

# NANOMETER



## THREE-PHASE STATIC MULTI-FUNCTIONAL METER (MFM)

- LOW VOLTAGE ELECTRICAL DISTRIBUTION
- EXTERNAL CURRENT TRANSFORMER (CT)
- MULTIFUNCTION DISPLAY
- HARMONIC ANALYSIS
- DIGITAL INPUT / OUTPUT
- EDS COMMUNICATION
- STANDARD 4-WAY DIN-RAIL MOUNT

RoHS



The NanOMeter is a static meter of active and reactive energy, designed for a standard 4-way DIN-rail mount, for three-phase systems with or without connecting to the neutral line. The large LCD display enables clear visualization of the total active and reactive energy, active and reactive power (total and per phase), of the phase voltage, of the phase current and of the power factor. Moreover, the meter provides the option to display harmonic analysis of the individual phases. The presence of the buttons allows you to perform basic programming operations. The device is also equipped with 2 programmable interfaces (1 digital IN and 1 digital OUT).

**DATA SHEET**

MODEL	NanOMeter
PRODUCT CODE	NE2
CERTIFICATIONS	RoHS, CE UAE RoHS, ECAS
MAXIMUM MEASUREMENT ERROR	±0,5%
POWER SUPPLY	12÷15Vdc or auxiliary power supply 230Vac
CURRENT DRAW	max 30mA at 13,9V
SIZE	90x70x59mm - 4 DIN modules
WEIGHT	120g
COMMUNICATION BUS	EDS
NOMINAL VOLTAGE	3x230Vac
NETWORK FREQUENCY	50Hz
INPUT CURRENT	5(6)A
MAXIMUM CT TRANSFORMATION RATIO	40.000/5A
DIGITAL INPUT	Dry contact
DIGITAL OUTPUT	Open collector (max voltage 48Vdc, max current 50mA)
MEASURING PARAMETERS	Total active energy, total reactive energy, total active power, active phase power, total reactive power, phase reactive power, phase voltage, phase current, power factor
HARMONIC ANALYSIS	Total harmonics from order 1 to 12, single phase harmonics from order 1 to 25
DISPLAY	1.8 " TFT LCD backlit in color 128x160pixel resolution
METROLOGICAL LED	10000imp/1KWh
OPERATING TEMPERATURE	min -25°C max +55°C
WAREHOUSING TEMPERATURE	min -40°C max +80°C

## EDS BUS SPECIFICATIONS

<b>MAXIMUM BUS LENGTH</b>	1200m linear over the whole system	<b>BUS LENGTH</b>	<10m	<30m	<100m	>100m
<b>BUS TOPOLOGY</b>	Star, series or promiscuous	<b>RECOMMENDED MINIMUM SECTION</b>	0,50 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>

1,5mm<sup>2</sup> is recommended for implants, a value which however depends on the location of the modules

## INSTALLATION INSTRUCTIONS

### SAFETY

In order to maintain these conditions and ensure safe use, the user must follow the indications and markings contained in the following instructions.

**Warning:** Failure to follow the instructions below can result in death.

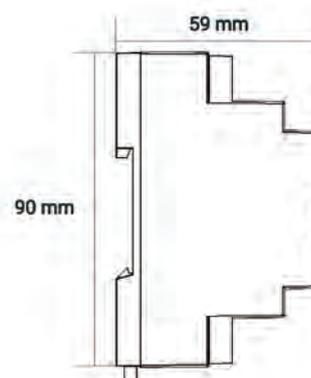
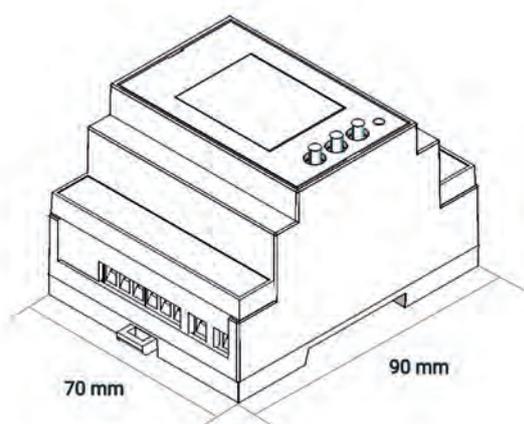


