ND31PLUS

POWER NETWORK METER

WITH ETHERNET DAISY CHAIN
AND MQTT (IIoT), BACNET/IP
OR MODBUS TCP/IP PROTOCOLS

FEATURES

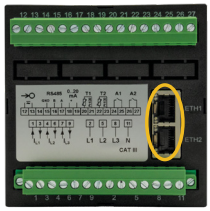
- Measurement of 54 power network parameters, including current and voltage harmonics up to 63rd in 1-phase 2-wire or 3-phase 3 or 4-wire balanced and unbalanced systems.
- **Ethernet Daisy Chain Topology.**
- Programmable choice of communication protocols: MQTT, BACnet / IP lub MODBUS TCP/IP.
- Modern and user-friendly BACnet/IP interface.
- High accuracy class (0.2S for active energy).
- Graphical color display: LCD 3.5" typu TFT, 640 x 480 pixels, fully configurable by a user.
- 14 predefined screens designed for intuitive operation, including harmonics display, analog-style meter visualization, and a demand power screen useful for forecasting power consumption.
- 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).
- Digital output RS-485 - MODBUS protocol.
- Archiving of up to 32 measured parameters in the internal memory 8 GB.
- 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,
  - Daisy Chain communication 2 x RJ45; 10/100 Mbit/s; 10Base-T / 100Base-TX.
- Programming of parameters using free eCon software.
- Overall dimensions: 96 x 96 x 77 mm.

ETHERNET DAISY CHAIN - ONE CABLE, MANY CONNECTIONS

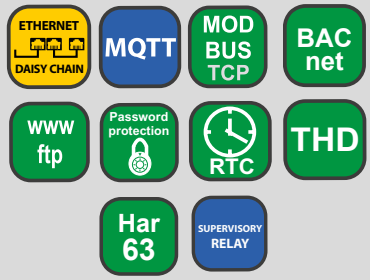
The **ND31PLUS** is equipped with **2 x RJ45 Ethernet ports** that support daisy chain topology — enabling serial connection of Ethernet devices without the need for network switches between them.

What does this mean in practice?

- Saves panel space – no need to install industrial switches,
- Reduces cabling and hardware costs – only one connection between devices,
- Faster installation and fewer errors – simplified wiring,
- Easy system expansion – new devices can be added without modifying the existing infrastructure,
- Improved cabinet organization – fewer cables result in a cleaner setup.

