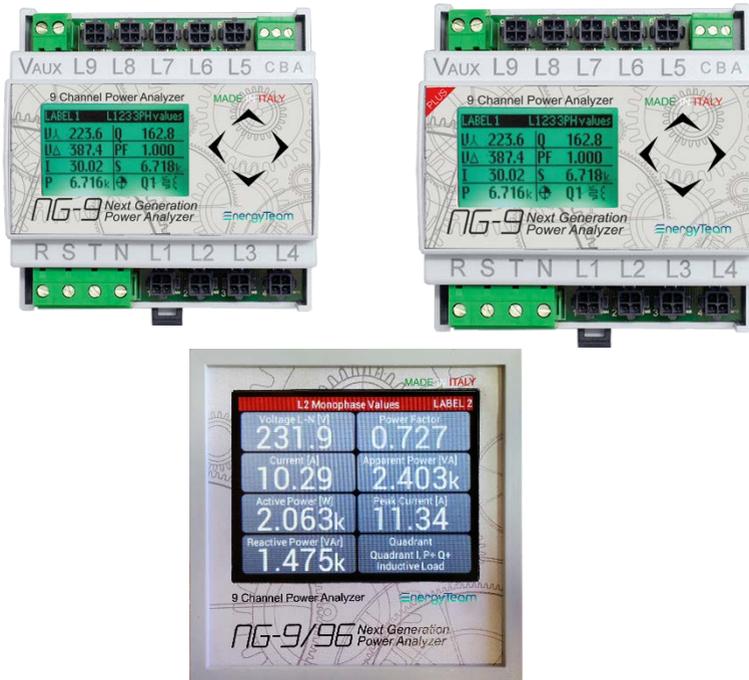


## USER'S MANUAL

# NG9 – NG9 Plus – NG9/96



## NG9 – NG9 Plus – NG9/96

---

Requests for any specific information on the product and/or on relating options not contained in the synthetic manual, may be sent to our web site: [www.energyteam.it](http://www.energyteam.it), section "CONTACTS", sending an email to @mail the TECHNICAL AREA" indicating the specific request.

Energy Team reserves the right to make the modifications it deems necessary without having to give any prior notice.

## CONTENTS

NG9 – NG9 Plus –NG9/96 .....	1
Introduction .....	5
List of Measurements.....	5
Compliance.....	6
Specification .....	9
Common measurements for NG9, NG9 Plus and NG9/96 .....	10
Specific measurements for NG9 and NG9 Plus .....	11
Specific measurements for NG9/96 .....	11
Dimensions of NG9 and NG9 Plus .....	12
Inputs/Outputs clamps and cable sections .....	13
RS485 serial connection .....	15
Sensors .....	16
Correct sensors insertion .....	16
Common sensors for NG9 – NG9 Plus – NG9/96 .....	19
Sensori per NG9 Plus e NG9-96 .....	19
Details of the Sensors .....	20
RG2K Flexy Sensor.....	20
RG-500 Flexy Sensor .....	21
CC24 Sensor .....	22
CC16 Sensor .....	23
CC06 Sensor .....	24
Sensors for NG9 Plus and NG9/96 .....	25
NG-RTD .....	25
Example of plant with NG-RTD sensor .....	26
RTD .....	28
NG-AIN.....	31
NG-DIG Pulse acquisition .....	32

Example of plant with NG-DIG sensor .....	33
NG-DIG Digital Status .....	36
NG9 and NG9 PLUS setting by Keyboard .....	37
NG-9/96 setting by Keyboard .....	52
NG9 and NG9 Plus – Examples of wiring .....	70
NG9/96 – Examples of wiring .....	75
<b>GENERAL SAFETY REGULATIONS</b> .....	81
<b>WARRANTY</b> .....	81
<b>DISPOSAL</b> .....	81

## Introduction

Average cost of a simple multi-function device with superior features; small dimensions that allow the integration of the instrument in an existing panel; quick Installation. All sensors are "openable" and have Plug-&-Play connectors.

The 96x96 version offers a color display with different font sizes for faster reference

## List of Measurements

### Direct measurements for each phase

- Phase-Neutral Voltage R-N
- Phase-Neutral Voltage S-N
- Phase-Neutral Voltage T-N
- Phase-Phase Voltage R-S
- Phase-Phase Voltage S-T
- Phase-Phase Voltage T-R
- Line Current and Peak Current on each of the 9 channels (from L1 to L9)
- Frequency (measured in Voltage, Channel L1)

### Derived measurements on each of the 9 channels (from L1 to L9)

- Bi-directional Active Power  
(positive= imported  
negative= exported)
- Bi-directional Reactive Power  
(positive= imported  
negative= exported)
- Apparent Power
- Power factor
- Imported Active Energy
- Exported Active Energy
- Imported Inductive Energy
- Imported Capacitive Energy
- Exported Inductive Energy
- Exported Capacitive Energy

### Measurements on 3 possible three-phase groups

- Equivalent line Current
- Three-phase Active Power bi-directional  
(positive= imported  
negative= exported)
- Three-phase Reactive Power bi-directional  
(positive= imported  
negative= exported)
- Three-phase Apparent Power
- Three-phase Power factor
- Imported Active Energy
- Exported Active Energy
- Imported Inductive Energy
- Imported Capacitive Energy
- Exported Inductive Energy
- Exported Capacitive Energy

# Compliance

## STANDARDS APPLIED

- IEC 61326-1:2012
- IEC 61010-1:2010
- IEC 61010-2-030:2010
- EN 61010-1:2010
- EN 61010-2-030:2010

## 300V CAT III

### The instrument shows the following symbols

	Pay attention – see the manual.
	Double power supply, both AC and DC current.
	Disposal of waste according to law.
	CE marking.
	Equipment in Class II (Double Insulation).



## GENERAL SAFETY WARNINGS

**Failure to observe the following points can lead to serious injury or death.**

- Use suitable personal protective equipment and adhere to the current standards governing electrical safety.
- **This device must only be installed by qualified personnel who have read all the information relating to the installation.**
- Check that the voltage supply and measurement are compatible with the range permitted by the device. Do not power on the instrument if its appearance is not intact.
- Make sure the power supply is Off before performing any inspection, visual inspection and testing on it. After stopping the power supply, make sure that the circuits are Off when tested.
- Disconnect all the power supplies prior to work on the device.
- Always use a suitable voltage detection device to check that the supply is interrupted.
- Pay attention to any dangers and carefully check the work area ensuring that no instruments or foreign objects have been left inside the compartment in which the device is housed.
- The correct use of this device depends on a correct manipulation, installation and use.
- Failure to observe the basic installation information can lead to injuries as well as damage to the electric instruments or to any other product. If the product is used in a manner not specified by the manufacturer, the anticipated safety could be compromised.
- NEVER connect an external fuse in by-pass.
- Disconnect all the Input and Output wires before carrying out a dielectric rigidity test or an insulation test on the panel in which the device is installed.
- The tests carried out at a high voltage can damage the device's electronic components.

**The manufacturer declines any responsibility in case of use of the instrument out of manual's specifications.**

**ATTENTION!**

It is strictly forbidden to install and use the instrument to anyone who does not possess the listed characteristics. Use suitable personal protective equipment and comply with current electrical safety regulations.



The device is made in compliance with the directives in force in the European Union and with the technical standards that incorporate the requirements, as evidenced by the CE mark on the device itself and in this publication.

**NOTE:**

For any calibration and maintenance contact Energy Team. In case of malfunction or failure, send the device back by attaching a precise description of the fault.

**NOTE**

This document is an integral part of the product and must therefore be kept with care.

## Specification

- Bi-directional Meter (Imported / Exported Energy)
- 160 Measurements carried out.
- 3 measurement mode: Three-phase, Single-phase, mixed.
- True RMS measurements.
- Measures on 4 quadrants.
- Graphic display with multicolor desktop and variable character size.  
**(for NG9 and NG9 Plus).**
- Graphic display Touchscreen with multicolor desktop, with variable character size **(only for NG9/96).**
- Full and clear indications of measurements.
- RS-485 Serial Port and Modbus protocol.
- Graphic display of Voltage, Current, Powers and  $\cos\phi$  of last 3 days.
- Simultaneous graphic display (2 colors) of 2 of the sizes above mentioned.
- 9x6 Energy totalizers on 4 quadrants, resettable through a request for confirmation.
- 6x3 Three-phase Energy totalizers on 4 quadrants, resettable through a request for confirmation.
- Clock and Calendar.
- Removable terminals to make assembly easier.
- Temperature probe inside the instrument.
- Different modules for current measurement are available.

### Options for NG9 Plus and NG9/96:

- Measurements up to 15<sup>^</sup> Harmonic.
- Different available modules to measure Currents and Physical sizes.
- Measurement of sizes including: Temperature, Pressure, Flow, etc.
- Pulse acquisition from meters and from different outputs.

### **IMPORTANT NOTE**

**The instrument is already supplied assembled. With regard to the location, it must always be inserted inside an electrical panel by DIN rail mounting.**

**We suggest to insert on the Voltage Inputs or a fuse-holder (250mA, delayed fuses) or a 6A magneto-thermal switch.**

## Common measurements for NG9, NG9 Plus and NG9/96

<b>Measurements on Network</b>	<b>Unit of measure</b>
<b>50/60HZ</b>	
Voltage	Vac
Active Power	W
Reactive Power	VAr
Apparent Power	VA
Three-phase equivalent current	A
Line current	A
Cosφ	
Power Factor	
Active Energy delivered	Wh
Active Energy absorbed	Wh
Reactive Inductive Energy	VArh
Reactive Capacitive Energy	VArh
Frequency	Hz
Accuracy	Classe 0,5
<b>Power Supply</b>	<b>Unit of measure</b>
Voltage	Vac: 100-240V, Vdc: 24-120V
Frequency	Hz: 50-60
Consumption	AC: 2W max, DC: 2W max
Electrical resistance between Voltage Inputs and communication port.	6 kV
<b>General</b>	<b>Unit of measure</b>
Protection degree	IP20
Relative humidity	95% without condensation.
Communication interface	RS-485 ModBus RTU, max selectable bitrate: 115200 bps.
Insulation 6 kV	Between Voltage input and RS485. Between Aux Power Supply and RS485.

## Specific measurements for NG9 and NG9 Plus

Main features		Unit of measure
Voltage Inputs.	Nr. Channels: 3	Maximum working voltage: 430 V peak, phase-neutral 300 Vac phase-neutral 520 Vac phase-phase
Current Inputs.	Nr. Channels: 3	A (on display)
Weight		gr. 95 (without external sensors)
Maximum dimensions: L x H x W		mm 88 x 90,5 x 62 (5 mod. DIN) T35 DIN rail mounting.
Working temperature		From -5 °C to +60 °C
Display		Graphic display 128x64 pixel, with multicolor desktop RGB LED.
Keyboard		5 functions selector button
Internal Battery		Lithium 3,6V "button type", CR1220

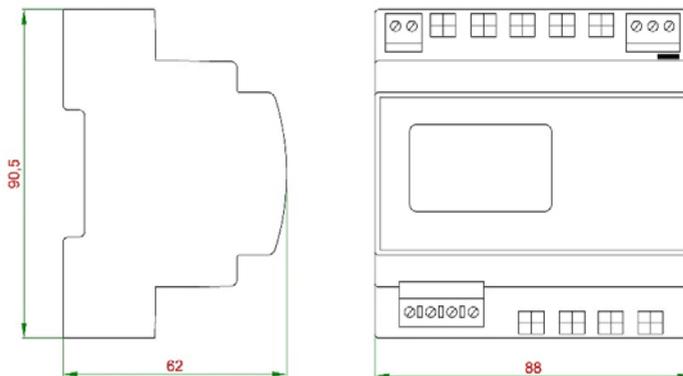
## Specific measurements for NG9/96

Main features		Unit of measure
Voltage Inputs.	Nr. Channels: 3	Maximum working voltage: 430 V peak, phase-neutral 300 Vac phase-neutral 520 Vac phase-phase
Current Inputs.	Nr. Channels: 9 (6 according to the combination of the Current sensors listed below, + 3 TA/5A)	A (on display)
Weight		gr. 300 (without external sensors)
Maximum dimensions, LxHxW: (Including the terminals on the back)		mm 96x96x96
Dimensions of the Built-in part, LxHxW: (Including the terminals on the back)		mm 88x88x90
Working temperature		-10 °C ÷ +55 °C
Display		LCD TFT 3,5" 320x240 pixel 262k Colors, resistive Touchscreen

## Dimensions of NG9 and NG9 Plus

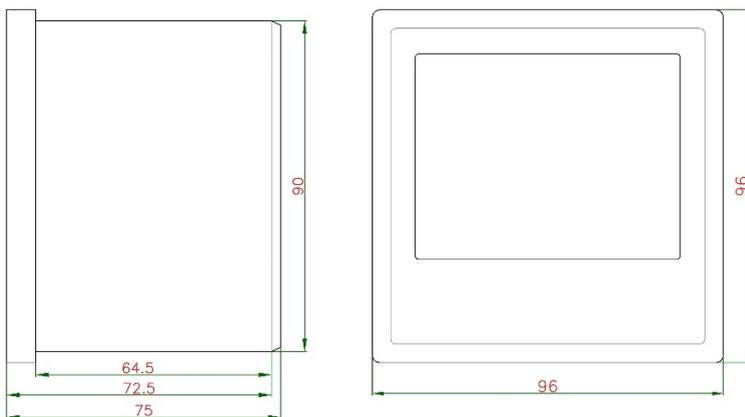
NG9/NG9 Plus:

### DIMENSIONS



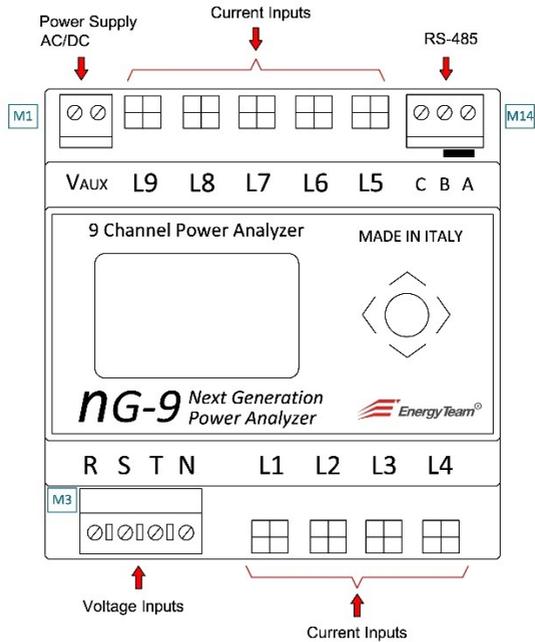
NG9/96

### DIMENSIONS



## Inputs/Outputs clamps and cable sections

NG9/NG9 Plus:



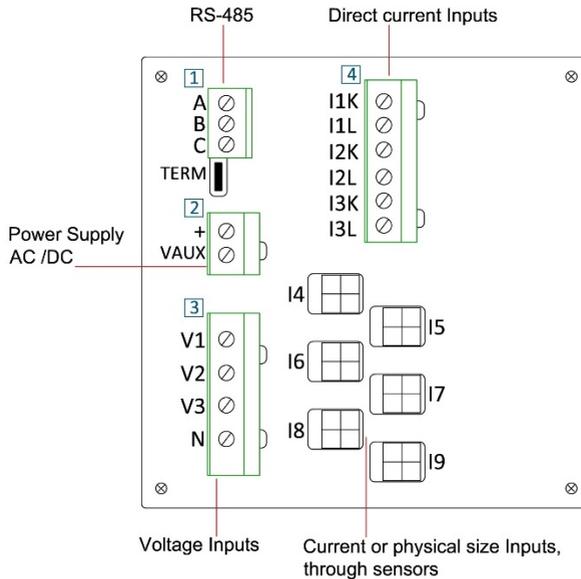
Cable section for NG9/NG9 Plus

**M1: Power Supply** - Maximum cable section:  $\varnothing$  2 mm<sup>2</sup> (16 AWG)

**M3: Inputs Voltage** - Maximum cable section:  $\varnothing$  2.5 mm<sup>2</sup> (14 AWG)

**M14: RS-485** - Maximum cable section:  $\varnothing$  0.75 mm<sup>2</sup> (18 AWG) *Belden 9841*

## NG9/96

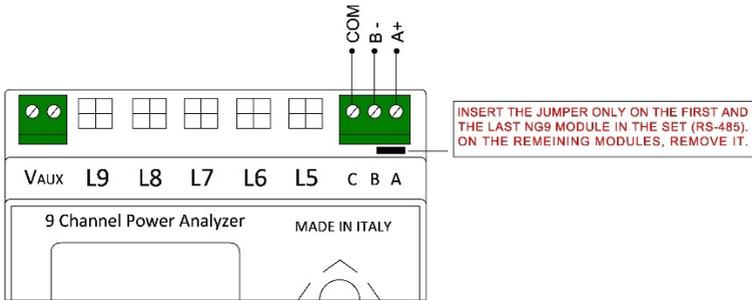


### Cable section for NG9/96

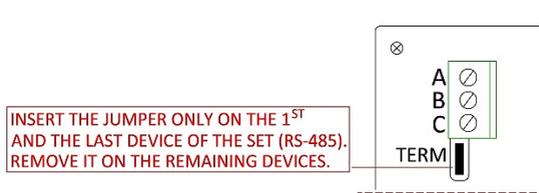
- 1: RS-485** - Maximum cable section:  $\varnothing 0.75 \text{ mm}^2$  (18 AWG) *Belden 9841*
- 2: Power Supply** - Maximum cable section:  $\varnothing 2 \text{ mm}^2$  (16 AWG)
- 3: Inputs Voltage** - Maximum cable section:  $\varnothing 2.5 \text{ mm}^2$  (14 AWG)
- 4: Direct Current Inputs** - Maximum cable section:  $2.5 \text{ mm}^2$  (14 AWG)

## RS485 serial connection

The picture below shows the RS485 serial connection, for NG9 and NG9 PLUS.



The picture below shows the RS485 serial connection, for NG9 and NG9/96



## Sensors

### Correct sensors insertion

To insert correctly the sensors, the connector must have the flap facing outwards, as shown in the images below.

Align the 2 connectors and press. It is not necessary to press hard during this operation; press until you hear the tongue snap into the connector on NG9 / NG9-Plus.

Particular about the connector of the Sensor.



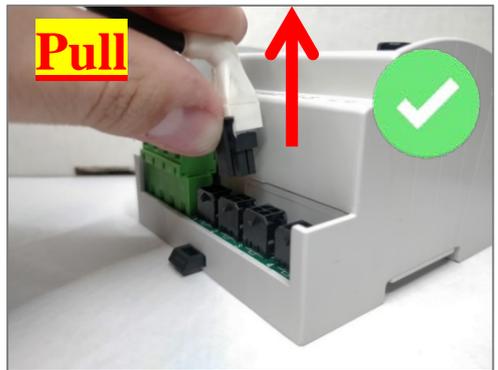
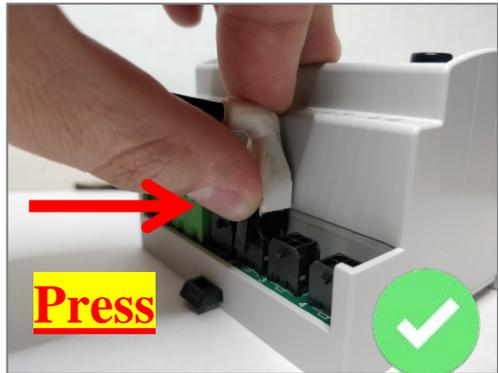
Particular about the connector of NG9.

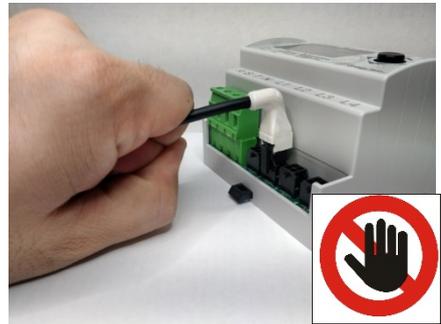


## Sensor removal

Should it be necessary to remove the sensors connected to the NG9 / NG9 Plus due to incorrect installations or repairs, proceed as follows:

Press the flap with your thumb and, applying light force, pull the connector upwards.





- Never force the mechanism, using objects such as scissors, pliers, screwdrivers ecc.
- Never use force to pull the connector.
- Never pull the connector from the cable.



## Common sensors for NG9 – NG9 Plus – NG9/96

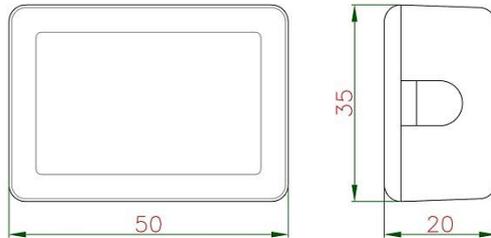
<b>RG2K Sensor</b>	<b>Amperometric Rogowski Probes,</b> Ø= 100mm, Range: 100; 200; 400; 1000; 2000A
<b>RG4K Sensor</b>	<b>Amperometric Rogowski Probes,</b> Ø= 200mm, Range: 200; 400; 400; 2000; 4000A
<b>RG-500 Sensor</b>	<b>Amperometric Rogowski Probes,</b> Ø= 36mm Range: 50; 100; 250; 500A
<b>CC24 Sensor</b>	<b>TA – Transformers with output in voltage, Ø ≤ 24 mm</b> Range: 20; 40; 100; 200A
<b>CC16 Sensor</b>	<b>TA – Transformers with output in voltage, Ø ≤ 16 mm</b> Range: 10; 20; 40; 100A
<b>CC06 Sensor</b>	<b>TA – Transformers with output in voltage, Ø ≤ 6 mm</b> Range: 1; 2; 5; 10A
<b>Extension cable for sensors</b>	Length = 4m
<b>XM2</b>	USB/Serial RS485 Converter

## Sensori per NG9 Plus e NG9-96

<b>NG-AIN Sensor</b>	<b>Input in Voltage:</b> max 10V <b>Input in Current:</b> max 20mA
<b>NG-DIG Sensor</b>	Acquisition of Digital signals and/or Status signals from passive outputs and/or from active outputs in Alternate Current (AC) or Continuous Current (DC). Maximum Frequency: 0/5Hz
<b>NG-RTD Sensor</b>	Input for Temperature measurement

	through RTD Sensor.
--	---------------------

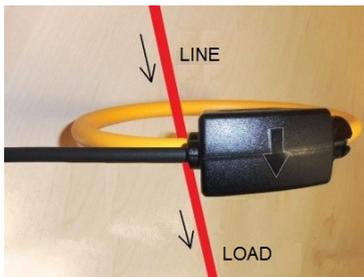
The dimensions of the sensors NG-AIN; NG-DIG and NG-RTD are identical for everyone and are:



## Details of the Sensors

### RG2K *Flexy Sensor*

Rogowski current probes

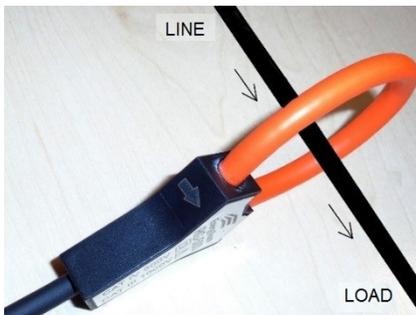


<b>Technical features</b>
Flexible and openable sensor
Tightening diameter: 100mm
Output Cable: 5 m - Shielded.
Accuracy: Class 1
Single and three-phase measurement (Nr. 3 probes)
Full-scale ranges: 100; 200; 400; 1000; 2000A
Removable terminal.

*RG-500 Flexy Sensor*  
Rogowski current probes



Technical features
Openable and flexible sensor
Tightening diameter: 100mm
Output Cable: 3 m - Shielded.
Accuracy: <0,5% (calibrated), in central position, at 25°C
Single and three-phase measurement (Nr. 3 probes)
Full-scale ranges: 50; 100; 250; 500A
Removable terminal.

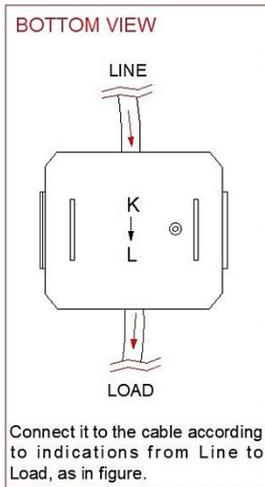


## CC24 Sensor

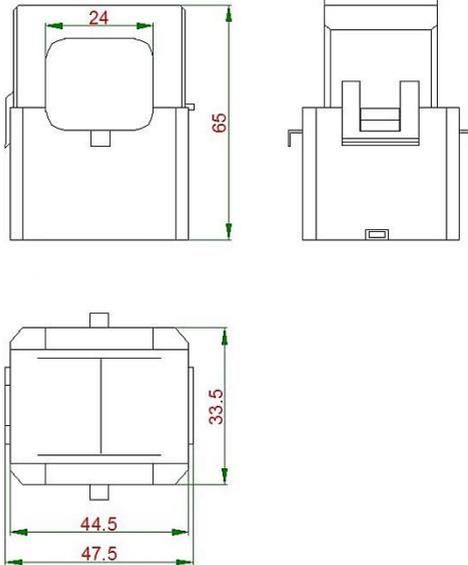
Current transformers (CT) with output in voltage



Technical features
Tightening diameter $\leq 24$ mm
Output Cable: 2 m
Single and three-phase measurement (from 1 to 3 transformers)
Full-scale ranges: 20, 40, 80, 200A a 50Hz



### DIMENSIONS



## CC16 Sensor

Current transformers (CT) with output in voltage



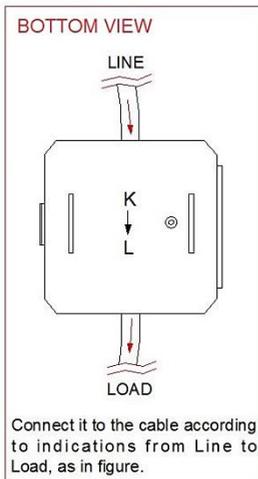
### Technical features

Tightening diameter  $\leq 16$  mm

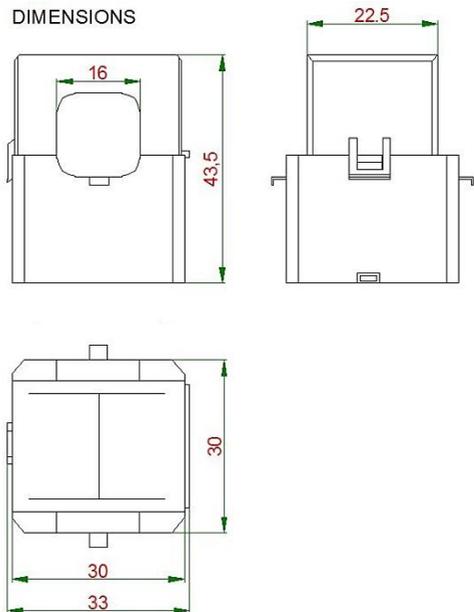
Output Cable: 2 m

Single and three-phase measurement  
(from 1 to 3 transformers)

Full-scale ranges:  
10, 20, 40, 100A a 50Hz

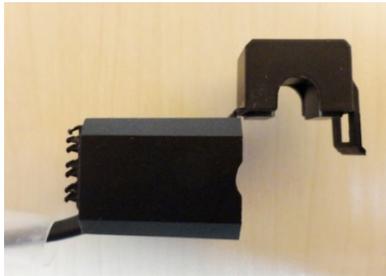


### DIMENSIONS

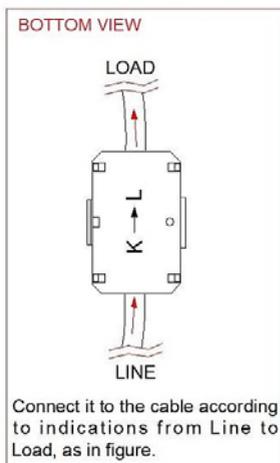


## CC06 Sensor

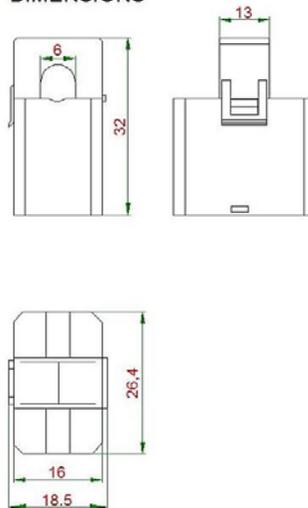
Current transformers (CT) with output in voltage



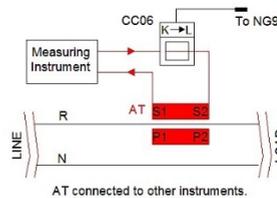
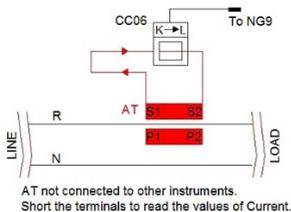
Technical features
Tightening diameter $\leq 6$ mm
Output Cable: 2m
Single and three-phase measurement (from 1 to 3 transformers)
Full-scale ranges: 1, 2, 5, 10A a 50Hz



### DIMENSIONS



Modality of CC06 insertion, in case of pre-existing Amperometric Transformer (AT)  
It's also valid for Three-phase lines.



## Sensors for NG9 Plus and NG9/96

### NG-RTD

Insulated Input to acquire temperature from RTD Sensors.



#### Technical features

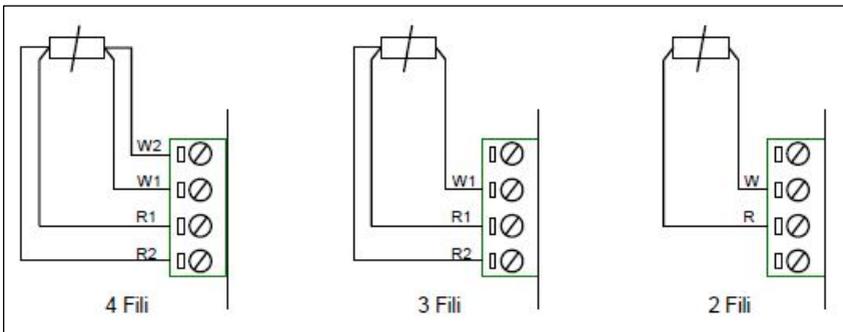
Cable length in output: 2 m

The measurement insulated with dielectric strength of 1kV between measurement input and NG9 simplifies use and improves noise immunity and system security.

