NANOVIP® CUBE WF™

INSTRUCTION MANUAL

Version 1.00

18/03/2021

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VERSION HISTORY

Rel	Implemented By	Revision Date	Comments	Firmware
0.10	Mikko Kumaleipe	27/12/2018	Version 0.10 of the document	4.00
0.20	Mikko Kumaleipe	10/06/2019	General review Main Additions: Phasor, Realtime counters, efficiencies, network scan	4.03
1.00	Mikko Kumaleipe	18/03/2021	Updated recordings menu	5.00

Congratulations on having chosen a ***NanoVIP® CUBE WF™*** product, based on Elcontrol's 50 years of experience in the control of power consumption and quality.

High technological content, careful material selection, and full compliance with the latest regulations and its new smart measuring concept make this product the only one of its kind.

NanoVIP® CUBE WF™ has been designed, built and tested in Italy. It complies with all qualitative requirements for European products regarding the environment, safety and work ethics.

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1 INTRODUCTION TO NANOVIP® CUBE WF™

1.1 AUDIENCE

The audience for this document includes first time users as well experienced NanoVIP® CUBE™ users.

Basic knowledge of electrical safety, technology and measures is a mandatory requirement.

1.2 PRESENTATION AND PURPOSE

NanoVIP® CUBE WF™ extends **NanoVIP® CUBE™** measuring range as it implements WiFi connectivity to enhance control and analysis capabilities.

WiFi technology permits to **NanoVIP® CUBE WF™** to report realtime measurement to a remote client as well as be fully driven from a remote place.

The purpose of this document is to provide user instruction of the **CUBE WF™** power quality analyzer.

1.3 PRODUCTS OF NANOVIP® FAMILY

	Model	Description
	**NanoVIP® TWO™**	Portable Power Quality analyzer for mono, bi, three phases balanced, medium and low voltages systems. NANOVIP® CUBE™ is a modern, powerful, portable network analyzer developed for professional analysis of consumption and power quality of the most complex electrical networks. It can be used on single-phase, two-phase, three-phase (balanced and unbalanced) networks, low and medium voltage.
	**NanoVIP® CUBE™**	Portable Power Quality analyzer for mono, bi, three phases (balanced and unbalanced), medium and low voltages systems. NANOVIP® CUBE™ is a modern, powerful, portable network analyzer developed for professional analysis of consumption and power quality of the most complex electrical networks. It can be used on single-phase, two-phase, three-phase (balanced and unbalanced) networks, low and medium voltage.
	**QUADRA+™** **Master Device**	Main component of a QUADRA system, it handles the measuring network. It can work as a standalone Power Quality Analyzer too. Always present one in a QUADRA measuring network.
	**DS™**	NanoVIP® DS: it is a peripherical remote device, specialized in measuring solar panel streams. It always works with a Master device. It cannot perform standalone measures Up to 5 in a net
	**DE™**	NanoVIP® DE: it is a peripherical remote device, specialized in measuring electrical measures. It always works with a Master device. It cannot perform standalone measures Up to 5 in a net
	**DGP™**	NanoVIP® DGP: it is a peripherical remote device, specialized in measuring non-electrical phenomena. It always works with a Master device. It cannot perform standalone measures. Up to 5 in a net
	**NanoVIP® CUBE+™**	NanoVIP® CUBE WF™: it is a power quality analyzer that, in addition to all standard NanoVIP® CUBE™ function, can work as an electrical node of a QUADRA measuring network. It can work with a Master device as a slave one. It can perform standalone electrical measures measures. Up to 5 in a net
	**NanoVIP® TWO+™**	NanoVIP® TWO+™: it is a power quality analyzer that, in addition to all standard NanoVIP® TWO™ functions, can work as a DGP device of a QUADRA measuring network. It can work with a Master device as a slave one. It can perform standalone electrical measures measures as well as up to four independent transducer inputs. Up to 5 in a net

1.4 INTENDED USE

NanoVIP® CUBE WF™ is a powerful measuring tool designed for those in need of an accurate and easy-to-use and scalable product.

It is aimed at both users who want to understand their energy systems (not only electrical ones) better like Energy Managers, system installers, electricians, maintenance workers (for diagnosis and intervention) as well as for the provision of integral consulting services on electrical power.

1.5 SAFETY AND WARRANTY

All NanoVIP® CUBE WF™ products have been designed and tested in accordance with the latest directives in force, and complies with all technical and safety requirements.

To preserve the product and ensure its safe operation, follow the instructions and the CE markings contained herein.

CAUTION! Please read these instruction carefully befare using the devices.

1.6 OPERATOR'S SAFETY

- The instrument described herein must only be used by trained personnel.
- Connection and maintenance operations must only be carried out by qualified and authorised personnel, as they may result in electrocution, burns or explosions.
- For the correct and safe use of the instrument, as well as for all installation and maintenance purposes, operators must always comply with standard safety procedures. The manufacturer shall in no way be liable if such procedures are not complied with.
- Before connecting the instrument to the electrical system, as well as before handling, maintaining or repairing the instrument, the instrument and the electrical cabinet to which it is connected must be disconnected from any voltage source.
- Before turning on the instrument, make sure the maximum voltage at the voltmeter inputs is 1000VAC phase/phase or 600VAC phase/neutral.
- If the instrument can no longer be operated safely, it must be discarded and measures must be taken to prevent accidental use. Safe operation is no longer possible in the following cases:
    - if damage to instrument is clearly visible;
    - if instrument is no longer working;
    - after being stored for an extended period under unfavourable conditions;
    - if instrument is badly damaged during transportation.

The symbol shown here on the right - when found on the product or elsewhere - means that the user manual must be consulted.The instrument described herein must only be used by trained personnel.

1.7 EC, ROHS & WEEE DECLATION OF CONFORMITY

Manufacturer:	ELCONTROL ENERGY NET S.r.l. Via dell'Industria 32 40043 Marzabotto (BO) - Italy
Product:	**NanoVIP® CUBE WF™**
Directives complied with:	93/68/EEC (Low Voltage Electrical Equipment); 89/336/EEC and 2004/108/EC (EMC - Electromagnetic Compatibility); 2006/95/EC - 72/23/EEC (LVD - Low Voltage Directive); 2002/95/EC (RoHS); 2002/96/EC and 2003/108/EC (WEEE).
Year of mark affixing:	2012
Certificate:	12CDC27 by Lem S.r.l. Notified Body
Reference standards for EC compliance:	EN 61010-1 EN 61010-1 EN 61326 EN 61326/A1 EN 61326/A2 EN 61326/A3

1.8 REFERENCE STANDARDS

Standard	Title	Description	Int. Link
EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use.	General safety requirements for electrical equipment intended for professional, industrial process, and educational use. Electrical test and measurement, control, and laboratory equipment.	Identical to IEC 61010-1:2001-02 EN 61010-1:2001-03
EN 61326	Electrical equipment for measurement, control and laboratory use. EMC requirements.	This Standard specifies the minimum requirements for immunity and emissions regarding electromagnetic compatibility (EMC) for electrical equipment, operating from a supply or battery of less than 1000 VAC or 1500 VDC, intended for professional, industrial-process, industrial-manufacturing and educational use, including equipment and computing devices for measurement and test; control; laboratory use; accessories intended for use with the above equipment.	Identical to IEC 61326-1: 1997-03 EN 61326-1:1997-04 EN 61326-1 Ec:1998-01
EN 61326/A1	Electrical equipment for measurement, control and laboratory use. EMC requirements.	This amendment modifies the requirements for the immunity tests laid down in Standard IEC EN 61326 for the three specific applications specified below: Use in industrial environment; use in laboratories or test and measurement areas with electromagnetically-controlled environments; portable test and measurement equipment operating from a battery or from the circuit being measured.	Identical to IEC 61326-1/A1: 1998-05 EN 1326/A1: 1998-06 EN 61326-1 Ec:1998-09
EN 61326/A2	Electrical equipment for measurement, control and laboratory use. EMC requirements.	This amendment adds an annex to the basic Standard introducing more detailed specifications regarding test configurations, operating conditions, and performance criteria for certain equipment intended for applications where no special EMC requirements are provided. Some examples of such equipment are: oscilloscopes, logic analysers, spectrum analysers, digital multimeters, etc.	Identical to IEC 61326-1/A2: 2000-08 EN 61326/A2: 2001-05
EN 61326/A3	Electrical equipment for measurement, control and laboratory use. EMC requirements	This amendment to IEC EN 61326 (IEC 65-50) adds regulatory Annexes E & F to the basic Standard, regarding test configurations, operating conditions, and performance criteria for portable test, measurement and monitoring equipment which are used in low voltage distribution systems.	Identical to: IEC 61326:2002-02 (Annex E & F); IEC 61326/Ec1:2002-07 EN 61326/A3:2003-12

1.9 WARRANTY CONDITIONS

1.9.1 Warranty disclaimers

Elcontrol guarantees that each NanoVIP® CUBE WF™ is free of defects, complies with technical specifications, and is suitable for the purposes declared by Elcontrol for a ***period of twelve (12) months from the documented purchase date*** or, in the absence of said date, the date of calibration.

The warranty covers faulty hardware parts, but not software, consumables, labour and transport costs.

Repairs under warranty shall only be performed if Elcontrol actually finds manufacturing defects or poor material quality.

The warranty shall no longer be valid if the defect is due to: incorrect electrical power supply, swells, improper connections, tampering, repairs or modifications carried out without the prior consent of the manufacturer, accidents or use other than that described herein. Damage resulting from disuse or any harm caused to third parties shall not be covered.

The warranty shall no longer be valid if the Quality check stick will be removed or damaged.

Faulty products must be returned to the importer/distributor of your country or to Elcontrol (**DELIVERED DUTY PAID**), subject to prior consent of Elcontrol.

A request for repair under warranty shall be accompanied by proof-of-purchase, stating the date on which the product was purchased. The warranty shall not be valid for products which have not been paid by the purchaser by the agreed deadline, as well as if the faulty product is returned from a country other than that where the product was sold, unless otherwise agreed.

1.9.2 Defect report

Any defect reports regarding delivered products - whether apparent or latent - shall be submitted to Elcontrol in writing.

The purchaser can in no way return the products without the prior consent of Elcontrol or following the decision of the judicial authorities.

Products must be returned within ten (10) days of the consent of Elcontrol or the judicial authorities.

In the event of a report - regardless of the object and reason therefore - the purchaser shall pay the full amount indicated on the invoice. If the delivered products have been modified, altered or used by the purchaser, no report shall be accepted or deemed valid.

Discrepancies which are deemed customary in trade, as well as discrepancies which cannot be technically avoided, especially those concerning quality, colours, manufacturing processes, drawings and similar aspects, cannot be the object of a claim.

Elcontrol reserves the right to make any changes to its products without altering their quality or performance. Such changes cannot be the object of a claim.

Whenever Elcontrol receives a claim regarding the condition of a product, quality defects or non-compliance with technical specifications, Elcontrol shall have the right - in its sole discretion - to replace the products without any charge, repair the products or issue a credit note.

Any kind of damage is excluded.

In case of interventions under the warranty period, all shipping costs for repairing and/or replacing the faulty products shall be borne by the purchaser.

1.9.3 Limitation of liability

Except for the warranty, Elcontrol shall in no way be liable for any direct or indirect damage incurred by the purchaser, such as – but not limited to – material damage, damage for loss in profit and loss, damage to purchaser's documents, archives or data, damage for third party claims, and damage claimed by any party whatsoever, resulting from applications obtained by the purchaser for himself or third parties, with the help – or the use – of products purchased from Elcontrol.

1.9.4 Final provisions

The warranty conditions described herein supersede and void any other obligations and warranties which the parties may have agreed upon – both orally and in writing – before the purchase of NanoVIP® CUBE WF™. Therefore, any such obligations or warranties shall be deemed void and invalid.

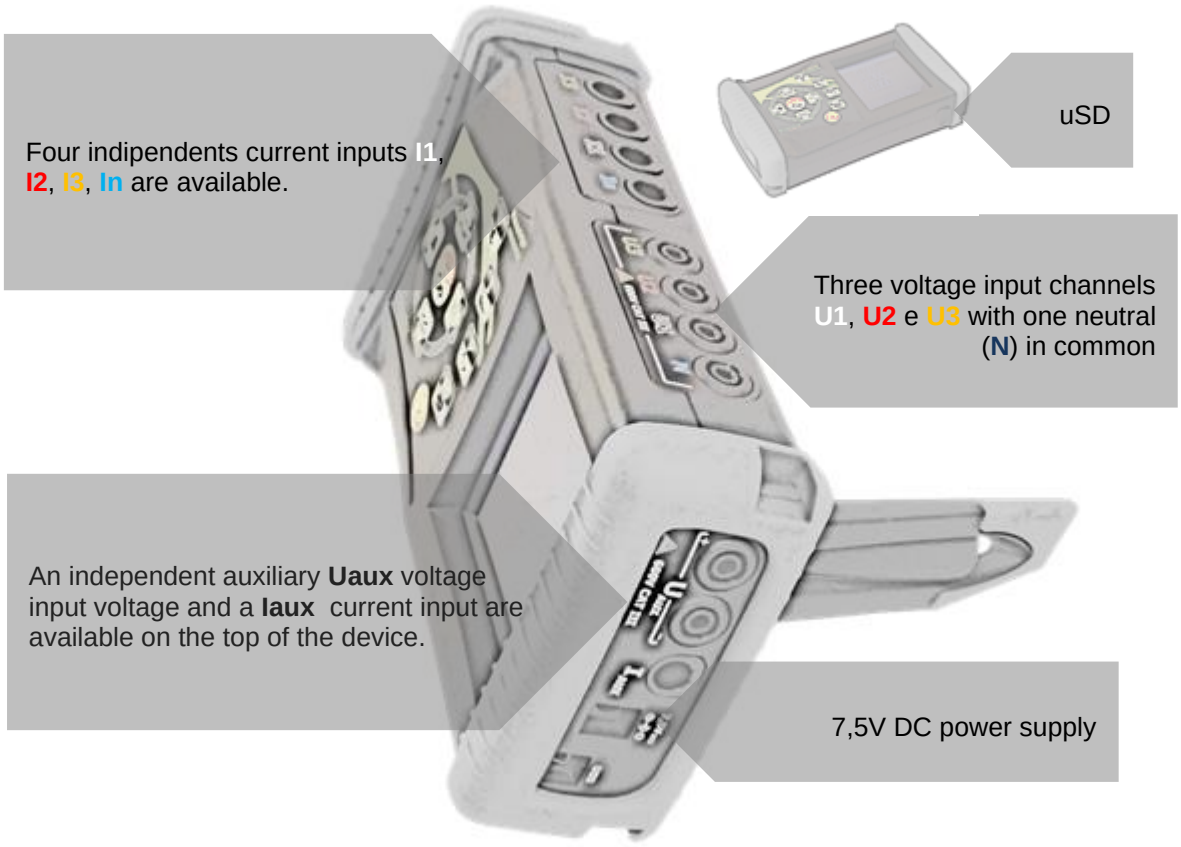
2 NANOVIP® CUBE WF™ OVERVIEW

NanoVIP® CUBE WF™ has been designed to perform both real-time measures and prolonged measurement campaigns.

It can work as a standalone measuring device as well as a remote measuring device fully driven from a remote place.

It has therefore been equipped with special shock-resistant and non-slip rubber which allow a practical handle to one or two hands and has also been provided with a support for resting on flat surfaces.

NanoVIP® CUBE WF™ is connected to the system by means of suitable voltage and current inputs.



The voltage inputs can be associated with the voltage enclosed cables, take care to respect the color matching or you can connect any cable with lamellar plug terminal ∅4mm being sure it is certified at least 600 V CAT III.

For the current connectors will be possible to combine the flexible current clamps (if included in the package), marked by appropriate colored rings or amperometric Elcontrol Energy Net probes of another type according to the need of measurement.

For further details, refer to probes related documentation and NanoVIP CUBE WF instruction manuals.

Neutral current input **In** is used to connect also solarimeter in case of basic solar measurement in a standalone configuration; in this case the In will be firmware calculated.

Cables, probes and solarimeter presence in the package depends from the configuration choosen; refer to sales documentation for details about model packages content.

2.1 POWER SUPPLY

NanoVIP® CUBE WF™ is equipped with an external power supply which can be connected to any socket (USA/JP, UK, EU, AU) with voltage 100÷240V~ ±10% and frequency 47÷63 Hz.

The output jack of the power supply is to be connected to the special 7.5VDC connector of the device.

The instrument is also equipped with a NiMh rechargeable battery pack, which guarantees more than 24 hours of use, without having to connect it to the main line. Batteries are recharged by the external power supply (supplied with the instrument). Batteries cannot be recharged through the USB connection.

If NanoVIP® CUBE WF™ is not used for a long period of time, then perform a charge cycle every two months (approximately) to prevent the batteries from going almost completely flat, in which case you will no longer be able to recharge them.

If the battery runs out you will loose date and time. In this case, NanoVIP® CUBE WF™ alerts the user to set the correct date and time, with a display message "Set date and time".

2.2 USB PORT

NanoVIP® CUBE WF™ can be connected to a PC through the USB port and the supplied cable. This connection allows the user to download the MODBUS measurement registers using the PC Energy Studio Manager software.

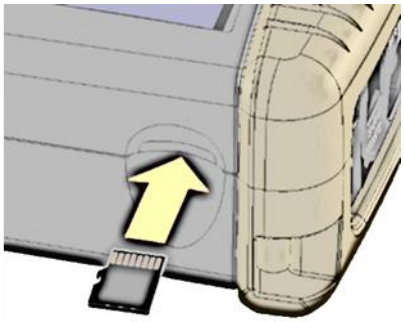
The USB communication may also allow easy upgrade of the firmware (internal software) of the instrument.

NOTE: If the PC does not automatically detects NanoVIP® CUBE WF™ as a device, download or update the appropriate drivers at www.ftdichip.com/Drivers/VCP.htm

2.3 MEMORY CARD

NanoVIP® CUBE WF™ is equipped with a slot for a 4 GB uSD memory card, which can be used to store measurement campaigns data, fast transients and inrush currents. Refer to related paragraphs for further details.

The memory card must be inserted as shown in the picture, with the contacts facing up.



NOTES: The slot is push-push type (the card is both inserted and removed by pressing it). Do not try to remove the card by pulling it, as this will damage the connector.

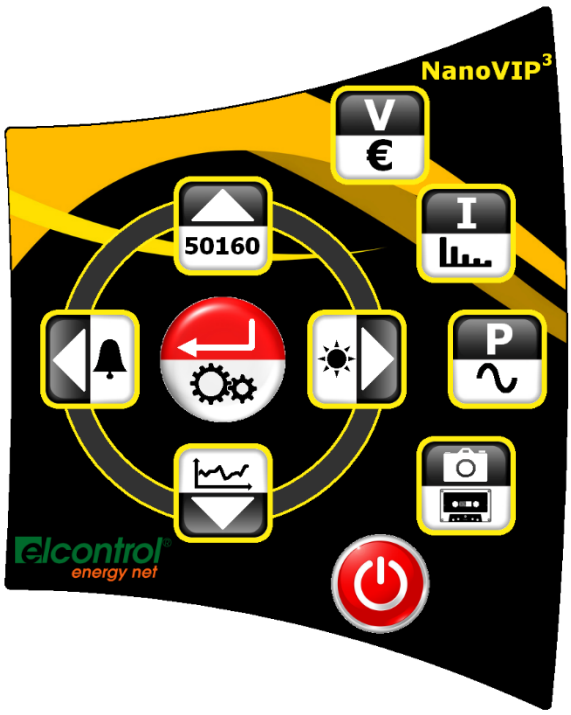
Do not remove the uSD card whilst a measurement campaign is being performed, as all data will be lost.

The uSD card is supplied with the instrument, together with the:

- User Manual
- PC software (See software manual for use)

2.4 KEYBOARD

The NanoVIP® CUBE WF™ keypad is equipped with 9 double-function keys, i.e. the function of each key varies depending on whether it is **pressed once or pressed and held** for approximately 3 seconds.



Specifically, the functions represented by the icons with black background are activated by pressing the relevant key, whereas the functions represented by the icons with white background are activated by pressing and holding down the relevant key.

Therefore, the instrument has 12 function keys, a central pad with the Enter function and arrow keys, and a key to access the Setup Menu directly, which allow for a more immediate and effective use of the instrument.

The Power (⏻) key must also be pressed for approximately 3 seconds to be activated.

Moreover, when an alphanumerical value in a field in the Setup Menu must be changed, pressing and holding down the ▲ or ▼ keys will accelerate scrolling, so that the desired value can be reached faster and easier.

Each key is made of a special metal dome. The "click" which can be heard when pressing a key confirms contact.

This technology is more reliable than the classic membrane with embossed keys. However, avoid pressing the keypad too hard, as this may cause damage or the keypad to malfunction.

2.5 KEYBOARD COMMANDS

KEY	FUNCTION	
	Single pressure	**Pressure over 3"**
		**SWITCH ON/OFF**
	Enter into **VOLTAGES**	Enter into **COUNTERS**
	Enter into **CURRENTS**	Enter into **HARMONICS**
	Enter into **POWERS**	Enter into **WAVES FORM**
	Function "snapshot": it freezes values at a certain time for a better analisys; it does not stop measurements.	Enter into **CAMPAIGNS**
	• Access to **AUX channel**. • It scrolls all related menus, after pressure of ↵, of: harmonics, trend, dips, interruptions, alarms.	Enter into **EXTRA/CUSTOM FUNCTIONS**
	• Descending scroll of measurements menu pages. • It moves the cursor toward lower part of setup pages. • It decreases a setup parametr value.	Enter into **TRANSIENTS**
	• Exit from **AUX channel**. • It scrolls all related menus, after pressure of ↵, of: harmonics, trend, dips, interruptions, alarms.	Enter into **ALARMS**
	• Ascending scroll of measurements menu pages. • It moves the cursor toward upper part of setup pages. • It increases a setup parametr value.	Enter into **EN 50160**
	• It selects a parametr to be modificed in setup. • Enter into a sub-page or measurement sub-menu. In this case the text ENTER will appear on le lower right corner.	Enter into **SETUP**

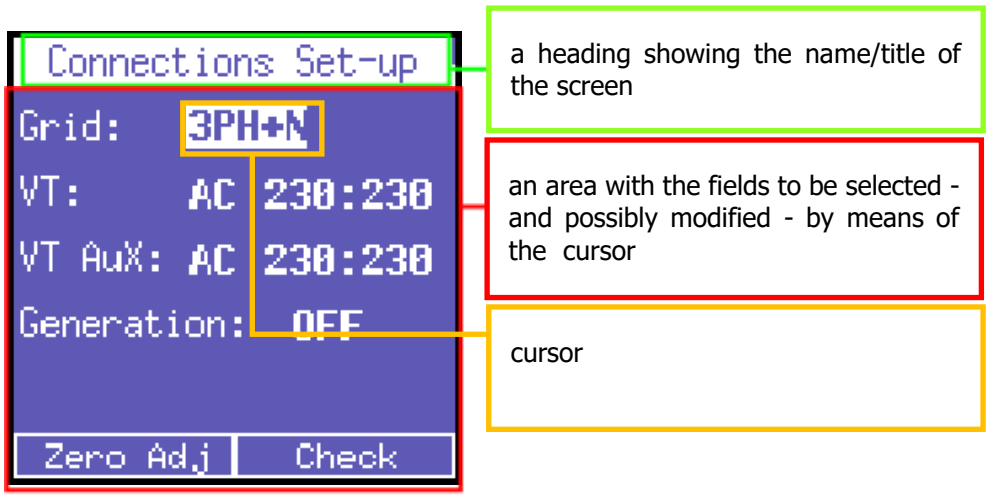
2.6 USER INTERFACE

For ease of use, NanoVIP CUBE WF is equipped with a graphic LCD and a membrane keypad with snap domes for tactile feedback, previously described.