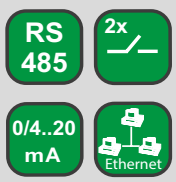


FEATURES

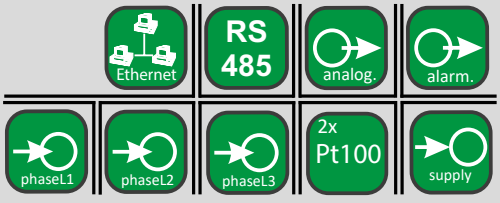


INPUTS

OUTPUTS



GALVANIC ISOLATION

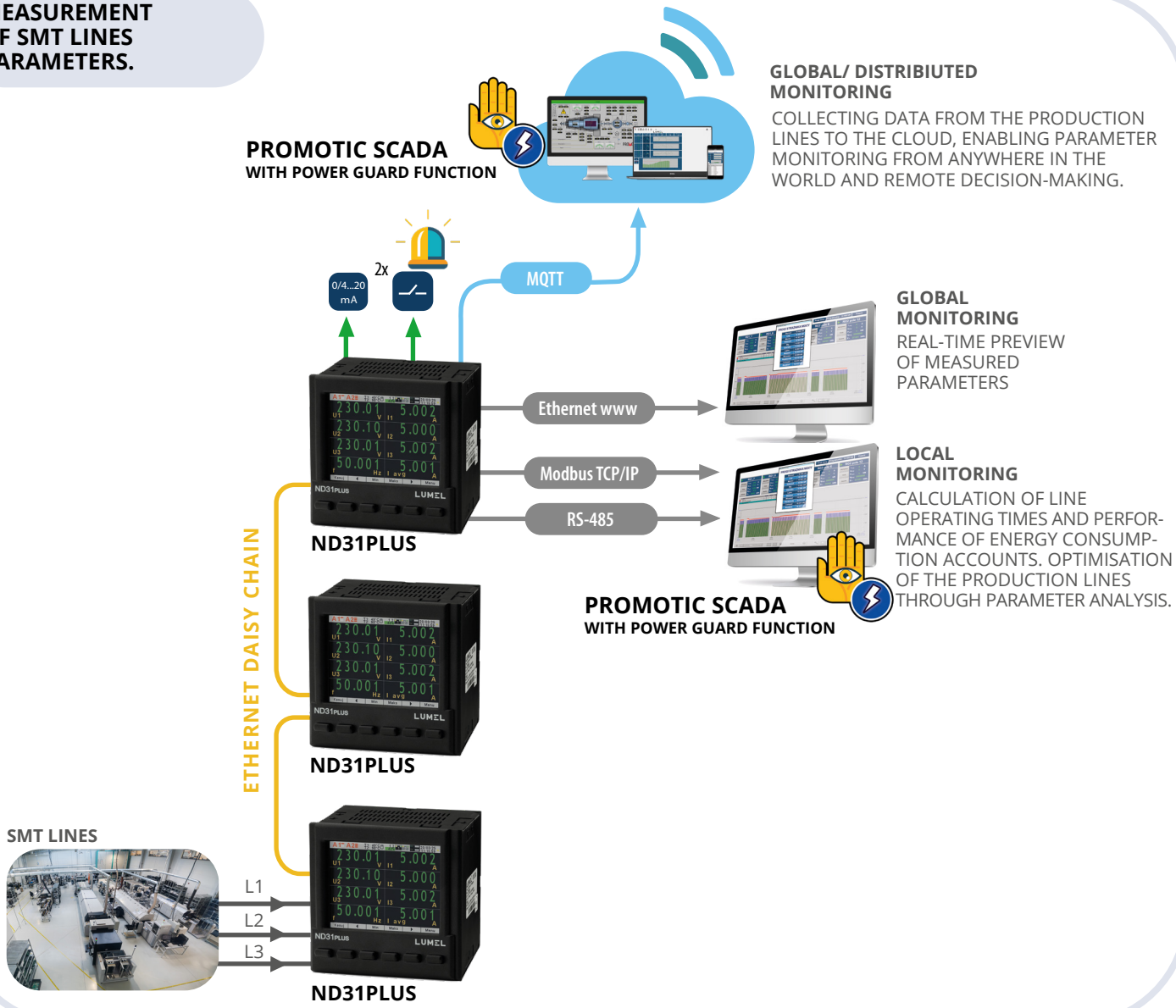


MEASUREMENT AND VISUALIZATION OF POWER NETWORK PARAMETERS

- 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: $tg\varphi_1$, $tg\varphi_2$, $tg\varphi_3$
- active, reactive and apparent 3-phase power: P, Q, S
- mean 3-phase power factors: PF, tgφ
- 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_U, THD_I
- harmonics for current and phase voltage up to 63rd!
- temperature (2 x Pt100 input)

EXAMPLE OF APPLICATION

MEASUREMENT OF SMT LINES PARAMETERS.



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≠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 W .. ..19999 MW (tr_U≠1,tr_I≠1)	•	•	•	•	0.5 (EN 61557-12)
Reactive power Q	-19999 MVar .. 0,000 Var .. ..19999 MVar (tr_U≠1,tr_I≠1)	•	•	•	•	1 (EN 61557-12)
Apparent power S	0.000 .. 1999,9 VA .. ..19999 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 kVarh				•	1 (EN 61557-12)
Apparent energy EnS	0.000 .. 99 999 999.999 kVAh				•	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}...U_{h63}, and current I_{h2} ... 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, measuring range -50...400°C, basic error 0.5 %

DIGITAL INTERFACE

Interface type	Transmission protocol		Remarks
Ethernet Daisy Chain (2 x RJ45) Ethernet 10/100 Base-T	Modbus TCP, HTTP, FTP		WWW server, FTP server, DHCP client, NTP server
	MQTT		
	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)
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

EXTERNAL FEATURES

Readout field	graphic color display LCD TFT 3,5", 640 x 480 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

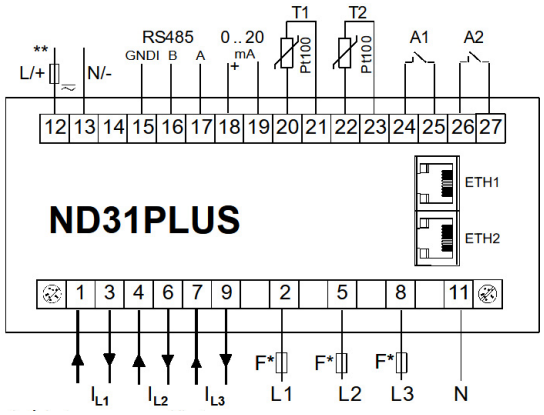
RATED OPERATING CONDITIONS

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_i, $tg\varphi_i$	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