- Upon receipt of the instrument, before proceeding with the installation, check that it is intact and has not been damaged during transport.
- Check that the operating voltage and the mains voltage coincide and then proceed with the installation.
- The instrument power supply must not be grounded.
- The instrument does not have a fuse to protect the power supply, so it must be protected by the installer.
- Maintenance and/or repair operations must be carried out only by qualified and authorized personnel.
- If you suspect that the tool is no longer secure, take it out of service and make sure it is not used inadvertently.
- Dangerous voltages can be present on voltage and current transformers. Follow standard safety precautions before performing any installation or service activity.
- The terminals on the back of the instrument must not be accessible by the operator after installation. The operator must be reachable only from the front.
- The instrument must be protected by a disconnecting device capable of disconnecting both the auxiliary power supply and the measuring terminals, which is easily accessible by the operator and well identified as the device's disconnecter.
- The instrument and its connections must be properly protected.
- The instrument must be installed following all local regulations.

**Precautions:** Failure to follow the instructions below can cause persistent damage to the instrument.

- The digital outputs and inputs are low voltage and cannot be connected to external power sources.

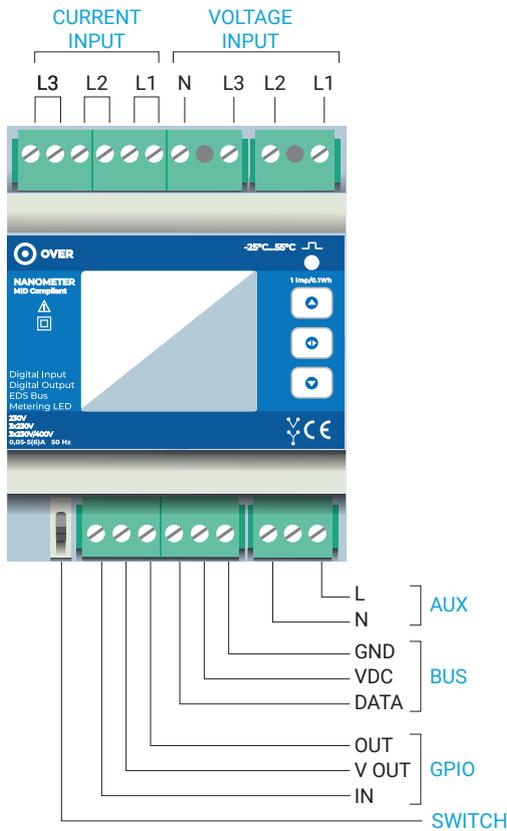
## SIZE



## COMPONENTS

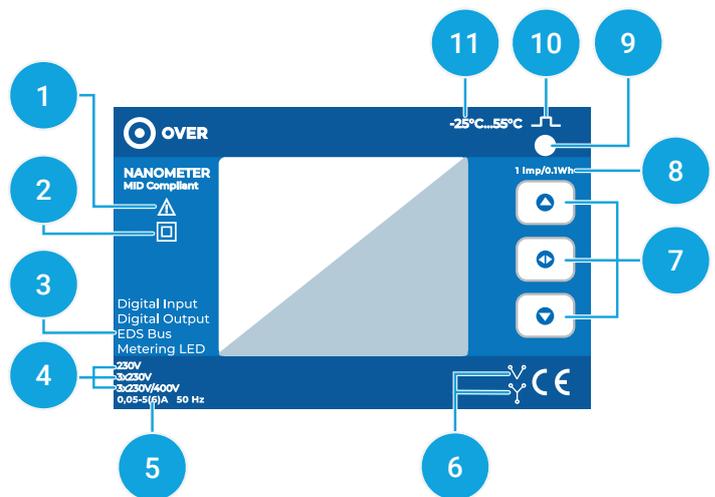
Two rows of input/output terminals are located on the top and bottom of the device. On the top of the device is the group of current inputs and the group of voltage inputs. On the bottom of the device, there is the group for the digital outputs, one for the BUS communication and another for the auxiliary power supply. Also, on the bottom of the device is a switch to set and adjust the programming mode (more information on programming mode in the next chapters).

