



**sifam tinsley**  
PRECISION INSTRUMENTATION



# ND31

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

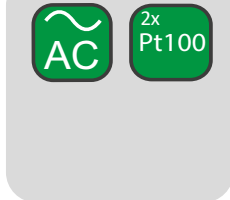
# FEATURES

- **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.

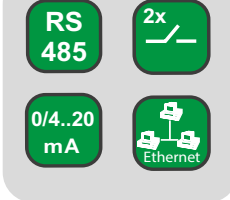
## FEATURES



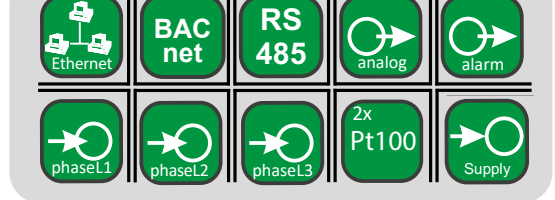
## INPUTS



## OUTPUTS



## GALVANIC ISOLATION



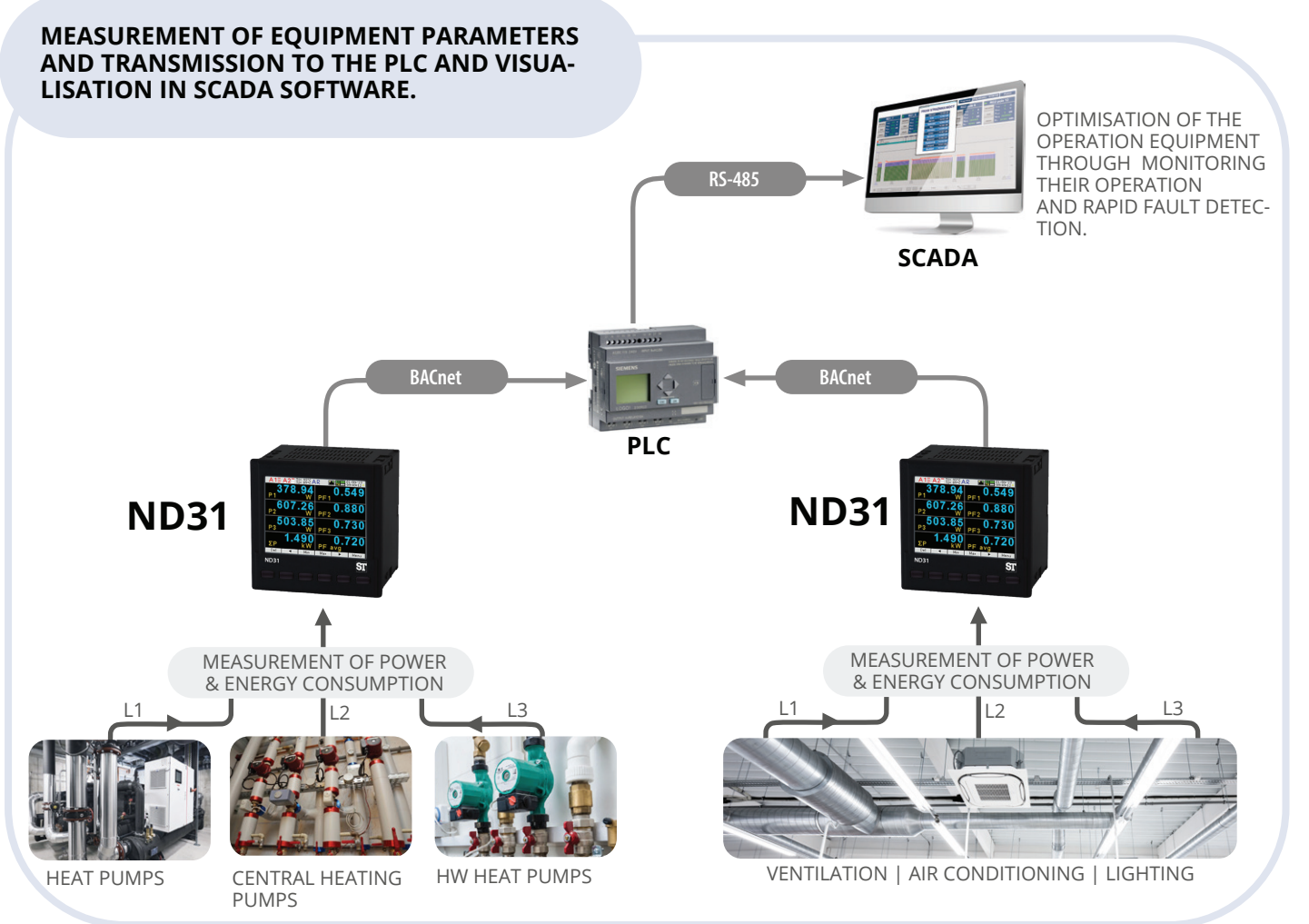
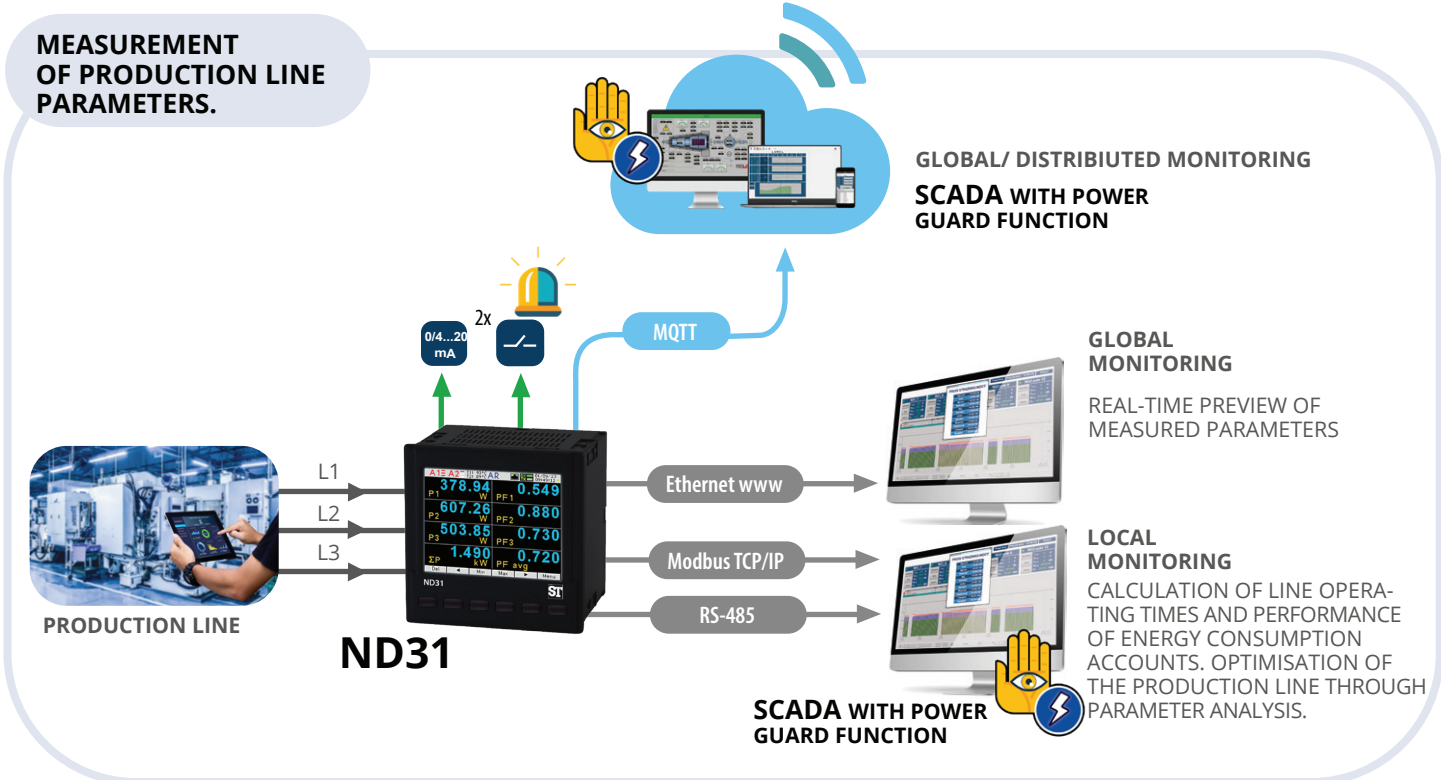
## MEASUREMENT AND VISUALIZATION OF POWER NETWORK PARAMETERS