Compatible RTD sensors:  
PT100, PT200, PT500,  
PT1000.

Accuracy:  
0,2% between -100 ÷  
+200°C  
0,1% between -20 ÷  
+100°C  
On the entire measurement  
chain.

#### CONNECTIONS

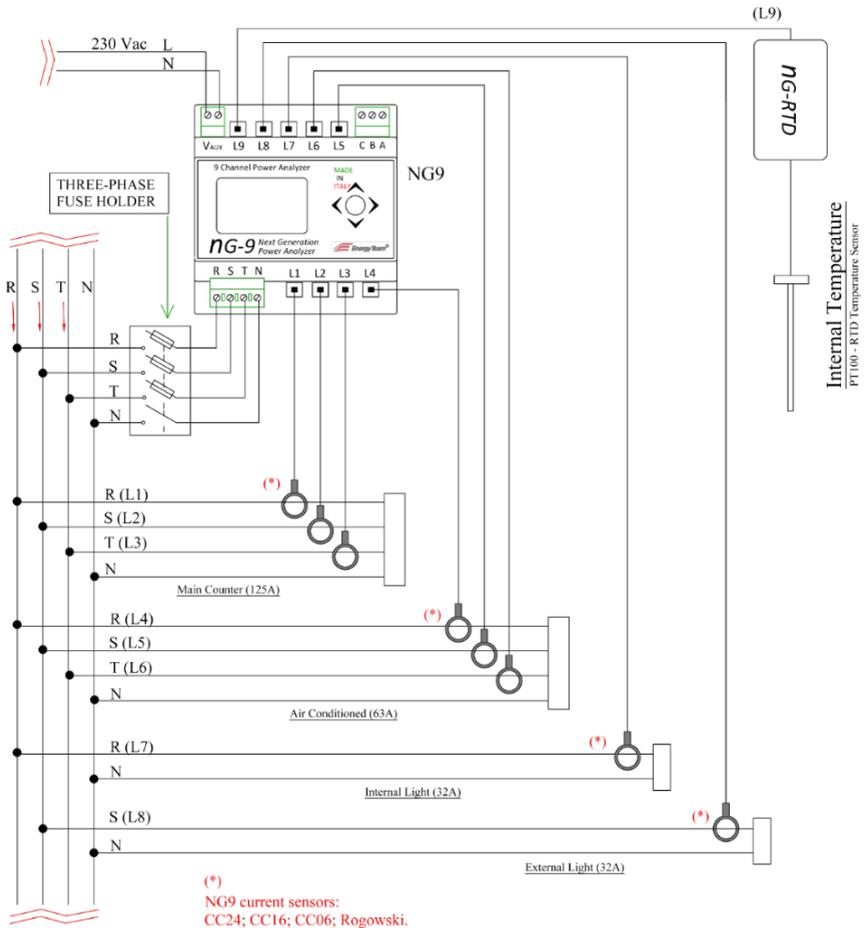


#### EXAMPLE OF ELECTRICAL CONNECTIONS

## Example of plant with NG-RTD sensor

We suppose to monitor a plant like the one shown below, with 2 Three-phase systems, 2 Single-phase systems and a RTD sensor.

**ATTENTION:** NG-RTD sensors can be used only with NG-9 PLUS and NG9/96.



#### L1-L2-L3 Main counter (125A)

In order to monitor the first load, we should use Rogowski Coils. Usually the wires going out from the main counter are bigger than 24 mm (maximum diameter possible with NG9 CT). Since the maximum current of the load is 125A, we can use the Rogowski Coil with 100 mm of diameter and 2000A as maximum current range.

#### L4-L5-L6 Air conditioned (63A)

In this case, we will assume that the diameter of the cable is less than 24 mm and the maximum current load is 63A. We can use a CC24 sensor (with diameter 24 mm).

#### L7 Internal light (32A)

In this case, we will assume that the diameter of the cable is less than 16 mm and the maximum current load is 32A. We can use a CC16 sensor (with diameter 16 mm).

#### L8 External light (32A)

In this case, we will assume that wire diameter is under 16 mm and since the maximum current range is 32 A for a mono phase load we will use a single CC16 sensor

#### L9 External temperature (PT100)

In the field is present a temperature sensor, a PT100. We can choose to install NG9 in the Plus Version with the NG-RTD sensor calibrated to work with the PT100 (NG-RTD sensors are available upon request calibrated with different set of RTD sensors).

Inside "*System setup*" of NG9-PLUS, we will select first the correct Insertion Mode, by reaching the menu, pressing enter and choosing the 2 three-phase and 3 mono-phase type mode. Then we select the sensor type and current range choosing from the table, for every NG9 Plus Channel from L1 to L9, through the specific section of System Setup Menu. Obviously, we can do the same thing for NG9 in the normal version, excluding the RTD sensor.

- For L1 – L2 – L3 channels we will select ***RG2K 200A f.s.***
- For L4 – L5 – L6 channels we will select ***CC24 100A f.s.***
- For L7 channel we will select ***CC16 40A f.s.***
- For L8 channel we will select ***CC16 40A f.s.***
- For L9 channel we will select ***RTD.***

**ATTENTION:** As you can see in the schematic, the Single-phase loads monitored through the sensors going in L7 and L8 channels, share the same Voltage phase. In this case, we should set the same voltage phase as reference inside NG9 plus menu. We should use this function only when two (or more) Single-phase channels are sharing the same Voltage phase. When considering Three-phase systems that don't match correspondence between current sensor and Voltage Phases, we should resolve the issues changing the wiring itself or changing the sensor position in order to match the correct Voltage phase.

To configure properly the NG9 reading, let's change Voltage Phase assigned to channel L8. After sensor configuration procedure, remain inside *System Setup* menu and scroll down until you reach this page:



From this page, scroll down until you reach *L9 Voltage Channel* page and select V2 (S) voltage channel.

After those steps, NG9 will need to be rebooted in order to apply the changes. Turn off the device and power it on again immediately or perform the software *Reboot* procedure.

From main menu, move the Joystick downwards until to display the menu about the Single-phase measurements.

RTD means "Resistance Temperature Detector" and, usually, it's made by a thin wire wrapped around a ceramic center (even if other methods are used). RTD sensor cable is in pure material, usually platinum, nickel or copper; all materials with high Resistance/Temperature ratio, used for indication of temperature. RTD elements are quite fragile and therefore are often protected by protective probes.

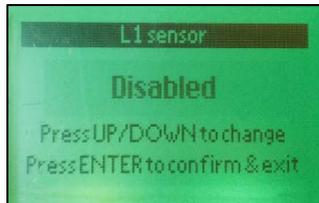
As described in the paragraph about the technical features, NG-RTD accepts the sensors type: RTD PT100, PT200, PT500 e PT1000. When you decide to buy the RG-RTD interface, you also must specify the type of sensors to be used. The device doesn't adapt automatically to different types of resistive

sensors, because Energy-Team must calibrate the device, so as to adapt correctly the probe resistance.

Once the correct version of NG-RTD has been purchased, all you need to do is to connect the probe to the device; NG9 PLUS will begin immediately to acquire Temperature values.

From System Setup menu, move the joystick downwards until to display the menu about the selection of the sensor, for each channel.

In this example, Channel L1 is used:



Press ENTER (central button) and move the joystick downwards until to display NG-RTD menu:



Press ENTER to confirm.



**NOTE:**

Having anticipated the screens, for a clearer and more detailed description of their use, with the respective steps to access sensors setting, see the chapter: **"PROGRAMMING NG9 AND NG9-PLUS FROM KEYBOARD"**.

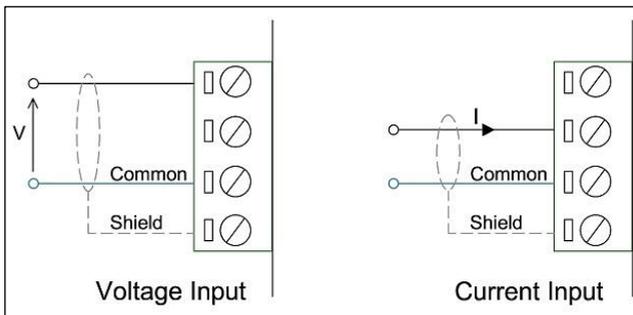
## NG-AIN

Insulated Input to acquire signals in Voltage or Current



Technical features
Cable length in Output: 2 m
Range: $\pm 10V$ , $0 \div 10V$ , $\pm 20mA$ , $0 \div 20mA$ , $4 \div 20mA$
The insulated test with dielectric strength of 1kV between measurement input and NG9, simplifies use and improves noise immunity and system security.
Accuracy: 0,2% in reading, plus 0,05% of the range. On the entire measurement chain.

## CONNECTIONS



### NOTE:

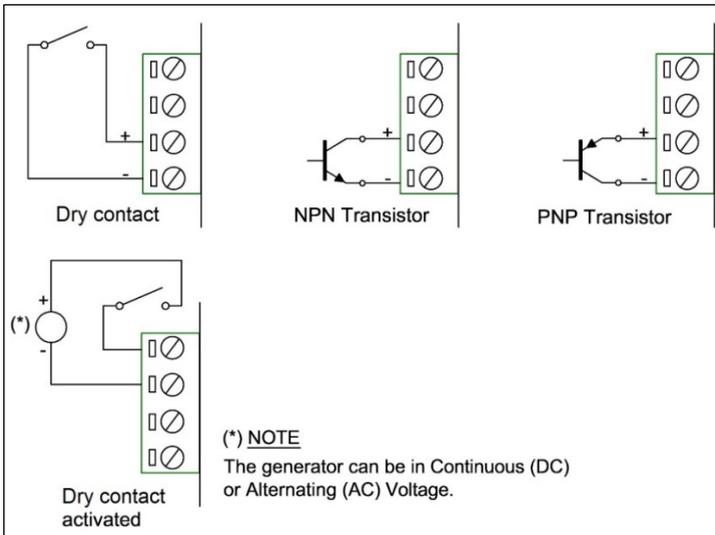
Set NG9 Input with this module; after set the K/slope factor (or KTA in the configurator) and the eventual Offset. The instrument ignores the parameter inserted as Pulse Weight.

## NG-DIG Pulse acquisition



Technical features
Cable length in Output: 2 m
Acquisition from Passive Outputs: - PNP, NPN, OPTOMOS - Electromechanical contacts. Minimum pulse duration: 5ms
The insulated test with dielectric strength of 1kV between measurement input and NG9, simplifies use and improves noise immunity and system security.
Acquisition from Active Outputs : 12÷110Vdc /Vac. Minimum pulse duration : 5ms (DC); 10ms (AC)
Pulse frequency: Max 10Hz

### CONNECTIONS

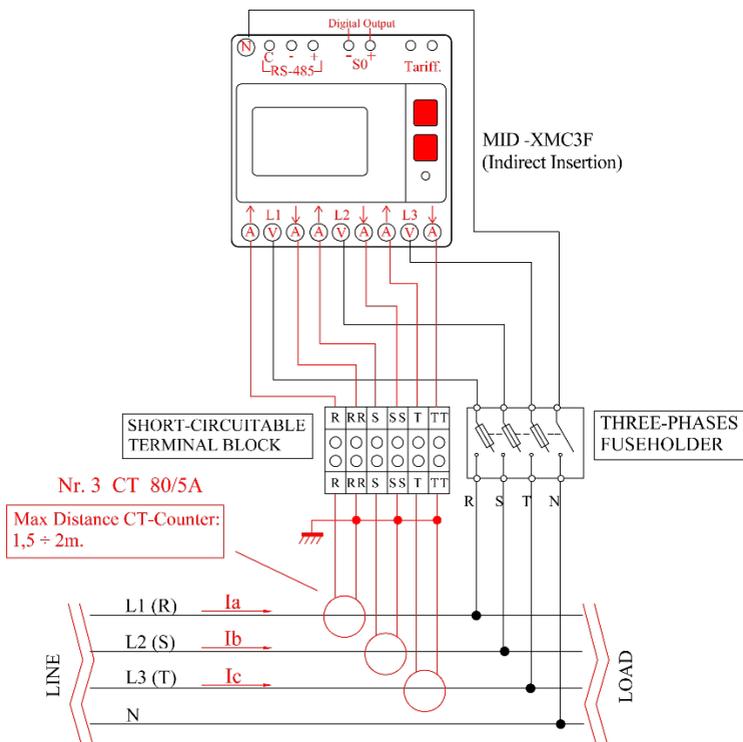


Example of plant with NG-DIG sensor.

**Acquisition of digital signals from a Counter of Electrical energy MID-XMC3F of Energy Team, in its semi-direct configuration. This configuration is described below:**

- MID-XMC3F with current transformers 80/5A on a three-phase system.
- NG-9 PLUS with NG-DIG sensor on the MID-XMC3F digital Output .

First, you must connect the Counter's digital output (S0) to NG-DIG sensor according to the scheme below:



After connecting the digital output of the counter to NG-DIG sensor, you must insert the reading parameters on the Counter technical data sheet. You must get the weight of the pulse in Output for each unit of measure (integer constant of the Counter). Since you are using a Transformer 80/5A, the ratio is 16 (primary divided by the secondary of the transformer). Now you know the transformation ratio, it's possible to select the correct pulse value for unit from technical data sheet of the MID-XMC3F.

**MID-XMC3F- Technical data sheet taken from User's manual.**

OUTPUT SO	
Passiva Optoisolated	
Maximum values (According to Standards EN 62053-31)	27V <sub>DC</sub> - 27 mA
Counter's constant depending by the ratio CT. The measure unit (imp/kWh, imp/kvarh, imp/kVAh) changes, depending on the associated counter. (kWh $\Sigma$ , kvarh $\Sigma$ , kVAh $\Sigma$ )	1000 → CT = 1...4 <span style="border: 1px solid red; padding: 2px;">200 → CT = 5...24</span> 40 → CT = 25...124 8 → CT = 125...624 1 → CT = 625...3124 0,1 → CT = 3125...10000
Pulse duration	50±2ms ON time 30 min ±2ms OFF time

As shown on the technical datasheet, with a CT ratio of 16, the digital output of the counter will produce 200 pulses each 1 kWh. Therefore, the weight of the single pulse will be:

$$1000\text{Wh} / 200 \text{ Imp} = 5\text{Wh/Imp.}$$

By knowing this value, it's possible to calculate the parameters k/Slope and Pulse weight to insert into NG-9 PLUS and NG9/96, let's go with order.

**Pulse Weight:** This parameter is used by NG9/96 and/or NG9 Plus to increase the inserted value, the totalizer. Therefore, set the value of the single-pulse weight, which is 5 in the example above (5 Wh /imp).

**K/Slope** (or KTA in the configurator): set the “instantaneous” measurement at full scale, by considering that the maximum frequency admitted for NG-DIG is 5Hz.