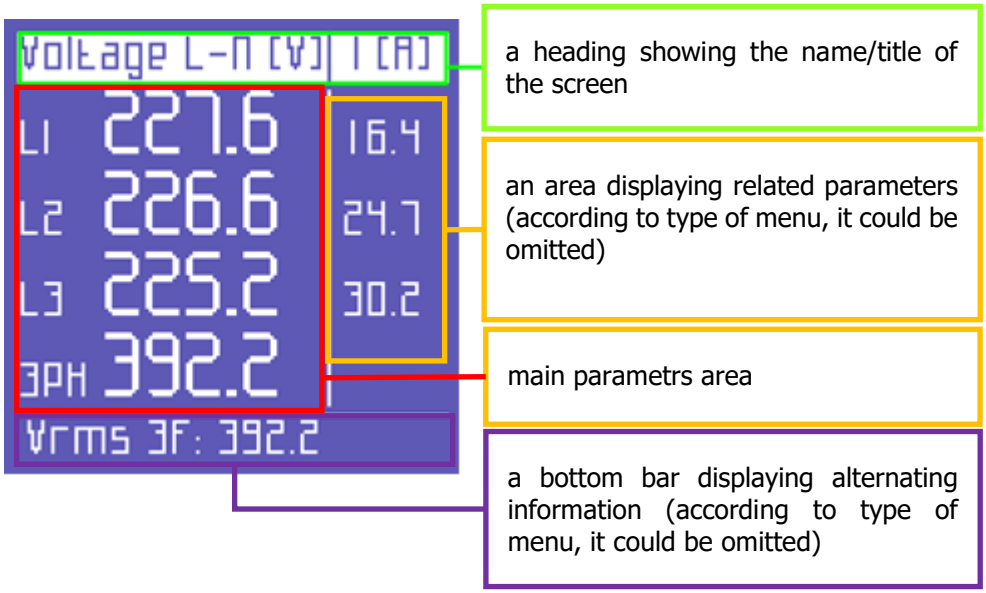
The software architecture of the instrument is divided into MENUS, more specifically SETUP and MEASUREMENT Menus. Each menu consists of a number of pages, which are described further on.

2.7 SETUP AND MEASUREMENT MENUS

A typical SETUP Menu consists of:



A typical MEASUREMENT Menu consists of:



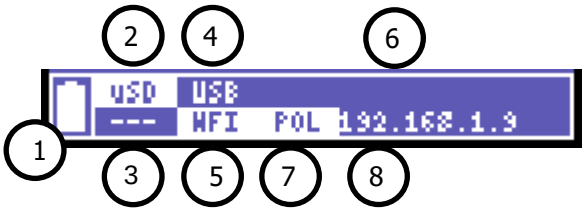
2.8 BOTTOM BAR

This area displays rolling informations regarding the status of the instrument and it can be customized by user via Setup.

Bottombar rolls through four different views, three of which customizable by user.

2.8.1 Main bar

, Main bar shows global device informations:



1) Battery level
2) Micro SD inserted if highlighted or not
3) Measurement campaign status: stopped (- - -), in progress (REC) or scheduled (PRG)
4) USB Modbus communication On (highlighted) or not
5) Wireless communication activated (highlighted): WFI, GSM or XBEE
6) Additional info related to model
7) Wireless activated mode: related to model
8) Additional wireless mode info: related to model

2.8.2 Additional bars

In addition to the above information, the bottom bar will alternate between 3 parameters of the user's choice.

User can select up to three parameters or clock to be shown alternatively in the bottom bar with together the active type of connection.

3 START-UP

Make sure the electrical cabinet is off before connecting the instrument. Only when the connection is complete and safely set, switch on the electrical cabinet.

01

3 sec

switch on the electrical cabinet and the instrument by pressing and holding down the POWER key for approximately 3 seconds (the same action switches off the instrument).

02

At start-up, the following screen will be displayed for a few seconds where following data are shown:

- Product
- Firmware release
- Serial number

03

NanoVIP CUBE WF is able to detect which current clamps (see note below) are connected to its inputs and to configure itself accordingly, storing such data in the appropriate setup.

If the detection is consistent, after about 20 seconds, or in the case where the user presses the button ↵, the instrument will automatically position on first page of voltage menu (step 7).

Conversely, if inconsistencies are detected, NanoVIP3 will stop, showing the message "Clamps error".

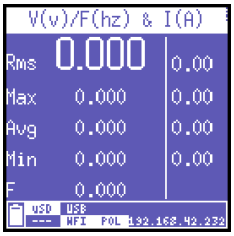
04

Error can be shown if in phases 1, 2, 3:

- One or more probes are missing
- One or more probes are different
- One or more probes are not recognize

The user can always skip this check by pressing the button ↵ and directly accessing the landing page of voltage menu and subsequently accessing the setup menu of the amperometric clamps, to perform manual configuration required.

05



Once completed the start-up and the clamp settings, system will move to the landing page of voltages.

Your NanoVIP CUBE WF is ready to work.

The current clamps automatically recognized by NanoVIP3 are only those provided by Elcontrol Energy Net:

- *Flexible mini probe Nanoflex™*
- *Flexible probe UltraFlex™*
- *Clamp 1000A/1V C107-EL*
- *Clamp 200A/1V MN13-EL*
- *Clamp 5A/1V MN95-OEM*

3.1 NANOVIP CUBE WF WORKING MODES

NanoVIP CUBE WF can operate in five different modes selected by two settings: Protocoll parameter in Communication setup to activate/deactivate WiFi and the Wifi mode.

According to these two parameters, master sets its main working mode as follows:

MODE	Protocoll	WiFi mode
ELECTRICAL STANDALONE	IEEE or BCD	Always DISABLED
AIRPLANE	WIFI	DISABLED
ACCESS	WIFI	ACCESS
POLL	WIFI	POLL
PUSH	WIFI	PUSH

3.1.1 Electrical Standalone mode

When NanoVIP® CUBE WF™ is set as electrical standalone device it will operate as a standard Power Quality Analyzer. It will work as a NanoVIP® CUBE™ analyzer without any external connectivity but the standard ModBus via USB.

3.1.2 AIRPLANE mode

When WIFI Protocoll is selected, NanoVIP can be set in Airplane mode to temporarily switch WiFi; during airplane mode no connectivity is available.

To reactivate Wifi, just select the desired mode (ACCESS, PUSH or POLL) and NanoVIP will try to reconnect with last connection parameters.

3.1.3 ACCESS mode

When WiFi mode is set to ACCESS, NanoVIP CUBE WF lauch a local wireless network operating as Access Point.

Local network will expose the serial number of your NanoVIP as SSID of an open network to which user can connect.

More detailed instruction can be found further in the document.

3.1.4 POLL mode

When WiFi mode is set to POLL, NanoVIP CUBE WF will connect to an available wireless local network through which it can be then reached from a remote place.

More detailed instruction can be found further in the document.

3.1.5 PUSH mode

When WiFi mode is set to PUSH, NanoVIP CUBE WF will connect to a local available wireless network to start pushing data to the Elcontrol cloud server: **cloud.elcontrol-energy.net**

User can register its own device to the cloud server and then read data with any web browser like Chrome, Internet Explorer etc.

More detailed instruction can be found further in the document.

4 SETUP

4.1 MAIN SETUP MENU

Press ⚙ for approximately 3 seconds to access the setup menu:

Use ▲ and ▼ keys to select the proper section and press ↵ to acces it; to return to the main setup menu, press ◀ from the main section page.

To exit from the setup, press again ⚙ for approximately 3 seconds.

> *When device is remotely driven, keyboard is not operative so setup menu and related commands will not be available to the user.*
>
> *Setup can be accessed from remote as well but it is suggested to operate directly on the device for main device setups.*

Setup menu is a rolling one and number of selection can change according to model and/or customization.

Standard setup menu structure includes following available areas:

- Connections: grid connection configuration
- Clamps: clamp parameters configuration
- Counters: settings for counters, averages, min-max and resets
- Alarms
- EN50160
- Tariffs
- Communication
- Display

- Bottom bar
- Clock
- Info

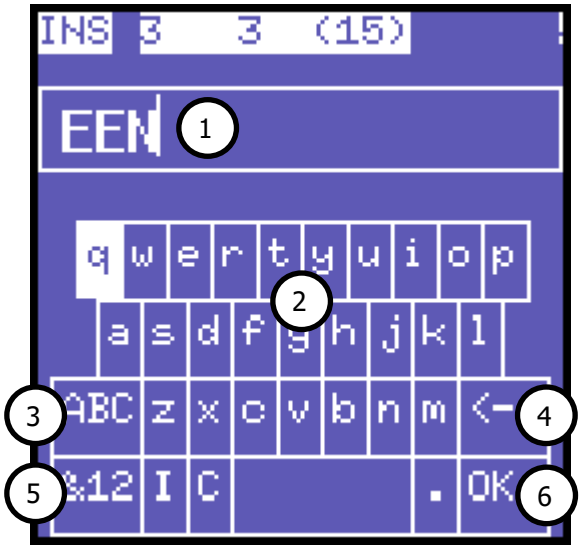
4.2 PARAMETER SETTING

When entered into desired section, parameters can be browsed and edited using following main keys:

- Use ▲ and ▼ keys to select the parameter to be configured.
- Press ↵ and the cursor will start to flash. Use ▲ and ▼ keys to modify the selected value.
- Press ↵ again to confirm the value. The cursor will stop flashing.
- Press ▶ and ◀ to scroll through the different section pages if available.
- Press ◀ from the main section page to return to the setup menu

4.2.1 Text editor

Whenever user select a text to be edited, a simple text editor is launched on the dispay:

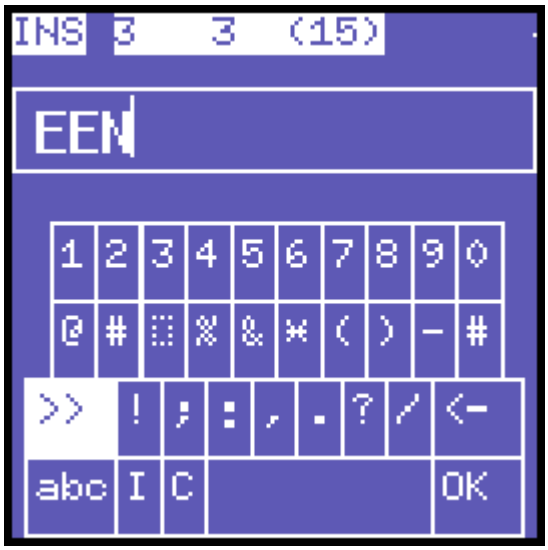


Use ▲, ▼, ▶ and ◀ keys to select the proper character and press ↵ to tap it.

Following parts compose the editor:

1) Current text
2) Available characters
3) Activate/Deactivate the capitalize letters or switch between different set of symbols whan in symbol mode
4) Backspace
5) Swap between text mode and symbol/number mode
6) Exit and save the modified text

If user press the **&12** key, the editor shows a different keyboard with numbers and symbols; meanwhile the **ABC** key change to **>>** key to allow to change to different symbols sets.



Press **abc** to return to alphabetical keyboard.

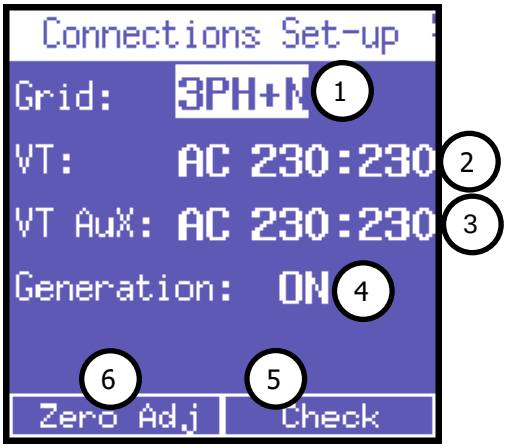
4.3 SETUP SECTIONS AND PAGES

Setup sections can be structured in more pages and available pages can change according to settled parameters.

4.3.1 Connections setup

Connections setup menu allows the user to:

1) Set the type of electrical network to which the instrument is connected.
2) Set the type of voltage and voltage ratio for phases L1, L2, and L3.
3) Set the type of voltage and voltage ratio for U AUX.
4) Activate/deactivate measurements in cogeneration mode.
5) Automatically adjust the zero level of measuring channels.
6) Check if the instrument and relevant probes are connected to the electrical system correctly.



4.3.1.1 Type of electrical connections Setup

To set the type of connection, enter the **CONNECTIONS SETUP** Menu, place the cursor on **GRID TYPE** and select one of the following options:

GRID TYPE	Description
3PH+N-BL	balanced three-phase system with neutral
3PH-BL	balanced three-phase system without neutral
3PH	unbalanced three-phase system without neutral
3PH+N	unbalanced three-phase system with neutral
2PH	two-phase system
1PH	single-phase system
UPS 3-3	Three Phase – Three Phase UPS connection
UPS 3-1	Three Phase – Mono Phase UPS connection

4.3.1.2 Type of Voltage & Voltage Ratio (VT) Setup for L1, L2, L3 phases

NanoVIP® CUBE WF™ can measure both alternate and direct currents. The user must set the type of voltage to be analysed, selecting:

VOLTAGE TYPE	Description
AC	Alternate current
DC	Direct current

When a voltmeter transformer has to be connected (i.e. when voltages higher than 600VAC must be measured) the corresponding transformation ratio must be set (default value = 1), changing the values as needed (1 to 60000).

4.3.1.3 Type of Voltage & Voltage Ratio (VT) Setup for U AUX

As described in the previous section, the same settings can be applied to the auxiliary voltage channel U Aux.

4.3.1.4 Cogeneration Setup

NanoVIP® CUBE WF™ can also be configured to measure the power and energy that might be generated. To do so, place the cursor on **GENERATION** and select **ON**.

By selecting **OFF**, the instrument will stop measuring the power generated, which will be considered absorbed power.

> *NOTE: when changing from Generation ON to Generation OFF, the counters of generated power are not reset.*

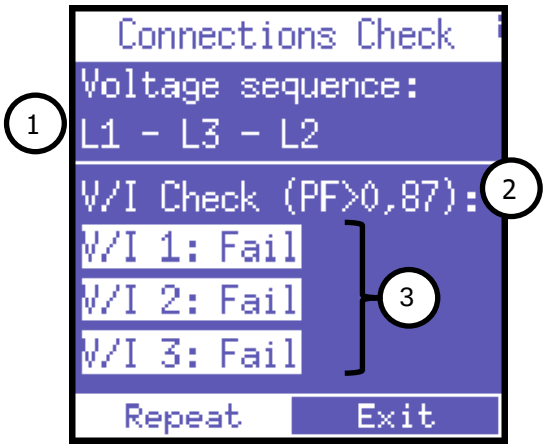
4.3.1.5 Zero Adjustment

After disconnecting the voltage and current input channels from the measuring grid, place the cursor on **START** and press ↵ to correct the offset, in case the latter has deviated. A page with numerical values will be displayed for the duration of the zero adjustment procedure (10-20"). When the procedure is complete, the system will automatically return to the CONNECTIONS SETUP page.

4.3.1.6 Connection Check

Once the instrument has been configured and connected to the system, the instrument can check if the connection to the electrical system has been performed correctly (to perform this check, the PF value must comply with the value indicated on the screen).

Place the cursor on **Connection Check** and press ↵ to perform the check. The related outcome will then be displayed.



Following information are reported:

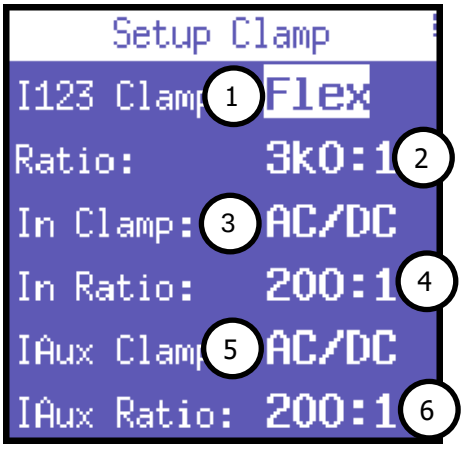
1) Voltage phase sequence
2) Threshold of the measured PF which allows for a correct analysis (if the PF is lower than the value indicated, the check cannot provide valid information)
3) Check of the correspondence between voltage and current of each phase and possible error message:
    a. **Ok** = Connection is correct
    b. **Invert CT** = Invert the direction of the current clamp indicated
    c. **Failed** = No correspondence between voltage and current or the PF value is lower than the threshold displayed

Select "Repeat" to perform a new check.

Select "Exit" to return to the CONNECTIONS SETUP page.

4.3.2 Current Probes Setup

Due to automatic recognition of current probes, the setup values will be those detected at power up. If you need to use different clamps from those recognized in power on, you will have to manually change the setup as shown below, or alternatively, make a new power on after connecting the new probes.



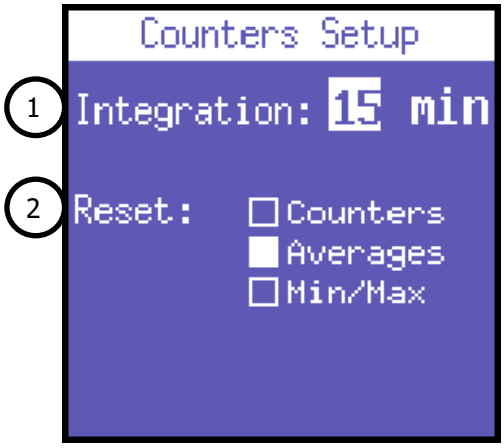
This page allows the user to select:

1) the type of probe used for I1, I2, I3, i.e. **Flex** (non-amplified flexible sensors) or **AC/DC** (clamp);
2) the sensor transformation ratio on I1, I2, I3 (press and hold down ▲ or ▼ to increase scrolling speed);
3) the type of probe used for In, i.e. **Flex** (non-amplified flexible sensor) or **AC/DC** (clamp) or **Solarimeter**;
4) the sensor transformation ratio on In (press and hold down ▲ or ▼ to increase scrolling speed); in case of Solarimeter selected, this parameter represent the total panel surface. Refer to solar measurements paragraph for further details
5) the type of probe used for Iaux, i.e. **Flex** (non-amplified flexible sensor) or **AC/DC** (clamp);
6) the sensor transformation ratio on Iaux (press and hold down ▲ or ▼ to increase scrolling speed).

*If you use **flexible probes**, set the current ratio to **3k0:1***

*When using the **AC/DC** dual range clamp **(PAC11)**, set ratio **1k0:1** when using the scale **1mV/A** and the **100:1** ratio if you use the scale **10mV/A**.*

4.3.3 Counters Setup



This page allows the user to:

1) Set the integration time, i.e. the time at which the average values and maximum demand are calculated.
2) Reset the counters and/or averages and/or Min/Max values by selecting the desired ones; when page will be left, the required parameters will be reset

> *Counters reset will stop Partial counting too if realtime counters function is in use.*

4.3.3.1 Integration Time Setup

To set the integration time, place the cursor on **INTEGR. TIME** and select the desired time, which is expressed in minutes (default value = 15 min).

4.3.3.2 Reset of Counters

To reset the counters values place the cursor on **Counters** and press ↵ to select it.

4.3.3.3 Reset of Average Values & Maximum Demand

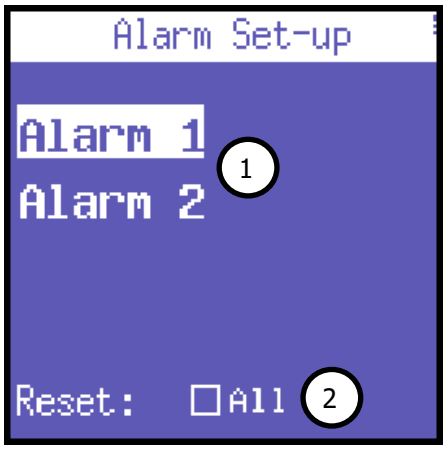
To reset the average values and maximum demand, place the cursor on **Averages** and press ↵ to select it.

4.3.3.4 Reset of Minimum & Maximum Values

To reset the minimum and maximum instant values, place the cursor on **Min/Max** and press ↵ to select it.

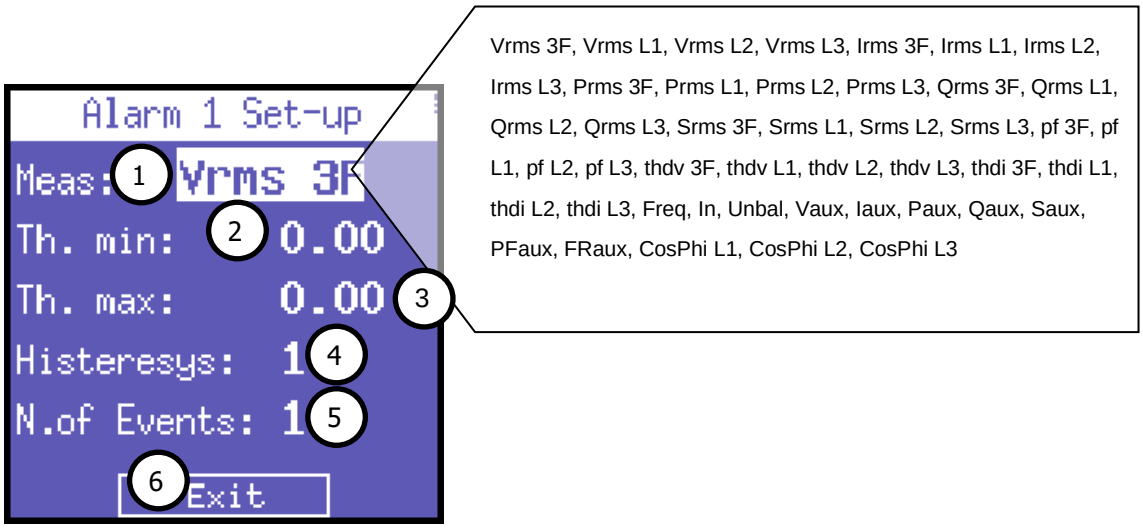
4.3.4 Alarm Setup and Reset

Two alarms can be set and configured with NanoVIP® CUBE WF™.



1) Place the cursor on either alarm and press ↵ to access the relevant configuration submenu.
2) Select **All** and press ↵ to reset all the stored alarms that can be viewed in the Alarm Menu.

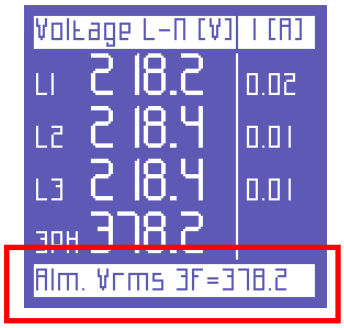
In the Alarm 1 or 2 configuration submenu, select OFF to disable the alarm or set the desired parameter to enable the alarm. The following parameters are available:



Alarm setting parameters meanings are as follows:

1) Available parameters as shown in picture
2) Set the minimum threshold value.
3) Set the maximum threshold value.
4) Set the hysteresis percentage (valid for both the minimum and maximum threshold).
5) Set the number of events after which the alarm should go off.
6) Return to the "Alarm Setup & Reset" page

if one of the alarms set goes off, it will be indicated in the bottom bar of the measurement pages, where the alarm will be displayed permanently until it is cleared



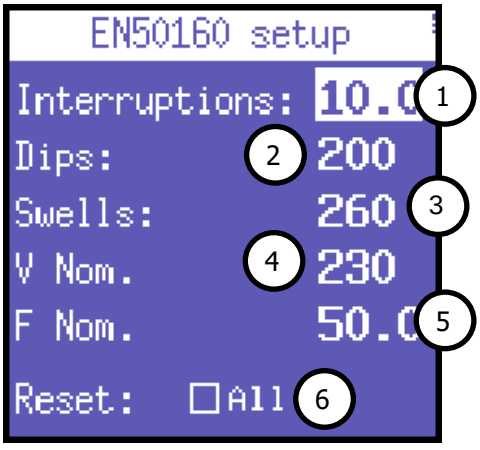
The last 5 alarms which have gone off are stored and can be displayed in the relevant menu.

