



ND31 - POWER NETWORK METER

with DATA RECORDING and MQTT (IIoT), BACnet/IP or MODBUS TCP/IP PROTOCOLS

- **Measurement** of 54 power network parameters, including **current and voltage harmonics up to 63rd** in 1-phase 2-wire or 3-phase 3 or 4-wire balanced and unbalanced systems.
- Programmable choice of communication protocols: **MQTT, BACnet / IP lub MODBUS TCP/IP.**
- **High accuracy class (0.2S for active energy).**
- **Graphical color display:** LCD TFT 3,5", 320 x 240 pixels, **fully configurable by a user** (10 screens, 8 parameters in each).
- **Additional 2 screens for harmonics presentation and 1 dedicated page for visualization in the form of an analog meter.**
- Memory of minimum and maximum values.
- 2 configurable alarm outputs.
- Supervisory relay mode for alarm outputs.
- Analog output 0/4...20 mA for retransmission of the measured value and two Pt 100 inputs (eg. for measurement of transformer temperature).
- Archiving of up to 32 measured parameters in the internal memory 8 GB.
- Digital output RS-485 - MODBUS protocol.
- **Modern and user-friendly Ethernet interface 10/100 BASE-T:**
 - protocol: MODBUS TCP/iP, HTTP, FTP,
 - protocol: MQTT,
 - protocol: BACnet/IP,
 - services: www server, ftp server, DHCP client, NTP server.
- Programming of parameters using **free eCon software.**
- Overall dimensions: 96 x 96 x 77 mm.

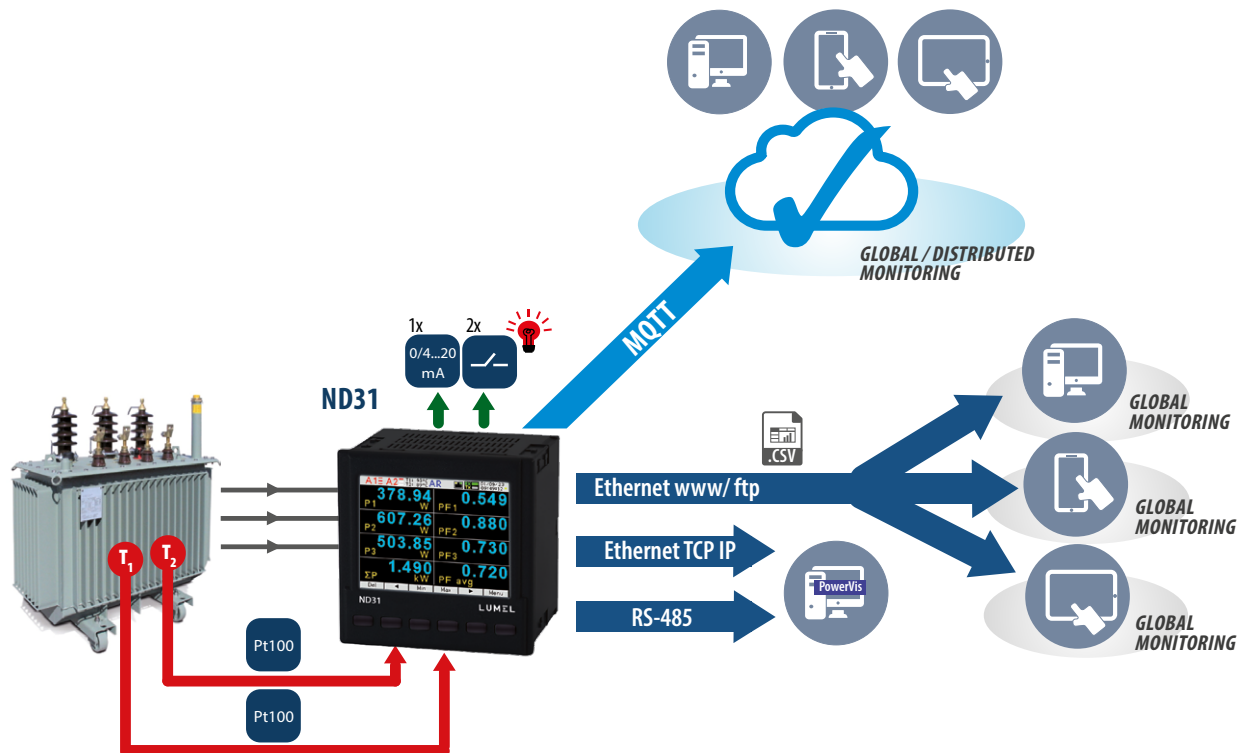
FEATURES	INPUTS	OUTPUTS	GALVANIC ISOLATION
<ul style="list-style-type: none"> MQTT BAC net MOD BUS TCP WWW ftp Password protection RTC THD Har 63 SUPERVISORY RELAY 	<ul style="list-style-type: none"> AC 2x Pt100 	<ul style="list-style-type: none"> RS 485 2x 0/4...20 mA Ethernet 	<ul style="list-style-type: none"> Ethernet BAC net RS 485 analog alarm phaseL1 phaseL2 phaseL3 2x Pt100 Supply

