

EMA-90N

Electrical Measurement Analyzer



User Manual

IM128-U-M v1.0



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TERMS OF WARRANTY

The warranty is valid for the period of 24 months after material receipt.

The warranty covers free repair or replacement of equipment parts, which are recognized as faulty due to manufacturing defects.

Warranty does not cover those parts which results defective due to misuse or improper use, incorrect installation or maintenance, operation by unauthorized personnel, damage during transportation, or which in any case do not show manufacturing defects of the equipment.

Not included in the warranty terms are technical interventions regarding equipment installation to electrical systems.

The manufacturer declines any responsibility for eventual injury or damage to persons, animals or things as result of failure to follow the instructions in the user manual or caused by improper use of equipment.

The expenses of transport as well as the relative risks of same both to and from the place of repair, will be the sole responsibility of the user.

This warranty expires after the date of purchase and any assistance required after said date including spare parts, labour, transport of personnel and material will be charged to the user following the tariffs in force for Technical Assistance Service at the time of such requested service.

In any case the replacement of the equipment as well as the extension of warranty after such breakdown is excluded.

Description

The EMA (Electrical Measurement Analyzer) has advanced analysis functions that allow the measurement of the main electrical parameters: voltage, current, frequency, power factor, crest factor, active and reactive power, active and reactive energy. The instrument allows the measurement and analysis in real time of electrical parameters, also verifying the quality of the energy thanks to THD measurement. Bidirectional metering of energy allows both production and consumption of energy to be monitored with a single device. All information monitored by the analyzer can be transmitted to remote locations through communication interfaces RS485, Ethernet, Profibus DP e MBUS.

Interaction with the control and supervision systems is possible using inputs and outputs, all programmable. EMA reads and displays the energy values measured in other energy meters connected to the network. This is achieved thanks to digital inputs, which are able to acquire the impulses generated by the counters. In this case, EMA acts as a data concentrator. It not only collects information from the electricity meters but also from the water, gas meters or other. EMA allows a complete, in-depth analysis of the network quality thanks to the measurement of the harmonic distortion (63th order) of the voltage and current signals (also for the 4th current channel).

Configuration

| | | STANDARD | Available options | | | | | | |
|----------|----------------|------------------------|----------------------------------|--------------------------------|---------------------------------|-----------------------------------|------------------------------------|------------------------------------|----------------------|
| Hardware | Format | 96x96 | 96x96 RINA | | | | | | |
| | Supply | 90÷250 Vac/dc | 20÷60 Vac/dc | | | | | | |
| | Current inputs | 1A & 5A ⁽¹⁾ | 1A & 5A + Neutral ⁽¹⁾ | 1A & 5A ⁽²⁾ | Rogowski ⁽³⁾ | Rogowski + Neutral ⁽³⁾ | TTA 50A ⁽⁴⁾ | | |
| | I/O | 2 DO | 4 DO + 4 DI | 6 DO + 2 DI | 8 DO | 4 DO + 2 AO | 4 DO + 4 AO | 8 DI + 2 DO ⁽⁵⁾ | 4 AI |
| | I/O type | DO photo-mos | DO: photo-mos DI: 24 Vac/dc | DO: photo-mos DI: 48 Vac/dc | DO: photo-mos DI: 115 Vac/dc | DO: photo-mos DI: 230 Vac/dc | | | 3 DO + safety + 2 AO |
| | COM | RS485 | RS485 RS485 | RS485 Profibus | RS485 MBUS | ETH-MOD ⁽⁶⁾ | RS485 ETH-MOD ⁽⁶⁾⁽⁷⁾ | RS485 ETH-WEB ⁽⁶⁾⁽⁹⁾ | 3 DO + safety + 4 AO |
| | Memory | none | 4MB | | | | | | |
| SW | Class | 1 | 0.5S | 0.2S | | | | | |
| | Version | STD | H | H+ | | | | | |

Note: It is possible select only one option for each category. The selected option replaces the standard configuration.

- (1) 5mm - removable terminal block - 10mA÷5A [in class] - I_{min} read 1mA - V_{min} read 1V
- (2) 10mm - fixed terminal block - 10mA÷5A [in class] - I_{min} read 1mA - V_{min} read 1V
- (3) 0.7mV÷350mV [see class] - V_{min} read 0,1mV
- (4) 0.1A÷50A
- (5) 8DI with one common pin
- (6) ETH-MOD version makes available Modbus TCP/IP communication available only.
- (7) the ethernet connector is located on the upper side of the box in the advanced area
- (8) ETH-WEB version makes available Modbus TCP/IP communication and the visualization on web pages of the main measures (through the webserver inside the instrument). In addition, it is possible to set and to download a log file [on web interface 1 MB].
- (9) the ethernet connector is located on the back of the box above the terminals of the RS485 communication

Software versions

| | STD Standard | H Harmonics | H+ Advanced function |
|-----------------|-----------------|------------------------|-------------------------|
| Waveforms | no | yes | yes |
| Harmonics | no | up to 63 th | up to 63 th |
| Dip / Swell | no | yes | yes |
| Interrupts [OV] | no | no | yes |

To enable one or more options (after the purchase) it's necessary to input a code in the instrument setup (*Setup* → *General* → *Password* → *Enable options*). To obtain this code it is necessary to provide the serial number at the time of the request made to the retailer.

Note: if the options are requested at the time of ordering it is not necessary to enter any code.

Software features

| Parameter | Range |
|--|----------------------------|
| Measures refresh [V, A, W, VAR, Hz] | ~ 200 ms |
| Modbus RTU response (38400 - 32 registers) | < 100 ms |
| Modbus TCP/IP response (MOD-TCP version) | < 100 ms |
| Ping (local network) | Min = 4; Avg = 4; Max = 4; |
| Profibus measures refresh | ~ 300 ms |
| Activation DO between setpoint | ~ 300 ms |
| Update of analog outputs | >200 ms |
| | <50 ms on request |

Installation

Warning for the user

Read carefully the instructions/indications contained in this manual before installing and using the instrument.
The instrument described in this manual is intended for use by properly trained staff only.

Safety

This device has been manufactured and tested in compliance with EN 61010-2 standards. In order to maintain these conditions and to ensure safe operation, it need to comply with the indications and markings contained in the manual.

When the device is received, before beginning installation, check that it's O.K. And it has not suffered any damage during transport.

When starting installation make sure that the operating voltage and mains voltage are compatible with the device instructions. The device power supply must not be earthed.

Maintenance and/or repair must be carried out only by qualified and authorized personnel. If there is ever the suspicious that, that there is a lack of safety, during operation, the device must be disconnected and cautions taken against accidental use.

Operation is no longer safe when:

- **The instrument doesn't work.**
- **The measured value has obviously wrong or unreasonable.**
- **There is visible damage.**
- **After serious damage incurred during transport.**
- **After a storage under unfavourable conditions.**

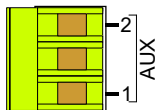
During normal operation of the devices, hazardous voltages at its terminals and in particular on the terminals of voltage and current transformers connected and on the terminals of the digital input and outputs.

The secondary circuits of the voltage and current transformers are capable of generating hazardous voltages and currents when their primary circuit is powered. Follow the standard safety precautions when performing any installation or service (such as making sure that the power supply is disconnected, disconnecting the fuses of the transformer voltages, short-circuiting the secondary of current transformers etc.).

Don't use the instrument when failure may cause injury or death, or generate sufficient energy to cause a fire.

The instrument is equipped with a fuse on the power supply type: 5x20mm 1A 250V time lag.

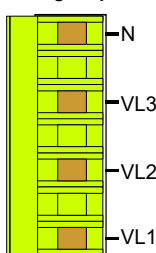
Auxiliary power supply



The instrument can be supplied with a voltage independent by the monitoring line. In this case, the instrument continues to operate independently by the voltage present on the lines under control.

Alternatively, only for 90÷250Vca/cc version, it is possible to take the power from the network under test, using the phase and neutral for a 4-wire network, phase to phase in a 3-wire system without neutral or from a VT in a MT application. In this case when the voltage of the monitored line falls below the minimum limit, the instrument turns off.

Voltage Inputs



4 terminals are available for direct connection to 3 phase network with neutral. In case of a 3 phases balanced system without neutral, or not distributed neutral to leave terminal N free.

3 inputs, range 30 ÷ 400Vac phase to neutral - 52 to 693Vac phase to phase (see Technical Features table for details); over these values must used the external voltage transformers.

Frequency range: 50/60Hz.

Permanent overvoltage allowed: 480Vac phase to neutral - 830VAC phase-phase.

Overvoltage category: II (permanent installations).

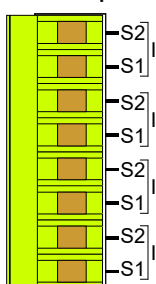
Pollution degree: 2 (normally non-conductive, conductive condensation temporary).

Input resistance: > 1.8MΩ.

Load (Burden) for each voltage input: 0.09VA.

Note: To detect the frequency of the network the terminal VL1 must be always connected.

Current Inputs



Current measurements can be performed by connecting the terminals of Current inputs.

All current inputs are isolated by current transformers with different ranges depending on the model of the instrument.

They can be interfaced directly to the line to be monitored or to be connected to the output of external CT with higher range.

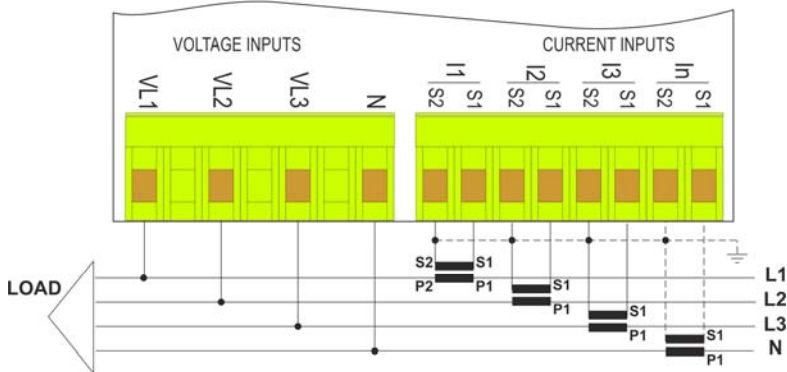
The connections to the lines to be monitored are described in chapter "**Wiring diagrams**".

With neutral current input option installed, the instrument allows the direct measurement of neutral current in the same way described for the line inputs.

Note: it is essential to observe the correct phase sequence, not invert the connections between the phases of the current inputs and voltage (i.e. the CT placed on L1 phase must absolutely match at I1 Current and VL1 voltage). Do not invert the terminals S1 and S2 of the CT because the measurement of power factors, and the powers would no longer be trusted.

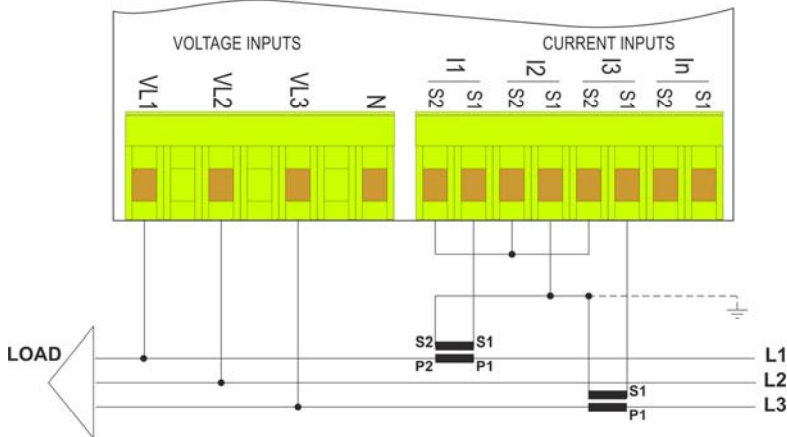
Neutral Current: the nominal current range depends by the version.

Three-Phase, 4-Wires Y Configuration



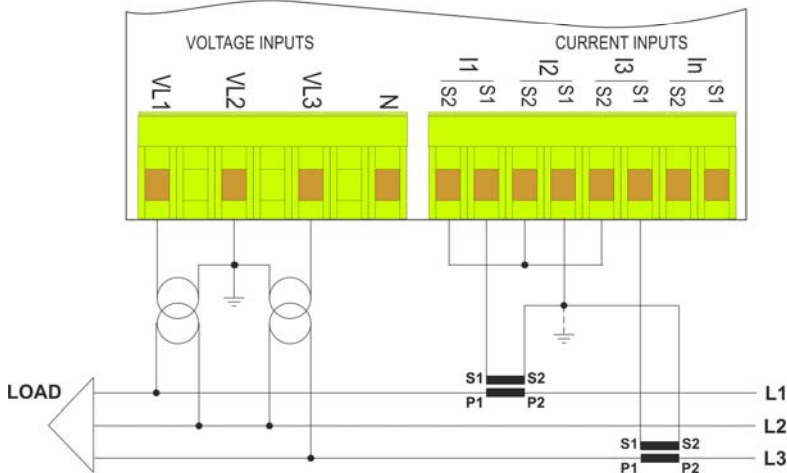
In case of connection in a 3 phase network (without neutral or with neutral not distributed) don't connect the N terminal.
WARNING: If the instrument has the TTA on the current inputs, **DON'T** connect the S2 terminals to the earth.

Three-Phase, 3-Wires Δ Configuration. ARON insertion (2CT)



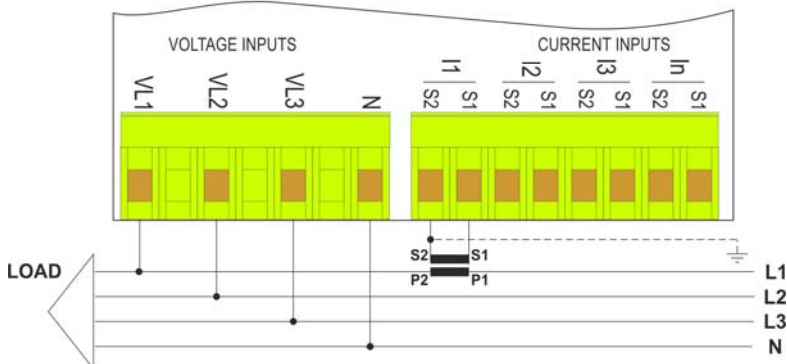
This connection with only 2 CT (and eventually 2VT) allows to measure accurately the three-phase currents.
WARNING: If the instrument has the TTA on the current inputs, **DON'T** connect the S2 terminals to the earth.