4.3.5 EN50160 Setup & Reset

As described in Standard EN 50160, the phenomenon "voltage disturbances" (swells, dips, interruptions, etc.) does not feature standard values by means of which power quality can be evaluated.

Therefore, it is the user's responsibility to evaluate whether the voltage disturbances of the system are actually harmful or if they can be disregarded, based on the type of installation, production, connected instrument, etc.

The **EN 50160 SETUP** page allows the user to set the values necessary for performing the 50160 TEST correctly, i.e. for evaluating the power quality of the system.

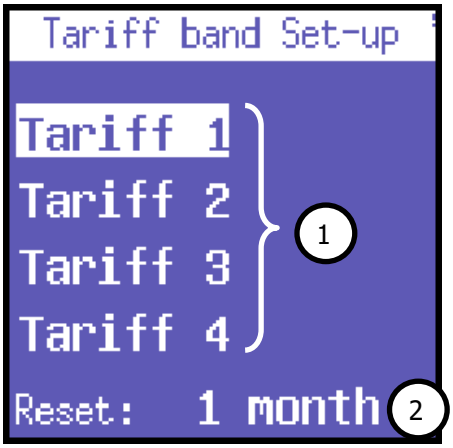


Specifically, the following parameters can be set:

1) Vrms value below which an interruption is defined
2) Vrms value below which a dip is defined

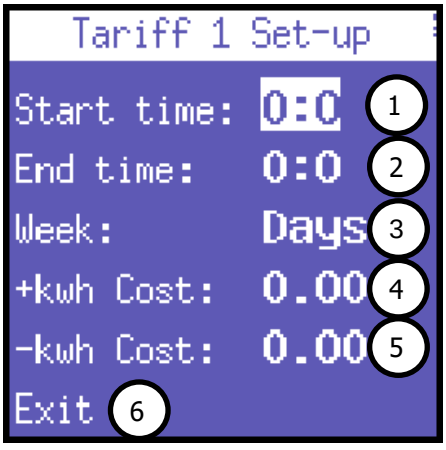
3) Vrms value above which a swell is defined
4) Nominal voltage
5) Nominal frequency
6) Reset the stored data related to all the grid disturbances that have been recorded.

4.3.6 Tariffs Setup



1) Choose the tariff band to be set by selecting it with the cursor and press ↵ to access the relevant configuration and reset the submenu
2) This function resets the measurements previously performed (for all 4 tariffs). The following options are available: **NEVER - 1 MONTH - 2 MONTHS - 3 MONTHS**

4.3.6.1 Tariff configuration and resetting



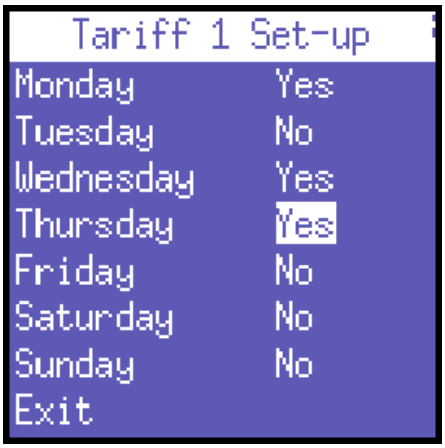
This page allows the user to set the following parameters for each tariff:

1) start time (with 15 minute intervals)
2) end time (with 15 minute intervals)

3) access to the subpage to select the days on which the tariff is to be applied (see further for details)
4) the cost of the kWh consumed (in the relevant currency)
5) the yield of the kWh generated (in the relevant currency)
6) return to the "Tariffs Setup" page

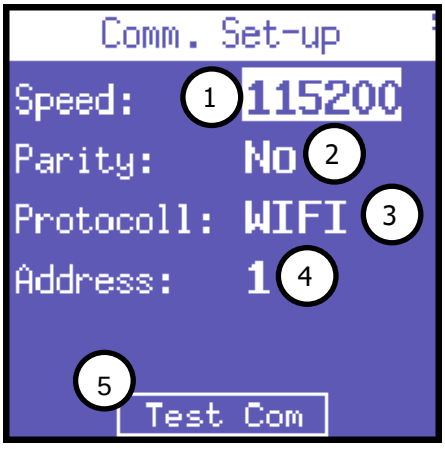
> *Avoid time of the different tariff bands to overlap. When the time of a tariff is changed, always make sure that it does not overlap with the time of another tariff. To set 12:00 am, select 0:00.*

To set the days on wich tariff will be active, select the day to be anabled/disabled and press ◀ or ▶ to change its status.



Select "Exit" and press ↵ to return to the "Tariff Setup" page.

4.3.7 Communication setup and Test



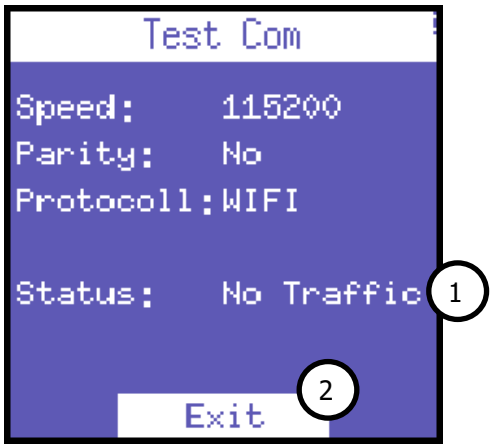
This page allows the user to set the following parameters:

1) Data transfer speed (baud rate): 4800, 9600, 19200, 38400, 57600, 115200 bps
2) Type of parity: no parity, even, or odd
3) Protocol type: WIFI, BCD or IEEE (factory set)
4) Address of the instrument (which must be unique) if the latter is connected to a PC with Energy Studio Manager monitoring software
5) Press ↵ to access the communication test page.

> *If you want you your NanoVIP CUBE WF device to be reachable Protocoll parameter is set to WIFI and Wifi mode other than DISABLED; when WIFI is selected, other parameters are set and cannot be modified by user.*

To consult the Modbus registers, see Appendix 1 attached hereto.

Test communication page is helpful when connecting the instrument to a device (local PC or remote devices like DE, DS etc.) to check if communication is correct, as well as to check if the instrument is working correctly.

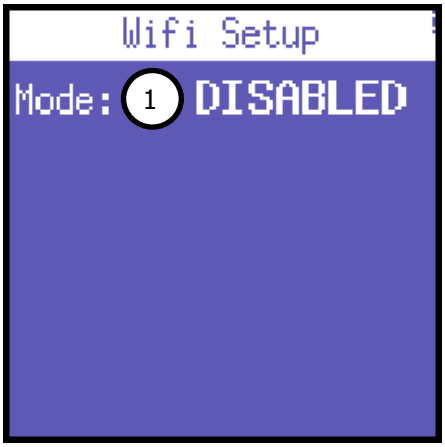


1) This field shows the current status (No communication, Comm. OK) or the type of error (checksum error, framing error, etc.) occurring during communication.
2) Return to the "Communication Setup" page

> *In case of a permanent error, check that the parameters have been configured correctly (PC and instrument)*

4.3.8 WiFi mode setting

When WIFI protocol is selected, user can enter in WiFi mode setting page by pressing the ▶ key; as factory setting the WiFi will be in DISABLED mode.



Press ↵ to change the mode to the desired one; available options are:

- DISABLED
- ACCESS
- POLL
- PUSH

> *Whenever you change the WiFi mode, NanoVIP will have to close all alive connections, reset the board and deploy the new mode; this process (depending of the environment conditions) could take several seconds. During this time frame, keyboard is deactivated till process is completed. When process is completed the active parameter will be highlighted again.*

NanoVIP CUBE WF succesfully connected to a network can be then reached via IP socket by any software able to send a proper ModBus query and NanoVIP will reply with a standard ModBus stream.

For a quick and easier use of NanoVIP CUBE WF capabilities, please, download NanoRemote application from Elcontrol website.

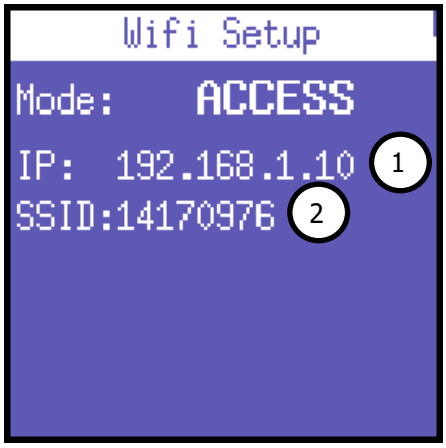
With NanoRemote, user will be able to fully monitor and drive NanoVIP from a remote location.

4.3.8.1 DISABLED mode

When device is set in DISABLED mode, the WiFi hardware is in Airplane Mode so no signal is sent or received and all communications are closed.

Device is still in WiFi communication mode and keeps last WiFi configuration stored in memory.

4.3.8.2 ACCESS mode



When ACCESS mode is selected, NanoVIP CUBE WF operates as a standard wireless AP (access point) of an open wireless network using its serial number as SSID (the network visible name).

When selected the page will show:

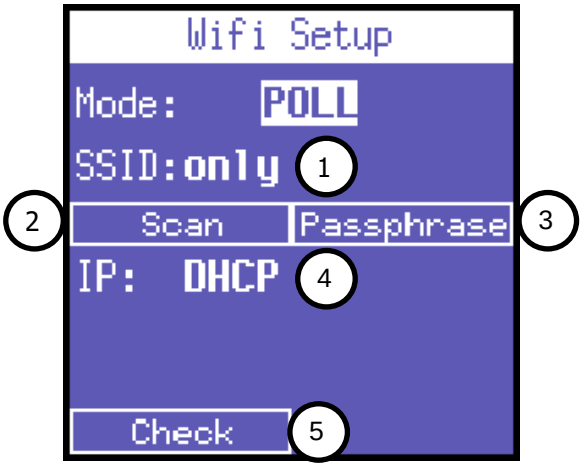
1) IP address to be used to reach the NanoVIP (always 192.168.1.10 in ACCESS mode)
2) The SSID of the wireless network generated

To connect directly to NanoVIP in ACCESS mode, be sure that your device will ask for DHCP to obtain a correct IP from NanoVIP automatically.

> *The wireless network generated will be an open one so any security or passphrase will be required on client side.*

4.3.8.3 POLL mode

Using the POLL mode NanoVIP CUBE WF can be reached through a local available wireless network.



To allow device to connect to local wireless network to obtain a valid IP address. Following data will be shown on page:

1) The SSID of the network to connect to
2) Button to enter network available APs discovery procedure
3) Button to set passphrase to connect to the wireless network
4) The IP assigned by the network if succesfully connected
5) Button to enter the connection status

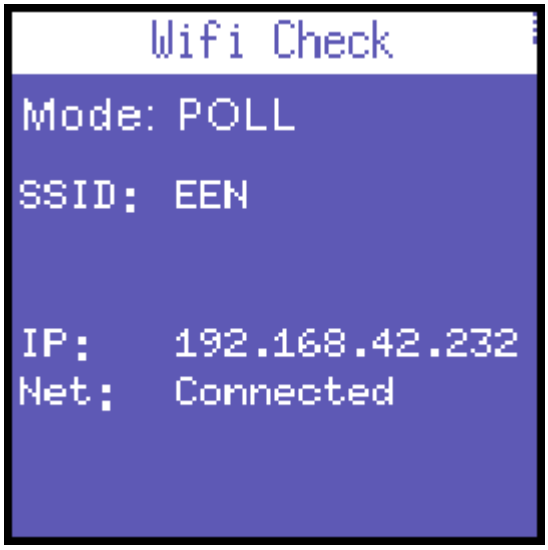
To connect to your local wifi network:

- Set the proper network SSID or push the Scan button to search for your network
- Set the related security passphrase

Anytime a connecting parameter is changed an **Apply** button will appear in the bottom of the display to launch the connection.

When Apply is pressed, a new connection procedure will be launched; it could take several seconds during which, keyboard is deactivated.

After new parameter setting application, user can select the Check button to verify the connection status:

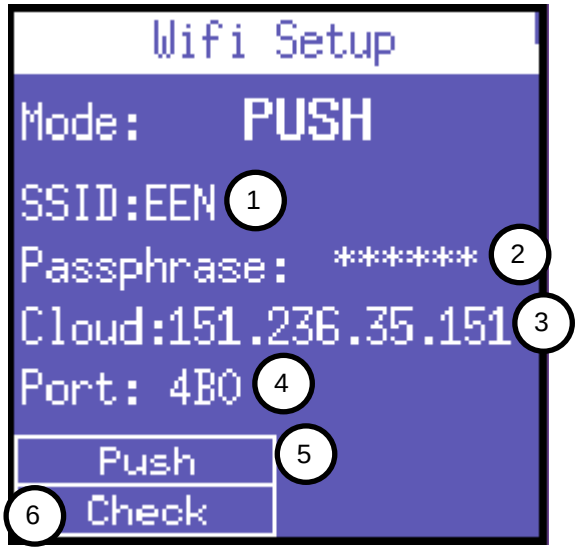


If connection succeeds a "Connected" value is reported in the Net parameter.

Press ↵ to refresh the display or press ◀ to return to the previous page.

> *Remote connection to NanoVIP in POLL mode is very straight forward as long as the client PC belongs to the same local network; to access the NanoVIP from an external place a port forward must be put in place. Port to be forwarded is the 9750.*

4.3.8.4 PUSH mode



In PUSH mode the NanoVIP CUBE WF connects to a local network to send data directly to Elcontrol Cloud: cloud.elcontrol-energy.net

On page are displayed following info:

1) The SSID of the network to connect to

2) The passphrase to connect to the wireless network
3) The IP assigned by the network
4) IP address of Elcontrol cloud (factory set)
5) Port of cloud server (factory set)
6) Button to start/stop sending data to cloud
7) Button to enter the connection status check

Parameters and connection procedure to the local wireless network are the same as for POLL mode; please refer to POLL mode setup for connection procedure details.

> *Cloud server IP address and Port do not require to be changed and they are editable only for future uses.*

When a succesfull connection is estabilished, user can push **Push** button to start sending data to the cloud server. Push button will switch to **Stop** to stop sending of data to the cloud.

Pushing activity will be reported on the bottom bar of the display.

> *Your NanoVIP will be automatically recognized by the cloud server and data will be immediately stored; to browse data on cloud server, go to cloud.elcontrol-energy.net and follow instruction to register your device and start monitoring your data.*

4.3.9 Scanning available Access Points

User can directly select the desired SSID instead for editing its name, by pressing the Scan button; when pressed NanoVIP will start searching for available wifi networks.

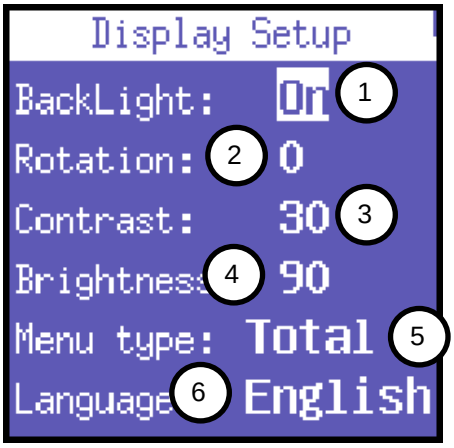
It will repeat a maximum of three scans that could take several seconds; if no AP will be found a "No AP available message" will be shown on display. To repeat search just press ↵ key.

If search will succeed, available APs will be listed directly on display:

Choose the desired WiFi network by using the ▲ or ▼ arrows and select it by pressing the ↵ key.

> *NanoVIP, during scan, will not listen to keyboard inputs; only WPA2 or Open networks found will be listed*

4.4 DISPLAY SETUP



This setup section collects all available parameters to customize your display aspect:

1) Backlight of the display
2) Display orientation
3) Contrast
4) Brightness
5) Menu type: total or partial
6) Language

4.4.1 Backlight Setup

The **LCD SETUP** page allows the user to set backlight of the display. Place the cursor on **BACKLIGHT** and select:

BACKLIGHT	Description
ALWAYS ON	
DELAY OFF 15 SEC	the backlight dims 15 seconds after the last key was pressed
DELAY OFF 1 MIN	the backlight dims 1 minute after the last key was pressed

Obviously, with time, LCD efficiency will depend on the number of hours of operation and the level of brightness selected. Therefore, unless strictly necessary, we advise against the level of brightness being higher than 70 and keeping the backlight ALWAYS ON.

> *The display turns on automatically if an alarm goes off.*

4.4.2 Display Orientation Setup

In particular situations, changing the display orientation may be practical, e.g. when the instrument must be placed in a vertical position. This function allows the user to rotate the LCD by 90° with respect to the default setting.

4.4.3 Contrast & Brightness Setup

To adjust the contrast and brightness of the display - so as to increase or decrease display efficiency and better adapt the instrument to different environmental conditions - place the cursor on **CONTRAST** or **BRIGHTNESS** and increase or decrease the parameters by increasing or decreasing the relevant values.

4.4.4 Menu Type Setup

Despite its easy-to-use interface, NanoVIP3 can perform a great number of measurements, and features many functions. If the user only needs a limited number of functions or measurements, this feature may sometimes be superfluous.

Therefore, to make using the instrument even easier, two different types of menus have been provided:

MENU TYPE	Description
TOTAL	All screens shown
PARTIAL	Menu, which only displays the Voltage, Currents, Power, Storage, and Setup Menus, making it less exhaustive but quicker to use

The Partial Menu only affects the displayed information. All data are always stored. If the user subsequently selects the Full Menu, the analyses performed in the previously disabled menus will also be displayed.

4.4.5 Language setup

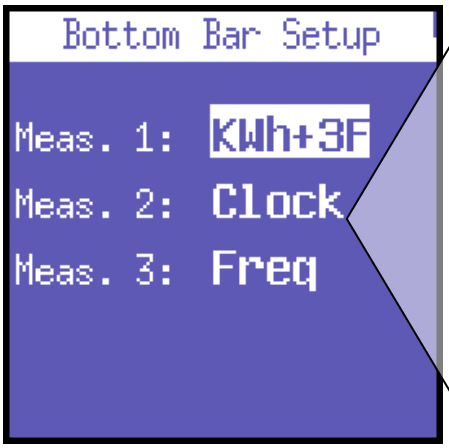
Select one of the following available languages:

- ENGLISH
- ITALIANO
- ESPAÑOL
- FRANÇAIS
- DEUTSCH

4.5 BOTTOM BAR SETUP

4.5.1 Bottom bar setup

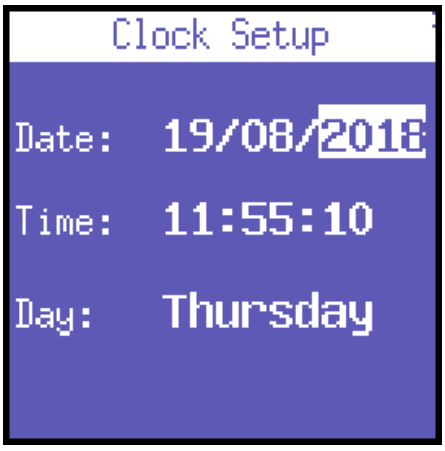
This page allows the user to choose 3 parameters (out of 63) to be displayed alternately in the bottom part of the measurement screens, in addition to the battery level. The following parameters are available for visualization:



Vrms 3F, Vrms L1, Vrms L2, Vrms L3, Irms 3F, Irms L1, Irms L2, Irms L3, Prms 3F, Prms L1, Prms L2, Prms L3, Qrms 3F, Qrms L1, Qrms L2, Qrms L3, Srms 3F, Srms L1, Srms L2, Srms L3, pf 3F", pf L1, pf L2, pf L3, thdv 3F, thdv L1, thdv L2, thdv L3, thdi 3F, thdi L1, thdi L2, thdi L3, KWh+3F, KWh L1, KWh L2, KWh L3, KVArh+3F, KVArhL1, KVArhL2, KVArhL3, KWh-3F, KVArh3F, KWh+F1, KWh+F2, KWh+F3, KWh+F4, Clock, Freq, In, Unbal, n.dip, n.swell, n.int, Vaux, Iaux, Paux, Qaux, Saux, PFaux, FRaux, CosPhi L1, CosPhi L2, CosPhi L3.

To display only one parameter, select the same parameter for all 3 options.

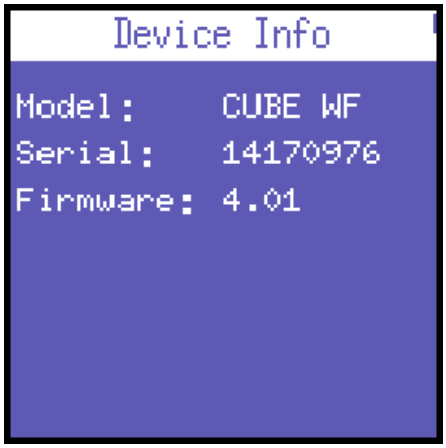
4.5.2 Clock setup



This page allows user to set the date and time; the format is DD/MM/YYYY.

4.6 INFO DEVICE

Last Setup menu section is aimed to report main information concerning the device:



Shown info can vary according to model, customization and firmware version.

4.7 SET-UP PASWORD PROTECTION

NanoVIP CUBE WF™ setup can be password protected with a 4 digit PIN.

> *This function must be considered a simple deterrent to avoid accidental changes when device is left on site for long periods.*

4.7.1 To set a password for Setup acces:

- Enter setup by pressing Enter key for 3 seconds
- Once in Setup, keep Voltage key pressed for 5 seconds: a password page will appear

- Set a four digit pin password using up and down keys; enter key will move through digits
- When finished, exit by pressing the left arrow key

From now on, entering into setup pages, user will be required to enter password.

4.7.2 How to reset password

Enter setup and digit the password "4321"; this will remove password setting and setup will not be password protected anymore.

5 INSTRUMENT USE & CONSULTATION

Press the desired key to access the relevant menu:

1)	**VOLTAGES** Menu (**V**)	Press once	
2)	**CURRENTS** Menu (**I**)	Press once	
3)	**POWER** Menu (**P**)	Press once	
4)	**COUNTERS** Menu (**€**)	Press 3''	
5)	**HARMONICS** Menu ( )	Press 3''	
6)	**WAVEFORMS** Menu ( )	Press 3''	
7)	**AUX CHANNEL** Menu (▶)	Press once	
8)	**SNAPSHOT** Function ( )	Press once	
9)	**EN 50160** Menu (**50160**)	Press 3″	
10)	**ALARMS** Menu ( )	Press 3″	
11)	**TRANSIENTS** Menu ( )	Press 3″	
12)	**CAMPAIGNS** Menu ( )	Press 3″	
13)	**EXTRA FUNCTIONS** Menu ( )	Press 3''	

5.1 NAVIGATING THROUGH MEASUREMENTS MENUS

When accessing a measurement menu, the first page of the selected menu is displayed.

Press ▲ or ▼ to scroll through the pages of the menu up and down, respectively.

In the Voltage, Currents, Power, Counters, Harmonics, and Waveforms Menus, press ▶ to access the relevant Auxiliary Channel Menu. Use ▲ or ▼ arrows to scroll the relevant auxiliary channel menu. Press ◀ to exit the auxiliary channel menu.

Certain pages (e.g. harmonic histograms) allow the user to access internal sub-functions by pressing ↵. The flowcharts of measurement menus are shown below.

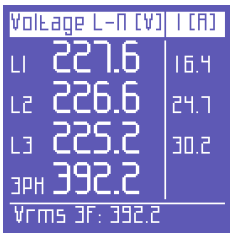
Entire menus or specific pages/parameters may not be displayed or changed, depending on the menu type which has been set in the LCD configuration (FULL or PARTIAL) and/or the type of electrical connection (e.g. if the single-phase connection has been set, the screens regarding three-phase data will not be displayed, and the structure of many other pages will be modified).