It needs that you have to multiply the pulse weight for 18000 (5Hz \* 3600). In this example, just insert:

$$5 \times 18000 = 90000$$

At the frequency of 5 Hz, the instantaneous measurement will be 90 kW of Power.

**Offset:** NG9/96 and/or NG9 Plus uses this parameter to “move” the size of an Offset. When the pulse comes from a counter, leave this parameter at “0”.

### *NG-DIG Digital Status*

In this case, no parameter needs to be set on NG-9/96 and/or NG9 PLUS, since the only value acquired by the instrument is the status of the physical contact on the NG-DIG terminal board.

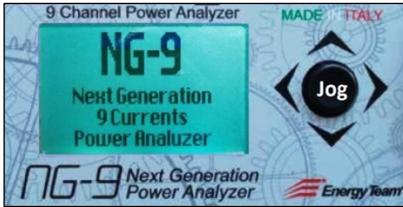
It will be essential to connect correctly the sensor to signal, by following the schemes. The pages about real-time data of NG9 PLUS will allow you to display the actual status of the Input (ON or OFF). If the system is reading signal status from Modbus registers, 0 or 1 are displayed (0 for OFF, 1 for ON).



**ATTENTION !**

**Installation and wiring of the device must only be performed by qualified personnel. Danger of electric shock, fire and electric arc. Use personal protective equipment that is suitable for complying with actual electrical safety regulations. Before making any connections, check the disconnection of the power supply with the voltage detection device.**

## NG9 and NG9 PLUS setting by Keyboard



### Jog Positions:



When the instrument is turned on, regardless of the screen displayed, click the Jog button on UP or DOWN position for scrolling the menu, until to display the main screen about system information



Click the Jog to RIGHT position to display a page showing: Serial number; calibration date; and Firmware version:



Then, by clicking UP or DOWN, the next page is displayed; it shows: Battery status; internal temperature; diagnostic code; node address (including speed b/s, parity and error codes).



By clicking RIGHT You return to main screen "System information", from which it's possible to scroll the main menu.

### SETUP

In order to set all system parameters, click the Jog button on UP or DOWN until the screen of Setup is displayed:



Click the RIGHT position to display the menu about PIN entry:



In order to enter PIN code, press the Jog button: the display changes color (green) and the first digit flashes. Then, click Jog to UP or DOWN for inserting the desired number. In the next step: click RIGHT to set the second digit and repeat the procedure already explained. So even for the remaining digits. Once the procedure is finished, press the Jog button to get the access to setting menu. **(the default PIN is 0000).**

### TIME SETTING

Click UP or DOWN to scroll the sub-menu. The next screen displayed is the following:



Through this menu it's possible to insert the number of meridian where the instrument is, so that the system calculates the local hour by summing this number to Greenwich hour.

Press Jog to enable the menu: it changes color (green) and the indication flashes. Click UP or DOWN to select one of these meridians, according to town:

- 0: London; Lisbon.
- +1: Milan; Rome; Paris; Madrid; Berlin;
- Wien; Prague.
- +2: Athens; Cairo.

**(default is CET (UTC+1)).**

Click DOWN to display the menu about the daylight saving time (DST):



**(default is "Enabled").**

In order to change the setting, push the Jog button, then click UP or DOWN to select Enabled for summer-time; Disabled for winter-time. Press again Jog to save the settings.

Click DOWN to display the next menu, about the modality used by the instrument to determine the hour (time), according to setting entered:



By pressing Jog and clicking UP or DOWN, it's possible to select one of the following options:

**Wall time:**  
**The instrument considers the time set, including DST (default function).**

Local time:  
 The instrument considers the winter-time as the time set.

UTC time:  
 In this modality, the instrument considers the time set as the Greenwich time and sums it to the number of the meridian, entered in "Timezone".

Then, press Jog to confirm and return automatically to main menu.

## POWER FACTOR

Click the Jog on DOWN position to scroll the main menu, until the following screen is displayed:



Then press Jog and click UP or DOWN to select the desired Power Factor:

**Power factor I.** When the power factor is displayed, the algebraic sign is determined by the active power: positive if it's absorbed; negative if it's delivered.

**Power factor II.** When the power factor is displayed, the algebraic sign is determined by the reactive power: positive if it's inductive; negative if it's capacitive (default function).

Press Jog to confirm.

## CONNECTION SETTING

Click DOWN to scroll the main menu until to display the screen about the insertion mode, according to the plant:



The indication shows the typology of connection, in the plant considered. In order to change it, press Jog for enabling the function, then click UP or DOWN to select one of the following configurations:

**3** + **0** : Plant made up of 3 Three-phase systems, no Single-phase system. As shown on the Example A), (default function).

**2** + **3** : Plant made up of 2 Three-phase systems and 3 Single-phase system. As shown on the Example B) (NG9 and NG9 Plus, Connections).

**1** + **6** : Plant made up of 1 Three-phase system and 6 Single-phase system. As shown on the Example C) (NG9 and NG9 Plus, Connections).

**0** + **9** : No Three-phase system, the plant is made up of 9 Single-phase systems. As shown on the Example D), (NG9 and NG9 Plus, Connections).

At the end, press Jog to save the setting and return automatically to main menu.

## TPOLOGY OF SENSORS

Click DOWN to scroll the menu, until to display the screen about the procedure to enable the channels and the sensor connected, beginning from the first channel (L1)



As previously described, press the Jog button to enable the menu, then click DOWN to select one of the following options:

**Disabled: to disable the data-reading on the channel (default function).**

Reserved: factory mode, only used in the laboratory in order to carry out some calibrations.

Repeatedly press DOWN to scroll all the sensors supported and select the installed one. The classes of sensors are the followings:

**RG8K:** Rogowski Probe with maximum value supported 8000A.

Full-scale selectable: 400, 800, 1600, 4000, 8000A

**RG4K:** Rogowski Probe with maximum value supported 4000A.

Full-scale selectable: 200, 400, 800, 2000, 4000A

**RG2K:** Rogowski Probe with maximum value supported 2000A.

Full-scale selectable: 100, 200, 400, 1000, 2000A

**RG-500:** Rogowski Probe with maximum value supported 500A.

Full-scale selectable: 50, 100, 250, 500A

**CC24:** Current Transformer with output in voltage, diameter 24 mm.

Full-scale selectable: 200, 100, 40, 20A

**CC16:** Current Transformer with output in voltage, diameter 16 mm.

Fondo-scala selezionabile: 100, 40, 20, 10A

**CC06:** Current Transformer with output in voltage, diameter 6 mm.

Full-scale selectable: 10, 5, 2, 1A

For each class it's possible to select the Full-scale value of the current.

**ONLY FOR NG9-PLUS:**

Features: See the Chapter:

**"Sensors for NG9 Plus and NG9/96"**

**AIN 4-20mA:** Sensor to acquire Current signals in the range 4÷20mA.

**AIN 20mA/10V:** Sensor to acquire signals in the range:

±10V, 0÷10V, ±20mA, 4÷20mA

**RTD:** Sensor for temperature measurements from probes PT100

**DIGITAL States:**

When the sensor NG-DIG is connected, select this function to acquire pulses related to digital states of the contacts.

**DIGITALE Counter:** When The NG-DIG sensor is connected, select this function if the pulse source is a counter or a similar instrument. The pulses are processed.

At the end press Jog to store the setting. With the same procedure described, set other channels, each of them is displayed at the next pressure of DOWN, up to L9.

## PHASE ASSIGNMENT TO EACH CHANNEL

The assignment of a determined phase to the respective channel is not so restrictive as in the example on the diagrams, but freely selectable.

*For example: the channel L1 can also be assigned to phase S or T, not only R. The same thing for the other channels. (default is: V1(R); V2(S); V3(T)).*

In order to set a phase, scroll the main menu by clicking the Jog on the position UP or DOWN, until the following screen is displayed



This menu shows the voltage channel L1, assigned to phase R. In order to assign it to a different phase (S or T), press the Jog button and the screen changes, as shown below:

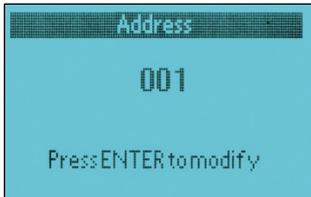


Click UP or DOWN to select the desired phase, then press Jog to save the setting. The display shows the initial color (blue) and the indication of the new phase for L1.

Repeat this procedure for the other channels, selected by clicking DOWN, until L9.

## NETWORK PARAMETERS

Click the Jog button on the positions UP or DOWN to scroll the menu, until to display the screen about the **node address (default is 001)**:



In order to change it, press the Jog button, the screen changes color (as seen previously) and the cursor flashes. Click RIGHT to bring the cursor on the first digit, then click UP or DOWN to enter a number from 0 to 9. In the next step, click RIGHT to bring the cursor on the second digit and repeat the procedure described, so for all digits. At the end, press Jog to save the setting.

Click DOWN to display the next screen about the **communication speed** (in bit per second):



In order to change it, press Jog and click UP or DOWN to select one of the following values: 115200; 57600; 38400; 19200; 9600. Then, press Jog to confirm.

All the instruments connected must have the same speed.

**(default is 57600).**

Click DOWN to display the next menu about the **Parity** code:



In the package of bits in which the signal is divided, the desired parity code can be set by using the same procedure described in the above paragraph, about the communication speed. Select "Even", "Odd" or "None".

**(default is Even).**

Click DOWN to display the next menu about the **stop bit**:



By using the same procedure described, select the stop bit between 1 or 2. **(default is 1).**

## PIN CHANGE

Click DOWN to display the next menu about the change of **PIN code**:



By using the same procedure above described (see "node address"), insert the digits of the new PIN code if You don't want to keep the default value.

**ATTENTION:**

***Once the PIN has been set, if you forget it, will NOT be possible to access the instrument configuration, even with the Configurator!***

**ENERGY MULTIPLIER**

The value refers to "step" or "increase in energy" displayed by the meter during the measurement, below which it keeps the last value; the next measurement value will be displayed every time that the increase exceeds the setting.

For example: if the value entered is 10Wh and the instrument starts from 0, the value 0 will be always displayed when the energy recorded is below 10Wh; but when the energy reaches this threshold, the display will show 10Wh and so on, in increments of 10, displaying: 10, 20, 30, 40, etc.

Scroll the main by clicking the Jog on UP or DOWN, until the following screen is displayed:



Press the Jog button to enable it, then click UP or DOWN to insert the desired value among the followings: 1Wh; 10Wh; 100Wh; 1KWh; Then press Jog to confirm.

**DIRECTION OF THE ENERGY**

Click the Jog button on DOWN position to display the menu about the direction of the measured energy:



Press Jog to enable it, then click UP or DOWN to insert the option according to the plant in which the instrument is installed:

**Bidirectional:**

**To measure both the energy absorbed by the electrical network (positive value) and the energy delivered to the electrical network (negative value).**

**(Default function).**

**Unidirectional:**

To measure only the energy produced or the energy absorbed.

At the end, press Jog to save the setting.

**CONSTANT TV**

By clicking DOWN, the next menu displayed is the following:



For voltage measurements, if a transformer is inserted, set the Voltmetric constant. In the absence of transformer, set 100.0V/100V: under these conditions, the range of the values displayed on the menu, coincides with those reported in the table of technical data, precisely:

430 V peak, phase-neutral  
300 Vac phase-neutral  
520 Vac phase-phase

The procedure for inserting the values through Jog command is the same described in the paragraph "node address". **(default is 100.0V/100V)**

ONLY FOR NG9-PLUS:

#### SETUP WITH NG-AIN SENSOR

If connecting a NG-AIN analog sensor to a channel, you must set two parameters: k/Slope and Offset.

Click DOWN to scroll the menu until to display the parameter k/Slope in the interested channel (Example: L1k/Slope) and enable it by pressing ENTER.

#### **k/Slope**

It represents the Full-scale of the values within the desired analog scale. The formula is the following:

$$(\text{Maximum value} - \text{Minimum value}) / I$$

Where "I" is the internal constant, in this case is 1.

Press ENTER to confirm. Then scroll the menu by clicking DOWN to repeat (if necessary) the operation also for other channels. Always using DOWN, scroll the menu until to display the "**Offset**" parameter (Example: L1Offset) as displayed.

#### **Offset**

It represents the Maximum value on the whole range; in order to set this parameter, enter the minimum value of the analog scale that is being measured.

Press ENTER to enable the screen, then enter the value using the same procedure with Joystick described initially.

Press ENTER to confirm and DOWN to scroll the other channels in the menu and, if necessary, repeat the operation.

#### EXAMPLE:

*We suppose to connect a solarimeter with 4±20 mA in output and we want to acquire the values of irradiation.*

*We know the range:*

*Maximum range: 1200 W/m<sup>2</sup>*

*Minimum range: 0 W/m<sup>2</sup>*

*k/Slope is (1200-0) = 1200*

*Offset is 0*

*If we want to acquire the solarimeter Temperature and we know the range of the instrument:*

*Tmax = 180°C; Tmin = -40°C*

*k/Slope is [180-(-40)] = 220*

*Offset is -40*

*This example is valid for every type of analog measurement and analog range that can be acquired. Just remember to take the correct parameters before starting the configuration.*

## SETUP WITH NG-DIG SENSOR

Through NG-DIG sensor it's possible to acquire digital signals or digital states from different sources.

In the Setup menu about the interested channel you can select two different Setup typologies for NG-DIG:

Digital counter and digital states,  
(Rif. Paragraph: "Typology of sensors").

To configure the sensor so that it acquires digital states, you must set two different parameters: K/Slope and Pulse Weight.

Scroll the menu by clicking DOWN until to display the interested channel, on which the NG-DIG module is connected (Example: L1).

It's displayed as: "**L1 k/Slope**".

**k/Slope**: In this case, it represents the constant applied by the instrument in order to calculate the real-time value and transform correctly the number of incoming pulses into the desired unit of measure.

Press ENTER to enable the screen and enter the value. Then press again ENTER to confirm.

Then scroll the menu until to display the screen about the pulse weight for the interested channel.

On the top side of the display (Example: L1), is shown the indication "**L1 Pulse Weight**"

### **Pulse Weight:**

It corresponds to number of the pulses acquired, for each unit of measure detected.

Press ENTER to enable the screen and enter the value. Press again ENTER to confirm.

Then click DOWN to scroll the same parameter on the others channels, repeating the operation if necessary.

### COSTANT TA

Similarly to the voltages, even for the Currents insert the amperometric constant if a Current Transformer is connected on the interested channel. To access to corresponding screen, click DOWN to scroll the menu until to display:



By using the same procedure described in the paragraph "node address", insert the correct value of the constant, according to Current Transformer used. At the end, by clicking DOWN, it's possible to set the constant of Current Transformers also for other channels, and so on, from L1 to L9. **(default is 1.000A/A)**

### ENTER NAME

Click UP or DOWN to scroll the menu until to display the screen about the name for each current channel, called LABEL:

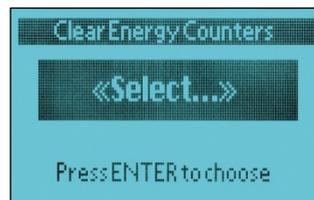


The procedure for changing the name is the same described in the paragraph "node address". In this case, besides the numbers, it's also possible to select the letters and the symbols. Maximum length of the word is 8 characters.

