---|---|---|---|---|
| 4316 | RW | 0, 29 | Page 2 display 6 | 29 |
| 4317 | RW | 0, 01..09, 28..33, 35, 38 | Page 3 display 1 | 02 |
| 4317 | RW | 0, 01..09, 28..33, 35, 38 | Page 3 display 1 | 02 |
| 4318 | RW | 0, 10..18, 28..33, 36, 38 | Page 3display 2 | 11 |
| 4319 | RW | 00,19..33, 37, 38 | Page 3 display 3 | 20 |
| 4320 | RW | 00, 28..34, 38..41 | Page 3 display 4 | 28 |
| 4321 | RW | 0, 42 .. 45 | Page 3 display 5-6 | 0 |
| 4322 | RW | 00, 28, 30, 31, 38 | Page 3 display 5 | 30 |
| 4323 | RW | 00, 29 | Page 3 display 6 | 29 |
| 4324 | RW | 00, 01..09, 28..33, 35, 38 | Page 4 display 1 | 03 |
| 4325 | RW | 00, 10..18, 28..33, 36, 38 | Page 4 display 2 | 12 |
| 4326 | RW | 00,19..33, 37, 38 | Page 4 display 3 | 21 |
| 4327 | RW | 00, 28..34, 38..41 | Page 4 display 4 | 32 |
| 4328 | RW | 0, 42 .. 45 | Page 4 display 5-6 | 0 |
| 4329 | RW | 00, 28, 30, 31, 38 | Page 4 display 5 | 30 |

| | | | | |
|---|---|---|---|---|
| 4330 | RW | 00, 29 | Page 4 display 6 | 29 |
| 4331 | RW | 00, 01..09, 28..33, 35, 38 | Page 5 display 1 | 04 |
| 4332 | RW | 00, 10..18, 28..33, 36, 38 | Page 5 display 2 | 13 |
| 4333 | RW | 00,19..33, 37, 38 | Page 5 display 3 | 22 |
| 4334 | RW | 00, 28..34, 38..41 | Page 5 display 4 | 33 |
| 4335 | RW | 0, 42 .. 45 | Page 5 display 5-6 | 0 |
| 4336 | RW | 00, 28, 30, 31, 38 | Page 5 display 5 | 30 |
| 4337 | RW | 00, 29 | Page 5 display 6 | 29 |
| 4338 | RW | 00, 01..09, 28..33, 35, 38 | Page 6 display 1 | 05 |
| 4339 | RW | 00, 10..18, 28..33, 36, 38 | Page 6 display 2 | 14 |
| 4340 | RW | 00,19..33, 37, 38 | Page 6 display 3 | 23 |
| 4341 | RW | 00, 28..34, 38..41 | Page 6 display 4 | 31 |
| 4342 | RW | 0, 42 .. 45 | Page 6 display 5-6 | 46 |
| 4343 | RW | 00, 28, 30, 31, 38 | Page 6 display 5 | 0 |
| 4344 | RW | 00, 29 | Page 6 display 6 | 0 |

| | | | | |
|---|---|---|---|---|
| 4345 | RW | 00, 01..09, 28..33, 35, 38 | Page 7 display 1 | 06 |
| 4346 | RW | 00, 10..18, 28..33, 36, 38 | Page 7 display 2 | 15 |
| 4347 | RW | 00,19..33, 37, 38 | Page 7 display 3 | 24 |
| 4348 | RW | 00, 28..34, 38..41 | Page 7 display 4 | 32 |
| 4349 | RW | 0, 42 .. 45 | Page 7 display 5-6 | 42 |
| 4350 | RW | 00, 28, 30, 31, 38 | Page 7 display 5 | 0 |
| 4351 | RW | 00, 29 | Page 7 display 6 | 0 |
| 4352 | RW | 00, 01..09, 28..33, 35, 38 | Page 8 display 1 | 07 |
| 4353 | RW | 00, 10..18, 28..33, 36, 38 | Page 8 display 2 | 16 |
| 4354 | RW | 00,19..33, 37, 38 | Page 8 display 3 | 25 |
| 4355 | RW | 00, 28..34, 38..41 | Page 8 display 4 | 33 |
| 4356 | RW | 0, 42 .. 45 | Page 8 display 5-6 | 43 |
| 4357 | RW | 00, 28, 30, 31, 38 | Page 8 display 5 | 0 |
| 4358 | RW | 00, 29 | Page 8 display 6 | 0 |
| 4359 | RW | 00, 01..09, 28..33, 35, 38 | Page 9 display 1 | 08 |