5.2 THREE-PHASE OR TWO-PHASE CONNECTION MENU

When switching on the instrument or exiting the Setup Menu, NanoVIP® CUBE WF™ displays the first page of the Voltages Menu. As shown in the flowcharts, the menus have a loop-type structure, i.e. when the end of the last page is reached, the menu automatically returns to the first page. You can scroll through the menus in either direction.

The information displayed will then vary, depending on the type of connection that has been set in the Setup Menu.

5.2.1 Voltages menu

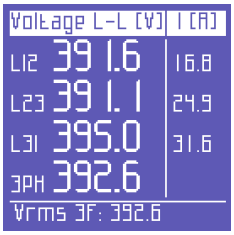


If the 3PH+N, 3PH+N-BL or 2PH connection is set (unbalanced/balanced three-phase with neutral connection or two-phase connection - See Sect. 4.2.1.1), the first page will display the phase-neutral voltages, the relevant phase currents, and the three-phase (or two-phase) voltage.

NOTE: if another type of electrical connections without neutral is set, this page will not be displayed.

▲ go to next page

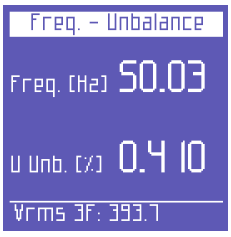
▼ go to previous



Line voltages and relevant phase currents.

▲ go to next page

▼ go to previous

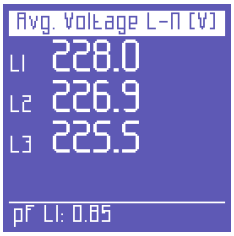


Frequency (measured on L1) and unbalance.

NOTE: in a three-phase system, the unbalance value is a parameter indicating a condition in which the effective values of phase voltages or the phase angles between consecutive phases differ. This parameter is one of the values which serve as an indication of power quality. The lower the percentage value, the better the power quality.

▲ go to next page

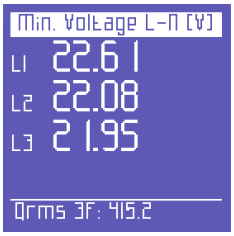
▼ go to previous



Average voltage levels (calculated on the basis of the integration time which has been set. Values can be reset..

▲ go to next page

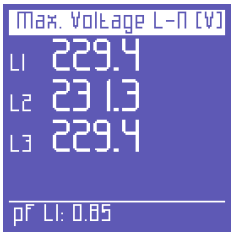
▼ go to previous



Minimum instant voltage values.Values can be reset

▲ go to next page

▼ go to previous



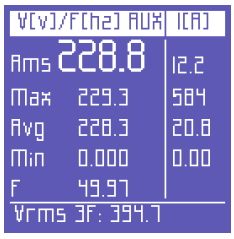
Maximum instant voltage values. Values can be reset

▲ go to first page

▼ go to previous

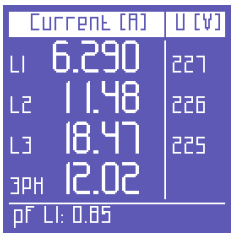
On any of the Voltages Menu pages, press ▶ to access the page containing all the information regarding auxiliary channel voltage. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Currents, Power, Counters, Harmonics, Waveforms) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



All the information regarding auxiliary channel voltage

5.2.2 Currents Menu

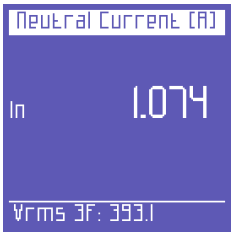


The first page of this menu displays the currents in each phase, as well as in the three-phase current (or two-phase current, depending on the electrical connection) and corresponding voltages.

When scrolling through the pages as described in Sect. 5.1, the following pages will be displayed.

▲ go to next page

▼ go to previous

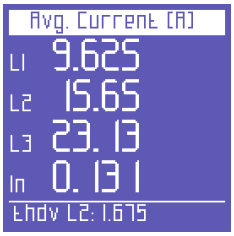


Neutral current or, in general, 4th current channel.

NOTE: if a connection other than 3PH+N or 3PH+N-BL (unbalanced or balanced three-phase with neutral - see Sect. 4.2.1.1) is used, the value will always be 0.000.

▲ go to next page

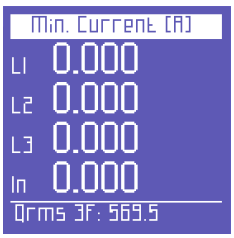
▼ go to previous



Average current values in each phase (calculated on the basis of the integration time set. Values can be reset).

▲ go to next page

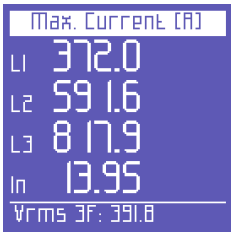
▼ go to previous



Minimum instant current values in each phase (values can be reset).

▲ go to next page

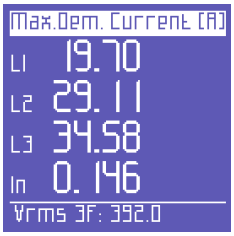
▼ go to previous



Maximum instant current values in each phase (values can be reset)

▲ go to next page

▼ go to previous



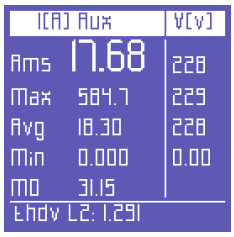
Load peaks, i.e. the highest average current (calculated on the basis of the integration time set. Values can be reset)

▲ go to first page

▼ go to previous

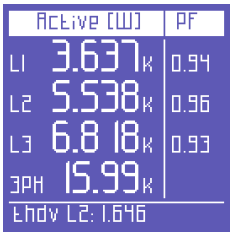
On any of the Currents Menu pages, press ▶ to access the page containing all the information regarding the auxiliary channel current. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Power, Counters, Harmonics, Waveforms) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



All the information regarding the auxiliary channel current.

5.2.3 Power Menu



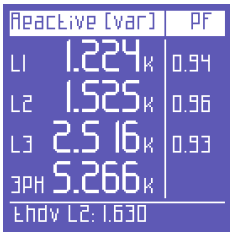
The first page of this menu displays the active power (W) in each phase and in the three-phase (or two-phase) connection and the corresponding PF values.

NOTE: as a norm, active power is shown as a negative when generated and a positive when absorbed.

When scrolling through the pages as described earlier, the following pages will be displayed.

▲ go to next page

▼ go to previous

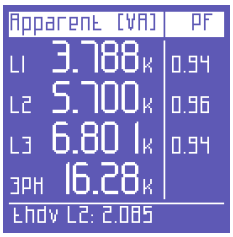


Reactive power (Var) in each phase and in the three-phase (or two-phase) connection and the corresponding PF values.

NOTE: as a norm, reactive power is shown as a negative when capacitive and a positive when inductive.

▲ go to next page

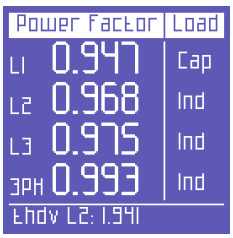
▼ go to previous



Apparent power (VA) in each phase and in the three-phase (or two-phase) connection and the corresponding PF values.

▲ go to next page

▼ go to previous

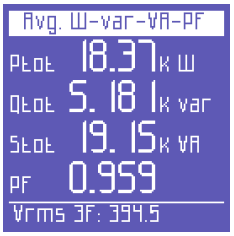


PF values in each phase and in the three-phase (or two-phase) connection and the relevant type (Ind = Inductive load; Cap = Capacitive load)

NOTE: the PF is always positive. As a norm, it is shown as a negative when active power is generated and a positive when absorbed

▲ go to next page

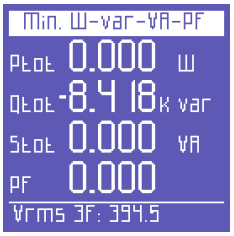
▼ go to previous



Average total power and PF (calculated on the basis of the integration time set. Values can be reset).

▲ go to next page

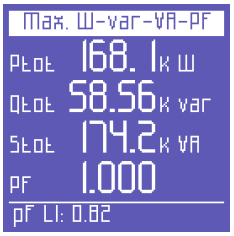
▼ go to previous



Minimum instant values of total power and PF (values can be reset)

▲ go to next page

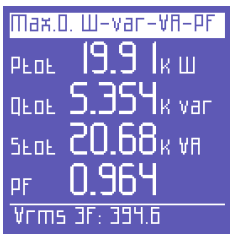
▼ go to previous



Maximum instant values of total power and PF (values can be reset)

▲ go to next page

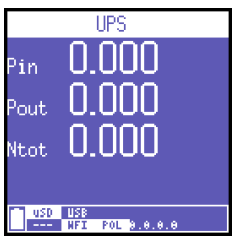
▼ go to previous



Load peaks and relevant PF, i.e. the highest average power (calculated on the basis of the integration time set. Values can be reset)

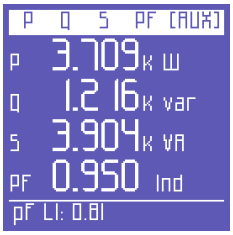
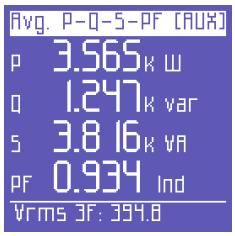
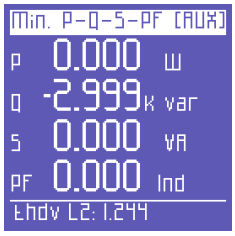
▲ go to next page

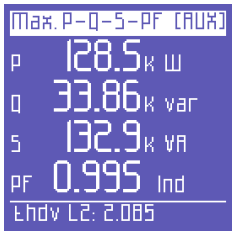
▼ go to previous



If Grid Type is set to **UPS 3-3** or **UPS 3-1** the **One Shot UPS™** efficiency page will be shown reporting following realtime values:

- Pin: instantaneous power entering the UPS
- Pout: instantaneous power exiting from UPS
- Ntot: efficiency of UPS system

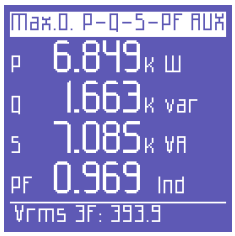
	▲ go to first page ▼ go to previous
	On any of the Power Menu pages, press ▶ to access a series of pages containing all the information regarding auxiliary channel power. The first page displays active, reactive and apparent power, as well as the PF. Use ▲ and ▼ arrows to scroll through the pages (See below). In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Counters, Harmonics, Waveforms), by selecting them with the relevant function keys. Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.
	The first page displays active, reactive and apparent power, as well as the PF of AUX channel.
	▲ go to next page ▼ go to previous
	Average power and PF (calculated on the basis of the integration time set. Values can be reset) related to the auxiliary channel.
	▲ go to next page ▼ go to previous
	Minimum instant values of power and PF (values can be reset) related to the auxiliary channel.
	▲ go to next page ▼ go to previous



Maximum instant values of power and PF (values can be reset) related to the auxiliary channel.

▲ go to next page

▼ go to previous



Load peaks and relevant PF, i.e. the highest average power (calculated on the basis of the integration time set. Values can be reset) related to the auxiliary channel.

▲ go to first page

▼ go to previous

5.2.4 Counters Menu

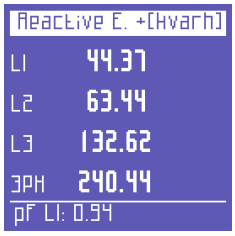
x3"

The first page of this menu shows the counters of the active power **absorbed** (+kWh) in each phase and three- or two-phase connections.

When scrolling through the pages as described, the following pages will be displayed.

▲ go to next page

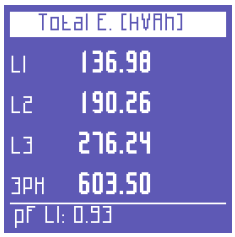
▼ go to previous



The counters of the reactive power **absorbed** (+kVarh) in each phase and in three- or two-phase connections.

▲ go to next page

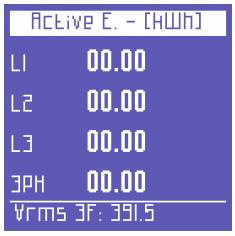
▼ go to previous



The counters of the apparent power (kVAh) in each phase and in the three- or two-phase connections.

▲ go to next page

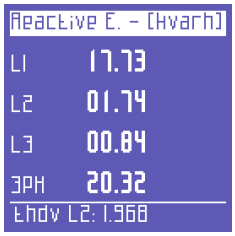
▼ go to previous



The counters of the active power **generated** (-kWh) in each phase and in three- or two-phase connections.

▲ go to next page

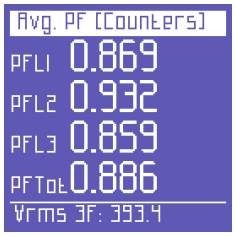
▼ go to previous



The counters of the reactive power **generated** (-kVarh) in each phase and in the three- or two-phase connections.

▲ go to next page

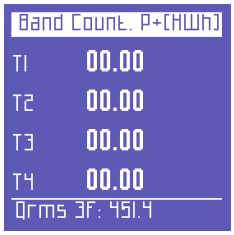
▼ go to previous



The average PFs calculated as kWh/kVAh ratio (only the real part of the counters is taken into account; the decimal part is not considered).

▲ go to next page

▼ go to previous

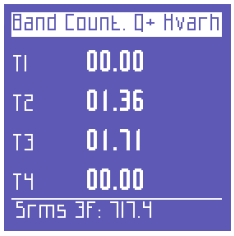


This page displays the absorbed and/or generated power, and the related costs for the time bands selected in the Setup Menu.

The first page displays the kWh absorbed during the various time bands.

▲ go to next page

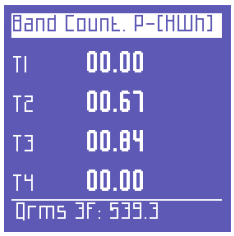
▼ go to previous



The kVArh absorbed during the various time bands.

▲ go to next page

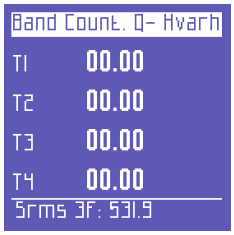
▼ go to previous



The kWh generated during the various time bands.

▲ go to next page

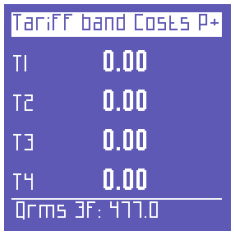
▼ go to previous



The kVArh generated during the various time bands.

▲ go to next page

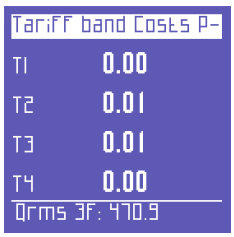
▼ go to previous



The cost of the kWh absorbed during the various tariff bands, expressed in the currency selected in the Setup Menu

▲ go to next page

▼ go to previous



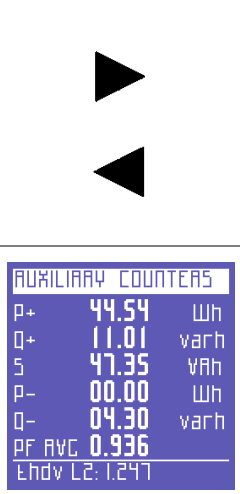
The income expressed in the set currency unit of the kWh generated during the different tariff bands.

▲ go to first page

▼ go to previous

On any of the Counters Menu pages, press ▶ to access the page containing all the information regarding auxiliary channel counters. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Power, Harmonics, Waveforms) by selecting them with the relevant function keys.

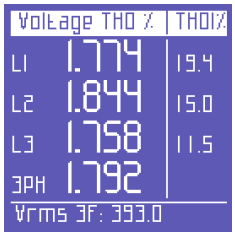
Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



All the information regarding auxiliary channel counters

5.2.5 Harmonics Menu

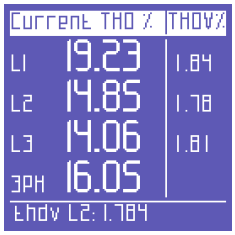

x 3"



The first page of this menu displays the THD% (Total Harmonic Distortion) of the voltage of each phase and the three-phase (or two-phase) connection, as well as the THD% of the relevant phase currents.

▲ go to next page

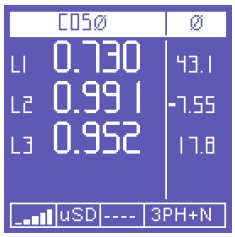
▼ go to previous



This page displays the THD% of the current of each phase and the three-phase (or two-phase) connection, as well as the THD% of the relevant phase voltages.

▲ go to next page

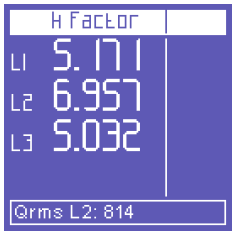
▼ go to previous



This page displays the cosφ of the 3 phases with the relevant angles expressed in degrees (the negative sign indicates that current comes before voltage; thus, the load is capacitive)

▲ go to next page

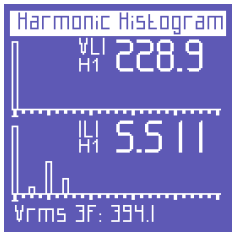
▼ go to previous



This page display the K factors of the phases

▲ go to next page

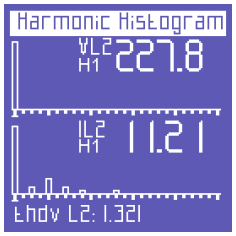
▼ go to previous



This page displays the harmonic histogram of the voltage and current of phase L1. To select and scroll through single harmonics, see next paragraph.

▲ go to next page

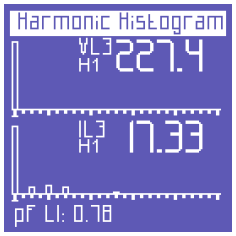
▼ go to previous



This page displays the harmonic histogram of the voltage and current of phase L2. To select and scroll through single harmonics, see next paragraph.

▲ go to next page

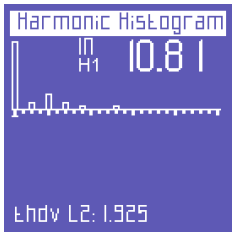
▼ go to previous



This page displays the harmonic histogram of the voltage and current of phase L2. To select and scroll through single harmonics, see next paragraph.

▲ go to next page

▼ go to previous



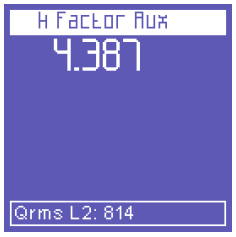
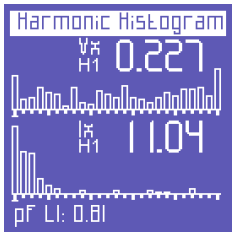
This page displays the harmonic histogram of the neutral current. To select and scroll through single harmonics, see next paragraph.

▲ go to first page

▼ go to previous

On any of the Harmonics Menu pages, press ▶ to access two pages containing all the information regarding auxiliary channel harmonics. The first page displays the THD% of V and I. Use ▲ or ▼ to view the other page (see below). In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Counters, Harmonics, Waveforms), by selecting them with the relevant function keys.

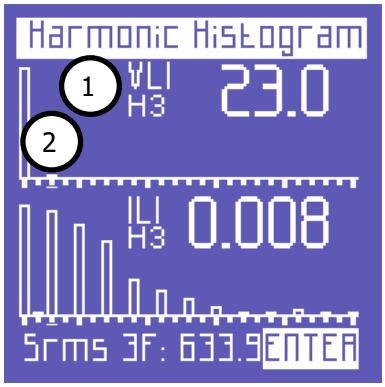
Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.

	First page of Auxiliary Harmonics displays THD% of V and I.
▼ ▲	▲ go to next page ▼ go to previous
	K factor of the auxiliary channel
▼ ▲	▲ go to next page ▼ go to previous
	Harmonic histogram of auxiliary voltage and current.
▼ ▲	▲ go to first page ▼ go to previous

5.2.5.1 Consulting Harmonic Histograms

On any of the Harmonic Histograms pages, press ↵ to access the function for selecting and scrolling through the single harmonics.

Press ▶ and ◀ to select each single harmonic of the histogram (up to the 50th) and check the relevant RMS values.

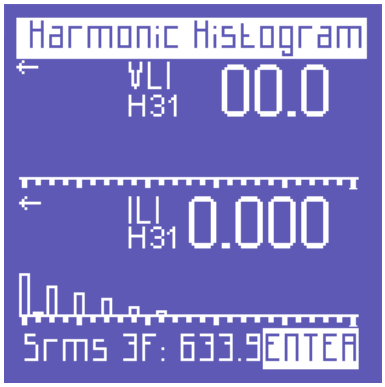


The selected harmonic is indicated by:

1) A number identifying the series;
2) The cursor below the histogram.

Over and above the 25th harmonic - which is the last one that can be displayed on one page - the screen will change, i.e. the first 25 harmonics of the spectrum will disappear to the left, and the harmonics between the 26th and the 50th will appear.

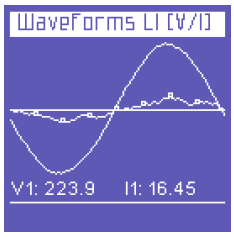
An arrow pointing towards the left indicates that the screen continues (to the left).



Press ↵ again to return to the function that allows you to scroll through the pages of the Harmonics Menu.

5.2.6 Waveforms Menu

x 3"



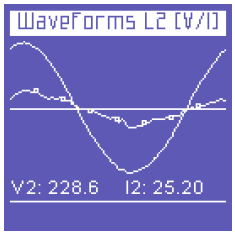
This menu shows the real-time waveforms and the relevant system voltage and current values.

NOTE: current tracing can be distinguished from voltage tracing by little square markers. Waveform amplitude is purely indicative and is automatically adjusted to screen size.

The first page of the menu displays the L1 voltage and current waveforms and relevant RMS values..

▲ go to next page

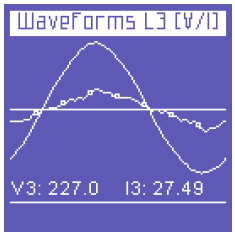
▼ go to previous



L2 voltage and current waveforms and relevant RMS values.

▲ go to next page

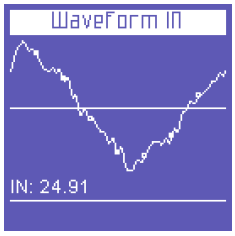
▼ go to previous



L3 voltage and current waveforms and relevant RMS values.

▲ go to next page

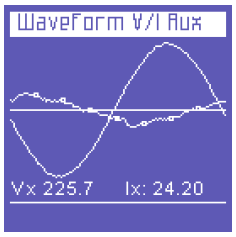
▼ go to previous



Neutral current waveform and relevant RMS value.

▲ go to first page

▼ go to previous

▶	On any of the Waveforms Menu pages, press ▶ to access the auxiliary channel tracing page. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Power, Counters, Harmonics) by selecting them with the relevant function keys.
◀	Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.
	Auxiliary channel tracing page.

5.2.7 Snapshot Function

During measurements, press the 📷 key to block all measurements immediately – not only those currently displayed. By doing so, the measurements will remain "frozen" on screen until the same key is pressed again.

After blocking the measurements, all other menus can be scrolled through to check the status of the other parameters captured at the same time.

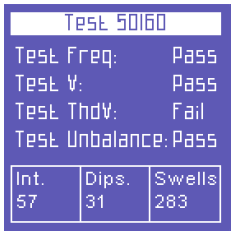
The word **STOP** appears on the bottom bar to indicate that measurements have been blocked.

Blocking not only interrupts what appears on the display, but also the entire measurement process. This means that the data during the block will not be recorded.

5.2.8 EN50160 Menu

x 3"

This menu allows the user to monitor main power quality parameters.



The first page displays the outcome of the EN50160 compliance test (Reference Standard for power quality), according to the parameters selected in the Setup Menu.

A test is performed to check whether frequency, voltage, harmonic voltage distortion, and unbalance comply with the above-mentioned reference Standard and the nominal values which have been set.

