



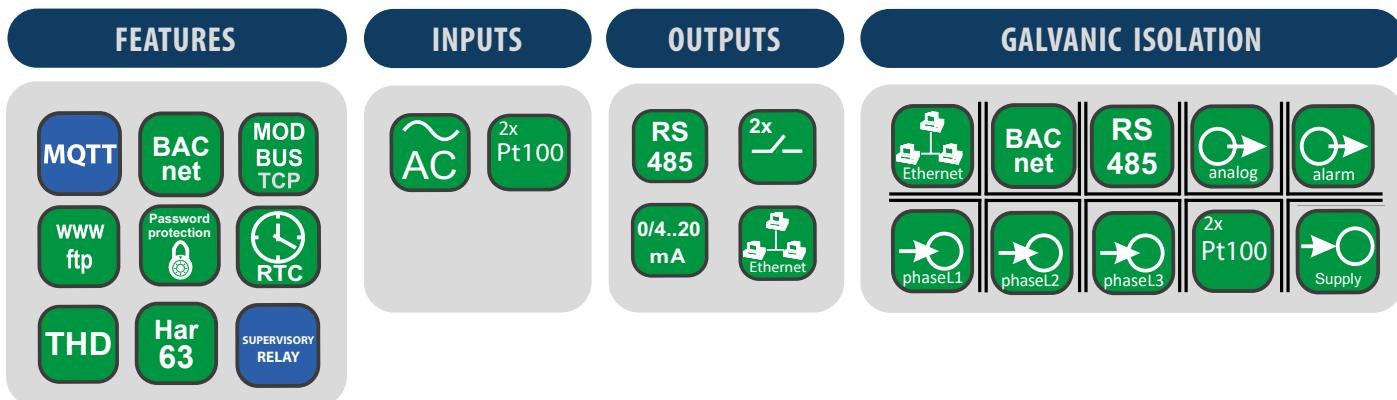
LUMEL



ND31
POWER NETWORK METER
WITH DATA RECORDING AND MQTT (IIoT),
BACNET/IP OR MODBUS TCP/IP PROTOCOLS

FEATURES

- **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.