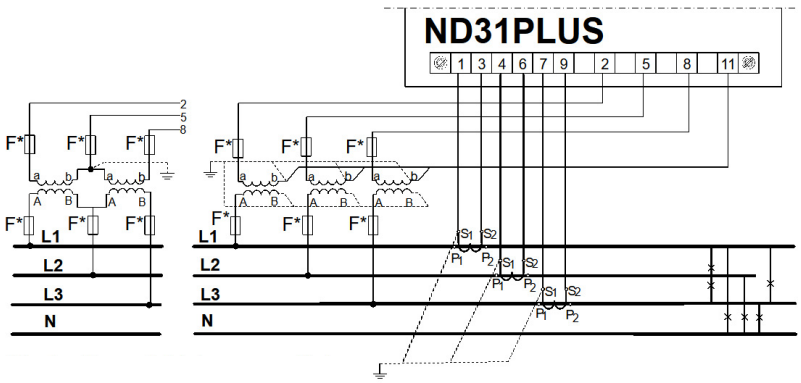
SAFETY AND COMPATIBILITY REQUIREMENTS

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	
	noise emissions	acc. to EN 61000-6-4, EN IEC 61326-1
Isolation between circuits	basic	acc. to EN 61010-1
Polution 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



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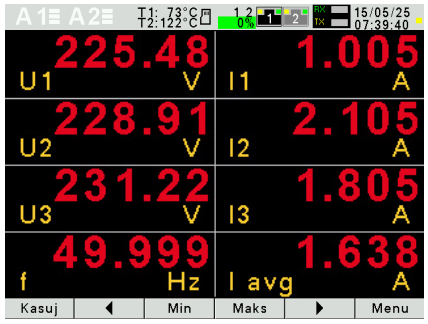
Description of meter connections strips

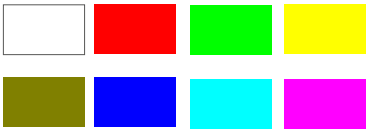
Indirect measurement in 4-wire network - connection of input signals

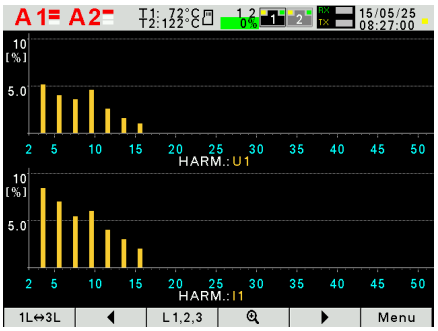
DISPLAING OF MEASUREMENT PARAMETERS



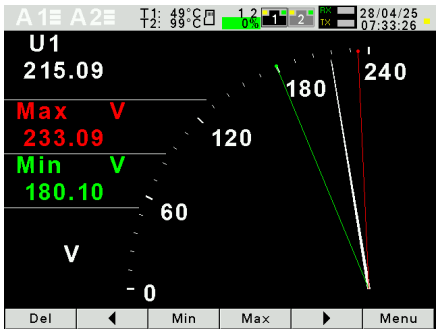
up to 10 programmable screens
(8 parameters per page);
ability to change color for all screens

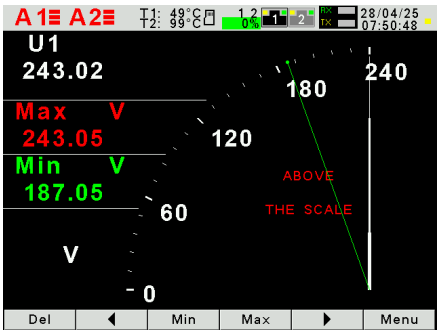
Available colors for digital indications:



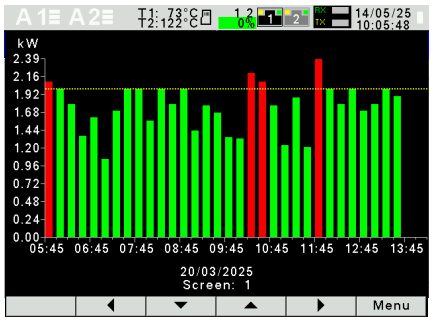


two screens dedicated to harmonics;
indication of individual harmonic
for voltages and currents (up to 51st);
bargraph presentation for all harmonics
with zoom function





