



# ND31U

## POWER NETWORK METER

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

# FEATURES

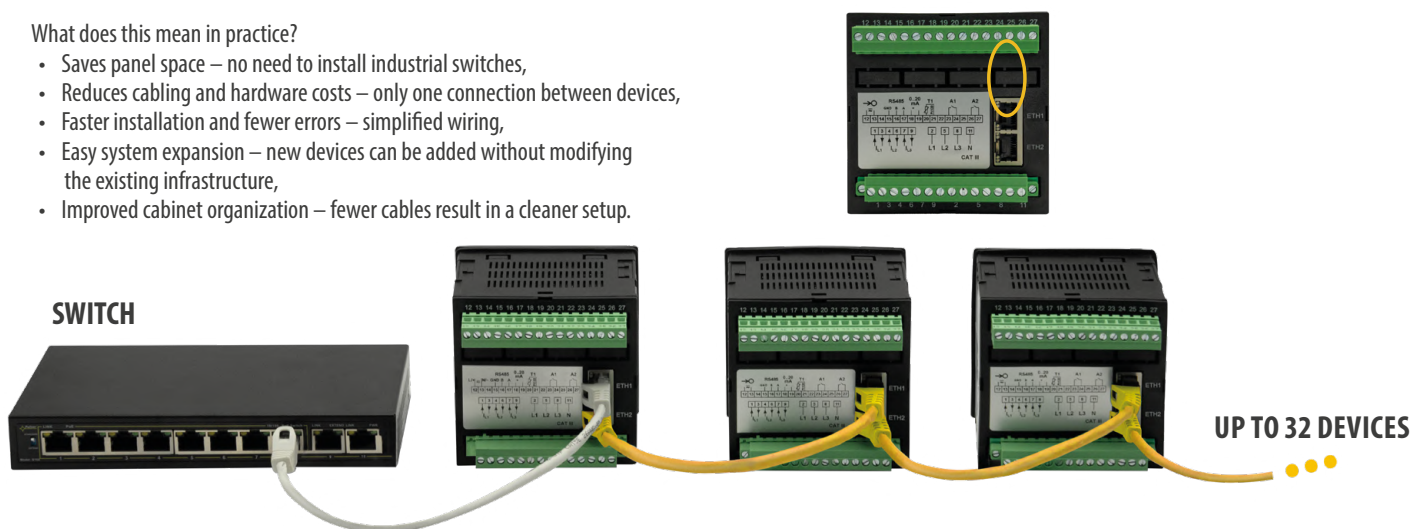
- Measurement of 54 power network parameters, including current and voltage harmonics up to 63rd in 1PW2, 1P3W split phase, 3P3W or 3P4W balanced and unbalanced systems:
  - 120/240 V Split-phase 180°,
  - 3 x 120/208 V,
  - 3 x 400/690 V three-phase Y/Δ 120°
- **Ethernet Daisy Chain Topology.**
- Programmable 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" tytu 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 Pt 100 input (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

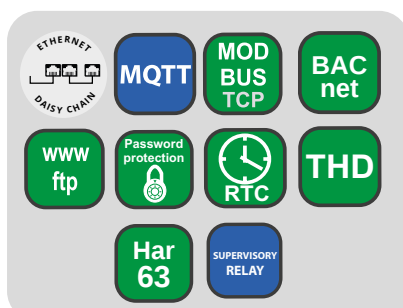
The **ND31U** is equipped with **2 x RJ45 Ethernet ports** that support daisy chain topology — enabling serial connection of Ethernet devices without the need for network switches between them.

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.