Once installation and programming of the device is complete, affix the respective covers supplied above the terminals.



## FRONT PANEL

- 1 Consult this manual before installation
- 2 Double insulation
- 3 Communication interface
- 4 Voltages (230V = voltage for single phase measurement, 3x230V = voltage for three-phase measurement without neutral, 3x230V/400V = voltage for three-phase measurement with neutral)
- 5 Rated current
- 6 Types of insertions allowed
- 7 Keypad
- 8 Pulse
- 9 Metrological LED
- 10 Pulse symbol
- 11 Operating temperatures



## VOLTAGE AND CURRENT METER CONNECTIONS

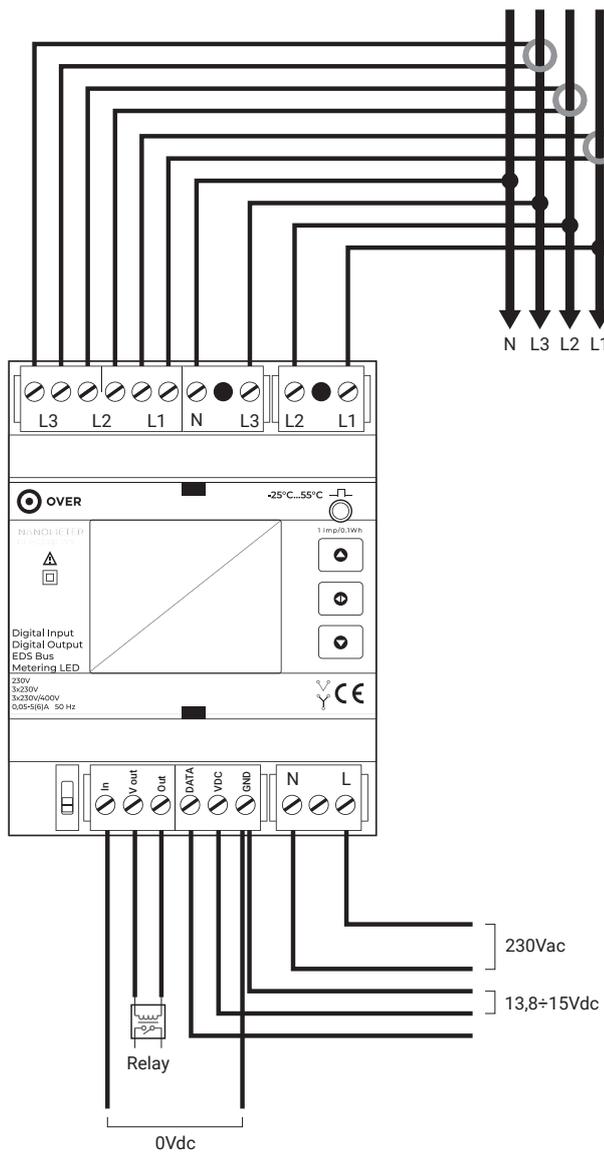
### VOLTMETRIC CONNECTIONS

Use cables with a max section of 2,5 mm if flexible, 4 mm if rigid and connect them to the marked terminals with voltage input according to the diagrams in the figure.

