



## ND30 - METER OF POWER NETWORK PARAMETERS

### ND30IoT - METER OF POWER NETWORK PARAMETERS FOR IoT APPLICATIONS

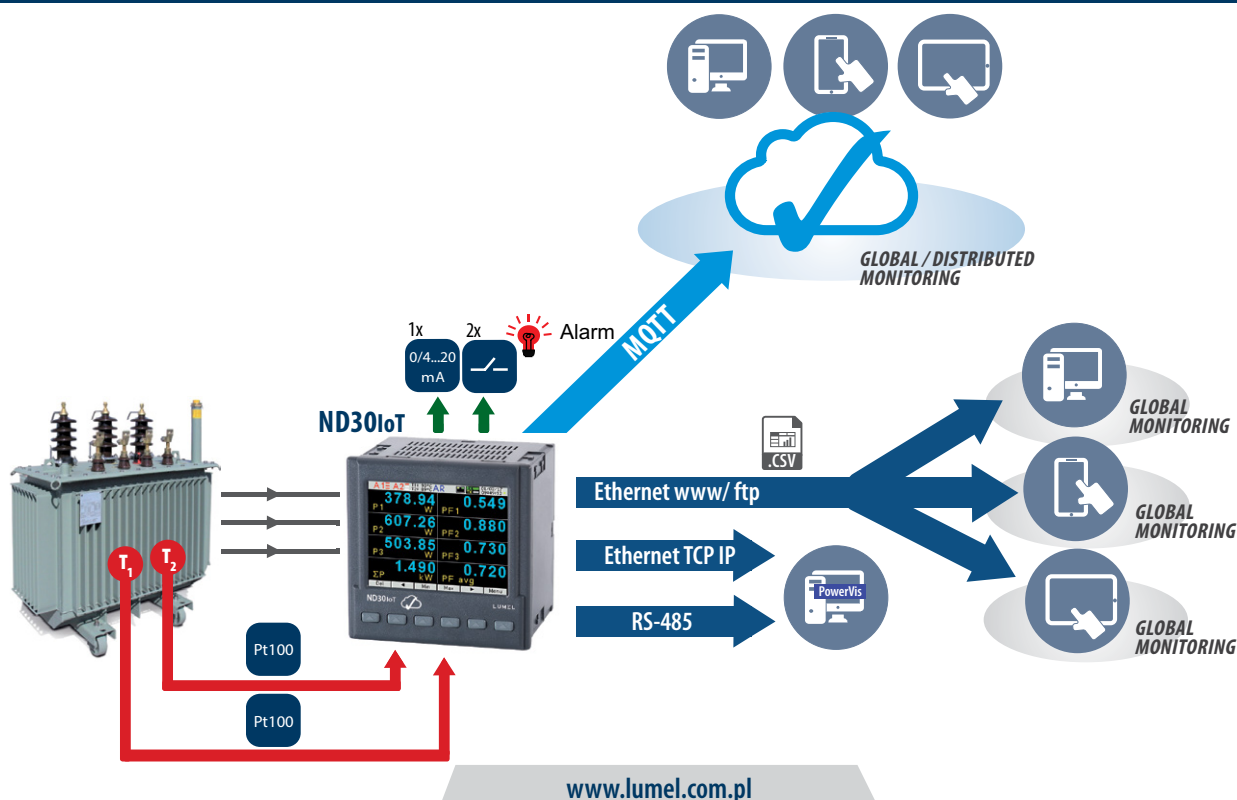
- **Measurement** of 54 power network parameters, including **current and voltage harmonics up to 63rd** in 1-phase 2-wire or 3-phase 3 or 4-wire balanced and unbalanced systems.
- **The MQTT protocol is ideal for communication in distributed acquisition systems data - IoT applications (ND30IoT).**
- **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 vies, 8 parameters in each).
- **Additional 2 pages for harmonics presentation and 1 dedicated page for visualization in the form of an analog meter.**
- Indications include the values of programmed ratios.
- Memory of minimum and maximum values.
- 2 configurable alarm outputs.
- Optional: analog output 0/4...20 mA and 2 PT 100 inputs (eg. for measurement of transformer temperature), 2 galvanically isolated binary inputs 0/5...24V d.c.
- Archiving of up to 32 measured parameters in the internal memory 8 GB (option).
- Digital output RS-485 - MODBUS protocol.
- **Modern and user-friendly Ethernet interface 10/100 BASE-T (option):**
  - protocol: MODBUS TCP/IP, HTTP, FTP,
  - protocol: MQTT (**ND30IoT**),
  - services: www server, ftp server, DHCP client.
- Programming of parameters using **free eCon software.**
- Battery backup RTC.
- Overall dimensions: 96 x 96 x 77 mm.
- **Supervisory relay mode for alarm outputs (ND30 and ND30IoT)**
- **MQTT protocol (for ND30)**