- 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 (2 x Pt100 input)

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## EXAMPLE OF APPLICATION



## TECHNICAL DATA

### MEASURING RANGE

Measured value	Measuring range	L1	L2	L3	Σ	Class
Current I/5 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 ..132.000 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 <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)
<b>Active energy EnP (imported or exported)</b>	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 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 <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)	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

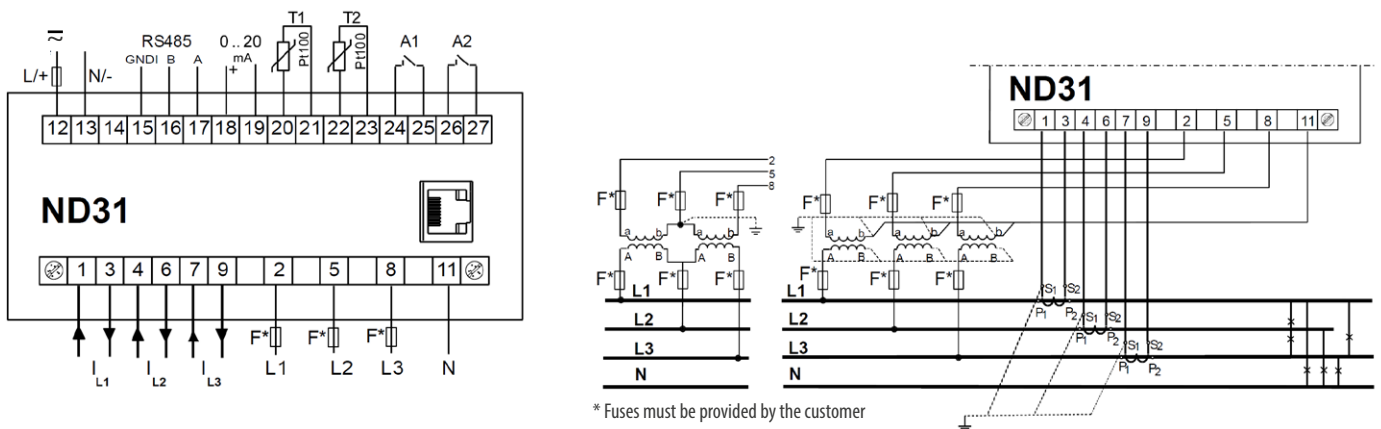
## RATED OPERATING CONDITIONS

Supply voltage	→ 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
	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

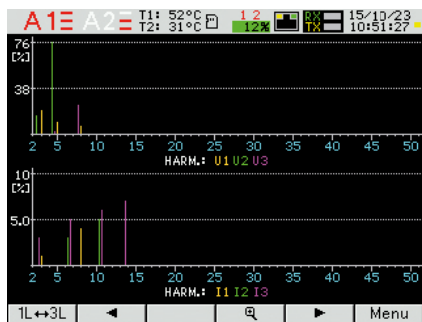
Indirect measurement in 4-wire network - connection of input signals

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

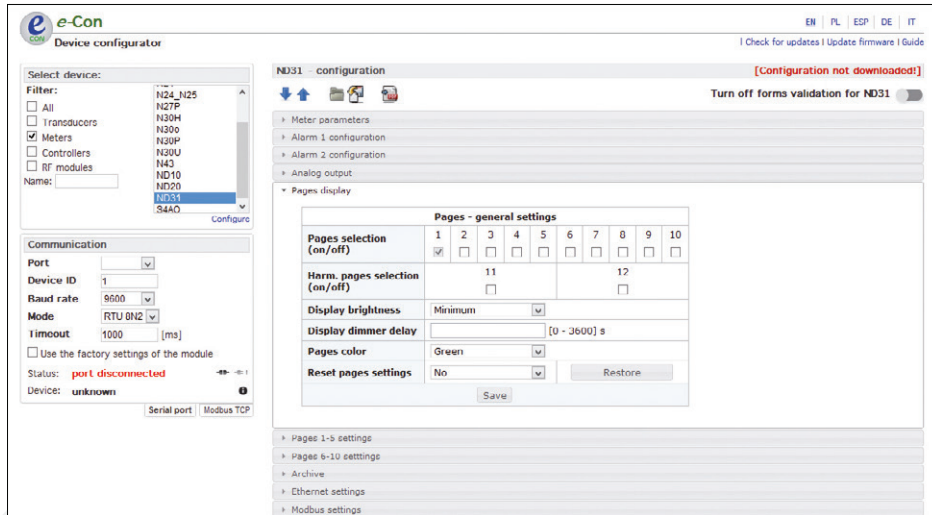


presentation in the form of analog  
meter view with min/max preview  
for display value and zoom function



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

## 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

The screenshot displays the '3-PHASE POWER NETWORK METER TYPE ND31' web interface. It features a navigation menu with icons for 'Measure values', 'Energy counters', 'Ethernet', and 'Min-max values'. The main content area is divided into five pages of data:

Page 1		Page 2	
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
ΣP	843.787 W	ΣP	843.787 W
ΣQ	725.969 var	ΣQ	725.969 var
I avg	1.638 A	ΣS	1125.615 VA
I avg	0.810 PF avg	U123	384.564 V
		PF avg	0.778
Page 3		Page 4	
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
I avg	0.810 PF avg	0.778	
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

At the bottom, there is a status bar with '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

The screenshot shows a 'Harmonics numbers' window. It contains two bar charts. The top chart is titled 'Harmonic U no : H18 U1=0.0%, U2=0.0%, U3=0.0%' and shows a significant peak at harmonic 4 (76.1%). The bottom chart is titled 'HARM: U1 U2 U3' and shows harmonic levels for phases U1, U2, and U3. The x-axis represents harmonic numbers from 2 to 27, and the y-axis represents percentage from 0.0% to 10.0%.

ORDERING CODE

Meter <b>ND31</b>	X	2	2	X	X	X	XXXX
<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>Outputs /inputs:</b>							
2 relays, 1 analog output, 2 inputs PT100		2					
<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>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	
<b>Version:</b>							
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 57.7/100V, 3 x 230/400V,
- 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