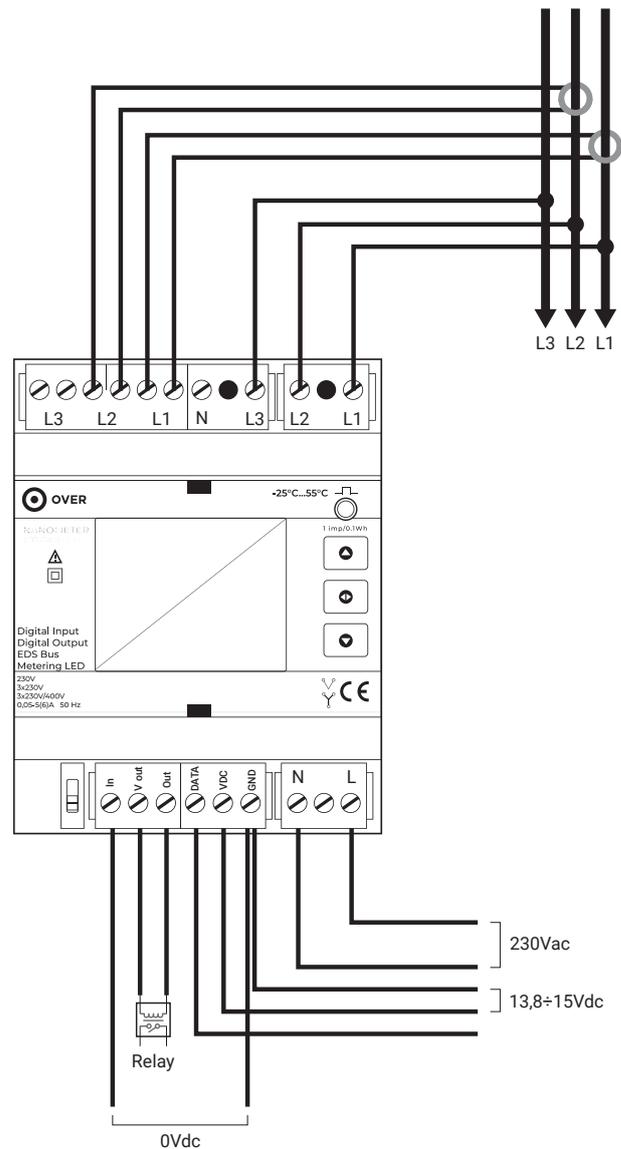
### AMPEROMETRIC CONNECTIONS

Use CTs with adequate primary and secondary 5A. Connect the amperometric signals coming from the CTs to the marked terminals by L1, L2, L3 (current input) according to the diagrams in the figure. Use cables of adequate section (to the power of the CT used and to the distance to be covered). The maximum cross-section for the terminal is 2,5 mm if flexible, 4 mm if rigid.

ELECTRICAL SCHEME WITH NEUTRAL

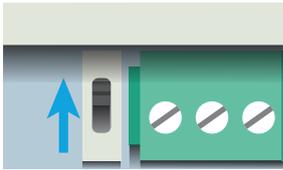


ELECTRICAL SCHEME WITHOUT NEUTRAL



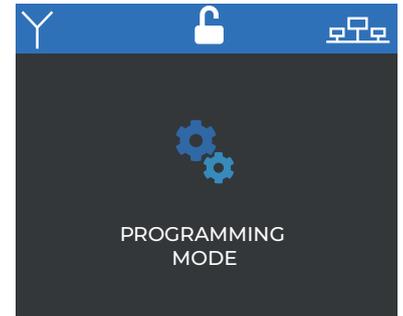
## PROGRAMMING

Once the device is connected, enter 'programming mode' using the appropriate switch. In the programming mode it is possible to affirm the direction of connection of the CTs to the respective terminals are correct, check the sequence of phases, specify the size of the CTs supplied to the device, change the address of the device on the BUS, test if connection of the digital input and that of the digital output are correct.



Use the switch located on the bottom of the device (see chapter "Components") to enter programming mode.

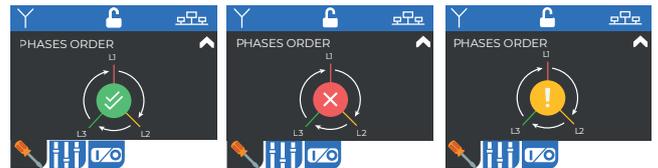
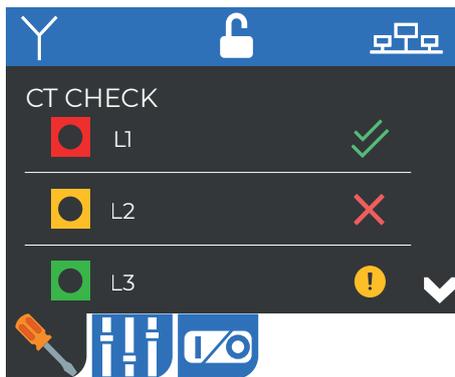
With the NanOMeter, it is possible to interact with the device using the three buttons on the front. The upper and lower buttons scroll through the screens on the tab (if the tab made up of several screens, an arrow icon will appear on the right corner of the screen) while with the central key it is possible to scroll through the tabs (always viewable in the lower bar with the respective icon). A quick press of the central button leads to the next tab while a long press leads to the previous one.