Three-Phase, 3-Wires Δ Configuration. ARON insertion (2VT and 2CT)

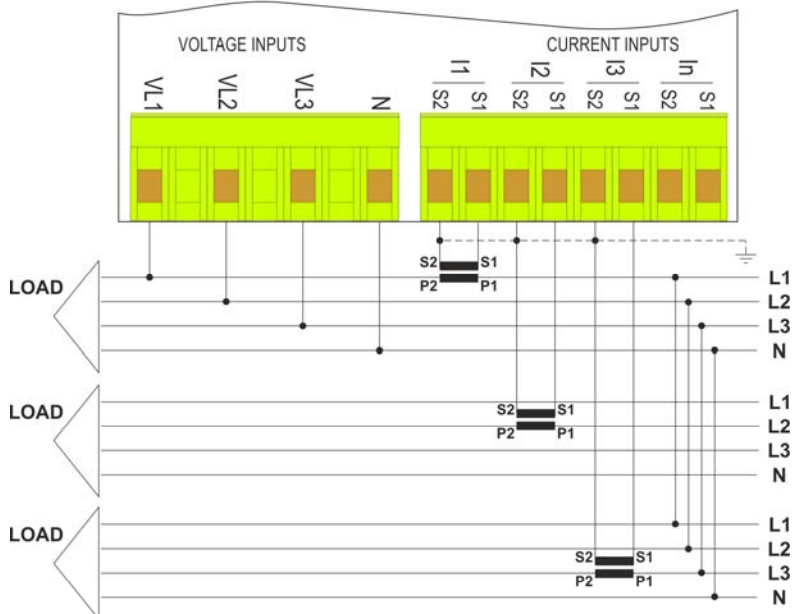


This connection can be used with distributed and equal loads. It is possible to measure the current on one phase (using only one CT). The unmonitored phase currents are mathematically calculated. The measurement of neutral current is optional.
WARNING: If the instrument has the TTA on the current inputs, **DON'T** connect the S2 terminals to the earth.

Three-Phase, balanced loads, 4-Wires Configuration



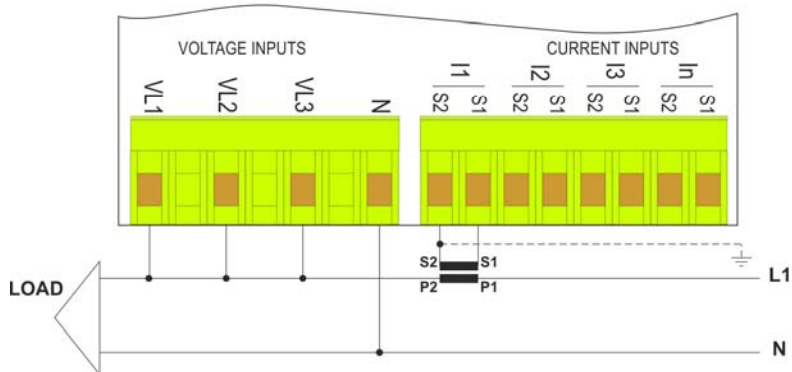
Three-Phase, balanced multiple loads, 4-Wires Configuration



In presence of multiple balanced loads in a three-phase network, the instrument calculates the electrical parameters checking a single phase current for each load, allowing to limit the number of CT used.

WARNING: If the instrument has the TTA on the current inputs, DON'T connect the S2 terminals to the earth.

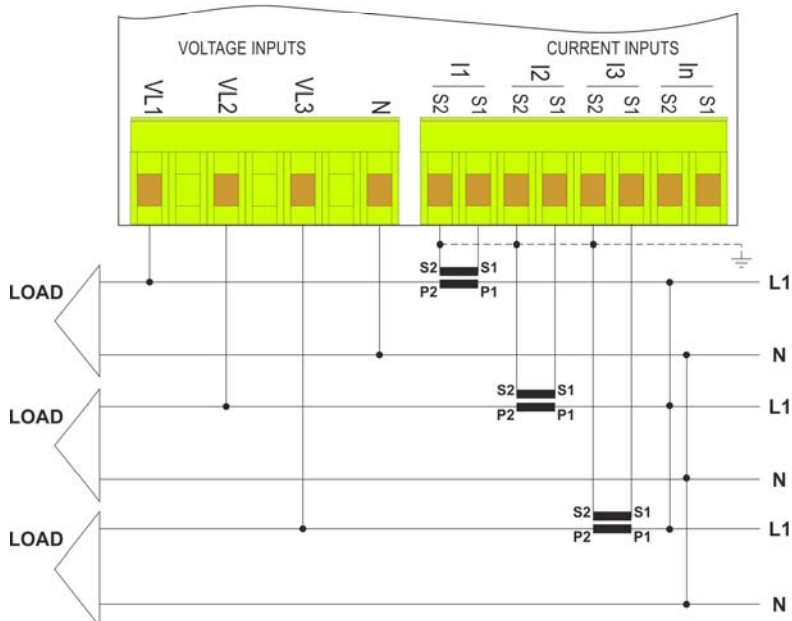
Single-Phase, 2-Wires Configuration



It is mandatory to connect the current input I1 and voltage input VL1.

WARNING: If the instrument has the TTA on the current inputs, DON'T connect the S2 terminals to the earth.

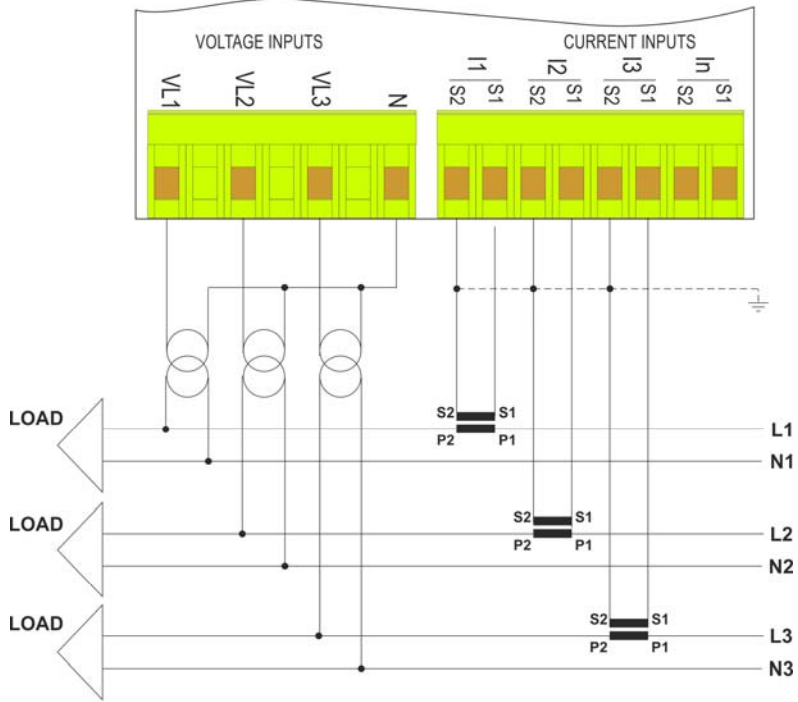
Single-Phase, multiple loads in the same network, 2-Wires Configuration



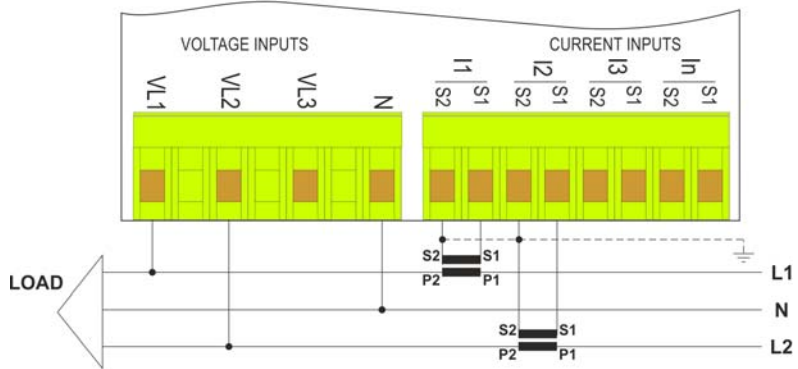
The electrical parameters are measured for individual loads. For correct calculation of power and energy, is mandatory to connect the voltage inputs related to the used current inputs.

WARNING: If the instrument has the TTA on the current inputs, DON'T connect the S2 terminals to the earth.

Single-Phase, 3 loads in 3 different networks, 6-Wires Configuration



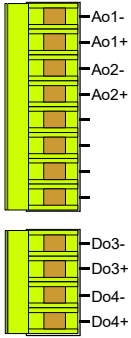
Two-Phase, 3-Wires Configuration



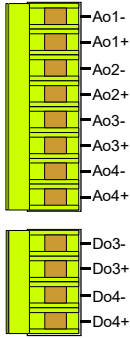
Digital Inputs / Outputs

see the "technical characteristics" section for further information.

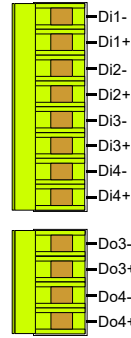
**4 digital outputs (4DO)
2 analog outputs (2AO)
4DO+2AO**



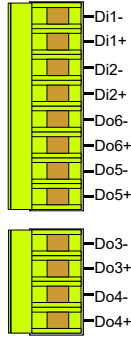
**4 digital outputs (4DO)
4 analog outputs (4AO)
4DO+4AO**



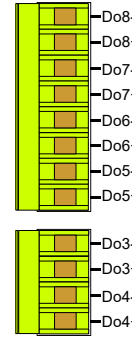
**4 digital outputs (4DO)
4 digital inputs (4DI)
4DO+4DI**



**6 digital outputs (6DO)
2 digital inputs (2DI)
6DO+2DI**



**8 digital outputs (8DO)
8DO**



Safety

The safety option is a safety device that is used in systems where it is necessary to monitor the state of full control of the device at all times.

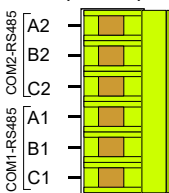
This solution allows the integration of the instrument with external supervision systems providing them with the information (through the opening of the Do4 digital output normally closed) of a possible anomaly, implementing the requirements of "safety redundancy" required in specific installations.

The reported anomaly can be of four types:

- failure of one or more parts of the device [hardware];
- watchdog intervention [software];
- power failure to the device;
- communication block (depending on the external supervision system, it can be activated and adjusted in order to allow interrogation with different times).

Note: the safety output (Do4) has the same characteristics as the standard DO.

Serial (RS-485)



Depending on the version, the instrument can be equipped with one or two isolated half duplex RS485 serial interface. With these options the instrument can communicate with the external with the Modbus protocol. The two ports are independent and they can perform the same operations. The presence of the serial port RS485 allows the software update. The instrument communicates via a asynchronous isolated serial interface in the standard RS485 Half-duplex that allows a connection in a network up to 247 nodes. This allows to implement a communication network between different instruments and a master unit (data concentrator) for a detailed control of an electrical installation. The maximum length of the line depends on variables such as the transmission rate and characteristics of the cables used. It's recommend to use a shielded twisted pair cable with low attenuation, with a minimum section of 0.36mm² (22AWG) and capacity of less than 60pF / m. The maximum length is about 1200m. For longer distances it's need to use signal amplifiers (repeaters). High

networking length and/or where environments are electrically "noisy", it requires the use of two termination resistors (at the beginning and end of the line) of 100-120Ω. The use of repeaters is also necessary in the case of networks with more than 32 nodes. At each repeater can be connected 32 units.

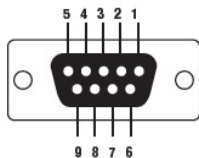
Please note that complex networks with large number of nodes cause a slower speed of response by the instruments.

Connection type: half-duplex (2 wires + common).

Insulation: opto-couples (3750 Vrms min.).

In the figure is showed a connection with a not shielded cable. In the shielded cable connection it's necessary to connect the shield to COM terminal.

Profibus



Profibus-DP is a multi-master systems. In the networks it's possible to have up to 126 devices on the same bus. In profibus-DP networks, the interchange of data between peripheral modules and the master is made automatically by the profibus controller, which 'virtualise' the data exchange memory

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | N.C. |
| 2 | N.C. |
| 3 | Profibus D+ |
| 4 | RTS |
| 5 | GND |
| 6 | 5V |
| 7 | N.C. |
| 8 | Profibus D- |
| 9 | N.C. |

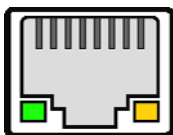
Meaning of the LEDs on the back of the instrument:

- LED Par flashing: instrument not parametrized;
- LED Par on: instrument parametrized correctly;
- LED ExB on: active data exchange;
- LED ExA on: no communication;

of the DP devices in the memory of the master. In the following picture the pin-out of the Profibus-DP port: 9.6 Kbit/s, 19.2 Kbit/s, 45.45 Kbit/s, 93.75 Kbit/s, 187.5 Kbit/s, 500 Kbit/s, 1.5 Mbit/s, 3 Mbit/s.

It is possible to request application examples, protocol and GSD in order to simplify the installation of the instrument.

Ethernet

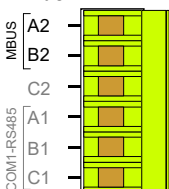


The Ethernet port (RJ45 connector) of analyzer incorporates 2 LED. The green LED of Ethernet status, Link/Data, is turned on when the Ethernet cable is plugged into the device. The LED blinks whenever an Ethernet pack is received.

