# Revalco®

Made in Italy

## network analysers
## multifunction meters

# NETWORK ANALYSER



# MULTIFUNCTION METERS

# PARAMETERS

| | NETWORK ANALYSER THREE PHASE | | SINGLE PHASE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| |  |  |  |  |  | | | | | | | |
| | **PLU-TO** | **1RANM8 2RAN968** | **1RANM2** | **1RANM2CT** | **1RANM23** | **2RAN72C** | **2RAN72C485** | **1RANM6 2RAN96** | **1RANM6R 2RAN96R** | **1RANM6C 2RAN96C** | **1RANM6CS 2RAN96CS** | **1RANM6C485 2RAN96C485** |
| DC Voltage 500 V max | | | | | | | | | | | | |
| DC Voltage ..../100V by divider | | | | | | | | | | | | |
| DC Current .../60mV | | | | | | | | | | | | |
| Bidirectional power | | | | | | | | | | | | |
| Bidirectional Total Energy | | | | | | | | | | | | |
| Bidirectional Ampere-hour Ah | | | | | | | | | | | | |
| Harmonic distorsion | | • | | | | | | | | | | |
| Total Harmonic distorsion | • | • | | | | | | | | | | |
| Voltage crest factor | | • | | | | | | | | | | |
| Current crest factor | | • | | | | | | | | | | |
| ctive Energy in 4 tarifs (+/-) | | • | | | | | | | | | | |
| Reactive Energy in 4 tarifs (+/-) | | • | | | | | | | | | | |
| Total initegration time (15min) | | • | | | | | | | | | | |
| Voltage phase-neutral | • | • | • | • | • | • | • | • | • | • | • | • |
| Voltage phase-phase | • | • | | | • | • | • | • | • | • | • | • |
| Medium phase voltage | • | | | | • | • | • | | | | | |
| Current (direct insertion) | | | • | | | | | | | | | |
| Current (insertion by CT) | • | • | | • | • | • | • | • | • | • | • | • |
| Current on neutral | | | | | • | • | • | | | | | |
| Power Factor | • | • | • | • | • | • | • | | | | | |
| Total equivalent Power Factor | • | • | | | • | • | • | | | • | • | • |
| Apparent Power | • | • | | | • | • | • | | | | | |
| Total Apparent Power | • | • | | • | • | • | • | | | • | • | • |
| Active Power (+/-) | • | • | • | • | • | • | • | | | | | |
| Total Active Power (+/-) | • | • | | | • | • | • | | | • | • | • |
| Reactive Power | • | • | | | • | • | • | | | | | |
| Total Reactive Power | • | • | | | • | • | • | | | • | • | • |
| Frequency | • | • | | • | • | • | • | | | • | • | • |
| Total Active Energy (import) resettable | • | | • | • | • | • | • | | | • | • | • |
| Relative Active Energy | | | | | | | | | | • | • | • |
| Total Active Energy (export) resettable | • | | | | • | • | • | | | | | |
| Total Reactive Energy resettable | • | | | • | • | • | • | | | • | • | • |
| Total working hours | • | | | | • | • | • | | | • | • | • |
| Partial working hours resettable | • | | • | • | • | • | • | | | • | • | • |
| Acoustic pre-alarm | | | • | | | | | | | | | |
| Phase sequence | • | | | | • | • | • | | | • | • | • |
| Phase-Neutral voltage asimmetry | • | | | | • | • | • | | | | | |
| **OUTPUT RELAY** | 2 | | 1 | 1 | | | | | 2 | | 2 | |
| **PROTOCOLL MODBUS SLAVE RTU** | RS485 | | | | | | RS485 | | | | | RS485 |
| **BLUETOOTH ACCESS (max 10 meters - Class 2)** Baude rate 115200 | | | | | | | | | | | | |
| **PERMANENT MEMORY** (EEPROM) | • | | | | | | | | | | | |
| **400V insertion,** 3 or 4 wires, 2 or 3 systems **(H1)** | • | | | | | | | | | | | |
| **VT..../100V,** 3 or 4 wires, 2 or 3 systems (0...9,9kV) **(H2)** | • | | | | | | | | | | | |
| **VT..../100V,** 3 or 4 wires, 2 or 3 systems (10...100kV) **(H3)** | • | | | | | | | | | | | |
| **Software on www.revalco.it** | • | • | | | | | • | | | | | • |
| Option **ETHERNET** or **PROFIBUS** | • | | | | | | | | | | | |
| Dimensions in mm | 96x96 | 8 DIN / 96x96 | 2 DIN | | 2 DIN | 72x72 | | 6 DIN e 96x96 | | | | |

# TABLE

## MULTIFUNCTION METERS

### THREE PHASE AND D.C. VERSIONS





| 1RANM6CS485<br>2RAN96CS485 | 1RANM6C232 | 1RAEM | 1RAEMC | 1RAEMCS | 1RAEMC485 | 1RAEMCS485 | 1RAEMBL485 | 1RAEM4C | 1RAEM4CS | 1RAEM4C485 | 1RAEM4CS485 | 1RAEM4C485DC | 1RAEM4C485DCH | 1RAEM63CS | 2RAE96L4C<br>2RAE72L4C | 2RAE96L4CS | 2RAE96L4C485<br>2RAE72L4C485 | 2RAE96L4CS485 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| • | • | • | • | • | • | • | • | • | • | • | • | | | • | • | • | • | • |
| | | • | • | • | • | • | • | | | | | | | | • | • | • | • |
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| • | • | • | • | • | • | • | • | • | • | • | • | | | | • | • | • | • |
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| 2 | 2 | | | 2 | | 2 | 2 | | 1 | | 1 | | | 1 | | 2 | | 2 |
| RS485 | RS232 | | | | RS485 | RS485 | | | | RS485 | RS485 | • | • | | | | RS485 | RS485 |
| | | | | | | | • | | | | | | | | | | | |
| | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | | | | | | | | | | | | | | | • 96x96 | | | • |
| | | | | | | | | | | | | | | | • 96x96 | | | • |
| | | | | | | | | | | | | | | | • 96x96 | | | • |
| • | • | | | | • | • | • | | | • | • | • | • | | | | • | • |
| | | | | | | | | | | | | | | | | | • 96x96 | • |
| | 6 DIN | | 6 DIN e 96x96 | | | | | | 4 DIN | | | | | | 72x72 e 96x96 | | | 96x96 |

# NETWORK ANALYSERS PLU-TO

## GENERAL DESCRIPTION


- Voltage input: 400V or insertion VT.../100V; 3 or 4 wires; 2 or 3 systems (end scale value 0...9,9kV and 10...100kV)
- Current input 5A
- Serial communication: RS 485
- Class: 0,5%
- Outputs: 2, by N.O. reed relays 0,5A/100V
- Power supply: 230V ± 10%
- Protocoll: MODBUS SLAVE RTU
- Memory EEPROM 2kbyte
- Dimensions: 96x96 mm

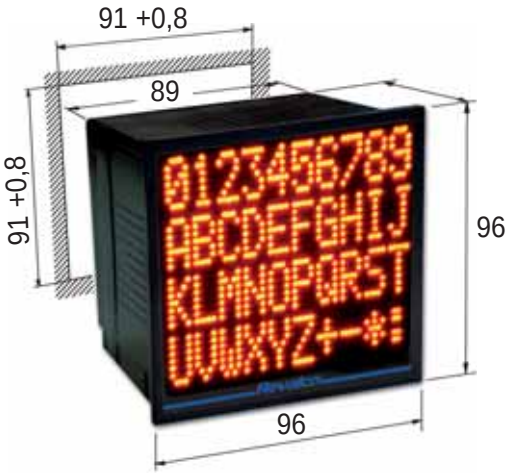
PLUS-TOP RANGE

***Preliminary range***
***Contact REVALCO for delivery time information***

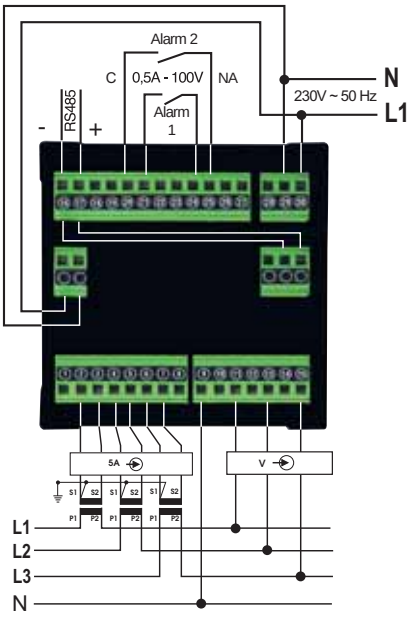
**Electrical parameters**

- Voltage (RMS) phase-neutral, Voltage (RMS) phase-phase, Current (RMS), Active Power, Reactive Power, Frequency, Apparent Power, Power Factor, Total Active Power, Total Reactive Power, Total Apparent Power, Total Power Factor, Total harmonic distorsion, Total Active Energy (import), Total Active Energy (export), Total Reactive Energy, Total hourmeter, Partial hourmeter, Sequence of phases, Voltage Asimmetry (phase-neutral)

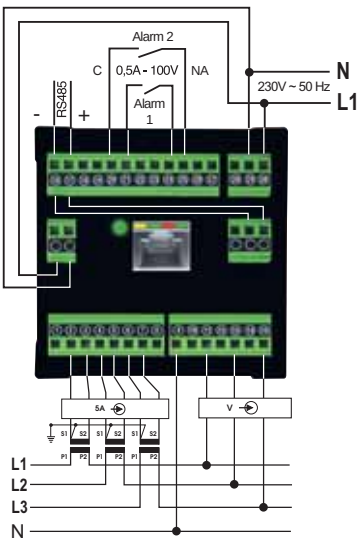
## DIMENSIONS



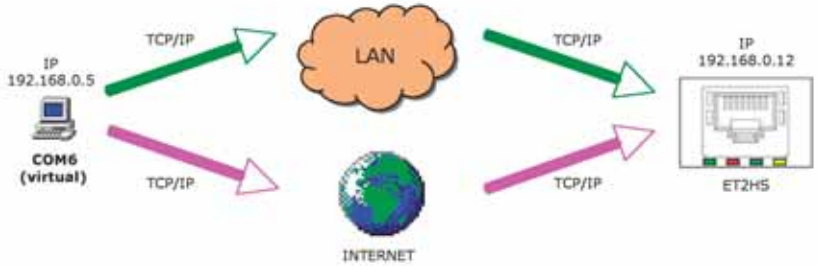

## CONNECTION DIAGRAMS



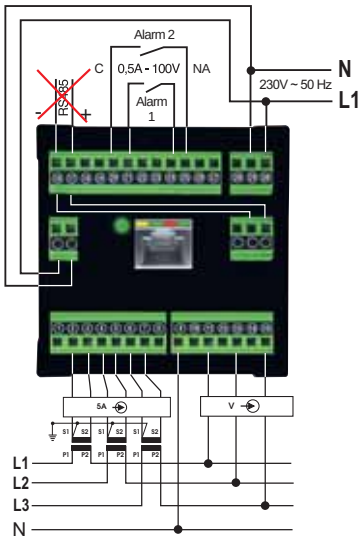

## ETHERNET OPTION - TYPE ETH2S FROM SERIAL TRANSDUCER



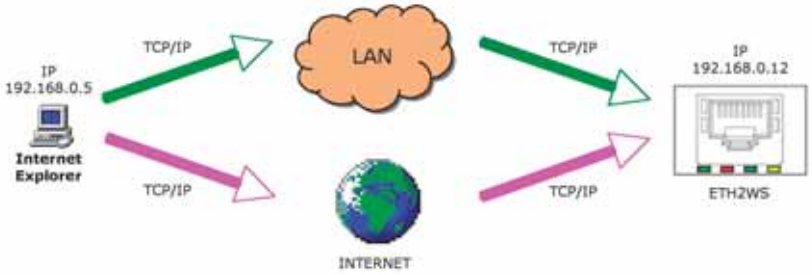

- PCB provided by an embedded RJ45 Ethernet socket and software
- Installing the software on a PC it is possible to have a series of tools which permit, passing through the Ethernet net (LAN or Internet), to establish together with the instrument a connection similar to a COM port (standard communications port) generated in virtual way, taking advantage as signal transport by the TCP/IP protocol.
- Hardware characteristics:
  - Transmission speed from 150 to 115.200 baud
  - Standard Ethernet socket RJ45
  - Ethernet port speed: 10/100 Mbit
  - Working situation controlled by 4 diagnostic leds
  - Ethernet port galvanically insulated
  - Not powered by the Ethernet cable or by the data net
  - Supports (without virtual COM port) UDP, ICMP(ping) and DHCP protocols
  - Working temperature: from -5°C to 55°C
- In particular way, after the connection of instrument to the net, the software permits to:
  - To assign an univocal IP address ( example: 192.168.0.12)
  - Starting from IP address, to generate o PC a virtual port “COMx” (example: COM6) to which refer using the forms of this hardware. Every supervision software (SCADA or other) which dispose of Modbus RTU communication protocol will be able to converse with this device through this port avoiding the TCP/IP translation but under the condition that the device be reachable in the net (Intranet or Internet) by its IP (example by its address ping)
- ORDER EXAMPLE:
  PLU-TOETH2S



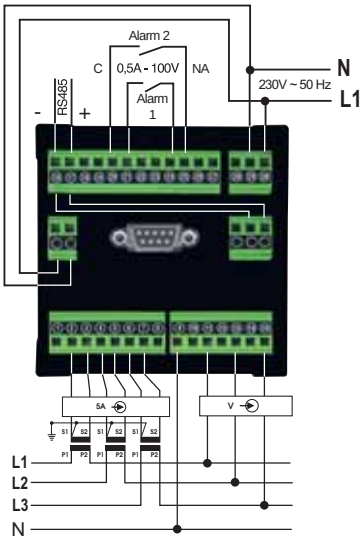
## ETHERNET OPTION - TYPE ETH2WS FROM WEB SERVER




- PCB provided by an embedded RJ45 Ethernet socket and software which permits under a request by a normal browser ( example Internet Explorer) to enter in a Web server organized in web pages (HTML)
- Hardware characteristics:
  - Standard Ethernet socket RJ45
  - Ethernet port speed: 10/100 Mbit
  - Working situation controlled by 4 diagnostic leds
  - Ethernet port galvanically insulated
  - Not powered by the Ethernet cable or by the data net
  - Working temperature: from -5°C to 55°C
- In particular way, after the connection of instrument to the net, the software permits to:
  - To assign an univocal IP address ( example: 192.168.0.12)
  - To assign an alphanumerical name to the product (example Substation SUD)
  - Enter to a Web server like a normal internet site simply dialling its IP address in a browser ( example: Internet Explorer). In a simply graphic form (table) the main measures will be shown
  - Up to 8 contemporaneous sessions (8 different users contemporary connected)
  - Connect to this device through its IP but under the condition that the device be rea chable in the net (Intranet or Internet) (example by its address ping)
- ORDER EXAMPLE:
  PLU-TOETH2WS



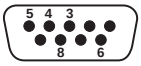

## PROFIBUS OPTION – TYPE PROF




- ORDER EXAMPLE:
  PLU-TOPROF

| DB9F PROFIBUS CONNECTOR | |
|---|---|
| **Pin** | **Signal** |
| 1 | |
| 2 | |
| 3 | Line B |
| 4 | RTS |
| 5 | GND BUS (Insulated) |
| 6 | +5V BUS (Insulated output max 100mA) |
| 7 | |
| 8 | Line A |
| 9 | |

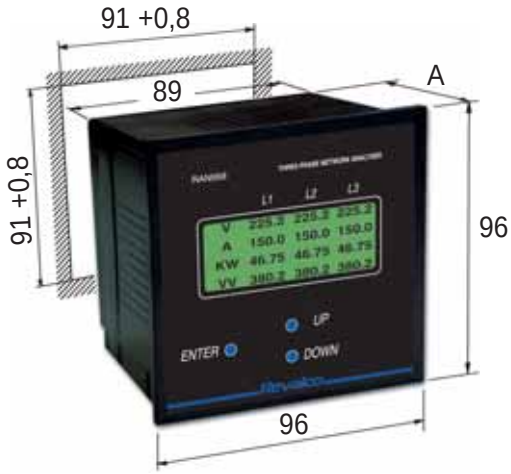
**PC side**



# NETWORK ANALYSERS 1RANM8 / 2RAN968

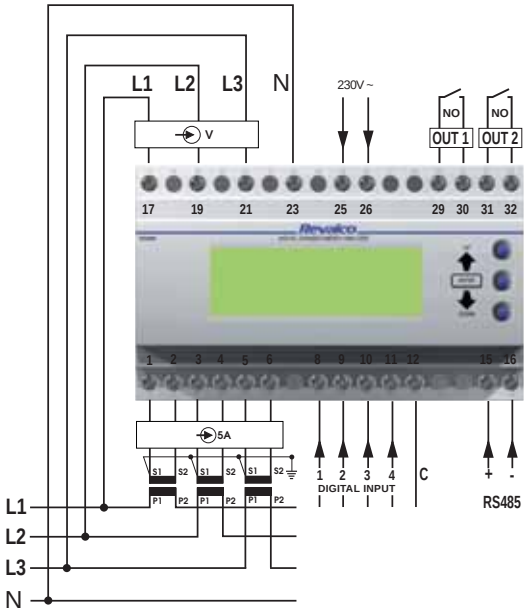
## DIMENSIONS in mm

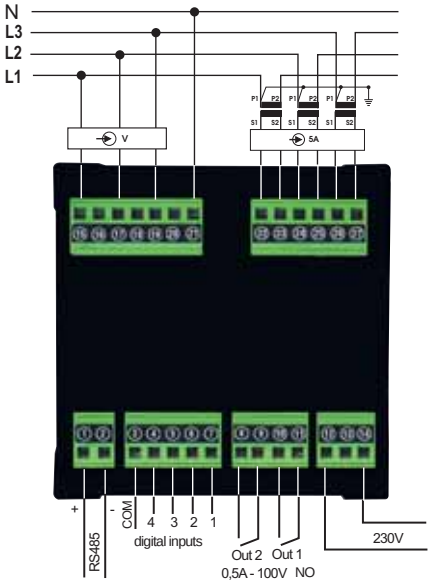

The 140 mm dimensions correspond to 8 DIN modules
Weight: 0,61 Kg




A = 97,3 without terminals cover; A = 116,5 with terminals cover
Weight: 0,55 kg

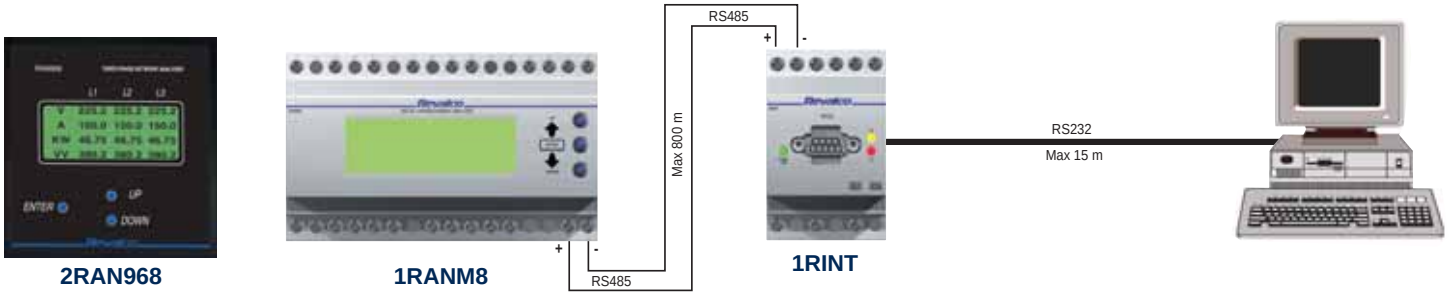
## CONNECTION DIAGRAMS



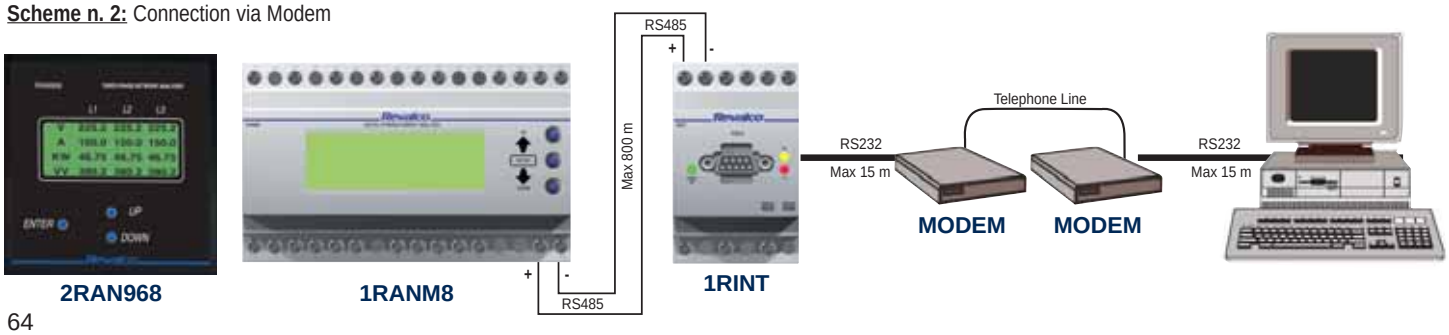




## SERIAL COMMUNICATION

**Scheme n. 1:** Connection between instruments and PC for distances up to 800m




**Scheme n. 2:** Connection via Modem



## GENERAL DESCRIPTION

Electronic instrument expressly developed to measure and control several electrical parameters in a threephase system of : Voltages, Currents, Power, Integrated Power, Frequency, Power factor, Crest factor and distorsion of the harmonic waves of voltage and current.
The selection of these parameters and the Network settings are made easy by the use of only three shift keys..

The instrument is convenient to use expecially for :

- Monitoring the energy consumption and the condition of the installed devices
- Use in automation systems and process control
- Management of the energy costs, related to the real consumption
- Control of the over power and/or optimising the use of the devices combined with PLC or PC

All the measured values are visible on the analyser's display or furnished to the above remote displays by a serial interface RS 485 (except the harmonic waves).

| **Electrical parameters** | **Measured values** | | **Computed values** | |
|---|---|---|---|---|
| - Voltage (RMS) phase-neutral | V1-V2-V3 | (V) | | |
| - Voltage (RMS) phase-phase | V1-V2-V3 | (VV) | | |
| - Current (RMS) | I1 - I2 - I3 | (A) | | |
| - Active Power | P1-P2-P3 | (W) | | |
| - Reactive Power | Q1-Q2-Q3 | (VAR) | | |
| - Frequency | F | (Hz) | | |
| - Apparent Power | | | S1-S2-S3 | (VA) |
| - Power Factor | | | Pf1-Pf2-Pf3 | (cos φ) |
| - Total Active Power | | | Pt | (W) |
| - Total Reactive Power | | | Qt | (VAR) |
| - Total Apparent Power | | | St | (VA) |
| - Total Power Factor | | | Pft | (cos φ) |
| - Harmonic distorsion (numerical and graphic) | | | 3xV - 3xI | (h1...h15%) |
| - Total harmonic distorsion | | | 3xVthd - 3xIthd | (%) |
| - Voltage crest factor | | | 3xVcrs | |
| - Current crest factor | | | 3xIcrs | |
| - Active Energy in 4 tarifs (positive and negative) | | | | (kWhr) |
| - Reactive Energy in 4 tarifs (positive and negative) | | | | (kVARhr) |

The above unit measurements change automatically in relation to the voltage and current ratio's in use

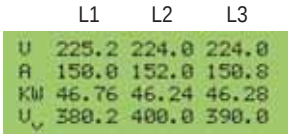
- **The software is available, free of charge, on our internet address www.revalco.it**

## TECHNICAL CHARACTERISTICS

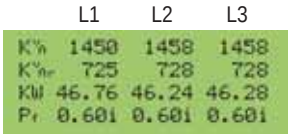
| | |
|---|---|
| - **DISPLAY** | LCD back illuminated, high performance,4 lines x 20 columns with Alfa numerical characters, FFT semigraphic<br>Working display time 100,000 h |
| - **TEST VOLTAGE** | 2 kV at 50Hz for 1 minute (1 kV for the measuring circuit) |
| - **POWER SUPPLY** | 230V +/- 10% 50/60Hz (others on request) |
| - **WORKING TEMPERATURE** | 0°C...+ 50°C |
| - **STORAGE TEMPERATURE** | - 20°C...+ 80°C |
| - **FRONT PROTECTION DEGREE** | IP 40 |
| - **TERMINALS PROTECTION DEGREE** | IP 20 |
| - **CONSUMPTION** | 5 VA |
| - **STANDARDS** | EN 50082-2/1994 |
| - **PROTOCOLL** | MODBUS SLAVE RTU |
| - **MEMORY** | EEPROM 2 kbyte |
| - **CLASS** | 0,5% for voltages phase-neutral and currents<br>1,5% for voltages phase-phase<br>0,3% for frequency<br>1% other parameters ±2 digit |
| - **MEASUREMENT METHOD** | 128 scannings/period, scanning time 20 msec elaboration included (FFT 3 sec) |
| - **SERIAL COMMUNICATION** | RS 485 (2 wires opto insulated) present on the analyser with the possibility of 255 address monitoring |
| - **VOLTAGE INPUT** | three inputs between 0..150V - 0..300V - 0..500V end scale<br>(for inputs 100V by means voltage transformer, select 150V) |
| - **CURRENT INPUT** | 5A RMS with possibility to choose the current transformer up to 10.000/5A |
| - **INPUTS** | 4, optoinsulated used for to count external impulses. Voltage from 10 to 30 VDC |
| - **OUTPUTS** | 2, by N.O. reed relays 0,5A/100V |

Powering the instrument; words Revalco, actual version and a description of the analyser appear on the display; after few seconds the instrument changes to the main page. Display selection and programming of the various parameters are achieved by operation of 3 shift keys UP (next) - DOWN (previous) - ENTER (variations of the parameters)
Press ENTER to illuminate the display.

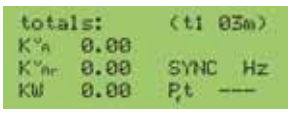
First page shows phase-neutral Voltage, Current, Active Power, phase-phase Voltage on the three phases



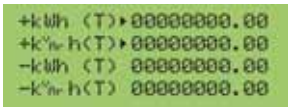

By pressing UP, second page appears which shows the Apparent Reactive and Active Power, Power Factor



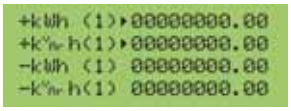

By pressing UP again you can see the third page which shows the total values of Power, Real Factor Power, and Frequency. “tx” shows the actual tariff of energy (t1, t2...) and the remaining time in the integration period. The peack values IPM and IPL are showed on fifth subpage




By pressing UP again fourth page appears showing the total values, import or export of Active and Reactive energy.
The arrows indicate the actual function of the analyser.