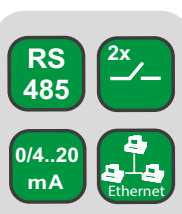
### FEATURES



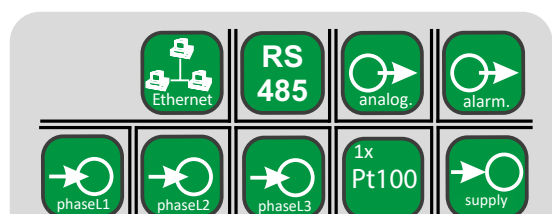
### INPUTS



### OUTPUTS



### GALVANIC ISOLATION

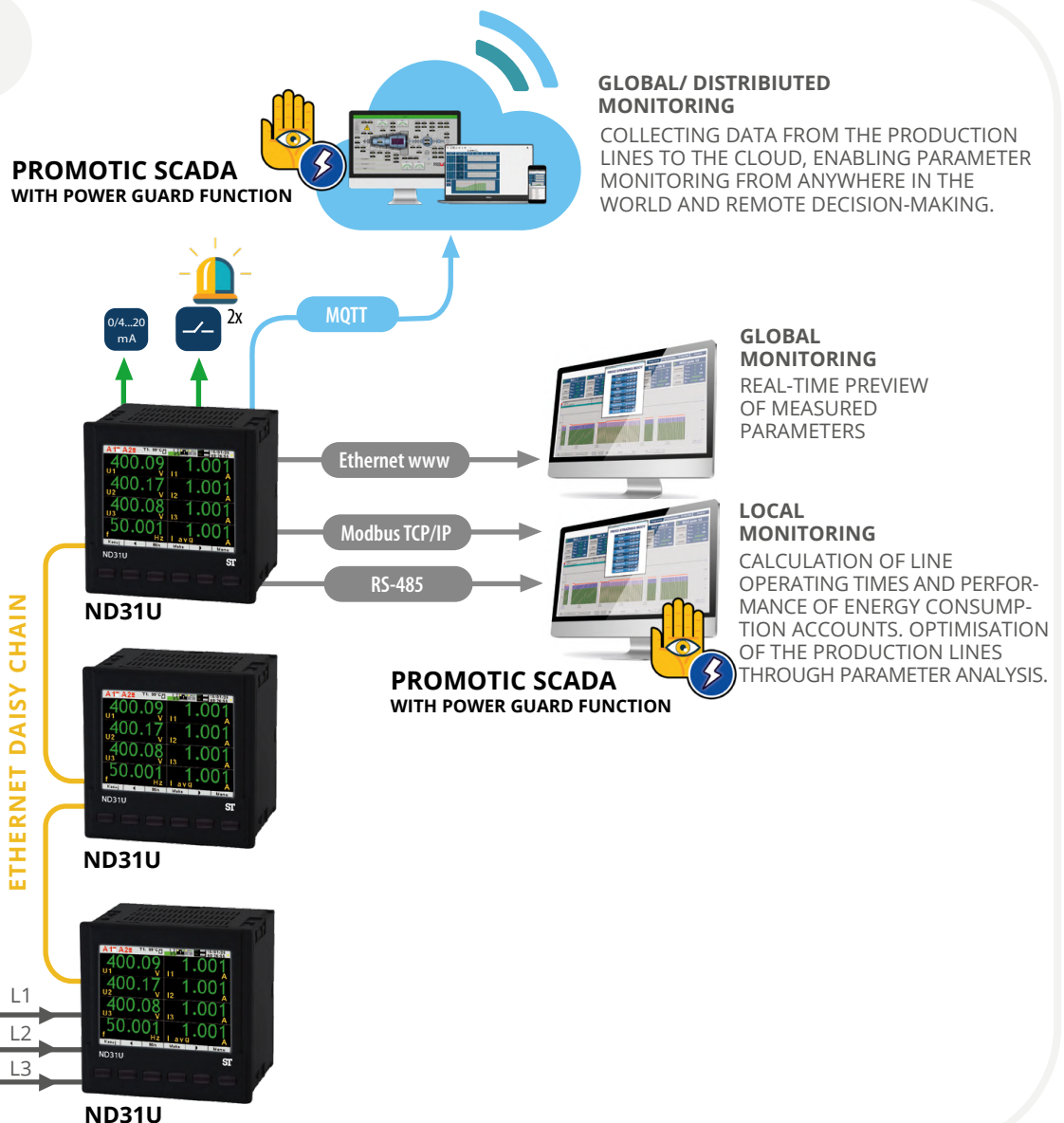


## MEASUREMENT AND VISUALIZATION OF POWER NETWORK PARAMETERS

- 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:  $tg\phi_1, tg\phi_2, tg\phi_3$
- 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 (1 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 I/S A 1 A~<br>5 A~                                                             | 0.002 .. 0.100 .. 1.200 A<br>0.010 .. 0.500 .. 6.000 A<br>... 100.00 kA (tr_I ≠ 1)          | •  | •  | •  |   | 0.2 (EN 61557-12)  |
| Voltage L-N 120 V~<br>400 V~                                                           | 12.000 .. 24.000 .. 144.000 V<br>40.000 .. 80.000 .. 480.000 V<br>... 1920.0 kV             | •  | •  | •  |   | 0.2 (EN 61557-12)  |
| Voltage L-L 208 V~<br>690 V~                                                           | 20.800 .. 41.600 .. 249.000 V<br>69.000 .. 138.000 .. 830.000 V<br>... 1999.0 kV (tr_U ≠ 1) | •  | •  | •  |   | 0.5 (EN 61557-12)  |
| Active power P                                                                         | -19999 MW .. 0.000 W ..<br>.. 19999 MW (tr_U ≠ 1, tr_I ≠ 1)                                 | •  | •  | •  | • | 0.5 (EN 61557-12)  |
| Reactive power Q                                                                       | -19999 MVar .. 0.000 Var ..<br>.. 19999 MVar (tr_U ≠ 1, tr_I ≠ 1)                           | •  | •  | •  | • | 1 (EN 61557-12)    |
| Apparent power S                                                                       | 0.000 .. 1999.9 VA ..<br>.. 19999 MVA (tr_U ≠ 1, tr_I ≠ 1)                                  | •  | •  | •  | • | 0.5 (EN 61557-12)  |