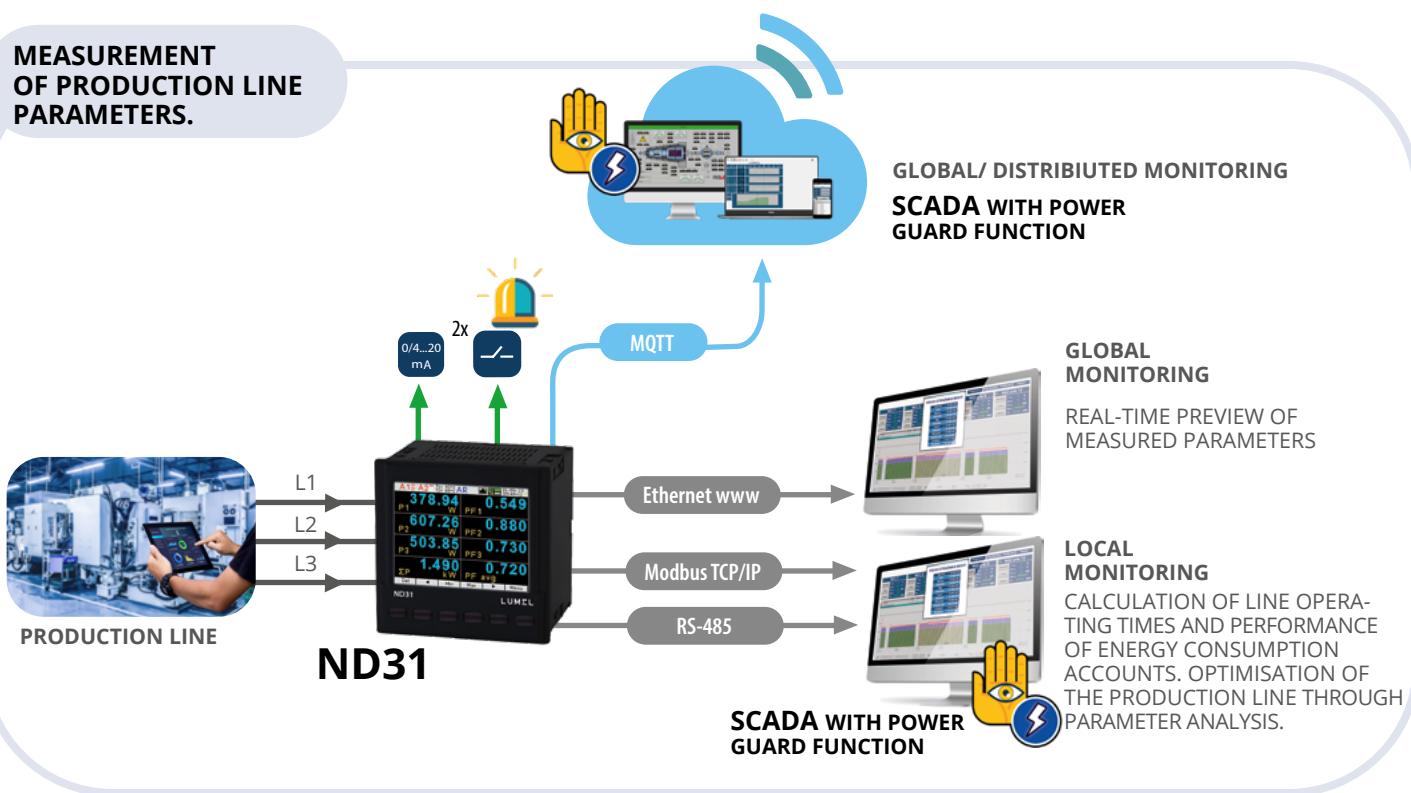


MEASUREMENT AND VISUALIZATION OF POWER NETWORK PARAMETERS

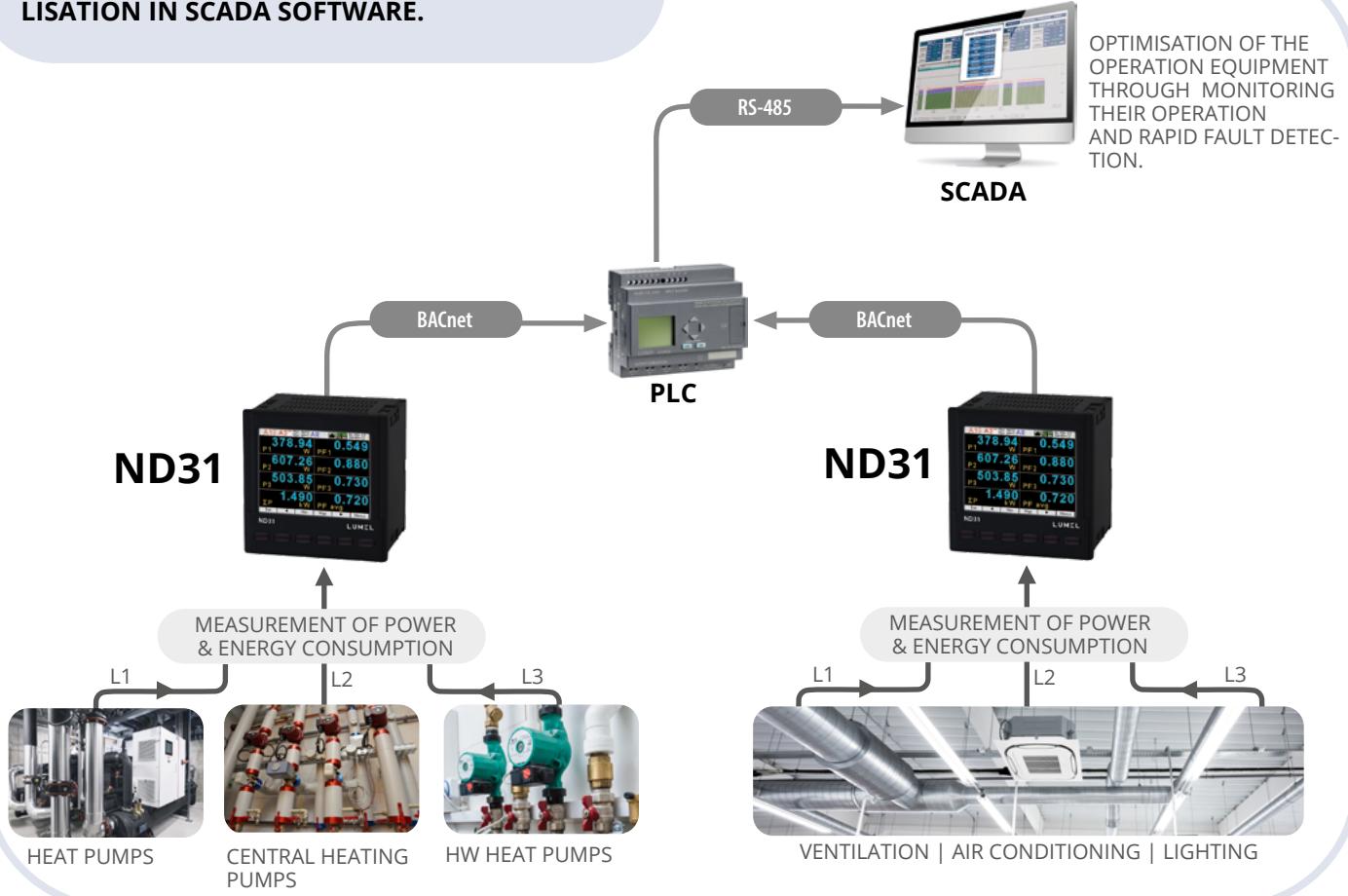
- phase voltages: U_1, U_2, U_3
- phase-to-phase voltages: U_{12}, U_{23}, U_{31}
- phase currents I_1, I_2, I_3
- active phase powers: P_1, P_2, P_3
- reactive phase powers: Q_1, Q_2, Q_3
- apparent phase powers: S_1, S_2, S_3
- active power factors: $\text{PF}_1, \text{PF}_2, \text{PF}_3$
- reactive/active power factors: $\text{tg}\varphi_1, \text{tg}\varphi_2, \text{tg}\varphi_3$
- active, reactive and apparent 3-phase power: P, Q, S
- mean 3-phase power factors: $\text{PF}, \text{tg}\varphi$
- 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: $\text{EnP}, \text{EnQ}, \text{EnS}$
- active, reactive and apparent energy from external counter: EnPE
- total harmonic content coefficients for phase voltages and currents $\text{THD}_{U1}, \text{THD}_{U2}, \text{THD}_{U3}, \text{THD}_{I1}, \text{THD}_{I2}, \text{THD}_{I3}$ and for 3-phase voltages and currents $\text{THD}_{U'}, \text{THD}_{I'}$
- harmonics for current and phase voltage up to 63rd!
- temperature (2 x Pt100 input)