| | | | | |
|---|---|---|---|---|
| 4360 | RW | 00, 10..18, 28..33, 36, 38 | Page 9 display 2 | 17 |
| 4361 | RW | 00,19..33, 37, 38 | Page 9 display 3 | 26 |
| 4362 | RW | 00, 28..34, 38..41 | Page 9 display 4 | 34 |
| 4363 | RW | 0, 42 .. 45 | Page 9 display 5-6 | 44 |
| 4364 | RW | 00, 28, 30, 31, 38 | Page 9 display 5 | 0 |
| 4365 | RW | 00, 29 | Page 9 display 6 | 0 |
| 4366 | RW | 00, 01..09, 28..33, 35, 38 | Page 10 display 1 | 09 |
| 4367 | RW | 00, 01..09, 28..33, 35, 38 | Page 10 display 2 | 18 |
| 4368 | RW | 00,19..33, 37, 38 | Page 10 display 3 | 27 |
| 4369 | RW | 00, 28..34, 38..41 | Page 10 display 4 | 39 |
| 4370 | RW | 0, 42 .. 45 | Page 10 display 5-6 | 45 |
| 4371 | RW | 00, 28, 30, 31, 38 | Page 10 display 5 | 0 |
| 4372 | RW | 00, 29 | Page 10 display 6 | 0 |
| 4373 | RW | 00, 01..09, 28..33, 35, 38 | Page 11 display 1 | 29 |
| 4374 | RW | 00, 01..09, 28..33, 35, 38 | Page 11 display 2 | 30 |

| | | | | |
|---|---|---|---|---|
| 4375 | RW | 00,19..33, 37, 38 | Page 11 display 3 | 31 |
| 4376 | RW | 00, 28..34, 38..41 | Page 11 display 4 | 40 |
| 4377 | RW | 0, 42 .. 45 | Page 11 display 5-6 | 42 |
| 4378 | RW | 00, 28, 30, 31, 38 | Page 11 display 5 | 0 |
| 4379 | RW | 00, 29 | Page 11 display 6 | 0 |
| 4380 | RW | 00, 01..09, 28..33, 35, 38 | Page 12 display 1 | 29 |
| 4381 | RW | 00, 01..09, 28..33, 35, 38 | Page 12 display 2 | 30 |
| 4382 | RW | 00,19..33, 37, 38 | Page 12 display 3 | 31 |
| 4383 | RW | 00, 28..34, 38..41 | Page 12 display 4 | 41 |
| 4384 | RW | 0, 42 .. 45 | Page 12 display 5-6 | 47 |
| 4385 | RW | 00, 28, 30, 31, 38 | Page 12 display 5 | 0 |
| 4386 | RW | 00, 29 | Page 12 display 6 | 0 |