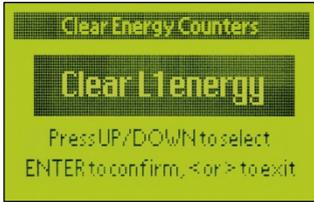
Once stored, repeat the procedure for the other channels. You can display the menu relative to each channel (from L1 to L9) by clicking DOWN.

### CLEARING OF THE ENERGY METERS

In order to clear all the values of energy stored in the meters, relative to each channel, click UP or DOWN to display the following menu:



Press the Jog button. The screen (the first is the channel L1), changes as shown below:



Click repeatedly the Jog button on UP or DOWN position to scroll all the channels until L9. Stop on the interested channel and press Jog. You will be asked to confirm; press again Jog. The values stored in the record of the meter, relative to interested channel, will be cleared. Then, automatically, the blue screen of the main menu will be displayed. You can repeat the procedure also for other channels.

### CLEARING OF THE MAXIMUM CURRENT REGISTERS

In order to clear all the values of the maximum current, stored in the registers relative to each channel, click the Jog button on DOWN to display the next screen:



The procedure is the same described above for clearing the energy records. The only difference is in the typology of data: in this case, the peak values of the currents.

### SETTING AND RESTARTING

Click the Jog button on DOWN, the screen displayed is the following:



Press the Jog button to enable it, then click UP or DOWN to select one of these options:

Set default setup: to clean the last settings and activate automatically the factory settings.

Reboot: to restart the instrument.

Press Jog to confirm the selected option.

### DATE AND TIME SETTING

Click display the screen about date and time setting:



Press the Jog button to enable it. The color changes (green) and a cursor flashes on the first digit.

The procedure to enter the values is the same described at the beginning of the paragraph:

"Network parameters" (Node address).

## CONTRAST

Click the Jog button on DOWN position; the last Setup screen displayed concerns the contrast on the display:



Press Jog to enable the function, then click the Jog to RIGHT or LEFT position, respectively to increase or decrease the contrast. Contemporarily you note the shape drawn by the slider that varies in length, according the value of contrast. Press Jog to confirm.

## GENERAL MEASUREMENTS

Returning to main menu shown when the instrument was turned on, click the Jog button on UP or DOWN position until to display the following screen:



Click RIGHT to get the access to a sub-menu in which, by clicking UP or DOWN, you can display alternatively two pages showing all the parameters about the three-phase measurements:

Phase-voltage ( $U_1$ ;  $U_2$ ;  $U_3$ ), average phase voltage ( $V_{\Delta}$ ), Star-voltage for each couple of phases ( $U_{12}$ ;  $U_{23}$ ;  $U_{31}$ ), Average star-voltage ( $U_{\Delta}$ ), Network frequency ( $F$ ), Internal temperature in the instrument ( $T$ ).

Voltages			
$U_1$	226.0	$U_{12}$	393.9
$U_2$	226.0	$U_{23}$	392.2
$U_3$	222.6	$U_{31}$	391.3
$V_{\Delta}$	226.0	$U_{\Delta}$	392.3

Various measures			
$F$	49.98	$T$	28.78

Click the Jog button on LEFT position to return to main screen.

## SINGLE-PHASE MEASUREMENTS

From main menu, click UP or DOWN until to display the following screen:



Click RIGHT to get the access to a sub-menu in which, by clicking UP or DOWN, you can display the pages showing all the parameters about the measurement on each phase channel.

The first page of the connected channel shows the following measurements:

L11PHvalues			
U	100.0	PF	0.000
I	0.000	S	0.000
P	0.000	IM	1.556k
Q	0.000	⊕	Q1

Phase Voltage (U); Phase Current (I); Active Power (P); Reactive Power (Q); Apparent Power (S); Maximum detected Current (IM); Power Factor (PF).

Click RIGHT to display the next page of the same channel, where You can see respectively the meters of: Active Energy Absorbed (A+) and Active Energy Delivered to the network (A-):

LABEL1 L1 Energy-kWh	
A+	000003451.818
A-	000000000.019

By clicking again the Jog button to RIGHT position You can see the last page of the same channel, showing 4 Reactive Energy Meters: each of them is referred to a determined quadrant and it begins to record the values according to direction of the Active and reactive Power, if the vector of the Apparent Power is in the area of the corresponding quadrant.

*Precisely: Active and Reactive Energy together positive (absorbed): Q1 starts. Active Energy negative (delivered) and Reactive Energy positive: Q2 starts. Active and Reactive Energy together negative: Q3 starts. Active Energy Positive and Reactive Energy negative: Q4 starts.*

LABEL1 L1 Energy-kVArh	
Q1	0000000005.707
Q2	0000000000.047
Q3	0000000000.001
Q4	000000378.098

By clicking the UP or DOWN position it's possible to see the same page, but relative to a different channel (from L1 to L9). If, during the channel setting, someone wasn't enabled, the corresponding page will show the message of "modality not enabled".

Click LEFT to return to previous page of the same channel.

### THREE-PHASE MEASUREMENTS

From main menu, click UP or DOWN to display the following screen:



Click RIGHT to get the access to a sub-menu about the measurements on all three-phase systems connected.

In the present three-phase systems, you can scroll through the screens for each of them, named according to the group of three current channels connected.

*For example: By setting the instrument for 2 three-phase systems and 3 single-phase systems, you can see the screen named as L123 and L456, each of them corresponds to respective three-phase connection. Instead, for L789, a message of "modality not enabled" is displayed.*

The first page displayed is the following:

LABEL 1		L1233PHvalues	
U $\Delta$	391.2	Q	-1.621k
U $\Delta$	225.8	PF	0.975
I	54.21	S	12.21k
P	11.94k	Q4	⊕ ⊖

It shows these values:

Average Phase Voltage (U $\Delta$ ); Average Star Voltage (U $\Delta$ ); Average Current (I); Overall Active Power (P); Overall Reactive Power (Q); Overall Apparent Power (S); Power Factor (PF).

Click the Jog button on RIGHT position to display the next page of the same Three phase system, where you can see respectively the counters of: Overall Active Energy Absorbed (A+) and Overall Active Energy Delivered to the network (A-):

LABEL 1		L123Energy-kWh	
A+	000009150.110		
A-	000000000.079		

Click again the Jog button on RIGHT position to display the last page of the same Three-phase system, showing 4 Reactive Energy meters: each of them is referred to a determined quadrant and it begins to record the values according to direction of the Active and reactive Power, if the vector of the Apparent Power is in the area of the corresponding quadrant. The principle is the same as that explained in the paragraph for single-phase systems.

LABEL 1		L123Energy-kVArh	
Q1	0000000006.669		
Q2	0000000000.174		
Q3	0000000000.002		
Q4	000001677.191		

By clicking on UP or DOWN position it's possible to see the same page, but relative to a different three-phase system. Click the LEFT position to return to previous screen relative to same system. Click repeatedly the LEFT position to return to first screen, in the main menu.

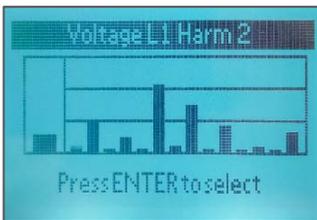
**NOTE:** Even for three-phase systems it's possible to see the measurement on each phase, for the respective channels from L1 to L9.

## HARMONICS (ONLY FOR NG9-PLUS)

In the "General measurements" menu shown above, it's also possible to see the distribution of the harmonics for each channel.

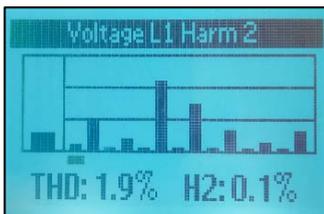
Click RIGHT to display the first screen of the submenu showing the Voltage values, the same shown above.

Click DOWN to display the following screen about the harmonics of a channel:



The left box shows the total harmonic distortion on this channel, instead the right box shows the harmonics distribution and, automatically, it indicates (from 2<sup>nd</sup> to 15<sup>th</sup>) the percentage of the corresponding harmonic.

Press ENTER to enable the menu in which it's possible to display the harmonics in real-time.

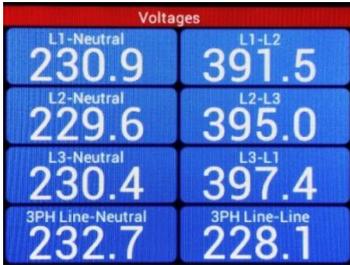


Click RIGHT to scroll the various harmonics, displaying below the percentage of the value for the interested harmonic.

Instead, click DOWN to scroll the menu of the harmonics for other channels.

At the end, press ENTER and click LEFT for returning to main menu:

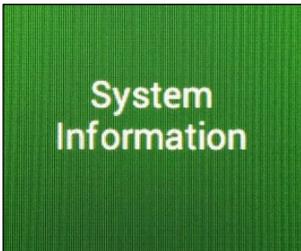
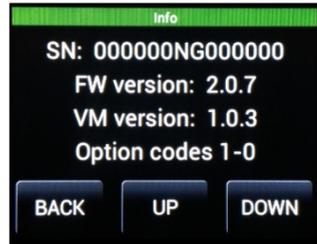
## NG-9/96 setting by Keyboard



Symbols which appear when touching the corresponding side on the display



When the instrument is turned on, regardless of the screen displayed, first tap the LEFT side of the display; the corresponding symbol (as mentioned above) will be temporarily displayed and the system returns to the main menu. Then tap UP or DOWN to scroll it, until to display the following screen:



Then, tap UP or DOWN keys to see the next information pages, showing: Calibration date; Battery status; internal temperature; diagnostic code; node address (including speed b/s, parity and error codes); Number of Bytes received (RX), Number of data packets correctly received (OK) and lost (KO)

Tap RIGHT to display the pages about system information; the first shows: Serial Number of the instrument; firmware and software version.





Tap BACK to return to screen "System information", from which it's possible to scroll the main menu.

### SETUP

From the main menu, tap UP or DOWN (respectively on the top and the bottom side of the display, as mentioned at first) until to display the following screen:



Tap RIGHT to display the keyboard:



Enter PIN code (**default PIN is 0000**). Then tap ">" to access to setting menu, or "X" to exit and return to preview screen.

### TIME SETTING

In the setting menu, the first screen displayed is the following:



You can insert the number of meridian where the instrument is, so that the system calculates the local hour by summing this number to Greenwich hour.

Tap the yellow area to enable the menu, it changes as follows:



Tap UP or DOWN to select one of these meridians, according to town:

- O: London; Lisbon.
- +1: Milan; Rome; Paris; Madrid; Berlin;
- Wien; Prague.
- +2: Athens; Cairo.

**(default is CET (UTC+1)).**

Tap OK confirm, or BACK to return to previous screen without saving.

Then, tap DOWN to display the screen about the "Daylight Saving Time" (DST):



**(default is "Enabled").**

In order to change the setting, tap the yellow area, the screen changes as follows:



Tap UP or DOWN to select Enabled for summer-time; Disabled for winter-time.

Tap OK confirm, or BACK to return to previous screen without saving.

Then tap DOWN to display the next screen, about the modality used by the instrument to determine the hour (time), according to setting entered:



Tap the yellow area, the screen changes as the ones previously shown (orange color). Tap UP or DOWN to select one of the following options:

**Wall time:**

**The instrument considers the time set, including DST (default function).**

**Local time:**

The instrument considers the winter-time as the time set. UTC time:

**UTC time:**

In this modality, the instrument considers the time set as the Greenwich time and sums it to the number of the meridian, entered in "Timezone".

Tap OK confirm, or BACK to return to previous screen without saving.

## POWER FACTOR

Then, tap DOWN to scroll the menu, until to display the following screen:



By using the same procedure above described, tap the yellow area, it becomes orange and the screen changes.

Tap UP or DOWN to select the desired Power Factor:

Power factor I. When the power factor is displayed, the algebraic sign is determined by the active power: positive if it's absorbed; negative if it's delivered.

**Power factor II. When the power factor is displayed, the algebraic sign is determined by the reactive power: positive if it's inductive; negative if it's capacitive (default function).**

Tap OK confirm, or BACK to return to previous screen without saving.

## CONNECTION SETTING

Then, tap DOWN to scroll the menu until to display the screen about the insertion mode, according to the plant:



The indication shows the typology of connection, in the plant considered. In order to change it, tap the yellow area to enable the function.

Then tap UP or DOWN to select one of the following configurations:  
(Ref. Examples shown in the Chapter: "NG9/96-CONNECTIONS")

33phs + 01phs

**Plant made up of 3 Three-phase systems, no Single-phase system. (As shown in the Example A).**

23phs + 31phs

Plant made up of 2 Three-phase systems and 3 Single-phase systems. (As shown on the Example B),

**13phs + 61phs**

Plant made up of 1 Three-phase system and 6 Single-phase systems.  
(As shown on the Example C),

**03phs + 91phs**

No Three-phase system, the plant is made up of 9 Single-phase systems.  
(As shown on the Example D),

At the end, Tap OK confirm, or BACK to return to previous screen without saving.

### TIPOLOGY OF SENSORS

Then, tap DOWN to scroll the menu, until to display the screen about the procedure to enable the channels and the sensor connected, beginning from the first channel (L1)



The first three channels (L1, L2, L3) are current inputs. Through the corresponding screen you can set the parameters about the Current Transformers connected.

Tap the yellow area to enable it, the color becomes orange and the screen changes. Then tap UP or DOWN to scroll the submenu, until to select the interested function:

**Disabled:** to disable the data-reading on the channel (**default function**).

**Calculated:** When using only 2 current transformers on a three-phase line without neutral, it calculates automatically the third current.

Use the same procedure to select the maximum range of the current from the connected CT, precisely:

**TA5 5A f.s:** Max 5A

**TA5 2.5A f.s:** Max 2,5A

**TA5 1A f.s:** Max 1A

At the end, Tap OK confirm, or BACK to return to previous screen without saving.

Use the same procedure for L2 and L3 channels.

From L4 to L9 channel, it's possible to connect sensors as: Rogowski probes; Current Transformers with output in Voltage; other sensors for different sizes. Now, let's describe the procedure to set them.

Once displayed the interested channel, tap the yellow area; it changes as shown in this example below:



Repeatedly tap UP or DOWN to scroll all the sensors supported and, for each of them, all the values of the full-scale range. The classes of sensors displayed are the followings:

**RG8K:** Rogowski probe with maximum value supported 8000A.

Full-scale selectable: 400, 800, 1600, 4000, 8000A

**RG4K:** Rogowski probe with maximum value supported 4000A.

Full-scale selectable: 200, 400, 800, 2000, 4000A

**RG2K:** Rogowski probe with maximum value supported 2000A.

Full-scale selectable: 100, 200, 400, 1000, 2000A

**RG-500:** Rogowski probe with maximum value supported 500A.

Full-scale selectable: 50, 100, 250, 500A

**CC24:** Current Transformer with output in voltage and diameter 24 mm.

Full-scale ranges selectable: 200, 100, 40, 20A

**CC16:** Current Transformer with output in voltage and diameter 16 mm.

Full-scale ranges selectable: 100, 40, 20, 10A

**CC06:** Current Transformer with output in voltage and diameter 6 mm.

Full-scale ranges selectable: 10, 5, 2, 1A.