| Active energy EnP<br>(imported or exported)                                            | 0.000 .. 99 999 999.999 kWh                                                                 |    |    |    | • | 0.2S (EN 62053-22) |
| Reactive energy EnQ<br>(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<br>(ratio of reactive power to active power)                            | -999.99... -1.20 .. 0 .. 1.20... 999.99                                                     | •  | •  | •  | • | 1                  |
| Frequency f                                                                            | 45.000... 65.000... 100.00 Hz                                                               |    |    |    | • | 0.1 (EN 61557-12)  |
| Total harmonic distortion<br>of voltage THDU and current THDI                          | 0.0 .. 100.0 %                                                                              | •  | •  | •  | • | 5 (EN 61557-12)    |
| Amplitudes of the voltage $U_{h2} \dots U_{h63}$<br>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) | 1 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)<br>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):<br>BACnet Application Specific Controller (B-ASC);<br><br>BACnet Interoperability Building Blocks (BIBB) Support (Annex K in BACnet Addendum 135d):<br>DS-RP-B, DS-WP-B, DS-RPM-B, DM-DOB-B, DM-DDB-B, DM-DCC-B, DM-RD-B;<br><br>Binding methods support:<br>Receive Who-Is, send I-Am (BIBB, DM-DDB-B);<br>Receive Who-Has, send I-Have (BIBB DM-DOB-B) |
| RS-485                                                    | Modbus RTU 8N2,8E1,8O1,8N1 | Address 1...247<br>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     |