EXAMPLE OF APPLICATION

**MEASUREMENT
OF PRODUCTION LINE
PARAMETERS.**



**MEASUREMENT OF EQUIPMENT PARAMETERS
AND TRANSMISSION TO THE PLC AND VISUA-
LISATION IN SCADA SOFTWARE.**



TECHNICAL DATA

MEASURING RANGE

Measured value	Measuring range	L1	L2	L3	Σ	Class
Current 1/5 A 1 A~ 5 A~	0.002 .. 0.100 .. 1.200 A 0.010 .. 0.500 .. 6.000 A ... 100.00 kA ($tr_I \neq 1$)	.	.	.		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 ($tr_U \neq 1$)	.	.	.		0.5 (EN 61557-12)
Active power P	-19999 MW .. 0,000 W 19999 MW ($tr_U \neq 1, tr_I \neq 1$)	.	.	.	.	0.5 (EN 61557-12)
Reactive power Q	-19999 MVar .. 0,000 Var 19999 MVar ($tr_U \neq 1, tr_I \neq 1$)	.	.	.	.	1 (EN 61557-12)
Apparent power S	0.000 .. 1999,9 VA 19999 MVA ($tr_U \neq 1, tr_I \neq 1$)	.	.	.	.	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 kVarh				.	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
Ethernet 10/100 Base-T	MQTT	BACnet Standardized Device Profile (Annex L); BACnet Application Specific Controller (B-ASC);
	BACnet/IP	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: Receive Who-Is, send I-Am (BIBB, DM-DDB-B); Receive Who-Has, send I-Have (BIBB DM-DOB-B)

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

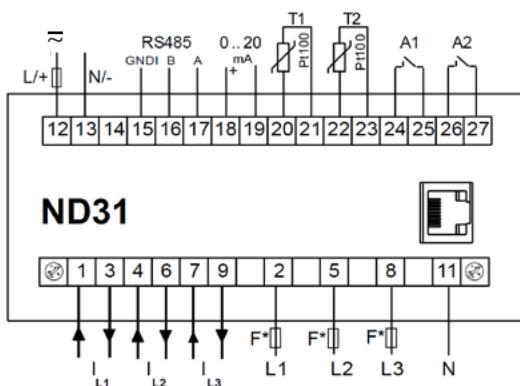
RATED OPERATING CONDITIONS

Supply voltage	→○ 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 ≤ 6 VA
Power consumption	in voltage circuit ≤ 0.5 VA	in current circuit ≤ 0.1 VA
Input signal	0...0.1...1.2 In; 0.1...0.2...1.2 Un for current, voltage, PF, tgφ	frequency 45...50...60...100 Hz, sinusoidal (THD ≤ 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	≤ 40...400 A/m d.c.	≤ 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

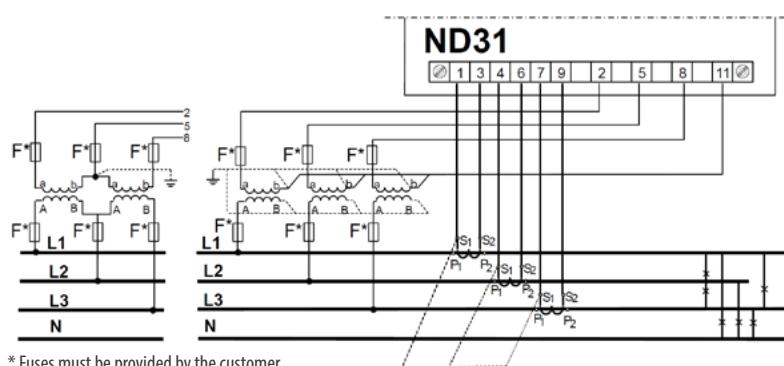
SAFETY AND COMPATIBILITY REQUIREMENTS

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
Polution level	basic	acc. to EN 61010-1
Overvoltage category OVC	2	acc. to EN 61010-1
Maximal phase-to-earth voltage	III	for voltage to earth up to 300V
	II	for voltage to earth up to 600V
Altitude a.s.l.	• 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
	< 2000 m	