Features of the sensors shown below:

(See the Chapter:

**"Sensors for NG9 Plus and NG9/96")**

**AIN 4-20mA:** Sensor to acquire current signals within a range of 4÷20mA

**AIN 20mA/10V:** Sensor to acquire current and voltage signals within the following ranges: ±10V, 0÷10V, ±20mA, 4÷20mA

**RTD:** Sensor to acquire temperature from PT100 probes

**DIGITAL state:** When NG-DIG sensor is connected, select this function to acquire pulses related to digital states or from contacts.

**DIGITAL Counter:** When NG-DIG sensor is connected, select this function if the pulse source is a counter or a similar instrument. The pulses are processed.

**Disabled:** to disable the data-reading on the channel.

**Calculated:** When using only 2 current sensors on a three-phase line without neutral, it calculates automatically the third current.

At the end, Tap OK confirm, or BACK to return to previous screen without saving.

## PHASE ASSIGNMENT TO EACH CHANNEL

The assignment of a determined phase to the respective channel is not so restrictive as in the examples of the wiring diagrams, but freely selectable.

*For example: the channel L1 can also be assigned to phase S or T, not only R. The same thing for the other channels. (default is: V1(R); V2(S); V3(T)).*

In order to set a phase, scroll the menu by tapping UP or DOWN, until to display the following screen:



This menu shows the voltage channel L1, assigned to phase R. In order to assign it to a different phase (S or T), tap the yellow area, the screen changes as previously described.

Tap UP or DOWN to select the desired phase, then tap OK to save the setting. The display shows the indication of the new phase for L1.

This procedure is the same for the other channels, selected by tapping DOWN, until L9.

## NETWORK PARAMETERS

Always on the Setting menu, Tap DOWN to scroll it, until to display the screen about the node address (default è 001):



Tap the yellow area display the keyboard, through which it's possible to enter the new node address:



Then, tap ">" to confirm or "X" to exit without saving.

Tap DOWN to display the next screen about the **communication speed** (in bit per second):



In order to change it, tap the yellow area, then tap UP or DOWN to select one of the following values: 115200; 57600; 38400; 19200; 9600.

(default is 57600). Tap OK to confirm.

All the instruments connected must have the same speed.

Tap DOWN to display the next screen about the **Parity** code:



To change the parity code on display, use the same procedure above described about the communication speed. Select "Even", "Odd" or "None". (default is Even).

Tap DOWN to display the next menu about the **stop bit**:



By using the same procedure previously described, select the stop bit between 1 or 2. **(default is 1).**

### PIN CHANGE

Tap DOWN to display the next screen about the change of **PIN code**:



By using the same procedure above described, enter the digits of the new PIN code if you don't want to keep the default value.

***ATTENTION: Once the PIN has been set, if you forget it, will NOT be possible to access the instrument configuration, even with the Configurator!***

### ENERGY MULTIPLIER

The value refers to "step" or "increase in energy" displayed by the counter during the measurement, below which it keeps the last value. The next measurement value will be displayed every time that the increase exceeds the setting.

*For example: if the value entered is 10Wh and the instrument starts from 0, the value 0 will be always displayed when the energy recorded is below 10Wh; but when the energy reaches this threshold, the display will show 10Wh and so on, in increments of 10, displaying: 10, 20, 30, 40, etc.. (default is 1 Wh).*

Tap DOWN to scroll the menu, until the following page is displayed:



By using the same procedure above described (tap the yellow area and then scroll the values through UP or DOWN), enter the desired value among the followings:

1Wh; 10Wh; 100Wh; 1KWh; Then tap OK to confirm.

### DIRECTION OF ENERGY

Tap DOWN, the next page refers to direction of the measured energy:



Tap the yellow area to enable it, then tap UP or DOWN to select the option according to the plant in which the instrument is installed:

**Unidirectional:** To measure only the energy produced or the energy absorbed.

**Bidirectional (Default function):**  
**To measure both the energies: absorbed by the electrical network (positive value) and delivered to the electrical network (negative value).**

At the end, tap OK to save the setting.

### CONSTANT TV

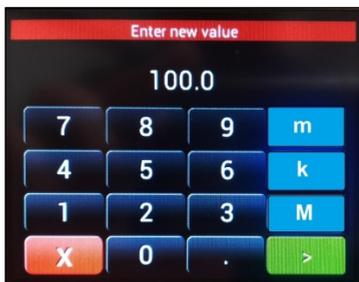
Tap DOWN, the next page displayed is the following:



For voltage measurements, if a transformer is inserted, set the Voltmetric constant. In the absence of transformer, set 100.0V/100V: under these conditions, the range of the values displayed on the menu, coincide with those reported in the table of technical data, precisely:

- 430 V peak, phase-neutral
- 300 Vac phase-neutral
- 520 Vac phase-phase

In order to change it, tap the yellow area. The following keyboard is displayed: **(default is 100.0V/100V)**:



Enter the desired value.

The blue keys indicating "m, k, M" are useful to enter the value directly expressed by the multiple or sub-multiple of the main unit. Precisely:

"m" = milli; "k" = kilo; "M" = Mega.

For each of them, tap a first time to enable the multiple (or sub-multiple), tap a second time to disable it, as will be shown to display.

Then, tap ">" to confirm, or "X" to exit and return to preview page.

### SETUP WITH NG-AIN SENSOR

Once selected the analog sensor type for the specific measure, you need to configure two parameters: k/Slope and Offset.

#### k/Slope

It represents the full scale of values inside the desired analog scale. The formula is the following:

$$\text{(Maximum value - Minimum value)}$$

where "l" is the internal constant, in this case it's 1.

### Offset

It represents the minimum value of the entire range; to set this parameter you need to enter the minimum value of the analog scale you are measuring.

#### EXAMPLE:

*Let's suppose to wire a solarimeter with 4÷20 mA analog outputs and we want to acquire the Irradiation measurement. We know the range:*

*Maximum range: 1200 W/m<sup>2</sup>*

*Minimum range: 0 W/m<sup>2</sup>*

*K/Slope is (1200-0) /1 = 1200*

*Offset è 0*

*If we want to acquire solarimeter Temperature, knowing the range of the instrument:*

*Tmax = 180°C; Tmin = -40°C*

*K/Slope is [180-(-40)] /1 = 220*

*Offset is -40*

*This example is valid for every kind of analog measure and analog range acquirable. Just remember to take correct parameters before starting the configuration.*

Tap DOWN to scroll the previous menu, until to display the page related to K/Slope on the interested channel, in which the NG-AIN sensor is wired.



Enter the new value through the keyboard displayed (same as the keyboard at page 37 for TV Constant).

Tap ">" to confirm, or "X" to exit and return to previous page.

Then, tap repeatedly DOWN until to display the page of the same channel, but related to Offset parameter:



Using the same procedure described, enter the Offset value.

### SETUP WITH NG-DIG SENSOR

With NG-DIG sensor you can acquire digital signals or digital states from different sources.

Inside the channel sensor setup menu, you can select two different kinds of NG-DIG setup:

Digital counter and Digital state, (Already described in the paragraph: "TIPOLOGY OF SENSORS").

In order to configure the sensor to acquire digital signals, you need to set two different parameters:

K/Slope and Pulse Weight.

**k/Slope:** In this case it represents the constant that the instrument applies to calculate the real time value and correctly transform the number of pulses incoming into the desired unit of measure.

**Pulse Weight:** It corresponds to the number of acquired pulses for every unit of measure acquired.

Tap DOWN to scroll the previous menu, until to display the page related to K/Slope on the interested channel, in which the NG-DIG sensor is wired.



Tap the yellow area to display the keyboard and enter the value of K/Slope

Tap ">" to confirm, or "X" to exit and return to previous page.

Then, tap repeatedly DOWN until to display the page of the same channel, but related to Pulse Weight:



Using the same procedure just described, enter the value of the pulse weight.

## ENTER NAME

Tap UP or DOWN to scroll the menu until to display the page about the name for each channel, called LABEL:



In order to change it, tap the yellow area. The following keyboard is displayed:



Enter the name to be assigned to the channel. If You want to enter also numbers, tape the key "1&!", a numerical keyboard will be displayed, with the key "ABC" for returning to main keyboard.

At the end, tap "OK" to save, or "X" to return to main menu without saving.

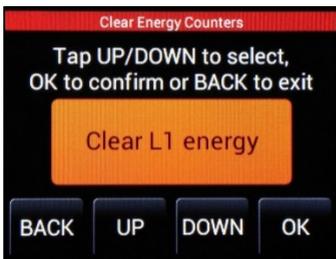
Once stored, repeat the procedure for the other channels (L1÷L9) by scrolling the menu with DOWN key.

## CLEAR ENERGY COUNTERS

In order to clear all the values of energy stored in the counters (relative to each channel) tap UP or DOWN until to display the following screen:



Tap the yellow area, the screen changes as shown:



Tap repeatedly UP or DOWN to scroll all the channels until L9. Stop on the interested channel and tap OK. You will be asked to confirm; tap again OK to execute. The values stored in the record of the counter, relative to interested channel, will be cleared. You can repeat the procedure also for other channels.

## CLEAR THE MAXIMUM CURRENT RECORDS

In order to clear all the values of the maximum currents stored in the registers related to each channel, tap DOWN to display the next screen:



Tap the yellow area. The page changes as shown:



The procedure is the same described above for clearing the energy counters. The only difference is in the typology of data: in this case is the peak values of the current.

## SETTING AND RESTARTING

Tap DOWN, the next page displayed is the following:



Tap the yellow area to enable it, the page changes. On the menu shown, through UP or DOWN it's possible to select these options:

Set default setup: to clean the last settings and activate automatically the factory settings.

Reboot: to restart the instrument.

Tap OK to confirm the selected option.

## DATE AND TIME SETTING

Tap DOWN to display the screen about date and time setting:



Tap the yellow area to enable it. The page changes as shown:

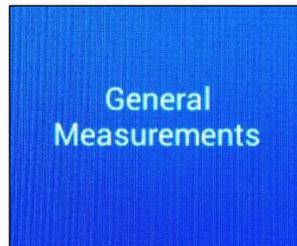


Tap the orange area corresponding to interested field. Through the keyboard shown, enter the desired value. Then tap OK to save the setting and return to above menu.

Repeat the procedure for the other fields. At the end, tap OK to save all the changes and BACK to return to menu.

## GENERAL MEASUREMENTS

Returning to main menu shown when the instrument was turned on, tap the UP or DOWN side until to display the following screen:



Tap the RIGHT side on the screen to access to a sub-menu. The main page shows all the parameters about the three-phase measurements:  
 Phase-Neutral voltage (L1, L2, L3);  
 Phase-Phase voltage (L1-L2, L2-L3, L3-L1);  
 Average Phase-Neutral Voltage (3PH Line-Neutral);  
 Average Phase-Phase Voltage (3PH Line-Line):



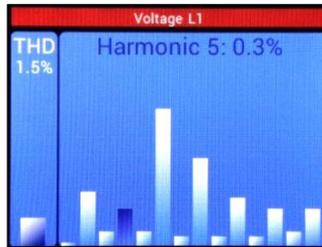
Tap the UP side to display the page with the frequency and the internal temperature:



## HARMONICS

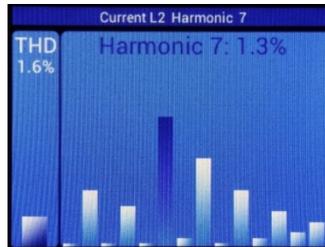
In the menu "General Measurements" above illustrated, it's also possible to see the distribution of harmonics on each channel.

Tap the UP or DOWN side to scroll the menu, until to display the page of the harmonics on a channel:



The left box shows the Total Harmonic Distortion on this channel, instead the right box shows the harmonics distribution and, automatically, it indicates from 2nd to 15th the percentage of the corresponding harmonic.

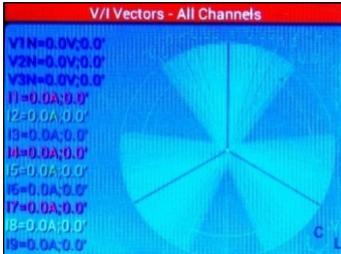
Tap the center area to read only the percentage value of an interested harmonic, the red bar changes in blue, as in the example below:



Tap again the center area for returning to previous screen (with red bar above).

Tap the RIGHT or LEFT sides to scroll the other channels. It's possible to see the harmonics on the Voltage channels (voltage L1÷L3) and the Current channels (Current L1÷L9).

Tap DOWN side to scroll the menu, until to display the page about the vector diagram:



It shows, in real time, the vector diagram of the three-phase electrical sizes on the system, such as: phase-phase voltages, phase-neutral voltages, line current, with the phase angles. All the sizes are shown in different colors for easy identification.

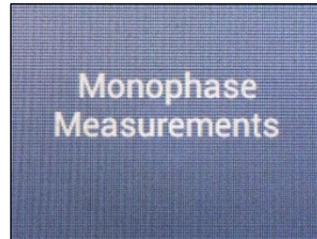
Tap UP or DOWN side to return to main screen (the first on the previous page, which shows the three-phase voltages):

Voltages	
L1-Neutral <b>230.9</b>	L1-L2 <b>391.5</b>
L2-Neutral <b>229.6</b>	L2-L3 <b>395.0</b>
L3-Neutral <b>230.4</b>	L3-L1 <b>397.4</b>
3PH Line-Neutral <b>232.7</b>	3PH Line-Line <b>228.1</b>

Tap again the LEFT side to return to main menu:



**SINGLE PHASE MEASUREMENTS**  
From main menu, tap UP or DOWN side to display the page about single-phase measurements:



Then, tap the RIGHT side. The first page of the connected channel shows the following measurements:

L1 Monophase Values		PIGNA
Voltage L-N [V] <b>233.4</b>	Power Factor <b>0.828</b>	
Current [A] <b>10.45</b>	Apparent Power [VA] <b>2.415k</b>	
Active Power [W] <b>2.224k</b>	Peak Current [A] <b>11.34</b>	
Reactive Power [VAr] <b>1.791k</b>	Quadrant Quadrant I, P+ Q+ Inductive Load	

Phase Voltage (V); Phase Current (A); Active Power (W); Reactive Power (VAr); Apparent Power (VA); Peak Current (A); Power Factor.

Tap RIGHT to display the next page of the same channel, where you can see respectively the counters for: Absorbed Active Energy (A+) and Delivered Active Energy to the network (A-):



By tapping again the RIGHT side you can see the last page of the same channel, showing 4 Reactive Energy counters: each of them is referred to a determined quadrant and it begins to record the values according to direction of the Active and Reactive Power, if the vector of the Apparent Power is in the area of the corresponding quadrant.

*Precisely: Active and Reactive Energy together positive (absorbed): Q1 starts. Active Energy negative (delivered) and Reactive Energy positive: Q2 starts. Active and Reactive Energy together negative: Q3 starts. Active Energy Positive and Reactive Energy negative: Q4 starts.*

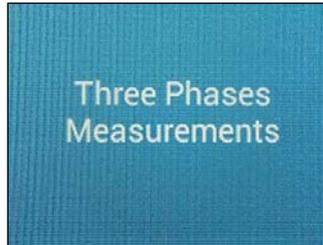
For each of the pages relative to a determined channel (in this example L1), tap the UP or DOWN side to see the same page, but related to a different channel (from L1 to L9).