ETH-WEB option: The yellow LED of the Ethernet status, 100BaseT, is turned on when the device links with the hub at 100Mb. The LED is off when the link is established at 10Mb. The status LED indicates the communication in transmission TX (green LED) and the communication in receiving RX (red LED). The SERVICE button has the function to restore the factory parameters following this steps:

turn off the instrument, turn on the instrument, wait for end of blinking green LED, press and hold the button for at least 10 seconds, turn off and turn on the instrument.

M-Bus



The wiring is performed using two conductors (MBUS1 and MBUS2 connected to A2 and B2) that are used for the data transmission and power supply of the MBUS communication module. The connection is independent of the polarity.

Keys functionality



Directional Keys (Up - Down - Left - Right)

The arrow keys are used to change pages in Metering, Energy, Advanced features, Graphics, Information and Setup. In the next chapters are shown the maps of how to move between the pages. In the same way the directional keys allow you to move and select the items in the Menu.

The **Up** and **Down** keys are used to increment and decrement or simply change the value set in the Setup pages.

Pressing the **Up** and **Down** keys at the same time returns to the default page from the current page.

By pressing the **Left** and **Right** keys at the same time, you can define the **default** page. The page title will change color and the home icon will appear next to the text to confirm the new default page.

ENTER key

The **Enter** key on the pages of Metering, Energy, Advanced features, Graphics, Information and Setup, allows you to enter the Menu and confirm the selected item. In the Setup you can select the parameter to be modified and confirm the new value.

ESC key

This button is used for:

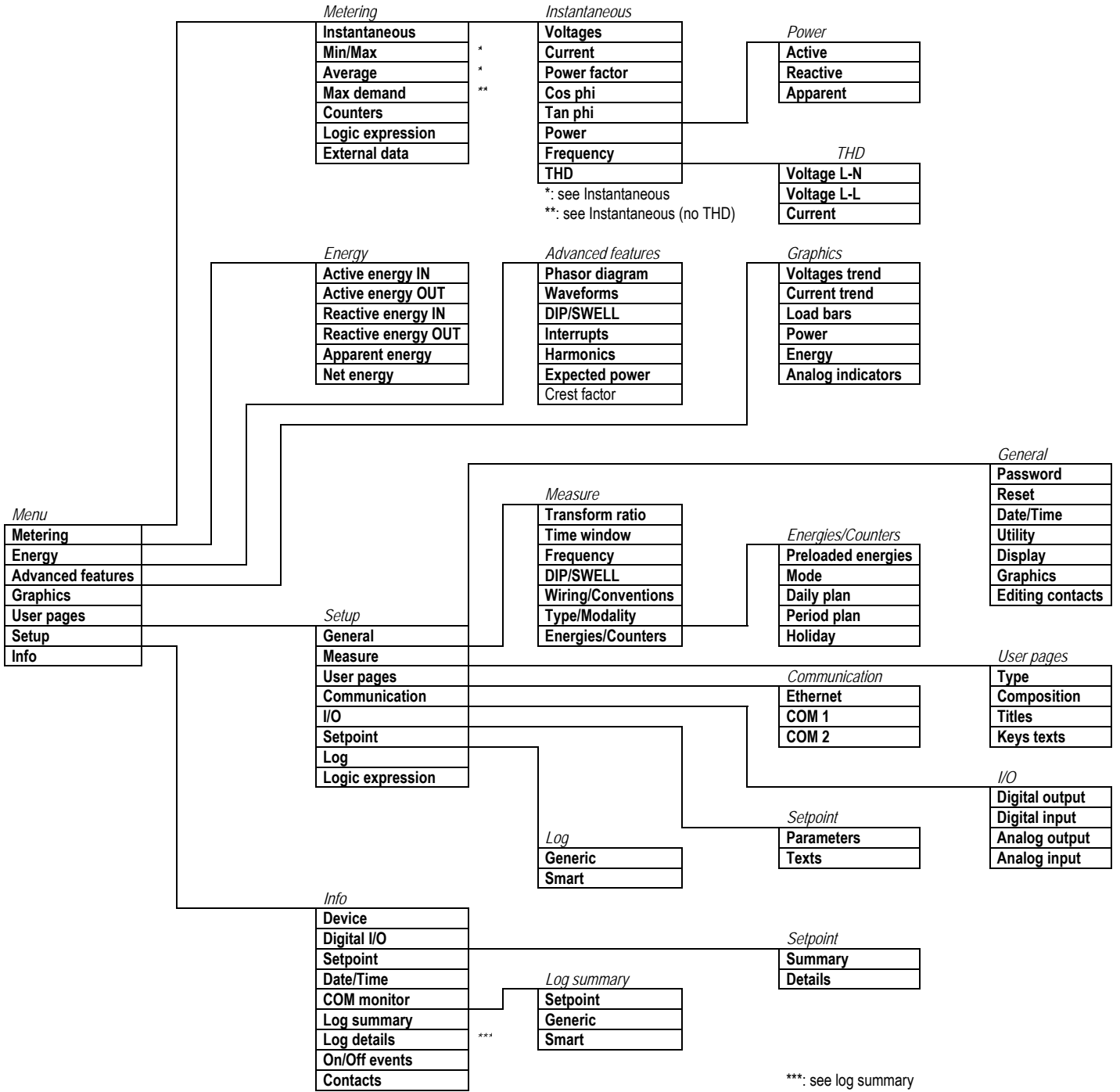
- exit without confirming the change in progress;
- return to the display page after entering any page of the instrument setup;
- return to the top level of the menu if multiple levels are open;

First configuration

At the first power on and after every **global reset**, the instrument allows to set the basic parameters for correct working:

- 1) Language selection;
- 2) Insertion (see paragraph [Connections](#) and table [Insertions / Conventions](#));
- 3) Primary TA ratio (see [Transformation ratio](#) table);
- 4) Secondary TA ratio (see [Transformation ratio](#) table);
- 5) Primary TA-N ratio (only if the neutral CT is present, see [Transformation ratio](#) table);
- 6) Secondary TA-N ratio (only if the neutral CT is present, see the [Transformation ratio](#) table);
- 7) Primary TV ratio (see [Transformation ratio](#) table);
- 8) Primary TV ratio (see [Transformation ratio](#) table);
- 9) Hour, Minutes, Seconds, Weekday, Day, Month, Year;

Menu



Using the up, down, left and right keys, you can move through the instrument menus.
 The presence of an arrow next to the displayed item indicates the presence of a sub-menu (to enter use the Right or Enter keys).
 By pressing the Enter key (if there are no further sub-menus), the selected page is accessed.
 The cursor position is shown in a different color than the other texts.

Note: if the option is not present on the analyzer version you are using, the text will be gray.

Visualization and measures

The analyzer allows to view the measures in different formats:

Numerics (measures and energy section)

By pressing the up and down keys it is possible to view the instantaneous measures (voltages, currents, powers etc.) while, where they are available, with the right and left keys it is possible to switch to the minimum / maximum relative categories, absolute minimum / maximum, average and maximum demand.

Note: The first page shown at power-up is "Phase voltages" (default page).

You can change this setting by go to the desired page and press the left and right keys simultaneously.

Graphics (advanced features and graphics section)

With the directional keys it is possible to move to view different types of information from the phasor page (to verify during installation that everything is correct) to the waveforms page to have an immediate view of the distortion that may be present on the monitored system.

User Pages

In these special pages the keys on the lower part of the instrument are not used to move between the pages present but each of them is associated with a unique page. This page is completely configurable from the text of the title to the text of the individual keys and also in the number and type of quantities displayed. The indication of the page (text key) has a different color than the others.

| CURRENTS | | |
|------------|-------|-----|
| ΣA | 38.62 | A |
| A1 | 10.53 | A |
| A2 | 15.67 | A |
| A3 | 12.42 | A |
| L-N | L-L | A |
| P.F | W | VAr |

Customization of the user page

Setup → User Pages → Titles: edit page title.

Setup → User Pages → Composition: changing the displayed measurement of the page.

with the possibility to change how many quantities are displayed on the same page (from 1 to 6).

Settings → User pages → Key text: change the texts corresponding to the 6 keys.

Note: when the user pages are displayed, the Menu is open after pressing for more than 4 seconds (and released).

Measures and derived

| | Instant | Relative min & max | Absolute min & max | AVG | Max demand | Graphics |
|----------------|---------|--------------------|--------------------|-----|------------|----------|
| Voltages L-N | X | X | X | X | X | X |
| Voltages L-L | X | X | X | | | |
| Currents | X | X | X | X | X | X |
| PF | X | X | X | X | X | X |
| Cos Phi | X | X | X | X | X | |
| Tan Phi | X | X | X | X | X | |
| Crest factor | X | X | X | | | |
| Active power | X | X | X | X | X | X |
| Reactive power | X | X | X | X | X | X |
| Apparent power | X | X | X | X | X | X |
| Frequency | X | X | X | X | | |
| THD V & A | X | | | | | |
| Harmonics | X | | | | | X |
| Counters | X | | | | | |
| Expected power | X | | | | | |

Setup

General

Setup → General → Password

| Password | Range | Default |
|--|--------------|---------|
| Level 1 [visual] By setting an Level 1 with a value different by zero, it'll be necessary to input it to change the page showed on display. | 0 ÷ 99999999 | 0 |
| Level 2 [setup] By setting an Level 2 with a value different by zero, it'll be necessary to input it to accede to Setup . | 0 ÷ 99999999 | 0 |
| Validity key [minutes] Time of free use of the setup after one access with password. | 1 ÷ 60 | 5 |
| Keys protect If is enabled, to modify the setup (from keys) it's necessary insert the password. | yes / no | No |
| Communication protect If it's enabled, to modify the setup (from communication interface) send the password command before another setup command. | yes / no | No |
| Enable options After the insertion of the code, switch off/on the instrument to enable software options. | 0 ÷ 99999999 | 0 |

Setup → General → Reset

| Reset | Range | Default |
|--|----------|---------|
| Global Reset to factory settings. | yes / no | No |
| Default setup Reset all settings in setup. | yes / no | No |
| All energies | yes / no | no |
| TB energies Reset all energies timebands (not total energies). | yes / no | no |
| Counters | yes / no | no |
| TB counters Reset all counters timebands (not total counters). | yes / no | no |
| Min-Max | yes / no | no |
| Max demand | yes / no | no |
| Log energies | yes / no | no |
| Log setpoint | yes / no | no |
| All logs | yes / no | no |
| ON/OFF events | yes / no | no |
| Manual reset SP-DO Manual Reset of the digital outputs used in Setpoint mode. | yes / no | no |

Setup → General → Date / Time

| Date/Time | Range | Default |
|--------------------|--------------------|---------|
| Hour | 0 ÷ 23 | XX |
| Minute | 0 ÷ 59 | XX |
| Seconds | 0 ÷ 59 | XX |
| Day of week | Monday ÷ Sunday | XX |
| Day | 1 ÷ 31 | XX |
| Month | January ÷ December | XX |
| Year | 2000 ÷ 2099 | XX |

Setup → General → Utility

| Utility | Range | Default |
|---|--|------------|
| Language | English / Italian / German / Polish / French / Swedish | English |
| Theme | blue-white ... gray-black | blue-white |
| Text dimension Set the dimension of the char of the instantaneous values showed in the display. | normal / big | normal |

Setup → General → Display

| Display | Range | Default |
|--|------------------------------|------------|
| Brightness | 1 ÷ 15 | factory |
| Return default page [minutes] After this time the instrument comes back to default page. | 1 ÷ 30 | 5 |
| Backlight keys After this time the instrument comes back to default page. | off / in standby / always on | in standby |
| Standby | no / si | si |
| Standby entry [minutes] After this time the instrument goes in the standby mode, as selected in the previous item. | 1 ÷ 60 | 10 |
| Refresh measures [1 = 250 ms] Display refresh time to instantaneous measurements. | 1 ÷ 60 | 4 (1 sec) |

Setup → General → Graphics

| Graphics | Range | Default |
|---|----------|---------|
| V/A sampling [seconds] Sampling time for the voltage and current graphic trend. | 1 ÷ 60 | 5 |
| Clear max bar Reset the maximum signal on the graphic bars. | yes / no | no |

Measure

Setup → Measure → Transform ratio

| Transform ratio | Range | Default |
|---|----------|---------|
| TA ratio – primary / Rogowski - A | 1 ÷ 5000 | --- |
| TA ratio – secondary / Rogowski - mV @50Hz | 1 ÷ 5000 | --- |
| 4° current ratio - primary / Rogowski 4° - A | 1 ÷ 5000 | --- |
| 4° current ratio - secondary / Rogowski 4° - mV @50Hz | 1 ÷ 5000 | --- |
| TV ratio - primary | 1 ÷ 5000 | 1 |
| TV ratio - secondary | 1 ÷ 5000 | 1 |

Setup → Measure → Time window

| Time window | Range | Default |
|---|---|----------|
| Upgrade time [minutes] The time used to calculate the average, maximum, minimum values and the expected power. | 1 / 2 / 3 / 5 / 6 / 10 / 12 / 15 / 20 / 30 / 60 | 15 |
| Type The type of the window to calculate the average values and expected power. | shifting / fixed | shifting |

Setup → Measure → Frequency

| Frequency | Range | Default |
|--|---------|---------|
| Fundamental [Hz] Select the base frequency of the monitoring network. | 50 / 60 | 50 |

Setup → Measure → DIP/SWELL

| DIP/SWELL | Range | Default |
|---|----------------------|---------------|
| Threshold DIP [V] Value under which the voltage must go down to be considered as an event. | 30 ÷ 400 | 210 |
| Number of cycles DIP Time for which the voltage value must be above the set limit. [1 = 10 ms @50Hz - 1 = 8.33 ms @60Hz] | 1 ÷ 1000 | 250 |
| Threshold SWELL [V] Value above which the voltage must rise to be considered as an event. | 1 ÷ 1000 | 270 |
| Number of cycles SWELL Time for which the voltage value must be above the set limit. [1 = 10 ms @50Hz - 1 = 8.33 ms @60Hz] | 1 ÷ 1000 | 250 |
| Interruptions [mV]* | 1000 ÷ 2000000000 | 205000 |
| Hysteresis interruptions [mV]* | 1000 ÷ 2000000000 | 215000 |
| Memory | FIFO o end of memory | end of memory |

* EN 61000

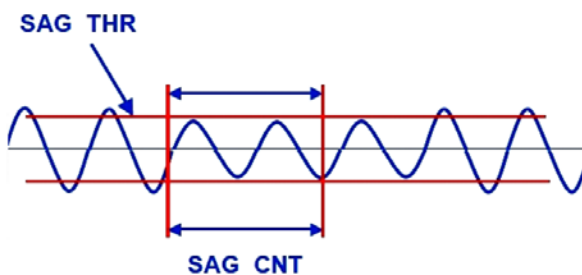


Fig.1: SAG parameters

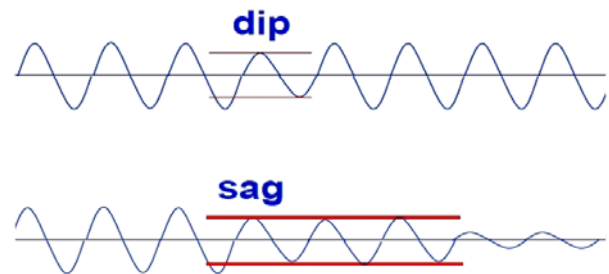


Fig.2: SAG explanation

A sag is defined as a hole of tension that lasts for more than one period of the base frequency while a brief undervoltage is called dip (see Fig. 2). To generate an event (sag) the voltage must remain below the value specified in **Threshold** for at least a minimum time defined in **Number of cycles**.