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EXAMPLE OF APPLICATION



MEASUREMENT AND VISUALIZATION OF POWER NETWORK PARAMETERS

- phase voltages: U_1, U_2, U_3
- phase-to-phase voltages: U_{12}, U_{23}, U_{31}
- phase currents I_1, I_2, I_3
- active phase powers: P_1, P_2, P_3
- reactive phase powers: Q_1, Q_2, Q_3
- apparent phase powers: S_1, S_2, S_3
- active power factors: PF_1, PF_2, PF_3
- reactive/active power factors: $tg\phi_1, tg\phi_2, tg\phi_3$
- active, reactive and apparent 3-phase power: P, Q, S
- mean 3-phase power factors: $PF, tg\phi$
- frequency f
- mean 3-phase voltage: U_s
- mean phase-to-phase voltage: U_{mf}
- mean 3-phase current: I_s
- 15, 30, 60 minutes' mean active power: P_{demand}
- mean apparent power S_{demand}
- average current I_{demand}
- active, reactive and apparent 3-phase energy: EnP, EnQ, EnS
- active, reactive and apparent energy from external counter: $EnPE$
- total harmonic content coefficients for phase voltages and currents $THD_{U1}, THD_{U2}, THD_{U3}, THD_{I1}, THD_{I2}, THD_{I3}$ and for 3-phase voltages and currents THD_v, THD_i
- harmonics for current and phase voltage up to 63rd!
- temperature (2 x Pt100 input)

TECHNICAL DATA

MEASURING RANGE

Measured value	Measuring range	L1	L2	L3	Σ	Class
Current I/S A 1 A~ 5 A~	0.002 ..0.100..1.200 A 0.010 ..0.500.. 6.000 A ...100.00 kA (tr _I ≠1)	•	•	•		0.2 (EN 61557-12)
Voltage L-N 57.7 V~ 110 V~ 230 V~ 400 V~	5.700..11.500 ..70.000 V 11.000..22.000 ..132.000 V 23.000..46.000 .. 276.000 V 40.000..80.000 .. 480.000 V ...1920.0 kV	•	•	•		0.2 (EN 61557-12)
Voltage L-L 100 V~ 190 V~ 400 V~ 690 V~	10.000 ..20.000..120.000 V 19.000 ..38.000..228.000 V 40.000..80.000 .. 480.000 V 69.000..138.000 .. 830.000 V ...1999.0 kV (tr _U ≠1)	•	•	•		0.5 (EN 61557-12)
Active power P	-19999 MW .. 0,000 W19999 MW (tr _U ≠1, tr _I ≠1)	•	•	•	•	0.5 (EN 61557-12)
Reactive power Q	-19999 MVar .. 0,000 Var19999 MVar (tr _U ≠1, tr _I ≠1)	•	•	•	•	1 (EN 61557-12)
Apparent power S	0.000 .. 1999,9 VA19999 MVA (tr _U ≠1, tr _I ≠1)	•	•	•	•	0.5 (EN 61557-12)
Active energy EnP (imported or exported)	0.000 .. 99 999 999.999 kWh				•	0.2S (EN 62053-22)
Reactive energy EnQ (inductive or capacitive)	0.000 .. 99 999 999.999 kWh				•	1 (EN 61557-12)
Apparent energy EnS	0.000 .. 99 999 999.999 kWh				•	0.5 (EN 61557-12)
Active power factor PF	-1.00 ..0 ..1.00	•	•	•	•	1 (EN 61557-12)
Coefficient tg (ratio of reactive power to active power)	-999.99...-1.20 .. 0 .. 1.20...999.99	•	•	•	•	1
Frequency f	45.00...65.000...100.00 Hz				•	0.1 (EN 61557-12)
Total harmonic distortion of voltage THDU and current THDI	0.0 ..100.0 %	•	•	•	•	5 (EN 61557-12)
Amplitudes of the voltage $U_{h2} \dots U_{h63}$ and current $I_{h2} \dots I_{h63}$	0.0 ..100.0 %	•	•	•		II (IEC61000-4-7)

tr_I - Current transformer ratio = Transformer primary current / Current transformer secondary current
tr_U - Voltage transformer ratio = Transformer primary voltage / Voltage transformer secondary voltage