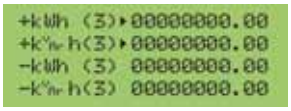



By pressing ENTER you can see the first subpage which shows the values of the Active/Reactive Energy of 1st tariff’s meter

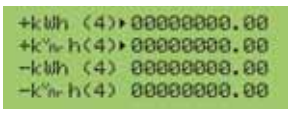



By pressing ENTER again you can see the second subpage which shows the values of the Active/Reactive Energy of the 2nd tariff’s meter

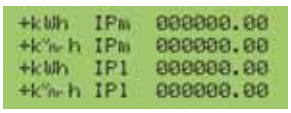

By pressing ENTER again you can see the third subpage which shows the values of the Active/Reactive Energy of the 3rd tariff’s meter



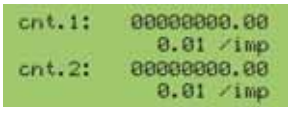

By pressing ENTER again you can see the fourth subpage which shows the values of the Active/Reactive energy of the 4th tariff’s meter




By pressing ENTER again you can see the fifth subpage which shows the actual peak values(IPM) and previous (IPL), integrated in the fixed time 15 min, of the Active/Reactive Energy.

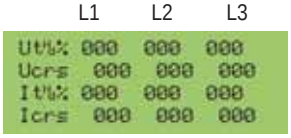



By pressing ENTER again you can see the sixth subpage which shows the registered values on two digital inputs (when connected), number of counting and “weight” of impulses




By pressing ENTER again you return to the fourth page,

By pressing UP fifth page appears showing the total harmonic distorsions waves and the crest values of Voltage and Current, of the three phases

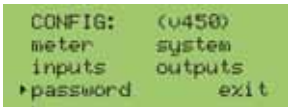



By pressing UP again sixth and last page appears showing in a numeric and graphic way, the distortion untill the fifthteenth harmonic wave


By pressing ENTER the waves to control change (h1, h2, h3....h15), while pressing ENTER for 2 seconds, the parameter to which you wish to control the distorsion of the harmonic waves (V1..I1..V2..I2..V3..I3) changes.

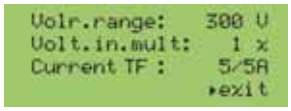
# CONFIGURATION SELECTION MENU

By pressing UP and DOWN at the same time ( more than 5 sec) you can have the following **configuration selection menu**:




by pressing ENTER you change the position of the arrow on the display, to choose the screen on which the display is shown

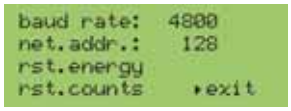
Choosing **Meter** and pressing UP, the following screen appears :




> volt range: by pressing UP or DOWN you select the input voltage between 150V, 300V or 600V (these are the ranges ; if you have 100V input choose 150V)
> volt in mult: by pressing UP or DOWN you select the multiplication factor from 1x to 240x for input 150V, from 1x to 120x for input 300V, from 1x to 70x for input 500V
> current range: by pressing UP or DOWN you select the primary current of the transformer, from 5A to 10.000A (the variation occurs 5A by 5A)
> exit : by pressing UP or DOWN you return to the CONFIG menù

To change the existing values and move the arrow, it is necessary to be in the CONFIG menù, move the arrow on >Password, press UP or DOWN to see > Password :_ _ _ _ on the display ; now press in sequence UP-UP-DOWN-UP untill you see **>New Password**. By pressing ENTER it is now possible move the arrow, while going in " Meter" and by pressing UP or DOWN it is now possible to change the values

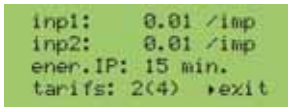
Choosing **System** and by pressing UP, the following screen appears :



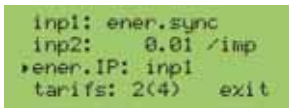

> baud rate : by pressing UP or DOWN you can change the transmission speed (bit/sec) between 1200, 2400, 4800 or 9600 baud
> net addr : by pressing UP or DOWN you can choose the address n°, from 1 to 255
> rst energy : by pressing UP or DOWN you can cancell the memorised energy values., while by pressing ENTER you see > rst IPmax and by pressing UP or DOWN you reset the actual peak value on the fifth subpage (IPM)
> rst counts : by pressing UP or DOWN you reset the totals of the counters connected to the digital inputs
> exit : by pressing UP or DOWN you return to the CONFIG menu

To change the existing values and move the arrow, it is necessary to select as explained before entering in "System" screen

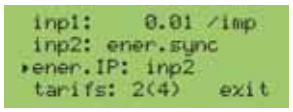
Choosing **Inputs** and pressing UP the following screen appears :



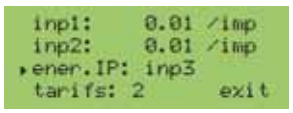

> inp.1 : by pressing UP or DOWN you change the "number" of the impulses on the digital input n° 1
> inp.2 : by pressing UP or DOWN you change the "number" of the impulses on the digital input n° 2
> ener IP : shows the integration time (fixed) of the totals, while by pressing UP you see the synchronisation's scren of the input n°1




by pressing UP again you see the synchronisation's screen of the input n° 2




by presssing UP again you can have the possible use of input n° 3 (only available when 2 tarifs are choosen. Infact with 4 tarifs, the inputs 3 and 4 are engaged)

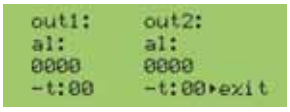



> tarifs : by pressing UP or DOWN you change the tarif"s n° ; 2 or 4 (on the screen with "ener IP 15 min" only)
> exit : by pressing UP or DOWN you return to the CONFIG menù

Choosing **Outputs** and by pressing UP you see the following screen:


By pressing ENTER the following screen appears:


By pressing UP the following screen appears:




> out 1/out 2 : by pressing UP or DOWN you choose the alarm type (< min or > max)
> al : by pressing UP or DOWN you choose the parameters for which you want the alarm option (always ON-always OFF-Pft-Hz-Vx-V3-V2-V1-Ix-I3-I2-I1-Qt-Pt-pl kVARh-pl kWh)
> 000 : by pressing UP or DOWN you change the numerical value of the alarm
> -t : by pressing UP or DOWN you change the delay's alarm (0....15 sec)
> exit : by pressing UP or DOWN you return to the CONFIG menù

To change the existing values and move the arrow, it is necessary to select as explained before, entering in "outputs" screen

Choosing **Password** you have already saw how to change the values into the various screens, and move the arrow pressing in sequence : UP-UP-DOWN-UP
You can also enter a secret, personalised password that **must have absolutely a different sequence respect to those already mentioned above**

**How to enter the personalised password :**
In the CONFIG " menù", move the arrow to > Password
press UP or DOWN for to see > Password :_ _ _ _
press in sequence UP-UP-DOWN-UP untill appears : > New password :_ _ _ _
enter now the new sequence, **(different from the previous)**
the word "repeat _ _ _ _" appears, now repeat the sequence selected and the new password is memorised.

To exit from the CONFIG menù, move the arrow to the > exit, then press UP

# LED MULTIFUNCTION METERS - TRUE RMS

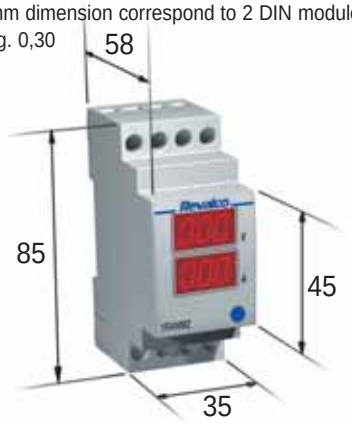
## SINGLE PHASE


1RANM2 1RANM2CT

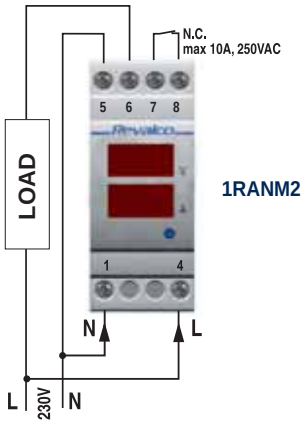
- Two display 3 digit each
- Easy and immediate reading without possible incomprehensions or further elaborations.
- The use of one button only permits to change the measurements pages in natural way.
- During the program phase, the instrument shows the different possibilities present in the device, so it is not necessary to have in hands the user's manual all the time.
- The "power supply" page can be used in all the cases on which is important **the information of "power supply loss"** (e.g. in refrigerating machines and/or cold storage).
- The 2 modules dimension is the right compromise between the necessity to reduce the space and a good readability of measurements that it is one off the main scope in an electrical net.
- The possibility to reset the energy and contemporary the hour/minutes value permits, in easy way, to see the relative consumption in a fixed time.
- **1RANM2 model is usable as priority relay 16A**

## DIMENSIONS in mm

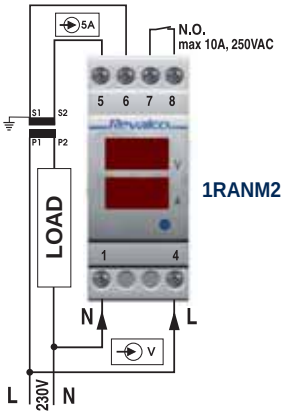
The 35 mm dimension correspond to 2 DIN modules
Weight kg. 0,30




## CONNECTION DIAGRAMS




1RANM2




1RANM2CT

## TECHNICAL CHARACTERISTICS

| | | 1RANM2 | 1RANM2CT |
|---|---|---|---|
| - **PARAMETERS** | | | |
| - Ph-N voltage | V | ● | ● |
| - Current (direct connection) | A | ● | |
| - Current (connection by means of C.T.) | A | | ● |
| - Power factor | ind/cap | ● | ● |
| - Apparent power | PVA | | ● |
| - Active power | PW | ● | ● |
| - Reactive power | Pvar | | ● |
| - Frequency | Hz | | ● |
| - Active Energy (resettable capacity) | kW/h | ● | ● |
| - Reactive Energy (resettable capacity) | kvar/h | | ● |
| - Partial working time (resettable capacity) | hh | ● | ● |
| - Acoustical pre-alarm | | ● | |
| - **OUTPUT RELAYS** (contact 250V-2500W) selectable on principal measures (V-A-Hz-Pw) | | **N.C.16A** | **N.O. 10A** |

**Auxiliary power supply**
- nominal value U AUX: 230V 50/60 Hz
- range: 0.9...1.1 UAUX
- max absorbed power: 2 VA

**Input voltmeter circuit**: Ph-N voltage
- direct insertion (Ph-N): max 300 V
- permanent overload: 120%
- thermic overload (1 s): 150%
- input impedance of voltmeter circuit: 1,5MΩ Ph-N

**Input ammeter circuit**
- current: direct insertion: max 32A
  insertion by means of C.T.: 5A
- permanent overload: 120%
- thermic overload (1 s): 200%
- range adjustment, CT ratio: 5...999

**Voltage measurement range**
- VLN measurement range (voltage phase, direct insertion) 0...250 V
- accuracy class: 0.5% f.s ± 2 digit

**Current Measurement range:**
- measurement range:
  direct insertion: 0,1...26A
  accuracy class on range 0,1... 26A: 0.5% f.s ± 2 digit
- measurement range:
  insertion by means of C.T.: 0,05...5A
  accuracy class on range 0,05...5 A: 0.5% f.s ± 2 digit

**Frequency Measurement range:**
- nominal value: 50/60Hz
- range: 45...65 Hz
- accuracy class: 0.3% vm ± 1 digit
- response time: < 300mS

**Active Power**
- range: direct insertion: 8 kW
  insertion by means of C.T.: 500 kW
- accuracy class: 1% f.s ± 2 digit

**Reactive Power**
- range: 250 kvar
- accuracy class: 1% f.s ± 2 digit

**Apparent Power**
- range: 250 kVA
- accuracy class: 1% f.s ± 2 digit

**Active Energy (Wh)**
- resettable visualization: Two separate
- calculating period: 15 minutes
- energy counting: direct insertion: 9,99 / 999 kWh
  insertion by means of C.T.: 9,99 / 999 kWh
- accuracy class with current 0,05...1.0 In: 2% fs ± 2 digit

**Reactive Energy (varh)**
- energy counting resettable 9,99 / 999 kvarh
- calculating period 15 minutes
- accuracy class with current 0.05...1.0 In 2% fs ± 2 digit

**Power Factor**
- range cosφ 0...1...0
- accuracy class with current 0.1...1.0 In and voltage 0.8...1.2 Un 2% fs ± 2 digit

**Working time**
- Partial working time hh:mm (from previous reset)

**Digital filter**
- Average 1...15

**Compatible current transformers**
- Nominal current 5 A
- Ratio 1...200

**Visualization**
- display 2 numerical lines
- number of characters 6 on two lines
- colour RED

**Mechanical characteristics**
- mounting on DIN rail DIN50022
- protection IP20/ frontal IP30

**Electrical characteristics, options** Galvanic insulation
- alarm relay coil-contact 3kV

**Relay characteristics (1RANM2)**
- **N.C.** contact maxV....maxI....maxP 250VAC,**16A** (resistive load), 2500W

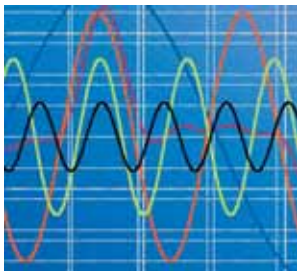
**Relay characteristics (1RANM2CT)**
- **N.O.** contact maxV....maxI....maxP 250VAC,**10A** (resistive load), 2500W

**When loads more than 10A are present, it is necessary to use (relays) auxiliary contactors**

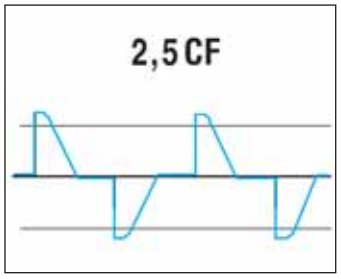
**Environment conditions**
Ambient temperature:
- nominal temperature 0...+45 °C
- range -5...+55 °C
- storage temperature -10...+70 °C
- humidity 10...95 %
- atmospheric pressure 70...110 kPa

**Standards CEI**
- Safety CEI EN 61010-1 300V CAT III
- Accuracy class CEI EN 60688
- Electromagnetic compatibility (immunity) CEI EN 61000-6-2 (ex EN 50082-2)
- Electromagnetic compatibility (emission) CEI EN 61000-6-4 (ex EN 50081-2)
- Protection IP CEI EN 60529

## MEASUREMENT'S TYPOLOGY



True RMS up to the 20th harmonic wave

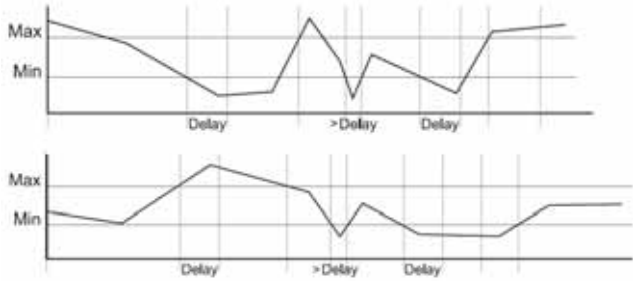



Crest factor up to 2,5 (Voltage and Current)

## ALARM RELAYS

One relay with normally closed or normally open contact.
Possibility to set the interventation threshold:
- "Hi" more of .... (>) and "Lo" less of... (<)
- delayed to the excitation " _ - ¯ " or to the disexcitation " ¯ - _ "

MEASURE'S CHANEL TO WHICH THE THRESHOLD IS REFERRED:
- min or max line Voltage
- min or max line Current
- min or max Frequency (1RANM2CT only)
- min or max Active Power




**USABLE AS:**
- **motor protection**
- **overload**
- **low consumption**
- **not presence of phase**
- **priority relay**
- **anomaly of frequency**
- **high consumption**
- **min voltage**

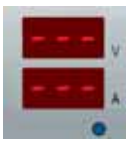
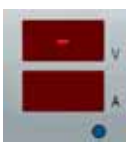
## 1RANM2

- Single phase multifunction meter direct insertion, 230V - 26A (usable on domestic homes and low loads)
- Instrument furnished already calibrated with the following data:
  selected cource = ACTIVE POWER
  maximum threshold = 4,0 kW
  acoustic alarm = 8 sec
  time isteresis = 10 min

## 1RANM2CT

Single phase multifunction meter by means of CT, 230V - from 5A to 1000/5A (for industrial use)

OPERATION: Measurements displaing.
The measurements and signalling pages which appear (pushing and releasing the frontal button) are the following:

| PUSHED BUTTON | RELEASED | DESCRIPTION |
|---|---|---|
| |  | This FLASHING signal appears only if:<br>- this page is selected as "default page" (see the correspondent configuration chapter) and the instruments is just light-on or if the auxiliary supply failed, immediately light-on or the parameters configuration is finished.<br>After the changement of this page, it disappears from the selection pages. |
|  "Blank" page |  | This page is selected in case of the display's light is extremely high; selectable as "default page" also.<br>The sole line light-on, means that the device is in any case working. |
|  voltage / current |  | On the upper line the value of the voltage (V) is displayed.<br>On the downer line the value of the current (A) is displayed. |

On the upper line the value of the voltage (V) is displayed.
On the downer line the value of the current (A) is displayed.
The decimal point is in function of the selected CT value.
100/5A = 99.9 indication
over 100/5A = 999 indication

| PUSHED BUTTON | RELEASED | DESCRIPTION |
|---|---|---|
|  frequency |  | On the downer line the value of the frequency (Hz) is displayed with one decimal resolution |
|  active power |  | On the downer line the value of the Active Power (kW) is displayed.<br>1RANM2 model has always the centesimal resolution (<9,99 kW max)<br>Active Power can be POSITIVE or NEGATIVE depending by the sense of the current.<br>If a red point (in the lower part of the extreme right) is light-on, it means that the value is NEGATIVE.<br>**It is necessary to verify the corrent insertion of the instruments.** |
|  power factor |  | Power Factor (Cos φ).<br>It is the Phase displacement between voltage and current.<br>When the showed value is 1,00 PF indication means that the phase displacement is ZERO (not capacitive or inductive but resistive only). |
| |  | Phase displacement is POSITIVE (current is delayed to the voltage = Inductive). |
| |  | Phase displacement is NEGATIVE (voltage is delayed to the current = Capacitive).<br>**It is necessary to verify the corrent insertion of the instruments.** |
|  reactive power |  | On the downer line the value of the Reactive Power (kvar) is displayed, with or without decimal points (decimal or centesimal resolution). The Reactive Power can be POSITIVE or NEGATIVE like the Power Factor (Cos φ).<br>If a red point (in the lower part of the extreme right) is light-on, it means that the value is NEGATIVE. **It is necessary to verify the corrent insertion of the instruments.** |
|  apparent power |  | On the downer line the value of the Apparent Power (kVA) is displayed, with or without decimal points (decimal or centesimal resolution).<br>Apparent Power is always positive (Vrms x Irms). |
|  active energy |  | On the entire display the Active Energy (kWh positive and/or negative) value appears, 6 numbers.<br>The example shows 134.261 kWh.<br>To grant long duration of the instrument's memory, automatic backup is effected every 15 minutes.<br>**If the instrument is light-off, the sum related to the last 15 minutes can be losed.** ⚠<br>The sum can be resetted by a long pressure of the frontal button. The value starts to flash, and after few seconds the numbers show permanentely ZERO. |
|  reactive energy |  | On the entire display the Reactive Energy (kvarh positive and/or negative) value appears, 6 numbers. The example shows 1583 kvarh. To grant long duration of the instrument's memory, automatic backup is effected every 15 minutes.<br>⚠ **If the instrument is light-off, the sum related to the last 15 minutes can be lossed.**<br>The sum can be resetted by a long pressure of the frontal button. The value starts to flash, and after few seconds the numbers show permanentely ZERO. |
|  partial hour-counter |  | On the entire display the Partial Hour-counter(hh) appears, 6 numbers.<br>The example shows 4.320 hours from the last zeroing.<br>To grant long duration of the instrument's memory, automatic backup is effected every 15 minutes.<br>**If the instrument is light-off, the sum related to the last 15 minutes can be losed.** ⚠<br>The sum can be resetted by a long pressure of the frontal button. The value starts to flash, and after few seconds the numbers show permanentely ZERO. |

| PUSHED BUTTON | RELEASED | DESCRIPTION |
|---|---|---|
|  |  | Situation of output relay<br>Off = rest relay (closed contact), **this situation is present with light-off instrument** |
| |  | On = Active relay (open contact)<br><br>Note: all the pages flash during the interventation of threshold<br>The showed light point shows that the interventation condition is present.<br>This point light-on on all the other pages too. |

output situation

- The activation of relay is evidenced by the display's flash, every page is displayed.
  The threshold intervention can be delayed during the configuration phase.
  The immediate overpassing of the selected value is displayed by the presence of a red point situated on the extreme right of the upper diplay, contemporary an acoustic alarm (pre-alarm) is emitted. This acoustic signal continue until the interventation of the relay.

  **The acoustic alarm is always inhibited within the firts 10 seconds starting from the powering of the device.** ⚠

1RANM2 | 1RANM2CT

PROGRAMMING: Make a long pressure (4 seconds about) on the frontal button staying in a page where the reset of parameter is not allowed.
So not on the pages of Energy and Hour-counter.

The following page appears: the flashing point means that it is possible now the configuration.

After 4 seconds the pages with configuration parameters start to be displayed; one page every 4 seconds showing the actual selected value.
If it is necessary to see the values without any modification don't touch nothing until the automatic end of the showed pages.

To change the values of parameters, it is enough to press the button while this parameter is displayed.
The value change immediately and closed to him a flashing point appears meaning that the value is in modification phase.
To fast forward maintain pressure on the front button. When the needed value is displayed release the button and after 4 seconds the further parameter appears, the modified value is automatically saved permanentely.

| DEFAULT PARAMETER | POSSIBLE VALUES | DESCRIPTION |
|---|---|---|
|  |  | Output will be activated when the value of selected measure will be HIGHER than the value of selected threshold (MAX THRESHOLD).<br>Default setting. |
| |  | Output will be activated when the value of selected measure will be LOWER than the value of selected threshold (MIN THRESHOLD). |
| |  | Output will be NEVER activated.<br>In this case, all the parameters related to the threshold CANNOT be displayed, so not settable |

threshold mode

| | | |
|---|---|---|
| **AVAILABLE IF tSh IS DIFFERENT FROM OFF ONLY**<br>  |  | The delay time will be applied to the ACTIVATION, the output light-off after the programmed delay time only.<br>(DELAYED TO THE EXCITATION). |
| |  | The delay time will be applied to the DEACTIVATION, the output light-off after the programmed delay time only.<br>(DELAYED TO THE DISEXCITATION). |

delay setting

| | | |
|---|---|---|
| **AVAILABLE IF tSh IS DIFFERENT FROM OFF ONLY**<br>  | VALUE<br>from 0 to 999 | It is the delayed value with which the alarm contact come back to the close situation after an eventual interventation.<br>It is particular usefull to avoid continuous interventations of the device.<br>Esxpressed in seconds.<br>Default setting = 600 |

delay

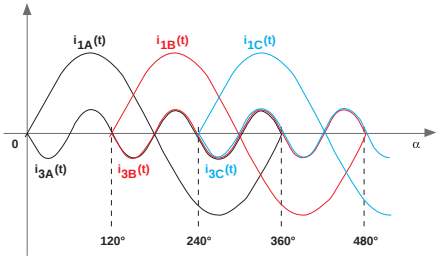
| DEFAULT PARAMETER | POSSIBLE VALUES | DESCRIPTION | |
|---|---|---|---|
| **AVAILABLE IF tSh IS DIFFERENT FROM OFF ONLY**<br>  <br>max sound duration | VALUE<br>from 0 to 255 | It is the delayed value with which the alarm contact works after the overpassing of the selected level.<br>This acoustic signal (pre-alarm) is always present together with the delay.<br>Default setting = 8 | |
| **AVAILABLE IF tSh IS DIFFE-RENT FROM OFF ONLY**<br>  <br>threshold source | |  VOLTAGE threshold.<br>  CURRENT threshold.<br>  ACTIVE POWER threshold.<br>Default setting. |  VOLTAGE threshold.<br>  CURRENT threshold.<br>  FREQUENCY threshold.<br>  ACTIVE POWER threshold. |
| **AVAILABLE IF tSh IS DIFFERENT FROM OFF ONLY**<br>  <br>threshold value | |  “Src” selected for VOLTAGE.<br>Selection range from 0 to 999 V without decimal points.<br>  “Src” selected for CURRENT.<br>Selection range from 0 to 99,9 A<br>  “Src” selected for ACTIVE POWER.<br>Selection range from 0 to 99,9 kW (decimal point depends by the Power value).<br>Default setting = 2,80 kW |  “Src” selected for VOLTAGE.<br>Selection range from 0 to 999 V without decimal points.<br>  A“Src” selected for CURRENT.<br>Selection range from 0 to 999 A with or without decimal point depending by the selected CT<br>  “Src” selected for FREQUENCY.<br>Selection range from 0 to 99,9 Hz with decimal point.<br>  “Src” selected for ACTIVE POWER.<br>Selection range from 0 to 99,9 kW (decimal point depends by the Power value). |
|  <br>average | VALUE<br>from 1 to 15 | It is the number (n) of single measures effected on the electrical parameter before it’s visualization on the display.<br>Practically it is the filter of the measure stabilization. The numbering rise up from 1 to 15; more higher is the selected number, more slow are the eventual variations of reading. This is valid for all the measured parameters. | |
|  <br>Default page | ONE OF THE AVAILABLE PAGES | Select the main page that you want to see after the initial powering of the instrument. | |
|  <br>current transformer secondary 5A | VALUE<br>from 5 to 999<br>every 5 steps | | Select the ratio .../5A of the current transformer. |

## THREE PHASE

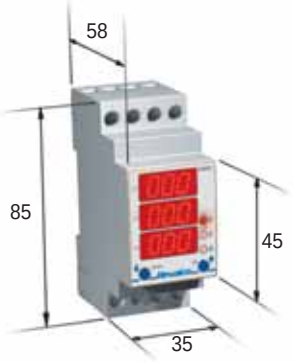
1RANM23

2RAN72C - 2RAN72C485

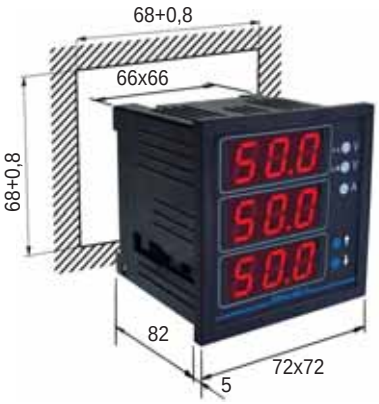
- 2 modules DIN (the smaller present on the market) is the best solution in order to save space on cabinets and in meantime to have a good readability of measures; main scope of multifunction meters in an electrical net.
- Nine red leds with high intensity on three lines, permit to show 3 measurements at the same time.
- Two buttons on front permit to change the measurement pages easily and in natural way.
- During the setting phase, the instrument shows the different possibilities present in the device; so it is not necessary to have in the hands the user's manual all the time.
- "Power supply" page can be used in all the cases on which is important the information of **"lost power supply"** (example in refrigerating machines and/or cold storage)
- The possibility to reset the energy consumption and time, permits to show in easy way the relative consumption in a certain time
- **Current on neutral wire:** meaning of $I_{unbalanced}$ measurement (unbalanced current). It is frequent now, also in normal distribution nets, the use of devices on which the load is not linear. With the scope to calculate correctly the neutral cable and to verify the correspondence with the project data, measurement of current on neutral ( or unbalanced current measure) become fundamental.
These loads absorb not sinusoidal currents, generating harmonic waves as consequence. Third harmonic waves and their multiples, in a 3phase system, are in phase between them constituting homopolar terns.
In a 4 wire systems these homopolar terns ($I_0$) makes an aritmetical sum and go along the neutral cable; as result the current on it is: $I_{no}=3*Io$. So, as example, a third harmonic component I3, present on 3 phases with amplitude 40% respect to the fundamental, causes on neutral a current higher than the fundamental (1,2*Inom)
It was in the past a rare situation. Current on neutral was caused principally by the unbalanced loads and the solution was to calculate the section of neutral cables equal or less to the phase cables section.
Now the standard CEI 64-8 art. 524.3, explain well that: neutral cable in multiphase circuits, on which the phase cables have section more than 16mm² (copper wire) or 25mm2 (aluminium cable), can have less section (min 16mm² or 25mm² in any case) on condition that the section supports the current present on neutral: **unbalanced current added of eventual harmonic waves**,
Our device 1RANM23 is able to measure this current.