Setup → Measure → Wiring/Conventions

| Wiring / Conventions | Range | Default |
|---|---|------------------------|
| Type See following table. | 3 phases [4 o 3 wires] ... balanced 3 wires | 3 phases [4 o 3 wires] |
| Neutral current On this item appears Measured if the CT is present or Computed if the CT is not present. The user can change the set showed. | Measured / Computed | See below |
| Power factor convention See the following picture for details on the selected configuration. | SIGN / IEC / DIN IEEE | SIGN |

Wiring parameters

| Description Wiring | 3 phases [4 or 3 wires] | ARON | 3-phase balanced | 3- phase multiload balanced | single-phase | 1-phase multiload | multi Single- phase | 2-phase 3 wires |
|---------------------------------------|----------------------------|------|---------------------------------|-----------------------------------|--------------|-------------------|------------------------|-----------------|
| SYSTEM VOLTAGE | X | X | X | X | | | | |
| PHASE VOLTAGE L _{1-N} | X | X | X | X | X | X | X | X |
| PHASE VOLTAGE L _{2-N} | X | X | X | X | | X | X | X |
| PHASE VOLTAGE L _{3-N} | X | X | X | X | | X | X | |
| LINE TO LINE VOLTAGE L ₁₋₂ | X | X | X | X | | | | |
| LINE TO LINE VOLTAGE L ₂₋₃ | X | X | X | X | | | | |
| LINE TO LINE VOLTAGE L ₃₋₁ | X | X | X | X | | | | |
| SYSTEM CURRENT | X | X | calculated | X | | | | |
| LINE CURRENT L ₁ | X | X | X | x3 | X | X | X | X |
| LINE CURRENT L ₂ | X | X | calculated | x3 | | X | X | X |
| LINE CURRENT L ₃ | X | X | calculated | x3 | | X | X | |
| SYSTEM POWER FACTOR | X | X | calculated | X | | | | |
| POWER FACTOR L ₁ | X | X | X | X | X | X | X | X |
| POWER FACTOR L ₂ | X | X | calculated | X | | X | X | X |
| POWER FACTOR L ₃ | X | X | calculated | X | | X | X | |
| SYSTEM COS φ | X | X | calculated | X | | | | |
| PHASE COS φ ₁ | X | X | X | X | X | X | X | X |
| PHASE COS φ ₂ | X | X | calculated | X | | X | X | X |
| PHASE COS φ ₃ | X | X | calculated | X | | X | X | |
| SYSTEM APPARENT POWER | X | X | calculated | X | | | | |
| APPARENT POWER L ₁ | X | X | X | x3 | X | X | X | X |
| APPARENT POWER L ₂ | X | X | calculated | x3 | | X | X | X |
| APPARENT POWER L ₃ | X | X | calculated | x3 | | X | X | |
| SYSTEM ACTIVE POWER | X | X | calculated | X | | | | |
| ACTIVE POWER L ₁ | X | X | X | x3 | X | X | X | X |
| ACTIVE POWER L ₂ | X | X | calculated | x3 | | X | X | X |
| ACTIVE POWER L ₃ | X | X | calculated | x3 | | X | X | |
| SYSTEM REACTIVE POWER | X | X | calculated | X | | | | |
| REACTIVE POWER L ₁ | X | X | X | x3 | X | X | X | X |
| REACTIVE POWER L ₂ | X | X | calculated | x3 | | X | X | X |
| REACTIVE POWER L ₃ | X | X | calculated | x3 | | X | X | |
| NEUTRAL CURRENT | | | calculated or measured (option) | | | | | |
| THD VOLTAGE L ₁ | X | X | X | X | X | X | X | X |
| THD VOLTAGE L ₂ | X | X | X | X | | X | X | X |
| THD VOLTAGE L ₃ | X | X | X | X | | X | X | |
| THD CURRENT L ₁ | X | X | X | X | X | X | X | X |
| THD CURRENT L ₂ | X | X | calculated | X | | X | X | X |
| THD CURRENT L ₃ | X | X | calculated | X | | X | X | |
| ANGLE 1-2 | X | X | X | X | X | X | X | X |
| ANGLE 2-3 | X | X | X | X | X | X | X | X |
| ANGLE 3-1 | X | X | X | X | X | X | X | X |
| SYSTEM TANGENT φ | X | X | calculated | X | | | | |
| PHASE TANGENT φ ₁ | X | X | X | X | X | X | X | X |
| PHASE TANGENT φ ₂ | X | X | calculated | X | | X | X | X |
| PHASE TANGENT φ ₃ | X | X | calculated | X | | X | X | |
| SYSTEM ACTIVE ENERGY IN | X | X | calculated | x3 | X | X | X | X |
| SYSTEM ACTIVE ENERGY OUT | X | X | calculated | x3 | X | X | X | X |
| SYSTEM REACTIVE ENERGY IN | X | X | calculated | x3 | X | X | X | X |
| SYSTEM REACTIVE ENERGY OUT | X | X | calculated | x3 | X | X | X | X |
| SYSTEM APPARENT ENERGY | X | X | X | x3 | X | X | X | X |
| ACTIVE ENERGY IN L ₁ | X | X | X | x3 | X | X | X | X |
| ACTIVE ENERGY OUT L ₁ | X | X | X | x3 | X | X | X | X |
| REACTIVE ENERGY IN L ₁ | X | X | X | x3 | X | X | X | X |
| REACTIVE ENERGY OUT L ₁ | X | X | X | x3 | X | X | X | X |
| APPARENT ENERGY L ₁ | X | X | calculated | x3 | | X | X | X |
| ACTIVE ENERGY IN L ₂ | X | X | calculated | x3 | | X | X | X |
| ACTIVE ENERGY OUT L ₂ | X | X | calculated | x3 | | X | X | X |
| REACTIVE ENERGY IN L ₂ | X | X | calculated | x3 | | X | X | X |
| REACTIVE ENERGY OUT L ₂ | X | X | calculated | x3 | | X | X | X |
| APPARENT ENERGY L ₂ | X | X | calculated | x3 | | X | X | |
| ACTIVE ENERGY IN L ₃ | X | X | calculated | x3 | | X | X | |
| ACTIVE ENERGY OUT L ₃ | X | X | calculated | x3 | | X | X | |
| REACTIVE ENERGY IN L ₃ | X | X | calculated | x3 | | X | X | |
| REACTIVE ENERGY OUT L ₃ | X | X | calculated | x3 | | X | X | |

the values read in this configuration aren't significant.

In the **WIRING** setup page it's possible to modify the wiring type and in the **DEVICE STATUS** page it's showed the voltage and current wiring state.

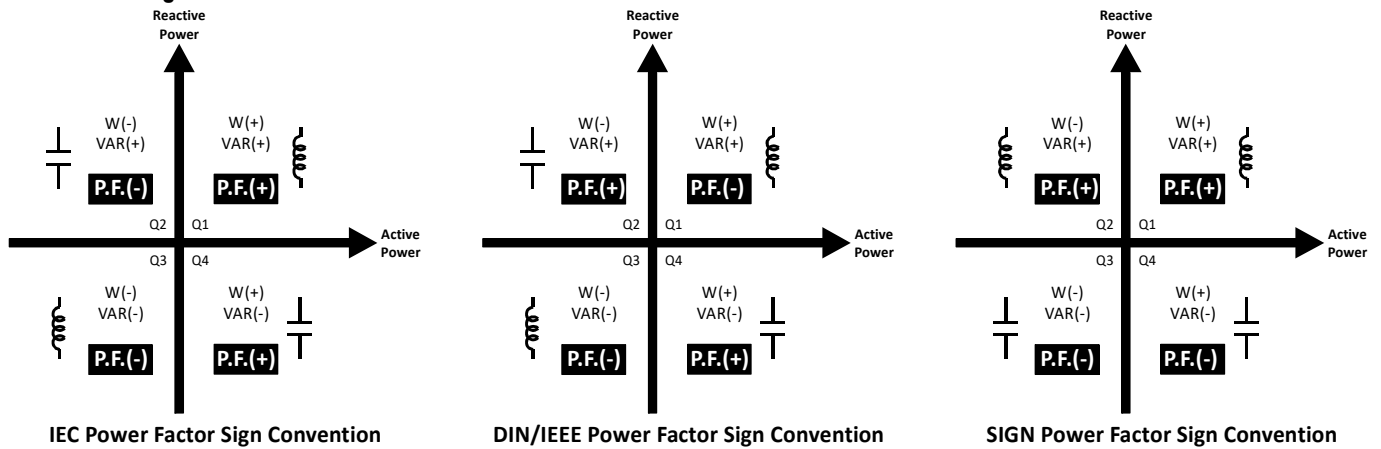
For the voltage wiring item it is possible to have the following option:

- Correct.
 - Not Correct.
- The order of voltage connections is not correct (the angles between phases is different by 120°) in the following insertion: Three phase, Three phase balanced, Three phase multi load balanced, Single phase multi load and Multi single phase.
- Not applied.
- All voltage inputs must be applied.

For the current wiring item it possible to have the following option:

- Correct.
 - Not correct: the order of current connections not be correct in the following insertion: Three phase, Three phase balanced, Three phase multi load balanced, Single phase multi load and Multi single phase.
- L1 reverse: the current of the L1 phase has the opposite sign respect others two phases.
 L2 reverse: the current of the L2 phase has the opposite sign respect others two phases.
 L3 reverse: the current of the L3 phase has the opposite sign respect others two phases.
- Not applied.
- All current must be applied and the loads must be balanced.

Power factor sign convention



Energies and Counters

The analyzer has 16 timebands to differentiate the power consumption. You can schedule the exchange of the timebands using **manual** (Modbus command), **from DI** (digital inputs) or **Preset** (*Setup* → *Timeband* → *Mode* → *Preset*).

With **from DI** it's necessary to set the use of digital inputs for this purpose (*Setup* → *I/O* → *DI 1, 2, 3, 4* → *Mode* → *Change TB*).

With **Preset** it is necessary to define a **Daily plan** in which you set the time of transition (maximum 16) from one to the next timeband. In the setting of **Period plan** (*Setup* → *Timeband* → *Preset* → *Daily/Period Plan*) it will be selected the month and the day of the start and the end, and it will be necessary to link each **Daily Plan** to one or more days of the week. At the end of setting the **Period Plan** will be enabled. Any holidays will be set in the menu **Holidays** (*Settings* → *Timeband* → *Preset* → *Holidays*).

Setup → *Measure* → *Energies/Counters* → *Mode*

| Mode [timeband] | Range | Default |
|---|---------------------------|---------|
| Energy changing It's possible to select the modality to change the timeband: - Manual. - From DI: the combination of digital inputs selects the actual timeband (TB) used (see the following table). - Preset (see timeband Daily and Period plan for more information). | manual / from DI / preset | manual |
| Counter changing It's possible to select the modality to change the timeband: - Manual. - From DI: the combination of digital input selects the actual timeband (TB) used (see the following table). | manual / from DI | manual |

| DI4 | DI3 | DI2 | DI1 | TB usata |
|-----|-----|-----|-----|----------|
| 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 2 |
| 0 | 0 | 1 | 0 | 3 |
| 0 | 0 | 1 | 1 | 4 |

| DI4 | DI3 | DI2 | DI1 | TB usata |
|-----|-----|-----|-----|----------|
| 0 | 1 | 0 | 0 | 5 |
| 0 | 1 | 0 | 1 | 6 |
| 0 | 1 | 1 | 0 | 7 |
| 0 | 1 | 1 | 1 | 8 |

| DI4 | DI3 | DI2 | DI1 | TB usata |
|-----|-----|-----|-----|----------|
| 1 | 0 | 0 | 0 | 9 |
| 1 | 0 | 0 | 1 | 10 |
| 1 | 0 | 1 | 0 | 11 |
| 1 | 0 | 1 | 1 | 12 |

| DI4 | DI3 | DI2 | DI1 | TB usata |
|-----|-----|-----|-----|----------|
| 1 | 1 | 0 | 0 | 13 |
| 1 | 1 | 0 | 1 | 14 |
| 1 | 1 | 1 | 0 | 15 |
| 1 | 1 | 1 | 1 | 16 |

Setup → *Measure* → *Energies/Counters* → *Daily plan*

| Daily plan X (from 1 to 16) | Range | Default |
|---|--------------------------|----------|
| Start Hour 1 Hour at which the timeband will be changed. | 00 ÷ 23 | 0 |
| Start Minute 1 Minute at which the timeband will be changed. | 00 ÷ 59 | 0 |
| Timeband Used 1 New timeband set. | not used ÷ TB-XX* (band) | not used |
| Start Hour 16 Hour at which the timeband will be changed. | 00 ÷ 23 | 0 |
| Start Minute 16 Minute at which the timeband will be changed. | 00 ÷ 59 | 0 |
| Timeband Used 16 New timeband set. | not used ÷ TB-XX* (band) | not used |

* XX in TB-XX, depends from the number of the Timeband enabled.