ADDITIONAL INPUTS

Input type	Properties
Input Pt100 (T1, T2)	2 x Pt100, 2-wire, -50...400°C, basic error 0.5 %

DIGITAL INTERFACE

Interface type	Transmission protocol	Remarks
RS-485	Modbus RTU 8N2,8E1,8O1,8N1 Address 1..247	baud rate: 4.8, 9.6, 19.2 38.4, 57.6, 115.2 kbit/s
	Modbus TCP,HTTP,FTP	WWW server, FTP server, DHCP client, NTP server
	MQTT	
Ethernet 10/100 Base-T	BACnet/IP	BACnet Standardized Device Profile (Annex L): BACnet Application Specific Controller (B-ASC); BACnet Interoperability Building Blocks (BIBB) Support (Annex K in BACnet Addendum 135d): DS-RP-B, DS-WP-B, DS-RPM-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B; Binding methods support: Recive Who-Is, send I-Am (BIBB, DM-DDB-B); Recive Who-Has, send I-Have (BIBB DM-DOB-B)

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EXTERNAL FEATURES

Readout field	graphic color display LCD TFT 3,5", 320 x 240 pixels	
Overall dimensions	96 x 96 x 77 mm	mounting hole 92.5 x 92.5 mm
Weight	0.3 kg	
Protection grade	from frontal side: IP65	from terminal side: IP20

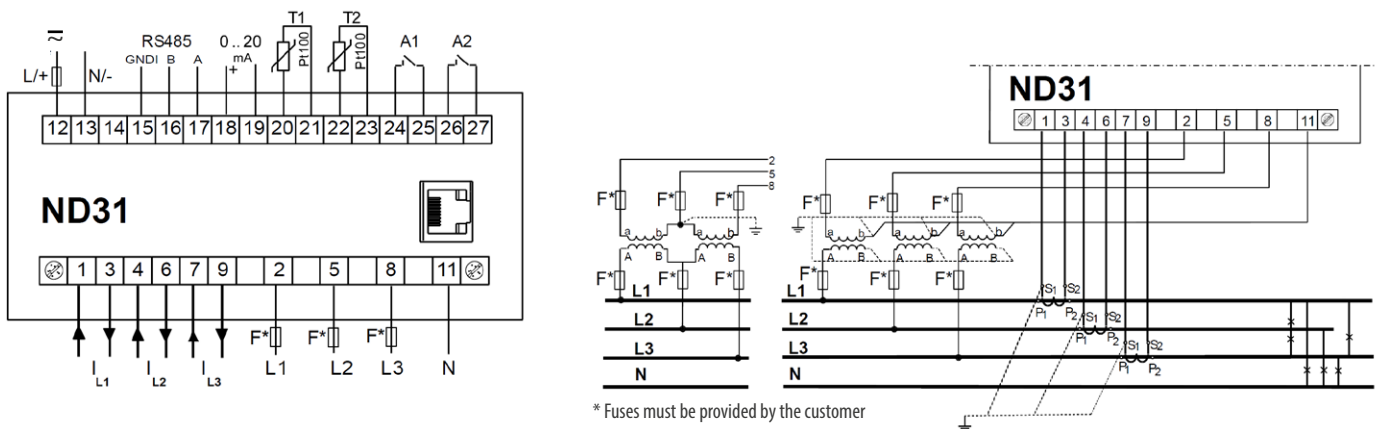
RATED OPERATING CONDITIONS

Supply voltage	→ \bigcirc 85...253 V a.c. (40...50...400 Hz), 90...300 V d.c. or 20...40 V a.c., 20...60 V d.c.	power consumption \leq 6 VA
Power consumption	in voltage circuit \leq 0.5 VA	in current circuit \leq 0.1 VA
Input signal	0...0.1...1.2 In; 0.1...0.2...1.2 Un for current, voltage, PF, tg ϕ ,	frequency 45...50...60...100 Hz, sinusoidal (THD \leq 8%)
Power factor	-1...0...1	
Preheating time	5 min.	
Ambient temperature	-10...23...55°C, class K55 acc. to EN61557-12	
Humidity	0...40...60...95%	without condensation
Operating position	any	
External magnetic field	\leq 40...400 A/m d.c.	\leq 3 A/m a.c. 50/60 Hz
Short-term overload	voltage input: 2 Un (5 sec.)	current input 50 A (1 sec.)
Admissible crest factor	current: 2	voltage: 2
Additional error (in % of the intrinsic error)		from ambient temperature change: $<$ 50% / 10°C