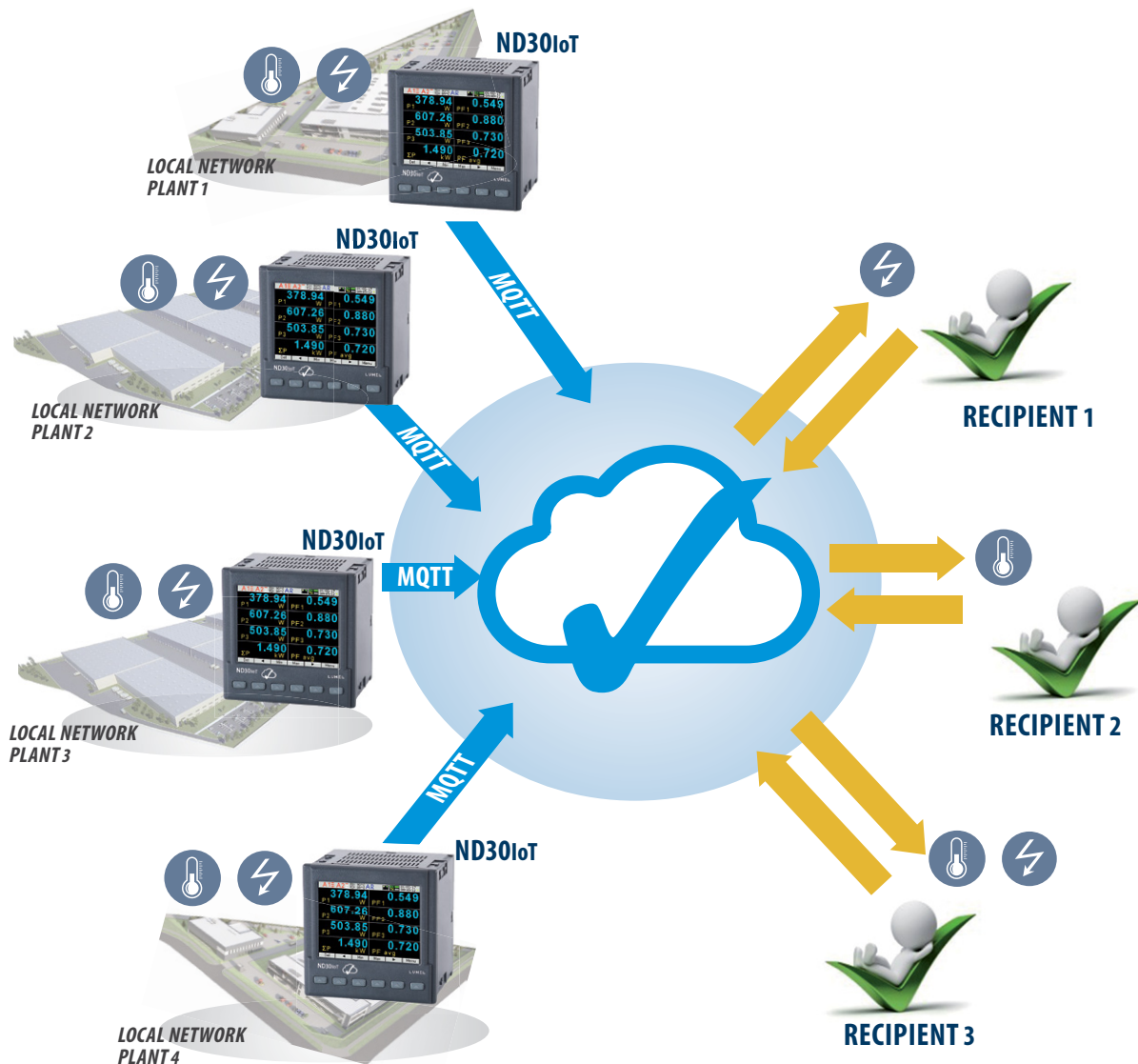
#### Remarks:

