LUMEL

POWER NETWORK PARAMETER METER

N13

SERVICE MANUAL

CE

POWER NETWORK PARAMETER METER - N13

SERVICE MANUAL

CONTENTS

1. APPLICATION and PROPERTIES

The N13 panel power network parameter meter is a digital instrument belonging to a new generation of meters for the simultaneous measurement of a lot of electrical quantities.

It is mainly destined to measure all basic parameters in three-phase three-wire or three-phase four-wire, balanced or unbalanced electrical power networks, with the simultaneous display of measured quantities and the digital transmission of their values and their conversion into an analogue standard signal.

It can be employed in data acquisition networks or can be used as a single meter instead of many different meters used till now : ammeters, voltmeters, wattmeters, warmeters, frequency meters, phase meters and others.

This parameter meter enables the control and optimization of power electronic devices, systems and industrial installations. It ensures the measurement of: rms voltage and current, active, reactive and apparent power, 15-minutes mean active power etc.

It additionally indicates the current time. Voltages and currents are multiplied by given voltage and current ratios of measuring transformers. The value of each measured quantity can be transmitted to the main system through the RS-485 interface. For execution with interface, the WizPar visualization program is delivered which enables the meter servicing through the serial link. One of the chosen quantity can be additionally transmitted by means of a standard current signal, the relay output can be used to signal overruns of chosen quantities. Measurements are carried out by the sampling method of voltage and current signals. The N13 parameter meter enables the measurement and visualisation of over 30 power energy quantities:

- phase voltages U1, U2, U3
- phase-to-phase voltages U12, U23, U31
- line currents I1, I2, I3
- phase active powers P1, P2, P3
- phase reactive powers Q1, Q2, Q3
- phase apparent powers S1, S2, S3
- phase active power factors Pf1, Pf2, Pf3

- phase reactive/active power factors tφ1, tφ2, tφ3
- frequency f
- 15 minutes mean active power PAV

2. METER SET

The meter set includes:

- N13 parameter meter	1 pc
- holders to fix the meter in the panel	2 pcs
- service manual	1 pc
- service manual of the WizPar program	2 pcs - for meter with RS-485
- diskette with WizPar program	2 pcs - for meter with RS-485
- guarantee card	1 pc

3. BASIC REQUIREMENTS, SAFETY INFORMATION

Symbols located in this service manual mean:

WARNING!

Warning of potential, hazardous situations. Especially important. One must acquaint with this before connecting the meter. The non-observance of notices marked by these symbols can occasion severe injuries of the personnel and the damage of the meter.

CAUTION!

Designates a general useful note. If you observe it, handling of the meter is made easier. One must take note of this when the meter is working inconsistently to the expectations. Possible consequences if disregarded.

In the security scope the meter meets the requirements of the EEC Low-Voltage directive (EN 61010-1 issued by CENELEC).

Remarks concerning the operator safety:

1. General

- The N13 parameter meter is destined to be mounted on a panel.
- Non-authorized removal of the required housing, inappropriate use, incorrect installation or operation creates the risk of injury to personnel or damage to equipment. For more detailed information please see the service manual.
- All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel and national regulations for the prevention of accidents must be observed.
- According to this basic safety information, qualified, skilled personnel are persons who are familiar with the installation, assembly, commissioning, and operation of the product and who have qualifications necessary for their occupation.

1. Transport, storage

Please observe the notes on transport, storage and appropriate handling. Observe the climatic conditions given in Technical Data.

2. Installation

- The meters must be installed according to the regulation and instructions given in this service manual.
- Ensure proper handling and avoid mechanical stress.
- Do not bend any components and do not change any insulation distances.
- Do not touch any electronic components and contacts.
- Meters contain electrostatically sensitive components, which can easily be damaged by inappropriate handling.
- Do not damage or destroy any electrical components since this might endanger your health!

4. ASSEMBLY

The N13 meter is adapted to be mounted into panels and cubicles by means of 2 holders according the fig.1.

The meter housing of 96 x 96 x 77 mm dimensions is made of a sell-extinguishing plastics. At the rear side of the meter there are terminal strips which enable the connection of up to 2.5 mm^2 conductors.

One must prepare a $91^{+0.5}$ x $91^{+0.5}$ mm hole in the panel which the thickness should not exceed 6 mm. The meter must be introduced from the panel front with the switched off supply. After its insertion, fix the meter by means of two holders.