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

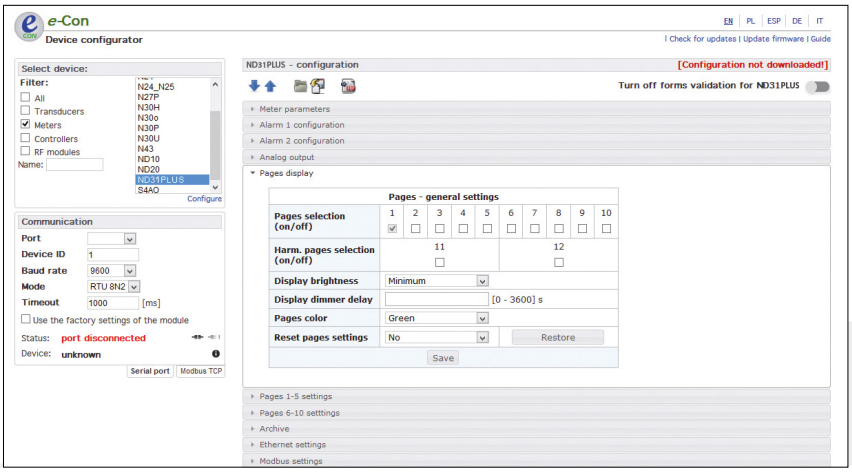


Contracted power representation
(Max Demand) in W, kW or MW, which
can be used for forecasting
power consumption.

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

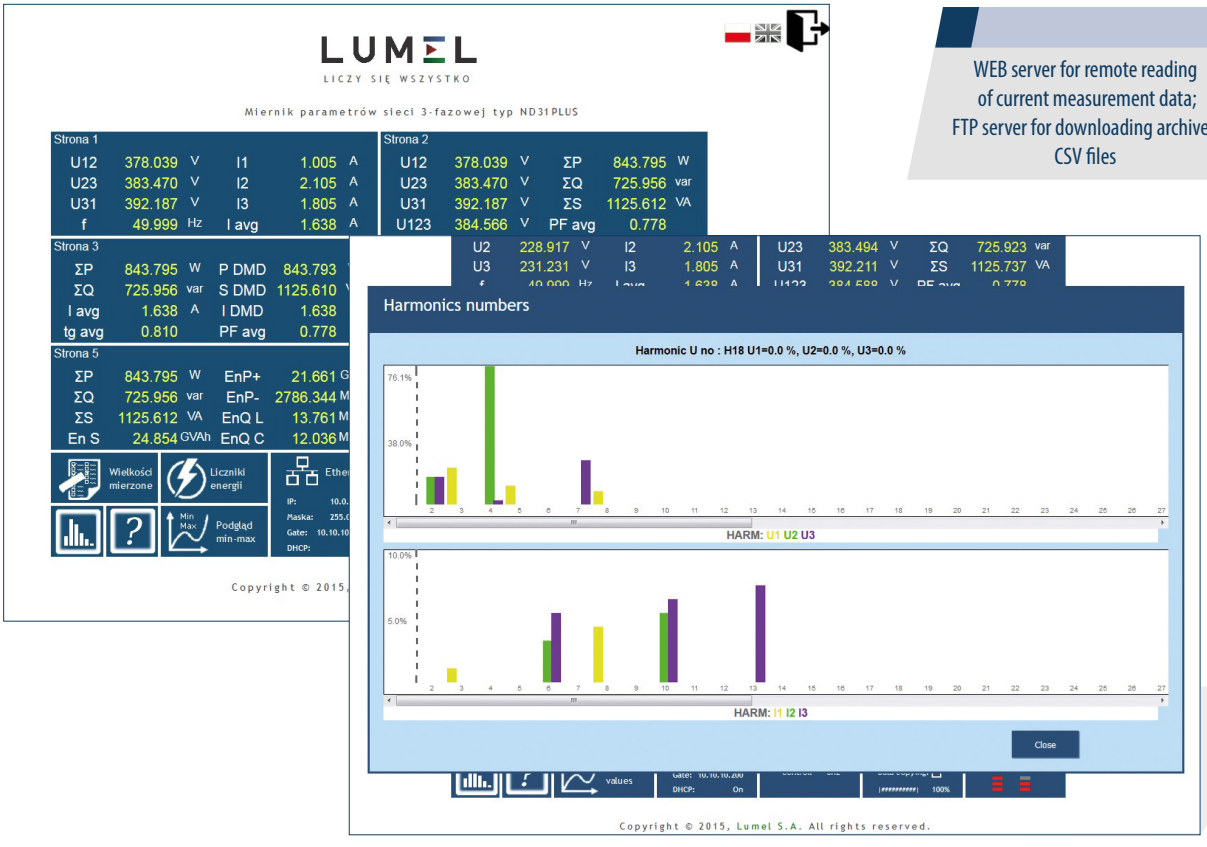
*- available depending on the ND31PLUS version

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 THROUG ETHERNET: **WWW SERVER, FTP**



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

ORDERING CODE

Meter ND31PLUS 2 relays, 1 analog output (0–20 mA), 2 Pt100 inputs, RS485, dual-port Ethernet, internal file system memory.	**X**	**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				
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 **ND31PLUS 11M0** means:
ND31PLUS – meter ND31PLUS,
1 – input voltage 3 x 57.7/100 V, 3 x 230/400 V,
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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