Setup → *Measure* → *Energies/Counters* → *Period plan*

| Period plan X (from 1 to 16) | Range | Default |
|--|--------------------|----------|
| Enable Enable or disable the plan. WARNING: Set all the following parameters before to enable it. | yes / no | no |
| Start Month Month at which the period start. | January ÷ December | January |
| Start Day Day at which the period start. | 1 ÷ 31 | 1 |
| End Month Month at which the period finish. | January ÷ December | December |
| End Day Day at which the period finish. | 1 ÷ 31 | 31 |
| Monday Plan Plan used for this day. | Plan 1 ÷ Plan 16 | Plan 1 |
| Sunday Plan Plan used for this day. | Plan 1 ÷ Plan 16 | Plan 1 |

| Holiday | Range | Default |
|---|--------------------|---------|
| Month holiday 1 | January ÷ December | January |
| Day holiday 1 | 1 ÷ 31 | 1 |
| Plan holiday 1 | --- ÷ plan 16 | --- |
| Plan used for this holiday. When the plane setting is different from --- the Holiday Plan is enabled. | | |
| | | |
| Month holiday 48 | January ÷ December | January |
| Day holiday 48 | 1 ÷ 31 | 1 |
| Plan holiday 48 | --- ÷ plan 16 | --- |
| Plan used for this holiday. When the plane setting is different from --- the Holiday Plan is enabled. | | |

Example of using the **Preset** function to plan the timebands consumption.
 2 daily plans are defined, the first is used for weekdays, the second for Saturdays and Sundays.
 Enabling is executed after the end of these settings (**Daily Plan** and **Period Plan**).
 For two days (January 6 and April 21) as exceptions to the standard weekly schedule you used the menu **Holidays**.

Setup → Measure → Energies/Counters → Daily plan

| | |
|-----------------|------|
| Daily Plan 1 | |
| Start hour 1 | 8 |
| Start minute 1 | 30 |
| Timeband used 1 | TB-1 |
| Start hour 2 | 18 |
| Start minute 2 | 30 |
| Timeband used 2 | TB-2 |

Setup → Timeband → Preset → Daily

| | |
|-----------------|------|
| Daily Plan 2 | |
| Start hour 1 | 7 |
| Start minute 1 | 00 |
| Timeband used 1 | TB-1 |
| Start hour 2 | 12 |
| Start minute 2 | 00 |
| Timeband used 2 | TB-2 |

Setup → Timeband → Preset → Period

| | |
|-----------------|------------|
| Period Plan 1 | |
| Start month | January |
| Start day | 1 |
| End month | July |
| End day | 31 |
| Monday plan | plan 1 |
| Tuesday plan | plan 1 |
| Wednesday plan | plan 1 |
| Thursday plan | plan 1 |
| Friday plan | plan 1 |
| Saturday plan | plan 2 |
| Sunday plan | plan 2 |
| <u>Enable</u> | <u>yes</u> |
| Month holiday 1 | January |
| Day holiday 1 | 6 |
| Plan holiday 1 | plan 2 |
| Month holiday 2 | April |
| Day holiday 2 | 21 |
| Plan holiday 2 | plan 2 |

Setup → Measure → Energies/Counters → Preset energies

| Energie preimpostate | Range | Default |
|-----------------------------------|--------------|---------|
| ΣWh IN [1 = 0.1kWh] | 0÷1000000000 | 0 |
| ΣWh OUT [1 = 0.1kWh] | 0÷1000000000 | 0 |
| ΣVArh IN [1 = 0.1kVArh] | 0÷1000000000 | 0 |
| ΣVArh OUT [1 = 0.1kVArh] | 0÷1000000000 | 0 |
| ΣVAh [1 = 0.1kAh] | 0÷1000000000 | 0 |
| Wh IN L1 [1 = 0.1kWh] | 0÷1000000000 | 0 |
| Wh OUT L1 [1 = 0.1kWh] | 0÷1000000000 | 0 |
| VArh IN L1 [1 = 0.1kVArh] | 0÷1000000000 | 0 |
| VArh OUT L1 [1 = 0.1kVArh] | 0÷1000000000 | 0 |
| VAh L1 [1 = 0.1kAh] | 0÷1000000000 | 0 |
| Wh IN L2 [1 = 0.1kWh] | 0÷1000000000 | 0 |
| Wh OUT L2 [1 = 0.1kWh] | 0÷1000000000 | 0 |
| VArh IN L2 [1 = 0.1kVArh] | 0÷1000000000 | 0 |
| VArh OUT L2 [1 = 0.1kVArh] | 0÷1000000000 | 0 |
| VAh L2 [1 = 0.1kAh] | 0÷1000000000 | 0 |
| Wh IN L3 [1 = 0.1kWh] | 0÷1000000000 | 0 |
| Wh OUT L3 [1 = 0.1kWh] | 0÷1000000000 | 0 |
| VArh IN L3 [1 = 0.1kVArh] | 0÷1000000000 | 0 |
| VArh OUT L3 [1 = 0.1kVArh] | 0÷1000000000 | 0 |
| VAh L3 [1 = 0.1kVAh] | 0÷1000000000 | 0 |

The values inserted will be added to the energies counters.

User pages

The instrument provides the user with six pages configurable. You can choose the type of page (instantaneous values, average values, energies, graphics and setpoint) and its composition (up to 6 measurements for page). If you choose the type setpoint, the text associated to each setpoint can be changed in *Setup* → *Setpoint* → *Texts* in order to have a clearer association between the alarm and its visualization.

In the user pages it's possible to change the title (*Setup* → *User pages* → *Titles*) so to have a clear view of the contents. For example, in the case of systems composed of several independent phases it's possible to group voltage, current and power of the L1 phase, in a single page with a title that can highlight the belonging to the same user.

Setup → *User page* → *Type*

| Type | Range | Default |
|-------------|--|---------|
| User page 1 | instant / averages / energies / setpoint | instant |
| User page 2 | instant / averages / energies / setpoint | instant |
| User page 3 | instant / averages / energies / setpoint | instant |
| User page 4 | instant / averages / energies / setpoint | instant |
| User page 5 | instant / averages / energies / setpoint | instant |
| User page 6 | instant / averages / energies / setpoint | instant |

Setup → *User page* → *Composition*

| User page X (da 1 a 6) | Range | Default |
|--|--|---------|
| Row 1 Selection of the measure displayed on the 1 st row of the user page X. | If the type is: instant → see Acronym table of Instantaneous group averages → see Acronym table of Averages group energies → see Acronym table of Energy group setpoint → 1 ÷ 32 | --- |
| Row 2 Selection of the measure displayed on the 2 nd row of the user page X. | See Row 1 | --- |
| Row 3 Selection of the measure displayed on the 3 th row of the user page X. | See Row 1 | --- |
| Row 4 Selection of the measure displayed on the 4 th row of the user page X. | See Row 1 | --- |
| Row 5 Selection of the measure displayed on the 5 th row of the user page X. | See Row 1 | --- |
| Row 6 Selection of the measure displayed on the 6 th row of the user page X. | See Row 1 | --- |

Setup → *User pages* → *Titles*

| Edit titles | Range | Default |
|-------------|-------|----------------|
| User page 1 | --- | VOLTAGES |
| User page 2 | --- | PHASE - PHASE |
| User page 3 | --- | CURRENTS |
| User page 4 | --- | POWER FACTOR |
| User page 5 | --- | ACTIVE POWER |
| User page 6 | --- | REACTIVE POWER |

Setup → *User pages* → *Keys texts*

| Edit keys texts | Range | Default |
|-----------------|-------|---------|
| Tasto 1 | --- | L-N |
| Tasto 2 | --- | L-L |
| Tasto 3 | --- | A |
| Tasto 4 | --- | P.F. |
| Tasto 5 | --- | W |
| Tasto 6 | --- | VAr |

Example: *Setup* → *User pages* → *Titles*
Setup → *User pages* → *Type*
Setup → *User pages* → *Composition*
Setup → *User pages* → *Composition*
Setup → *User pages* → *Composition*
Setup → *User pages* → *Composition*
Setup → *User pages* → *Composition*
Setup → *User pages* → *Composition*

User page 1
 User page 1
 Row 1
 Row 2
 Row 3
 Row 4
 Row 5
 Row 6

Warehouse
 instant
 W1
 VAr1
 W2
 VAr2
 W3
 VAr3

| WAREHOUSE | |
|-----------|------------|
| W1 | X.XXX kW |
| VAr1 | X.XXX kVAr |
| W2 | X.XXX kW |
| VAr2 | X.XXX kVAr |
| W3 | X.XXX kW |
| VAr3 | X.XXX kVAr |

With these set the user page will be this:

Communication

Setup → Communication → COM 1 & 2 → Setting

| COM 1 & 2 setting | Range | Default |
|--|--|---------|
| Mode | Slave / Master | Slave |
| Slaves to read Number of slave connected in master mode. | 1 ÷ 20 | 1 |
| Master Timeout [ms] Time after than it will be set the no slave response flag and increase the NO RESPONSE COUNTER if the answer isn't received (Master Mode). | 0 ÷ 10000 | 800 |
| Scan rate [ms] Delay between two master requests (Master mode). | 0 ÷ 10000 Note: this value must be greater than TIMEOUT. | 1000 |
| Node address Instrument identifier on the modbus network. | 1 ÷ 247 Note: valid only in Slave Mode. | 1 |
| Baud rate [kbit/s] | 4800 / 9600 / 19200 / 38400 / 57600 / 115200 | 38400 |
| Stop bits | 1 / 2 stop | 1 stop |
| Data format | 8-None / 8-Odd / 8-Even | 8-None |
| Min. response delay [ms] Modify this value if use a slow external converter. | 5 ÷ 100 | 10 |

Setup → Communication → COM1 & 2 → Slave tipology

| COM 1 & 2 slave tipology | Range | Default |
|--|---------------------|---------|
| Slave node 1 Type of slave (instrument) connected to the address 1. | TTC-V / CTT-4 / ... | --- |
| Slave node 20 Type of slave (instrument) connected to the address 20. | TTC-V / CTT-4 / ... | --- |

Note: Accessible only with COM in master mode.

Setup → Communication → COM 1 & 2 → Editing slaves name

| COM 1 & 2 Editing slaves name | Range | Default |
|-------------------------------|-------|----------|
| Slave node 1 | | Slave 1 |
| Slave node 20 | | Slave 20 |

Note: Accessible only with COM in master mode.

Setup → Communication → Profibus

| Profibus | Range | Default |
|--------------------------------|---------|---------|
| Address [profibus node] | 1 ÷ 126 | 1 |

Setup → Communication → Ethernet

| Ethernet | Range | Default |
|--------------------|---------------------------|------------|
| IP address | 0.0.0.0 ÷ 255.255.255.255 | 10.0.0.100 |
| Subnet mask | 0.0.0.0 ÷ 255.255.255.255 | 255.0.0.0 |
| IP gateway | 0.0.0.0 ÷ 255.255.255.255 | 10.0.0.254 |
| Port TCP #1 | 0 ÷ 65535 | 502 |
| Port TCP #2 | 0 ÷ 65535 | 503 |
| DHCP * | enable or disable | disable |
| Timeout [s] | 10 ÷ 100000 | 4200 |

*: only in the MOD-TCP version

| M-BUS | Range | Default |
|---|---|---------|
| Node [address MBUS] | 1 ÷ 250 | 1 |
| Baudrate [kbit/s] | 300 / 600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 | 2400 |
| Stop bits | 1 / 2 stop bit | 1 stop |
| Data format | 8-None / 8-Odd / 8-Even | 8-Even |
| Min. response delay [ms] | 5 ÷ 100 | 35 |
| Modify this value if use a slow external converter. | | |

| M-Bus Frame A | Range | Default |
|--|--|----------|
| Group 1 Group of the 1 st measure read. | See Acronym Group table | Energies |
| Measure 1 1 st measure read | See acronym in the table of the group selected | ΣWh IN |
| | | |
| Group 18 Group of the 18 th measure read. | See Acronym Group table | not used |
| Misura 18 18 th measure read. | See acronym in the table of the group selected | not used |

| M-Bus Frame B | Range | Default |
|--|--|---------------|
| Group 1 Group of the 1 st measure read. | See Acronym Group table | Instantaneous |
| Measure 1 1 st measure read | See acronym in the table of the group selected | V1 |
| | | |
| Group 18 Group of the 18 th measure read. | See Acronym Group table | not used |
| Misura 18 18 th measure read. | See acronym in the table of the group selected | not used |

| Factory setting frame A | Group | Measure |
|-------------------------|---------------|----------|
| 1 | Energies | ΣWh IN |
| 2 | Energies | ΣVArh IN |
| 3 | Instantaneous | W |
| 4÷18 | not used | not used |

| Factory setting frame B | Group | Measure |
|-------------------------|---------------|----------|
| 1 | Instantaneous | V1 |
| 2 | Instantaneous | V2 |
| 3 | Instantaneous | V3 |
| 4 | Instantaneous | A1 |
| 5 | Instantaneous | A2 |
| 6 | Instantaneous | A3 |
| 7÷18 | not used | not used |