## DIMENSIONS in mm

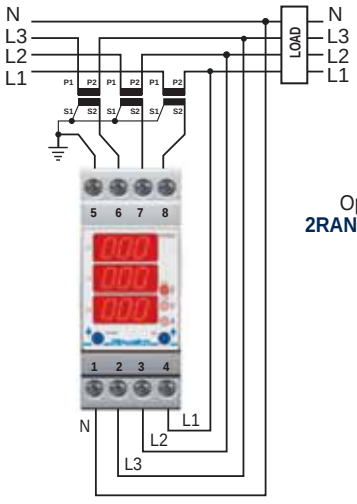



- 2 DIN modules
- Weight kg. 0,30

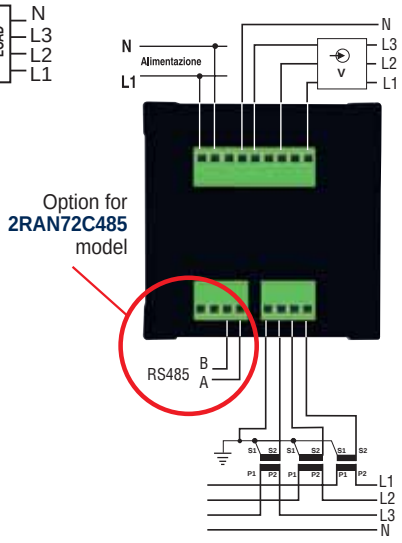



- Weight kg. 0,30

## CONNECTION DIAGRAMS




1RANM23




2RAN72C

## TECHNICAL CHARACTERISTICS

**PARAMETERS:**

| | |
|---|---|
| - Ph-Ph voltage | VL1, VL2, VL3 |
| - Ph-N voltage | VL1-N, VL2-N, VL3-N |
| - Medium voltage of phase | medium VL |
| - Phase current | I1, I2, I3 |
| - Medium current of phase | medium I |
| - Current on neutral | Iun (< unbalance >) |
| - Phase Active Power (+/-) | L1, L2, L3 |
| - Total Active Power (+/-) | Pw |
| - Phase Reactive Power | L1, L2, L3 |
| - Total Reactive Power | Pvar |
| - Phase Apparent Power | L1, L2, L3 |
| - Total Apparent Power | Pva |

| | |
|---|---|
| - Total Active Energy (import) | +kW/h* |
| - Total Active Energy(export) | -kW/h* |
| - Total Reactive Energy | kvar/h* |
| - Total and Partial working time | hh:mm* |
| - Phase Power Factor | ind/cap L1, L2, L3 |
| - Total Equivalent Power factor | Total ind/cap |
| - Frequency | Hz |
| - Sequence of phases | L1>L2>L3 (symbol only) |
| - Phase-neutral Asimmetry voltage | (>L1 L2 L3-N) - (<L1 L2 L3-N) |

*resettable parameters

**True RMS measurements reading up to 20th harmonic wave**

**Auxiliary power supply**
- nominal value U AUX: 230V 50/60 Hz selfsupplied
- range: 0.6...1.1 Uaux
- max absorbed power: 2 VA

**Input voltmeter circuit**: Ph-Ph voltage
- direct insertion: max 500 V
- permanent overload: 120%
- thermic overload (1 s): 150%
- input impedance: 2MΩ Ph-N/Ph-Ph

**Input ammeter circuit**: Current:
- nominal current: 5 A
- permanent overload: 120%
- thermic overload (1 s): 200%
- range adjustment, CT ratio: 5…1000

**Voltage measurement**: Range:
- VLN measurement range (voltage phase, direct insertion) 0...290 V
- accuracy class: 0.5% f.s ± 2 digit

**Current measurement**: range:
- insertion by means of C.T.: 0.05...5.00 A
- accuracy class on range 0.05...5.00 A: 0.5% f.s ± 2 digit

**Frequency measurement**: range:
- nominal value: 50 / 60 Hz
- range: 45...80 Hz
- accuracy class: 0.3% vm ± 1 digit
- response time: < 300mS

**Apparent Power measurement (S1, S2, S3)**
- range: 870 KVA
- accuracy class: 1% f.s ± 2 digit

**Active Energy measurement (Wh)**
- import / export kWhmeter: 2, different
- resettable: yes
- calculating period: 15 minutes
- energy counting: 999.999 kWh
- accuracy class with current 0.05...1.0 In: 2% fs ± 2 digit

**Reactive Energy measurement (varh)**
- energy counting: 999.999 kVARh
- resettable: yes
- calculating period: 15 minutes
- accuracy class with current 0.05...1.0 In: 2% fs ± 2 digit

**Power Factor measurement**
- cosφ range: -1…0…+1
- accuracy class with current 0.1...1.0 In and voltage 0.8...1.2 Un 2% fs ± 2 digit
- cosφ value measured in continuous wave (from 0,00 to 1,00 in all quadrants) permits to display the Active Power in import and export, as consequence inductive and catacitive Reactive Power too.

**Phase/phase voltages measurement (medium value)** V=(V12+V23+V31)/3

**Phase current measurement (medium value)** A=(A12+A23+A31)/3

**Working time**
- Total working time (with presence of voltage): hh 999.999
- Partial working time (from previous reset): hh 999.999

**Digital filter**
- Average (to stabilize the measures): 1…15

**Compatible current transformers**
- Nominal current: 5 A
- Ratio: 1...200

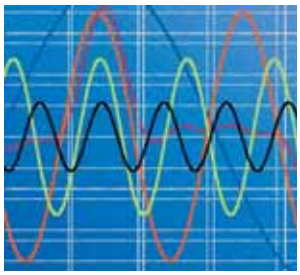
**Visualization**
- display: 3 numerical lines LED
- number of characters: 9 on three lines
- colour: red

**Mechanical characteristics**
- mounting: on DIN rail DIN50022
- protection: IP20/ frontal IP30

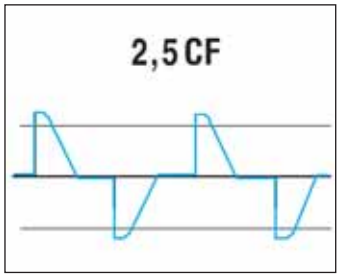
**Environment conditions**: Ambient temperature:
- nominal temperature: 0...+45 °C
- range: -5...+55 °C
- storage temperature: -10...+70 °C
- humidity: 10...95 %
- atmospheric pressure: 70...110 kPa

**Standards CEI**
- Safety CEI EN 61010-1 300V CAT III
- Accuracy class CEI EN 60688
- Electromagnetic compatibility (immunity) CEI EN 61000-6-2
- Electromagnetic compatibility (emission) CEI EN 61000-6-4
- Protection IP CEI EN 60529

## MEASUREMENT'S TYPOLOGY



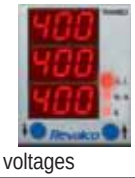
True RMS up to the 20th harmonic wave

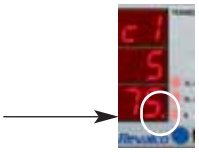
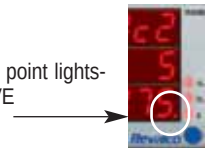
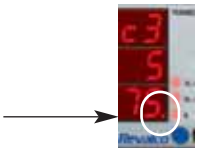
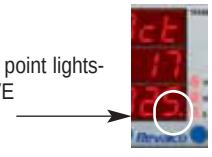



Crest factor up to 2,5 (Voltage and Current)

OPERATION: Instrument furnished already calibrated with the following data: Average = 3; default page = lost voltage; Current transformer = 25/5A; Nominal voltage = 213V (ph-n) and 400V (ph-ph)

- When powered the device makes a self test (all segments of leds light-on for some seconds).
  Changement of pages can be effected "FORWARD" by short pressure of right button, or "BACKWARD" by short pressure of left button.
  Maintaining pressure on buttons you can have: fast forward, reset or configuration of parameters.
  When one of the button is pressed, the "title" of the page is shown.
- Measurements displaing
  The measurements and signalling pages that appear (pushing and releasing the frontal button) are the following:

| PUSHED BUTTON | RELEASED | DESCRIPTION |
|---|---|---|
| |  | This FLASHING signal appears only if:<br>- this page is selected as "default page" (see the correspondent configuration chapter) and the instruments is just light-on or if the auxiliary supply light-off and immediately light-on, or the parameters configuration is finished.<br>After the changement of this page, it disappears from the selection pages. |
|  <br>medium voltage phase-phase |  | On the downer line the value of the voltage in Volt is displayed |
|  <br>phase-phase voltages |  | Measurement of voltage in Volt; the first upper led lights-on<br>If the small points, on the right, light-on (close to each value of the voltage) it means that the sequence of the phases is WRONG.  |

| PUSHED BUTTON | RELEASED | DESCRIPTION |
|---|---|---|
|  |  | Measurement of voltage in Volt; the central led lights-on<br>If the small points, on the right, light-on (close to each value of the voltage) it means that the sequence of the phases is WRONG.  |
| phase-neutral voltages | | |
|  |  | On the downer line the value of asimmetry in Volt is displayed. |
| phase-phase voltage asimmetry | | |
|  |  | On the downer line the value of current in Ampere is displayed. |
| medium current | | |
|  |  | Values of current in Ampere. The bottom led lights-on |
| phase-phase currents | | |
|  |  | On the downer line the value of current in Ampere is displayed. |
| current on neutral | | |
|  |  | On the downer line the value of frequency in Hz is displayed. |
| frequency | | |
|  |  | Measurement of Actice Power in Watt.<br>The example shows 5775 W (5,775kW).  |
| active power - phase 1 | | |
|  |  | If on the right side of the value, a little point lights-on it means that the value is NEGATIVE  |
| active power - phase 2 | | |
|  |  |  |
| active power - phase 3 | | |
|  |  | Measurement of Actice Power in Watt.<br>The example shows 17325 W (17,325kW).<br>If on the right side of the value, a little point lights-on it means that the value is NEGATIVE  |
| total active power | | |

| PUSHED BUTTON | RELEASED | DESCRIPTION |
|---|---|---|
|   |   | Power factor (cosφ). 4 quadrants value, between 0.00 and +/- 1.00.<br>If the displacement is POSITIVE (inductive) the indications on the display will be <ind> and a point on the right lower side will be lights-off.   |
| power factor - phase 1 | | |
|   |   | If the displacement is NEGATIVE (capacitive) the indications on the display will be <cap> and a point on the right lower side will be lights-on.<br>When the value is 1.00, the indication conventionally will be <ind>.   |
| power factor - phase 2 | | |
|   |   |   |
| power factor - phase 3 | | |
|   |   | Power factor (cosφ). 4 quadrants value, between 0.00 and +/- 1.00.<br>If the displacement is POSITIVE (inductive) the indications on the display will be <ind> and a point on the right lower side will be lights-off.<br>If the displacement is NEGATIVE (capacitive) the indications on the display will be <cap> and a point on the right lower side will be lights-on.<br>When the value is 1.00, the indication conventionally will be <ind>.   |
| total power factor | | |
|   |   | Measurement of Reactive Power in Var.<br>The example shows 954 var (0,954kvar).   |
| reactive power - phase 1 | | |
|   |   | If on the right side of the value, a little point lights-on it means that the value is NEGATIVE, so the measured value is CAPACITIVE instead of INDUCTIVE.   |
| reactive power - phase 2 | | |
|   |   |   |
| reactive power - phase 3 | | |
|   |   | Measurement of Reactive Power in Var.<br>The example shows 2862var (2,862kvar).<br>If on the right side of the value, a little point lights-on it means that the value is NEGATIVE, so the measured value is CAPACITIVE instead of INDUCTIVE.   |
| total reactive power | | |
|   |   | Measurement of Apparent Power in VA.<br>The example shows 5775 VA (5,775kVA). |
| apparent power - phase 1 | | |
|   |   | |
| apparent power - phase 2 | | |
|   |   | |
| apparent power - phase 3 | | |
|   |   | Measurement of Apparent Power in VA.<br>The example shows 17325 VA (17,325kVA). |
| total apparent power | | |

| PUSHED BUTTON | RELEASED | DESCRIPTION |
|---|---|---|
|  active energy (import) |  | Measurement of Energy in kWh.<br>The example shows 12521 KWh. When 999999 is displayed, counting start again from 0.<br><br>RESET:<br>By a long pressure of right button only, the value flashes, and after few seconds it will be resetted. |
|  active energy (export) |  | Measurement of Energy in kWh.<br>The example shows 327 KWh. When 999999 is displayed, counting start again from 0.<br><br>RESET:<br>By a long pressure of right button only, the value flashes, and after few seconds it will be resetted. |
|  reactive energy |  | Measurement of Energy in kvarh.<br>The example shows 2543 kvarh. When 999999 is displayed, counting start again from 0.<br><br>RESET:<br>By a long pressure of right button only, the value flashes, and after few seconds it will be resetted. |
|  total hourmeter |  | Measurements of hours (h). It shows the total working time (from powering of instrument).<br>The example shows 37820 h. When 999999 is displayed, counting start again from 0. |
|  partial hourmeter |  | Measurements of hours (h). It shows the partial working time (from last reset of instrument).<br>The example shows 249 h. When 999999 is displayed, counting start again from 0.<br><br>RESET:<br>By a long pressure of right button only, the value flashes, and after few seconds it will be resetted. |

PROGRAMMAZIONE: Make a long pressure (4 seconds about) on the RIGHT button, while you stay in a page where the resettable parameters are NOT allowed. So not on the pages of Energy or Hour-counter otherwise you obtain the reset of these values without enter on the configuration pages.

The following page appears:

Where in the central line you'll see the device type and release n°. Dot on upper right side of display flashes, three leds light-on meaning the configuration mode. This situation will remain until the end of procedure.

After 4 seconds the pages with configuration parameters start to be displayed; one page every 4 seconds showing the actual selected value.
If it is necessary to see the values without any modification don't touch nothing until the automatic end of the showed pages.

To change the values of parameters, it is enough to press the RIGHT button while this parameter is displayed.

The value change immediately and closed to him a flashing points appear meaning that the value is in modification phase.
To fast forward maintain pressure on the RIGHT button.

The following can be made by pressing the left button:
- pressed during the automatic display of the pages, it increases the time you stay on this page until it is released.
- pressed during the setting of some value (when all the points on the right flashes) decrease step by step this value and it increases the time you stay on this page until it is released.

The modified value is automatically saved in permanent way when the automatic display of the pages starts again.
The following pages can be present or not depending by the model of instruments.

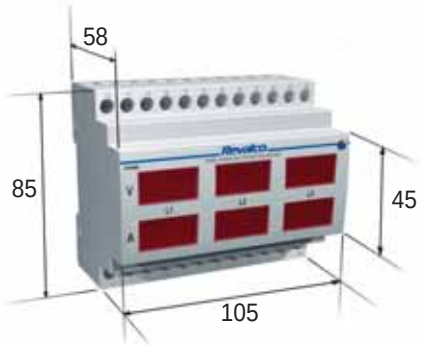
| DEFAULT PARAMETER | POSSIBLE VALUES | DESCRIPTION |
|---|---|---|
|  average | VALUE from 1 to 15 | It is the number (n) of single measures effected on the electrical parameter before it's visualization on the display.<br>Practically it is the filter of the measure stabilization. The numbering rise up from 1 to 15; more higher is the selected number, more slow are the eventual variations of reading. This is valid for all the measured parameters. |
|  Default page | ONE OF THE AVAILABLE PAGES | Select the main page that you want to see after the initial powering of the instrument. |
|  CT .../5A | VALUE from 5 to 999 every 5 steps | Select the ratio .../5A of the current transformer. |
|  voltage setting | VALUE from 200 to 262 | It represent the NOMINAL voltage value of end scale value.<br>Phase-phase voltage on the central line.<br>Phase-neutral voltage on the lower line.<br><br>**The default value (calibrated in factory) is 231V (400V phase-phase).** |

# THREE PHASE LED MULTIFUNCTION METERS

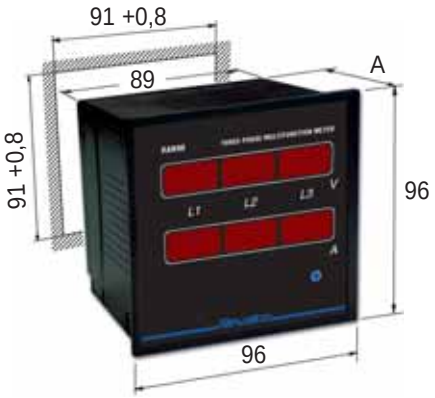

**1RANM6....**


**2RAN96....**

## DIMENSIONS in mm




The 105 mm dimensions correspond to 6 DIN modules




A = 97,3 without terminals cover
A = 116,5 with terminals cover
Weight: 0,55 kg

## TECHNICAL CHARACTERISTICS

| MODULAR VERSION<br>SWITCHBOARD VERSION | 1RANM6<br>2RAN96 | 1RANM6R<br>2RAN96R | 1RANM6C<br>2RAN96C | 1RANM6CS<br>2RAN96CS | 1RANM6C485<br>2RAN96C485 | 1RANM6CS485<br>2RAN96CS485 | 1RANM6C232 |
|---|---|---|---|---|---|---|---|
| **ELECTRICAL PARAMETERS** | | | | | | | |
| - Phase-phase Voltage | • | • | • | • | • | • | • |
| - Phase-neutral Voltage | • | • | • | • | • | • | • |
| - Current | • | • | • | • | • | • | • |
| - Total Active Power | | | • | • | • | • | • |
| - Total Reactive Power | | | • | • | • | • | • |
| - Total Apparent Power | | | • | • | • | • | • |
| - Total Active Energy | | | • | • | • | • | • |
| - Partial Active Energy | | | • | • | • | • | • |
| - Total Reactive Energy | | | • | • | • | • | • |
| - Power Factor | | | • | • | • | • | • |
| - Frequency | | | • | • | • | • | • |
| - Phase sequence | | | • | • | • | • | • |
| - Partial and Total working hours | | | • | • | • | • | • |
| **Possibility to use the output contacts by software (for example: turn-on or turn-off an engine)** | | | | | | • | |
| **The software is available, free of charge, on our internet address www.revalco.it** | | | | | • | • | • |
| **STANDARD POWER SUPPLY** | 230 VAC 50/60Hz | | | | | | |
| **NOMINAL INPUT VALUES** | Voltage: 500V<br>Primary current: from 5A to 6000A selectable by button located at the front<br>Secondary current: 5A (1A on request)<br>Frequency: from 40 to 60 Hz | | | | | | |
| **SELECTABLE CAPACITIES** | from 5A to 1000A with steps of 5A – from 1000A to 6000A with steps of 50A | | | | | | |
| **PRECISION CLASS** | 2% ± 2 digit (Power and Energy) 0,5% ± 2 digit (all other values) | | | | | | |
| **CONSUMPTION** | 4VA | | | | | | |
| **FRONT PROTECTION DEGREE** | IP20 | | | | | | |
| **INSULATION CLASS** | II | | | | | | |
| **WORKING TEMPERATURE** | -5°C ..... +50°C | | | | | | |
| **STORAGE TEMPERATURE** | -20°C ..... +70°C | | | | | | |
| **TEST VOLTAGE** | 2kV at 50Hz for 1 minute | | | | | | |
| **MEMORY** | EEPROM | | | | | | |
| **TWO OUTPUT REED RELAYS with high power (max 20VA), switching voltage (1000VDC) or peak AC** | | NA (0,5A-1000V) | | NA (0,5A-1000V) | | NA (0,5A-1000V) | |
| **SERIAL OUTPUT** | | | | | RS485 | | RS232 |
| **PROTOCOL** | | | | | MODBUS SLAVE RTU | | MODBUS SLAVE RTU<br>**ASCI on request** |
| **INSULATION VOLTAGE** | | | | | 3kV | | |
| **WEIGHT kg** | | | | | 0,50 | | |

# 1RANM6 - 2RAN96

## OPERATION

- Powering the instrument you can see the following page  Main fault

- By pressing the front button, the introduction page of this analyser appears, on which the actual version is also identified. 

**In this position, the configuration selection menu page will appear (see at the bottom of this page)**
**To enter into the configuration menu maintain pressure on the front button for a few seconds**

- Maintaining pressure on the front button you will see the parameters displayed on this page
  **Releasing the button the measurements will be shown**
   three voltages phase/phase
  three currents

- Maintaining pressure on the front button you will see the parameters displayed on this page
  **Releasing the button the measurements will be shown**
   three voltages phase/neutral
  three currents

## CONFIGURATION SELECTION MENU

- By pressing the front button for a few seconds a flashing page appears, indicating that you are entering into the configuration selection menu, and you will see for example:
  
  Maintain pressure on the front button untill the following page is displayed. Releasing the button the further pages will be **automatically** shown
  

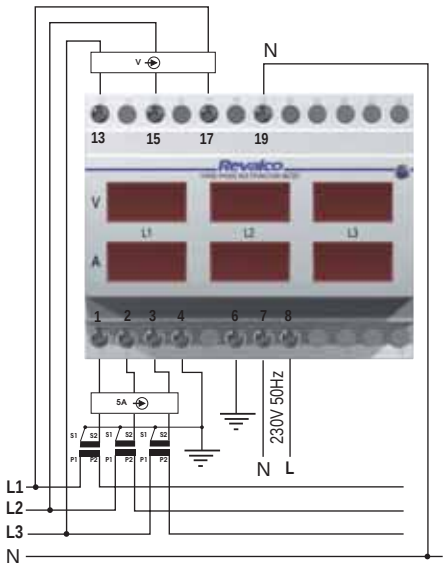
- After a few seconds the CT selection page appears, by pressing the front button you can select the required CT value. From 5A up to 999A with steps of 5A
  

  From 1000A up to 6000A with steps of 50A for their display it is necessary to refer in kA values where this unit measurement is indicated by the illumination of the light located on the extreme right of the display . To fast forward maintain pressure on the front button
   The example shows the displays of a 1200A CT

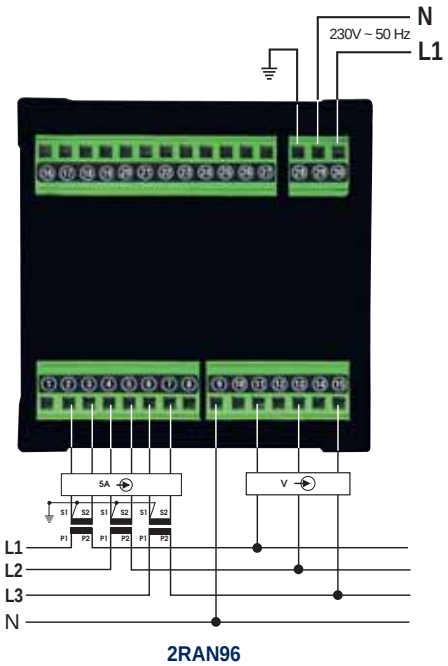
- After a few seconds the page of the mathematical medium n° of samples appears; practically it is the stability filter of the measurement. The numbering goes from 1 to 60; the higher is the selected number the slower is the change of displays.
  

- Automatically the following page appears: here it is possible to select and memorise the main page that you want to see after the initial energising of the instrument. By pressing in succession the front button, the various titles of the pages available appear and when you see the one required release the button to memorise it.
  After 5 seconds the next page appears.
  

## CONNECTION DIAGRAMS




**1RANM6**




**2RAN96**

# 1RANM6R - 2RAN96R

## OPERATION

- Powering the instrument you can see the following page  Main fault

- By pressing the front button, the introduction page of this analyser appears, on which the actual version is also identified. 

**In this position, the configuration selection menu page will appear (see at the bottom of this page)**
**To enter into the configuration menu maintain pressure on the front button for a few seconds**

- Maintaining pressure on the front button you will see the parameters displayed on this page  three voltages phase/phase
**Releasing the button the measurements will be shown** three currents

- Maintaining pressure on the front button you will see the parameters displayed on this page  three voltages phase/neutral
**Releasing the button the measurements will be shown** three currents

- Maintaining pressure on the front button you will see the parameters displayed on this page  Showing the actual situation of the thresholds
**Releasing the button ,the activation(ON) or the deactivation(OFF) of the two thresholds (th1 and th2) appears**

## CONFIGURATION SELECTION MENU

- By pressing the front button for a few seconds a flashing page appears, indicating that you are entering into the configuration selection menu, and you will see for example: 

Maintain pressure on the front button untill the following page is displayed. 
Releasing the button further pages will be **automatically** shown

- After a few seconds the CT selection page appears, by pressing the front button you can select the required CT value. From 5A up to 999A with steps of 5A 

From 1000A up to 6000A with steps of 50A for their display it is necessary to refer in kA values where this unit measurement is indicated by the illumination of the light located on the extreme right of the display . To fast forward maintain pressure on the front button  The example shows the displays of a 1200A CT

- After a few seconds the page of the mathematical medium n° of samples appears; practically it is the stability filter of the measurement. The numbering goes from 1 to 60; the higher is the selected number the slower is the change of displays. 

- Automatically the following page appears: here it is possible to select and memorise the main page that you want to see after the initial energising of the instrument. By pressing in succession the front button, the various titles of the pages available appear and when you see the one required release the button to memorise it.
After 5 seconds the next page appears. 