A table also shows the number of interruptions, dips and swells which have occurred during the period monitored.

▲ go to next page

▼ go to previous

These pages display the last 5 interruptions recorded (if any occurred).

NOTE: according to Standard EN50160, an "interruption" is defined as the simultaneous drop of all phase voltages below 5% of nominal V. However, a different threshold may be set by the user.

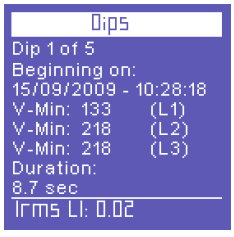
The Start Date and Time and Duration of each interruption are displayed.

When scrolling through the EN50160 Menu, the page of the most recent interruption is displayed automatically.

To view any previous interruptions, scroll through the relevant pages using the ◀ and ▶ keys.

▲ go to next page

▼ go to previous



These pages display the last 5 dips recorded (if any occurred).

NOTE: according to Standard EN50160, a "dip" is defined as a drop of one or more phase voltages below 90% of nominal V. However, a different threshold may be set by the user.

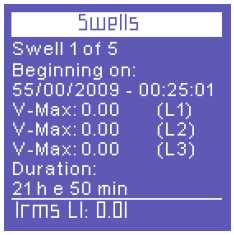
The Start Date and Time, Affected Phase(s), and Duration of each dip are displayed.

When scrolling through the EN50160 Menu, the page of the most recent dip is displayed automatically.

To view any previous dips, scroll through the relevant pages using the ◀ and ▶ keys.

▲ go to next page

▼ go to previous



These pages display the last 5 swells recorded (if any occurred).

NOTE: according to Standard EN50160, a "swell" is defined as an increase of one or more phase voltages above 110% of nominal V. However, a different threshold may be set by the user.

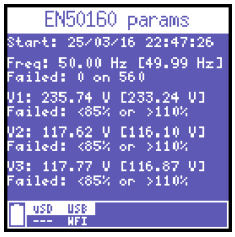
The Start Date and Time, Affected Phase(s), and Duration of each swell are displayed.

When scrolling through the EN50160 Menu, the page of the most recent swell is displayed automatically.

To view any previous swells, scroll through the relevant pages using the ◀ and ▶ keys.

▲ go to next page

▼ go to previous



This page report EN50160 test progress since last reset of counters or survey start.

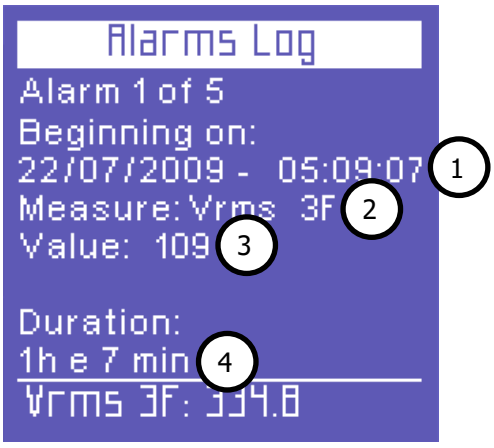
▲ go to first page

▼ go to previous

5.2.9 Alarms menu

 x 3"

This menu stores and displays the last 5 alarms to go off (if any did go off); see Setup menu chapter for alarm setting. The menu automatically displays the page of the most recent alarm.



Each alarm is identified by:

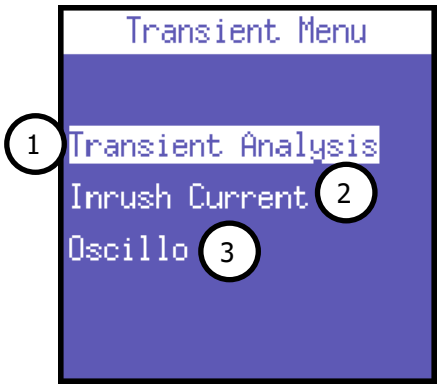
1) Start Date and Time;
2) Type of parameter that exceeded the thresholds set;
3) Value of the parameter which caused the alarm to go off;
4) Duration of the event.

To view any previous alarms, scroll through the relevant pages using the ◀ and ▶ keys.

NOTE: Alarms are stored - hence displayed - only at the end of the event, i.e. when the parameter in question falls within the set values again.

5.2.10 Transients Menu

 x 3"

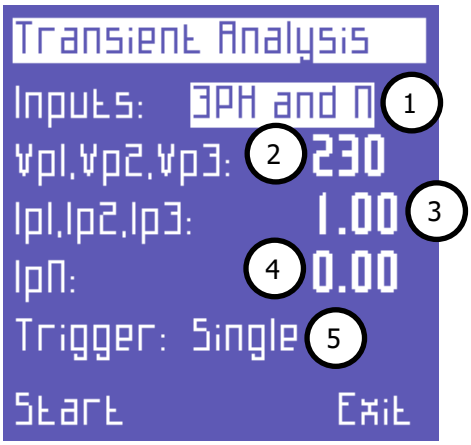


This menu can be used to capture and analyse temporary signal-specific phenomena and variations, such as:

1) Fast transient events
2) Inrush currents
3) Oscillo measures

5.2.10.1 Transients Setup

This page allows the user to set the thresholds that the instrument will use to identify the transient event (i.e. the instant swell or overcurrent of peak).



The following parameters must be set:

1) Channels to be measured.
2) The voltage peak threshold.
3) The phase current peak threshold.
4) The neutral current threshold - which obviously is not present if the "Inputs" field is set to "Auxiliary".
5) The capturing mode.

5.2.10.1.1 Input Selection

The two options available are:

- "Three-phase and neutral inputs" (3PH and N)
- "Auxiliary input".

> *NOTE: This field does not indicate the electrical connection; therefore, the channels will always be identified as 3PH and N, even if a single phase, two-phase or three-phase without neutral connection is being used.*

5.2.10.1.2 Voltage Threshold

This value indicates the **peak** voltage threshold over which the instrument will identify the presence of a transient. Set "0" to disable this transient search function.

5.2.10.1.3 Current Threshold

This value indicates the **peak** phase current threshold over which the instrument will identify the presence of a transient. Set "0" to disable this transient search function.

5.2.10.1.4 In Threshold

This value indicates the **peak** In current threshold over which the instrument will identify the presence of a transient. Set "0" to disable this transient search function.

5.2.10.1.5 Transient Detecting Mode

Transients can be detected in 4 different modes.

MODE	Description

SINGLE TRIGGER	only one transient (the first to occur) will be detected and displayed, but not stored
SINGLE TRIGGER + MEM	same as single trigger, but the transient will also be stored on the uSD card
AUTO TRIGGER	the instrument will detect all transients and display the last one
AUTO TRIGGER + MEM	same as auto trigger, but all transients will also be stored on the uSD carD

NOTES:

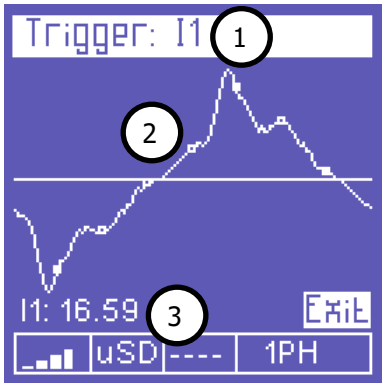
Do not set thresholds lower than the nominal peak value of the signal, as this will result in the continuous recording of events.

In detection modes with storage on uSD, it is necessary that the date and time are set correctly. If they are not NanoVIP3 prevents the initiation of the detection, displaying the message "Set date and time".

After setting all the parameters, select **START** to start the transient search. Select "Exit" to return to the Transient Menu.

A waiting page will then appear. The instrument will stay in this state until a transient actually occurs or the user presses ↵ (Exit) to exit and return to the Transient Setup page.

If transient is detected, event graph is displayed with following information:



1) Channel(s) in which the transient has occurred.

2) Transient waveform.

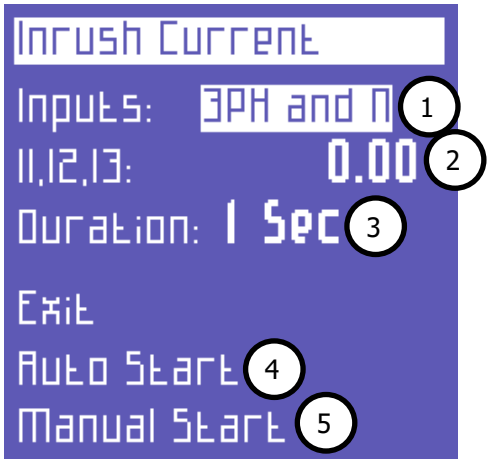
3) Relevant peak value

To scroll through the transients that occurred at the same time as the one being displayed (all the channels on which a transient has occurred are listed in the heading of the page), use the ▲ and ▼ keys.

To exit and return to the Transients Menu, press ↵ (Exit).

5.2.10.2 Inrush Current Setup

On any of the Transients Menu pages, select "Inrush Current" to access the configuration page for analysing said phenomenon.



The following parameters can be set:

1) Channels to be measured.

2) The current RMS threshold.

3) The duration of the analysis.

4) Automatic start.

5) Manual start.

5.2.10.2.1 Input Selection

The two options available are "Three-phase and neutral inputs" (3PH and N) or "Auxiliary input".

> *NOTE: this field does not indicate the electrical connection; therefore, the channels will always be identified as 3PH and N, even if a single phase, two-phase or three-phase without neutral connection is being used.*

5.2.10.2.2 Current Threshold

This value indicates the current threshold expressed in RMS amperes over which the instrument will identify current as "inrush current". A threshold slightly higher than the nominal I of the connected instrument should be set.

As NanoVIP³ CUBE WF™ cannot know the value of the inrush current to be measured, it will try to use the most appropriate amplification scale based on the threshold set by the user to perform as accurate a measurement as possible. However, the estimate may be incorrect and the instrument may suggest performing a new measurement.

5.2.10.2.3 Analysis Duration

This field allows the user to set the maximum duration (in seconds) of the inrush current analysis.

5.2.10.2.4 Automatic Start

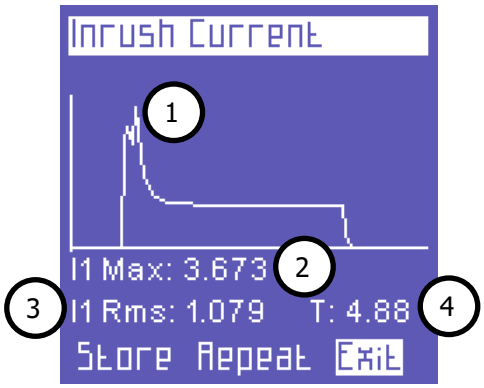
If automatic start is selected, the instrument will wait for the inrush current to occur, and then detect it automatically.

> *NOTE: If an unsuitable threshold is set, the instrument may not detect any event; it will remain in standby mode. To exit this condition, press ↵.*

5.2.10.2.5 Manual Start

If manual start is selected, the instrument will detect any current (without the threshold set acting as a trigger) occurring during the time period selected. At the end of the selected time period, the waveform detected will be displayed.

5.2.10.3 Inrush Current Display



When an inrush current is detected, the following information will be displayed:

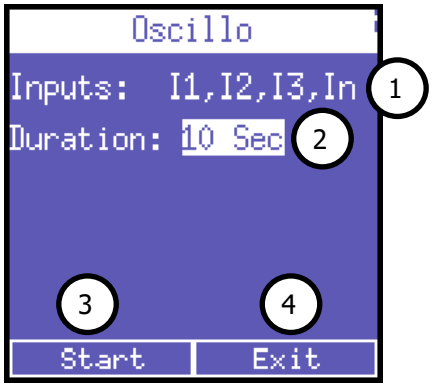
1) Waveform
2) Maximum value
3) RMS value
4) Duration

This screen will be displayed until the user:

- Exits (Exit = Return to the Setup page
- Repeats the measurement using the same settings (Repeat).
- Stores the measurement on the uSD card (Store).

5.2.10.4 Oscillo measures setup

By selecting the Oscillo function the device shows the Oscillo setup measure menu:



1) Inputs to be measured: Currents or Voltages and frequency
2) Duration of the measure: 1 sec, 5 sec or 10 sec
3) Start measure
4) Leave oscillo function

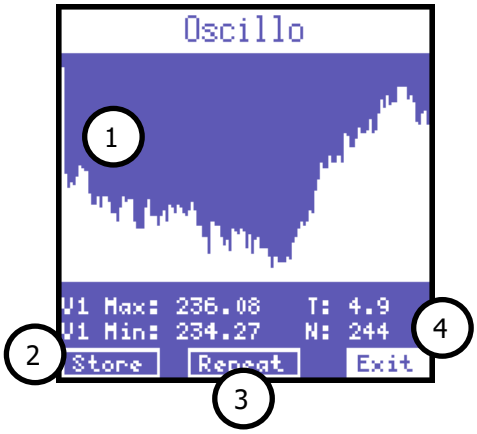
5.2.10.4.1 Launch oscillo measurement

By pressing the Start button, NanoVIP will start to measure the required parameters for the selected duration.

During measurement keyboard, display and communication will be temporarily suspend for the whole measure duration; a "Measuring…." Message will be shown on display.

5.2.10.4.2 Oscillo results

At the end of measure diplay will report the L1 parameter, scaling it within its maximum and minimum detected values.



1) Graph area reportinh the whole test result and following params: minimum and maximum of the parameter, sampling time (T) and number of samples taken (N)
2) Store data on mSD
3) Repeat measure
4) Return to oscillo setup

Use the ▲ and ▼ keys to scroll through channels (L1, L2 and L3) and ◀ and ▶ keys to select the proper button.

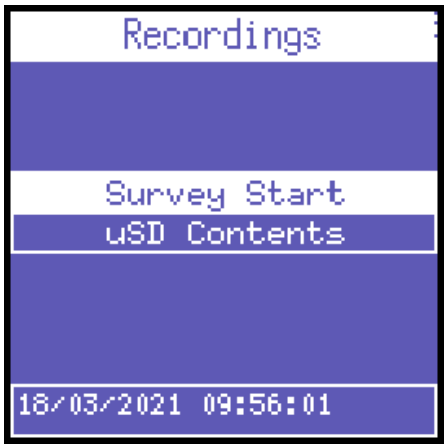
The Store function will save on mSD a OSC file with reslts that can be then analysed with NanoStudio 4.00 or later.

5.2.11 Measurements Campaigns Menu

 x 3"

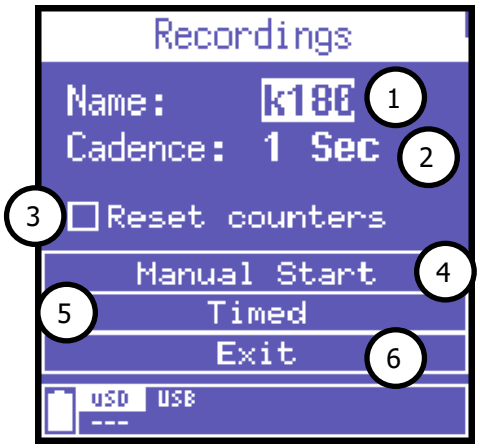
This menu allows the user to:

- Set a Measurement Campaign
- View the data stored on the uSD card



5.2.11.1 Measurements campaigns

Select "Start Campaign" to view the Measurement Campaign configuration page.



The following parameters can be set:

5) Campaign Name.
6) Storing Rate.
7) Counter reset on start
8) Manual Start.
9) Scheduled Start.
10) Return to measuring menu

5.2.11.1.1 How to set campaign name

To assign a name to the campaign, place the cursor on the first character, press ↵ and change the character using the ▲ and ▼ keys.

The selection of the other characters has been made easier: move the flashing cursor using the ▶ and ◀ keys, and change the character as described above.

The campaign name must have 6 alphanumeric characters (if the same name is assigned to more than one campaign, progressive numbers will automatically be added to subsequent campaign names, e.g. Survey01).

5.2.11.1.2 Storing rate

This parameter indicates the rate at which NanoVIP³ CUBE WF™ stores the data.

The following options are available: 1" - 5" - 30" - 1' - 5' - 15'. Obviously, from the choice of memorization frequency and duration of the campaign, will depend the MB employed by the campaign on uSD. It 'is clear that a storage every second for a long period of time, would produce a campaign very heavy and therefore not practical to analyze.

To properly tune these parameters we recommend that you refer to the following main criteria.

Campaign duration	Suggested rate	Maximun use of storage memory
Up to 12h	1 second	217 Mb
From 12h to 48h	5 seconds	174 Mb
From 48h to 2 weeks	30 seconds	204 Mb
From 2 weeks to 1 month	60 seconds	217 Mb
From to 6 months	5 minutes	264 Mb
From 6 months to 1 year	15 minutes	176 Mb

NOTE: if the number of records stored exceeds 50.000, NanoVIP³ CUBE WF™ closes the storage file and it automatically opens another one, identified with the same name but with and increased progressive number (eg. filename01, filename02, etc..), to avoid that they yield files too large, which later would jeopardize the proper consultation by the software.

5.2.11.1.3 Counter reset on start

Check this flag if you want counters to be reset on campaign start; if not, campaign will keep actual counters values unchanged and will update them during campaign.

5.2.11.1.4 Manual Start

Select "Manual Start" to start a campaign immediately. NanoVIP³ CUBE WF™ will automatically display the first page of the Voltages Menu.

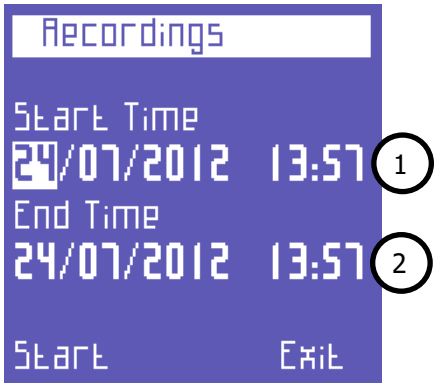
To make sure the campaign has started correctly, check that "Rec" features on the bottom bar.

To stop the campaign, return to the Menu, where the "Stop" function appears, and press ↵ to stop the campaign and return to the Measurement Campaigns Menu.

> *NOTE: If the date and time have been lost (eg for battery discharge) or has not been correctly set, is prevented from the start of the campaign and displayed the message "Set date and time".*

5.2.11.1.5 Scheduled start

Select "Scheduled" to access the page for scheduling a campaign.



The following parameters can be set:

1) Start Date and Time;
2) End Date and Time.

By selecting "Start", NanoVIP CUBE WF will automatically display the first page of the Voltages Menu.

To make sure the campaign has been scheduled correctly, check that "Prg" features on the bottom bar instead of the "Rec" text.

To stop a campaign (if already underway) or cancel a scheduled one, return to the Menu, where the "Stop" function appears, and press ↵ to stop the campaign and return to the Measurement Campaigns Menu.

> *NOTE: If the date and time have been lost (eg for battery discharge) or has not been correctly set, is prevented from the start of the campaign and displayed the message "Set date and time".*

5.2.11.2 uSD Content

Select "uSD Content" to review all stored data.

There are three types of recordings:

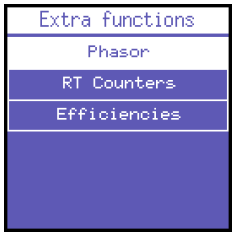
- Manual or scheduled measurement campaigns.
- Fast transients.
- Inrush currents.

Measurement campaigns are identified by the name assigned to them, whereas transients and inrush currents are identified by the abbreviations TRANS (transients), INRU (inrush) or OSC (Oscillo) respectively, which are numbered progressively.

To scroll through the various recordings, use the ▲ and ▼ keys.

5.2.12 Extra functions Menu

 x 3"



This page displays the menu with alla available extra and custom functions (if any)

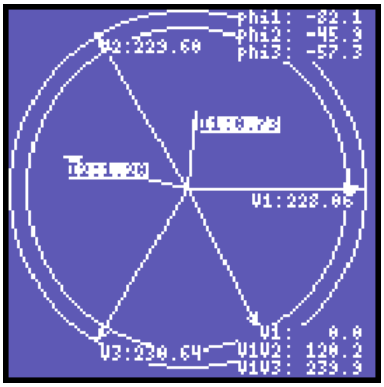
▲ go to previous function

▼ go to next function

↵ launch the highlighted function

5.2.12.1 Phasor

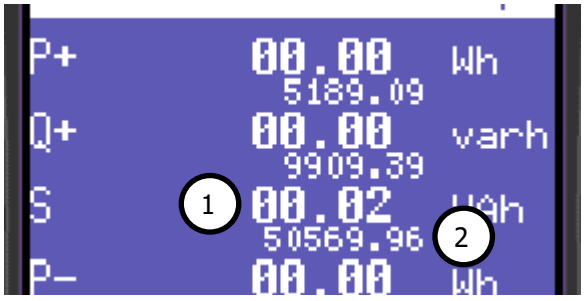
Phasor page visualize Tension and Current vectors relative positions in relatime.



5.2.12.2 Realtime counters

Realtime counters page offers the possibility to measure a limited time frame counters progression without resetting them compromising a running survey.

Per each counter two separate values are shown:



1) Partial value (big font)
2) Absolute value (small font)

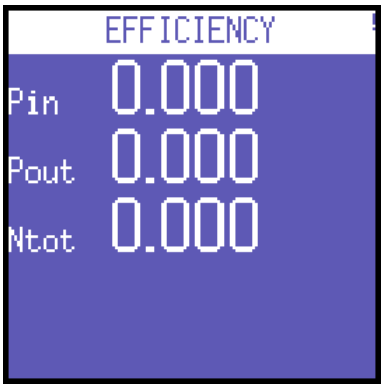
When user logs to this page Partial counters are automatically reset to zero; press ↵ to start counting partial values and press ↵ again to stop partial counting.

Third pressure of ↵ will reset partial counters and restart calculation.

> *Once Partial counting is launched, user can freely move to other pages and partial calculation will proceed normally.*
>
> *Return to the Realtime counters to stop partial couners.*

Counters reset will reset Partial ones too.

5.2.12.3 Efficiencies



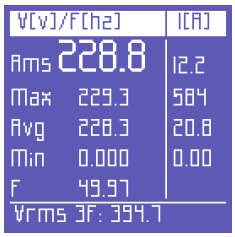
This page reports Power balance between Threephase channel (Pin) and Aux channel (Pout).

> *Pay attention: in case of UPS 3-1 or UPS 3-3, refer to Power measurement pages to get the proper efficiency ratio related to the selected connection*

5.3 SINGLE-PHASE CONNECTION MENU

As already mentioned, if the single-phase connection is set, the instrument will automatically change the structure of the menus, eliminating the non-applicable items for this type of electrical connection, and grouping information in fewer pages.

5.3.1 Voltages Menu (1 ph)

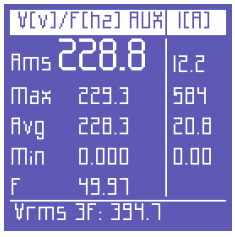


This page displays the RMS voltage, maximum, average and minimum value, and frequency, and the relevant currents.

Minimum and maximum voltage values can be reset as well as the average value

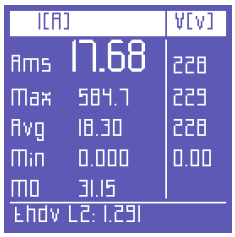
On any of the Voltages Menu pages, press ▶ to access the page containing all the information regarding auxiliary channel voltage. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Currents, Power, Counters, Harmonics, Waveforms) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



All the information regarding auxiliary channel voltage

5.3.2 Currents Menu (1 ph)

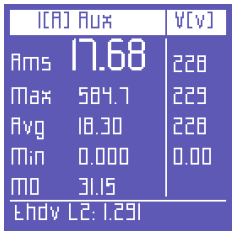


This page displays the RMS current, maximum, average and minimum value, and maximum demand (load peaks are calculated on the basis of the integration time set), and the relevant voltages.

Minimum and maximum current values can be reset as well as the average value and the maximum demand.