I/O

Setup → I/O → Digital output

| Digital output X | Range | Default |
|---|-----------------------------|-------------|
| State Select 1 for close the DO, 0 to open. | 0 / 1 | 0 |
| Level Active low: initial state high level. Active high: initial low level status. | Active low / Active high | Active high |
| Mode Status: see the Status item set. Pulse: see the measure associated (Associated DO-X). Setpoint: the digital output is controlled by setpoint function. | Status / Pulse / Setpoint | Status |
| Pulse weight [Wh-VArh] The pulse is generated every time that the energy selected is increased of the selected value. | 1 ÷ 10000 | 100 |
| Pulse duration [ms] The pulse has a duty cycle of 50% (Ton equal Toff) and the duration selected. | 60 ÷ 1000 | 500 |
| Associated Associated measure to the digital output DO. | See Acronym table of Energy | ---- |

Setup → I/O → Digital output [safety option]

| Safety | Range | Default |
|--|------------------|---------|
| Safety communication | Enable / disable | disable |
| Minimum safety time Minimum interrogation time by a supervision system. If the instrument is not interrogated within this time the safety output will be opened to signal the anomaly. | 1 ÷ 100000 | 60000 |

Setup → I/O → Digital Input

| Digital input X | Range | Default |
|---|--|-------------|
| Mode - Status - Counter - Change energy timeband actually used (see example) - Change counter timeband actually used (see example) Example: DI-4 = 1, DI-3, = 0 DI-2 = 0, DI-1 = 1: the timeband selected is 1001bin -> TB 9 DI-4 = 0, DI-3, = 0 DI-2 = 1, DI-1 = 1: the timeband selected is 0011bin -> TB 3 | See below - Change energy and counter timeband actually used (see example) - External trigger - Reset SP-DO | Status |
| Multiplier If the digital inputs mode is Counter this parameter multiply the input pulse for the coefficient set. | 1 ÷ 100000 | 1 |
| Divider If the digital input mode is Counter this parameter divide the input pulse for the coefficient set. | 1 ÷ 100000 | 1 |
| SP-DO level The output set in SP-DO reset will go back to the initial status. | active high / active low | active high |
| SP-DO reset If is set SP-DO reset mode on the input, this parameter allows to set the outputs that will be reset when the input status is the same indicated in the SP-DO Level set. | DO-1, 2, 3, 4, 5, 6, 7, 8 | disabled |
| Measure unit Measure unit displayed during the use of the Digital Input in the Counter mode. | --- | [-] |

Setup → I/O → Analog output

| Analog output X | Range | Default |
|--|---|---|
| Range Selection of the modality of the output (current or voltage) and relative limits. | 0÷5V / 0÷10V / ±5V / ±10V / 4÷20mA / 0÷20mA | 0 ÷5V |
| Measure group Selection of the group for the actual analog output. | See Acronyms Group table | |
| Measure associated Selection of the measure to associate of the actual analog output, inside the selected Measure group . | See acronym in the table of the group selected | --- |
| High threshold Maximum value associated to the high threshold associated. | ± 9999 | 0 |
| High threshold unit Unit measure of threshold. Voltage: <u>mV</u> -V-kV-MV Current: <u>mA</u> -A-kA-MA Apparent Power: <u>VA</u> -kVA-MVA-GVA | See below Active Power: <u>W</u> -kW-M-GW Reactive Power: <u>VA</u> r-kVAr-MVAr-GVAr Frequency: <u>mHz</u> | See below underlined Temperature: °C THD and harmonics: %*100 Angle: degree*10 |
| Low threshold Minimum value associated to the low threshold. | ± 9999 | 0 |
| Low threshold unit Unit measure of threshold. Voltage: <u>mV</u> -V-kV-MV Current: <u>mA</u> -A-kA-MA Apparent Power: <u>VA</u> -kVA-MVA-GVA | See below Active Power: <u>W</u> -kW-M-GW Reactive Power: <u>VA</u> r-kVAr-MVAr-GVAr Frequency: <u>mHz</u> | See below underlined Temperature: °C THD and harmonics: %*100 Angle: degree*10 |

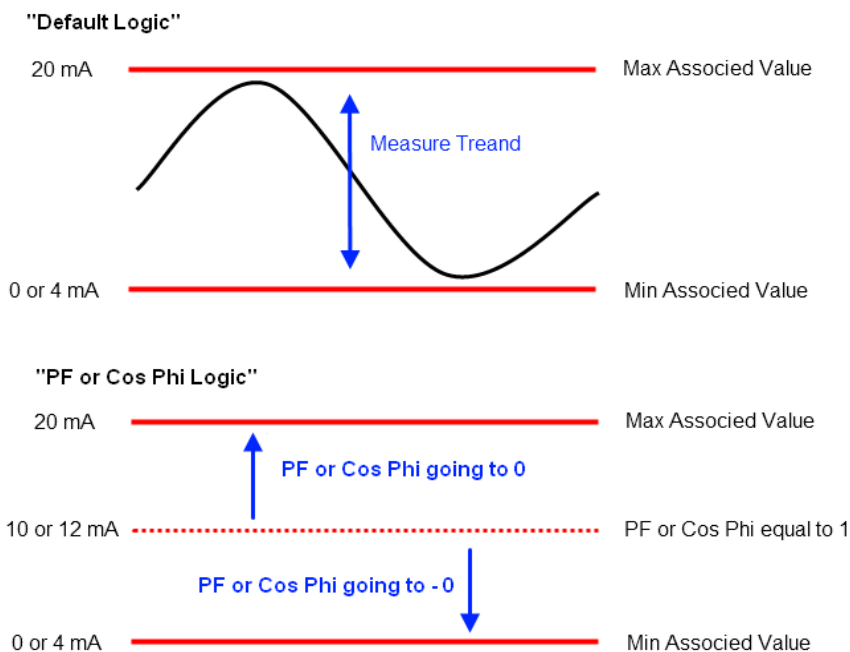
Example: to associate the L1 phase voltage to the analog output it is necessary select instantaneous for the item **Measure group** and the acronym V1 for the item **Measure associated**. If the maximum value is set to 300V and 100V to the minimum, with the scale of 0÷20mA, it will have that with 200V as measured voltage, the output will be 10 mA.

Only for the power factor, $\cos\phi$ and $\tan\phi$ is used a different logic (see the following example).

Selecting the $\cos\phi$ or the power factor as a measure to associate to the analog output, the intermediate output value (10 or 12 mA) is set to $\cos\phi=1$ (and coinciding with $\cos\phi=-1$). The value of the output signal will trend to increase when the positive values of $\cos\phi$ decrease from 1 to 0 while for the negative values, it will decrease when the value trend to 0.

Example: Setting +800 and -800 as maximum and minimum values when $\cos\phi=0.9$ the value will be 15 mA, while when the $\cos\phi=-0.9$ it will be 5 mA.

In the case of selection of $\tan\phi$ the intermediate output value (10 or 12 mA) is set to $\tan\phi=0$ and the output signal will be directly proportional to the variation of the measure.



Setpoint

The instrument provides to the user, functionality that perform multiple actions when a measure exceeds the set limits, in the way to take automatic corrective actions.

The setpoint (32 available) are made by 3 main areas:

- parameter to be controlled with its limits;
- logic to be used;
- action to be taken.

To use the setpoints correctly, it's necessary to follow these points:

- Select the **Source** of the measure to control between internal measures and external (COM in Master mode).
- Select the **Group** and the **Item** (the measure inside the group).
- Define what are the limits that the measure must not exceed (**High threshold + High threshold unit** and **Low threshold + Low threshold unit**) and the time spent out of the limits themselves (**Over debounce**, **Entry debounce** and **Hysteresis**) in order to avoid continuous changes the state of alarm when the read value is near the thresholds set.

- If the limits are exceeded and if it's necessary to control more parameters simultaneously and to have a single action, there is the possibility to link more setpoints using the two main logical operations (AND and OR). To use this feature you must set only one setpoint as "primary" with the following setup:

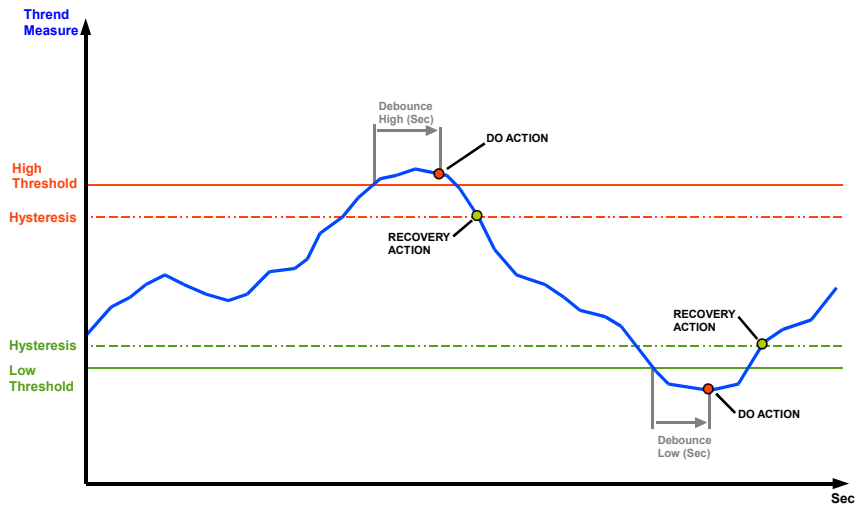
- limits;
- debounce (Over / Entry);
- logic (Over / Entry);
- operands (secondary setpoints to be included in the logic);
- action (Over / Entry);

and others setpoint as "secondary" in which only the limits and the debounces will be set.

- Set the action or the actions to be taken (**Action over / Action entry**) in the case of pass / return of the limits previously set, between the following items:

- save the event;
- change the status of one or more digital outputs;
- increase the counter of exceeding limits;
- start the timer whenever the measure exceeds the limits.

- After setting the parameters of the set point, and only at the end, it's necessary to select **yes** for the voice **Enable**.



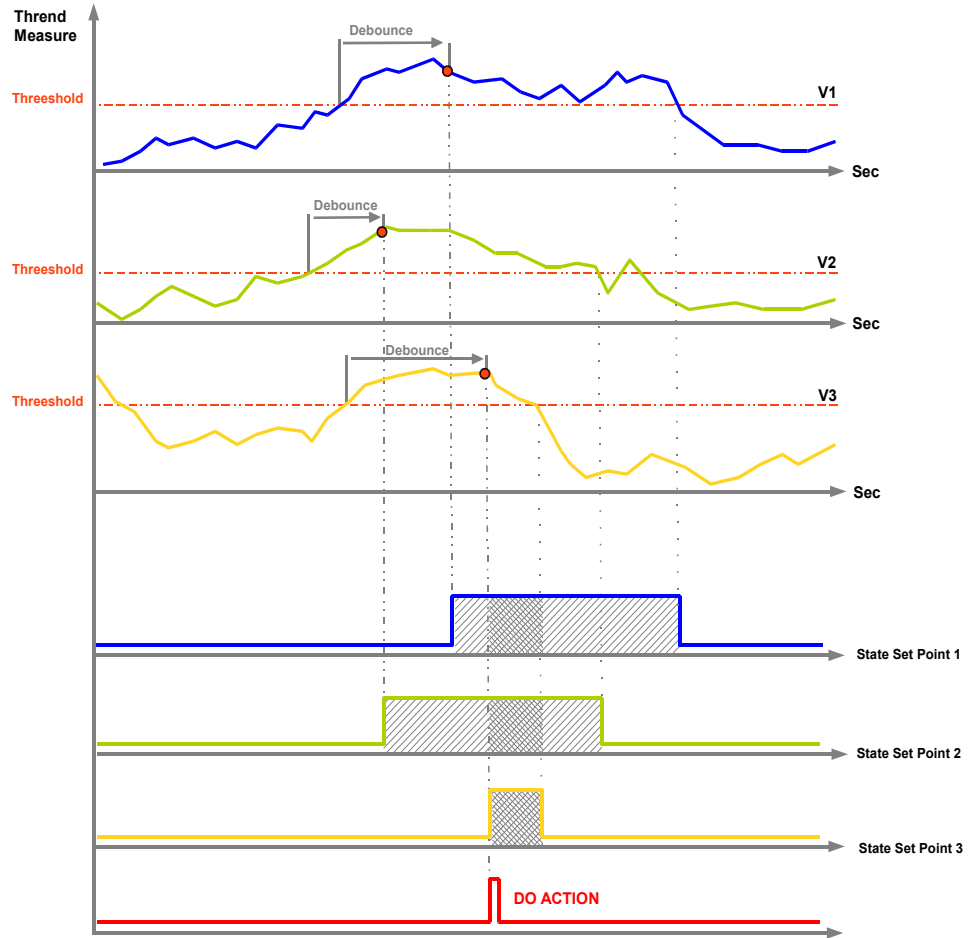
| Setpoint X (da 1 a 32) | Range | Default |
|---|--|----------------------|
| Enable Enable or disable the setpoint function. | Yes / No | No |
| Source Select the instrument from which the measure to analyze it will be read. | Internal measures / Measures node X | Internal measures |
| Group Selection of the group for the actual setpoint if it is set Internal measures as Source . | See Acronyms Group table | --- |
| Item Selection of the measure in the selected Measure Group of the actual setpoint. | See acronym in the table of the group selected | --- |
| High threshold The Action is executed if the measure exceed the set value. | ± 9999 | 0 |
| High threshold unit With Measure node X as Source , the multiplier factor will be 1, 1000, 1000000 while with Internal measures there will be: Voltage: <u>mV-V-kV-MV</u> Reactive power: <u>VAR-kVAR-MVAR-GVAR</u> Angle: <u>degree*10</u> Current: <u>mA-A-kA-MA</u> Frequency: <u>mHz</u> Apparent energy: <u>VAh*100-kVAh-MVAh-GVAh</u> Apparent power: <u>VA-kVA-MVA-GVA</u> Temperature: <u>°C</u> Active energy: <u>Wh*100-kWh-MWh-GWh</u> Active power: <u>W-kW-MW-GW</u> THD and harmonics: <u>%*100</u> Reactive energy: <u>VArh*100-kVArh-MVArh-GVArh</u> | See below | See below underlined |
| Low threshold The Action is executed if the measure is lower than the set value. | ± 9999 | 0 |
| Low threshold unit See the description of High threshold unit . | See below | See below underlined |
| Over debounce [seconds] 0: instantaneous execution of the Action 1÷10000: execution of the Action if the condition is kept for the time set | 0 ÷ 10000 | 0 |
| Entry debounce [seconds] 0: instantaneous execution of the Action 1÷10000: execution of the Action if the condition is kept for the time set | 0 ÷ 10000 | 0 |
| Hysteresis (for high & low threshold) Setting a value different by 0, the hysteresis is enabled with a percentage value set. | See below | 0 |
| Logic operation over - No logic: the Action is executed without to verify the status of others setpoint [Default]. - OR logic: the Action is execute after the check of result of the OR logic operation with the setpoint selected in operands. - AND logic: the Action is execute after the check of result of the AND logic operation with the setpoint selected in operands. WARNING: it's not possible to set OR logic for logic operation over and logic operation entry at the same time. | See below | no logic |
| Logic operation entry - No logic: the Action is executed without to verify the status of others setpoint [Default]. - OR logic: the Action is execute after the check of result of the OR logic operation with the setpoint selected in operands. - AND logic: the Action is execute after the check of result of the AND logic operation with the setpoint selected in operands. WARNING: it's not possible to set OR logic for logic operation over and logic operation entry at the same time. | See below | no logic |
| Operands (1-16) Setpoint 1: select Yes to include the setpoint 01 in the logic. ----- Setpoint 16: select Yes to include the setpoint 16 in the logic. | See below | No Operands |
| Operands (17-32) Setpoint 17: select Yes to include the setpoint 17 in the logic. ----- Setpoint 32: select Yes to include the setpoint 32 in the logic. | See below | No Operands |
| Action over It possible to select one, more or anything action: - Display and save the event. - Increase a variable that indicates the number of events. - Change the DO-X state. - Increase a variable that indicates the duration time of the event. | See below | None |
| Action entry It possible to select one, more or anything action: - Display and save the event. - Change the DO-X state | See below | None |
| DO used It possible to select (with Yes) one or more DO: DO-1, DO-2, DO-3, DO-4, DO-5, DO-6, DO-7, DO-8. WARNING: for a correct functioning before to select the output it's necessary to set the SETPOINT mode under the item MODE in the setup page of the DO group (DO-1, 2, 3, 4 or DO-5, 6, 7, 8). | See below | None |