**1st alarm threshold configuration page**
When pressing the front button it is possible to choose between: OFF,
Hi (max alarm),
Lo (min alarn) 

- On the further page it is possible to select the delay time of the 1st threshold
When pressing the front button it is possible to choose between: OFF - On (excitation relay delay) or
On - OFF (disexcitation relay delay) 

- On the further page it is possible to select the delay time up to max 30 seconds 

- On the further page it is possible to select the parameter to which applies the **1st** alarm threshold between:


**3U** alarm applied simultaneously to the three phase-neutral voltages, where is enough that one of the three voltages exceeds the selected value to activate the alarm

**3UF** alarm applied simultaneously to the three phase-phase voltages, where is enough that one of the three voltages exceeds the selected value to activate the alarm

**3i** alarm applied simultaneously to the three currents, where is enough that one of the three currents exceeds the selected value to activate the alarm

**i1** alarm applied to the L1 current phase

**i2** alarm applied to the L2 current phase

**i3** alarm applied to the L3 current phase

**U1** alarm applied to the L1 phase-neutral voltage phase

**U2** alarm applied to the L2 phase-neutral voltage phase

**U3** alarm applied to the L3 phase-neutral voltage phase

**U12** alarm applied to the L1-L2 voltage phase

**U23** alarm applied to the L2-L3 voltage phase

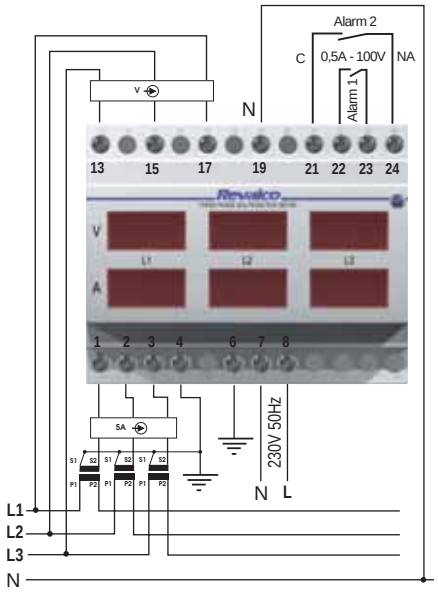
**U31** alarm applied to the L3-L1 voltage phase

- The further page shows also the percentage value of the alarm.It is possible to modify the percentage value of the alarm; by pressing the front button the percentage is varied with steps of 1%( to fast forward maintain pressure on the front button) and displayed on the page is the equality between the numerical value and the percentage.
Example: having choosen the parameter 3UF, the percentage 51% correspond to 255V

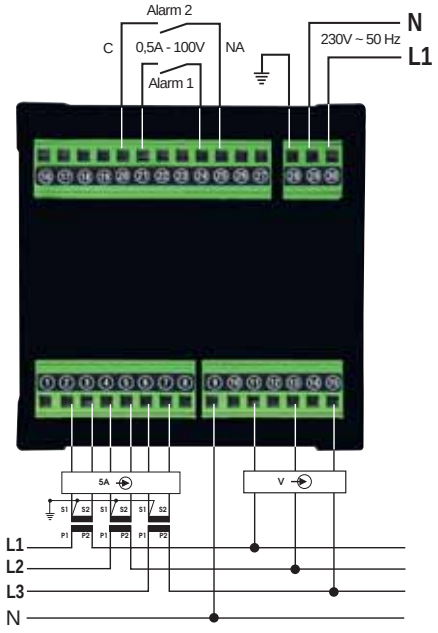


**Now the 2nd alarm threshold configuration page appears**
Where it is necessary to act exactly as explained above


## CONNECTION DIAGRAMS




**1RANM6R**




**2RAN96R**

# 1RANM6C / 1RANM6C485 / 1RANM6C232
# 2RAN96C / 2RAN96C485

## OPERATION

- Powering the instrument you can see the following page  Main fault

- By pressing the front button, the introduction page of this analyser appears on which the actual version is also identified.

 or  or 

**In this position, the configuration selection menu page will appear (see at the bottom of this page)**
**To enter into the configuration menu maintain pressure on the front button for a few seconds**

- Maintaining pressure on the front button you will see the parameters displayed on this page
  **Releasing the button the measurements will be shown**

three voltages phase/phase

three currents

- Maintaining pressure on the front button you will see the parameters displayed on this page
  **Releasing the button the measurements will be shown**

three voltages phase/neutral

three currents

- Maintaining pressure on the front button you will see the parameter displayed on this page
  **Releasing the button the measurement will be shown**

Total Active Power, expressed in Watt

- Maintaining pressure on the front button you will see the parameter displayed on this page
  **Releasing the button the measurement will be shown**

Total Reactive Power expressed in Var

- Maintaining pressure on the front button you will see the parameter displayed on this page
  **Releasing the button the measurement will be shown**

Total Apparent Power, expressed in VA

- Maintaining pressure on the front button you will see the parameter displayed on this page
  **Releasing the button the measurement will be shown**

Total Active Energy expressed in kWh

- Maintaining pressure on the front button you will see the parameter displayed on this page showing the quantity of energy used in 15 min
  **Releasing the button the measurement will be shown**

Relative Active Energy, expressed in kWh, memorised every 15 min.

The flashing symbol means that the instrument is counting the used energy during 15 minutes; when the symbol becomes static it means that the 15 minutes are passed and the final value is shown. To zero this value, maintain pressure on the front button.

- Maintaining pressure on the front button you will see the parameter displayed on this page
  **Releasing the button the measurement will be shown**

Total Reactive Energy expressed in kVar

- Maintaining pressure on the front button you will see the parameters displayed on this page
  Capacitive ( cAP ) or Inductive Power Factor ( ind ) in number ( toS ), or in electrical degrees ( dEG )
  Frequency from 30hz to 70Hz ( FrE )
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameters displayed on this page

Phase sequence
Releasing the button this indication appears no (not correct sequence)
or YES (correct sequence)

- Maintaining pressure on the front button you will see the parameter displayed on this page
  Hourmeter indicating the working hours of the instrument, the memorising of the time occurs every 15 min
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameter displayed on this page
  **Releasing the button the measurement will be shown**

Partial hourmeter indicating the working hours of the instrument

**(zeroing in the next page)**

- Maintaining pressure on the front button you will see the parameters displayed on this page:
  **Releasing the button the measurement will be shown**

Actual analogue bar of the Active Power respect to the Total Apparent Power

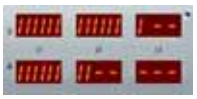
Actual analogue bar of the Reactive Power respect to the Total Apparent Power

This page serves to give an immediate visual display showing the situation of the installation
Releasing the button you can see for example at cosφ1 the following display:

Active Power

Reactive Power

If the value of the cosphi goes down, the phase displacement angle is immediately displayed, and the Active Power's bar goes down while the Reactive Power's bar will increase as for example in the figure:



Active Power

Reactive Power

- Maintaining pressure on the front button you see the parameter displayed on this page
  Visual simulation of the rotation of the electromechanical active kWh-meter indicating how much energy you are using at that time
  **Releasing the button the graphics will be shown**


- Maintaining pressure on the front button you see the parameter displayed on this page
  **Releasing the button the graphics will be shown**


Analogue display bar of the Active Power (settable)

If for example the selected CT is 50/5A but it is well known that the installation is already at 100% with 40A, You'll set the instrument in the way that with 40A the bar shows 100%

## CONFIGURATION SELECTION MENU

- By pressing the front button for few seconds a flashing page appears, indicating that you are entering into the configuration selection menu, and you will see for example:


or


or


Maintain pressure on the front button untill the following page is displayed. Releasing the button the further pages will be **automatically** shown


- After a few seconds the CT selection page appears, by pressing the front button you can select the required CT value. From 5A up to 999A with steps of 5A


From 1000A up to 6000A with steps of 50A and for their display it is necessary to refer in kA values where this unit measurement is indicated by the illumination of the light located on the extreme right of the display . To fast forward maintain pressure on the front button
The example shows the displays of a 1200A CT


- After a few seconds the page of the mathematical medium n° of samples appears; practically it is the stability filter of the measurement. The numbering goes from 1 to 60; the higher is the selected number the slower is the change of displays.


- After a few seconds the following page appears, on which it is possible to select the end scale value of the analogue bar of the Active Power (Act Ratio). The indicated example shows a value of 92% that can be modified (with steps of 1%) by pressing the front button(To fast forward maintain pressure on the front button)


Releasing the button the page will show also the numerical equality in Watt of the percentage choosen
In function of the nominal calibration data. If for example the CT 50/5A is selected and the percentage is 92% you'll see:


where 6900W correspond to the end scale (92%)
calculated as follow: 92% = Vnom (230V ph/n (400V ph/ph)) x CT value (50/5A) x 3

230 x 50 = 11500 11.500 : 5 = 2300 2300 x 3 = 6900

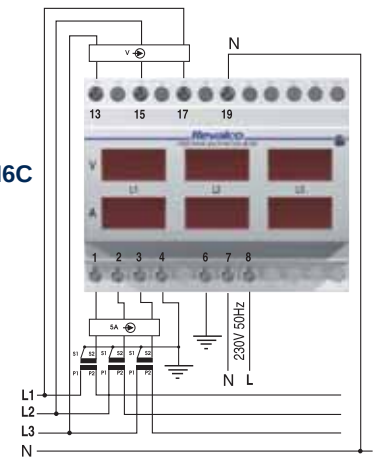
- Automatically the following page appears: here it is possible to select and memorise the main page that you want to see after the initial energising of the instrument. . By pressing in succession the front button, the various titles of the pages available appear and when you see the one required release the button to memorise it.


- After 5 seconds the next page appears( version 1RANM6C485 only) on which, by pressing the front button, it is possible to change the address to assign)

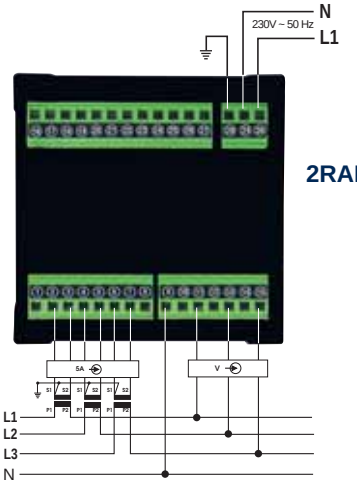

serial address

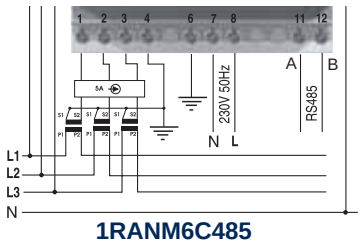
## CONNECTION DIAGRAMS - For serial communication, see the proper pages

**1RANM6C**

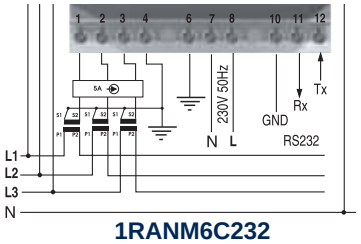



**2RAN96C**

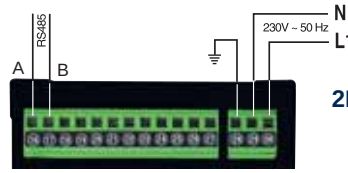



**1RANM6C485**




**1RANM6C232**




**2RAN96C485**

# 1RANM6CS / 1RANM6CS485
# 2RAN96CS / 2RAN96CS485

## OPERATION

- Powering the instrument you can see the following page  Main fault

- By pressing the front button, the introduction page of this analyser appears, on which the actual version is also identified.  or 

**In this position, the configuration selection menu page will appear (see at the bottom of this page)**
**To enter into the configuration menu maintain pressure on the front button for a few seconds**

- Maintaining pressure on the front button you will see the parameters displayed on this page  three voltages phase/phase
  three currents
  **Releasing the button the measurements will be shown**

- Maintaining pressure on the front button you will see the parameters displayed on this page  three voltages phase/neutral
  three currents
  **Releasing the button the measurements will be shown**

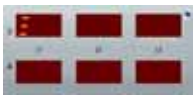
- Maintaining pressure on the front button you will see the parameter displayed on this page  Total Active Power, expressed in Watt
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameter displayed on this page  Total Reactive Power expressed in Var
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameter displayed on this page  Total Apparent Power, expressed in VA
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameter displayed on this page  Total Active Energy expressed in kWh
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameter displayed on this page showing the quantity of energy used in 15 min  Relative Active Energy expressed in kWh memorised every 15 min.
  **Releasing the button the measurement will be shown**



The flashing symbol means that the instrument is counting the used energy during 15 minutes; when the symbol becomes static it means that the 15 minutes are passed and the final value is shown. To zero this value, maintain pressure on the front button.

- Maintaining pressure on the front button you will see the parameter displayed on this page  Total Reactive Energy expressed in kVar,
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameters displayed on this page
  Capacitive ( cAP ) or Inductive Power Factor ( ind ) in number ( coS ), or in electrical degrees ( dEG )
  Frequency from 30Hz to 70Hz ( FrE ) 
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameter displayed on this page  Phase sequence
  Releasing the button this indication appears : no (not correct sequence)
  or YES (correct sequence)

- Maintaining pressure on the front button you will see the parameter displayed on this page 
  Hourmeter indicating the working hours of the instrument, the memorising of the time occurs every 15 min
  **Releasing the button the measurement will be shown**

- Maintaining pressure on the front button you will see the parameter displayed on this page  Partial hourmeter indicating the working hours of the instrument
  **Releasing the button the measurement will be shown**

**(zeroing in the next page)** 

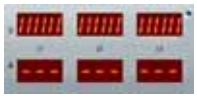
- Maintaining pressure on the front button you will see the parameter displayed on this page  Actual situation of the thresholds
  Releasing the button, the activation (**ON**) or the deactivation (**OFF**) of the two thresholds (th1 and th2) appears showing

- Maintaining pressure on the front button you see the parameters displayed in this page
  **Releasing the button the measurement will be shown**

Actual analogue bar of the Active Power respect to the Total Apparent Power

Actual analogue bar of the Reactive Power respect to the Total Apparent Power

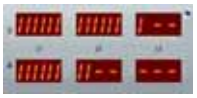
This page serves to give an immediate visual situation of the installation
Releasing the button you can see for example at cosφ1 the following display



Active Power

Reactive Power

If the value of the cosphi goes down, the phase displacement angle is immediately displayed, and the Active Power's bar goes down while the Reactive Power's bar will increase as for example in the figure:



Active Power

Reactive Power

- Maintaining pressure on the front button you see the parameter displayed on this page
  Visual simulation of the rotation of the electromechanical active kWh-meter indicating how much energy you are using at that time
  **Releasing the button the graphics will be shown**

- Maintaining pressure on the front button you see the parameter displayed on this page
  **Releasing the button the graphics will be shown**

Analogue display bar of the Active Power (settable)

If for example the selected CT is 50/5A but it is well known that the installation is already at 100% with 40A,
You'll set the instrument in the way that with 40A the bar shows 100%

## CONFIGURATION SELECTION MENU

- By pressing the front button for a few seconds a flashing page appears, indicating that you are entering into the configuration selection menu, and you will see for example:

or

Maintain pressure on the front button untill the following page is displayed.
Releasing the button the further pages will be **automatically** shown

- After a few seconds the CT selection page appears, by pressing the front button you can select the required CT value. From 5A up to 999A with steps of 5A

From 1000A up to 6000A with steps of 50A and for their display it is necessary to refer in kA values where this unit measurement is indicated by the illumination of the light located on the extreme right of the display. To fast forward maintain pressure on the front button

The example shows the display of a 1200A CT

- After a few seconds the page of the mathematically medium n° of samples appears; practically it is the stability filter of the measurement. The numbering goes from 1 to 60; the higher is the selected number the slower is the change of displays.

- After a few seconds the following page appears, on which it is possible to select the end scale value of the analogue bar of the Active Power (Act Ratio). The indicated example shows a value of 92% that can be modified (with steps of 1%) by pressing the front button
  (To fast forward maintain pressure on the front button).

Releasing the button the page will show also the numerical equality in Watt of the percentage choosen
In function of the nominal calibration data. If for example the CT 50/5A is selected and the percentage is 92% you'll see:

where 6900W correspond to the end scale (92%)
Calculated as follow: 92% = Vnom (230V ph/n, 400V ph/ph) x CT value 50/5A x 3

230 x 50 = 11500 11.500 : 5 = 2300 2300 x 3 = 6900

- Automatically the following page appears: here it is possible to select and memorise the main page that you want to see after the initial energising of the instrument. By pressing in succession the front button, the various titles of the pages available appear and when you see the one required release the button to memorise it.

- After 5 seconds the next page appears. (version 1RANM6CS485 only)
  on which , by pressing the front button, it is possible to change the address to assign

serial address

**1st alarm threshold configuration page**
Where pressing the front button it is possible to choose between: OFF
Hi (max alarm),
Lo (min alarn)

- On the further page it is possible to select the delay time of the 1st threshold
  Where pressing the front button it is possible to choose between: OFF - On (excitation relay delay) or
  On - OFF (disexcitation relay delay)

- On the further page it is possible to select the delay time up to max 30 seconds

On the further page it is possible to select the parameter to which apply the **1st** alarm threshold between:


**3U** alarm applied simultaneously to the three phase-neutral voltages, where is enough that one of the three voltages exceeds the selected value to activate the alarm
**3UF** alarm applied simultaneously to the three phase-phase voltages, where is enough that one of the three voltages exceeds the selected value to activate the alarm
**3i** alarm applied simultaneously to the three currents, where is enough that one of the three currents exceeds the selected value to activate the alarm
**i1** alarm applied to the L1 current phase
**i2** alarm applied to the L2 current phase
**i3** alarm applied to the L3 current phase
**U1** alarm applied to the L1 phase-neutral voltage phase
**U2** alarm applied to the L2 phase-neutral voltage phase
**U3** alarm applied to the L3 phase-neutral voltage phase
**Act** alarm applied to the Active Power
**rEA** alarm applied to the Reactive Power
**APP** alarm applied to the Apparent Power
**U12** alarm applied to the L1-L2 voltage phase
**U23** alarm applied to the L2-L3 voltage phase
**U31** alarm applied to the L3-L1 voltage phase
**FrE** alarm applied to the frequency
**deg** alarm applied to the electrical degrees of the Power factor
**CoS** alarm applied to the COSphi of the Power Factor

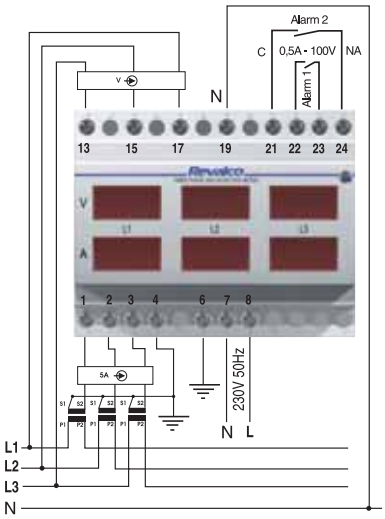

The further page shows also the percentage value of the alarm.It is possible to modify the percentage value of the alarm; by pressing the front button the percentage is varied with steps of 1%( to fast forward maintain pressure on the front button) and displayed on the page is the equality between the numerical value and the percentage. Example: having choosen the parameter 3UF, the percentage 51% correspond to 255V


**Now the 2nd alarm threshold configuration page appears**
Where it is necessary to act exactly as explained before

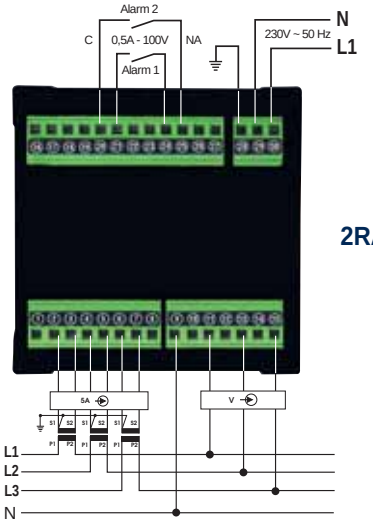

**If in the configuration phase you decide NOT to use one or both threshold, these will remain available to be controlled via MODBUS SLAVE RTU, by the controll software.**

## CONNECTION DIAGRAMS

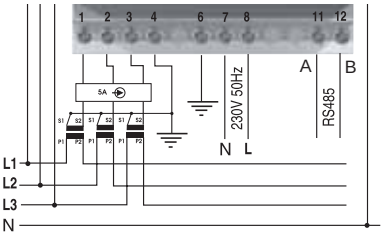
**1RANM6CS**



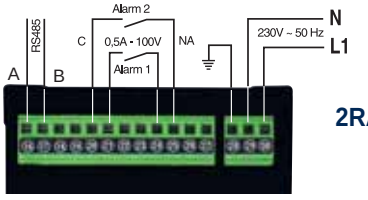

**2RAN96CS**




**1RANM6CS485**



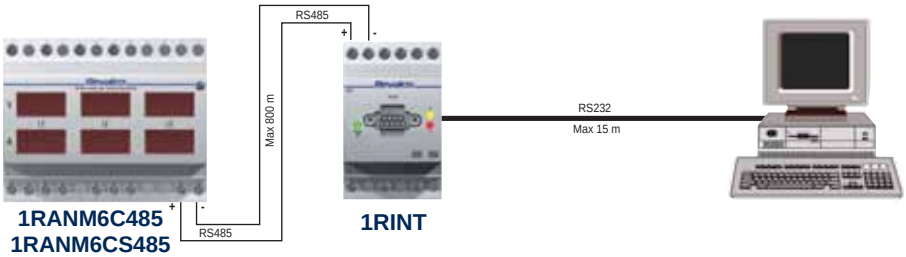

**2RAN96CS485**




## SERIAL COMMUNICATION

**Scheme n. 1:** Connection between instruments and PC for distances up to 800m

**2RAN96C485**
**2RAN96CS485**

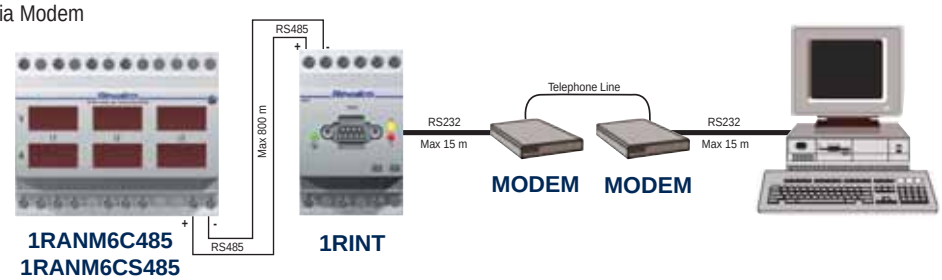



**1RANM6C485**
**1RANM6CS485**

**1RINT**

**Scheme n. 2:** Connection via Modem

**2RAN96C485**
**2RAN96CS485**



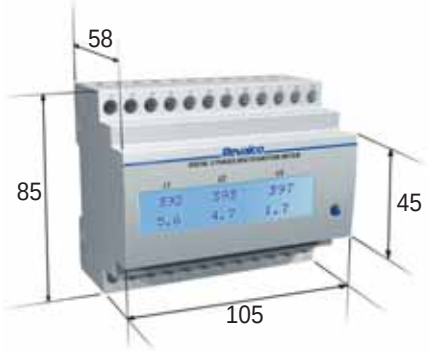

**1RANM6C485**
**1RANM6CS485**

**1RINT**

**MODEM** **MODEM**

# THREE PHASE LCD MULTIFUNCION METERS - TRUE RMS

## DIMENSIONS in mm




**1RAEM6....**
6 DIN modules

## GENERAL DESCRIPTION

- Advanced technology of light blue display and blue leds, has visibility and luminosity comparable with the conventional red led display of previous generation.
- All the electrical measurements are represented in their natural form without the use of any multiplicator factor or other artificies for scale change or measuring units.
- Easy and immediate reading without possible incomprehensions or further elaborations.
- The use of one button only permits to change the measurements pages in natural way. The button is lighted to permit the use in darkness ambient also.
- During the program phase, the instrument shows the different possibilities present in the device, so it is not necessary to have in hands the user's manual all the time.
- The first powered page can be selected in the program phase. The "power supply" page can be used in all the cases on which is important **the information of "power supply loss"** (e.g. in refrigerating machines and/or cold storage).
- The possibility to reset the energy and contemporary the hour/minutes value permits, in easy way, to see the relative consumption in a fixed time.
- The possibility to communicate by the rs485 modbus protocol permits to enter , as peripheric bus, into an automation net. **This is one of the " faster" instrument present in the market due the 115200 BAUDE RATE**.
- The software to install on the PC, showed free of charge on the web site, is simple and extremely potent. It permits to visualize, in RS485 MODBUS connection, by a double wire or by BLUETOOH technology, all the measurements showed by the instrument to diagnose with simplicity the status of an electrical net.

  **By the double possibilities: visualizer and 3-Phase Voltage and Current Oscilloscope**

  It permits a complete diagnosis of the electrical system showing the wave form without interferences against the normal functions of the instrument(measurement and memorization mode).

In presence of critical situations or not easy diagnoseable phenomena with available numerical data, exixt the possibility to send to the instrument a command of normal activity suspension and enter in the **"quick voltage/current oscilloscope"** mode.

In this mode the isntrument is able to show graphically, in real time, the needed wave form (voltage/current sysncroinized wave of phase L1 or in combination with phases L2 and L3; therefore 6 sinusoidal waves visualized) and see **what actually is happening** on the net.