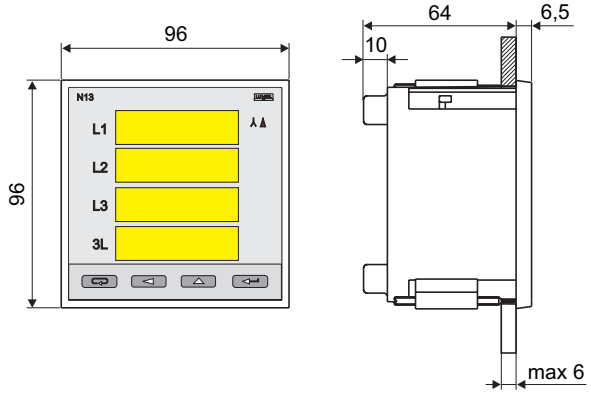


Fig.1 NA13 meter dimensions

5. METER DESCRIPTION

5.1. Measured and calculated values by the meter

The N13 parameter meter enables the measurement and visualisation of over 30 power energy quantities:

Measured quantities	Single-phase parameters	Three-phase parameters
Phase voltages	U1,U2,U3	
Phase-to-phase voltages	U12, U23, U31	
Line currents	I1, I2, I3	
	I	
Phase active powers	P1, P2, P3	P
Phase reactive powers	Q1, Q2, Q3	Q
Phase apparent powers	S1, S2, S3	S
Power factor cos cosφ	PF1, PF2, PF3	PF
Power factor tgφ	tg1, tg2, tg3	tg
Frequency		f
15 minutes' mean active power		Pav

Maximal and minimal parameter values are also memorized.

The assignment of individual keys is as follow:

1		Enter of parameter configuration (press ? 3 s) Enter of acceptance key
2		Select phase: L1, L2, L3 or 3L Value increase key
3		Select measured quantities: power, current,... Left displacement key.
4		Escape, cancellation key

A selective highlighting allows the display of units and symbols of over 30 different parameters.

We can deliver with the meter if ordered, a visualisation program named WizPar.

5.2. Inputs, outputs, Interface

5.2.1. Current inputs

All current inputs all galvanically insulated (internal current transformers). The meter is adapted to co-operate with external current transformers. Displayed current values and derivative quantities are automatically calculated in relation to the introduced external current transformer ratio. Current inputs are defined in the order as 1 A or 5 A.

5.2.2. Voltage inputs

The quantity on voltage inputs is automatically calculated in relation to the introduced external voltage transformer ratio. Voltage inputs are defined in the order as 3 x 57.7/100 V, 3 x 230/400 V or 3 x 400/690 V

Connection diagrams of the meter in a three-phase network

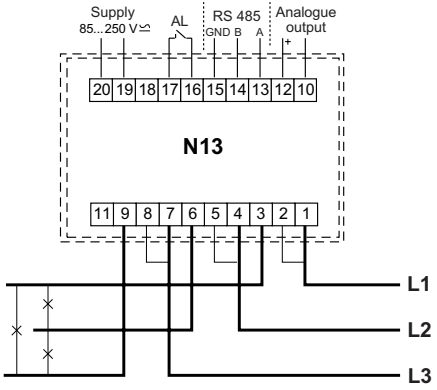


Fig. 2a Direct measurement in a three-phase network

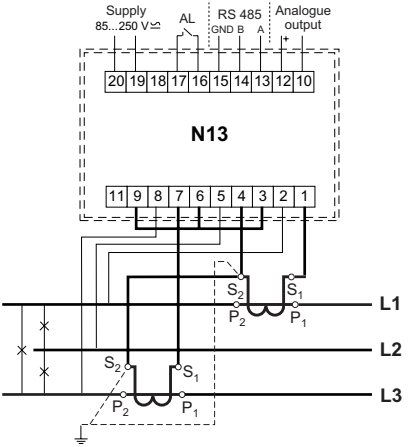


Fig. 2b Semi-indirect measurement in a three-phase network

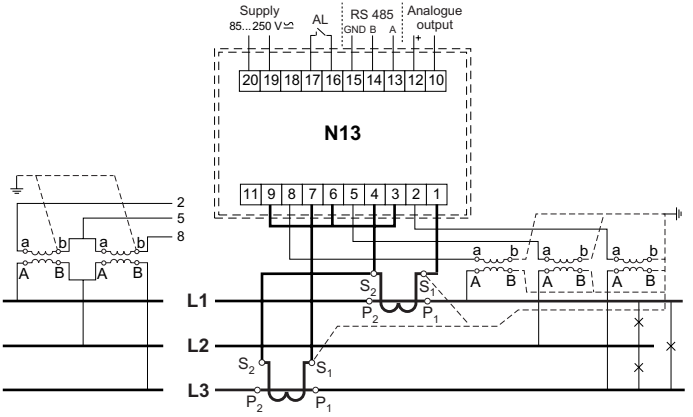


Fig. 2c Indirect measurement with the use of 2 current transformers and two or three voltage transformers in a three-phase network