Example of setting (in the correct order) to set an alarm when the voltage exceed 230V on the phases 1, 2 and 3 (V1 AND V2 AND V3) with saving the event and the switching of a digital output when the alarm is present and when it disappear.

SETPOINT 1 (primary)
Source: Internal measures
Group: instant
Item: V1
High threshold: 230
High threshold unit: V
Over debounce: 10 (sec.)
Logic operation over: AND
Operands 1-16:
 - **Setpoint 2:** yes
 - **Setpoint 3:** yes
Action over:
 - **save event:** yes
 - **DO change:** yes
Action entry:
 - **save event:** yes
 - **DO change:** yes
DO used:
 - **DO-1:** yes
Enable: yes

SETPOINT 2 (secondary)
Source: Internal measures
Group: instant
Item: V2
High threshold: 230
High threshold unit: V
Over debounce: 10 (sec.)
Enable: yes

SETPOINT 3 (secondary)
Source: Internal measures
Group: instant
Item: V3
High threshold: 230
High threshold unit: V
Over debounce: 10 (sec.)
Enable: yes



Log

The analyzer provides the user with 2 types of logs in each of which you can select up to 14 measures.

Only one log can be enabled at the same time, but only after all the settings have been completed (see examples below).

Warning: if you erroneously enable a second log while another is already active, you will disable both and delete any saved data.

If you need to switch from one type to another without the risk of losing the stored data, the procedure to be performed is as follows: stop the active log, read the stored data and enable the other type of log.

Generic

Sampling can be performed with a frequency ranging from 1 second up to once a month between instantaneous measurements, averages and energies.

Setup → Log → Generic

| Generic | Range | Default |
|--|--|------------------|
| Enable Before enabling the log function, it is necessary to disable the other enabled logs. <u>Only one</u> type of log can be used at a time. How to use: - <u>always</u> : the log is active immediately after setting; - <u>in the period</u> : the log is active (on the selected days of the week) in the selected period only (month and day); - <u>in the timetable</u> : the log is active (on the selected days of the week) in the set time; - <u>in the period and in the timetable</u> : the log is active (on the selected days of the week) in the selected period and time; - <u>trigger</u> : the log is active when the status set is verified; | none ÷ trigger | none |
| Sampling Acquisition timing. | 1sec/.../60min/end of day/end of week/end of month/end of year | 15 min |
| Storage Type of storage. Note: FIFO after 10 consecutive cycles is automatically disabled. | FIFO / end memory | end memory |
| Start month | January ÷ December | January |
| Start day | 1 ÷ 31 | 1 |
| Start hour | 0 ÷ 23 | 0 |
| Start minute | 0 ÷ 59 | 0 |
| End month | January ÷ December | January |
| End day | 1 ÷ 31 | 1 |
| End hour | 0 ÷ 23 | 23 |
| End minute | 0 ÷ 59 | 59 |
| Monday Enable or disable the log for this day. | yes / no | no |
| Saturday Enable or disable the log for this day. | yes / no | no |
| Trigger input Input that triggers the log. | DI high level, DI low level, Setpoint | DI high level |
| DI used Digital input used for the trigger input. | 1 ÷ 8 | 1 |
| Setpoint used Setpoint used for the trigger input. | 1 ÷ 32 | 1 |
| Source 1 Source select of the 1 st measure sampled | internal measure / measure node x | internal measure |
| Group 1 Group select of the 1 st measure sampled | See Acronym Group table | --- |
| Measure 1 Measure select of the 1 st measure sampled | | |
| Source 14 Source select of the 14 th measure sampled | internal measure / measure node x | internal measure |
| Group 14 Group select of the 14 th measure sampled | See Acronym Group table | --- |
| Measure 14 Measure select of the 14 th measure sampled | | |

Warning: All recordings for all log will be lost if any parameter is changed.

Example: Setup → Log → Generic

| | |
|---------------|------------------|
| Sampling | 20 sec |
| Storage | end memory |
| Source 1 | internal measure |
| Group 1 | instantaneous |
| Measure 1 | W1 |
| Source 2 | internal measure |
| Group 2 | instantaneous |
| Measure 2 | W2 |
| Source 3 | internal measure |
| Group 3 | instantaneous |
| Measure 3 | W3 |
| <u>Enable</u> | <u>yes</u> |

To display how many log were acquired and the remaining storing time: Information → Log summary → Generic.

To display the single log: Information → Log detail → Generic.

Smart
 It is possible to define the measurements of which the average, the min and the max in the set period will be calculated (from 1 min to the end of the year).
Setup → *Log* → *Smart*

| Smart | Range | Default |
|--|--|------------|
| Enable Before enabling the log function, it is necessary to disable the other enabled logs. <u>Only one type of log can be used at a time.</u> | yes / no | no |
| Sampling Acquisition timing. | 1min/.../60min/end of day/end of week/end of month/end of year | 15 min |
| Storage Type of storage. <u>Note:</u> FIFO after 10 consecutive cycles is automatically disabled. | FIFO / end memory | end memory |
| Group 1 Group select of the 1 st measure sampled | See Acronym Group table | --- |
| Measure 1 Measure select of the 1 st measure sampled | | |
| | | |
| Group 14 Group select of the 14 th measure sampled | See Acronym Group table | --- |
| Measure 14 Measure select of the 14 th measure sampled | | |

Warning: All recordings for all log will be lost if any parameter is changed.
 For an example, see the Generic Log.
 To display how many log were acquired and the remaining storing time: *Information* → *Log summary* → *Smart*.
 To display the single log: *Information* → *Log detail* → *Smart*.

Math
 In the 8 “maths” available, it will be possible to define the measures and the mathematic operation (sum, subtraction, multiplication, division) to perform to obtain a result that can showed, read (communication interfaces) and used in the setpoint or as an argument in another mathematic for operation more complex.

Setup → *Math*

| Math X | Range | Default |
|--|--|-------------------|
| Enable Enable or disable the math X. | yes / no | no |
| Compute timing Time to update the results of math. | 1sec / ... / 60min / end of day / end of week / end of month | 1 sec |
| Source 1 Select the instrument from which the measure to analyze is required. | Internal measures / Measure node X | Internal measures |
| Group 1 Selection of the group for the first operand if it is set Internal measures as Source . | --- / instantaneous / average / energies / digital input / counters /analog input / math | --- |
| Item 1 Inside the Group chosen before, select the measure to check. | If the selected Group is instantaneous or average or energies, see the acronym in the relative table. | --- |
| Multiplier 1 Setting of the multiply factor for the operand before to perform the operation. | 1 ÷ 100000 | 1 |
| Divisor 1 Setting of the division factor for the operand before to perform the operation. | 1 ÷ 100000 | 1 |
| Operation Select the operation to be performed. | sum / subtraction / multiplication / division | sum |
| Source 2 Select the instrument from which the measure to analyze is required. | Internal measures / Measure node X | Internal measures |
| Group 2 Selection of the group for the first operand if it is set Internal measures as Source . | --- / instantaneous / average / energies / digital input / counters /analog input / math | --- |
| Item 2 Inside the Group chosen before, select the measure to check. | If the selected Group is instantaneous or average or energies, see the acronym in the relative table. | --- |
| Multiplier 2 Setting of the multiply factor for the operand before to perform the operation. | 1 ÷ 100000 | 1 |
| Divisor 2 Setting of the division factor for the operand before to perform the operation. | 1 ÷ 100000 | 1 |

Acronym tables

Acronyms group table

| Acronym |
|---------------|
| Instantaneous |
| Average |
| Energies |
| Setpoint |

Acronyms table of Instantaneous group

| Acronym | Description |
|--------------|---------------------|
| ΣV | System Voltage |
| V1 | Voltage L1 |
| V2 | Voltage L2 |
| V3 | Voltage L3 |
| V1-V2 | L1-L2 Voltage |
| V2-V3 | L2-L3 Voltage |
| V3-V1 | L3-L1 Voltage |
| ΣA | System Current |
| A1 | Current L1 |
| A2 | Current L2 |
| A3 | Current L3 |
| ΣPF | System Power Factor |
| PF1 | Power Factor L1 |
| PF2 | Power Factor L2 |
| PF3 | Power Factor L3 |
| ΣCOS | System COS |
| COS1 | COS L1 |
| COS2 | COS L2 |
| COS3 | COS L3 |

| Acronym | Description |
|--------------|-------------------------------|
| ΣVA | System Apparent Power |
| VA1 | Apparent Power L1 |
| VA2 | Apparent Power L2 |
| VA3 | Apparent Power L3 |
| ΣW | System Active Power |
| W1 | Active Power L1 |
| W2 | Active Power L2 |
| W3 | Active Power L3 |
| ΣVar | System Reactive Power |
| Var1 | Reactive Power L1 |
| Var2 | Reactive Power L2 |
| Var3 | Reactive Power L3 |
| 4° A | 4 th Current Input |
| FREQ | Frequency |
| INT TEMP | internal temperature |
| THD V1 | THD Voltage L1 |
| THD V2 | THD Voltage L2 |
| THD V3 | THD Voltage L3 |
| THD A1 | THD Current L1 |

| Acronym | Description |
|----------------|-----------------------|
| THD A2 | THD Current L2 |
| THD A3 | THD Current L3 |
| DEG V1-V2 | Phase Angle L1-L2 |
| DEG V2-V3 | Phase Angle L2-L3 |
| DEG V3-V1 | Phase Angle L3-L1 |
| ΣTAN | System Tangent |
| TAN1 | Tangent L1 |
| TAN2 | Tangent L2 |
| TAN3 | Tangent L3 |
| $\Sigma EXP W$ | System Expected Power |
| EXP W1 | Expected Power L1 |
| EXP W2 | Expected Power L2 |
| EXP W3 | Expected Power L3 |
| DEG V-A 1 | Phase Angle V1-A1 |
| DEG V-A 2 | Phase Angle V2-A2 |
| DEG V-A 3 | Phase Angle V3-A3 |
| | |
| | |
| | |

Acronyms table of Average group

| Acronym | Description |
|-----------------|-----------------------------|
| AVG ΣV | System Average Voltage |
| AVG V1 | Average Voltage Phase 1 |
| AVG V2 | Average Voltage Phase 2 |
| AVG V3 | Average Voltage Phase 3 |
| AVG ΣA | System Average Current |
| AVG A1 | Average Current L1 |
| AVG A2 | Average Current L2 |
| AVG A3 | Average Current L3 |
| AVG ΣPF | System Average Power Factor |
| AVG PF1 | Average Power Factor L1 |
| AVG PF2 | Average Power Factor L2 |
| AVG PF3 | Average Power Factor L3 |

| Acronym | Description |
|------------------|-------------------------------|
| AVG ΣCOS | Average COS L1 |
| AVG COS1 | Average COS L2 |
| AVG COS2 | Average COS L3 |
| AVG-COS3 | System Average Apparent Power |
| AVG ΣVA | Average Apparent Power L1 |
| AVG VA1 | Average Apparent Power L2 |
| AVG VA2 | Average Apparent Power L3 |
| AVG VA3 | System Average Active Power |
| AVG ΣW | Average Active Power L1 |
| AVG W1 | Average Active Power L2 |
| AVG W2 | Average Active Power L3 |
| AVG W3 | Average COS L1 |

| Acronym | Description |
|------------------|-------------------------------|
| AVG ΣVar | System Average Reactive Power |
| AVG VAR1 | Average Reactive Power L1 |
| AVG VAR2 | Average Reactive Power L2 |
| AVG VAR3 | Average Reactive Power L3 |
| AVG 4° A | 4 th Current Input |
| AVG Hz | Average Frequency |
| AVG ΣTAN | Average System Tan |
| AVG TAN1 | Average Tangent L1 |
| AVG TAN2 | Average Tangent L2 |
| AVG TAN3 | Average Tangent L3 |
| | |
| | |