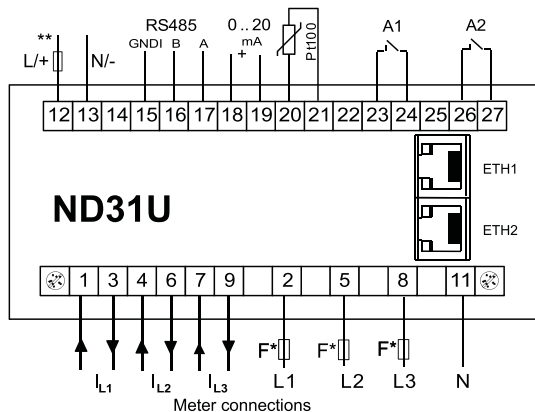
## RATED OPERATING CONDITIONS

|                                                |                                                                          |                                                                |
|------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------|
| Supply voltage                                 | 85...300 V a.c. (50/60 Hz), 90...300 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 $\phi$ | 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: $< 50\%$ / $10^\circ\text{C}$ |

## SAFETY AND COMPATIBILITY REQUIREMENTS

|                                |                                                                                                                                         |                                      |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Electromagnetic compatibility  | noise immunity                                                                                                                          | acc. to EN 61000-6-2, EN IEC 61326-1 |
|                                | radio-frequency common mode:<br>• level 2: 0.15...1 MHz<br>• 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<br>• for measuring input 500 V<br>• for circuits of RS-485, Ethernet, analog outputs: 50 V | acc. to EN 61010-1                   |
| Altitude a.s.l.                | $< 2000$ m                                                                                                                              |                                      |

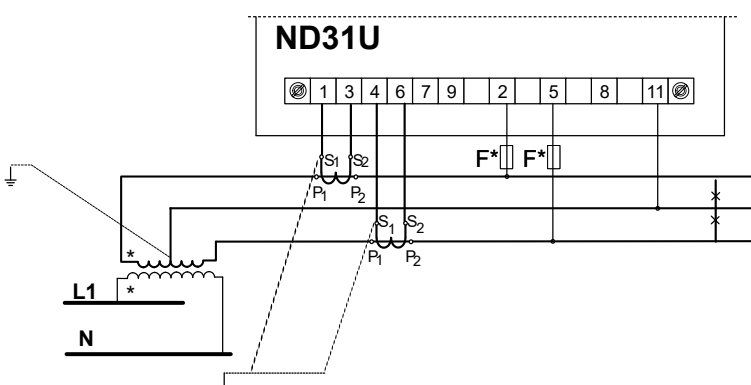
## CONNECTION DIAGRAMS



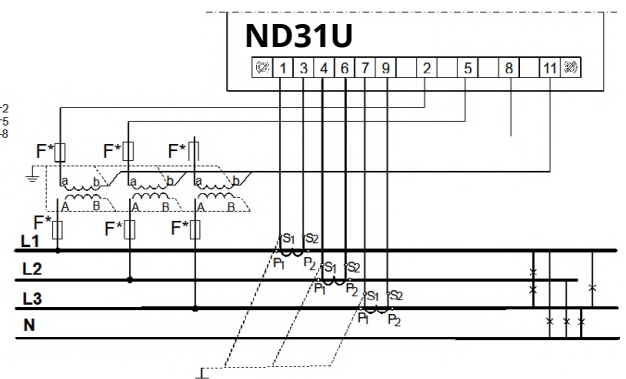
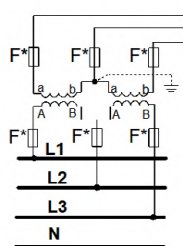
\* Fuses must be provided by the customer

\*\*Connection of supply voltage

### Description of meter connections strips



\* Fuses must be provided by the customer



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

\* Fuses must be provided by the customer.