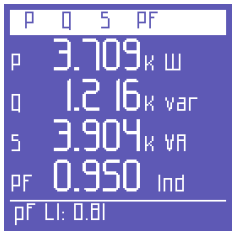
Press ▶ to access the page containing all the information regarding auxiliary channel current. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Power, Counters, Harmonics, Waveforms) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



All the information regarding auxiliary channel currents

5.3.3 Power Menu (1 ph)



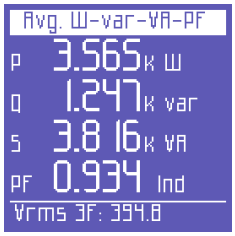
This page displays active, reactive and apparent power, and the PF (including a note whether the latter is inductive or capacitive).

As a norm:

- Active power is shown as a negative when generated and a positive when absorbed.
- Reactive power is shown as a negative when capacitive and a positive when inductive.
- The PF is shown as a negative when active power is generated and a positive when it is absorbed..

▲ go to next page

▼ go to previous



Average power and PF (calculated on the basis of the integration time set. Values can be reset).

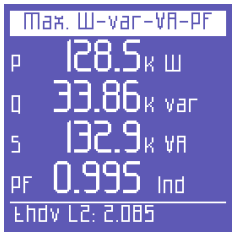
▲ go to next page

▼ go to previous

Minimum instant values of power and PF (values can be reset)

▲ go to next page

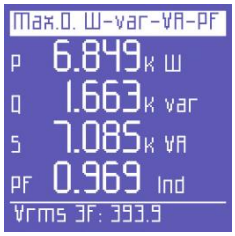
▼ go to previous



Maximum instant values of power and PF (values can be reset)

▲ go to next page

▼ go to previous



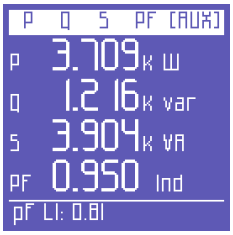
Load peaks of power and PF, i.e. the highest average values (calculated on the basis of the integration time set. Values can be reset).

▲ go to first page

▼ go to previous

On any of the Power Menu pages, press ▶ to access a series of pages containing all the information regarding auxiliary channel power. The first page displays active, reactive and apparent power, as well as the PF. Use ▲ and ▼ arrows to scroll through the pages (See below). In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Counters, Harmonics, Waveforms), by selecting them with the relevant function keys.

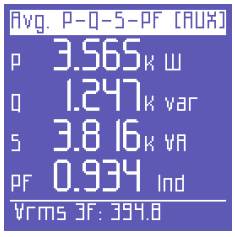
Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



The first page displays active, reactive and apparent power, as well as the PF of AUX channel.

▲ go to next page

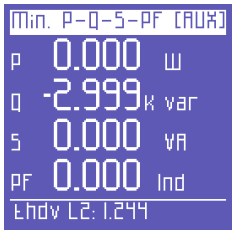
▼ go to previous



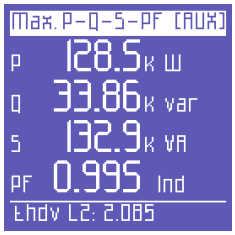
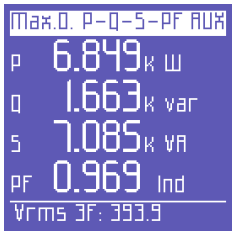
Average power and PF (calculated on the basis of the integration time set. Values can be reset) related to the auxiliary channel.

▲ go to next page

▼ go to previous

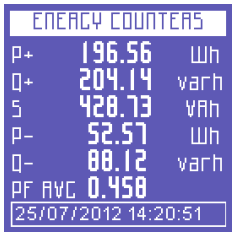
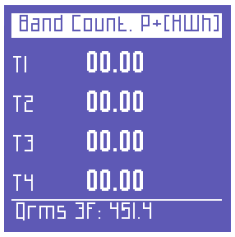
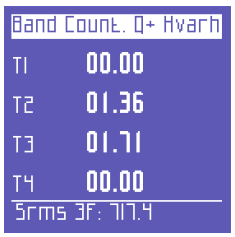
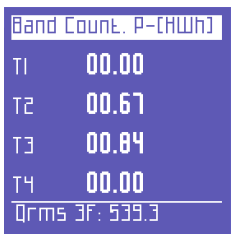


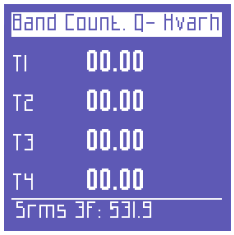
Minimum instant values of power and PF (values can be reset) related to the auxiliary channel.

	▲ go to next page ▼ go to previous
	Maximum instant values of power and PF (values can be reset) related to the auxiliary channel.
	▲ go to next page ▼ go to previous
	Load peaks and relevant PF, i.e. the highest average power (calculated on the basis of the integration time set. Values can be reset) related to the auxiliary channel.
	▲ go to first page ▼ go to previous

5.3.4 Counters Menu (1 ph)

x3"

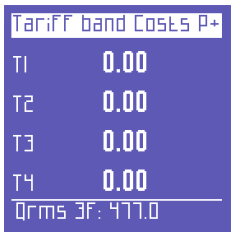
	Counters of absorbed (P+ Q+) and generated (P- Q-) power, and average value of the PF calculated as kWh/kVAh ratio.
	▲ go to next page ▼ go to previous
	This page displays the absorbed and/or generated power, and the related costs for the time bands selected in the Setup Menu. The first page displays the kWh absorbed during the various time bands.
	▲ go to next page ▼ go to previous
	The kVArh absorbed during the various time bands.
	▲ go to next page ▼ go to previous
	The kWh generated during the various time bands.
	▲ go to next page ▼ go to previous



The kVArh generated during the various time bands.

▲ go to next page

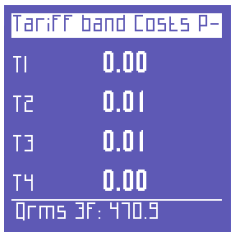
▼ go to previous



The cost of the kWh absorbed during the various tariff bands, expressed in the currency selected in the Setup Menu.

▲ go to next page

▼ go to previous



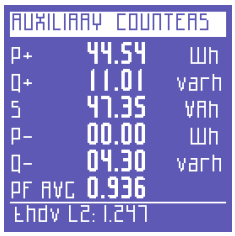
The income expressed in the set currency unit of the kWh generated during the different tariff bands.

▲ go to first page

▼ go to previous

On any of the Counters Menu pages, press ▶ to access the page containing all the information regarding auxiliary channel counters. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Power, Harmonics, Waveforms) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



All the information regarding auxiliary channel counters

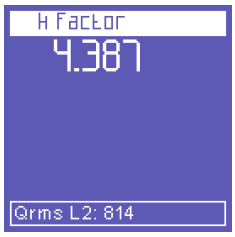
5.3.5 Harmonics Menu (1 ph)


x 3"

THD% (Total Harmonic Distortion) for voltage and current, Cosφ value and relevant angle expressed in degrees (the negative sign indicates that current comes before voltage and that the load is capacitive).

▲ go to next page

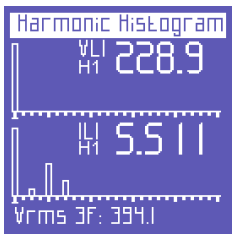
▼ go to previous



K factor.

▲ go to next page

▼ go to previous



Harmonic histogram of current and voltage.

▲ go to first page

▼ go to previous

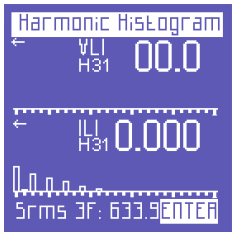
On any of the Harmonics Menu pages, press ▶ to access two pages containing all the information regarding auxiliary channel harmonics. The first page displays the THD% of V and I. Use ▲ or ▼ to view the other page (see below). In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Counters, Harmonics, Waveforms), by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.

First page of Auxiliary Harmonics displays THD% of V and I.

▲ go to next page

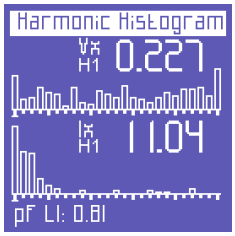
▼ go to previous



K factor of the auxiliary channel

▲ go to next page

▼ go to previous



Harmonic histogram of auxiliary voltage and current.

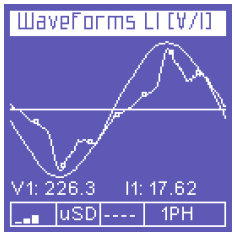
▲ go to first page

▼ go to previous

NOTE: consultation of harmonic histograms functions for the single phase connection, are identical to the corresponding menus of the three-phase connection.

5.3.6 Waveforms Menu

x 3"

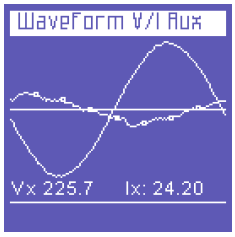


This page displays the real-time waveforms and the relevant voltage and current RMS values.

NOTE: current tracing can be distinguished from voltage tracing by little square markers. Waveform amplitude is purely indicative and is automatically adjusted to screen size

On any of the Waveforms Menu pages, press ▶ to access the auxiliary channel tracing page. In the AUX Menu, the user can also access the other Auxiliary Channel Menus (Voltages, Currents, Power, Counters, Harmonics) by selecting them with the relevant function keys.

Press ◀ to exit the Auxiliary Menu and return to the first page of the relevant menu.



Auxiliary channel tracing page.

NOTE: the "EN 50160", "Transients", "Alarms", and "Measurement Campaigns" Menus, as well as the "Snapshot" function for the single phase connection, are identical to the corresponding menus of the three-phase connection.

NOTE: the "EN 50160", "Transients", "Alarms", and "Measurement Campaigns" Menus, as well as the "Snapshot" function for the single phase connection, are identical to the corresponding menus of the three-phase connection.

6 CONNECTION SCHEMES

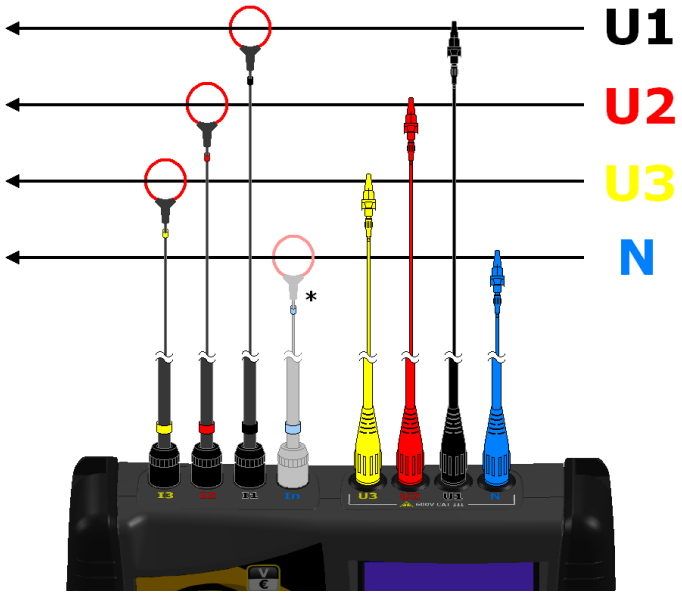
This chapter resume main usual connection schemes that can be applied to NanoVIP CUBE WF analyzer; availability of required CT clamps and voltages captors can be affected by the package in user hands.

In case of network multipoint application, usage of these schemes (in terms of number and placement) depends on the network structure and measurement aims: please, refer to network measurement schemes chapter for further details.

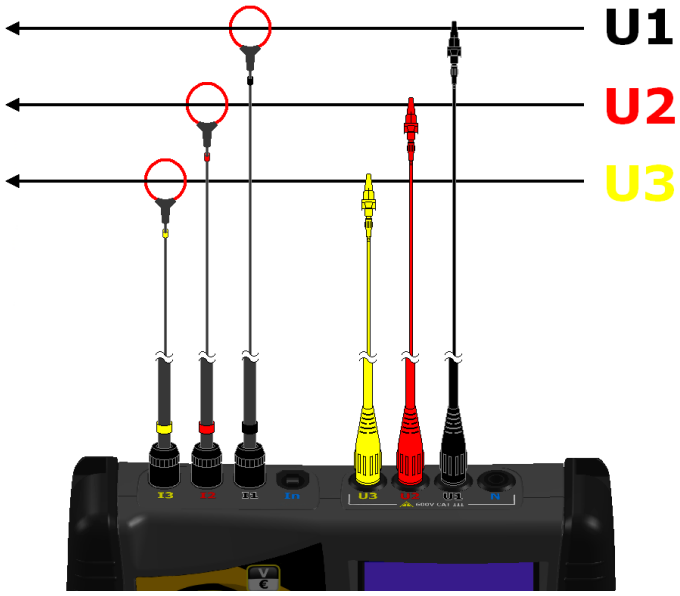
DURING CONNECTION SETUP (CT CLAMPS AND VOLTAGE CAPTORS), BE SURE ELECTRICAL NETWORK IS POWERED OF AND FOLLOW ALL ELECTRICAL SAFETY REQUIREMENT.

DURING CONNECTION SETUP KEEP ANALYZER SWITCHED OFF TO AVOID ANY POSSIBLE DAMAGE DUE TO CONNECTION OPERATIONS

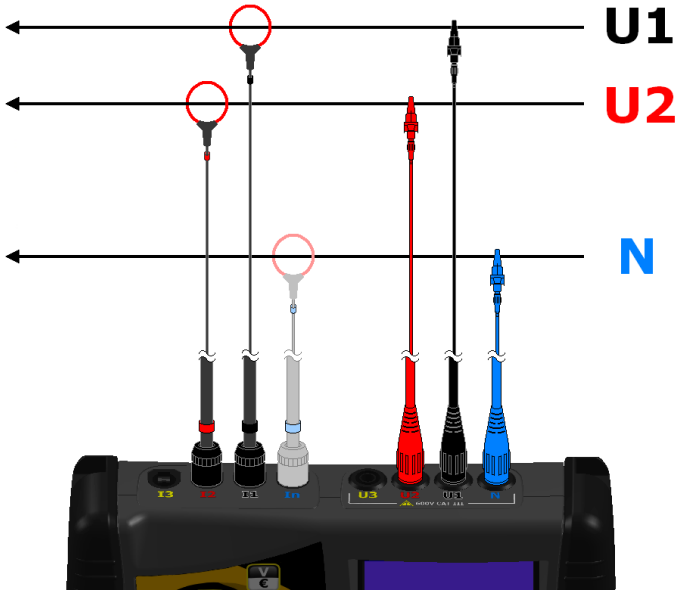
6.1 3PHN - THREE PHASES AND NEUTRAL (BALANCED AND UNBALANCED)



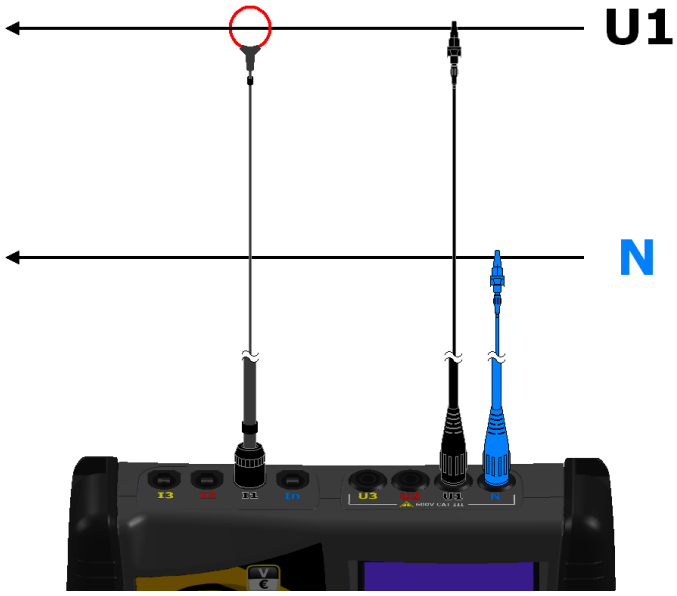
6.2 3PH - THREE PHASES (BALANCED AND UNBALANCED)



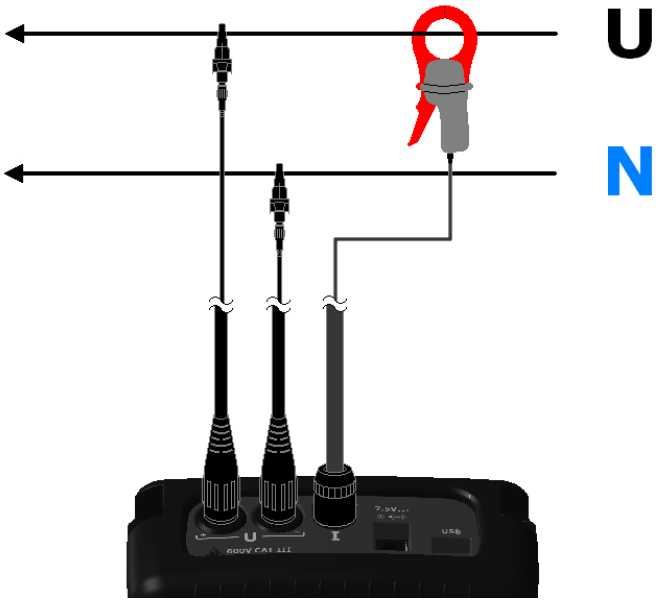
6.3 2PH - TWO PHASES



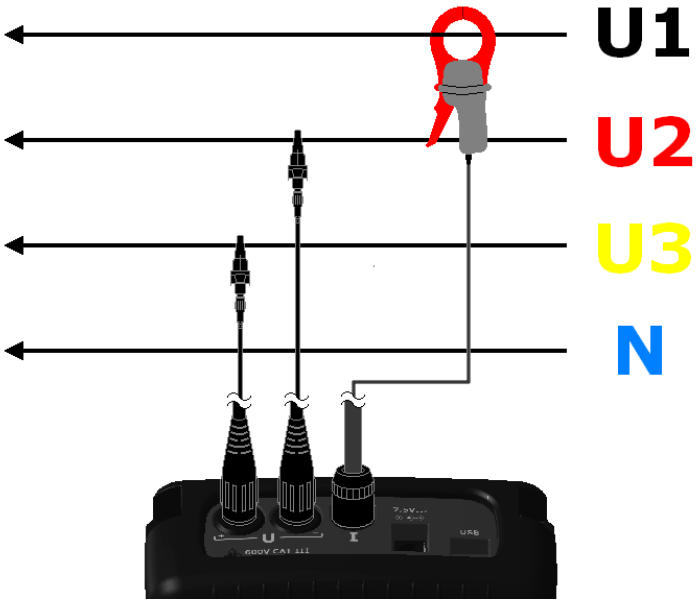
6.4 1PH - MONOPHASE



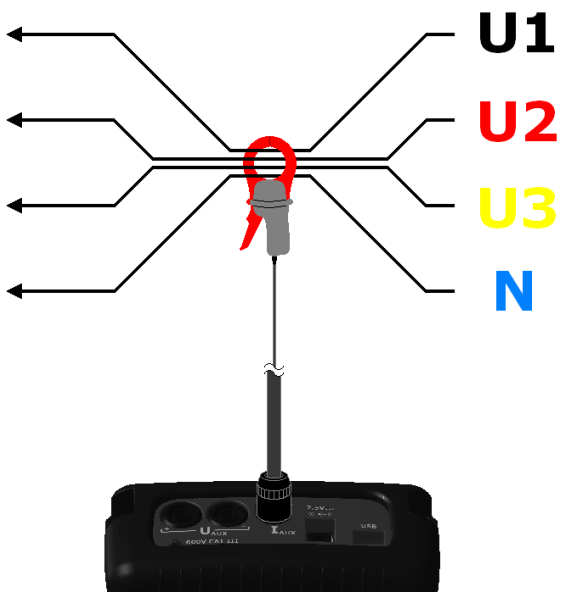
6.5 1PHAUX - MONOPHASE ON AUXILIARY CHANNEL



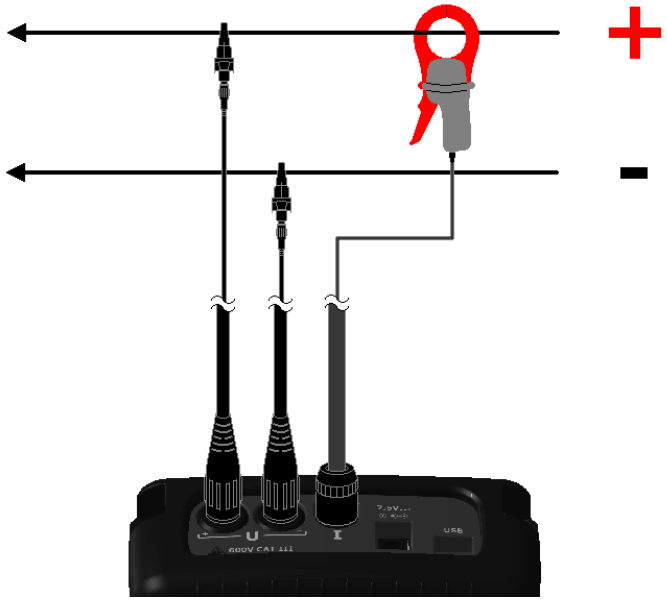
6.6 3PHAUX - THREE PHASES BALANCED ON AUXILIARY CHANNEL



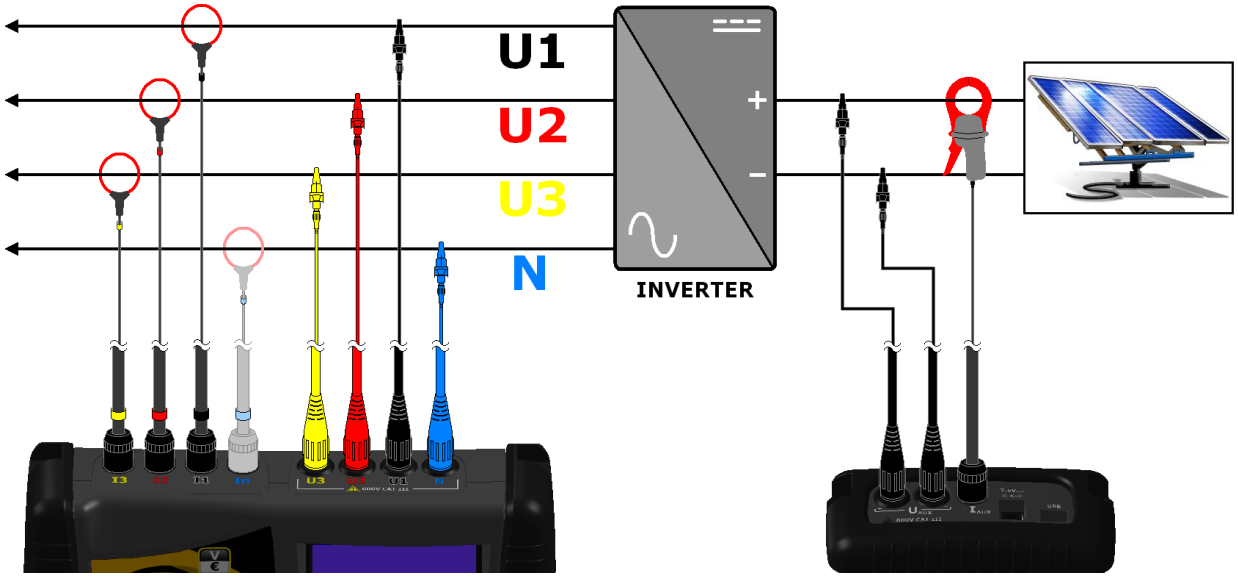
6.7 DISP - DISPERSION MEASUREMENT ON AUXILIARY CHANNEL