The loading screen for programming mode appears automatically once the switch is activated.

### 1 Checking Connections

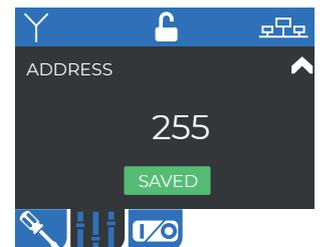
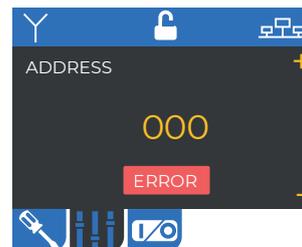
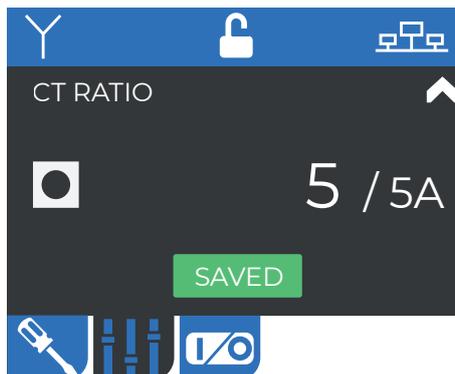
In the first tab it is possible to check the CT connection status for the individual phases. The example shows the three possible connection statuses. The first status, in green, confirms the correct connection. The second, in red, alerts of an incorrect connection order (you need to reverse the direction of the CT) and the third, in yellow, corresponds to an indeterminate connection status (CT not connected or load on the line is absent).



On the second page of the tab shown above, the phase sequence is indicated. The first example demonstrates that the order of the voltage connections correspond to the order of the phases. In the event that the phases are not ordered correctly, the second example on the screen will appear, while the third example indicates an indeterminate connection status.

### 2 CT settings and EDS addresses

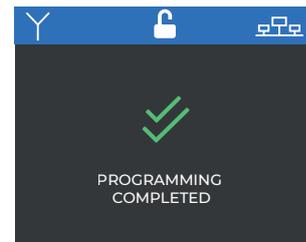
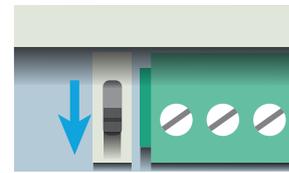
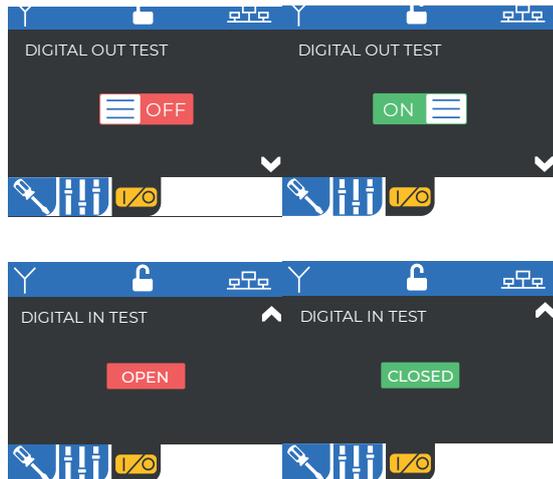
In the second tab you can set the size of the CT supplied to the meter. To change the values, hold down the central key of the keypad (the editable values are highlighted in yellow with the selected one flashing) and adjust the values to the desired numbers using the scroll buttons. Press and hold again to confirm the change.



In this screen it is possible to program the device address on the BUS. In the event an error occurs while attempting to save the address, an "error" message will appear in red. The green message "saved" will confirm the operation completed successfully.