Connection diagrams of the meter in a four-wire network

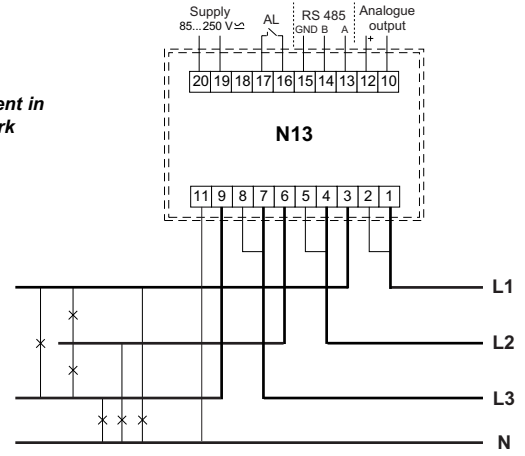


Fig. 3a
Direct measurement in a four-wire network

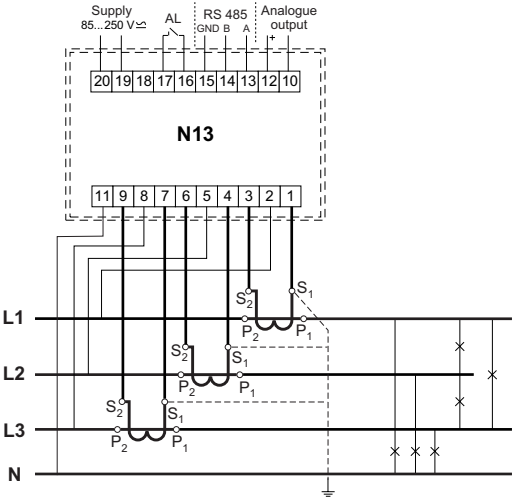


Fig.3b
Semi-indirect measurement in a four-wire network

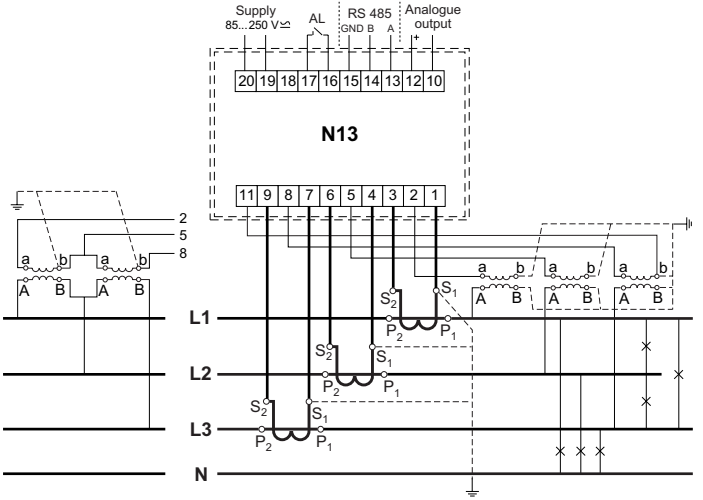


Fig. 3c Indirect measurement with the use of three current transformers and two or three voltage transformers in a four-wire network

5.2.3. Analogue outputs

Each measured or calculated value can be monitored by means of an analogue current signal in the range - 20 mA...0...20 mA. The scaling of the measured quantity and also the value of the current signal are realised.

5.2.4. Relay output

The internal relay signals the exceeding state of programmed ranges of the chosen quantity.

Set of quantities for the analogue and relay output.

Table 1

Quantity		Lower range value for outputs	Upper range value for outputs
Phase voltages	U1,U2,U3	1 V... 930 kV	1 V... 930 kV
Phase-to-phase voltages	U12, U23, U31	2 V... 1,6 MV	2 V... 1.6 MV
Phase currents	I1, I2, I3, I	0.01A... 45 kA	0.01A... 45 kA
Active power	P1, P2, P3, P	- 220...0...220 GW*	- 220...0...220 GW
Reactive power	Q1, Q2, Q3, Q	- 220...0...220 GVar*	- 220...0...220 GVar
Apparent power	S1, S2, S3, S	- 220...0...220 GVA*	-220...0...220 GVA
Power factor	PF1, PF2, PF3, PF	- 1.00...0...1,000	- 1.00...0...1.000
Power factor	tg1, tg2, tg3, tg	- 99.9...0... 99.99	- 99.9...0...99.99
Frequency	f	0. 20... 100 Hz	0. 20... 100 Hz

* Multiplier **Giga** - is shown on the display simultaneously by lighting of the symbol **Kilo** and **Mega**

5.2.5. Interface

The meter can communicate with the main system by means of the RS-485 interface with the MODBUS transmission protocol.

The converter RS-485/RS-232 (e.g. PD5 type from LUMEL S.A.) or the RS-485 interface card is necessary to connect the meter with a computer of PC class.