Table 10

| 16-bit register address | 32-bit register address | Operations | Description | Unit | 3Ph/4W | 3Ph/3W |
|---|---|---|---|---|---|---|
| 6000/7000 | 7500 | R | L1 phase voltage | V | √ | x |
| 6002/7002 | 7501 | R | L1 phase current | A | √ | √ |
| 6004/7004 | 7502 | R | L1 phase active power | W | √ | x |
| 6006/7006 | 7503 | R | L1 phase reactive power | VAr | √ | x |
| 6008/7008 | 7504 | R | L1 phase apparent power | VA | √ | x |
| 6010/7010 | 7505 | R | L1 phase active power factor (PF1=P1/S1) | - | √ | x |
| 6012/7012 | 7506 | R | tgφ factor of L1 phase (tg1 =Q1/P1) | - | √ | x |
| 6014/7014 | 7507 | R | THD U1 | V / % | √ | x |
| 6016/7016 | 7508 | R | THD I1 | A / % | √ | x |
| 6018/7018 | 7509 | R | L2 phase voltage | V | √ | x |
| 6020/7020 | 7510 | R | L2 phase current | A | √ | √ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6022/7022 | 7511 | R | L2 phase active power | W | √ | x |
| 6024/7024 | 7512 | R | L2 phase reactive power | VAr | √ | x |
| 6026/7026 | 7513 | R | L2 phase apparent power | VA | √ | x |
| 6028/7028 | 7514 | R | L2 phase active power factor (PF2=P2/S2) | - | √ | x |
| 6030/7030 | 7515 | R | tgφ factor of L2 phase (tg2 =Q2/P2) | - | √ | x |
| 6032/7032 | 7516 | R | THD U2 | V / % | √ | x |
| 6034/7034 | 7517 | R | THD I2 | A / % | √ | x |
| 6036/7036 | 7518 | R | L3 phase voltage | V | √ | x |
| 6038/7038 | 7519 | R | L3 phase current | A | √ | √ |
| 6040/7040 | 7520 | R | L3 phase active power | W | √ | x |
| 6042/7042 | 7521 | R | L3 phase reactive power | VAr | √ | x |
| 6044/7044 | 7522 | R | L3 phase apparent power | VA | √ | x |
| 6046/7046 | 7523 | R | L3 phase active power factor (PF3=P3/S3) | - | √ | x |
| 6048/7048 | 7524 | R | tgφ factor of L3 phase (tg3 =Q3/P3) | - | √ | x |
| 6050/7050 | 7525 | R | THD U3 | V / % | √ | x |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6052/7052 | 7526 | R | THD I3 | A / % | √ | x |
| 6054/7054 | 7527 | R | Mean 3-phase voltage | V | √ | x |
| 6056/7056 | 7528 | R | Mean 3-phase current | A | √ | √ |
| 6058/7058 | 7529 | R | 3-phase active power (P1+P2+P3) | W | √ | √ |
| 6060/7060 | 7530 | R | 3-phase reactive power (Q1+Q2+Q3) | VAr | √ | √ |
| 6062/7062 | 7531 | R | 3-phase apparent power (S1+S2+S3) | VA | √ | √ |
| 6064/7064 | 7532 | R | 3-phase active power factor (PF=P/S) | - | √ | √ |
| 6066/7066 | 7533 | R | mean tgφ factor for 3 phases (tg=Q/P) | - | √ | √ |
| 6068/7068 | 7534 | R | Frequency | F | √ | √ |
| 6070/7070 | 7535 | R | Phase-to-phase voltage $L_{1-2}$ | V | √ | √ |
| 6072/7072 | 7536 | R | Phase-to-phase voltage $L_{2-3}$ | V | √ | √ |
| 6074/7074 | 7537 | R | Phase-to-phase voltage $L_{3-1}$ | V | √ | √ |
| 6076/7076 | 7538 | R | Mean phase-to-phase voltage | V | √ | √ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6078/7078 | 7539 | R | active power averaged (P Demand) | W | √ | √ |
| 6080/7080 | 7540 | R | apparent power averaged (S Demand ) | VA | √ | √ |
| 6082/7082 | 7541 | R | current averaged (I Demand) | A | √ | √ |
| 6084/7084 | 7542 | R | THD U mean 3-phase | V / % | √ | x |
| 6086/7086 | 7543 | R | THD I mean 3-phase | A / % | √ | x |
| 6088/7088 | 7544 | R | Neutral wire current (calculated from vectors) | A | √ | x |
| 6090/7090 | 7545 | R | Active 3-phase input energy (no. of register 7546 overflows, resets to 0 after reaching 99999.9 MWh) | 100 MWh | √ | √ |
| 6092/7092 | 7546 | R | Active 3-phase input energy (counter counting up to 99999.9 kWh) | kWh | √ | √ |
| 6094/7094 | 7547 | R | Active 3-phase output energy (no. of register 7548 overflows, resets to 0 after reaching 99999.9 MWh) | 100 MWh | √ | √ |
| 6096/7096 | 7548 | R | Active 3-phase output energy (counter counting up to 99999.9 kWh) | kWh | √ | √ |
| 6098/7098 | 7549 | R | Reactive 3-phase inductive energy (no. of register 7550 overflows, resets to 0 after reaching 99999.9 MVArh). | 100 MVArh | √ | √ |
| 6100/7100 | 7550 | R | Reactive 3-phase inductive energy (counter counting up to 99999.9 kVArh) | kVArh | √ | √ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6102/7102 | 7551 | R | Reactive 3-phase capacity energy (no. of register 7552 overflows, resets to 0 after reaching 99999.9 MVArh) | 100 MVArh | √ | √ |
| 6104/7104 | 7552 | R | Reactive 3-phase capacity energy (counter counting up to 99999.9 kVArh) | kVArh | √ | √ |
| 6106/7106 | 7553 | R | Apparent energy (no. of register 7554 overflows, resets to 0 after reaching 99999.9 MVAh) | 100 MVAh | √ | √ |
| 6108/7108 | 7554 | R | Apparent energy (counter counting up to 99999.9 kVAh) | kVAh | √ | √ |
| 6110/7110 | 7555 | R | Time – seconds | - | √ | √ |
| 6112/7112 | 7556 | R | Time – hours, minutes | - | √ | √ |
| 6114/7114 | 7557 | R | Reserved | - | √ | √ |
| 6116/7116 | 7558 | R | Reserved | - | √ | √ |
| 6120/7118 | 7559 | R | Mean 3-phase current (max) | A | √ | √ |
| 6120/7120 | 7560 | R | Max 3-phase voltage phase / phase-to--phase for 3PH-4 – 3-phase, 4-wire - max phase for 3PH-3 – 3-phase, 3-wire - max phase-to-phase | V | √ | √ |
| 6122/7122 | 7561 | R | Active power averaged (P Demand) min | W | √ | √ |
| 6124/7124 | 7562 | R | Active power averaged (P Demand) max | W | √ | √ |
| 6126/7126 | 7563 | R | Apparent power averaged (S Demand) max | VA | √ | √ |
| 6128/7128 | 7564 | R | Current averaged (I Demand) max | A | √ | √ |