- New features available from 1.07 firmware version.
- To make functions active, order appropriate licence key – details in ordering code.
- Functions can be also activated on the devices which have been already installed on the facility after software upgrade.

### EXAMPLE OF APPLICATION



## 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  $THD_U, THD_I$
- harmonics for current and phase voltage up to 63rd!
- temperature (2 x Pt100 input)

FEATURES	INPUTS	OUTPUTS	GALVANIC ISOLATION

## 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 <sub>I</sub> ≠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 ..132.00 V 23.000..46.000 .. 276.00 V 40.000..80.000 .. 480.00 V ...1920.0 kV	•	•	•		0.2 (EN 61557-12)
Voltage L-L 100 V~ 190 V~ 400 V~ 690 V~	10.000 ..20.000..120.00 V 19.000 ..38.000..228.00 V 40.000..80.00 .. 480.00 V 69.000..138.00 .. 830.00 V ...1999.0 kV (tr <sub>U</sub> ≠1)	•	•	•		0.5 (EN 61557-12)
Active power P	-19999 MW .. 0,000 W .. ..19999 MW (tr <sub>U</sub> ≠1, tr <sub>I</sub> ≠1)	•	•	•	•	0.5 (EN 61557-12)
Reactive power Q	-19999 MVar .. 0,000 Var .. ..19999 MVar (tr <sub>U</sub> ≠1, tr <sub>I</sub> ≠1)	•	•	•	•	1 (EN 61557-12)
Apparent power S	0.000 .. 1999,9 VA .. ..19999 MVA (tr <sub>U</sub> ≠1, tr <sub>I</sub> ≠1)	•	•	•	•	0.5 (EN 61557-12)
Active energy EnP (imported or exported)	0.000 .. 99 999 999.999 kWh				•	<b>0.2S (EN 62053-22)</b>
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 <sub>h2</sub> ...U <sub>h63</sub> and current I <sub>h2</sub> ... I <sub>h63</sub>	0.0 ..100.0 %	•	•	•		II (IEC61000-4-7)

tr<sub>I</sub> - Current transformer ratio = Transformer primary current / Current transformer secondary current  
tr<sub>U</sub> - Voltage transformer ratio = Transformer primary voltage / Voltage transformer secondary voltage

### ADDITIONAL INPUTS

Input type	Properties
Input Pt100 (T1, T2) - option	2 x Pt100, 2-wire, -50...400°C, basic error 0.5 %
Binary inputs - option	0V d.c. – binary input inactive, 5...24V d.c. – binary input active

### 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
Ethernet 10/100 Base-T -option	Modbus TCP,HTTP,FTP MQTT	WWW server, FTP server, DHCP client