## TECHNICAL CHARACTERISTICS

| 6 DIN MODULAR VERSION | 1RAEM | 1RAEMC | 1RAEMCS | 1RAEMC485 | 1RAEMCS485 | 1RAEMBL485 |
|---|---|---|---|---|---|---|
| - **PARAMETERS** | | | | | | |
| - Ph-N voltage | ● | ● | ● | ● | ● | ● |
| - Ph-Ph voltage | ● | ● | ● | ● | ● | ● |
| - Medium voltage of phases | ● | ● | ● | ● | ● | ● |
| - Current | ● | ● | ● | ● | ● | ● |
| - Power factor | | ● | ● | ● | ● | ● |
| - Total equivalent power factor | | ● | ● | ● | ● | ● |
| - Apparent power | | ● | ● | ● | ● | ● |
| - Total Apparent power | | ● | ● | ● | ● | ● |
| - Active power (+/-) | | ● | ● | ● | ● | ● |
| - Total Active power (+/-) | | ● | ● | ● | ● | ● |
| - Reactive power | | ● | ● | ● | ● | ● |
| - Total Reactive power | | ● | ● | ● | ● | ● |
| - Frequency | ● | ● | ● | ● | ● | ● |
| - Total Active Energy (import) resettable parameter | ● | ● | ● | ● | ● | |
| - Total Active Energy (export) resettable parameter | | ● | ● | ● | ● | ● |
| - Reactive Total energy resettable parameter | | ● | ● | ● | ● | ● |
| - Total working time resettable parameter | | ● | ● | ● | ● | ● |
| - Partial working time parametro azzerabile | | ● | ● | ● | ● | ● |
| - Sequence of phases | | ● | ● | ● | ● | ● |
| - Voltage asymmetry (Ph-N) | | ● | ● | ● | ● | ● |
| - **TWO ALARM OUTPUT RELAYS** (contact N.O. 1000V-0,5A-20VA) | | | ● | | ● | ● |
| - **PROTOCOL MODBUS SLAVE RTU** | | | | | | |
| Baude rate 9600 - 19200 - 38400 - 56800 - 115200 | | | | ● | ● | |
| - **ACCESS BLUETOOTH POINT (max 10 meters - Class 2)** Baude rate 115200 | | | | | | ● |
| - **The software is available, free of charge, on our internet address www.revalco.it** | | | | ● | ● | ● |
| - **PERMANENT MEMORY FOR SET POINT AND ENERGIES** (EEPROM) | | ● | ● | ● | ● | ● |

# TECHNICAL CHARACTERISTICS

**Auxiliary power supply**

| | | |
|---|---|---|
| - nominal value U AUX | 230 | 230V, 50/60 Hz |
| | -P1 | 22...36VAC and 19...70VDC |
| | -P2 | 44..130VAC and 70...240VDC |
| - range | | 0.9...1.1 UAUX |
| - max absorbed power | | 2 VA |

**Input voltmeter circuit** — Phase-phase voltage:

| | |
|---|---|
| - direct insertion | max 500 V |
| - permanent overload | 120% |
| - thermic overload (1 s) | 150% |
| - input impedance of voltmeter circuit | ≈ 2 MΩ Ph-N/Phase-Phase |

**Input ammeter circuit**

| | |
|---|---|
| - nominal current | 5 A |
| - permanent overload | 120% |
| - thermic overload (1 s) | 200% |
| - range adjustment, CT ratio | 5...6000 |

**Voltage measurement range**

| | |
|---|---|
| - VLN measurement range (voltage phase, direct insertion) | 0...290 V |
| - accuracy class | 0.5% f.s ± 2 digit |

**Current Measurement range:**

| | |
|---|---|
| - measurement range insertion on CT secondary | 0.05...5.00 A |
| - accuracy class on range 0,05.....5A | 0.5% f.s ± 2 digit |

**Frequency Measurement range:**

| | |
|---|---|
| - nominal value | 50/60Hz |
| - range | 45...80 Hz |
| - accuracy class | 0.3% vm ± 1 digit |
| - response time | < 300mS |

**Active Power (P1, P2, P3)**

| | |
|---|---|
| - range | 85 MW |
| - accuracy class | 1% f.s ± 2 digit |

**Reactive Power (Q1, Q2, Q3)**

| | |
|---|---|
| - range | 85 Mvar |
| - accuracy class | 1% f.s ± 2 digit |

**Apparent Power (S1, S2, S3)**

| | |
|---|---|
| - range | 85 MVA |
| - accuracy class | 1% f.s ± 2 digit |

**Active Energy (Wh)**

| | |
|---|---|
| - import / export counters resettable | Two separate |
| - calculating period | 15 minutes |
| - energy counting | 4.294.967.295 kWh |
| - accuracy class with current 0.05...1.0 In | 2% fs ± 2 digit |

**Reactive Energy (varh)**

| | |
|---|---|
| - energy counting resettable | 4.294.967.295 kvarh |
| - calculating period | 15 minutes |
| - accuracy class with current 0.05...1.0 In | 2% fs ± 2 digit |

**Power Factor**

| | |
|---|---|
| - range cosφ | -1...0...+1 |

- accuracy class with current 0.1...1.0 In and voltage 0.8...1.2 Un 2% fs ± 2 digit

**Phase/phase voltages measurement (medium value)** V=(V12+V23+V31)/3

**Phase current measurement (medium value)** A=(A12+A23+A31)/3

**Working time**

| | |
|---|---|
| - Total working time | hh:mm (in presence of aux power supply) |
| - Partial working time | hh:mm (from previous reset) |

**Digital filter**

| | |
|---|---|
| - Average | 1...15 |

**Compatible current transformers**

| | |
|---|---|
| - Nominal current | 5 A |
| - Ratio | 1...1200 |

**Visualization**

| | |
|---|---|
| - display | LCD with white leds |
| - number of characters | 18 on two lines |
| - colour | BLUE |

**Mechanical characteristics**

| | |
|---|---|
| - mounting | on DIN rail DIN50022/ encased DIN43700 |
| - protection | IP20/ frontal IP30 |

**Electrical characteristics, options** — Galvanic insulation

| | |
|---|---|
| - alarm relay coil-contact | 4.25kV |
| - RS 485 | 3kV |

**Relay characteristics**

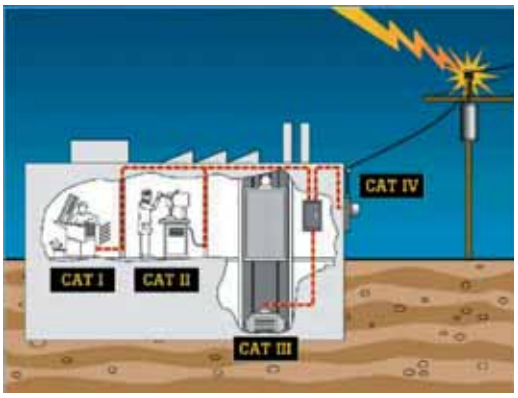
| | |
|---|---|
| - N.O. contacts maxV....maxI....maxP | 1000V 0.5A 20VA |

**Environment conditions**

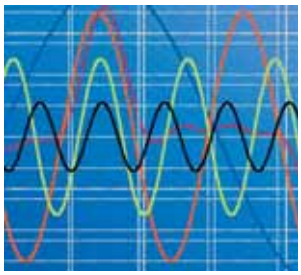
| | |
|---|---|
| - ambient temperature: | 0...+45 °C |
| - range | -5...+55 °C |
| - storage temperature | -10...+70 °C |
| - humidity | 10...95 % |
| - atmospheric pressure | 70...110 kPa |

**Standards CEI**

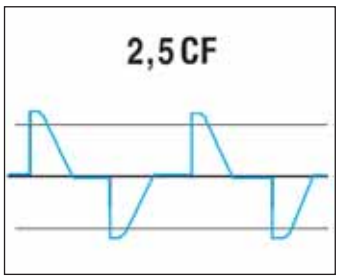
- Safety CEI EN 61010-1 300V CLASS III
- Accuracy class CEI EN 60688
- Electromagnetic compatibility (immunity) CEI EN 61000-6-2 (ex EN 50082-2)
- Electromagnetic compatibility (emission) CEI EN 61000-6-4 (ex EN 50081-2)
- Protection IP CEI EN 60529




## MEASUREMENT'S TYPOLOGY:



- True RMS up to the 20th harmonic wave




- Crest factor up to 2,5 (Voltage and Current)

## SERIAL INTERFACE

- Two types are forecasted:

1) "485" version: Serial interface RS 485 galvanically insulated (3 kV), suitable for conventional net.
2) "BL" (BLUETOOTH) version: BLUETOOTH interface class 2E. RS 485 interface, galvanically insulated(3 kV). This version permits to execute an access point on net RS485 also, with a fixed speed on demand.
   **The standard type has 115.200 bps.**
   A115200bps BLUETOOH interface only permits to have the oscilloscope function, and eventually RS485 also if connected with the same speed (115200bps).
   Version "BL" in any case can be connected and used as "485", independently by the bluetooh option present.

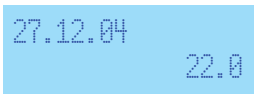
## COMMUNICATION DATA

- MODBUS RTU Protocol
- Address from 1 to 255
- Selectable speed on "485" (bps) version: 9600, 19200, 38400, 57600, 115200
- Selectable speed on "BT" (bps) version: standard 115200; on request 9600, 19200, 38400, 57600
- Parity: N; Bits: 8; Stop Bit: 1
- The MODBUS registers table of instrument is available on request or on the web site.

# 1RAEM

## OPERATION

- Powering the instrument you can see the following page




Software date revision and version.
Update

- 


First powering page. A different page can be selected within the available page present on this type.
At first powering the display shows automatically this page

- Introduction page.


- 


Program page.Entering in this page and maintaining pressed the button, it is possible to program the parameters of instruments. "Prog" flashes until to enter in program phase. (*)

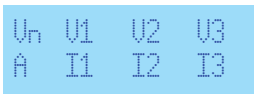
- Maintaining pressure on the front button you will see the parameters displayed on this page
**Releasing the button the measurements will be shown**


Medium phase voltage (L1+L2+L3)/3 Frequency
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Phase-phase voltage L1-L2, L2-L3, L3-L1
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**




Phase-neutral voltage L1-N, L2-N, L3-N
Current I1, I2, I3

## CONFIGURATION SELECTION MENU

- To enter in program phase, see "**OPERATION**" (**red rectangle**)
- The sliding of "programmation parameters" pages is automatic.
To intervene on one or more of these pages it is enough to press the button and start with a serie of short pressure and releases to increase the numbers one by one; to fasr forward maintain pressure on the front button.
Once selected the needed number, release the button and the actual page will advance to the next. At the end of the forecasted pages the instrument will go itself to "measurement visualization" mode and, in case of any modification madde, will save the new values in the permanent memory.

(*) 


Program mode page.

- Selection of current transformer ratio.


- 

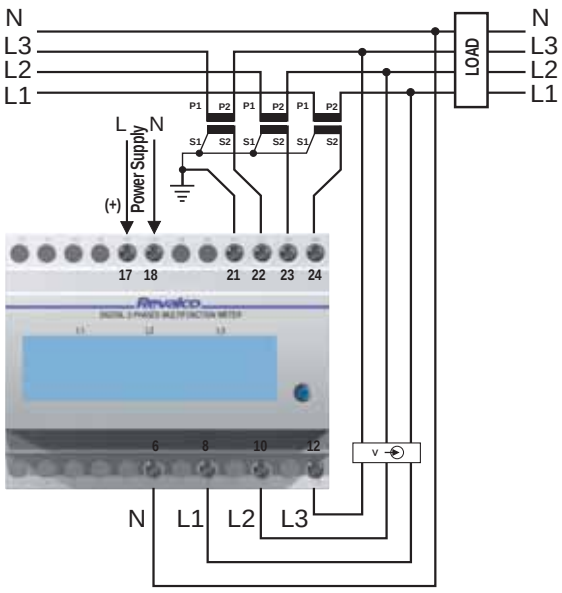

End scale, nominal measurement ph-n. Calibrated in factory. <u>This page is used on models with voltage transformer only.</u>

- Mathematical medium n° of samples, practically it is the stability filter of the measurements. Calibrated in factory. In case of not stabilized measurement, increase the number.


- 


Choose of first page at first powering. "Power On Ready" page selected in factory is useful when it is important to know if an electric interrumption occoured.

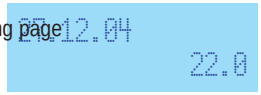
## CONNECTION DIAGRAM



# 1RAEMC / 1RAEMC485

## OPERATION

- Powering the instrument you can see the following page




Software date revision and version.

Update

- 


First powering page. A different page can be selected within teh available page present on this type.
At first powering the display shows automatically this page

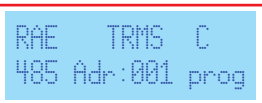
- Introduction page.


or


Correct sequence of phases indication.
Light OFF = correct sequence

- 


or



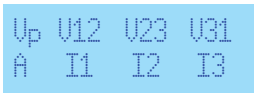

Program page.Entering in this page and maintaining pressed the button, it is possible to program the parameters of instruments. “Prog” flashes until to enter in program phase. (*)

- Maintaining pressure on the front button you will see the parameters displayed on this page
**Releasing the button the measurements will be shown**


Medium phase voltage (L1+L2+L3)/3 Frequency

Current I1, I2, I3

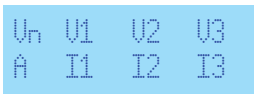
- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**




Phase-phase voltage L1-L2, L2-L3, L3-L1

Current I1, I2, I3

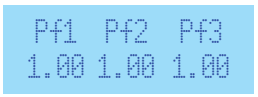
- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**




Phase-neutral voltage L1-N, L2-N, L3-N

Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**




Phase Cosφ Ind/Cap Ind/Cap Ind/Cap

L1 L2 L3

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
**Releasing the button the measurements will be shown**


Active power L1


Active power L2


Active power L3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Total Active power (L1+L2+L3)

I/C Total Cosφ (I=Ind, C=Cap)

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
**Releasing the button the measurements will be shown**


Reactive power L1


Reactive power L2


Reactive power L3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Total Reactive power

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
**Releasing the button the measurements will be shown**


Apparent power L1


Apparent power L2


Apparent power L3

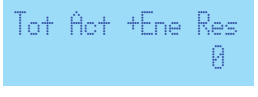
- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Total Apparent power

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Total Active Energy (Import)

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**

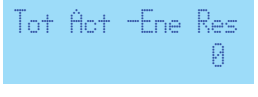



Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**

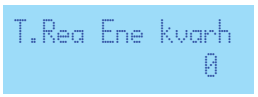

Total Active Energy (Export)

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**



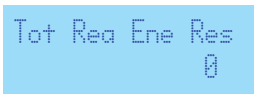

Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**



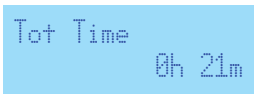

Total Reactive Energy

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**



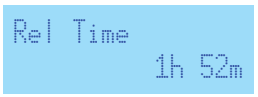

Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**



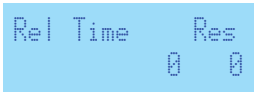

Working hours and minutes with powered instrument.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**




Working hours and minutes with powered instrument and from the last reset.Counting time between two resets.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**




Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**


Phase asymmetry. Max L1 Phase-neutral voltage value or L2 or L3 less the minimum value of L1 or L2 or L3. The difference determine the voltage lack between the phases.

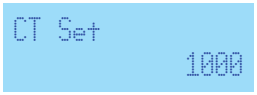
## CONFIGURATION SELECTION MENU

- To enter in program phase, see “**OPERATION**” (**red rectangle**)
- The sliding of “programmation parameters” pages is automatic.
  To intervene on one or more of these pages it is enough to press the button and start with a serie of short pressure and releases to increase the numbers one by one; to fasr forward maintain pressure on the front button.
  Once selected the needed number, release the button and the actual page will advance to the next. At the end of the forecasted pages the instrument will go itself to “measurement visualization” mode and, in case of any modification madde, will save the new values in the permanent memory.

(*)


Program mode page.

- Selection of current transformer ratio.




- 

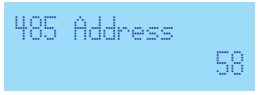

End scale, nominal measurement ph-n. Calibrated in factory. <u>This page is used on models with voltage transformer only.</u>

- Mathematical medium n° of samples, practically it is the stability filter of the measurements. Calibrated in factory. In case of not stabilized measurement, increase the number.


- 

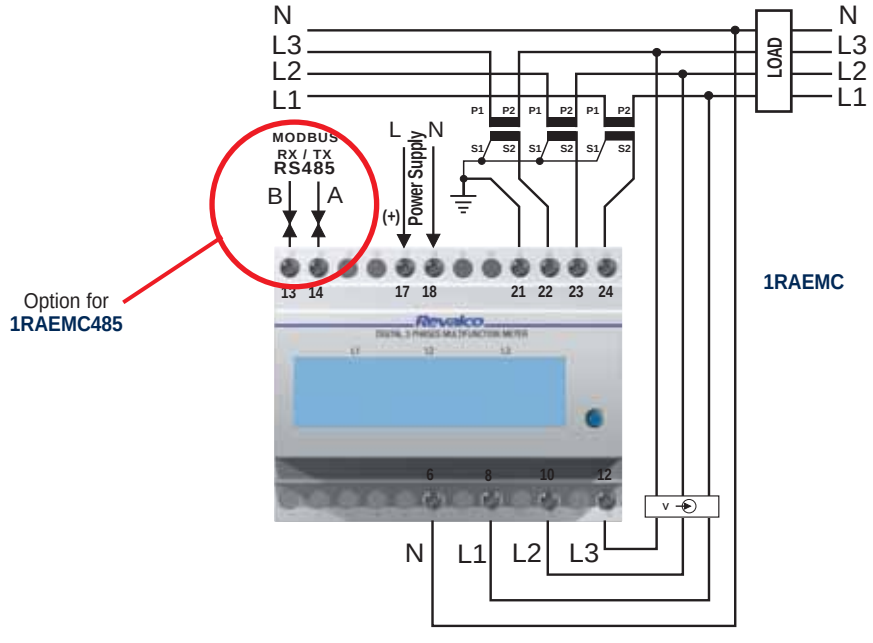

Choose of first page at first powering. “Power On Ready” page selected in factory is useful when it is important to know if an electric interruption occoured.

- Serial speed 0=9600, 1=19200, 2=38400, 3=57600, 4=115200
  Baude rate = selected speed: N.8.1


- 


MODBUS RTU address (froom 1 to 255)

## CONNECTION DIAGRAMS



# 1RAEMCS
# 1RAEMCS485 - 1RAEMBL485

## OPERATION

- Powering the instrument you can see the following page


Software date revision and version.
Update

- 


First powering page. A different page can be selected within teh available page present on this type.
At first powering the display shows automatically this page

- Introduction page.

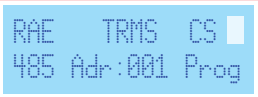

or


or

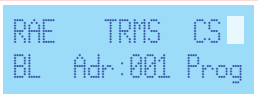

Correct sequence of phases indication.
Light OFF = correct sequence

- 


or




or

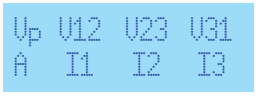



Program page.Entering in this page and maintaining pressed the button, it is possible to program the parameters of instruments. “Prog” flashes until to enter in program phase. (*)

- Maintaining pressure on the front button you will see the parameters displayed on this page
**Releasing the button the measurements will be shown**


Medium phase voltage (L1+L2+L3)/3 Frequency
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**

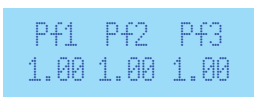



Phase-phase voltage L1-L2, L2-L3, L3-L1
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Phase-neutral voltage L1-N, L2-N, L3-N
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**




Phase Cosφ Ind/Cap Ind/Cap Ind/Cap
L1 L2 L3

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
**Releasing the button the measurements will be shown**


Active power L1


Active power L2


Active power L3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Total Active power (L1+L2+L3)
I/C Total Cosφ (I=Ind, C=Cap)

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
**Releasing the button the measurements will be shown**


Reactive power L1


Reactive power L2


Reactive power L3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Total Reactive power

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
**Releasing the button the measurements will be shown**


Apparent power L1


Apparent power L2


Apparent power L3

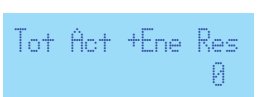
- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Total Apparent power

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**


Total Active Energy (Import)

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**

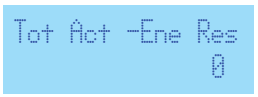



Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
**Releasing the button the measurements will be shown**

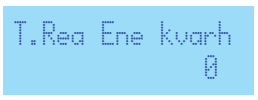

Total Active Energy (Export)

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**



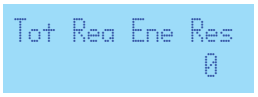

Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**



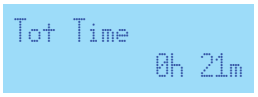

Reattiva Total Reactive Energy

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**



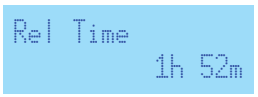

Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**



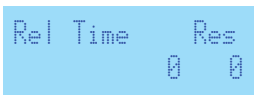

Working hours and minutes with powered instrument.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**




Working hours and minutes with powered instrument and from the last reset.Counting time between two resets.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**




Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**


Phase asymmetry. Max L1 Phase-neutral voltage value or L2 or L3 less the minimum value of L1 or L2 or L3. The difference determine the voltage lack between the phases.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  **Releasing the button the measurements will be shown**


Thresholds status with output relays. “ On” means that the alarm is active and the contact is closed ( the relay is normally open)

## CONFIGURATION SELECTION MENU

- To enter in program phase, see “**OPERATION**” (**red rectangle**)
- The sliding of “programmation parameters” pages is automatic.
  To intervene on one or more of these pages it is enough to press the button and start with a serie of short pressure and releases to increase the numbers one by one; to fasr forward maintain pressure on the front button.
  Once selected the needed number, release the button and the actual page will advance to the next. At the end of the forecasted pages the instrument will go itself to “measurement visualization” mode and, in case of any modification madde, will save the new values in the permanent memory.

(*)


Program mode page.

- Selection of current transformer ratio.


- 


End scale, nominal measurement ph-n. Calibrated in factory. <u>This page is used on models with voltage transformer only.</u>

- Mathematical medium n° of samples, practically it is the stability filter of the measurements. Calibrated in factory. In case of not stabilized measurement, increase the number.


- 


Choose of first page at first powering. “Power On Ready” page selected in factory is useful when it is important to know if an electric interruption occoured.

- Serial speed 0=9600, 1=19200, 2=38400, 3=57600, 4=115200
  Baude rate = selected speed: N.8.1


- 

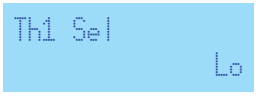

MODBUS RTU address (froom 1 to 255)

- **QUALIFICATION OF RELAY 1** as threshold. If “Off” is selected, this relay can be used by serial way as a peripheric to command another net.


- 


Threshold 1 qualified.
Function selection: “Hi” intervention for higher values.
**Threshold higher**. Lower or equal value is the stand-by condition.

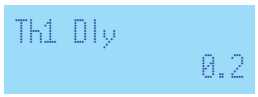
- Threshold 1 qualified.
  Function selection: “Lo” intervention for lower values.
  **Threshold lower**. Higher or equal value is the stand-by condition.




- 


**Delay type of threshold 1.**
“Off-On” delay to the excitation = delay from hold to work.

- **Delay type of threshold 1.**
  “On-Off” delay to the disexcitation = delay from work to hold.



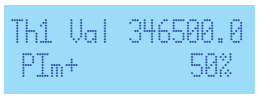

**Delay time of threshold 1.**
From 0.0 sec, to 25.0 sec- steps 0.1 sec

**Parameters to which the threshold 1 is related.**

**3Vff** = min or max value of 3 phase-phase voltages.
**3I** = min or max value of currents.
**Pim+**= min or max value of buyed power (+, import).
**Vas** = min or max value of voltage asymmetry.
**V23** = min or max value of phase-phase voltage L2.
**V1** = min or max value of phase-neutral voltage L1.
**V3** = min or max value of phase-neutral voltage L3.
**I2** = min or max value of current L2.

**3Vn** = min or max value of 3 phase-neutral voltages.
**Fre** = min or max value of frequency.
**Pex-** = min or max value of selled power (-, export).
**V12** = min or max value of phase-phase voltage L1.
**V31** = min or max value of phase-phase voltage L3.
**V2** = min or max value of phase-neutral voltage L2.
**I1** = min or max value of current L1.
**I3** = min or max value of current L3.

Threshold 1 selected as alarm on buyed power. Selected on the 50% of the nominal value.
Nominal value= (CT value) x (ph-n voltage value) x 3.




**QUALIFICATION OF RELAY 2** as threshold. If "Off" is selected, this relay can be used by serial way as a peripheric to command another net.



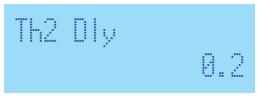
Threshold 2 qualified.
Function selection: "Hi" intervention for higher values.
**Threshold higher**. Lower or equal value is the stand-by condition.

Threshold 2 qualified.
Function selection: "Lo" intervention for lower values.
**Threshold lower**. Higher or equal value is the stand-by condition.



**Delay type of threshold 2.**
"Off-On" delay to the excitation = delay from hold to work.

**Delay type of threshold 2.**
"On-Off" delay to the disexcitation = delay from work to hold.


**Delay time of threshold 2.**
From 0.0 sec, to 25.0 sec- steps 0.1 sec

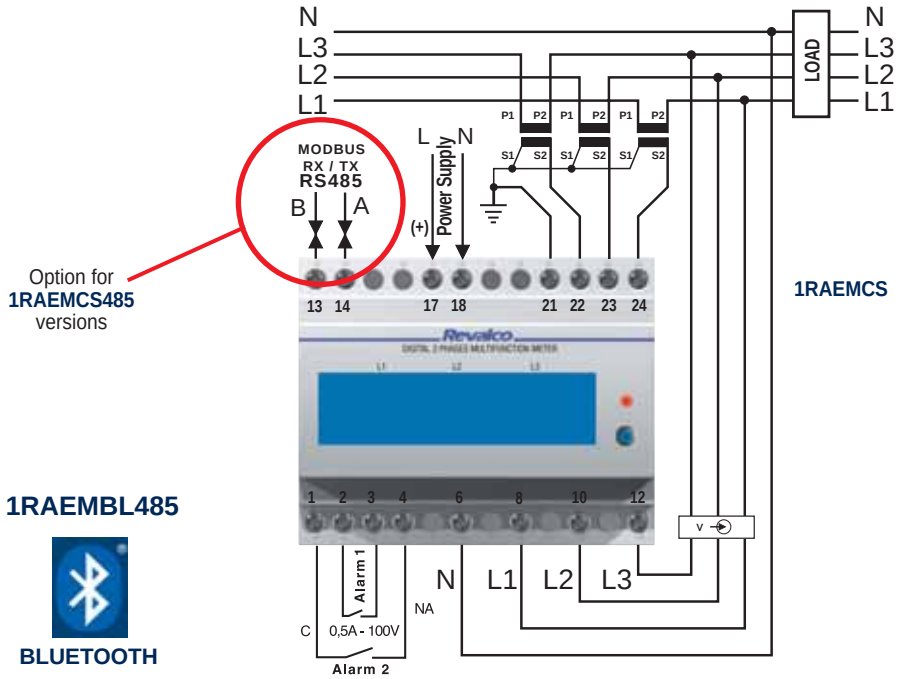
**Parameters to which the threshold 2 is related.**

**3Vff** = min or max value of 3 phase-phase voltages.
**3I** = min or max value of currents.
**Pim+**= min or max value of buyed power (+, import).
**Vas** = min or max value of voltage asymmetry.
**V23** = min or max value of phase-phase voltage L2.
**V1** = min or max value of phase-neutral voltage L1.
**V3** = min or max value of phase-neutral voltage L3.
**I2** = min or max value of current L2.

**3Vn** = min or max value of 3 phase-neutral voltages.
**Fre** = min or max value of frequency.
**Pex-** = min or max value of selled power (-, export).
**V12** = min or max value of phase-phase voltage L1.
**V31** = min or max value of phase-phase voltage L3.
**V2** = min or max value of phase-neutral voltage L2.
**I1** = min or max value of current L1.
**I3** = min or max value of current L3.


Threshold 2 selected as alarm on frequency. Selected 50 Hz.Value of selected parameter as reference for the correspondent selected alarm value. Being it an absolute value, the selection correspond to the real value.

## CONNECTION DIAGRAMS




If on 1RAEMBL485 version, RS485 is not connected, it is necessary to mount a 120 Ohm resistance between terminals 13 and 14.

# THREE PHASE LCD MULTIFUNCTION METERS - 4 DIN TRUE RMS

## DIMENSIONS in mm

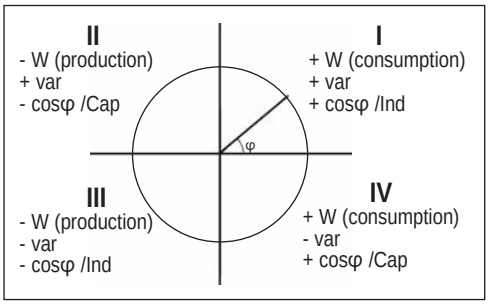

- **Weight kg 0,70**
- **Sealable terminals cover included**

**Input 5A**

**Input 63A**

## GENERAL DESCRIPTION

The 4 DIN instrument is suited for use in an industrial environment. Simple and extremely compact, it features an alphanumerical display with 2 eight-character lines, 6 auxiliary LEDs and 2 buttons for display selection and keyboard programming. The machine is extremely user-friendly and information is presented clearly on the display. It is unlikely you will need to consult instruction manual which is not generally kept readily available at the site. When properly installed, the instrument can accept full intake flow from external CT 5A to 6A max. While it is 63A direct connection for model 1RAEM63CS.
Voltage can be direct, max 290Vac Phase/Neutral (=230Vac+25%), or from VT (optional). In this case it is possible to program the full scale value for equivalent voltage at up to 400Vfn (=690Vcc), with guarantee of the displayed values up to 25% more (500Vfn/860Vff).
For direct connection, the Vt must be the same as the rated phase/neutral voltage, normally 231Vac.
There is a “standard” range of measurements for a high precision industrial environment.
The power and power factor data are indicated on 4 dials according to annex E in standard EN61268.
The individually resettable energies (consumed, produced and reactive) can be easily calculated when you need to service the system and/or test line operation, determine zone consumption values, establish cost centres, etc.
NOTE: The instrument uses simple energy totalizing methods for purposes of diagnostics and statistics.
The instrument cannot replace an energy counter.
The following are provided according to model:
2 counters (non-resettable total and resettable partial value)
1 threshold with output on “NO” control relay (500mA/1000V), fully programmable.
1 x RS485 3kV optoinsulated programmable high speed interface with MODBUS RTU protocol.
The operating instructions, measurements and technical specifications are given below.