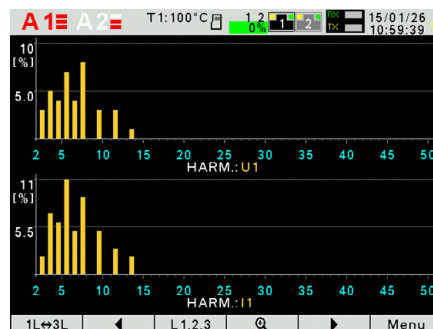
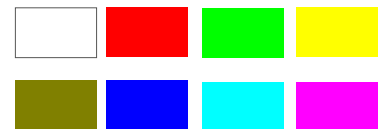
### Measurement in 1-phase 3-wire network

## DISPLAING OF MEASUREMENT PARAMETERS

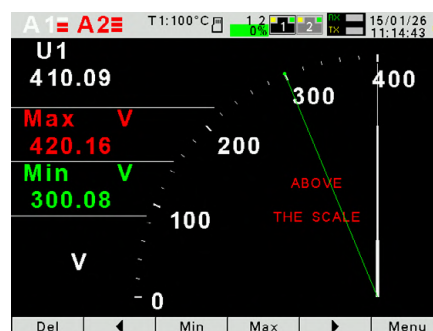
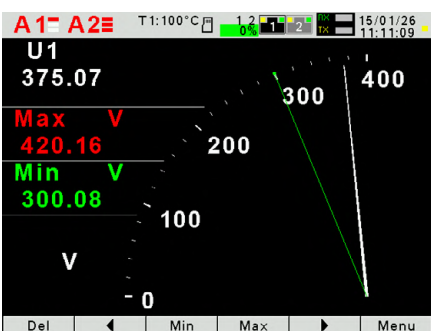


up to 10 programmable screens  
(8 parameters per page);  
ability to change color for all screens

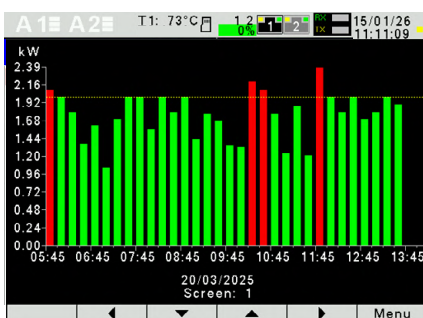
Available colors for digital indications:



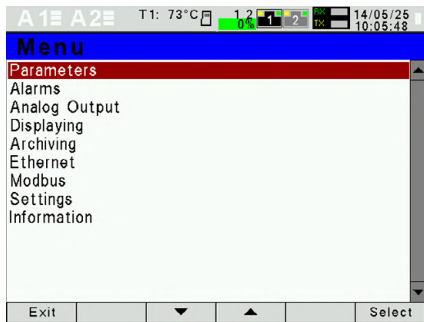
two screens dedicated to harmonics;  
indication of individual harmonic  
for voltages and currents (up to 51st);  
bargraph presentation for all harmonics  
with zoom function



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

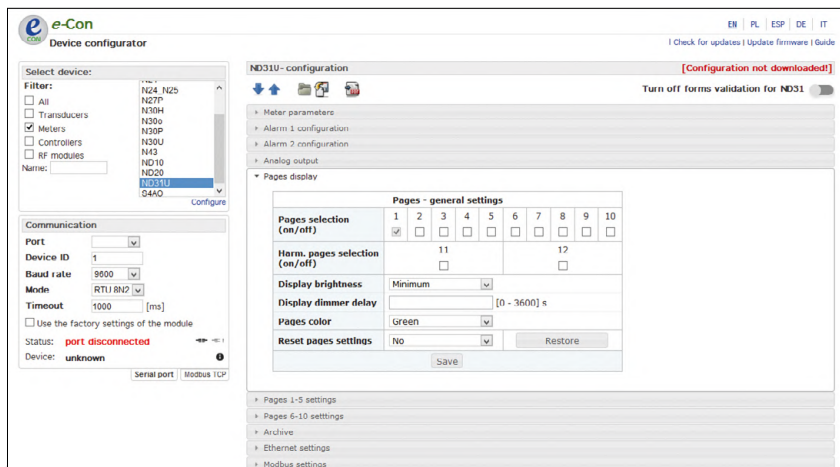


contracted power representation  
(Max Demand) in W, kW or MW,  
which can be used for forecasting  
power consumption.