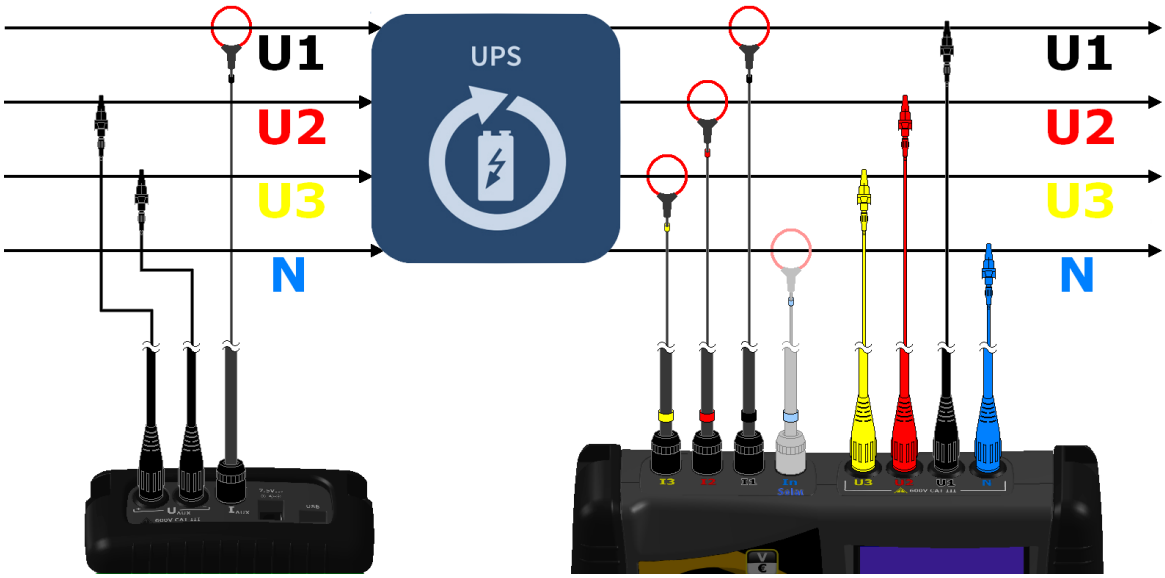
6.8 DC – DC MEASUREMENT ON AUXILIARY CHANNEL



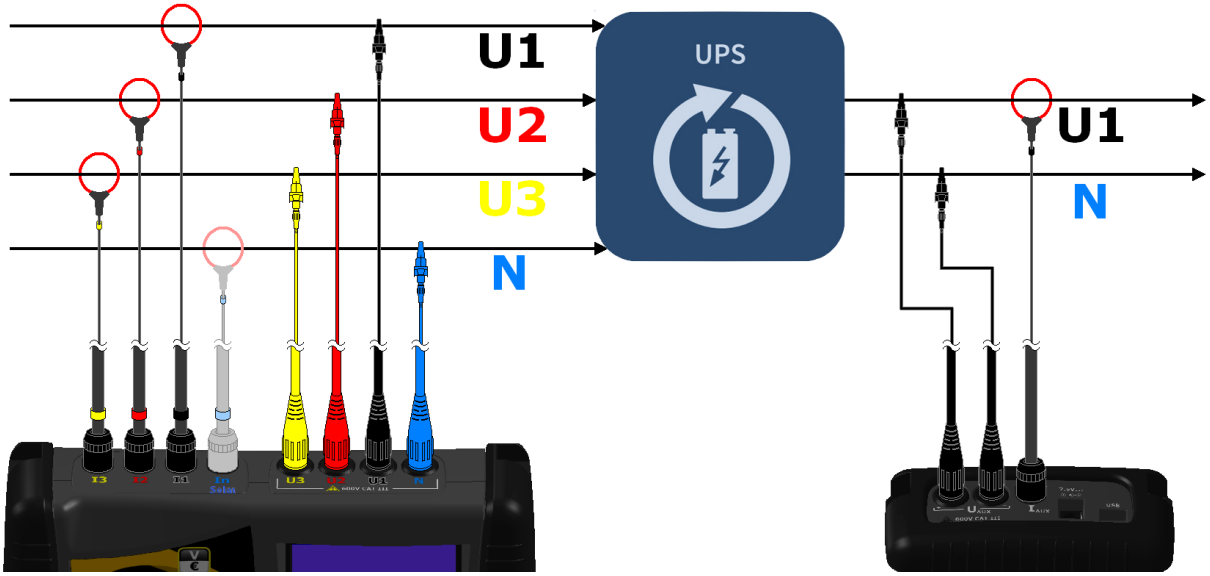
6.9 INV - INVERTER MEASUREMENT



6.10 UPS 3-3 – THREE PHASE TO THREE PHASE UPS MEASUREMENT



6.11 UPS 3-1 – THREE PHASE TO MONO PHASE UPS MEASUREMENT



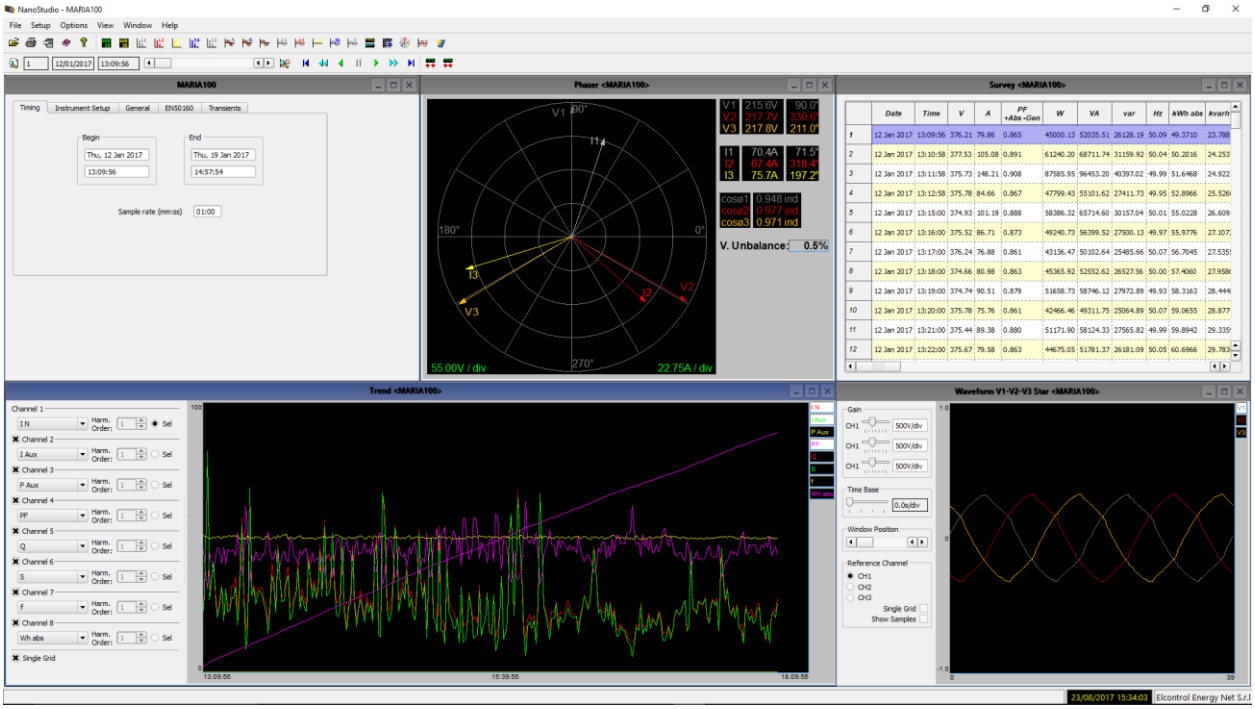
7 NANOSTUDIO SOFTWARE

NanoStudio™ Software is a powerfull and versatile analysis tool of the measurement campaigns performed with NanoVIP® family analyzers.

NanoStudio™ is available for Windows and Android operative systems and does not require any installation; if can be downloaded (included instruction manual) from our website at:

http://www.elcontrol-energy.net/download/

With NanoStudio, user will be able to analyse all the events recorded in the campaign, export the measurements performed to an EXCEL file, create reports, etc.

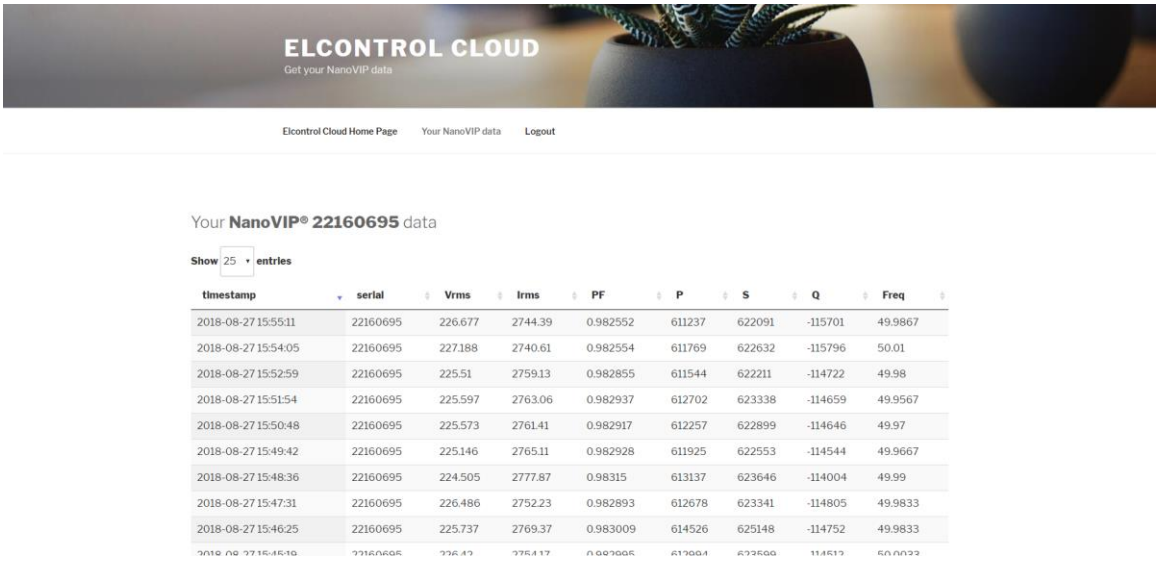


8 CONNECTION TO ELCONTROL CLOUD

NanoVIP CUBE WF can be easily connected to Elcontrol Cloud by means of NanoCloud™ software that can be download from our website at:

http://www.elcontrol-energy.net/download/

Installation and connection instructions are included in same package.



NanoCloud™ is a simple software to be run on a PC connected to your NanoVIP CUBE WF to allow user to check remotely that measuresa are proceeding correctly; it is not a monitoring software.

9 MAINTENANCE

NanoVIP® CUBE WF™ requires basic maintenance according to common rules that apply to any electronic device:

- Clean the instrument with a soft and clean cloth (the edges must not be frayed).
- Do not use detergents or corrosive or abrasive substances.
- Do not store the instrument in areas where the humidity and temperature levels exceed the ranges prescribed below.

9.1 ACCURACY CHECK

The manufacturer cannot determine in advance the frequency at which an accuracy check should be performed, as instrument performance will depend on the conditions of use (heavy- or light-duty, environmental conditions, etc.).

Therefore, the user should perform periodical performance checks, using a sample instrument (of a higher category).

At first, accuracy checks should be performed yearly, and thereafter increased or decreased based on the outcome of the checks.

If new calibration is required, the instrument can be sent to the manufacturer's in-house laboratory.

If deemed appropriate, the user can also request that the manufacturer perform the accuracy check.

> *NOTE: the in-house calibration laboratory of Elcontrol Energy Net is currently the only authorised calibration centre used.*

9.2 REPAIR

NanoVIP® CUBE WF™ is a sophisticated electronic product designed by Elcontrol Energy Net.

Any attempt to repair the instrument without the necessary know-how may pose a safety risk.

Therefore, no unauthorised personnel or laboratories should carry out repair, maintenance or calibration operations. The warranty shall no longer be valid if the instrument is tampered with by third parties.

[blank intentionally]

10 TROUBLESHOOTING

GENERAL:	
Instrument does not switch on	The battery ran out. Connect instrument to power supply
The display is blurry	Go to LCD Setup page and check brightness and contrast levels of the LCD
The display dims after few seconds	Go to LCD setup and check Backlight parameter setting
The display stays on permanently, even though it has been set-up differently	Check if there is an active video alarm
Certain pages or entire menus are not displayed	Go to LCD setup page and set Menu type parameter to Total Go to Connection setup menu and check that Grid type parameter is set according to your needs
A significant number of alarms have gone off	Go to Alarm setup page and verify a proper Histeresys parameter value has been set

CONNECTIVITY:	
I cannot connect to my WiFi network	Check your NanoVIP is not in Airplane Mode by checking the WiFi Mode is not set to DISABLE Verify your desired WiFi network is actually available by reaching WiFi Setup page and launching the Scan function to detect available APs Check your WiFi network is WPA2 protected Check your Passphrase is correct
Network scan reports "No AP available"	In some conditions, Scan could require up to 3 repetitions
I cannot reach my device with NanoRemote	Be sure you belongs to the same local network your NanoVIP is connected too If you are trying to connect from outside the network be sure proper NAT rule is in place
Where do I set the SSID for NanoVIP when in ACCESS mode	SSID for ACCESS Mode is always the device serial number
Where is password listed to connect to NanoVIP in ACCESS mode	When NanoVIP is in ACCESS Mode, it creates and open network; no password is required
Cannot see NanoVIP data on cloud	Check your NanoVIP is successfully connected to the local WiFi network Check your NanoVIP is correctly set in PUSH Mode Check you correctly activated the pushing mode; this is visible in bottom bar where "PUS" indicator should be highlighted and "Pushing" should be written as well Be sure at least one record has been pushed to cloud by checking the countdown reported beside the "Pushing" label

MEASUREMENT:	
Instrument does not perform correct measurements	Make sure the current and voltage ratios match the current clamps and VTs connected to the system Make sure the current clamps are not connected inversely Make sure the phase sequence is correct
One Shot UPS page is not available	Go to Connections setup page and check if Grid type parameter is set to UPS 3-3 or UPS 3-1
THDI% is 0.00 even if currents are correctly shown	Check you correctly connected the voltage cables; no THDI can be performed without voltage connection as it is impossible to detect the foundamental.

11 TECHNICAL SPECIFICATIONS

11.1 OVERALL

CASE:	
Dimensions	203x116x53mm
Material	ABS with self-extinguishing V0 grade
Protection class	IP30
Weight	580 g
DISPLAY:	
Dimensions	68x68mm
Type	128x128 FSTN Negative dot matrix graphic LCD
Backlight	White LED
Languages	English - Spanish - Italian - German - French
KEYPAD:	
Type	Membrane keypad with 10 double-function keys
POWER SUPPLY:	
External power supply	wall-plug switching; input 100-240VAC ±10% 47-63Hz with interchangeable plug; output 7.5VDC - 12W
Battery pack	4 x AA NiMh 2100mAh
Duration of the battery charge	>24h (wireless off)
CONNECTING SYSTEMS:	
Systems frequencies	50Hz – 60Hz – 400Hz
Single phase	✓
Two phase	✓
Three-phase, 3-wires, balanced	✓
Three-phase, 3-wires, unbalanced	✓
4-phase, 4-wires, balanced	✓
4-phase, 4-wires, unbalanced	✓
CONNECTIONS:	
Voltages	Flexible cables L = 1.5m; 2.5mm^2 - 36A; 1000V CAT III - 600V CAT IV with a 4mm, 90° protected blade plug connector, crocodile clips with a 45mm opening (for sections up to 32mm) and magnetic captors
Currents	Elcontrol Energy Net interchangeable amperometric sensors
Solar radiation	-
PT100	-
Anemometer	-
Transducers	-
FUNCTIONS:	
Traditional electrical analisys	V, I, P, Q, S, F, PF, THD(V)%, THD(I)%, cosφ, φ, peaks, minimums, maximums, averages, max. demands, etc.
Neutral current	Measured
Three phase counters	kWh, kVArh, kVAh, both absorbed that generated
Counters for each single phase	kWh, kVArh, kVAh, both absorbed that generated
Cogeneration	✓
Waveforms	V & I
Harmonics	Values and histograms up to the 50th order
Sags	Dips, swells & interruptions
Transients	Overvoltages & overcurrents
Unbalance	✓

Test EN 50160	✓
Inrush current	✓
DC measures	✓
K factor	Up to the 25th order
Alarms	Displayed
Alarms log	5 at display
Tariff bands	4
Energy costs	✓
IEC 61724 network parameters	✓
Test EN 82.25	-
OSU™ (One Shot UPS)	-
Measurament campaigns	unlimited, up to fill the memory card
MEASUREMENTS:	
Sampling frequency	128 samples per cycle (adaptive in 40Hz-70Hz range) 16 samples per cycle at 400HZ
Data record rate	1 sec.
Data storage rate	User selectable: 1", 5", 3", 1', 5', 15'
Type of connections available	Three-phase (3 or 4 leads), two-phase (2 leads), and single phase grid
Type of grid which can be connected	Low and medium voltage (LV and MV)
VOLTAGE (TRMS)	
Channels	3 channels with common neutral + 1 independent, auxiliary channel
Input impedance	4 Mohm
Scales	2
Direct measurement	Phase-phase: 7-1000VAC 40-70Hz Phase-neutral: 5-600VAC 40-70Hz Aux: 5-1000VAC 40-70Hz, 10-1400VDC
Measurement with VT	Ratio: 1-60000 Maximum value which can be displayed: 20MV
Permanent overload	Phase-phase: 1200VAC Phase-neutral: 700VAC Aux: 1200VAC, 1700VDC
Sensitivity	5VAC Phase-neutral, 7VAC Phase-phase, 10VDC
CURRENT (TRMS)	
Channels	5 independent channels
Input impedance	10KOhm
Scales	4
Measurement with current clamps	Ratio: 1-60000 Maximum value which can be displayed: 500KA
Sensitivity	0,2% of F.S.
POWERS	
Single phase power	Values < 999 GW, Gvar, GVA
Total power	Values < 999 GW, Gvar, GVA
POWER COUNTERS	
Maximum value before reset	99999999 kWh, kvarh, kVAh
ACCURACY	
RMS voltages:	
Scale 1	±0.25% + 0.1%FS (2) @ RMS V < 350VAC (1)
Scale 2	±0.25% + 0.05%FS (2) @ RMS V > 350VAC (1)

RMS currents:	
Scale 1	±0.25% + 0.1%FS (2) @ RMS I < 5% IN clamp (1)
Scale 2	±0.25% + 0.05%FS (2) @ 5% < RMS I < 20% IN clamp (1)
Scale 3	±0.25% + 0.05%FS (2) @ 20% < RMS I < 50% IN clamp (1)
Scale 4	±0.25% + 0.05%FS (2) @ > 50% IN clamp (1)
Power	±0.5% + 0.05%FS (2)
Power Factor (PF)	±0.5°
Frequency	±0.01 Hz (40-70Hz)
Active power count (kW)	Class 0.5
Reactive power count (kVar)	Class 1
HARMONIC ANALISYS	Up to 50th order Up to 7th at 400Hz
ANALYSIS of EN50160 parameters	
Interruptions	>500mS
Dips	>500mS
Swells	>500mS
Transient ANALYSIS	
Swells and overcurrents	>150uS
Inrush current analysis	RMS continuous sampling every 2 periods – Duration 1, 2, 5, 10 sec.
COMMUNICATION:	
MRH™	-
Server mode	-
Connectable MRH™ clients	-
Client mode	-
Zigbee®	-
Maximum distance outdoor	-
Maximum distance indoor	-
Mesh network	-
WiFi®	✓
Wifi modes	802.11 b, 802.11 g, 802.11 g with security WEP, WPA and WPA2
Avalable wl features	Access Point, Poll, Push to cloud function
Elcontrol Cloud connectivity	✓
Wireless realtime to PC	✓
Realtime connection to PC	✓
DATA STORAGE:	
Internal memory	64kB
External memory	Micro SD (4GB included)
OPERATING CONDITIONS:	
Operating temperature	-10 to +55 °C
Storage temperature	-20 to +85 °C
Relative humidity	Max 95%
Maximum altitude a.s.l. (600V CAT III)	2000 m
EC COMPLIANCE:	
Directives	93/68/EEC (Low Voltage Electrical Equipment); 89/336/EEC and 2004/108/EC (EMC - Electromagnetic Compatibility); 2006/95/EC - 72/23/EEC (LVD - Low Voltage Directive); 2002/95/EC (RoHS - Restriction of Hazardous Substances); 2002/96/EC and 2003/108/EC (WEEE - Waste Electrical and Electronic Equipment);

	IEC 61724
REFERENCE STANDARDS:	
Safety	EN 61010-1
Electromagnetic Compatibility (EMC)	EN 61326 EN 61326/A1 EN 61326/A2 EN 61326/A3
Temperature	IEC 60068-2-1 (Operating temperature) IEC 60068-2-2 (Storing temperature)
Vibrations	IEC 60068-2-6
Humidity	IEC 60068-2-30 (Humidity)
Overload	IEC 60947-1

(1) The instrument changes the voltage and current scale automatically when the values of the signals detected by the analogue-to-digital converter exceed a pre-set threshold. Therefore, the thresholds provided are purely indicative. The following table summarizes the accuracy of the instrument on current, with the various Elcontrol Energy Net clamps (see par. 9 - Accessories and Spare Parts)

11.2 ACCURACY

RMS currents with flexible probe 3000A (Nanoflex o A101-EL):		
Scale 1	± 0,25%+0,15A (2)	@ 6A < I RMS < 150A
Scale 2	± 0,25%+0,30A (2)	@ 150A < I RMS < 600A
Scale 3	± 0,25%+0,75A (2)	@ 600A < I RMS < 1500A
Scale 4	± 0,25%+1,50A (2)	@ 1500A < I RMS < 3000A
RMS currents with 1000A clamp C107-EL		
Scale 1	± 0,25%+0,05A (2)	@ 2A < I RMS < 50A
Scale 2	± 0,25%+0,10A (2)	@ 50A < I RMS < 200A
Scale 3	± 0,25%+0,25A (2)	@ 200A < I RMS < 500A
Scale 4	± 0,25%+0,50A (2)	@ 500A < I RMS < 1000A
RMS currents with 200A clamp MN13-EL		
Scale 1	± 0,25%+0,01A (2)	@ 0,4A < I RMS < 10A
Scale 2	± 0,25%+0,02A (2)	@ 10A < I RMS < 40A
Scale 3	± 0,25%+0,05A (2)	@ 40A < I RMS < 100A
Scale 4	± 0,25%+0,10A (2)	@ 100A < I RMS < 200A
RMS currents with 5A clamp MN95-OEM		
Scale 1	± 0,25%+0,25mA (2)	@ 0,01A < I RMS < 0,25A
Scale 2	± 0,25%+0,50mA (2)	@ 0,25A < I RMS < 1A
Scale 3	± 0,25%+1,25mA (2)	@ 1A < I RMS < 2,5A
Scale 4	± 0,25%+2,50mA (2)	@ 2,5A < I RMS < 5A
Currents with double scale clamp AC/DC PAC11		
Scale 1 - 1mV/A (AC)	± 0,25%+0,02A (2)	@ 0,8A < I RMS < 20A
Scale 2 - 1mV/A (AC)	± 0,25%+0,04A (2)	@ 20A < I RMS < 80A
Scale 3 - 1mV/A (AC)	± 0,25%+0,10A (2)	@ 80A < I RMS < 200A
Scale 4 - 1mV/A (AC)	± 0,25%+0,20A (2)	@ 200A < I RMS < 400A
Scale 1 - 10mV/A (AC)	± 0,25%+2mA (2)	@ 0,08A < I RMS < 2A
Scale 2 - 10mV/A (AC)	± 0,25%+4mA (2)	@ 2A < I RMS < 8A
Scale 3 - 10mV/A (AC)	± 0,25%+10mA (2)	@ 8A < I RMS < 20A
Scale 4 - 10mV/A (AC)	± 0,25%+20mA (2)	@ 20A < I RMS < 40A
Scale 1 - 1mV/A (DC)	± 0,25%+0,03A (2)	@ 1,2A < I RMS < 30A

Scale 2 - 1mV/A (DC)	± 0,25%+0,06A (2)	@ 30A < I RMS < 120A
Scale 3 - 1mV/A (DC)	± 0,25%+0,15A (2)	@ 120A < I RMS < 300A
Scale 4 - 1mV/A (DC)	± 0,25%+0,30A (2)	@ 300A < I RMS < 600A
Scale 1 - 10mV/A (DC)	± 0,25%+3mA (2)	@ 0,12A < I RMS < 3A
Scale 2 - 10mV/A (DC)	± 0,25%+6mA (2)	@ 3A < I RMS < 12A
Scale 3 - 10mV/A (DC)	± 0,25%+15mA (2)	@ 12A < I RMS < 30A
Scale 4 - 10mV/A (DC)	± 0,25%+30mA (2)	@ 30A < I RMS < 60A

12 PACKAGE CONTENT

Here follows list of parts in a NanoVIP® CUBE WF™ master package.