If, during the channel setting, someone wasn't enabled, the corresponding page will show the message: "modality not enabled".

Tap the LEFT side for returning to previous page of the same channel.

### THREE PHASE MEASUREMENTS

From main menu, tap UP or DOWN side to display the following screen:



Tap the RIGHT side to access to a sub-menu about the measurements on all three-phase systems connected.

If the three-phase systems are connected, you can scroll the screens for each of them, named according to the group of three current channels connected

*For example: By setting the instrument for 2 three-phase systems and 3 single-phase systems, as shown on the scheme at page 23, you can see the screen named as L123 and L456, each of them corresponds to respective three-phase connection. Instead, for L789, a message of "modality not enabled" is displayed.*

The first page displayed is the following:



It shows these values:

Average Phase Voltage; Average Star Voltage; Average Current; Overall Active Power; Overall Reactive Power; Overall Apparent Power; Power Factor.

Tap the RIGHT side to display the next page of the same Three phase system, where you can see respectively the counters of: Overall Active Energy Absorbed (A+) and Overall Active Energy Delivered to the Network (A-):



Tap again RIGHT side to display the last page of the same Three-phase system, showing 4 Reactive Energy meters: each of them is referred to a determined quadrant and it begins to record the values according to direction of the Active and Reactive Power, if the vector of the Apparent Power is in the area of the corresponding quadrant. The principle is the same as that explained in the paragraph for single-phase systems.



Tap the UP or DOWN side to see the same page, but related at a different three-phase system.

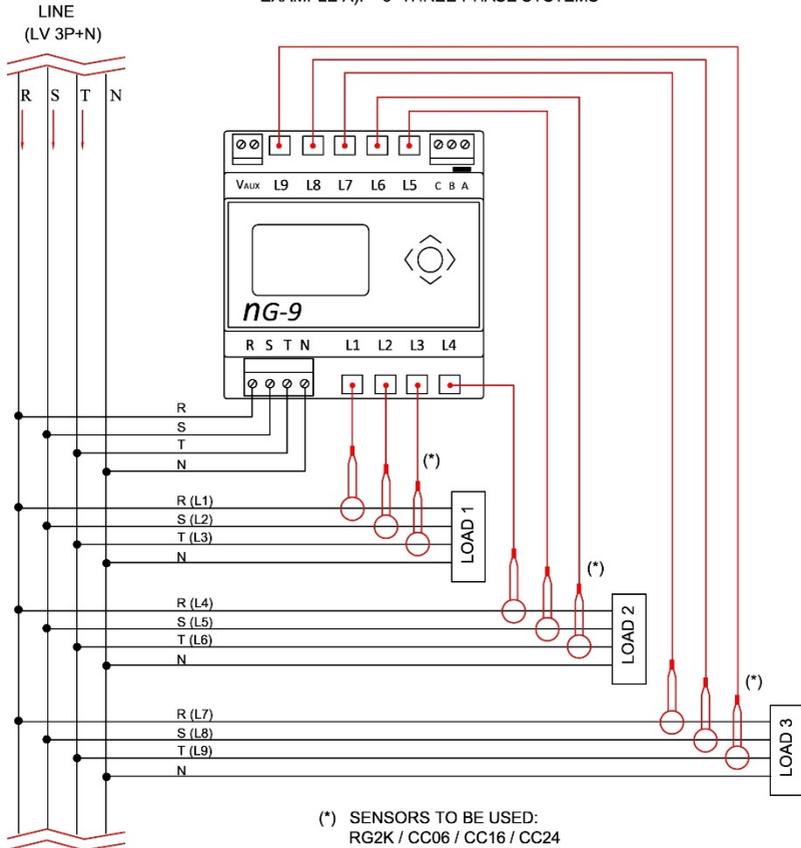
Tap the LEFT side to return to previous screen related at the same system. Tap repeatedly the LEFT side to return to first screen, in the main menu.



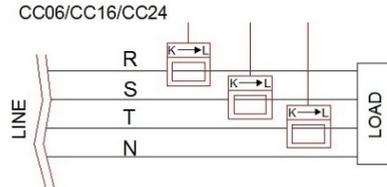
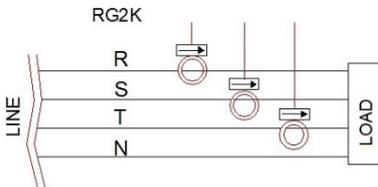
**NOTE:** Even for three-phase systems it's possible to see the measurement on each phase, for the respective channels from L1 to L9.

# NG9 and NG9 Plus – Examples of wiring

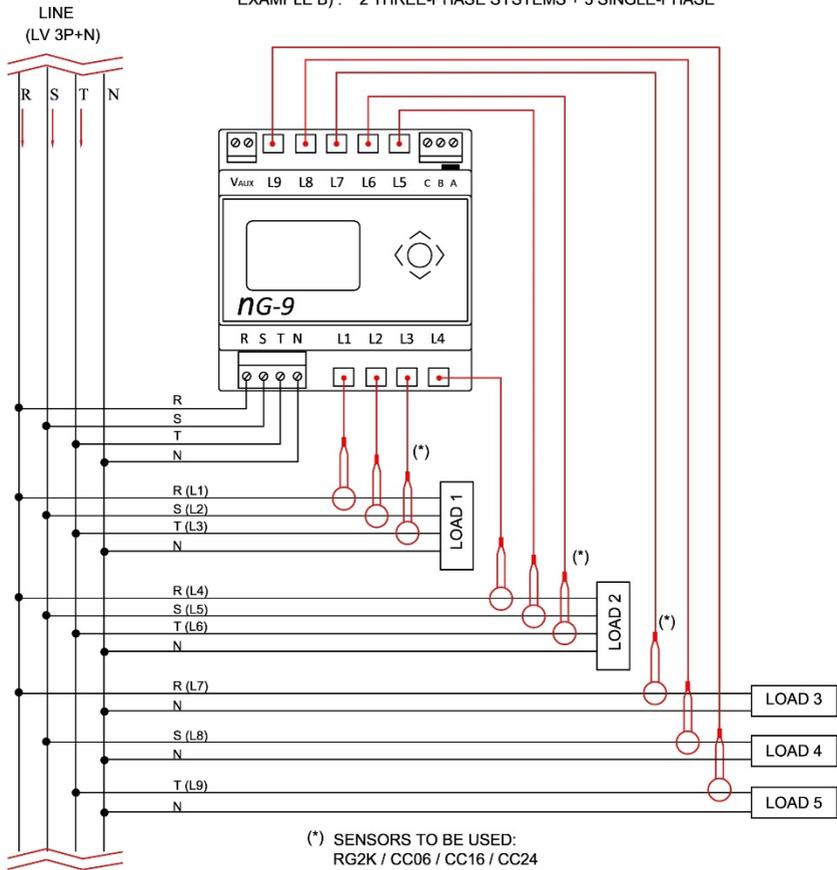
EXAMPLE A): 3 THREE-PHASE SYSTEMS



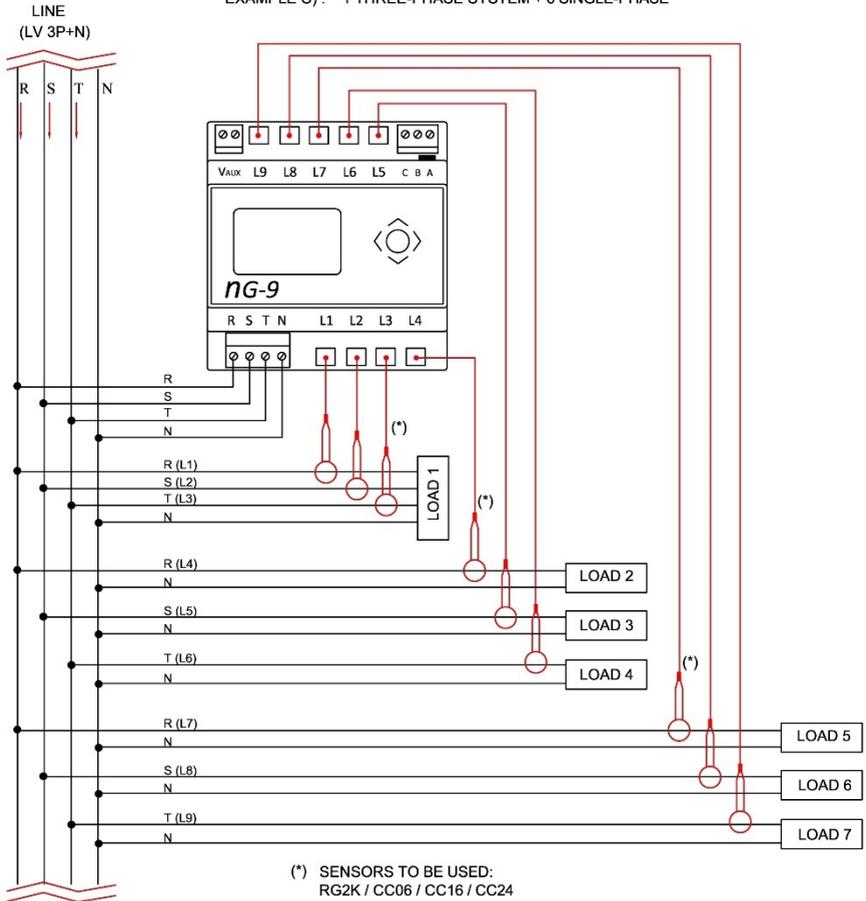
**IMPORTANT NOTE:** Connect the sensors respecting the direction of the current, according to symbol on each of them, as shown below (it's valid for all connections, three-phase and single-phase) :



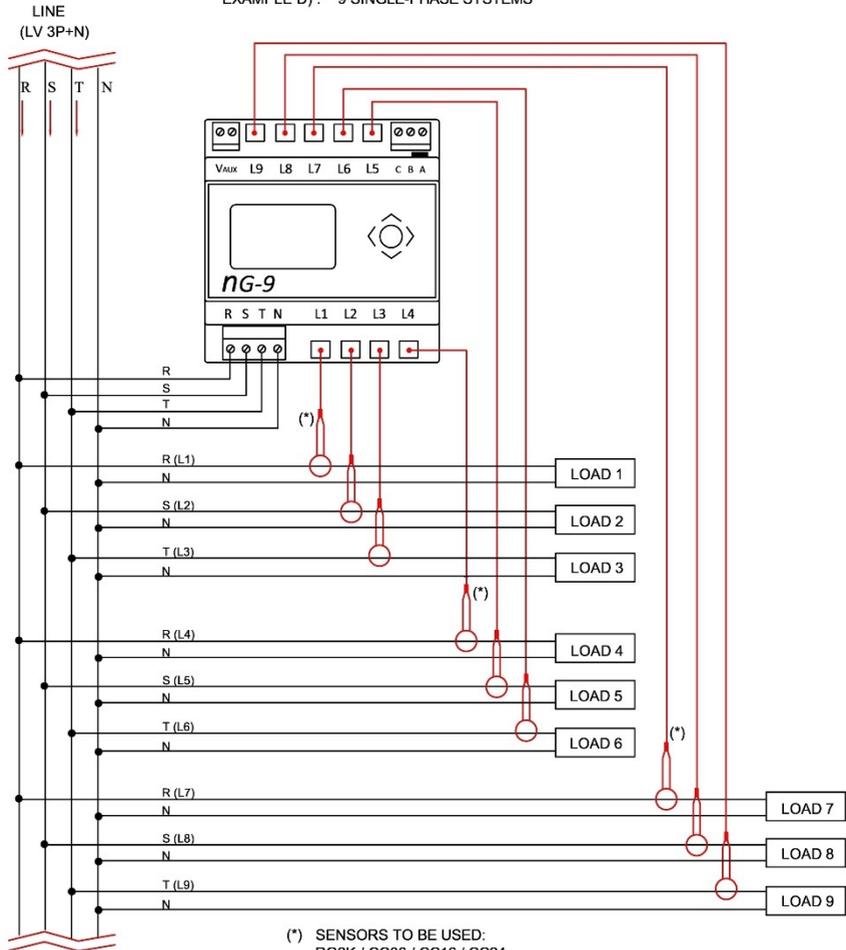
EXAMPLE B): 2 THREE-PHASE SYSTEMS + 3 SINGLE-PHASE



EXAMPLE C) : 1 THREE-PHASE SYSTEM + 6 SINGLE-PHASE



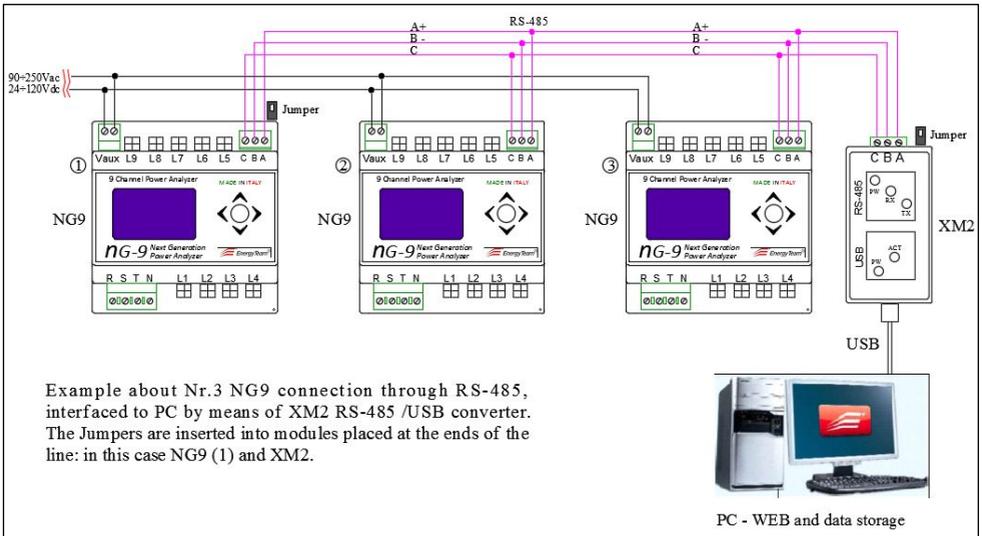
EXAMPLE D) : 9 SINGLE-PHASE SYSTEMS



**NOTE:** The diagrams are also valid for RG-500 sensors.

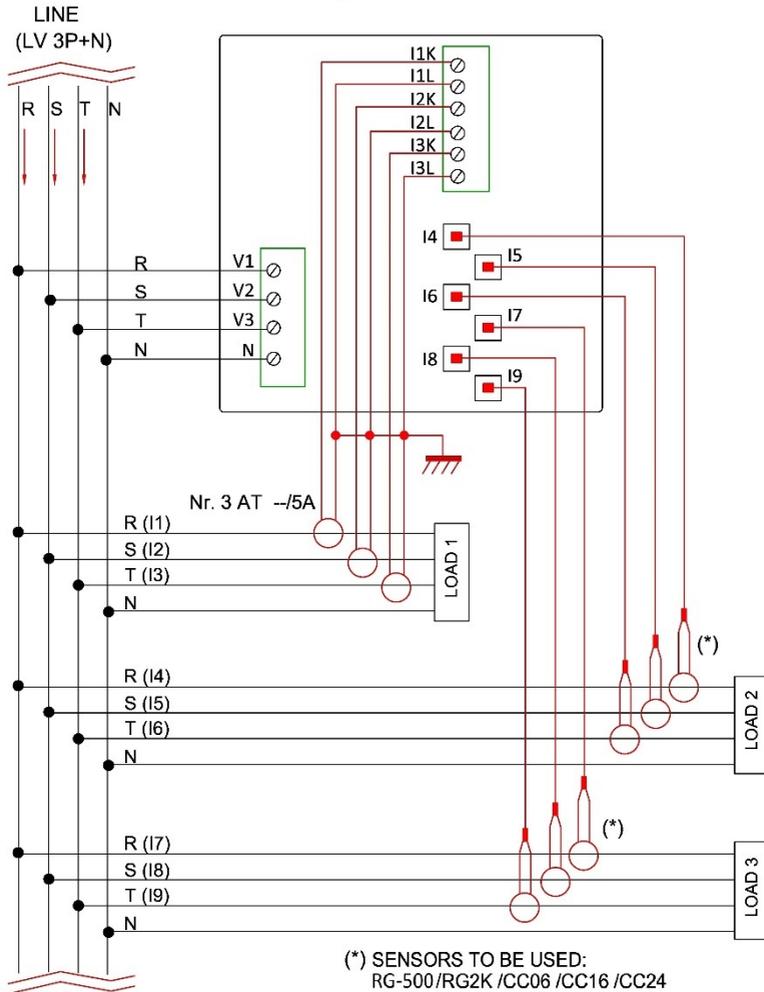
**NOTE:**

For each single-phase connection, the type of phase (R, S or T) is freely selectable.