## 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

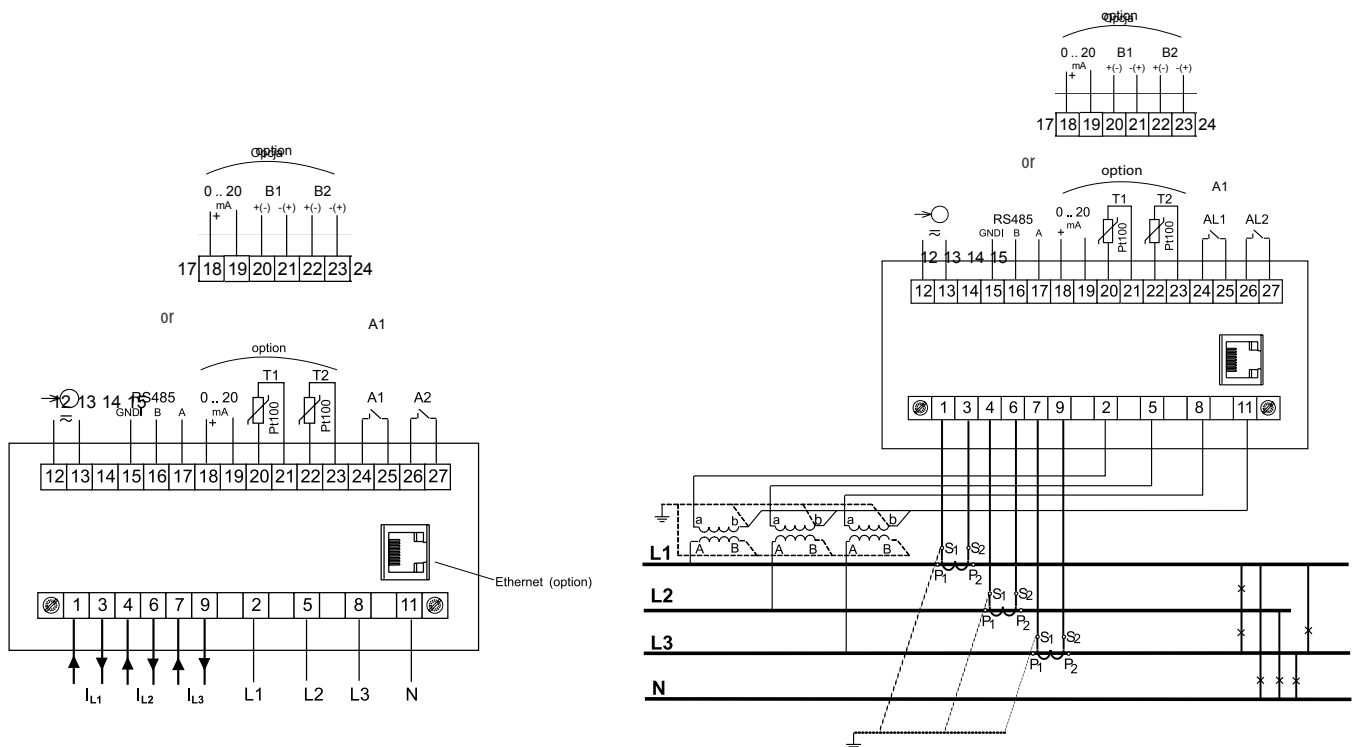
## RATED OPERATING CONDITIONS

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 ≤ 0.2 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 <sub>p</sub>	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...65...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 COMPABILITY REQUIREMENTS

Electromagnetic compatibility	noise immunity	acc. to EN 61000-6-2
	noise emissions	acc. to EN 61000-6-4
Isolation insured by the casing	double	acc. to EN 61010-1
Isolation between circuits	basic	acc. to EN 61010-1
Polution level	2	acc. to EN 61010-1
Installation category	III	acc. to EN 61010-1
Maximal phase-to-earth voltage	<ul style="list-style-type: none"> <li>for supply circuit and relay outputs 300 V</li> <li>for measuring input 500 V</li> <li>for circuits of RS-485, Ethernet, pulse input and output, analog outputs: 50 V</li> </ul>	acc. to EN 61010-1
Altitude a.s.l.	< 2000 m	

## CONNECTION DIAGRAMS



Description of meter connections strips

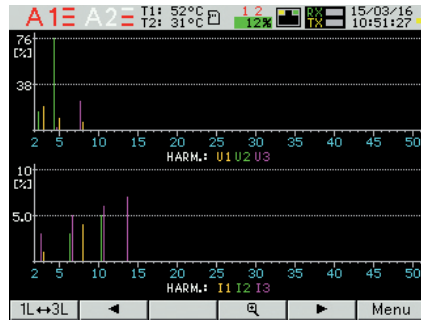
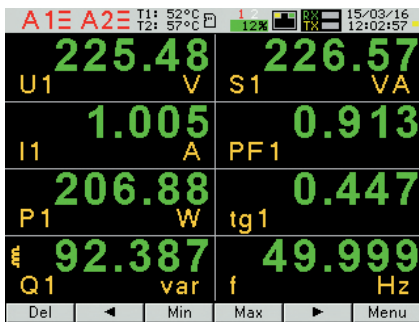
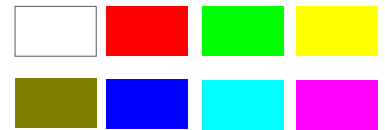
Indirect measurement in 4-wire network - connection of input signals