Acronyms table of Energies and TB (from 1 to 16) groups

| Acronym | Description |
|-------------------|----------------------------|
| ΣWh IN | System Active Energy IN |
| ΣWh OUT | System Active Energy OUT |
| $\Sigma Varh$ IN | System Reactive Energy IN |
| $\Sigma Varh$ OUT | System Reactive Energy OUT |
| ΣVAh | System Apparent Energy |
| Wh IN 1 | Active Energy L1 IN |
| Wh OUT 1 | Active Energy L1 OUT |

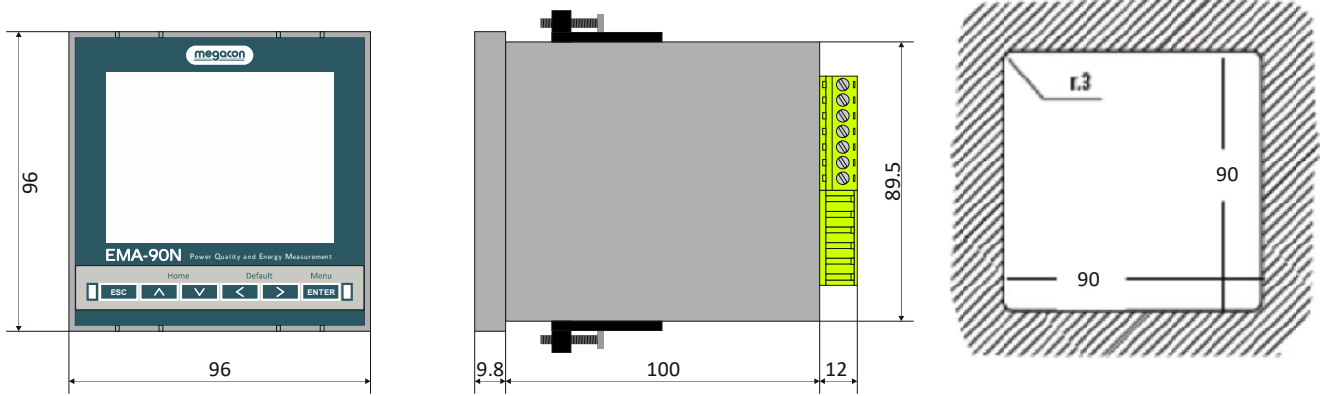
| Acronym | Description |
|------------|------------------------|
| VARh IN 1 | Reactive Energy L1 IN |
| VARh OUT 1 | Reactive Energy L1 OUT |
| VAh 1 | Apparent Energy L1 |
| Wh IN 2 | Active Energy L2 IN |
| Wh OUT 2 | Active Energy L2 OUT |
| VARh IN 2 | Reactive Energy L2 IN |
| VARh OUT 2 | Reactive Energy L2 OUT |

| Acronym | Description |
|------------|------------------------|
| VAh 2 | Apparent Energy L2 |
| Wh IN 3 | Active Energy L3 IN |
| Wh OUT 3 | Active Energy L3 OUT |
| VARh IN 3 | Reactive Energy L3 IN |
| VARh OUT 3 | Reactive Energy L3 OUT |
| VAh 3 | Apparent Energy L3 |
| | |

Dimensions

For fixing the flush mount version instrument to the panel, use the fixing devices supplied, by inserting them in the side grooves of the enclosure and tighten the screws.

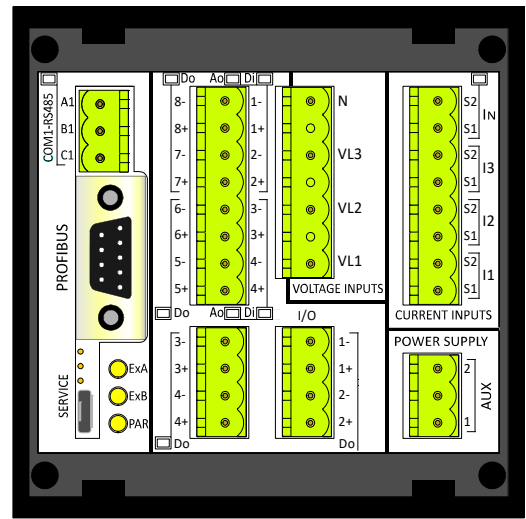
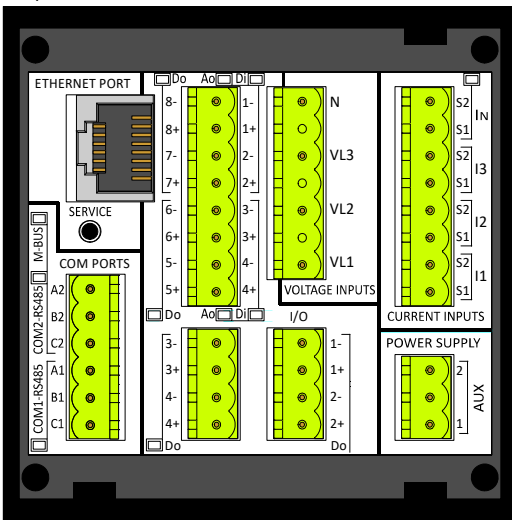
For safety reasons, place an external fuse protection at the input voltages, and use adequate cables for the working voltages and currents, with a section from 0.5 to 2.5 mm².



Connections

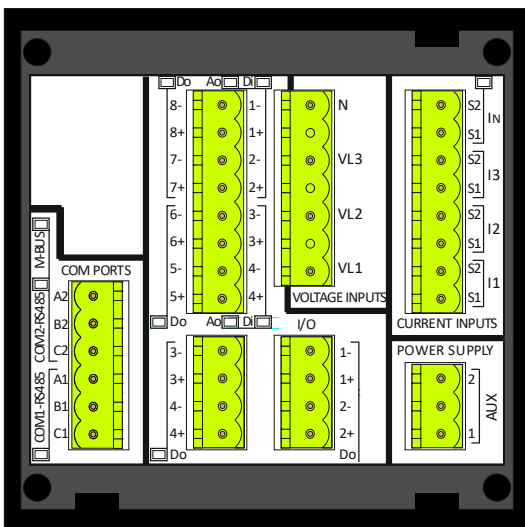
Analyzer with all terminal blocks for I/O and communication ports and WEB option.

Analyzer with all I/O terminal blocks, and **profibus** communication port

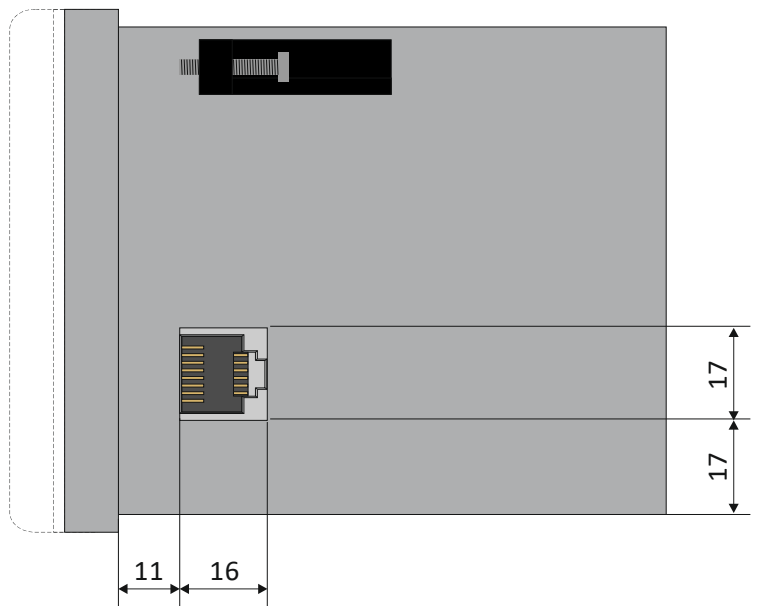


Analyzer with TCP option with all I/O terminal blocks and communication ports. The Ethernet port is located at the top of the instrument.

BACK VIEW



TOP VIEW



Technical features

| Auxiliary power supply | |
|--------------------------------|---|
| Voltage range | 90÷250 Vac/dc 20÷60 Vac/dc |
| Frequency range | 50/60 Hz |
| Protection fuse | 5x20 mm - 1A time lag (option 90÷250 Vac/dc) 5x20 mm - 3.15A time lag (option 20÷60 Vac/dc) |
| Power consumption | 10VA max – 3VA min (depending on the options and activities) |
| Measures / precision | |
| Energy | Factory Default: CEI EN 62053-21 compliant – Class 1 (1%) CEI EN 62053-22 compliant – Class 0.5 S (0.5%) CEI EN 62053-22 compliant – Class 0.2 S (0.2%) |
| Frequency | 40 ÷ 70 Hz |
| Power factor | ± 1.000 |
| Cosφ | ± 1.000 |
| Tanφ | ± tan 89.9° |
| THD | IEC62053-22 compliant |
| Harmonics | up to 63 th Harmonics – IEC62053-22 |
| Refresh rate | ~ 200 mS |
| Measurement range | |
| Voltage | 30÷400Vac phase to neutral (52÷693 Vac phase to phase) |
| Current 1A | 10mA÷1A (for 1, 0.5S or 0.2S Class accuracy, depending on the option) |
| Current 5A | 50mA÷5A (for 1, 0.5S or 0.2S Class accuracy, depending on the option) |
| Installation | |
| Distribution networks | low and medium voltage - single phase connection - three phase with neutral - three phase without neutral |
| Voltage inputs | |
| Inputs type | 3 phase inputs + Neutral |
| Permitted over voltage | 480 Vac phase to neutral (830Vac continuous phase to phase) Over-voltage category: III (permanent installations) |
| Input resistance | >1.8MΩ |
| Frequency range | 50/60 Hz Note: V1 terminal must be connected |
| Load (Burden) for each input | 0.12 VA |
| Current inputs | |
| Inputs type | 3 inputs isolated by internal current transformers additional input for neutral current with the same characteristics to the phase inputs |
| Maximum continuous overload 1A | 1.3A |
| Maximum continuous overload 5A | 6.5A |
| Load (Burden) for each input | 0.001 V _{MAX} |
| Mechanical | |
| Overall dimension | 96x96x130 mm |
| Protection degree | IP50 on front (IP65 with frontal transparent cover) IP20 housing |
| Weight | 450 gr |
| Environment conditions | |
| Operating temperature | 0... +60°C |
| Storing temperature | -10... +70°C |
| Relative humidity | 5...95% |
| Communication RS485 | |
| Protocol | Modbus RTU |
| Standard | RS485 half-duplex with optical isolation |
| Baud rate | 4.8 – 9.6 – 19.2 – 38.4 – 57.6 – 115.2 kbps |
| Node | 1 ÷ 247 |
| Parity | Even - Odd – None |
| Stop bit | 1, 2 |
| Communication Profibus | |
| Protocol | Slave DP-V0 |
| Baud rate | 9.6Kbits/s - 3Mbits/s |
| Node | 0-126 |
| Connector | DB 9 female connector |
| Communication Ethernet | |
| Protocol | ModbusTCP, SNMP (eth-web) |
| Connector | RJ45 |
| Communication Mbus | |
| Baud rate | 0.3 - 0.6 - 1.2 - 2.4 - 4.8 - 9.6 - 19.2 - 38.4 kbps |
| Node | 0-250 |
| Parity | Even - Odd – None |
| Stop bit | 1, 2 |

| Digital input | | |
|--------------------------------------|---|---|
| Number of digital inputs | 2, 4 | |
| Input voltage range | Input rated voltage V_{INPUT} 24, 48, 115, 230 Vac/dc (only one defined in the order) | |
| Input current | Rated input current I_{INPUT} @ V_{INPUT} : $5mA_{MAX}$ @ V_{INPUT} =all voltages | |
| Inputs configuration | 2 terminals (A-K) for each input: NPN, PNP | |
| Isolation voltage | 3.5KV for 60 sec. | |
| Input filter | Digital | |
| Pulse duration | T_{ON_min} 30ms, T_{OFF_min} 30ms | |
| Digital output | | |
| Number of digital outputs | 2, 4, 6, 8 | |
| Type | Photo-MOS (solid state); R_{ON} = 8 Ω typ. (12 Ω MAX) | |
| Range Voltage/Current | 10 ÷ 300Vcc 150mA $_{MAX}$; 12 ÷ 250Vca 150mA $_{MAX}$ | |
| Isolation voltage | 4KV per 60 sec. | |
| Output functionality | Programmable output as pulse / status / alarm. | |
| Minimum impulse period | T_{ON_min} 30ms, T_{OFF_min} 30ms | |
| Analog output | | |
| Number of analog outputs | 2, 4 | |
| Auxiliary power supply | Not required | |
| Insulation level | 3.5KV for 60 sec. | |
| Maximum length of connection | 1200m | |
| Resolution | 12bit (4096 valori) | |
| Analog outputs type | Current | Voltage |
| Mode | 0÷20mA or 4÷20mA | 0÷10V or -10÷10V or 0÷5V or -5÷5V |
| Load | Max 600 Ω | Min 1K Ω |
| Error | Max: 0.5% on E.S. – Typical 0.2% on E.S. | Max: 0.3% on E.S. – Typical 0.1% on F.S. |
| | Linearity: 0.01 on F.S. - Thermal stability: 0.01 on F.S. | |
| Settling time | 50 μ s(0÷20mA)@ R_{LOAD} =1K Ω , C_{LOAD} =200pF, L_{LOAD} =1mH | 50 μ s(-10 ÷10V)@ R_{LOAD} =1K Ω , C_{LOAD} =200pF |
| Clock calendar | | |
| Date and time | Hours, minutes, seconds, day of week, date, month, year | |
| Update | Through modbus command and keys | |
| Retention (in absence of voltage) | 7 days backup guaranteed | |
| Storage | | |
| Standard memory | 100 KB | |
| Certifications and compliance | | |
| References standards | CEI EN 61000-6-2:2006, CEI EN 61000-6-4:2007, CEI EN 61010-1:2013 | |



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User Manual

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