### 3 Digital output and input test

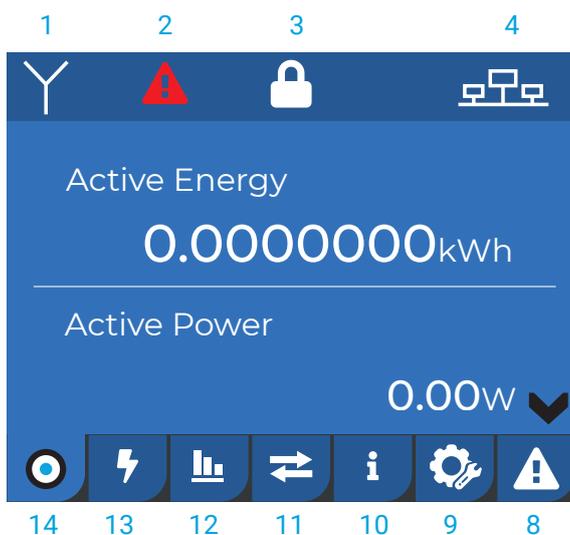
In the third tab you can check the digital output and input connections. By pressing the central button, the device starts the verification process by showing either an OFF/ON status for the digital output and either an OPEN/CLOSED status for the digital input. Below are the two screens with their respective possible states.



Once the device programming is complete, flip the switch down to finalize the settings. An automatic screen will confirm completion of programming.

## OPERATION

At the end of the programming procedure, the system will show the "home" screen on the display. From this screen, it is possible to access the detected data, information on the device status, the status of connections and any errors at any given time. It is possible to interact with the interface, as for programming mode, using the keypad on the front panel. All the icons that can be displayed on the first screen are explained below.



### HOME SCREEN

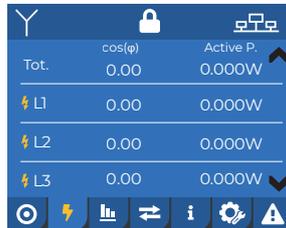
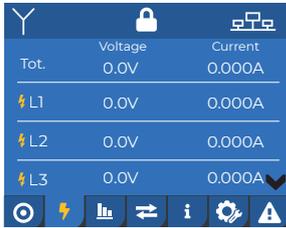
- 1: Three-phase system with or without neutral (the possible icons are indicated in point 6 on the frontpanel).
- 2: Contact support. The icon appears only in the event of a serious error. It may appear due to an error in reading the measurements or saving data (e.g. memory full).
- 3: It Indicates the switch status.
- 4: BUS icon, it turns yellow when the device does not detect the BUS.
- 5: Quantity of accounted energy.
- 6: Instant measurement.
- 7: Page change icon. It Indicates the possibility of scrolling through pages within the same tab using the keypad next to the display.
- 8: Errors and anomalies tab.
- 9: CT Configuration tab.
- 10: Device Information tab.
- 11: Communication tab.
- 12: Harmonic analysis tab.
- 13: Real-time measures tab.
- 14: Home tab.

Scrolling through the pages of the tab, you can view total active energy, total reactive energy, total active power, active phase power, total reactive power, phase reactive power, phase voltage, phase current and the power factor.

The device automatically returns to the "Home" screen after one minute of inactivity. The screens that make up the various tabs are shown on the next page.

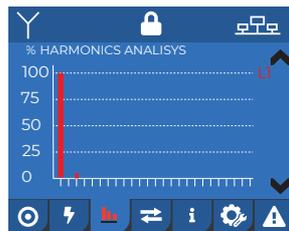
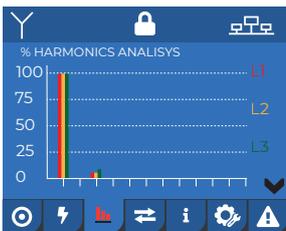
### Real-time detection tab

This tab shows the data divided into three screens in real time: the first shows the average voltage and current data, the second the active power factor and the third the reactive power. The data displays total and single phase readings.



### Harmonic analysis tab

The graph shows the harmonics of the three phases simultaneously (up to the 12<sup>th</sup> harmonic). Scrolling through the pages of the sheet you can see the harmonics of the single phase in greater detail (up to the 25<sup>th</sup> harmonic).