## 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

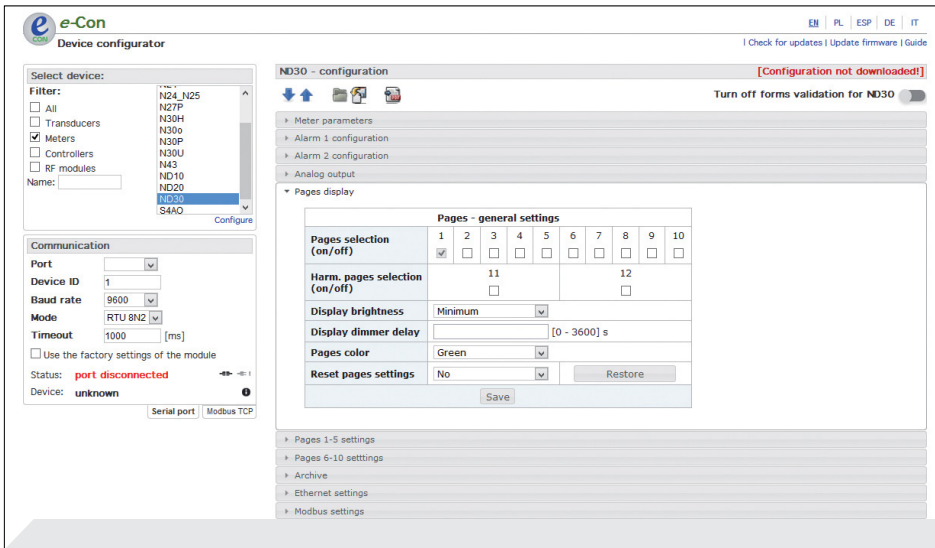


easy to use and intuitive menu;  
information bar with status of: phase sequence, alarm outputs, temperature measurements\*, archiving and memory\*, Ethernet\* and RS-485 interfaces, time and date

\*- availability of feature depends on hardware version of ND30IoT, ND30



## METER CONFIGURATION WITH FREE eCON SOFTWARE



ability to configure and update ND30IoT, ND30 with free eCon software (via RS-485 or Ethernet\* interface)

\*- availability of feature depends on hardware version of ND30IoT, ND30

## REMOTE READOUT OF PARAMETERS THROUGH ETHERNET: WWW SERVER, FTP

The screenshot shows the LUMEL web server interface for a '3-PHASE POWER NETWORK METER TYPE ND30'. It displays multiple pages of data:

- 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, tg 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 GWh, 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

At the bottom, there are navigation icons for 'Measure values', 'Energy counters', and 'Ethernet' settings (IP: 10.0.0.69, Mask: 255.0.0.0, Gate: 10.10.10.200, DHCP: On).

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

\*- availability of feature depends on hardware version of ND30IoT, ND30

The 'Harmonics numbers' window displays two bar charts. The top chart is titled 'Harmonic U no : H18 U1=0.0 %, U2=0.0 %, U3=0.0 %' and shows harmonic levels for phases U1, U2, and U3. The bottom chart is titled 'HARM: U1 U2 U3' and shows harmonic levels for phases H1, H2, and H3. The charts show significant harmonic content at the 4th and 13th orders.