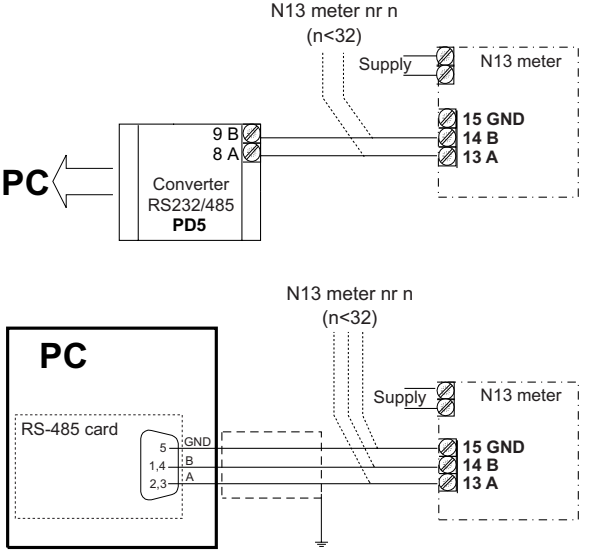


Fig. 4 Connection of meters with RS-485 interface to a PC.

Note: One can extend the network up to 247 devices.

After each 31 devices, one must install a PD5 repeater in series which enlarges the possibilities of the network by 31 successive address numbers and increases the installation distance by ca 1000 m.

6. PROGRAMMING OF N 13

6.1. Frontal panel

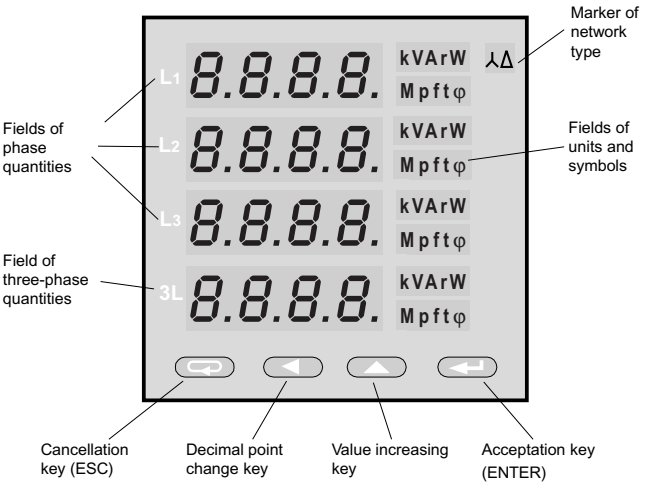
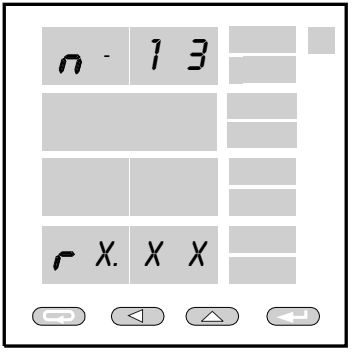


Fig. 5 Frontal panel

6.2. Messages after switching the supply on

After switching the supply on, the meter carries out the test of displays and displays the current version of the program.



Where: r.x.xx is the number of the current version of the program or the number of the custom-made execution.

Fig. 6 Message after switching the supply on

Note: If at the moment of the start, the message UnCx (x = I,U,A) appears on the displays, one must contact an authorized service.

6.3. Description of the user's interface

In the measuring mode, quantities are displayed according settled tables. The quantity in the tables and accessible parameters depend on the kind of connected power network. **The pressure of the key (top) causes the transition between displayed single-phase quantities. The pressure of the key (left) causes the transition between displayed three-phase quantities.**

The display of phase and phase-to-phase quantities is independent.

6.4. Accessible measuring quantities

Accessible phase quantities for a four-wire network

L1	U1	U12	I1	P1	Q1	S1	PF1	TG1
L2	U2	U23	I2	P2	Q2	S2	PF2	TG2
L3	U3	U31	I3	P3	Q3	S3	PF3	TG3

Accessible phase quantities for a three-phase network.

L1	U12	I1
L2	U23	I2
L3	U31	I3

Three-phase and mean quantities for 3 and 4-wire networks.

3L	I	P	Q	S	PF	TG	F	PAU

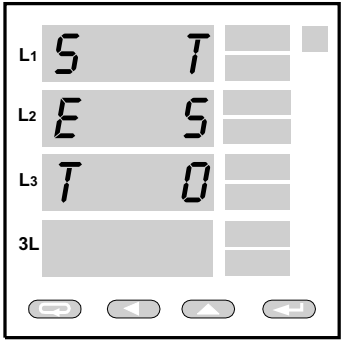


Fig. 7 Setup menu

Settings

The entry into the programming mode proceeds through the holding of the (enter) key during 3 s. The entry into the programming mode is protected by the access code. The code is introduced for all parameters. In case of lack of code the program transits at once in the programming option. The set inscription (column 1) and symbols of each levels: T, S, O are displayed.