## PARAMETERS

| | 1RAEM4C | 1RAEM4CS | 1RAEM4C485 | 1RAEM4CS485 | 1RAEM63CS |
|---|---|---|---|---|---|
| - 3 phase-to-phase voltages, direct or from VT (optional) | ● | ● | ● | ● | ● |
| - 3 phase-to-neutral voltages, direct or from VT (optional) | ● | ● | ● | ● | ● |
| - 3 currents from CT..../5A (1 decimal) | ● | ● | ● | ● | |
| - Current in neutral from CT..../5A (1 decimal) | ● | ● | ● | ● | |
| - Frequency with 2 decimals | ● | ● | ● | ● | ● |
| - 3 x Active Powers with 4 dialsi | | | ● | ● | |
| - Total Active Powers with 4 dials | ● | ● | ● | ● | ● |
| - 3 x Reactive Powers with 4 dials | | | ● | ● | |
| - Total Reactive Powers with 4 dials | ● | ● | ● | ● | ● |
| - 3 x Apparent Powers | | | ● | ● | |
| - Total Apparent Power | ● | ● | ● | ● | ● |
| - Power Factor of the 3 phases | | | ● | ● | |
| - Total Power Factor | ● | ● | ● | ● | ● |
| - Total Active Energy (import) resettable parameter | ● | ● | ● | ● | ● |
| - Total Active Energy ( export) resettable parameter | ● | ● | ● | ● | ● |
| - Total Reactive Energy resettable parameter | ● | ● | ● | ● | ● |
| - Total operation counter | ● | ● | ● | ● | ● |
| - Partial operation counter resettable parameter | ● | ● | ● | ● | ● |
| - Programmable threshold with “NO” relay output 500mA/1000V | | ● | | ● | ● |
| - Threshold status summary page | | ● | | ● | ● |
| - Threshold activation signal | | ● | | ● | ● |
| - Indication of the correct voltage phase sequence | ● | ● | ● | ● | ● |
| - Indication of failed voltage supply | ● | ● | ● | ● | ● |
| - RS485 3kV optoinsulated high-speed 5-speed interface | | | ● | ● | |
| - **MODBUS RTU SLAVE PROTOCOL** Full compliance | | | ● | ● | |
| - Keypad configurable settings | ● | ● | ● | ● | ● |
| - Remote configurable settings | | | ● | ● | |
| - Remote resetting of the energies | | | ● | ● | |
| - Remote resetting of the partial counter | | | ● | ● | |
| - Remote relay output control (if the threshold is OFF) | | | | ● | |
| - Configurable password for access to programming | ● | ● | ● | ● | ● |
| - Restore factory settings | ● | ● | ● | ● | ● |
| - Programming of initial page upon start-up | ● | ● | ● | ● | ● |
| - Programming of CT.../5A of 5 to 6000A with step of 5A | ● | ● | ● | ● | |
| - Programming of VT (optional) with double indication L-L and L-N | ● | ● | ● | ● | |
| - Programming of the analog average (V, A and P) | ● | ● | ● | ● | |
| - **Download the software for free from our website www.revalco.it** | | | ● | ● | |

| | | |
|---|---|---|
| **Auxiliary power supply** | | |
| - UAUX nominal value | 230 | 230V 50/60 Hz (self supplied for 1RAEM63CS model) |
| | -P1 | 22...36VCA and 19...70VCC |
| | -P2 | 44...130VCA and 70....240VCC |
| - max rated consumption | | 2 VA |
| **Amp measuring circuits for CT /5** | | |
| - Max applicable current (Imax) | | 6A |
| - Rated current measurement (Inom) | | 5A (63A for 1RAEM63CS model) |
| - Direct current range | | 0.03...6A (0.6...60A for 1RAEM63CS model) |
| - Input impedance | | approx 20mΩ ± 1% |
| - Permanent overload | | 110% (Inom) |
| - Thermal overload (1 s) | | 200% (Inom) |
| - Current transformer (Ct) control range (/5) | | 5…6000A at steps of 5A |
| - Precision | | 0.5%*Imax ± 2 digits |
| **Compatible amp transformers** | | |
| - rated current | | 5 A |
| - Transformer ratio | | 1…1200 |
| **Voltmeter measuring circuits (instrument for direct insertion)** | | |
| - Max applicable voltage (Vmax) | | 300 Vf n (5 20 Vff) |
| - Rated voltage measurement (Vnom) | | 231Vfn(400Vff) |
| - Direct measuring field | | 0-300Vfn (520Vff) TRMS up to 20ma arm. |
| - Input impedance of voltage circuit | | approx 2MΩ Phase/Neutral and Phase/Phase |
| - Vt control range | | =Vnom |
| - Precision | | 0.5%*Vmax ± 2 digits |
| **Voltmeter measuring circuits (instrument for insertion from VT /100)** | | |
| - Maximum applicable voltage (Vmax) | | 75Vfn(130Vff) |
| - Rated voltage measurement (Vnom) | | 57,75 Vfn(100Vff) |
| - Direct measuring range | | 0-75Vfn(130Vff) TRMS up to 20ma arm. |
| - Imput impedance | | 500KΩ Phase/Neutral and Phase/Phase about |
| - Control range VT | | 50…400Vfn(86,5…692Vff) |
| - Class | | 0.5%*Vmax ± 2 digit |
| **Compatible voltmeter transformers** | | |
| - Rated voltage | | 100 V |
| - Transformer ratio | | 1...6 |
| **Frequency measurement** | | |
| - Frequency measuring range | | 9.50...100.00Hz |
| - Operating range (V1) | | 35 – 300 Vfn |
| - Precision | | 0.1% ± 1 digit |
| **Single power measurement** | | |
| - Measurement capacity per line | | ±2.88 MW /±2.88Mvar /2.88MVA (50kW/50kvar/50kVA for 1RAEM63CS model) |
| - Precision (0.05 > Inom > 1.0) | | 1 % full scale ± 2 digits |
| **Total power measurements** | | |
| - Measuring capacity | | ±8.64 MW /±8.64Mvar /8.64MVA |
| - Precision (0.05 > Inom > 1.0) | | 1 % ± 2 digits |
| **Power factor measurement (all)** | | |
| - Measuring range cosφ | | -1.00…0.00…+1.00 |
| - Precision (0.1 > Inom > 1.0, 0.8 > Vnom >1.2) | | 2% full scale ± 2 digits |
| **Energy totalizing** | | |
| - Counting capacity | | 99999999kWh /kvarh |
| - Counting period | | 15 minutes |
| - Resettable | | YES |
| - Precision (0.05 > Inom > 1.0) | | 2% Max |
| **Operating counter** | | |
| - Counting capacity | | 99999:59 hhhhhh:mm |
| - Counting period | | 15 minutes |
| - Resettable | | NO |
| - Precision | | 2% Max |
| **Partial counter** | | |
| - Counting capacity | | 99999:59 hhhhhh:mm |
| - Counting period | | 15 minutes |
| - Resettable | | YES |
| - Precision | | 2% Max |
| **Screens** | | |
| - Display | | Backlit LCD, 8 characters x 2 lines, temp. -20°/+70° |
| - Auxiliary signals | | 6 red LEDs |
| **Relay control output (only “S” models)** | | |
| - Type of contact | | NO |
| - Contact specifications | | 1000Vac / 0.5Aac(res. load) / 20VA max |
| - Reel-contact insulation | | 4.25kVac |
| - Remote operation via MODBUS | | YES, only for “S485” models |
| **RS485 serial interface (only “485” models)** | | |
| - Insulation | | 3kV |
| - Max communication speed | | 115.200 bps |
| - Communication protocol | | MODBUS RTU Full-compliant / JBUS |
| - Programmability and remote controls | | YES |
| **Special functions** | | |
| - 3-digit password for programming the settings | | |
| - Black-out indicator system | | |
| **Terminal specifications** | | |
| - Rated current | | 30A |
| - Cable cross-section | | 22-10AWG 4mm² |
| - Torque | | 0.5Nm (4.5lb.in) |

**Mechanical properties**

| | | |
|---|---|---|
| - Dimensions | Standard 4 DIN modules | |
| - Type of assembly | DIN50022 guide | |
| - Degree of protection | for entire device: IP20/ Front IP30 | |
| **Environmental conditions** | | |
| - Operating temperature: | | |
| Nominal range | 0...+45 °C | |
| Extreme range | -5...+55 °C | |
| - Storage temperature | -10...+70 °C | |
| - Relative humidity | 10...95 % | |
| - Atmospheric pressure | 70...110 kPa | |
| **Standards of reference** | | |
| - Safety | CEI EN 61010-1 | 300V CAT III |
| - Precision | CEI EN 60688 | (ex EN 50082-2) |
| - Electromagnetic compatibility (immunity) | CEI EN 61000-6-2 | (ex EN 50081-2) |
| - Electromagnetic compatibility (emission) | CEI EN 61000-6-4 | |
| - Cover protection (IP code) | CEI EN 60529 | |
| **Modbus:** | | |
| - Protocol specifications | V1.1b, 28.12.2006 | |

## GENERAL OPERATION (FOR ALL MODELS)

The instrument calculates and monitors the electrical measurements of the plant to which it is connected. It displays the information on one of the pages on the display, selected by quickly pressing one of the buttons. The right button is for “next” and the left button is for “previous”. The 6 LEDs on the right help to indicate the main electrical measurement pages and switch on according to the type of measurement shown on the display at the time. The first measurement page that appears upon start-up can be programmed.
The “S” models with threshold allow you to configure the measurement to be controlled, the type of threshold (off, maximum or minimum), the millesimal threshold value in relation to the full scale of the controlled measurement, time delay upon activation or deactivation, if applicable, and the time delay in tenths of a second up to 25.5 seconds (0=no delay)
Refer to the “Programming” section for details on programming values and the “Operation of the programmable threshold” section.
The “485” models with RS485 interface can communicate via a network when they are assigned a programmable address of between 1 and 255. You are advised not to put more than 32 devices on a network so as to ensure reliable communication.
If this is not adequate, there are “special” versions able to support more than 64 devices.
Communication speed can be set at between 9600bps and 115,200bps.
You are advised to set the communication speed at maximum if only these devices are used.
If the speed is set too low and there are frequent requests and/or there is a high number of required records, interactions with the instrument may also slow down. All measurements and parameters can be viewed on the MODBUS RTU reader interface.
The instrument also enables “on the fly” remote programming of the work settings via the MODBUS writer interface with the respective records that support it. In certain situations you are also allowed to carry out some macro-operations and controls, such as restoring the factory settings of models that enable this, resetting of the totalizers or direct switching on and off of the output relay for models with threshold. Note: the “485” models offer additional measurements via Modbus, in particular single phase measurements of the powers and cosφ values. Some models feature a blackout indication page.
It is like the measurement page but with flashing content which has to be programmed like the initial page shown on start-up.
When you press the keys to change the measurement page, the “blackout” condition is reset. This is proposed again after any programming of the settings on the keyboard.
Some models feature 2 counters – one for total operation and another that can be reset. The latter allows you to check the average consumption if reset together with one or more energy totalizers.
Some models require a 3-digit password (that can be excluded) to change the work settings and reset the counters.
This password is not intended to guarantee full protection but to prevent accidental access to the programming area and ensure the settings are not changed by someone not authorized to do so.
**There is no easy way to recover or cancel a password that has been configured and then forgotten. You will have to try all the combinations or return the product to the factory for reprogramming.**

## NOTES AND OPERATING INSTRUCTIONS

**DO NOT PRESS ANY OF THE KEYS** while switching on the instrument (i.e. when connecting it to the auxiliary power supply).
Otherwise you may accidentally start the calibration procedure normally carried out at the factory which, if the instrument is connected to the system rather than to the respective calibration devices, could cause the instrument to be permanently uncalibrated. In the interest of safety, **ALWAYS WAIT FOR THE INITIAL DIAGNOSTICS TO FINISH** (scanning of the LEDs) before pressing any of the keys.
“S” instruments with threshold: The threshold relay is blocked for the first ten seconds after the instrument is switched on.
The relay is “frozen” until you have finished configuring the settings.

## OPERATION

When you start up the device, the firmware information page appears for a few seconds and all the LEDs switch on in order (initial diagnostics).
You will then see, for a few seconds, the page with the “title” of the measurements that will appear on the display, and the respective LED will switch on if the page requires it to do so. When the first measurement page appears, you can press the buttons to scroll through the available pages.
You can scroll FORWARDS by QUICKLY PRESSING the RIGHT-HAND button, or BACKWARDS by pressing the LEFT-HAND button.
Pressing and holding the right-hand button will take you to the next page as well as allow you to program the instrument’s settings.
Pressing one of the 2 buttons quickly displays the “title” of the measurement page to be displayed.

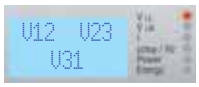
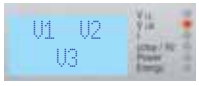
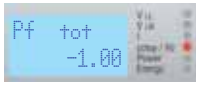
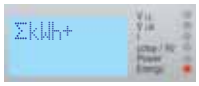
## OPERATION

The measurement and indication pages that can be accessed by pressing and QUICKLY releasing the RIGHT-HAND button are as follows:


Appears only for about 3 seconds when the instrument is switched on.
Provides information on the instrument's firmware and operating details.
When this page is displayed, the LEDs flash quickly to indicate they are working properly.


**Black-out page**
For this to appear, it has to be configured as the default page. Appears only when the instrument is switched on.
It disappears as soon as the display is moved. It reappears after the settings are configured using the keypad.


**INFO page.** Indicates the instrument model and version. The lit-up square (first line on the right) indicates the voltage phases are OUT OF SEQUENCE. The square does not appear when the sequence is correct. Only in the case of the "485" models does the last value at the bottom on the right indicate the node number of the instrument on the MODBUS network.

| PRESSED BUTTON | WHEN RELEASED | DESCRIPTION |
|---|---|---|
|  Phase-to-phase voltages |  | Value of each phase-to-phase voltage (V) |
|  Phase-to-neutral voltages |  | Value of each phase-to-neutral voltage (V) |
|  Currents of Lines 1 and 2 |  | Value of A1 and A2 (A)<br>The values have decimal points if the selected CT is less than 1000A (/5), otherwise they are whole. |
|  Current of Line 3 / Current in neutral |  | Value of A3 and Neutral Current (A)<br>The values have decimal points if the selected CT is less than 1000A (/5), otherwise they are whole. |
|  Frequency |  | Frequency (Hz)<br>This is measured by V1. |
|  Total active power |  | Total active power (W)<br>The measurement is POSITIVE for consumed power, NEGATIVE for power produced. |
|  Power factor |  | Three-phase power factor (Cosφ)<br>The value is the same as the active line power.<br>The offset is void without the indicators "C" (capacitive) or "I" (inductive). |
|  Reactive power |  | Measurement of Three-phase Reactive Power (var)<br>The measurement is POSITIVE for dials 1 and 2, NEGATIVE for dials 3 and 4. |
|  Three-phase apparent power |  | Value of Three-phase Apparent Power (VA) |
|  Totalizing of total active energy consumed |  | Total Active Energy consumed (kWh) |
|  Totalizing of total active energy produced |  | Total active energy produced (kWh) |
|  Totalizing of total reactive energy |  | Total reactive energy (kvarh) |
|  Total counter |  | The instrument's operating time in hours and minutes (hhhhh:mm) |

| PRESSED BUTTON | WHEN RELEASED | DESCRIPTION |
|---|---|---|
|  |  | Time since last reset in hours and minutes (hhhhh:mm) |
| Partial counter | | |
|  |  | **ONLY FOR "S" MODELS**<br>Status of output relay contact (On=closed) and source of the threshold |
| Relay | | |

**OPERATION OF THE PROGRAMMABLE THRESHOLD**

The "S" models allow you to apply a maximum or minimum threshold as a percentage of the required size, in relation to its intended full scale.

| Required size (Th1 Src) | Full scale (= 100.0%) | Description |
|---|---|---|
| W+ | CT Set * VT Set * 3 | Max or Min of instantly consumed active power |
| W- | CT Set * VT Set * 3 | Max or Min of instantly produced active power |
| Hz | 100Hz | Max or Min of frequency measured on V1 |
| 3Vf | VT Set * 1,73 | Max or Min of a phase-to-phase voltage |
| V12 | VT Set * 1,73 | Max or Min of V12 |
| V23 | VT Set * 1,73 | Max or Min of V23 |
| V31 | VT Set * 1,73 | Max or Min of V31 |
| 3Vn | VT Set | Max or Min of a phase-to-neutral voltage |
| V1 | VT Set | Max or Min of V1 |
| V2 | VT Set | Max or Min of V2 |
| V3 | VT Set | Max or Min of V3 |
| 3A | CT Set | Max or Min of a current |
| A1 | CT Set | Max or Min of A1 |
| A2 | CT Set | Max or Min of A2 |
| A3 | CT Set | Max or Min of A3 |
| An | CT Set * 3 | Max or Min of An |

The threshold activation (threshold active) point is the condition "more than Th1 Val" if Th1 Sel = Hi; otherwise "less than Th1 Val" if Th1 Sel = Lo. The threshold's quiescent operating (threshold inactive) point is the condition "less than or equal to Th1 Val" if Th1 Sel=Hi; otherwise "more than or equal to Th1 Val" if Th1 Sel=Lo. The "active threshold" condition attempts to CLOSE the relay's "NO" contacts and this occurs instantly unless there is the delay Th1 Dly if Th1 DD is "Off-On". The "inactive threshold" condition attempts to OPEN the relay's "NO" contacts and this occurs instantly unless there is the delay Th1 Dly if Th1 DD is "On-Off".

There are 2 cases whereby the output relay does NOT mirror the threshold condition. These are as follows:

- During the first 10 seconds from starting up the instrument, when the relay is kept inactive to avoid unwanted operation while the measurements are stabilized, and
- when the settings are being programmed on the keypad, it is kept at the same status at the time of starting the procedure, to prevent partial modification of the settings from causing unwanted change to its status.

Relay status is shown on the display at page "OUT", together with the title of the size of the threshold selected in Th1 Src.
Closing of the relay also determines flashing of the LED associated with the selected size (when applicable), providing the selected measurement page is not the one associated with the LED, in which case the LED light remains steady.

**"S485" Models**

When Th1 Sel=OFF (threshold OFF), there is the option of controlling the relay directly by means of MODBUS commands to open and close INSTANTLY, regardless of the Th1 Dly and Th1 DD settings. "Src=REM"(REMOTE) appears on the OUT page to indicate remote access of the relay.

## PROGRAMMING

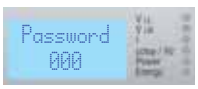
For programming, press and hold the RIGHT-HAND button (for 4 seconds or more). The first page to appear when you are granted access to the programming mode is the one of programmable values. Releasing the button will make the display flash (to indicate you are in programming mode) and the pages begin to scroll through slowly (one every 4 seconds or so), indicating the title and value of the current set-point. If you do not touch the button when you get the last page, normal operation is restored without saving any changes.

To make a change, simply press one of the buttons when the required page appears, respectively:

**LEFT-HAND button** = DECREASES the value; **RIGHT-HAND button** = INCREASES the value.

At that point (after pressing the button) the display remains steady so you can check the modification and the value changes by one unit. If you have to modify a value quite considerably, you can press and hold the button for more than 2 seconds to speed up the process. The longer you hold down the button, the faster you can scroll through the numbers (4 speeds). They are all "roll" values so when you get to the maximum permitted value you restarted from the minimum value, and vice versa. When you have set the value as required, release the button and wait for over 4 seconds. The pages then continue scrolling and the modification is automatically saved. Modifiable pages then follow.

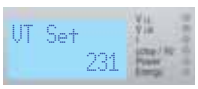

indicates you have entered the setting configuration phase.




**A password is only requested if NewPassw is set at a value other than 0** (see below).
Select the correct number and wait for the next page. In the case of a missing or incorrect entry, the instrument returns to normal operation after about 4 seconds.


By pressing a key when this page is shown, all value parameters return equal to the factory programming, except totalizer resetting one by one.


Select the CT value (/5) in Ampères. Between 5 and 6000 in steps of 5.
Default = 100




Select the voltage full-scale value.
If in direct connection, it must be settable between 87 and 692 at steps of 1 V (default = 400) equal to the rated value of the phase-to-neutral line voltage.


During configuration, above is the phase-to-phase value settable between 87 and 692, at steps of 1 V (Default = 400). Below is the phase-to-neutral value settable between 50 and 400 at steps of 1 V (Default = 231)


Average of the analog values measured (V, A and P). To stabilize the displayed values.
The higher the number, more of the measurements are stable – although they will be slow to update.
Settable between 1 and 15 at steps of 1. Default = 3


Configuration of the first measurement page to be viewed upon start-up. Using the buttons to scroll through displays the "titles" of the available pages – the same ones that appear when you press the right-hand button in sequence.
Settable on all the available pages. **Default = Blackout detection page, if available, otherwise the INFO page.**


Setting this at zero disables password protection for programming with the keypad. The same applies for password protection for programming by remote control. Settable between 0 and 999 at steps of 1.
**Default = 0 (disabled)**


Resetting the Totalizer of the Total Active Energy consumed

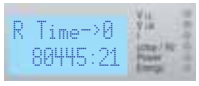

Pressing and holding the right-hand button for more than 4 seconds reset the value


Resetting the Totalizer of the Total Active Energy produced


Pressing and holding the right-hand button for more than 4 seconds reset the value


Resetting the Totalizer of the Total Reactive Energy


Pressing and holding the right-hand button for more than 4 seconds reset the value




Resetting the Partial counter


Pressing and holding the right-hand button for more than 4 seconds reset the value

**THE WINDOWS BELOW APPLY ONLY TO THE "S" MODELS**


**Selecting the threshold operation mode**. Settable between: Hi=High threshold, Lo=Low threshold and Off=threshold disabled.
If the threshold is OFF, you will not view the following pages. **Default = Hi (high threshold).**


**Delay time for activation of the output relay** (page displayed only if Th1 Sel is not Off)
In seconds. Settable between 0.0 and 25.5 in steps of 0.1. **Default = 0.1**


**Assigning the delay time for activating the threshold** (page displayed only if Th1 Sel is not Off)
The delay time is applicable from the start of threshold activation (Off-On) or at the end (On-Off). **Default = Off-On (at the start)**


**Assigning the size for activating the threshold** (page displayed only if Th1 Sel is not Off)
Settable at: W+, W-, Hz, 3Vf, V12, V23, V31, 3Vn, V1, V2, V3, 3A, A1, A2, A3,An. **Default = W+**


**Regulating the threshold value as a percentage of the full scale** (page displayed only if Th1 Sel is not Off)

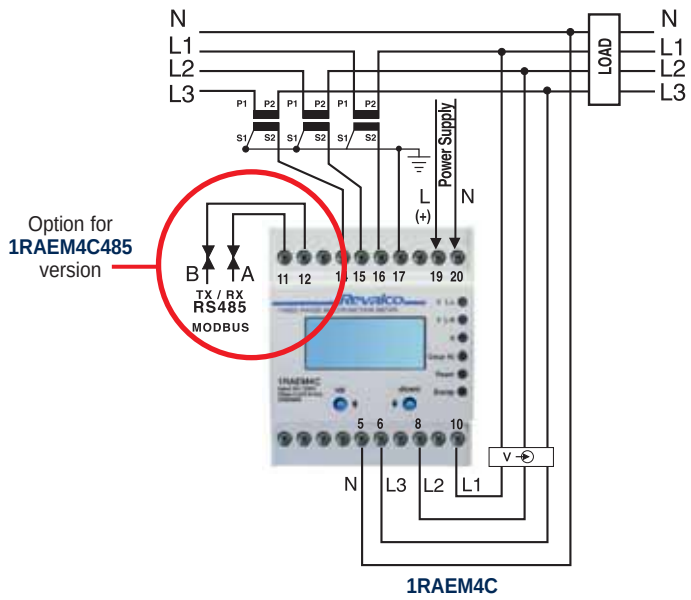

At the top is the effective value of the threshold for the selected size. Settable between: 0.0 and 100.0, in steps of 0.1.
**Default = 50.0(%)**

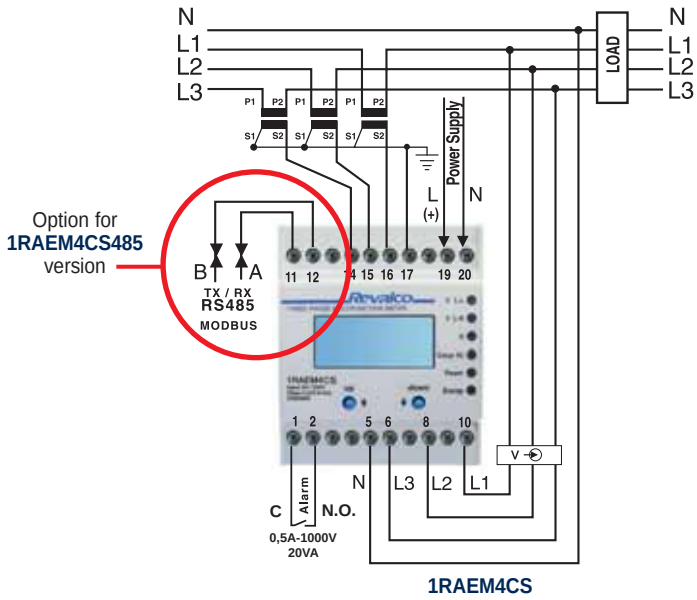
**THE WINDOWS BELOW APPLY ONLY TO THE "485" MODELS**


**Assigning the MODBUS address node number** (of the "INFO" page). Settable between 1 and 255.
**Default = 1**


**Configuring the speed of the RS485 serial port (bps).**
Settable between 0 and 4 (0=9600, 1=19200, 2=38400, 3=57600, 4=115200)
**Default = 4**

## CONNECTION DIAGRAMS



# 1RAEM63CS - 63A Input

## OPERATION

- Powering the instrument you can see the following page: Model Revised software, update.

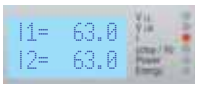

Correct sequence of phases indication.
Light OFF = correct sequence

- 

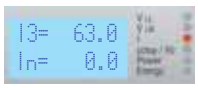

By pressing the front button (down↓), **FIRST LED** lights-on showing the values of Phase-phase voltage. (V L-L)

- 


By pressing again the front button (down↓), **SECOND LED** lights-on showing the values of Phase-neutral voltage. (V L-N)

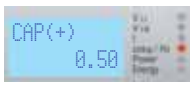
- 


By pressing again the front button (down↓), **THIRD LED** lights-on showing the values of L1 and L2 currents. (A)

- 


By pressing again the front button (down↓), display shows the value of L3 current and In (neutral) (A)

- 




By pressing again the front button (down↓), **FOURTH LED** lights-on showing the values of Capacitive or Inductive Cosφ (indication on 4 quadrants).

- 


By pressing again the front button (down↓), display shows the value of Frequency. (Hz)

- 


By pressing again the front button (down↓), **FIFTH LED** lights-on showing the values of Apparent Power (W)

- 


By pressing again the front button (down↓), display shows the value of Reactive Power (var).