## ORDERING CODE

Meter ND30	X	X	X	X	XX	X	X
<b>Input voltage (phase/phase-to-phase) Un:</b>							
3 x 57.7/ 100 V, 3x 230/ 400 V	1						
3 x 110/ 190 V, 3 x 400/ 690 V	2						
<b>Additional outputs /inputs:</b>							
2 relays	1						
2 relays, 1 analog output, 2 inputs PT100	2						
2 relays, 1 analog output, 2 isolated binary inputs	3						
<b>Interface:</b>							
RS-485	1						
RS-485 and Ethernet, internal memory	2						
<b>Supply:</b>							
85...253 V a.c., 90...300 V d.c.	1						
20...40 V a.c., 20...60 V d.c.	2						
<b>Version:</b>							
standard					00		
supervisory relay					SR		
custom-made*					XX		
<b>Language:</b>							
Polish/English						M	
other*							X
<b>Acceptance tests:</b>							
without additional quality requirements							0
with an extra quality inspection certificate							1
with an extra calibration certificate							2
acc.to customer's request							X

\* only after agreeing with the manufacturer

### ORDERING WAY OF ADDITIONAL FUNCTIONS (SUPERVISORY RELAY, MQTT PROTOCOL)

Ordering code	Description of the license key
LKEY WXND30MQ	activation of the MQTT protocol in ND30
LKEY WXND30SR	activation of the supervisory relay function in ND30
LKEY WXND30MS	activation of the MQTT protocol and the supervisory relay function in ND30

**Important:** When ordering, please provide the meter's execution code and serial number ND30. It is placed on the meter's nominal plate, in the configuration menu in the Information mode (see below - figure 1) or on the bar in the eCon program (Fig.2)

#### Order example:

The code: **ND30\_122100M0** means:

**ND30** - meter ND30

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

**2** - 2 relays, 1 analog output, 2 inputs PT100

**2** - RS-485 and Ethernet, internal memory

**1** - supply: 85...253 V a.c., 90...300 V d.c.

**00** - standard version

**M** - Polish/ English language version

**0** - without additional quality requirements.

Meter ND30IoT	X	X	2	X	XX	X	X
<b>Input voltage (phase/phase-to-phase) Un:</b>							
3 x 57.7/ 100 V, 3x 230/ 400 V	1						
3 x 110/ 190 V, 3 x 400/ 690 V	2						
<b>Additional outputs /inputs:</b>							
2 relays	1						
2 relays, 1 analog output, 2 inputs PT100	2						
2 relays, 1 analog output, 2 isolated binary inputs	3						
<b>Interface:</b>							
RS-485 and Ethernet, internal memory	2						
<b>Supply:</b>							
85...253 V a.c., 90...300 V d.c.	1						
20...40 V a.c., 20...60 V d.c.	2						
<b>Version:</b>							
MQTT protocol					MQ		
supervisory relay + MQTT protocol					MS		
<b>Language:</b>							
Polish/ English						M	
other*							X
<b>Acceptance tests:</b>							
without additional quality requirements							0
with an extra quality inspection certificate							1
with an extra calibration certificate							2
acc.to customer's request*							X

\* only after agreeing with the manufacturer

### ORDERING WAY OF ADDITIONAL FUNCTIONS (SUPERVISORY RELAY)

Ordering code	Description of the license key
LKEY WXND30IOTMS	activation of the supervisory relay function in ND30IoT

**Important:** When ordering, please provide the meter's execution code and serial number ND30IoT. It is placed on the meter's nominal plate, in the configuration menu in the Information mode (see below - figure 1) or on the bar in the eCon program (Fig.2)

#### Order example:

The code: **ND30IoT\_1221MQM0** means:

**ND30IoT** - meter ND30IoT

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

**2** - 2 relays, 1 analog output, 2 inputs PT100

**2** - RS-485 and Ethernet, internal memory

**1** - supply: 85...253 V a.c., 90...300 V d.c.

**MQ** - MQTT version

**M** - Polish/ English language version

**0** - without additional quality requirements.

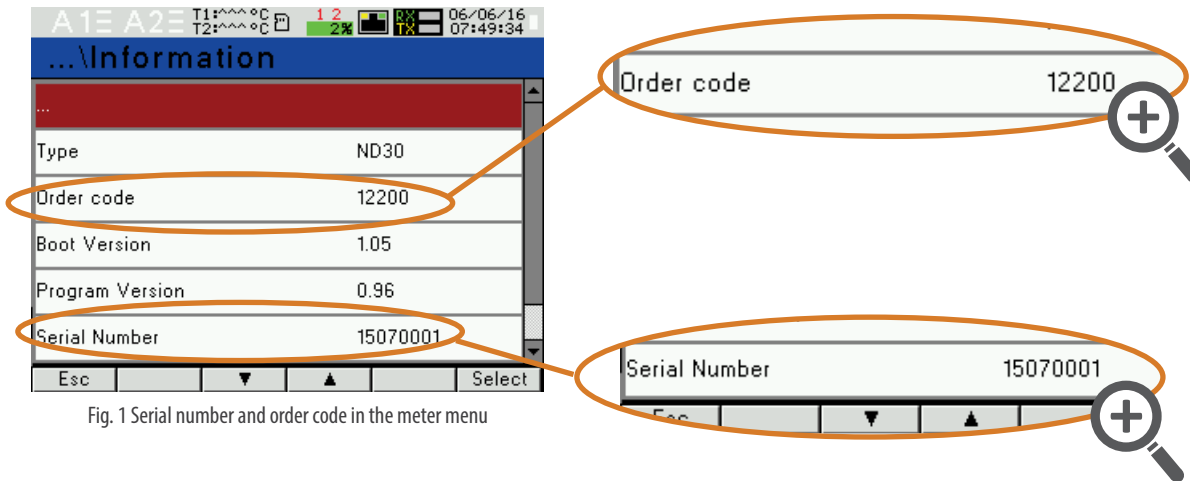


Fig. 1 Serial number and order code in the meter menu

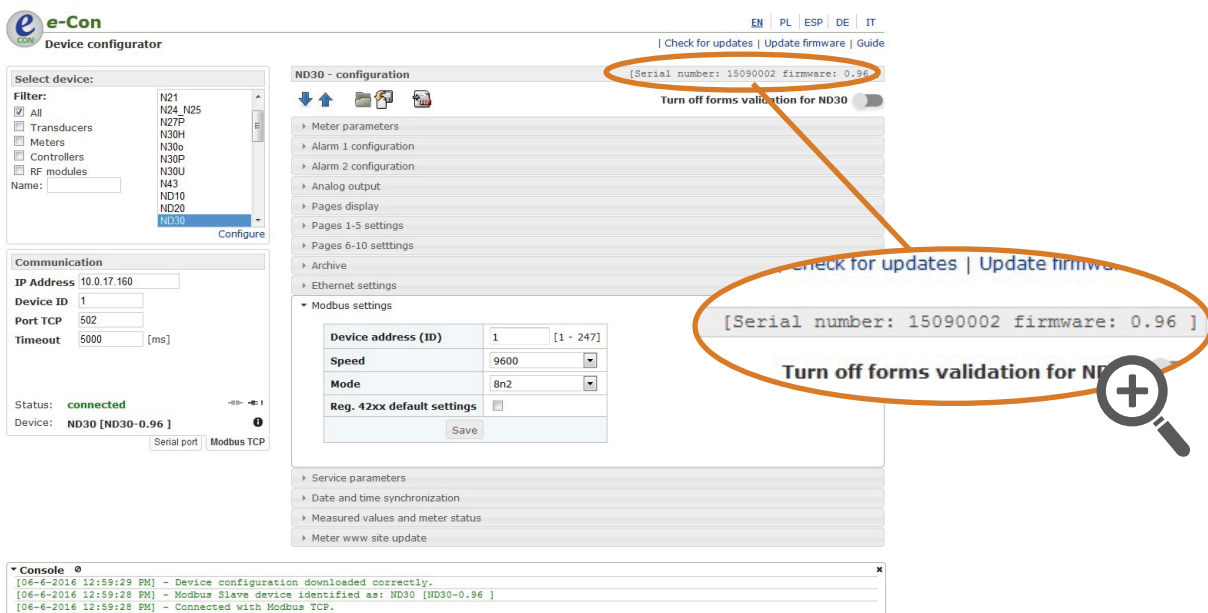


Fig. 2 Serial number in the eCon software bar

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ND30-19F\_ND30IoT-19B\_en



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EVERYTHING COUNTS

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