CONNECTION DIAGRAMS



* Fuses must be provided by the customer



* Fuses must be provided by the customer

Description of meter connections strips

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

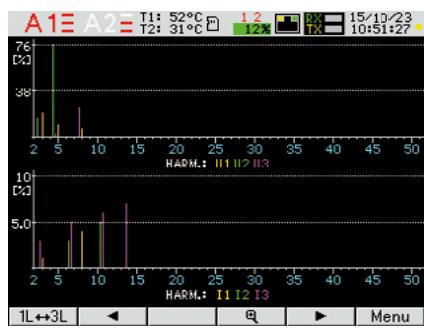
DISPLAYING OF MEASUREMENT PARAMETERS

A1	A2	T1: 52°C	T2: 31°C	12%	TX	15/10/23	11:33:16
225.48	1.005						
U1	V	I1	A				
228.91		2.105					
U2	V	I2	A				
231.22		1.805					
U3	V	I3	A				
49.999		1.638					
f	Hz	avg	A				
Del	<	Min	Max	>	Menu		

A1	A2	T1: 131°C	T2: 329°C	12%	TX	15/10/23	13:04:26
843.80		21 660 807.201					
ΣP	W	En P+ kWh					
726.01		2 786 343.635					
ΣQ	var	En P- kWh					
1.126		13 760.862					
ΣS	kVA	En Q± kvarh					
24 853 934.200		12 035.698					
En S	kVAh	En Q± kvarh					
Del	<	Min	Max	>	Menu		

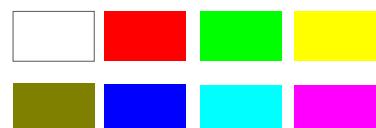
A1	A2	T1: 52°C	T2: 57°C	12%	TX	15/10/23	12:02:57
225.48		226.57					
U1	V	S1	VA				
1.005		0.913					
I1	A	PF1					
206.88		0.447					
P1	W	tg1					
92.387		49.999					
Q1	var	f	Hz				
Del	<	Min	Max	>	Menu		

A1	A2	T1: 49°C	T2: 53°C	12%	TX	22/10/23	13:36:31
0.905		I1	%				
U1			%				
0.905		I2	%				
U2			%				
0.903		I3	%				
U3			%				
Har. 5							
50160	<	▼	▲	►	Menu		



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

METER CONFIGURATION WITH FREE eCON SOFTWARE

The screenshot shows the e-Con Device configurator interface for the ND31. In the top left, there's a sidebar titled "Select device" with a "Filter" section containing checkboxes for "All", "Transducers", "Meters", "Controllers", and "RF modules". Below this is a "Name:" input field and a "Configure" button. The main panel has tabs for "Communication" (Port: RS485, Device ID: 1, Baud rate: 9600, Mode: RTU 8N2, Timeout: 1000 ms) and "Modbus TCP". On the right, there's a "Pages - general settings" section with tabs for "Pages 1-5 settings", "Pages 6-10 settings", "Archive", "Ethernet settings", and "Modbus settings". A "Save" button is at the bottom.

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

REMOTE READOUT OF PARAMETERS THROUG ETHERNET: WWW SERVER, FTP

The screenshot shows the LUMEL 3-PHASE POWER NETWORK METER TYPE ND31 web interface. It features several sections:

- Page 1:** Displays three-phase voltage (U12, U23, U31) and current (I1, I2, I3) values, frequency (f), and power factor (PF avg).
- Page 2:** Displays total power (ΣP), reactive power (ΣQ), apparent power (ΣS), and power factor (PF avg).
- Page 4:** Displays THD values for each phase (THDU12, THDU23, THDU31).
- Harmonics numbers:** Two stacked bar charts showing harmonic content for phases U1, U2, U3. The top chart is for Harmonic U no : H18 and the bottom for HARM: U1 U2 U3.

 The interface also includes a sidebar with icons for "Measure values", "Energy counters", and "Ethernet" settings, along with IP, Mask, and Gateway fields. A copyright notice at the bottom reads "Copyright © 2015, Lumel S.A. All rights reserved.".

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

ORDERING CODE

Meter ND31	X	2	2	X	X	X	XXXX
Input voltage (phase/phase-to-phase) Un:							
3 x 57.7 / 100 V, 3 x 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 – RS485and 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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