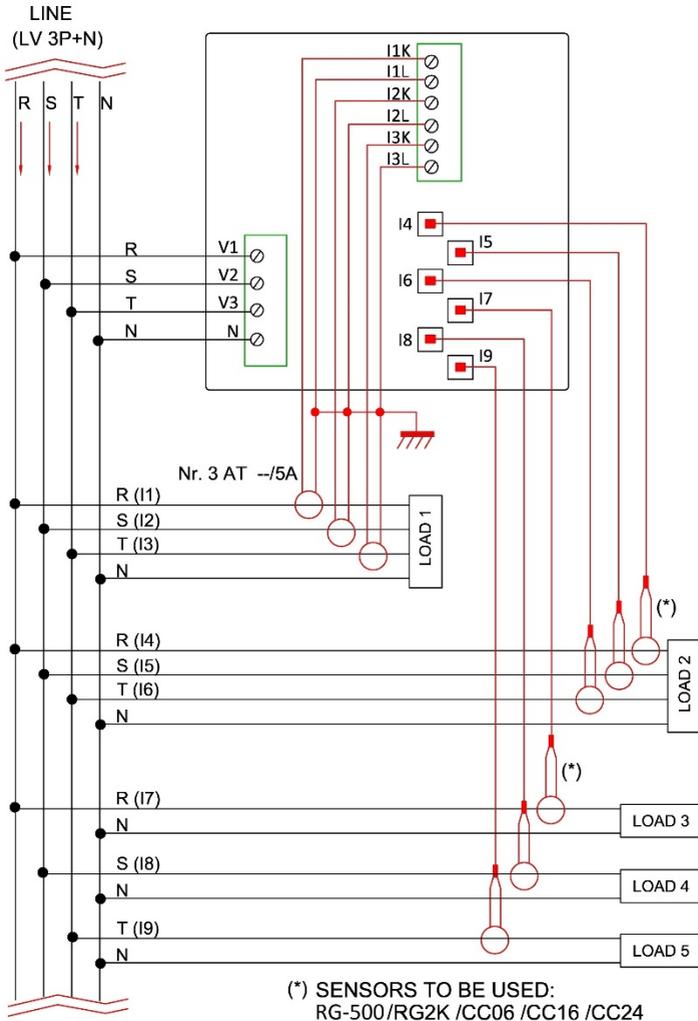


# NG9/96 – Examples of wiring

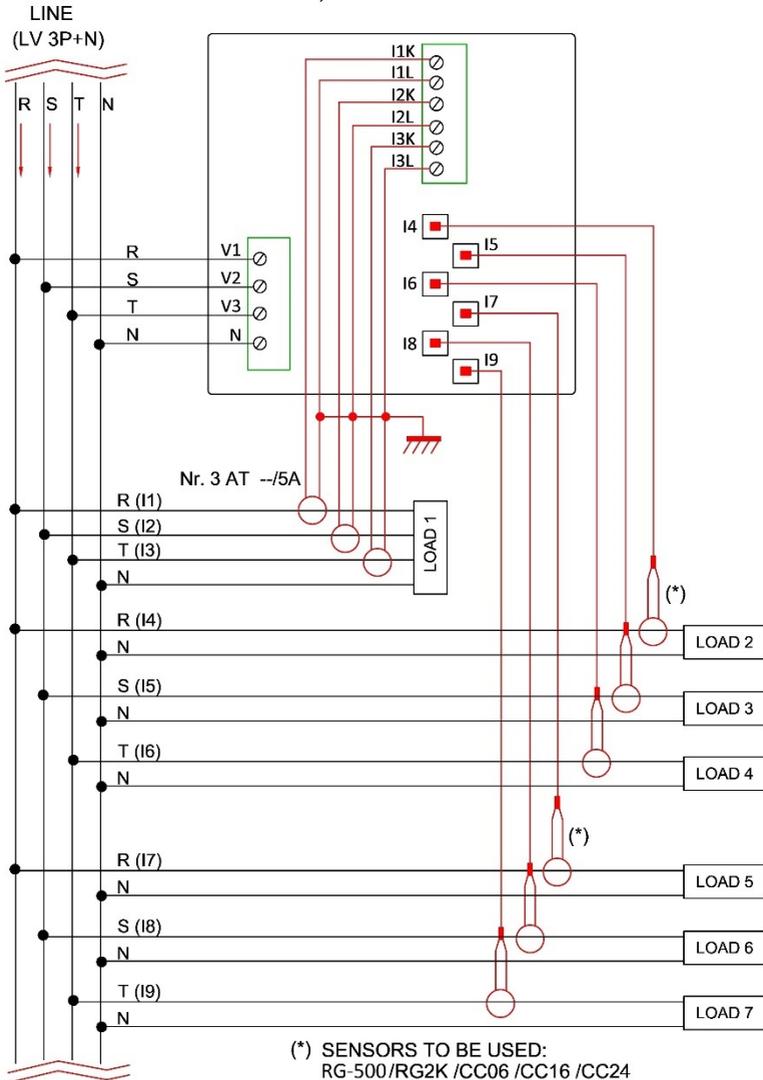
EXAMPLE A): 3 THREE-PHASE SYSTEMS



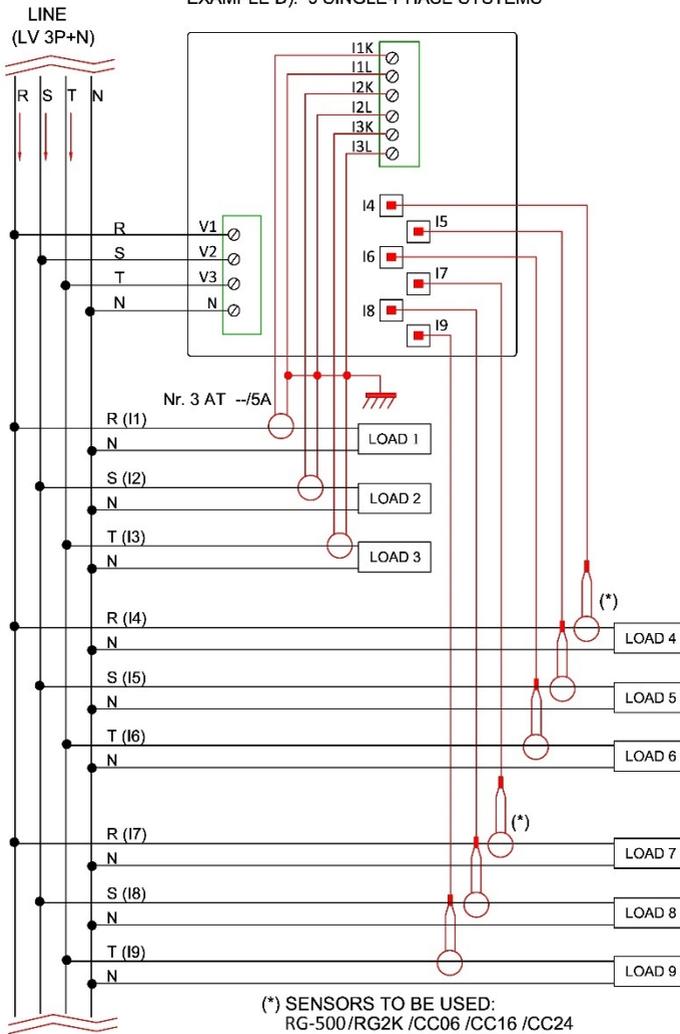
EXAMPLE B): 2 THREE-PHASE SYSTEMS + 3 SINGLE-PHASE



EXAMPLE C): 1 THREE-PHASE SYSTEM + 6 SINGLE-PHASE



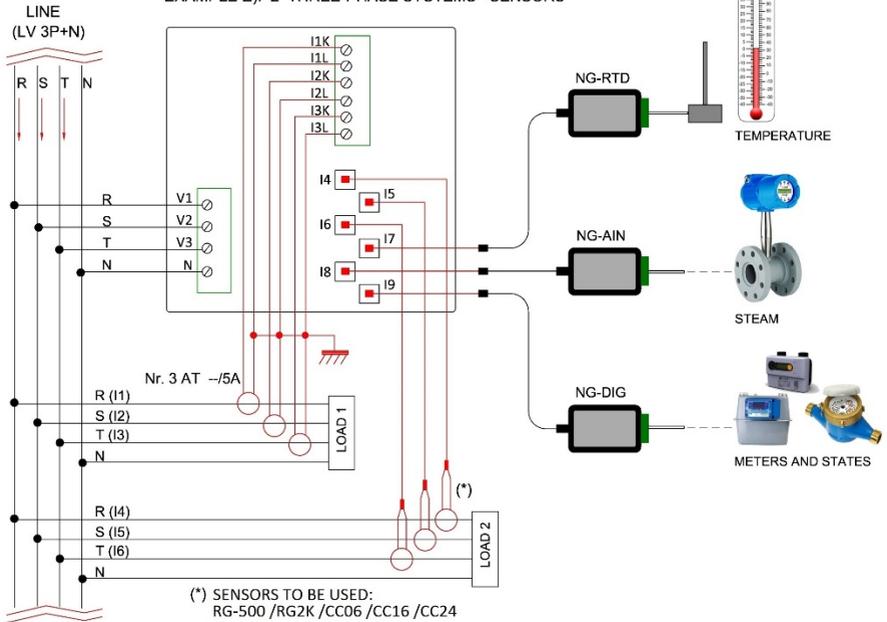
EXAMPLE D): 9 SINGLE-PHASE SYSTEMS



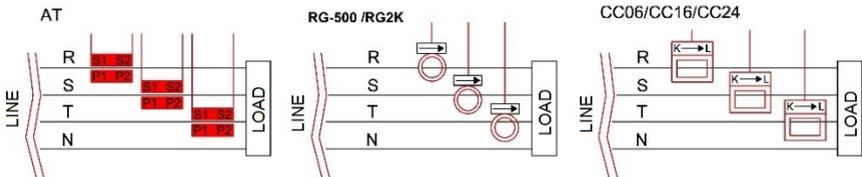
**NOTE:**

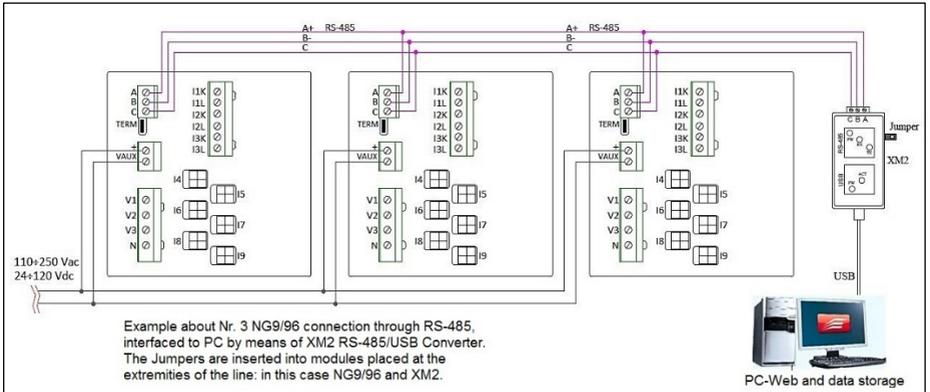
For each single-phase connection, the type of phase (R, S or T) is freely selectable.

EXAMPLE E: 2 THREE-PHASE SYSTEMS + SENSORS



**IMPORTANT NOTE:** Connect the sensors respecting the direction of the current, according to symbol on each of them, as shown below (it's valid for all connections, three-phase and single-phase):







## GENERAL SAFETY REGULATIONS

- These devices must be used by specialized and qualified personnel only.
- Remove all types of power supply and connection to the terminals of the device before opening the case. **Attention:** device powered to 230 Vac and 400 Vac power supplies.
- Do not use in presence of water.
- Strictly comply with the indications and diagrams in this manual when connecting the device.
- Any use, intervention or tampering not expressly specified by the manufacturer is absolutely prohibited. This, in any case, determines the compromise of the product functions and the immediate forfeiture of its warranty.

## WARRANTY

Energy Team guarantees that the supplied products are free from defects and suitable for use. If any malfunction occurs and these are due to manufacturing defects, E.T. will respond within the terms and modalities foreseen by General Conditions of Supply, with particular reference to articles **5B** (terms and duration), **1C** (limits), **5D** (other warranties). Whatever operation or manumission made by third parties not expressly authorized determines in each case the immediate termination of the warranty.

## DISPOSAL



**RIFIUTI DI APPARECCHIATURE ELETTRICHE ED ELETTRONICHE ( RAEE ).**  
**Non gettare tra i rifiuti generici ma raccogliere a parte per operazioni di riciclaggio e smaltimento a norma di legge.**



**NOTE:** If you have any doubts about the installation procedure or the use of the product, contact the technical assistance or the local distributor



**NOTA:** In order to ensure in the time the accuracy indicated, we recommend the instrument check every 24 months.

## Energy Team S.p.A.

Via della Repubblica, 9, 20090 Trezzano sul Naviglio (MI)

P +39 02 40405033 – F. +39 02 48405035 – E [info@energyteam.it](mailto:info@energyteam.it) – PEC [pec@pec.energyteam.it](mailto:pec@pec.energyteam.it) – W [www.energyteam.it](http://www.energyteam.it)