SAFETY AND COMPATIBILITY REQUIREMENTS

Electromagnetic compatibility	noise immunity	acc. to EN 61000-6-2, EN IEC 61326-1
	radio-frequency common mode: • level 2: 0,15...1 MHz • level 3: 1 MHz...80 MHz	
Isolation between circuits	noise emissions	acc. to EN 61000-6-4, EN IEC 61326-1
	basic	acc. to EN 61010-1
Pollution level	2	acc. to EN 61010-1
Overvoltage category OVC	III	for voltage to earth up to 300V
	II	for voltage to earth up to 600V
Maximal phase-to-earth voltage	• for supply circuit and relay outputs 300 V • for measuring input 500 V • for circuits of RS-485, Ethernet, analog outputs: 50 V	acc. to EN 61010-1
Altitude a.s.l.	$<$ 2000 m	

CONNECTION DIAGRAMS



* Fuses must be provided by the customer

Description of meter connections strips

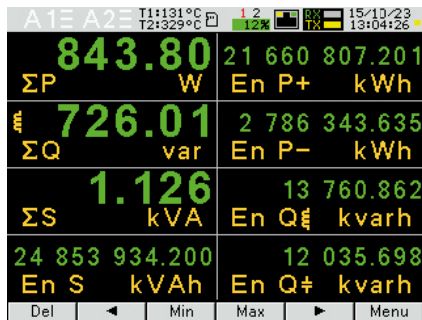
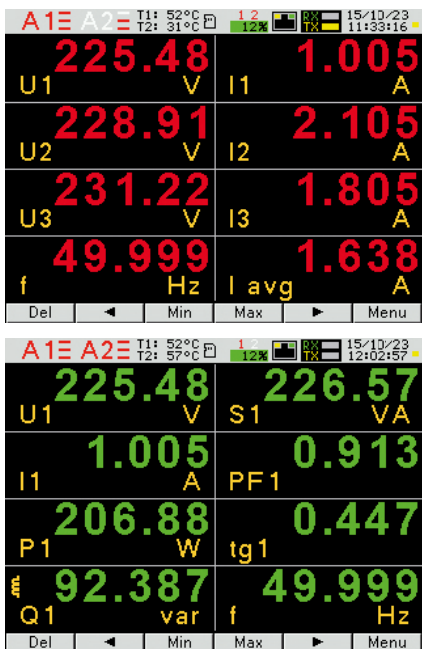
Indirect measurement in 4-wire network - connection of input signals

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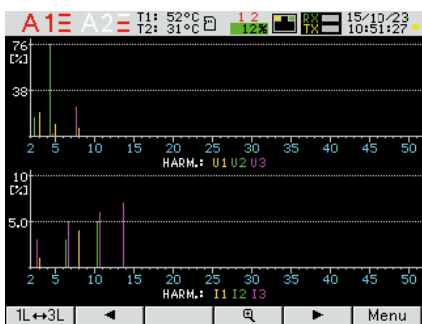
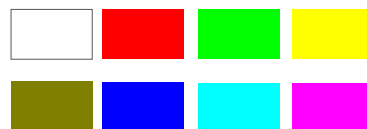


DISPLAING OF MEASUREMENT PARAMETERS



up to 10 programmable screens (8 parameters per page); ability to change color for all screens

Available colors for digital indications:



two screens dedicated to harmonics; indication of individual harmonic for voltages and currents (up to 51st); bargraph presentation for all harmonics with zoom function



presentation in the form of analog meter view with min/max preview for display value and zoom function