- 

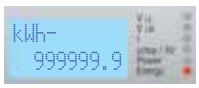

By pressing again the front button (down↓), display showing the values of Apparent Power (VA).

- 


By pressing again the front button (down↓), **SIXTH LED** lights-on showing the values of Active Energy (import) (kWh+).

Resettable page 


Maintaining pressure on the button, display flashes and the numbers go to zero.

- 


By pressing again the front button (down↓), display showing the values of Active Energy (export) (kWh-)

Resettable page 


Maintaining pressure on the button, display flashes and the numbers go to zero.

- 


By pressing again the front button (down↓), display showing the values of Reactive Energy (kvarh)

Resettable page 


Maintaining pressure on the button, display flashes and the numbers go to zero.

- 


By pressing again the front button, all the displays light-off showing the function Hourmeter (T Time = Total Time), with aux supply present instrument.

- 


Time spent ( hh and mm),with aux supply present on the instrument, starting from the last annulment. Counting of time interval between two annulments.

Resettable page 


Maintaining pressure on the button, “R time” (Relative Time) flashes and the numbers go to zero.

- 


Output status. On the parenthesis the parameter on which is setted the threshold appears.
The parameters which can appear are:
V12 - V23 - V31 - V1 - V2 - V3 - I1 - I2 - I3 - 3Vff - 3Vn - 3I - Fre - Plm+ - PEx - **LED ARE LIGHT OFF.**

## CONFIGURATION SELECTION MENU

- **To enter in programming menu press the left button for 4 seconds about. When the first page appears than press the right button to see the next. Choosed the needed page press the right button to enter in configuration mode. Once in configuration, pressing the right button it is possible to change the values while the left button serves to exit from the actual page. To come back on nominal use press the right button for more than 4 seconds.**


Recalibration of original parameters. Pressing the left button the "0" appears, by pressing the right button the instruments returns to the parameters calibrated in factory without modifications of energy and hours values.


Choose of first page at first powering. "Power On Ready" page selected in factory is useful when it is important to know if an electric interrumption occoured.


**Maximum threshold (Hi).** Relè will work when the value of chosen parameter will go over the selected value.
Default value = Hi


**Minimum threshold (Lo).** Relè will work when the value of chosen parameter will go under the selected value


**Selecting the threshold operation (Off)**. If the threshold is OFF, you will not see the following pages.


**Delay time for activation of the output relay.** Delayed time selected on the next page "Th Dly", will have effect on "Off-On mode".
This page will be displayed if "Th" is different from OFF. Default value = Off-On


**Delay time for activation of the output relay.** Delayed time selected on the next page "Th Dly", will have effect on "On-Off mode".
This page will be displayed if "Th" is different from OFF

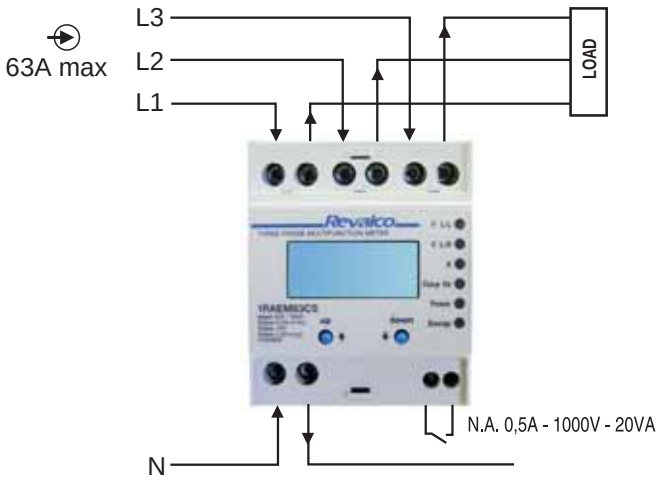

**Delay time.** From 0,1 to 25,5. This page will be displayed if "Th" is different from OFF. Default value = 0,1


**Assigning the parameter for activating the threshold**
Settable between: V12 – V23 – V31 – V1 – V2 – V3 – I1 – I2 – I3 – 3Vff – 3Vn – 3I – Fre – W+ – W-
This page will be displayed if "Th" is different from OFF. Default value = W+


**Regulating the threshold value as a percentage of the full scale**
On first line the equivalent value appear. On the second line you will see the percentage value to select.
This page will be displayed if "Th" is different from OFF. Default value = 50%


**Default page**
To select between the operation pages.

## CONNECTION DIAGRAM



# LCD MULTIFUNCTION METERS - 4 DIN MODULES D.C. VERSION

## DIMENSIONS in mm


- **Weight kg 0,70**
- **Sealable terminals cover included**

## PARAMETERS

| | 1RAEM4C485DC | 1RAEM4C485DCH |
|---|---|---|
| **Electrical parameters** | | |
| - DC Voltage 500 V max | ● | |
| - DC Voltage ..../100V by divider | | ● |
| - DC Current .../60mV | ● | ● |
| - Bidirectional power | ● | ● |
| - Bidirectional Total Energy | ● | ● |
| - Bidirectional Ampere-hour Ah | ● | ● |
| - Total working hours settable parameter | ● | ● |
| - Partial working hours settable parameter | ● | ● |
| - MODBUS SLAVE RTU Baude rate 9600 - 19200 - 38400 - 56800 - 115200 | ● | ● |
| - Serial interface RS485 | ● | ● |
| - Software is available, free of charge, on our internet address www.revalco.it | ● | ● |
| - PERMANENT MEMORY FOR SET POINT AND ENERGY (EEPROM) | ● | ● |

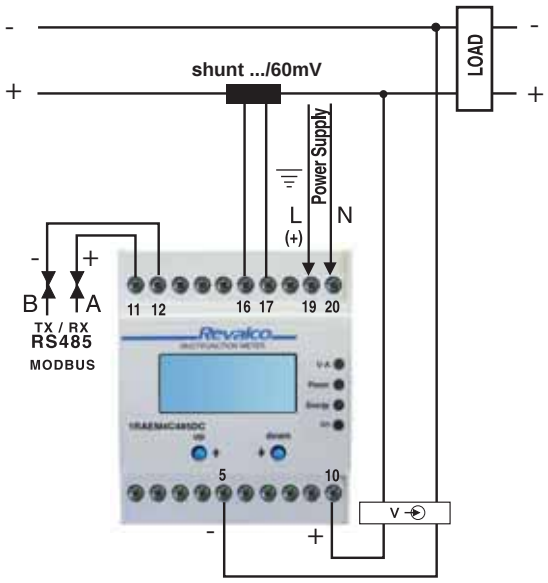
## TECHNICAL SPECIFICATIONS

| | | |
|---|---|---|
| **Auxiliary power supply** | | |
| - UAUX nominal value | 230 | 230V 50/60 Hz |
| | -P1 | 22...36VCA and 19...70VDC |
| | -P2 | 44...130VCA and 70....240VDC |
| - max rated consumption | | 2 VA |
| **Voltmeter measuring circuits** | | |
| - Direct insertion | | max 500VDC |
| - Insertion from divider 100V | | 100VDC....800VDC for model 1RAEM4C485DCH |
| - Permanent overload | | 120% |
| - Thermal overload (1 s) | | 150% |
| - Class | | 0,5% +/- 2 digit |
| **Ammeter measuring circuits** | | |
| - Insertion by shunts | | .../60mVDC (1...1200A) |
| - Permanent overload | | 120% |
| - Thermal overload (1 s) | | 150% |
| - Current range | | 5A...6000A |
| - Class | | 0,5% +/- 2 digit |
| **Power measuring circuit** | | |
| - Range | | 48MW |
| - Class | | 1% +/- 2 digit |
| **Energy** | | |
| - kWh meters (Import / Export) | | 2 separate |
| - Resettable | | YES |
| - Counting period | | 15 minutes |
| - Counting capacity | | 4.294.967.295 kWh |
| - Precision (0.05 > Inom > 1.0) | | 2% +/- 2 digit |
| **Operating counter** | | |
| - Total (in presence of power supply) | | hh:mm |
| - Partial (from previous reset) | | hh:mm |
| **Mechanical properties** | | |
| - Dimensions | | Standard 4 DIN modules |
| - Type of assembly | | DIN50022 guide |
| - Degree of protection | | for entire device: IP20/ Front IP30 |
| **Environmental conditions** | | |
| - Operating temperature: | | |
| Nominal range | | 0...+45 °C |
| Extreme range | | -5...+55 °C |
| - Storage temperature | | -10...+70 °C |
| - Relative humidity | | 10...95 % |
| - Atmospheric pressure | | 70...110 kPa |

**Standards of reference**

| | | |
|---|---|---|
| - Safety | CEI EN 61010-1 | 300V CAT III |
| - Precision | CEI EN 60688 | (ex EN 50082-2) |
| - Electromagnetic compatibility (immunity) | CEI EN 61000-6-2 | (ex EN 50081-2) |
| - Electromagnetic compatibility (emission) | CEI EN 61000-6-4 | |
| - Cover protection (IP code) | CEI EN 60529 | |
| **Modbus:** | | |
| - Protocol specifications | V1.1b, 28.12.2006 | |

## CONNECTION DIAGRAM



# THREE PHASE LCD MULTIFUNCTION METERS - 4 LINES
# TRUE RMS

## DIMENSIONS in mm


A = 97,3 without terminals cover
A = 116,5 with terminals cover
Weight: 0,55 kg (0,50 kg for 72x72)


## TECHNICAL CHARACTERISTICS

| 96X96 VERSION<br>72X72 VERSION | 2RAE96L4C<br>2RAE72L4C | 2RAE96L4CS | 2RAE96L4C485*<br>2RAE72L4C485 | 2RAE96L4CS485* |
|---|---|---|---|---|
| - **PARAMETERS** | | | | |
| - Ph-N voltage | • | • | • | • |
| - Ph-Ph voltage | • | • | • | • |
| - Medium voltage of phases | • | • | • | • |
| - Current | • | • | • | • |
| - Power factor | • | • | • | • |
| - Total equivalent power factor | • | • | • | • |
| - Apparent power | • | • | • | • |
| - Total Apparent power | • | • | • | • |
| - Active power (+/-) | • | • | • | • |
| - Total Active power (+/-) | • | • | • | • |
| - Reactive power | • | • | • | • |
| - Total Reactive power | • | • | • | • |
| - Frequency | • | • | • | • |
| - Total Active Energy (import) resettable parameter | • | • | • | • |
| - Total Active Energy (export) resettable parameter | • | • | • | • |
| - Reactive Total energy resettable parameter | • | • | • | • |
| - Total working time resettable parameter | • | • | • | • |
| - Partial working time parametro azzerabile | • | • | • | • |
| - Sequence of phases | • | • | • | • |
| - Voltage asymmetry (Ph-N) | • | • | • | • |
| - **TWO ALARM OUTPUT RELAYS** (contact N.O. 1000V-0,5A-20VA) | | • | | • |
| - **PROTOCOL MODBUS SLAVE RTU** | | | | |
| Baude rate 9600 - 19200 - 38400 - 56800 - 115200 | | | • | • |
| - **The software is available, free of charge, on our internet address www.revalco.it** | | | • | • |
| - **PERMANENT MEMORY FOR SET POINT AND ENERGIES** (EEPROM) | • | • | • | • |
| - **400V insertion, 3 or 4 wires line, 2 or 3 systems** (see pages 108 and 111) | 2RAE96L4CH1 | | | 2RAE96L4CS485H1* |
| - **VT..../100V insertion, 3 or 4 wires line, 2 or 3 systems** (see pages 108 and 111) | 2RAE96L4CH2 | | | 2RAE96L4CS485H2* |
| ⚠ Primary voltage up to 9,9 kV | | | | |
| - **VT..../100V insertion, 3 or 4 wires line, 2 or 3 systems** (see pages 108 and 111) | 2RAE96L4CH3 | | | 2RAE96L4CS485H3* |
| ⚠ Primary voltage from 10 to 100 kV | | | | |

* **ETHERNET OPTION** from serial transducer **(suffix ETH2S)** - * **ETHERNET OPTION** from web server **(suffix ETH2WS)** - * **PROFIBUS OPTION (suffix PROF)**

# 2RAE72L4C / 2RAE72L4C485 - 2RAE96L4C / 2RAE96L4C485

## OPERATION

- Powering the instrument you can see the following page

```
PowerOn
Ready
```

First powering page. A different page can be selected within the available page present on this type. At first powering the display shows automatically this page

- By pressing “UP” front button, the introduction page appears showing: instruments type, interface type, node number and software release.

```
RAE TRMS CS
485 Adr: 001 64.00
```

→ Correct sequence of phases indication. Light OFF = correct sequence

- By pressing again “UP” front button, the page shows phase-phase Medium Voltage values, Frequency, 3 Currents L1-L2-L3, Total Active Power and Total Power Factor (Cosφ).

```
3V: 400  F:   50.0
A.  1000 1000 1000
W:        693000.0
PfTot:   IND +0.99
```

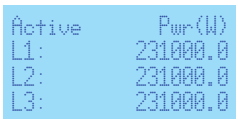
- By pressing again “UP” front button, the page shows the phase-phase Voltage L12-L23-L31, phase-neutral Voltages L1-L2-L3, Phase-Neutral asimmetry Voltage and 3 Currents L1-L2-L3.

```
Vp  400  400  400
Vn  231  231  231
DV  0
A   1000 1000 1000
```

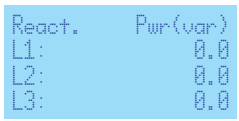
- By pressing again “UP” front button, the page shows Power Factor (Cosφ) of each phase and the Total Power Factor (Cosφ).

```
Pf1:     IND +0.99
Pf2:     IND +0.99
Pf3:     IND +0.99
PfTot:   IND +0.99
```

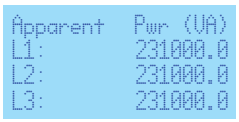
- By pressing again “UP” front button, the page shows the Active Powers of L1-L2-L3.



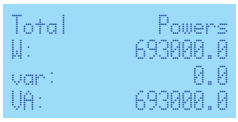

- By pressing again “UP” front button, the page shows the Reactive Powers of L1-L2-L3.



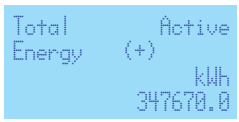

- By pressing again “UP” front button, the page shows the Apparent Powers L1-L2-L3.




- By pressing again “UP” front button, the page shows the Total Powers (Active, Reactive and Apparent).



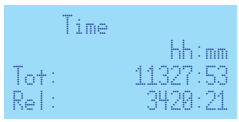

- By pressing again “UP” front button, the page shows the Active Energy (Import +). Settable parameter from programming page




- By pressing again “UP” front button, the page shows the Active Energy (Export -). Settable parameter from programming page

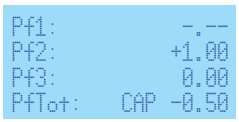

- By pressing again “UP” front button, the page shows the Total Active Energy. Settable parameter from programming page


- By pressing again “UP” front button, the page shows the Total and Partial Working Time
  Partial working time is a settable from programming page




**PARTICULAR VISUALIZATIONS RELATED TO THE POWER FACTOR**

- When Apparent Power is “0” some lines are displayed
- When Cosφ = 1 the mark is displayed
- When Cosφ = 0 no mark is displayed
- 2nd quadrant indication (seling Power) has φ = 120°




## CONFIGURATION SELECTION MENU’

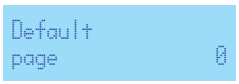
- To enter in programming phase press the right-hand button (UP) more than 4 seconds. “Program Mode” page will be displayed and after 4 seconds the other pages with actual values will be showed. If it is necessary to modify the parameters, press the button when it appears on the display. To increase the value press “UP” to decrease it press “DOWN”. Maintaining pressure on the button the sliding is automatic and the speed increase automatically; once the needed value is displayed release the button (the new value will be saved in a permanent memory)
- **INPUT PASSWORD ADMITTING**
  This page will be displayed only if parameter “Password” was modified and it is different from “000”. To enter in programming phase it is necessary to write the same memorized number otherwise you’ll go out from this page


- **CURRENT TRANSFORMER SELECTION (.../5A)**
  In this page it is possible to select the primary value of CT in Ampere and it represent the end scale value of currents when 5A income. The possible range is from 5A to 6000A with 5A steps.
  The default value is 1000A.


- **VOLTAGE TRANSFORMER SELECTION (.../100V)**
  In this page it is possible to select the primary value of VT in Volts and it represent the end scale value of voltage when 100V income. Directly connected, this is the value of Phase-Neutral nominal voltage.
  The possible range is from 50V to 4615V (8000V for Phase-Phase voltage V-ff). The default value 231V

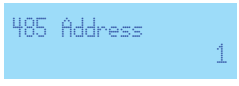

- **AVERAGE**
  In this page it is possible to select the reading numbers to which calculate the medium value. Practically it is the stability filter of measurements. Increasing the number, stability increases too. Regulation is possible from 1 to 15 and the default number is 3.


- **DEFAULT PAGE**
  First powering page. A different page can be selected within the available pages.
  The default page is 0.



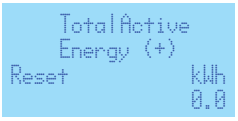

- **SERIAL PORT SPEED**
  In this page it is possible to select the interface type which changes by the model chosen.
  The meaning table is: 0= 9600 - 1=19200 – 2=38400 – 3=57600 – 4 =115200 bps. Default number is “0”


- **NODE ADDRESS ( MODBUS PROTOCOL)**
  It is the instrument identification number for serial communications in the net.
  The address numbers are included from 1 to 255. Default value is 1.

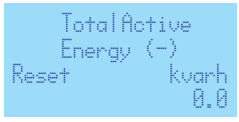



- **PASSWORD**
  In this page it is possible to change the password in order to be able to enter in programming pages; it is constituted by 3 numbers between 000 and 999. Default value is “000”


- **POSITIVE ACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value

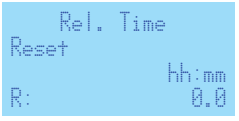



- **NEGATIVE ACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value

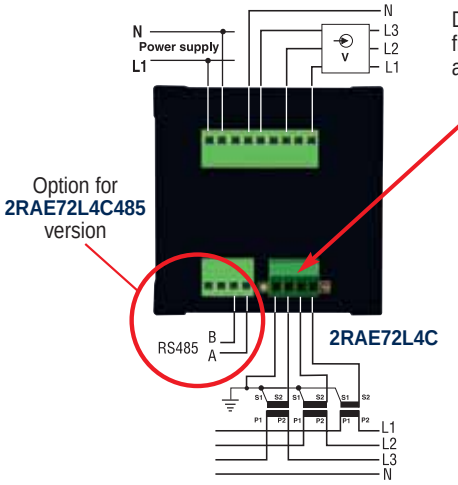



- **REACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value


- **PARTIAL HOURS RESET**
  It is enough to press one of the button to reset the value



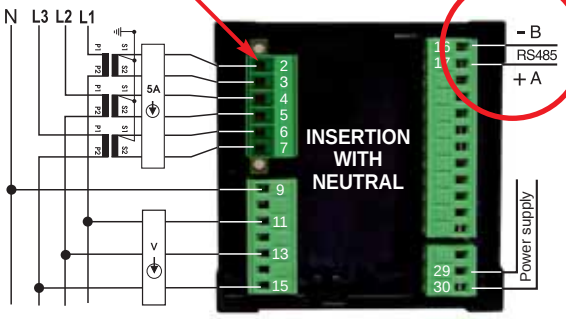
## CONNECTION DIAGRAMS




Option for **2RAE72L4C485** version

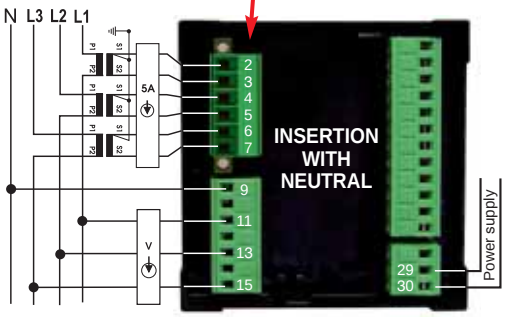
**2RAE72L4C**

Differently from the others, the CT connecting terminal is fixed to avoid errors of insertion or damages caused by a possible secondary terminals CT opening

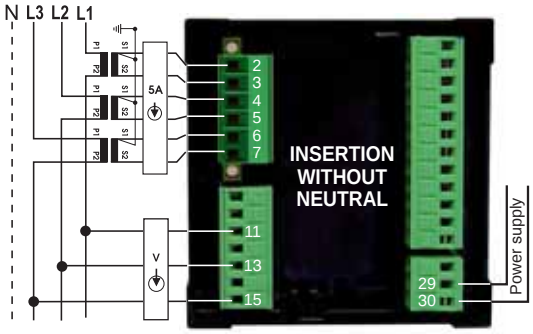



Option for **2RAE96L4C485** version

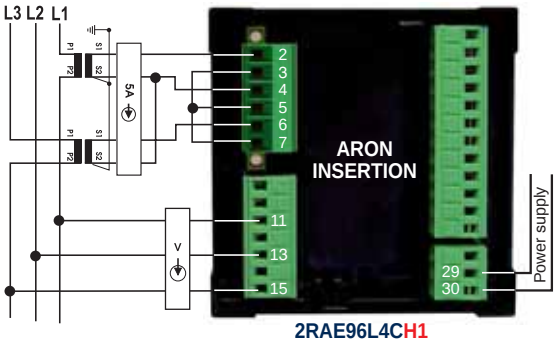
**2RAE96L4C**




**2RAE96L4CH1**



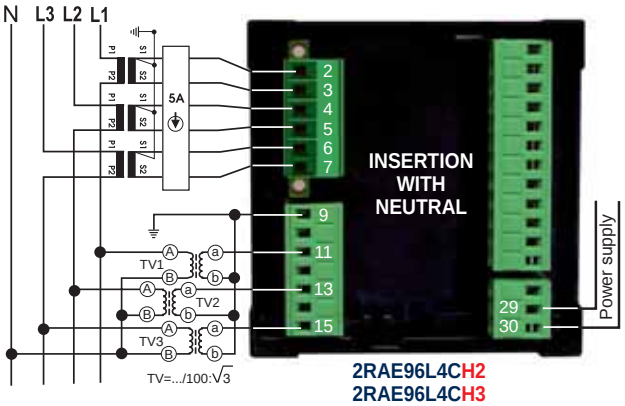

**2RAE96L4CH1**




**2RAE96L4CH1**

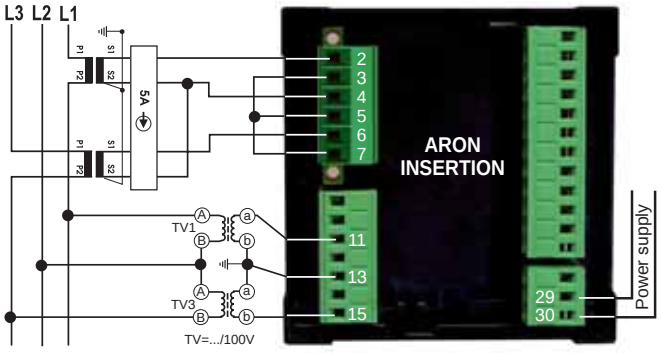
The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

## VT CONNECTION DIAGRAMS

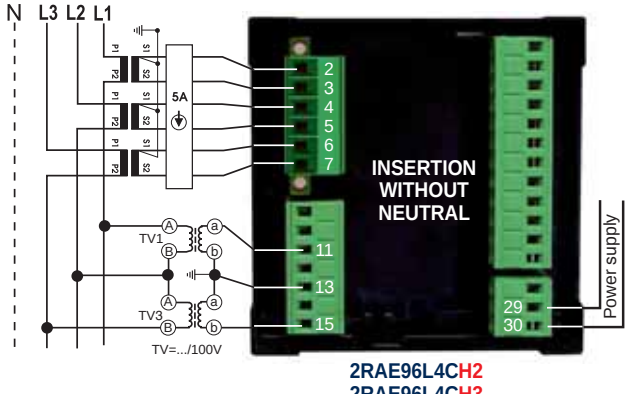



**2RAE96L4CH2**
**2RAE96L4CH3**

Instruments with code ...CH2 show primary voltages up to 9,9kV
Instruments with code ...CH3 show primary voltages from 10kV to 100kV




**2RAE96L4CH2**
**2RAE96L4CH3**




**2RAE96L4CH2**
**2RAE96L4CH3**

The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

## OPERATION

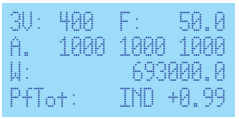
- Powering the instrument you can see the following page


This is the first powering page. A different page can be selected within the available page present. At first powering the display shows automatically this page

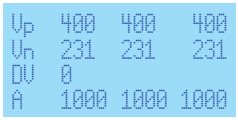
- By pressing the frontal button “UP” the first page appears indicating: instrument code, interface type, node number and software revision


Correct sequence of phases indication
light-out = correct sequence

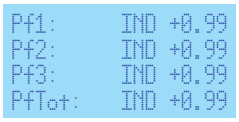
- By pressing again the frontal button “UP”, the second page appears showing the 3 phase-phase voltages (medium value, Frequency, 3 currents L1 L2 L3, Total Active Power and Total Power Factor.



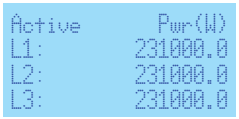

- By pressing again the frontal button “UP”, the third page appears showing the 3 phase-phase voltages L12-L23-L31, 3 phase-neutral voltages L1-L2-L3, difference of the phase-neutral voltages (asymmetry) and 3 currents L1 L2 L3.



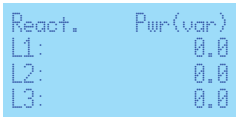

- By pressing again the frontal button “UP”, the fourth page appears indicating the phase-phase and total Power Factor.



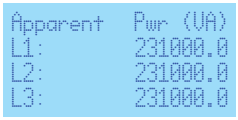

- The fifth page will display the L1-L2-L3 Active Powers



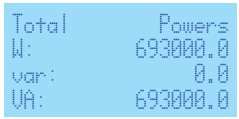

- The sixth page will display the L1-L2-L3 Reactive Powers



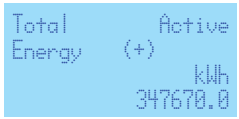

- The seventh page will display the L1-L2-L3 Apparent Powers



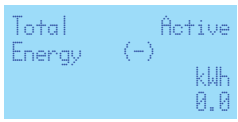

- By pressing again the frontal button “UP”, the new page appears showing the all powers ( Active, Reactive and Apparent)



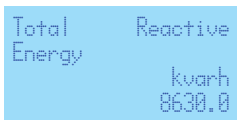

- By pressing again the frontal button “UP”, the new page appears indicating the Active Energy (Import +). It is possible to reset this parameter on the programming page.




- By pressing again the frontal button “UP”, the new page appears indicating the Active Energy (Export -). It is possible to reset this parameter on the programming page.




- By pressing again the frontal button “UP”, the eleventh page appears indicating the Total Reactive Energy. It is possible to reset this parameter on the programming page.

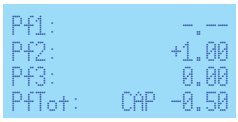



- By pressing again the frontal button “UP”, the new page appears indicating the Total and Partial hours counters It is possible to reset the Partial hours parameter on the programming page.