6.5. Setting of the date and time

Mode: **time**

Table 2

Parameter name	Assumptive value	Change range
Year	Current date and time	2002... 2082
Month		1... 12
Day		1... 31
Hour		0... 23
Minute		0... 59

After entry into the SETUP procedure we choose the t mode by means of the key (top) and accept by means of the key (enter)

y	y	y	Y
		m	M
		d	d

➔ (enter)

		H	H
		M	M
		S	S

Where:

yyyy - year
mm - month
dd - day

HH - hour
MM - minutes
SS - seconds

We settle values by means of keys (top) and (left): i.e. we choose the position of the decimal number with the key (left) and the value of the number with the key (top).The active position is signalled by the cursor The value is accepted by the key (enter) or cancelled by pressing (ESC).

After the parameter dd (day), the successive pressure causes the transition to set hours and minutes.

The second counter is resetted to zero after the minutes, after a successive pressure of the key (enter). For a precise measurement of time one must wait till the full minute and press (enter).

6.6. Setting of meter parameters

Mode: Parameters - **setup** Table 3

Parameter name	Displayed quantity	Assumptive quantity	Change range
Assumptive setting	dEF	N	Y/n
Input	3 - 4	4	3... 4
Current transformer ratio	tr_I	1	1... 9000
Voltage transformer ratio	tr_U	1	1... 4000
Cancellation of mean power	PA_0	n	Y/n
Mean power interval (min)	PA_t	15	0, 15, 30, 60
Mean power synchronization	PA_S	N	Y/n
Display brightness	brt	15	0..15
Change of the access code	SECU	0000	0000... 9999

The entry into the parameter mode is protected by the access code if it is different from zero. In case of the code 0000, the inquiry about the password is omitted.

If the access code is different from zero and the user does not introduce the correct code, only the review of parameters is possible. In case of introducing a value over the range, after accepting, the value is set on the upper limit range.

6.7. Setting of meter output parameters

Mode: **Output**

Table 4

	Parameter name	Displayed quantity	Assumptive value	Range change
	Address of the meter in the network [1)]	Addr	0	0... 247
	Baud rate [kbd]	bAUd	19.2 k	4800 9600 19200
	Mode of the protocol	trYb	r8n2	OFF A8n1 A7E1 A7o1 r8n2 r8E1 r8o1 r8n1
Relay output	Quantity on the relay output [1)]	A_n	OFF	Tab. 5
	Switch-on value in % of the nominal range	A_on	101.0	- 120.0...0...120.0
	Switch-off value in % of the nominal range	A_of	99.0	- 120.0...0...120.0
	Delay in the alarm action [s]	A_dt	0	0... 100

Table 4 (continuation)

Analogue output	Quantity on the continuous output [1]	Ao_n	OFF	Tab. 5
	Lower value of the input range in % of the nominal range	AoIL	0	- 120.0…0…120.0
	Upper value of the input range in % of the nominal range	AoIH	100	- 120.0…0…120.0
	Lower value of the output range (mA)	AoOL	4	- 20…0…20
	Upper value of the output range (mA)	AoOH	20	- 20…0…20

[1] In case of the off or zero quantity value in these quantities, other common output parameters will not be displayed.

Outputs are active if a value different from zero (off) was assigned to them. Relay and analogue outputs are not connected with the displayed quantities on the page. In case of negative numbers the introduction of minus follows after the cursor transition on the position 4 (thousands' number) and pressing the key (top).

Example of programming:

Set the continuous output on the input range 180... 220 V of the U1 voltage on the output range 4... 20 mA.

Check the percentage participation of the signal in the whole nominal range. E.g. 230/400 V

230 V - 100%
180 V - x %

230 - 100%
220 - x %

$$x1 = \frac{180\ V \cdot 100\%}{230\ V} \qquad x2 = \frac{220\ V \cdot 100\%}{230\ V}$$

X1 = 78% of the input range.
X2 = 96% of the input range

We assign U1 for the Ao_n parameter
AoIL = 78
AoIH = 96
AoOL = 4
AoOH = 20
In case of using external transformers, ratios are taken in consideration in the calculation formula.
E.g. *TrU 230 = 100%

Table 5

Symbol	Unit	Quantity name
U1	V	Voltage of L1 phase
I1	A	Current of L1 phase
P1	W	Active power of L1 phase
q1	Var	Reactive power of L1 phase
S1	VA	Apparent power of L1 phase
PF1		Active power factor of L1 phase
tG1		Ratio of reactive to active power of L1 phase
U2	V	Voltage of L2 phase
I2	A	Current of L2 phase
P2	W	Active power of L2 phase
q2	Var	Reactive power of L2 phase
S2	VA	Apparent power of L2 phase
PF2		Active power factor of L2 phase
tG2		Ratio of reactive to active power of L2 phase
U3	V	Voltage of L3 phase
I3	A	Current of L3 phase
P3	W	Active power of L3 phase
q3	Var	Reactive power of L3 phase
S3	VA	Apparent power of L3 phase
PF3		Active power factor of L3 phase
tG3		Ratio of reactive to active power of L3 phase
I	A	Mean phase current
P	W	Mean 3-phase power
q	Var	Reactive 3-phase power
S	VA	Apparent 3-phase power
PF		Mean active power factor