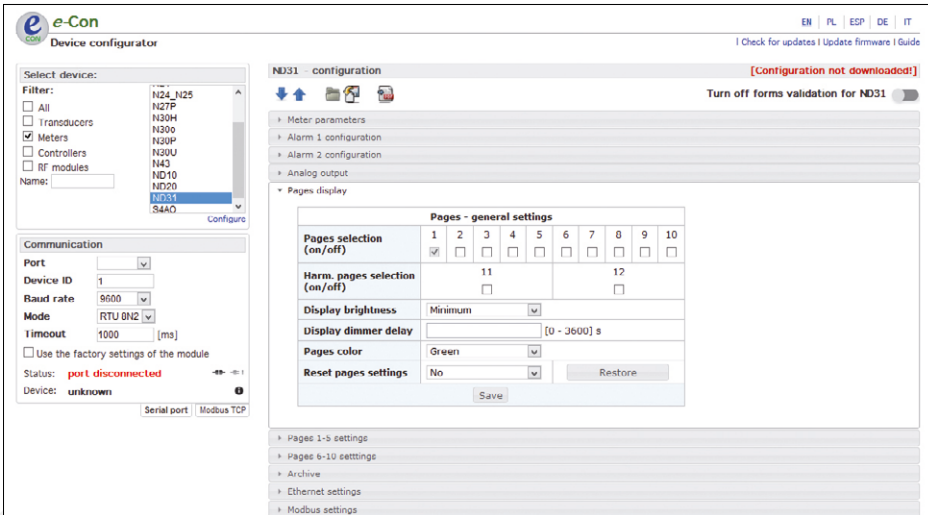
easy to use and intuitive menu; information bar with status of: phase sequence, alarm outputs, temperature measurements, archiving and memory, Ethernet and RS-485 interfaces, time and date

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METER CONFIGURATION WITH FREE eCON SOFTWARE



ability to configure and update ND31 with free eCon software (via RS-485 or Ethernet interface)

REMOTE READOUT OF PARAMETERS THROUGH ETHERNET: WWW SERVER, FTP

Page 1

U12	378.040	V	I1	1.005	A
U23	383.467	V	I2	2.105	A
U31	392.184	V	I3	1.805	A
f	49.999	Hz	I avg	1.638	A

Page 2

U12	378.040	V	ΣP	843.787	W
U23	383.467	V	ΣQ	725.969	var
U31	392.184	V	ΣS	1125.615	VA
U123	384.564	V	PF avg	0.778	

Page 3

ΣP	843.787	W	P DMD	843.795	W
ΣQ	725.969	var	S DMD	1125.611	VA
I avg	1.638	A	I DMD	1.638	A
Ig avg	0.810		PF avg	0.778	

Page 4

THDU12	43.049	%	THD I1	4.100	%
THDU23	43.359	%	THD I2	5.784	%
THDU31	22.461	%	THD I3	10.879	%

Page 5

ΣP	843.787	W	EnP+	21.661	OWh
ΣQ	725.969	var	EnP-	2786.344	MWh
ΣS	1125.615	VA	EnQ L	13.761	Mvarh
En S	24.854	GVAh	EnQ C	12.036	Mvarh

Page 6

U2	228.917	V	I2	2.105	A
U3	231.231	V	I3	1.805	A
f	49.999	Hz	I avg	1.638	A
U23	383.494	V	ΣQ	725.923	var
U31	392.211	V	ΣS	1125.737	VA
U123	384.599	V	PF avg	0.778	

Harmonics numbers

Harmonic U no : H18 U1=0.0 %, U2=0.0 %, U3=0.0 %

HARM: U1 U2 U3

HARM: I1 I2 I3

WEB server for remote reading of current measurement data; FTP server for downloading archived CSV files

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ORDERING CODE

Meter ND31	X	2	2	X	X	X	XXXX
Input voltage (phase/phase-to-phase) Un:							
3 x 57.7/ 100 V, 3x 230/ 400 V	1						
3 x 110/ 190 V, 3 x 400/ 690 V	2						
Outputs /inputs:							
2 relays, 1 analog output, 2 inputs PT100	2						
Interface:							
RS-485 and Ethernet, internal memory	2						
Supply:							
85...253 V a.c., 90...300 V d.c.	1						
20...40 V a.c., 20...60 V d.c.	2						
Language:							
Polish/ English				M			
other*				X			
Acceptance tests:							
without additional quality requirements						0	
with an extra quality inspection certificate						1	
with an extra calibration certificate						2	
acc.to customer's request*						X	
Version:							
standard							
custom-made*							XXXX

* only after agreeing with the manufacturer

ORDERING EXAMPLE: The code **ND31 1221M0** means:

ND31 – ND31 meter,

1 – input voltage 3 x 57.7/100 V, 3 x 230/400 V,

2 – 2 relays, 1 analog output 0..20 mA, 2 x Pt100 inputs,

2 – RS485 and Ethernet, internal file system memory,

1 – supply 85..253 V a.c., 90..300 V d.c.

M – polish-english version,

0 – without additional quality requirements,

– standard version.

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ND31-19



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