In case of exceeding (measuring value is out of the measuring range) the value 1e20 is set.

# 9. ERROR CODES

During the meter operation the error messages may be displayed. Following list shows reasons of errors.

- **Er1** – if too low voltage or current during measurement:
  - PFi, $tg\varphi_i$,$THDU_i$, less than 10% $U_n$,
  - PFi, $tg\varphi_i$, less than 0,2% $I_n$,
  - $THDI_i$, less than 10% $I_n$,

- **Er2** – during THD measurement, when frequency value is outside 48 – 52 Hz range for 50 Hz and 58 – 62 for 60 Hz;
- **Err bat** – displayed when the battery of the internal RTC clock is used up. The measurement is carried out after switching the supply on and every day at midnight. You can disable the message by the push-button ↵. The disabled message remains inactive till the renewed switching of the meter on.
- **Err CAL, Err EE** – displayed when the meter memory is damaged. A meter should be sent back to the manufacturer.

- **Err PAr** – incorrect operational parameters of the meter. In such case a meter should be set to manufacturer settings (from menu or via RS-485 interface). Message can be disabled by pressing ↵ .

- - - - – exceedance. Measuring value is out of the measuring range.

# 10. ACCESSORIES

For the N43 meters you can order:
USB CABLE A/miniUSB - 1m BLACK;
Order code 1126-271-028.