### Communication tab

Shows the address of the device on the BUS.



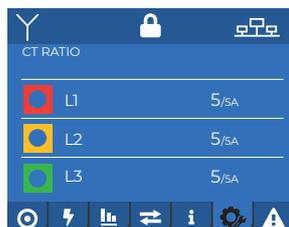
### Device information tab

These screens show the device serial number, the firmware version, the hardware version, the time and date the device started to meter energy.



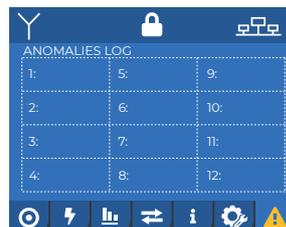
### CT configuration tab

In this screen it is possible to configure the CT ratio for the single phase.



### Errors and anomalies tab

In the last tab, is a compiled list of recorded errors, sorted from most to least recent.



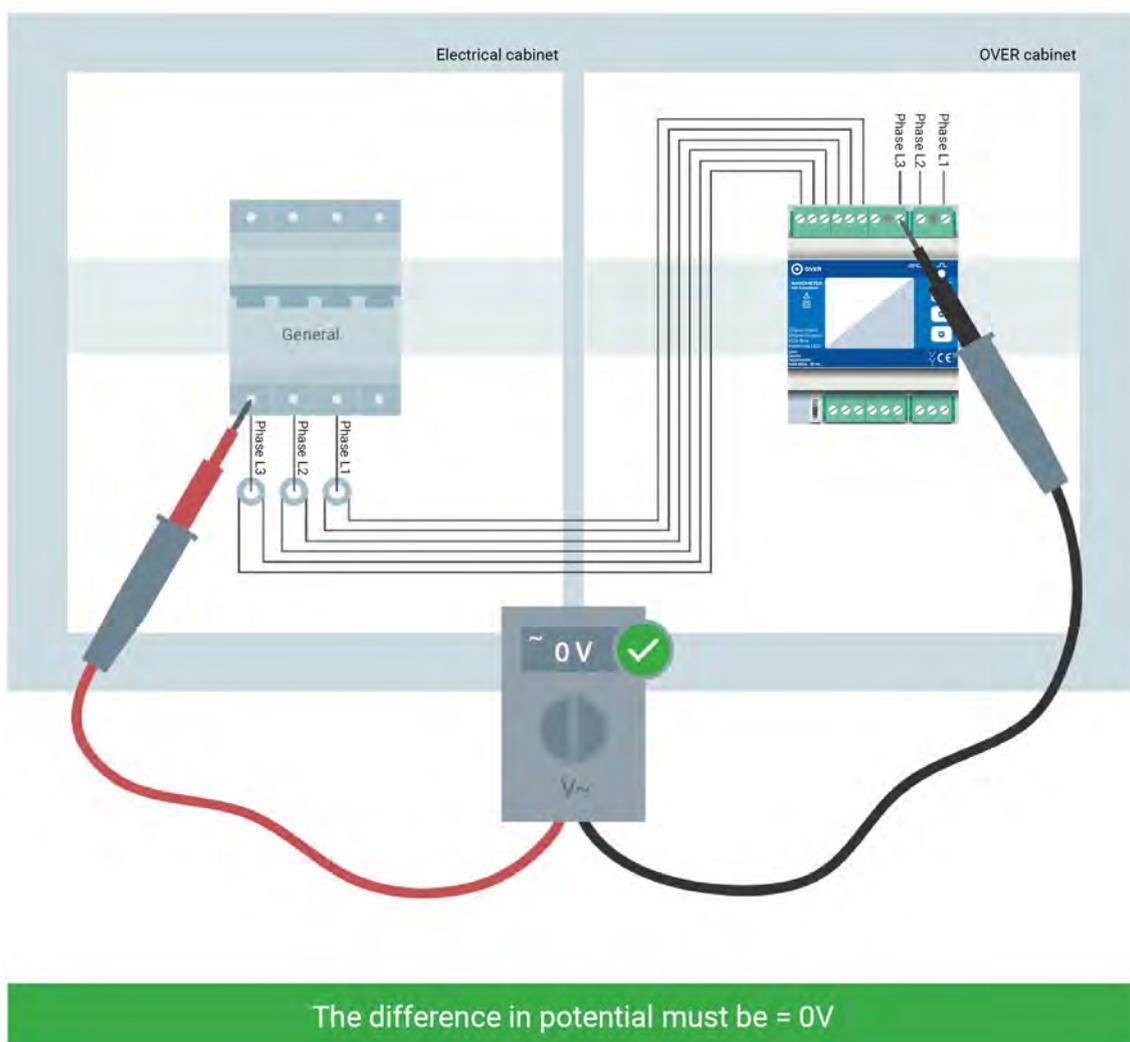
## CONNECTION AND LOAD CHECK

Once the programming procedure is complete, check the connection of the NanOMeter and the related CTs. A properly functioning system should show all  $\cos\phi > 0.95$  and an equitable load distribution over the three phases. Old electrical systems may have accumulated changes over time which can lead to a recoding of  $\cos\phi > 0.85$  which is still admissible, any recordings below this threshold indicate a probable wiring error.

### CT CONNECTION TEST

It often happens that the connection of the phases is reversed in the electrical panels. If you notice power factors below 0.85 (even on a single phase) it is possible that this happened.

In addition to verifying the correct connection of the CTs with the respective inputs of the NanOMeter, the following test must be performed:



If the potential difference has a value of 230Vac or 400Vac, it means that they correspond and that the connections of the power supply and the NanOMeter must be changed.

**Caution:** always check the consistency of the measured data (for example, the general line is greater than the other loads) and the settings of the CT conversion factors are correct.

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## ASSISTENCE

### WARRANTY

This product is guaranteed against any material and manufacturing defects according to the period established by law from the date of purchase, even if the product has not been installed. The warranty period starts from the moment of purchase. The buyer must report any defects in the delivered products in writing to Over S.p.A.: the communication must contain a description of the reasons for defects and/or discrepancies, also indicating the serial number, the delivery date, the delivery number and date of the transport document or invoice.