Table 5 (continuation)

tG		Mean ratio of reactive to active power
F	Hz	Frequency
U12	V	L1- L2 phase-to-phase voltage
U23	V	L2- L3 phase-to-phase voltage
U31	V	L3- L1 phase-to-phase voltage
PAr	W	Mean power (e.g. 15 min.)

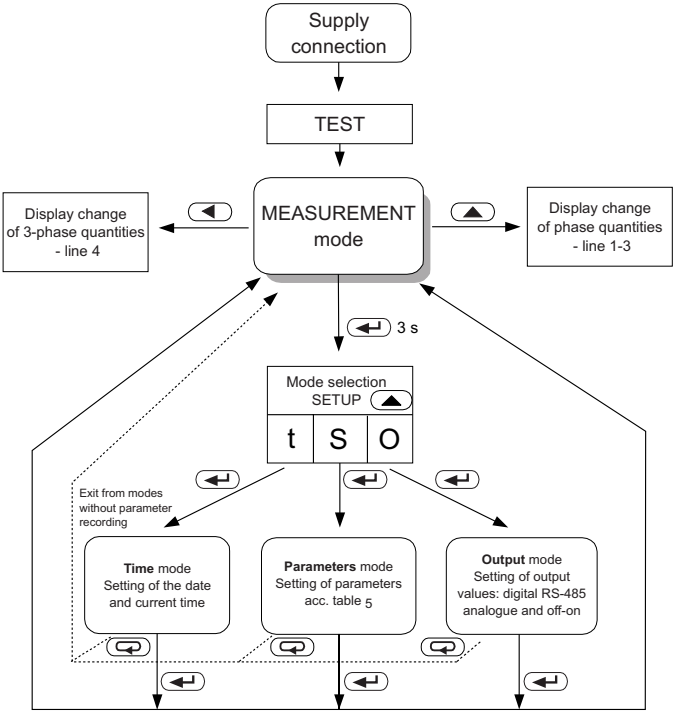


Fig. 8 Working modes of N13 parameter meter

7. RS-485 INTERFACE

In executions with interface the meter has the possibility to communicate with a PC through the RS-485 line.

In the N13 meter, data are inserted in 16 and 32-bit registers.

Process variables and meter parameters are placed in the address space of registers in a way depending on the type of the variable value. In the 16-bit register, bits are numbered from the youngest to the oldest (b0-b15). 32-bit registers include numbers of the float type in the

IEEE-745 standard.

The register map is divided into the following areas.

Table 6

Address range	Value type	Description
4000 - 4020	Integer (16 bit)	Value inserted in one 16-bit register. The register description is included in the table 7. Registers for recording and readout.
7500 - 7532	Float (32 bit)	Value inserted in one 32-bit register. The register description is included in the table 8. Registers for readout.

Table 7

It.	Address	Symbol	Range	Description
1	4000	Tr_I	1... 9000	Ratio of the current transformer
2	4001	Tr_U	1... 4000	Ratio of the voltage transformer
3	4002	3-4	0,1	Choice of network type: 3 or 4-wire
4	4003	P_A0	0,1	Cancellation of mean power
5	4004	P_AU	0,1,2,3	Interval of mean power O-off, 1-15; 2-30; 3-60
6	4005	P_AS	0,1	Synchronization with RTC
7	4006	brt	0...15	Display brightness
8	4007	A_n	0,1...33	Quantity on the relay output
9	4008	A_on	- 120...0...120	Lower switch-on value

Table 7 (continuation)

10	4009	A_oF	- 120...0...120	Upper switch on value
11	4010	A_dt	0...100	Delay of the alarm switch on
12	4011	Ao_n	0,1...33	Quantity on the analogue output
13	4012	AoIL	- 120...0...120	Lower threshold of the input quantity
14	4013	AoIH	- 120...0...120	Upper threshold of the input quantity
15	4014	AoOL	- 20...0...20	Lower threshold of the output scaling [mA]
16	4015	AoOH	- 20...0...20	Upper threshold of the output scaling [mA]
17	4016	YeAr	2002... 2084	Year
18	4017	MonDay		Month*100 + day
19	4018	HourMin		Time in the format Hour*100 + minutes
20	4019	ALm		State of the relay output