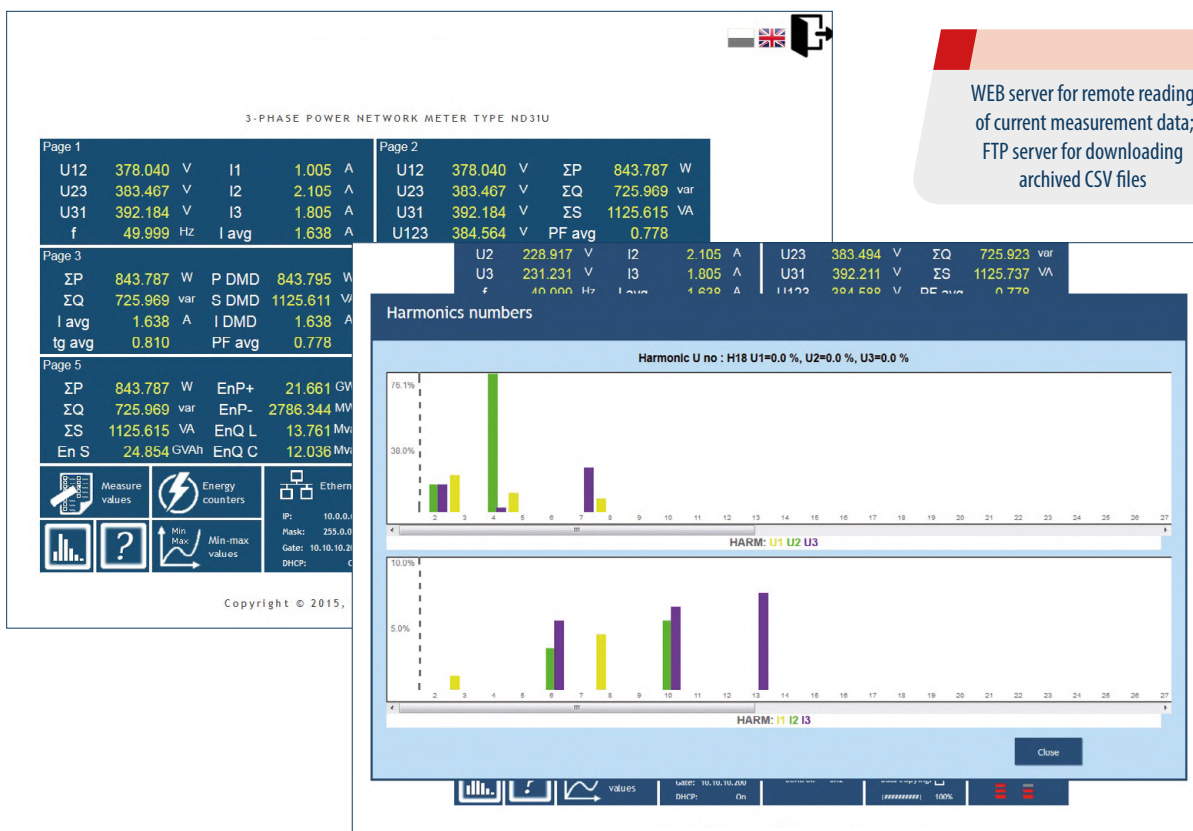
easy to use and intuitive menu;  
information bar with status of: phase  
sequence, alarm outputs, temperature  
measurements, archiving and memory,  
Ethernet and RS-485 interfaces,  
time and date

## 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



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

## ORDERING CODE

|                                              |   |   |      |
|----------------------------------------------|---|---|------|
| Meter ND31U                                  | X | X | XXXX |
| <b>Language</b>                              |   |   |      |
| 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 |      |
| <b>Version</b>                               |   |   |      |
| standard                                     |   |   |      |
| custom made*                                 |   |   | XXXX |

\* only by agreement with the manufacturer.

ORDER EXAMPLE, code **ND31U - M 0** means:

**ND31U** – ND31U meter,

**M** – English language version,

**0** – no additional requirements,

– standard version.