The Supplier's warranty does not extend to products that are defective and/or damaged due to natural attrition or breakdown caused by improper use or an operating procedure not contemplated in this manual, of negligence, or are tampered with or repaired by third parties or accidentally damaged caused by atmospheric agents, or firmware updates.

The warranty intervention by the Supplier remains subject to the Buyer's compliance with the payment conditions as well as the technical evaluation of the existence of the warranty conditions verified by Over S.p.A. During the warranty period, Over S.p.A. undertakes to repair or replace, free of charge, those products that have manufacturing defects or bad quality at its headquarters.

### RETURN AND REPAIR PROCEDURE

All returned products must be returned in the same condition in which they were supplied at the Buyer's expense, to the headquarters of Over S.p.A. in Viale Piemonte 37 - 20093 Cologno Monzese (MI) and packed by the Buyer in order to avoid damages for which the Buyer himself would be responsible. No return of goods will be accepted in the absence of authorization by Over S.p.A. to the Buyer.

No refund, even if authorized, will be accepted if the information regarding quantity, type of device returned and reason for return is not included in the transport document or the accompanying letter.

Products not covered by the warranty will be returned to the Buyer at his own expense and charged to him for the costs incurred, after quantification and communication, for the control and further testing and calibration of the same.

The replaced parts remain the property of Over S.p.A.

### DECLARATION OF CONFORMITY

This instrument has been tested in accordance with standards IEC 50470-1-3. Over S.p.A. declares that its family of instruments complies with the directives EMC 89/336/ ECC 73/23CE 93/68 CE and meets the requirements of the directives IEC 61326, IEC 61010. The device was tested in the typical installation configuration and with peripherals complying with the directives EMC and the low voltage directive.

Device designed, produced and distributed by Over S.p.A.

This manual was last updated on 04/27/2021.

The latest updated version of the manual is available in digital format downloadable from the website [www.overttechnologies.com](http://www.overttechnologies.com)

Check that the version of this manual, written on the front cover, corresponds to the updated version of the manual.

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## NOTES