PART	*Quantity*	*Standard/Option*
NanoVIP CUBE WF	1	Standard
Battery pack	1	Standard
Voltage cables	4	Standard
Crocodiles	4	Standard
Magnetic voltage captors	4	Standard
mSD 4Gb	1	Standard
mSD adaptor	1	Standard
External power supply + adapters	1	Standard
Bag	1	Standard
Carton box	1	Standard
Calibration certificate	1	Standard
AC Current probes	3	Option - According to package
DC Current clamp	1	Option - According to package

13 ACCESSORIES AND SPARE PARTS

13.1 ACCESSORIES

Code	*Description*
4AAZARP	NanoFlex™ (40cm 3000A flexible mini-clamp) with automatic recognition function
4AAXX	80 cm flexible Rogowski sensor 1000A
4AAYWRP	5A Clamp MN95-OEM with automatic recognition function
4AR10RP	200A Clamp MN13-EL with automatic recognition function
4AAWSRP	1000A Clamp C107-EL with automatic recognition function
4AABUS	Double scale clamp for AC/DC measures from 0,2A to 600A
4AADM	LMA clamp for dispersion detection
4AAB6	NanoVIP® multi bag (up to 6 devices)
4AAER	5A/1V adapter (for medium voltage measurements)
4ASOL	Solar meter + fixing clamp

13.2 SPARE PARTS

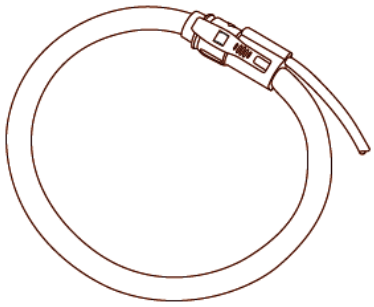
Code	*Description*
6MAON	NanoVIP® battery pack
4AQ03	NanoVIP® power supply
4AQ05	Little carrying case
4AQ06	Big carrying case
4AAZL	Set of 4 colored voltage cables
4AAZI	Set of 4 colored crocodile captors
4AAZH	Set of 4 magnets for rubbers
4AAZE	Set of 4 magnetic captors
4AQ04	USB-A/miniUSB-B cable
4AUSD	Memory card MicroSD 4GB
4AAZP	2xPT100 kit
4AQ12	2xConnection cable for transducers (0..1V and 4..20mA)

13.3 CT CLAMPS AND PROBES

13.3.1 AmpFlex™ - FLEXIBLE CURRENT PROBE 80cm up to 1000Amps

ELECTRICAL SPECIFICATIONS[1]:	
Measured range	up to 1000A
Operating voltage	600V rms or DC (CAT IV) 1000V rms or DC (CAT III)
Voltage at sensor terminals	39,1µV/A at 50Hz on 10kΩ load
Accuracy	≤ 2 % + 0.3 A (only sensor)
Linearity	<0.3%
Phase shift	-90° ± 0,5° at 50 Hz
Interchangeability error	≤ 0.5% (maximum error between 2 sensor for the same measurement point)
[1] Conditions of reference	23 °C ± 5 °K, 20% to 75% RH Continuous external DC magnetic field (earth field) < 40 A/m Absence of external AC magnetic field External electrical field < 1 V/m Position of conductor measured: centred in the measurement coil Shape of measurement coil: quasi-circular Measurement instrument input impedance (oscilloscope) ≥ 1 MΩ Frequency and form of signal measured: 40 to 400 Hz sinusoidal

MECHANICAL SPECIFICATIONS:	
Dimensions	Ø of sensor: 12,0 mm approx. Sensor lenght: 800mm Output cable length: 2m
Weight	60g
Operating temperature	-20 °C to +60 °C
Storage temperature	-40 °C to +80 °C
Max temperature of clamped conductor (measured)	≤ 90 °C
Operating altitude	0 to 2000 m (for 600V CAT III)
Storage altitude	≤ 12000m
Casing protection rating (leakproofing)	IP65 according to EN 60529/A1 Ed.06/2000
Self-extinguishing capability	UL94 V0

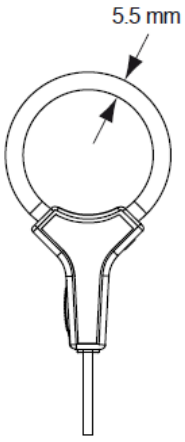


SAFETY	
Electrical safety	Class II equipment with double or reinforced insulation between the primary and the secondary (winding connected to the connection cable) as per EN 61010-1 & EN 61010-2-032: - 1000V CAT III, pollution degree 2 - 600V ACT III, pollution degree 2 - Type-B sensor

13.3.2 NanoFlex™ - FLEXIBLE CURRENT PROBE 40cm up to 3000Amps

ELECTRICAL SPECIFICATIONS(1):	
Measured range	6A up to 3000A
Operating voltage	600V rms or DC (CAT IV) 1000V rms or DC (CAT III)
Voltage at sensor terminals	39,1µV/A at 50Hz on 10kΩ load
Accuracy	≤ 1 % + 0.3 A (only sensor)
Linearity	<0.3%
Phase shift	-90° ± 0,5° at 50 Hz
Interchangeability error	≤ 0.5% (maximum error between 2 sensor for the same measurement point)
Influence of temperature	0.05%/10 °k from -20 °C to +60 °C
Influence of humidity	0.1% from 10% to 90% RH
Influence of conductor position with non sensor deformation:	≤ 1.5%
Influence of adjacent conductor placed 1cm from sensor:	≤ 0.7% of the adjacent current at 50Hz
Influence of sensor deformation (flattened/oblong shape):	≤ 0.5%
Common mode rejection	≥ 100dB for a voltage of 600V / 50Hz applied between the sensor enclosure and the secondary
(1) Conditions of reference	23 °C ± 5 °K, 20% to 75% RH Continuous external DC magnetic field (earth field) < 40 A/m Absence of external AC magnetic field External electrical field < 1 V/m Position of conductor measured: centred in the measurement coil Shape of measurement coil: quasi-circular Measurement instrument input impedance (oscilloscope) ≥ 1 MΩ Frequency and form of signal measured: 40 to 400 Hz sinusoidal

MECHANICAL SPECIFICATIONS:	
Dimensions	Ø of sensor: 5.5mm approx. Sensor lenght: 600mm Output cable length: 2m
Weight	60g
Operating temperature	-20 °C to +60 °C
Storage temperature	-40 °C to +80 °C
Max temperature of clamped conductor (measured)	≤ 90 °C
Operating altitude	0 to 2000 m (for 600V CAT III)
Storage altitude	≤ 12000m
Casing protection rating (leakproofing)	IP50 according to EN 60529/A1 Ed.06/2000
Self-extinguishing capability	UL94 V0



SAFETY	
Electrical safety	Class II equipment with double or reinforced insulation between the primary and the secondary (winding connected to the connection cable) as per EN 61010-1 & EN 61010-2-032: - 1000V CAT III, pollution degree 2 - 600V ACT III, pollution degree 2 - Type-B sensor

13.3.3 TrueFlex - FLEXIBLE CURRENT PROBE 60cm up to 3000Amps

ELECTRICAL SPECIFICATIONS[1]:	
Measured range	3000A
Operating voltage	600V rms or DC (CAT IV) 1000V rms or DC (CAT III)
Voltage at sensor terminals [2]	39,10µV/A at 50Hz on 10kΩ load
Accuracy	≤ 2%
Frequency range	approximately 8 Hz to 20 kHz the range depends on the coil length
Test voltage	7400 Vrms / 1 min
[1] Conditions of reference	23 °C ± 2 °C, 20% to 75% RH Position of conductor measured: centred in the measurement coil Shape of measurement coil: quasi-circular Measurement instrument input impedance (oscilloscope) ≥ 1 MΩ Frequency and form of signal measured: 40 to 400 Hz sinusoidal
[2] Output levels	The Rogowski coil output is proportional to the rate of change of current. The calculation formula is: Ampere rms x Hertz x K x 10-6, where K depends on manufacturing. The K value is 2 for 100 mV model and 0.8 for 40 mV model.

MECHANICAL SPECIFICATIONS:	
Dimensions	Ø of sensor: 8,3 mm approx. Sensor lenght: 600mm (optionally different measures available) Output cable length: 2m
Weight	90g
Locking system	Bayonet holder
Operating temperature	-20 °C to +80 °C
Storage temperature	-40 °C to +80 °C
Self-extinguishing capability	UL94 V0

SAFETY	
Electrical safety	EN61010-1, EN61010-031, EN61010-2-031, EN61010-2-032 standards

13.3.4 UltraFlex - FLEXIBLE CURRENT PROBE 60cm up to 6000Amps

ELECTRICAL SPECIFICATIONS[1]:	
Measured range	6000A (optionally higher currents can be provided)
Operating voltage	600V rms or DC (CAT IV) 1000V rms or DC (CAT III)
Voltage at sensor terminals [2]	19,55µV/A at 50Hz on 10kΩ load
Accuracy	≤ 2%
Frequency range	approximately 8 Hz to 20 kHz the range depends on the coil length
Test voltage	7400 Vrms / 1 min
[1] Conditions of reference	23 °C ± 2 °C, 20% to 75% RH Position of conductor measured: centred in the measurement coil Shape of measurement coil: quasi-circular Measurement instrument input impedance (oscilloscope) ≥ 1 MΩ Frequency and form of signal measured: 40 to 400 Hz sinusoidal
[2] Output levels	The Rogowski coil output is proportional to the rate of change of current. The calculation formula is: Ampere rms x Hertz x K x 10-6, where K depends on manufacturing. The K value is 2 for 100 mV model and 0.8 for 40 mV model.

MECHANICAL SPECIFICATIONS:	
Dimensions	Ø of sensor: 8,3 mm approx. Sensor lenght: 600mm (optionally different measures available) Output cable length: 2m
Weight	90g
Locking system	Bayonet holder
Operating temperature	-20 °C to +80 °C
Storage temperature	-40 °C to +80 °C
Self-extinguishing capability	UL94 V0

SAFETY	
Electrical safety	EN61010-1, EN61010-031, EN61010-2-031, EN61010-2-032 standards

13.3.5 CLAMP 1000A AC

ELECTRICAL SPECIFICATIONS(1):

Measured range	0,1 A up to 1200A
Operating voltage	600V rms
Output signal	1 mV AC / A AC (1 V for 1000A)

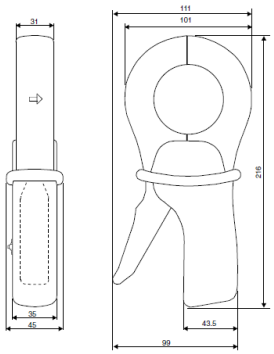
Accuracy and Phase shift

Primary current	0.1 A…10 A	10 A	50 A	200 A	1000 A	1200 A
% Accuracy of output signal	≤ 3 % + 0.1 mV	≤ 3 %	≤ 1.5 %	≤ 0.75 %	≤ 0.5 %	≤ 0.5 %
Phase shift	not specified	≤ 3°	≤ 1.5°	≤ 0.75°	≤ 0.5°	≤ 0.5°

Bandwidth	30 Hz …10 kHz
Crest factor	≤ 6 for a current ≤ 3000 A peak (500 A rms)
Maximum currents	1000 A continuous for a frequency ≤ 1 kHz (limitation proportional to the inverse frequency beyond)
Common mode voltage	600 V category III and pollution degree 2
Influence of adjacent conductor:	≤ 1 µV / A at 50 Hz
Influence of conductor position in jaws:	≤ 0.1 % of output signal for frequencies ≤ 400 Hz
Influence of DC current >20A overlying on the nominal current:	< 1% of output signal for a current ≤ 30A DC
Influence of frequency(2):	< 1% of output signal from 30Hz…48Hz < 0,5% of output signal from 56Hz…1kHz < 1% of output signal from 1kHz…5kHz
Influence of crest factor:	< 1% of output signal for crest factor ≤ 6 with current ≤ 3000A peak (500A rms)
(1) Conditions of reference	23 °C ± 5 °K, 20% to 75% RH Continuous external DC magnetic field (earth field) < 40 A/m Absence of external AC magnetic field External electrical field < 1 V/m Position of conductor measured: centred in the measurement coil Shape of measurement coil: quasi-circular Measurement instrument input impedance (oscilloscope) ≥ 1 MΩ Frequency and form of signal measured: 40 to 400 Hz sinusoidal
(2)	Out of reference domain

MECHANICAL SPECIFICATIONS:

Dimensions	216 x 111 x 45 mm
Weight	550g
Operating temperature	-10 °C to +55 °C
Storage temperature	-40 °C to +70 °C
Influence of temperature:	≤ 0.1 % of output signal per 10 °K
Relative humidity for operation:	0 to 85% RH decreasing linearly above 35 °C
Influence of relative humidity:	< 0.1 % of output signal from 10% to 85% RH
Operating altitude	0 to 2000 m (for 600V CAT III)
Storage altitude	≤ 12000m
Clamping capacity:	Cable: Ø max 52 mm Busbar: 1 busbar of 50 x 5 mm / 4 busbars of 30 x 5 mm
Drop test:	1 m (IEC 68-2-32)
Shock resistance:	100 g 6 ms ½ period (IEC 68-2-27)
Vibration resistance:	5/15 Hz 1.5 mm; 15/25 Hz 1 mm; 25/55 Hz 0.25 mm; (IEC 68-2-6)
Self-extinguishing capability	Casing: UL94 V2 Jaws: UL94 V0



SAFETY

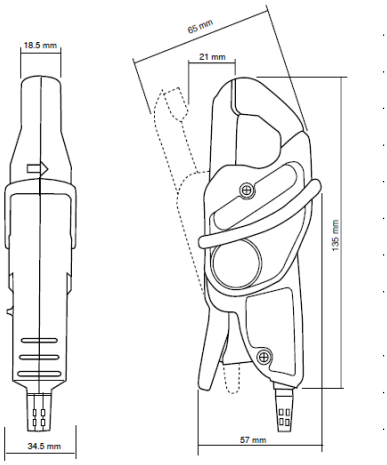
Electrical safety	Class II equipment with double or reinforced insulation between the primary and the secondary (winding connected to the connection cable) as per EN 61010-1 & EN 61010-2-032: - 1000V CAT III, pollution degree 2 - 600V ACT III, pollution degree 2 - Type-B sensor

13.3.6 CLAMP 200A AC

ELECTRICAL SPECIFICATIONS(1):	
Measured range	0,5 A up to 240A
Operating voltage	600V rms
Output signal	5 mV AC / A AC (1,2 V for 240A)
Accuracy and Phase shift	

Primary current	0.5 A…5 A	5 A…15 A	15 A…40 A	40 A…100 A	100 A…240 A
% Accuracy of output signal	≤ 2 % + 0,5 mV	≤ 1 % + 0,25 mV		≤ 1 %	≤ 0,5 %
Phase shift	not specified	≤ 7°	≤ 5°	≤ 3°	≤ 1,5°

Bandwidth	40 Hz …10 kHz
Crest factor	3 for a current of 200A rms
Maximum currents	200 A continuous for a frequency ≤ 1 kHz (derating proportional to the inverse of frequency beyond)
Common mode voltage	600 V category III and pollution degree 2
Influence of adjacent conductor:	≤ 15mA / A at 50 Hz
Influence of conductor position in jaws:	≤ 0.5 % of output signal at 50 / 60 Hz
Influence of DC current >20A overlying on the nominal current:	≤ 5%
Influence of frequency(2):	< 3% of output signal from 40Hz…1kHz < 12% of output signal from 1kHz…10kHz
Influence of crest factor:	< 3% of output signal for a crest factor of 3 and current of 200A rms
(1) Conditions of reference	23 °C ± 5 °K, 20% to 75% RH Continuous external DC magnetic field (earth field) < 40 A/m Absence of external AC magnetic field External electrical field < 1 V/m Position of conductor measured: centred in the measurement coil Shape of measurement coil: quasi-circular Measurement instrument input impedance (oscilloscope) ≥ 1 MΩ Frequency and form of signal measured: 40 to 400 Hz sinusoidal
(2)	Out of reference domain
MECHANICAL SPECIFICATIONS:	
Dimensions	135x51x30 mm
Weight	180g
Operating temperature	-10 °C to +55 °C
Storage temperature	-40 °C to +70 °C
Influence of temperature:	≤ 15% of output signal per 10 °K
Relative humidity for operation:	0 to 85% RH decreasing linearly above 35 °C
Influence of relative humidity:	< 0.2 % of output signal from 10% to 85% RH
Operating altitude	0 to 2000 m (for 600V CAT III)
Storage altitude	≤ 12000m
Clamping capacity:	Cable: ∅ max 20 mm Busbar: 1 busbar of 20 x 5 mm
Drop test:	1 m (IEC 68-2-32)
Shock resistance:	100 g 6 ms ½ period (IEC 68-2-27)
Vibration resistance:	10/55/10 Hz, 0.15mm (IEC 68-2-6)
Casing protection rating	IP40 (IEC 529)
Self-extinguishing capability	Casing: UL94 V2 Jaws: UL94 V0
SAFETY	
Electrical safety	Class II equipment with double or reinforced insulation between the primary and the secondary (winding connected to the connection cable) as per EN 61010-1 & EN 61010-2-032: - 1000V CAT III, pollution degree 2 - 600V ACT III, pollution degree 2 - Type-B sensor

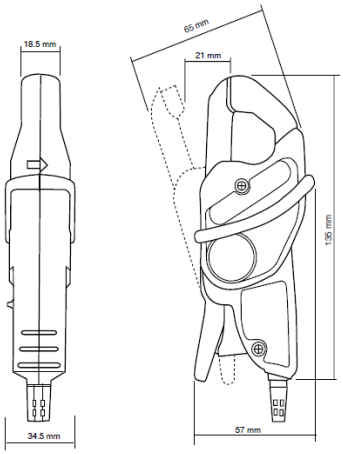


13.3.7 CLAMP 5A AC

ELECTRICAL SPECIFICATIONS(1):	
Measured range	0,01 A up to 6 A
Operating voltage	600V rms
Output signal	200 mV AC / A AC (1,2 V for 6A)
Accuracy and Phase shift	

Primary current	0.01A...0.1A	0.1A...1A	1A...6A
Accuracy in % of output signal	≤ 2%	0.5%	≤ 0,5%
Phase shift	Not specified	≤ 1.3°	0.7°

Bandwidth	40 Hz ...10 kHz
Crest factor	3 for a current of 6A rms
Maximum currents	6 A continuous for a frequency ≤ 10 kHz (derating proportional to the inverse of frequency beyond)
Common mode voltage	600 V category III and pollution degree 2
Influence of adjacent conductor:	≤ 15mA / A at 50 Hz
Influence of conductor position in jaws:	≤ 0.5 % of output signal at 50 / 60 Hz
Influence of DC current >20A overlying on the nominal current:	≤ 3%
Influence of frequency(2):	< 5% from 20 to 1kHz < 10% from 1kHz to 10 kHz
Influence of crest factor:	< 3% of output signal for a crest factor < 5 with current < 6A rms
(1) Conditions of reference	23 °C ± 5 °K, 20% to 75% RH Continuous external DC magnetic field (earth field) < 40 A/m Absence of external AC magnetic field External electrical field < 1 V/m Position of conductor measured: centred in the measurement coil Shape of measurement coil: quasi-circular Measurement instrument input impedance (oscilloscope) ≥ 1 MΩ Frequency and form of signal measured: 40 to 400 Hz sinusoidal
(2)	Out of reference domain
MECHANICAL SPECIFICATIONS:	
Dimensions	135x51x30 mm
Weight	180g
Operating temperature	-10 °C to +55 °C
Storage temperature	-40 °C to +70 °C
Influence of temperature:	≤ 15% of output signal per 10 °K
Relative humidity for operation:	0 to 85% RH decreasing linearly above 35 °C
Influence of relative humidity:	< 0.2 % of output signal from 10% to 85% RH
Operating altitude	0 to 2000 m (for 600V CAT III)
Storage altitude	≤ 12000m
Clamping capacity:	Cable: ∅ max 20 mm Busbar: 1 busbar of 20 x 5 mm
Drop test:	1 m (IEC 68-2-32)
Shock resistance:	100 g 6 ms ½ period (IEC 68-2-27)
Vibration resistance:	10/55/10 Hz, 0.15mm (IEC 68-2-6)
Casing protection rating	IP40 (IEC 529)
Self-extinguishing capability	Casing: UL94 V2 Jaws: UL94 V0
SAFETY	
Electrical safety	Class II equipment with double or reinforced insulation between the primary and the secondary (winding connected to the connection cable) as per EN 61010-1 & EN 61010-2-032: - 1000V CAT III, pollution degree 2 - 600V ACT III, pollution degree 2 - Type-B sensor



13.3.8 CLAMP AC/DC up to 600Amps

ELECTRICAL SPECIFICATIONS(1):

Measured range	AC: 0,2 A up to 400A (600A peak) DC: 0,4 A up to 600A
Operating voltage	600V rms
Overload	2000A DC and 100A AC up to 1kHz
Accuracy and Phase shift	

Calibre	60 A	600 A
Current range	0.2 A ... 40 A (60 A peak) 0.4 A ... 60 A DC	0.5 A ... 400 A (600 A peak) 0.5 A ... 600 A DC
Output signal	10 mV/A	1 mV/A
% Accuracy of output signal (1)	0.5 A...40 A: 1.5 % ±5 mV 40 A...60 A DC: 1.5 %	0.5 A...100 A: 1.5 % ±1 mV 100 A...400 A DC: 2 % 400 A...600 A DC: 2.5 %
Phase shift (45...65 Hz) (1)	10 A...20 A: < 3° 20 A...40 A: < 2°	10 A...100 A: < 2° 100 A...400 A: < 1.5°
Noise	DC...1 kHz: < 8 mV DC...5 kHz: < 12 mV 0.1 Hz...5 kHz: < 2 mV	DC...1 kHz: < 1 mV DC...5 kHz: < 1.5 mV 0.1 Hz...5 kHz: < 500 µV
Rise/fall time	≤ 100 µs from 10 % to 90 % of the voltage value	≤ 70 µs from 10 % to 90 % of the voltage value

Bandwidth	DC...10 kHz at -3dB
Common mode voltage	600 V rms
Influence of adjacent conductor:	< 10mA/A at 50 Hz
Influence of conductor position in jaws:	0.5 % of the reading
Influence of DC current >20A overlying on the nominal current:	< 1% of output signal for a current ≤ 30A DC
Battery	9V alkaline
Battery lasting time	50 hours
(1) Conditions of reference	23 °C ± 5 °K, 20% to 75% RH Continuous external DC magnetic field (earth field) < 40 A/m Absence of external AC magnetic field External electrical field < 1 V/m Position of conductor measured: centred in the measurement coil Shape of measurement coil: quasi-circular Measurement instrument input impedance (oscilloscope) ≥ 1 MΩ Frequency and form of signal measured: 40 to 400 Hz sinusoidal

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