# 11. TECHNICAL DATA

## Measuring ranges and permissible basic errors

Table 11

| Measured value | Measuring range | L1 | L2 | L3 | Σ | Basic error** |
|---|---|---|---|---|---|---|
| Current In 1 A~<br>5 A~<br>63 A~ | 0.002 ...1.20 A or kA *<br>0.010 ... 6.00 A or kA *<br>0.10 ... 76.0A~ | ● | ● | ● | | ±0.5 % |
| Voltage L-N 57,7 V~<br>230 V~<br>290 V~ | 2.80 ..70.0 V or kV*<br>10.0 .. 276 V~<br>14.0 .. 348 V~ | ● | ● | ● | | ±0.5 % |
| Voltage L-L 100 V~<br>400 V~<br>500 V~ | 5.00 .. 120 V or kV*<br>20.0 .. 480 V~<br>25.0 .. 600 V~ | ● | ● | ● | | ±1 % |
| Frequency | 47.0 .. 63.0 Hz | | | | ● | ±0.5 % |
| Active power<br>/consumed or exported/ | 0.00 .. 999<br>W, kW or MW | ● | ● | ● | ● | ±1 % |
| Reactive power<br>/capacity or inductive/ | 0.00 .. 999<br>VAr, kVAr lub MVAr | ● | ● | ● | ● | ±1 % |
| Apparent power | 0.00 .. 999<br>VA, kVA or MVA | ● | ● | ● | ● | ±1 % |

| | | | | | | |
|---|---|---|---|---|---|---|
| Active energy /consumed or exported/ | 0.0 .. 99999.9 kWh or MWh | | | | ● | ±1 % |
| Reactive energy /capacity or inductive/ | 0.0 .. 999999.9 kVArh or MVArh | ● | ● | ● | ● | ±1 % |
| Apparent energy | 0.0 .. 999999.9 kVAh or MVAh | | | | ● | ±1 % |
| Active power factor PF | -1 ... 0 ... 1 | ● | ● | ● | ● | ±1 % |
| Tangent φ | -1.2 ... 0 ...1.2 | ● | ● | ● | ● | ±1 % |

* Depending on the setting of trU (voltage transformer ratio: 0.1 ... 4000.0) and trI (current transformer ratio: 1 ... 10000)

** Calculated for the nominal range In, Un

**Power consumption:**

- in current circuit ≤ 4 VA
- in voltage circuit ≤ 0.05 VA
- in current circuit ≤ 2.00 VA

**Readout field** dedicated 3.5” LCD display,

| | |
|---|---|
| **Relay outputs** | **3 x** relays,<br>volt-free NO contacts<br>load capacity 0,5 A 250 V AC;<br>1 A 30 V DC; |
| **Serial interface** | **RS485**: address 1..247<br>mode: 8N2, 8E1, 8O1,8N1<br>baud rate: 4.8, 9.6, 19.2, 38.4 kbit/s<br>transmission protocol: Modbus RTU<br>maximum time to start the response: 600 ms<br>**USB**: 1.1/2.0, address 1, mode 8N2;<br>baud rate 9.6 kbit/s,<br>transmission protocol: Modbus RTU<br>maximum time to start the response: 800 ms,<br>USB wire length ≤ 3 m |
| **Energy pulse output** | OC (NPN) output, class A passive, compliant with EN 62053-31;<br>supply voltage 18...27 V,<br>current 10...27 mA |

**Pulsing constant of OC output**

5000 - 20000 pulses/kWh for In=1A/5 A independently of set tr_U, tr_I;
100 – 1000 pulses/kWh for In=63 A

**Terminals**

| | **direct connection (63 A)** | **indirect connection (1/5 A)** |
|---|---|---|
| **Diameter** | | |
| solid-core wire | 2.5 ... 16 mm² | 0.2 ... 5.3 mm² |
| stranded wire | 4 ... 16 mm² | 0.2 ... 5.3 mm² |
| **Clamping screws** | M5 | M3.5 |
| **Tightening torque** | 1.2 ... 2.0 Nm | 1.0 Nm |