Table 8

It.	**Register address**	**Symbol**	**Unit**	**Quantity name**
1	7500	U_1	V	L1 phase voltage
2	7501	I_1	A	L1 phase current
3	7502	P_1	W	L1 phase active power
4	7503	q_1	Var	L1 phase reactive power
5	7504	S1	VA	L1 phase apparent power
6	7505	PF_1		Active power factor of L1 phase
7	7506	tG_1		Ratio of reactive to active power of L1 phase
8	7507	U_2	V	L2 phase voltage
9	7508	I_2	A	L2 phase current
10	7509	P_2	W	L2 phase active power
11	7510	q_2	Var	L2 phase reactive power
12	7511	S_2	VA	L2 phase apparent power
13	7512	PF_2		Active power factor of L2 phase
14	7513	tG_2		Ratio of reactive to active power of L2 phase

Table 8 (continuation)

lt.	Register address	Symbol	Unit	Quantity name
15	7514	U_3	V	L3 phase voltage
16	7515	I_3	A	L3 phase current
17	7516	P_3	W	L3 phase active power
18	7517	q_3	Var	L3 phase reactive power
19	7518	S_3	VA	L3 phase apparent power
20	7519	PF_3		Active power factor of L3 phase
21	7520	tG_3		Ratio of reactive to active power of L3 phase
22	7522	I	A	Mean phase current
23	7523	P	W	Active 3-phase power
24	7524	q	Var	Reactive three-phase power
25	7525	S	VA	Apparent three-phase power
26	7526	PF		Mean active power factor
27	7527	tG		Mean ratio of active to reactive power
28	7528	Freq	Hz	Frequency
29	7529	U12	V	L1- L2 phase-to-phase voltage
30	7530	U23	V	L2- L3 phase-to-phase voltage
31	7531	U31	V	L3- L1 phase-to-phase voltage
32	7533	Pav	W	Mean power (e.g. 15 minutes)

8. ERROR CODES

Messages about errors can appear during the meter work. The causes of these errors are presented below:

Err - when the voltage or current is too small during the measurement:

Pf_i, $t\varphi_i$ below 7% Un, 7% In

f below 1% Un

- The full time interval of the Pau power averaging is not expired.

9. TECHNICAL DATA

Measuring ranges and admissible basic errors are presented in the table 9

Table 9

Measured quantity	Range	Basic error	remarks
U_i voltage	57.7/100 V (Ku=1) 230/400 V (Ku=1) 400/ 690 V (Ku =1) for Ku≠1...1,6 MV	± (0.2% m.v. +0.1% range)	Ku = 1...4000 (max 1.6 MV)
I_i current	1.000 A (Ki=1) 5.000 A (Ki=1) for Ki≠1...45 kA	± (0.2% m.v. +0.1% range)	Ki = 1...9000 (max 45 kA)
P_i active power P_{AV} mean active power	0.0... 999.9 W for Ku≠1, Ki≠1 (-)220 GW	± (0.5% m.v. +0.2% range)	
S_i apparent power	0.0... 999.9 VA for Ku≠1, Ki≠1 220 GVA	± (0.5% m.v. +0.2% range)	
Q_i reactive power	0.0... 999.9 Var for Ku≠1, Ki≠1 (-)220 GVar	± (0.5% m.v. +0.2% range)	
Pf_i active power factor	- 1.00 ...0.00 ...1.000	± 1% m.v. ±2c	Pf=Power factor=P/S
$T\varphi_i$ factor (ratio of reactive power to active power)	- 99.9....0....99.9	± 1% m.v. ±2c	Error in the range - 99.9...0...99.9
F frequency	20.0... 500.0 Hz	± 0.5% m.v.	

Where: Ku - voltage transformer ratio
Ki - current transformer ratio
m.v. - measured value
c - less significant display digit

Power consumption:	
- supply circuit	≤ 12 VA
- voltage circuit	≤ 0.5 VA
- current circuit	≤ 0.1 VA
Supply	85...253 V d.c. or a.c., 40...400 Hz
Display field:	4 x 4 LED digits, 10 mm high, red or green display control of the display brightness
Outputs:	
- analogue output	1 analogue programmed output: -20... 0...+20 mA accuracy: 0.2%
- relay output	1 relay output, (alarm freely assigned) voltageless make contacts load capacity: 250 V a.c./ 0.5 A a.c.
Serial interface	RS-485
Transmission protocol	MODBUS ASCII and RTU
Meter reaction to decays and supply recovery	data and meter state preservation during supply decays, (battery support), work continuation after supply recovery
Protection degree ensured by the housing acc. IEC529:	
- frontal side	IP 40
- terminal side	IP 10
Weight	400 g
Overall dimensions	$96 \times 96 \times 70.5$ mm
Panel cut-out dimensions	$91^{+0.5} \times 91^{+0.5}$

Reference conditions and nominal operation conditions:

- Input signal: 0...0.02...1.2 In, 0.02...1.2 Un, for voltage, current, frequency, power
  0...0.07...1.2 In, 0.07...1.2 Un, for Pf and tφ factors, frequency 20...45...65...500 Hz
  sinusoidal current (THD ≤ 8%)
- power factor - 1...0...1
- ambient temperature 0...23...55°C
- air relative humidity 25...95% (no condensation)
- storage temperature - 20...70°C
- supply 85... 253 V d.c. or a.c. 40... 400 Hz
- admissible peak factor:
- current 2
- voltage 2
- external magnetic field 0...40...400 A/m
- short duration overload (5 sec):
- voltage inputs 2 Un (max.1000 V)
- current inputs 10 In
- working position any
- warm-up time 5 minutes

Additional errors in % of the basic error:

- from frequency of input signals < 50%
- from ambient temperature changes < 50%/10°C

Electromagnetic compatibility:

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

Safety requirements: acc. EN 61010-1+A1

- insulation ensured by the housing dual
- insulation between circuits basic
- pollution degree 2
- for voltages up to 300 V in relation to earth: installation category III
- for voltages up to 600 V in relation to earth: installation category II

10. EXECUTION CODES AND ORDERING WAY

Table 10

NETWORK PARAMETER METER N13 -	X.	X.	X.	X.	X.	XX.	X
Input current In: 1 A (X/1) ..... 1 5 A (X/5) ..... 2 on order* 9							
Input phase/phase-to-phase voltage Un: 3 × 57.7/100 V ..... 1 3 × 230/400 V ..... 2 3 × 400/690 V ..... 3 on order* 9							
Current analogue output: without analogue output ..... 0 with a programmed output - 20... + 20 mA 1							
Digital output: without interface ..... 0 with RS-485 interface 1							
Display: red digits ..... 1 green digits 2							
Kind of execution: standard ..... 00 custom-made XX							
Acceptance test: without an extra quality inspection certificate ..... 0 with an extra quality inspection certificate ..... 1 acc user's agreement** X							

* After agreeing by the manufacturer

** The execution numbering will be made by the manufacturer.

Coding example:

The N13.2.2.1.1.2.00.1 code means:
input range: 5 A, input voltage: 3 × 230/400 V, with a programmed current analogue output: - 20... 20 mA, RS-485 interface, green digits, standard execution, with an extra quality inspection certificate.

11. MAINTENANCE AND GUARANTEE

The N13 parameter meter does not require any periodical maintenance.
In case of some incorrect unit operations:

1. **From the shipping date, during the period given in the annexed guarantee card.**
   One should take the instrument down from the installation and return it to the Manufacturer's Quality Control Dept.
   If the instrument has been used in compliance with the instructions, the Manufacturer guarantees to repair it free of charge.
2. **After the guarantee period:**
   One should turn over the instrument to repair in a certified service workshop. The disassembling of the housing causes the cancellation of the granted guarantee.
   Spare parts are available for the period of ten years from the date of purchase.

The Manufacturer's policy is one of continuous improvement and we reserve the right to make changes in design and specifications of any products as engineering advances or necessity requires and revise the above specification without notice.

SALES PROGRAMME

MEASUREMENT
CONTROL
RECORDING

- DIGITAL PANEL METERS
- BARGRAPH INDICATORS
- MEASURING TRANSDUCERS
- ANALOGUE PANEL METERS (DIN INSTRUMENTS)
- DIGITAL CLAMP-ON METERS
- PROCESS and HOUSEHOLD CONTROLLERS
- CHART and SCREEN RECORDERS
- POWER CONTROL UNITS and FREQUENCY INVERTERS
- AUTOMOTIVE DASHBOARD INDICATORS
- STATIONARY and PORTABLE CALIBRATORS
- MEASUREMENT ACCESSORIES (SHUNTS, SENSORS, TRANSFORMERS)
- MEASURING SYSTEMS (ENERGY, HEAT, CONTROL, MEASUREMENT)
- CUSTOM-MADE PRODUCTS

WE ALSO OFFER OUR SERVICES IN THE PRODUCTION OF:

- ALUMINIUM ALLOY PRESSURE CASTINGS
- PRESSURE CASTING DIES AND INJECTION MOULDS
- PRECISION ENGINEERING AND THERMOPLASTICS PARTS

QUALITY PROCEDURES:

According ISO 9001 international requirements.
All our instruments have CE mark.
For more information, please write to or phone our Export Department.

LUMEL

Lubuskie Zakłady Aparatów Elektrycznych LUMEL S.A.
ul. Sulechowska 1
65-022 Zielona Góra - Poland

Tel.: (48-68) 32 95 100 (exchange)
Fax: (48-68) 32 95 101
e-mail: lumel@lumel.com.pl
http://www.lumel.com.pl

Export Department:

Tel.: (48-68) 32 95 302 or 04
Fax: (48-68) 325 40 91
e-mail: export@lumel.com.pl

July 2004-KZ1072/03