**Protection grade of the housing**

| | |
|---|---|
| from the front | IP 50 |
| from terminals side | IP 00 |

| | |
|---|---|
| **Weight** | 0.3 kg |
| **Dimensions** | 105 x 110 x 60 mm |

**Reference and rated operating conditions:**

| | |
|---|---|
| - supply voltage | 85..253 V a.c. (40...400) Hz<br>or 90..300 V d.c.<br>20..40 V a.c. (40...400) Hz<br>lub 20..60 V d.c. |
| - input signal: | 0 ... 0.002..1.2$I_n$; 0.05...1.2$U_n$<br>for current, voltage<br>0...0.002...1.2$I_n$; 0...0.1...1.2$U_n$;<br>for factors $PF_i$ ,$t\varphi_i$<br>frequency 47...63 Hz;<br>sinusoidal ( THD ≤ 8% ) |
| - power factor | -1...0...1 |
| - ambient temperature | -10..23..+55°C |
| - storage temperature | -20...+70°C |
| - humidity | 0...95 % (inadmissible condensation) |
| - max peak factor: | |
| - current | 2 |
| - voltage | 2 |

- external magnetic field 0...40...400 A/m
- short-term overload

| | | |
|---|---|---|
| voltage inputs | 5 sec. | 2 Un |
| voltage inputs | 1 sec. | 50 A /version **In** 1A/5 A / |
| | 1 sec. | 630 A /version **In** 63 A / |

- working position any
- warm-up time 5 min.

**Real time clock battery:** CR2032

**Additional errors:**

in % of the basic error

- from ambient temperature changes < 50 % / 10°C
- for THD > 8% < 100 %

**Test voltages:**

- supply and alarm outputs 2.1 kV d.c.

- voltage and current inputs 3.2 kV d.c.
- USB, RS-485 and OC outputs 0.7 kV d.c.

**Standards fulfilled by the meter:**

**Electromagnetic compatibility:**

- noise immunity acc. to EN 61000-6-2
- noise emission acc. to EN 61000-6-4

**Safety requirements:**

acc. to EN 61010-1 standard

- isolation between circuits: basic,
- installation category III (for voltages above 300 V – category II)
- pollution grade 2,
- maximum phase-to-earth operating voltage:
  - for supply circuits and relay outputs 300 V
  - for measuring input 300 V – cat III (600 V – cat II)
  - for circuits RS-485, USB, pulse output: 50 V
- altitude a.s.l. < 2000m.

# 12. ORDERING CODE

N43 network parameters meter ordering code.

Table 12

| N43 - | X | X | X | XX | X | X |
|---|---|---|---|---|---|---|
| **Current input In:** | | | | | | |
| 1 A/5 A (X/1; X/5) | **1** | | | | | |
| 63 A | **2** | | | | | |
| **Voltage input (phase/ phase-to-phase) Un:** | | | | | | |
| 3 x 57.7/100 V | | **1** | | | | |
| 3 x 230/400 V | | **2** | | | | |
| 3 x 290/500 V | | **3** | | | | |
| **Auxiliary supply:** | | | | | | |
| 85...253 V a.c., 90...300 V d.c. | | | **1** | | | |
| 20...40 V a.c., 20...60 V d.c. | | | **2** | | | |
| **Version:** | | | | | | |
| standard | | | | **00** | | |
| custom-made* | | | | **XX** | | |
| **Language:** | | | | | | |
| Polish | | | | | **P** | |
| English | | | | | **E** | |
| other* | | | | | **X** | |
| **Acceptance tests:** | | | | | | |
| without extra quality requirements | | | | | | **0** |
| with an extra quality inspection certificate | | | | | | **1** |
| acc. to customer's request* | | | | | | **X** |

* -after agreeing with the manufacturer

## EXAMPLE OF ORDER:

The code **N43 - 2 2 1 00 E 0** means:

**N43** - meter of network parameters of N43 type
**2** - current input: 63 A
**2** - input voltage (phase/phase-to-phase)
Un = 3 x 230 V/ 400 V
**1** - auxiliary supply: 85...253 V a.c., 90...300 V d.c.
**00** - standard version
**E** - all descriptions and user's manual in English
**0** - without extra quality requirements.

LUMEL
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