- By pressing again the frontal button “UP”, the thirteenth page appears indicating the alarm relay situation. The status of relay cannot be “ON” during the first 10 seconds after powering and cannot change during the parameters programming.


**PARTICULAR DISPLAYING OF POWER FACTOR**

- When the Apparent power is null, little lines are displayed
- When Cos phi =1 the mark is displayed
- When Cos phi =0 no marks are displayed
- The indication of 2nd quadrant (Power export) is displayed with Cos φ=120°

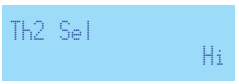


## CONFIGURATION SELECTION MENU'

- To enter in programming phase press the right-hand button (UP) more than 4 seconds. "Program Mode" page will be displayed and after 4 seconds the other pages with actual values will be showed. If it is necessary to modify the parameters, press the button when it appears on the display. To increase the value press "UP", to decrease it press "DOWN". Maintaining pressure on the button the sliding is automatic and the speed increase automatically; once the needed value is displayed release the button (the new value will be saved in a permanent memory)

- **INPUT PASSWORD ADMITTING**
  This page will be displayed only if parameter "Password" was modified and it is different from "000". To enter in programming phase it is necessary to write the same memorized number otherwise you'll go out from this page

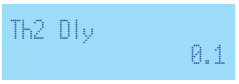

- **THRESHOLD 1/THRESHOLD 2 SELECTION**
  In this page it is possible to select the threshold type (Hi=max, Lo=min) and if it must remain light-out (OFF). In case OFF is selected, all the pages related to the threshold will be not present. It will be possible to act the relay by a MODBUS command from serial line.

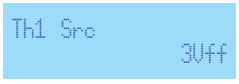

- **THRESHOLD 1/THRESHOLD 2 DELAY TYPE APPLICATION**
  In this page it is possible to select the delay threshold type which can be OFF-ON or ON-OFF.
  This page will be displayed if Th1/Th2 different from OFF

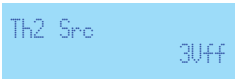


- **THRESHOLD 1/THRESHOLD 2 DELAY TIME**
  In this page it is possible to select the delay time threshold which can be selected from 0,0 to 25,5 seconds. This page will be displayed if Th1/Th2 different from OFF

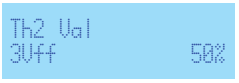




- **THRESHOLD 1/THRESHOLD 2 PARAMETER**
  In this page it is possible to select the parameter to which associate the threshold between: 3Vn,3A, F, W+, W-, DW, V12,V23,V31, V1,V2, V3, A1, A2 and A3.
  3 Phase-Phase voltages (Vff) is selected by default.
  This page will be displayed if Th1/Th2 different from OFF




- **THRESHOLD 1/THRESHOLD 2 PERCENTAGE VALUE**
  This page shows the selected parameter and its value . Default page = 50%. Starting with the selection, over the percentage value , you'll see the real equivalent value.
  This page will be displayed if Th1/Th2 different from OFF


- **CURRENT TRANSFORMER SELECTION (.../5A)**
  In this page it is possible to select the primary value of CT in Ampere and it represent the end scale value of currents when 5A income. The possible range is from 5A to 6000A with 5A steps. The default value is 1000A.


- **VOLTAGE TRANSFORMER SELECTION (.../100V)**
  In this page it is possible to select the primary value of VT in Volts and it represent the end scale value of voltage when 100V income. Directly connected, this is the value of Phase-Neutral nominal voltage.
  The possible range is from 50V to 4615V (8000V for Phase-Phase voltage V-ff). The default value 231V

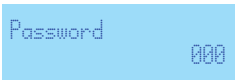

- **AVERAGE**
  In this page it is possible to select the reading numbers to which calculate the medium value. Practically it is the stability filter of measurements. Increasing the number, stability increases too. Regulation is possible from 1 to 15 and the default number is 3.


- **DEFAULT PAGE**
  First powering page. A different page can be selected within the available pages. The default page is 0.

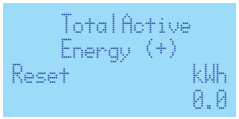

- **SERIAL PORT SPEED**
  In this page it is possible to select the interface type which changes by the model chosen.
  The meaning table is: 0= 9600 - 1=19200 – 2=38400 – 3=57600 – 4 =115200 bps. Default number is "0"

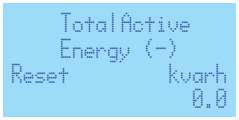

- **NODE ADDRESS ( MODBUS PROTOCOL)**
  It is the instrument identification number for serial communications in the net. The address numbers are included from 1 to 255.
  Default value is 1.


- **PASSWORD**
  In this page it is possible to change the password in order to be able to enter in programming pages; it is constituted by 3 numbers between 000 and 999. Default value is "000"



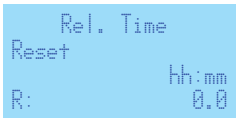

- **POSITIVE ACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value




- **NEGATIVE ACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value

- **REACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value

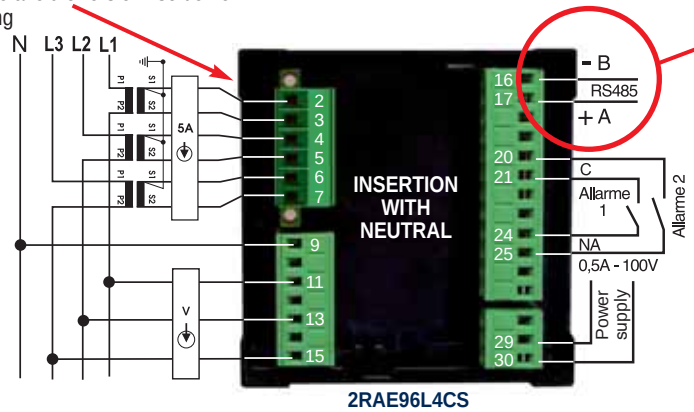




- **PARTIAL HOURS RESET**
  It is enough to press one of the button to reset the value

## CONNECTION DIAGRAMS

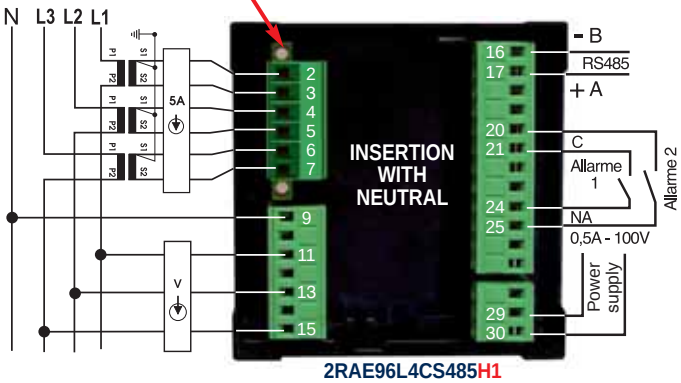
Differently from the others, the CT connecting terminal is fixed to avoid errors of insertion or damages caused by a possible secondary terminals CT opening

Option for **2RAE96L4CS485** version

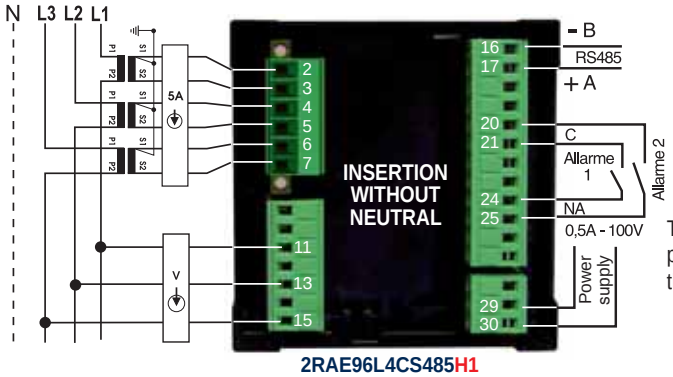



**2RAE96L4CS**

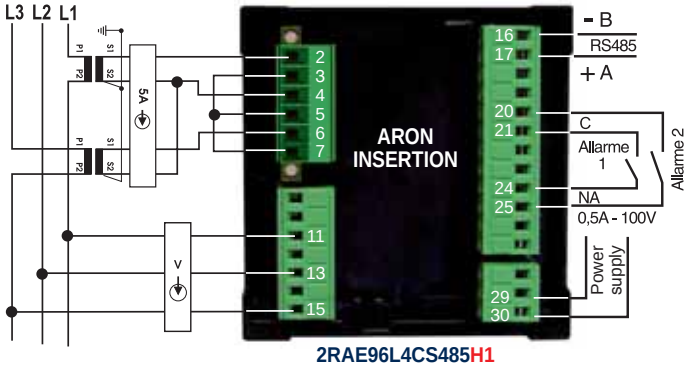
Differently from the others, the CT connecting terminal is fixed to avoid errors of insertion or damages caused by a possible secondary terminals CT opening




**2RAE96L4CS485H1**




**2RAE96L4CS485H1**

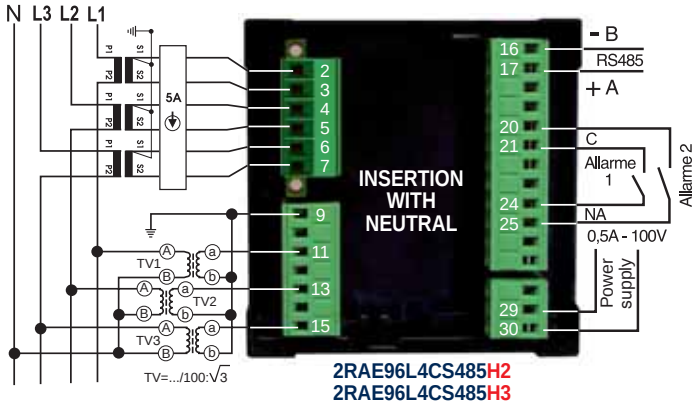



**2RAE96L4CS485H1**

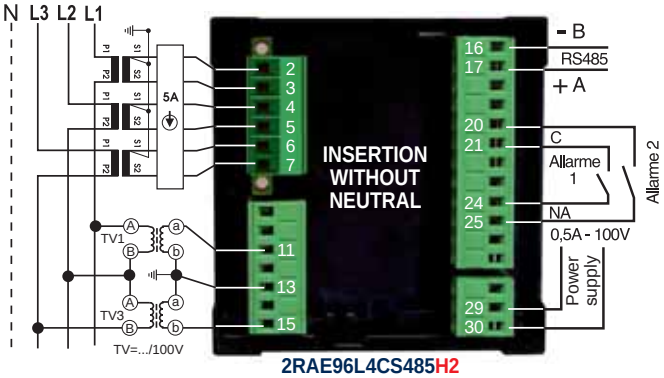
The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

## VT CONNECTION DIAGRAMS

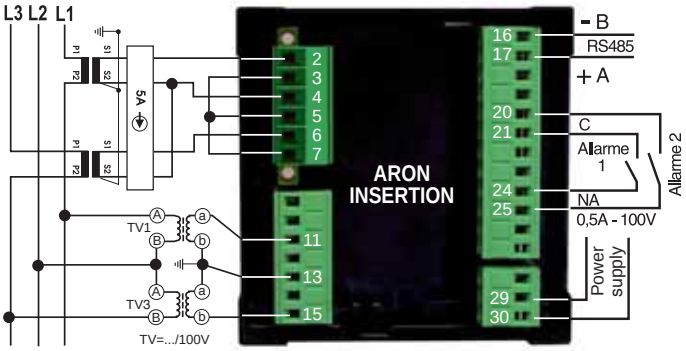
- Instruments with code ...CH2 show primary voltages up to 9,9kV
- Instruments with code ...CH3 show primary voltages from 10kV to 100kV




**2RAE96L4CS485H2**
**2RAE96L4CS485H3**



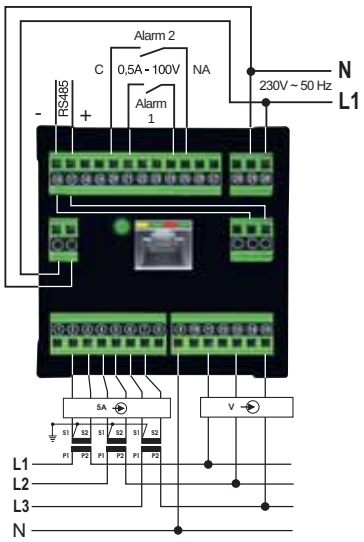

**2RAE96L4CS485H2**
**2RAE96L4CS485H3**




**2RAE96L4CS485H2**
**2RAE96L4CS485H3**

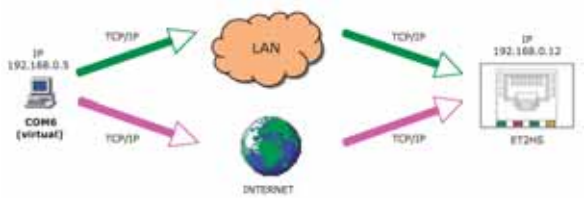
The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

## ETHERNET OPTION - TYPE ETH2S FROM SERIAL TRANSDUCER



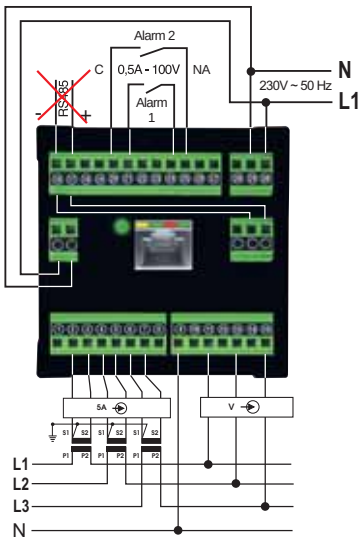

**FOR MODELS 2RAE96L4C485, 2RAE96L4CS485, 2RAE96L4CS485H2 AND 2RAE96L4CS485H3**

- PCB provided by an embedded RJ45 Ethernet socket and software
- Installing the software on a PC it is possible to have a series of tools which permit, passing through the Ethernet net (LAN or Internet), to establish together with the instrument a connection similar to a COM port (standard communications port) generated in virtual way, taking advantage as signal transport by the TCP/IP protocol.
- Hardware characteristics:
  - Transmission speed from 150 to 115.200 baud
  - Standard Ethernet socket RJ45
  - Ethernet port speed: 10/100 Mbit
  - Working situation controlled by 4 diagnostic leds
  - Ethernet port galvanically insulated
  - Not powered by the Ethernet cable or by the data net
  - Supports (without virtual COM port) UDP, ICMP(ping) and DHCP protocols
  - Working temperature: from -5°C to 55°C



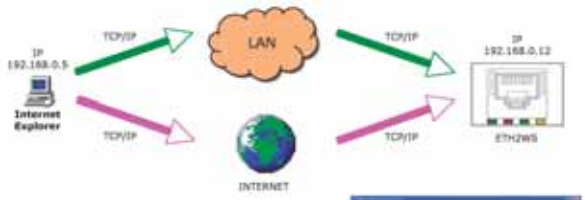

- In particular way, after the connection of instrument to the net, the software permits to:
  - To assign an univocal IP address ( example: 192.168.0.12)
  - Starting from IP address, to generate o PC a virtual port "COMx" (example: COM6) to which refer using the forms of this hardware. Every supervision software (SCADA or other) which dispose of Modbus RTU communication protocol will be able to converse with this device through this port avoiding the TCP/IP translation but under the condition that the device be reachable in the net (Intranet or Internet) by its IP (example by its address ping)
- ORDER EXAMPLES: 2RAE96L4C485230ETH2S; 2RAE96L4CS485-P1ETH2S; 2RAE96L4CS485H2-P2ETH2S

## ETHERNET OPTION - TYPE ETH2WS FROM WEB SERVER




**FOR MODELS 2RAE96L4C485, 2RAE96L4CS485, 2RAE96L4CS485H2 AND 2RAE96L4CS485H3**

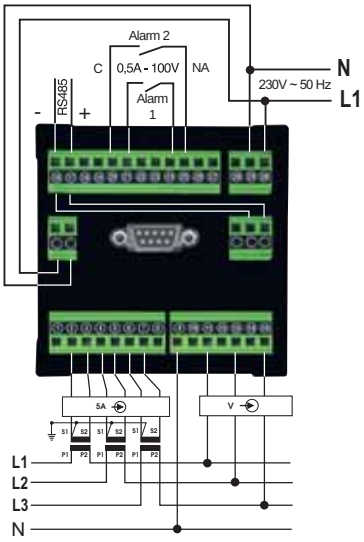
- PCB provided by an embedded RJ45 Ethernet socket and software which permits under a request by a normal browser ( example Internet Explorer) to enter in a Web server organized in web pages (HTML)
- Hardware characteristics:
  - Standard Ethernet socket RJ45
  - Ethernet port speed: 10/100 Mbit
  - Working situation controlled by 4 diagnostic leds
  - Ethernet port galvanically insulated
  - Not powered by the Ethernet cable or by the data net
  - Working temperature: from -5°C to 55°C




- In particular way, after the connection of instrument to the net, the software permits to:
  - To assign an univocal IP address ( example: 192.168.0.12)
  - To assign an alphanumerical name to the product (example Substation SUD)
  - Enter to a Web server like a normal internet site simply dialling its IP address in a browser ( example: Internet Explorer). In a simply graphic form (table) the main measures will be shown
  - Up to 8 contemporaneous sessions (8 different users contemporary connected)
  - Connect to this device through its IP but under the condition that the device be rea chable in the net (Intranet or Internet) (example by its address ping)

- ORDER EXAMPLES: 2RAE96L4C485230ETH2WS; 2RAE96L4CS485-P1ETH2WS; 2RAE96L4CS485H2-P2ETH2WS

## PROFIBUS OPTION – TYPE PROF

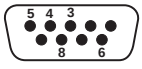



**FOR MODELS 2RAE96L4C485, 2RAE96L4CS485, 2RAE96L4CS485H2 AND 2RAE96L4CS485H3**

- ORDER EXAMPLES: 2RAE96L4C485230PROF; 2RAE96L4CS485-P1PROF; 2RAE96L4CS485H2-P2PROF

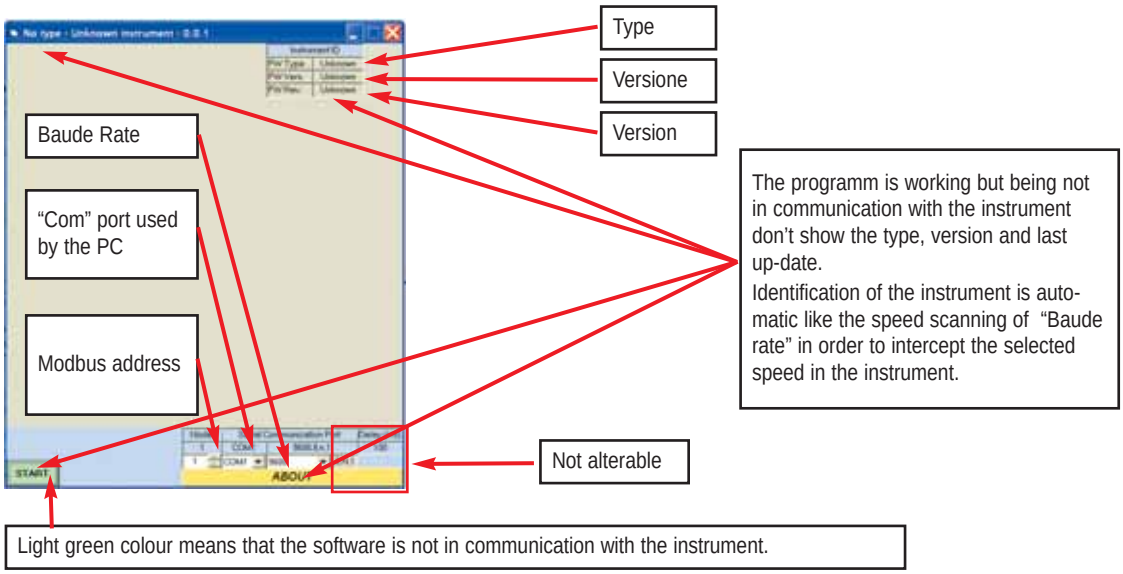
| DB9F PROFIBUS CONNECTOR | |
|---|---|
| **Pin** | **Signal** |
| 1 | |
| 2 | |
| 3 | Line B |
| 4 | RTS |
| 5 | GND BUS (Insulated) |
| 6 | +5V BUS (Insulated output max 100mA) |
| 7 | |
| 8 | Line A |
| 9 | |

**PC side**



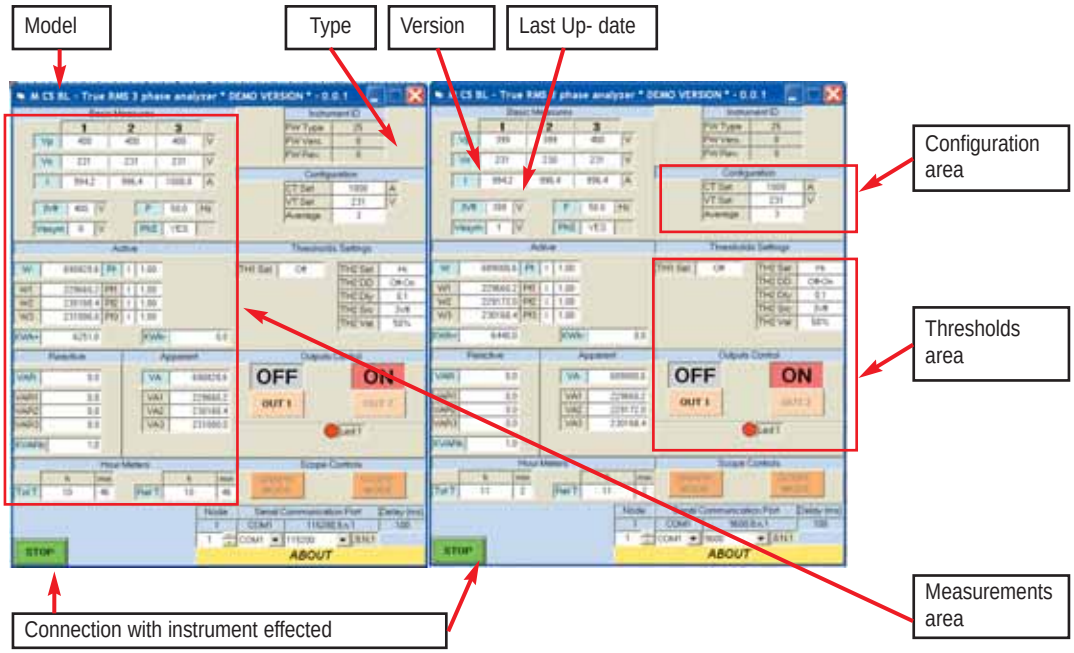
# SOFTWARE USE

INSTRUCTIONS: Use of software equiped to the types provided by communication interface RS485, BL or RS485 and BL. After the download from CD or from the INTERNET WEB SITE the free software( it permits to see the main measurements available on the instrument) proceed to its installation. Once installed the software, execute the application. In “run” mode, the software will show this display:



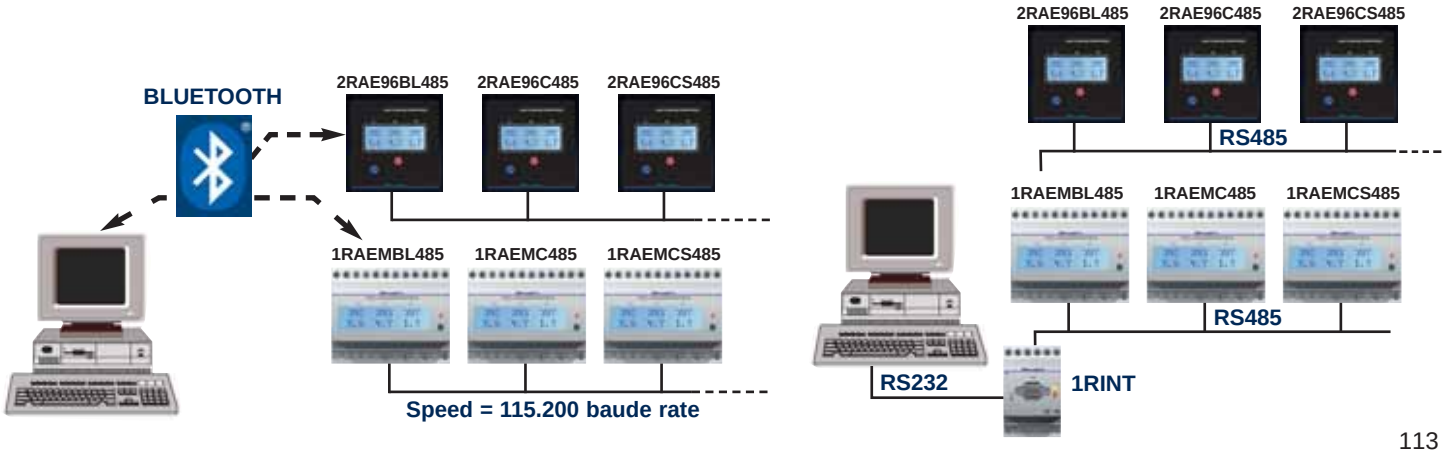

*By the mouse press start.....*

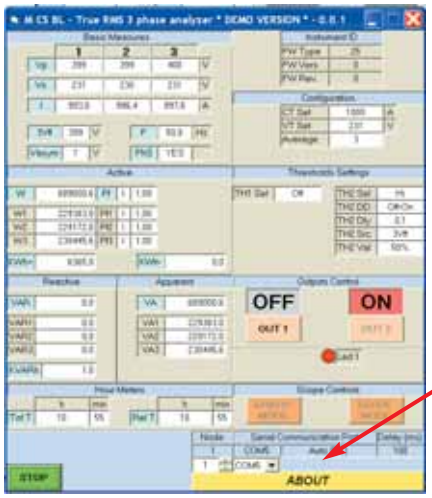
The instrument in this example is the BL type (the “Top” in our range). The software starts the scanning (self-identification) and it connect itself to the instrument.




*Founded the connection by cableat 115200 bps or at 9600. Configured the display, it visualize the data.....OR*

Possibility to use the “access point” in Bluetooth standard (peripheric inserted on USB port or on PC). In this way it is possible to have a wireless connection with this type of instrument with the advantage to access to the instrument by everybody know the PIN CODE (printed on the back of the instrument).
More, being present the RS485 interface it is possible the conversion from BLUETOOTH to RS485. It is possible to realize a WIRELESS connection with the first instrument in a chain of instruments having the RS485 interface only and by this access to the others. Alternatively it is possible connect in RS485 this instrument also and proceed to the pothers,if present, by a classic connection with two standard wires.

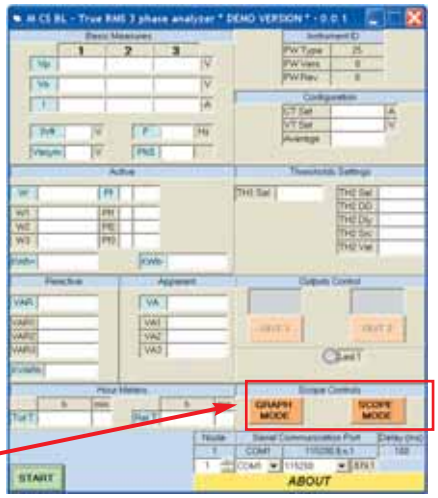




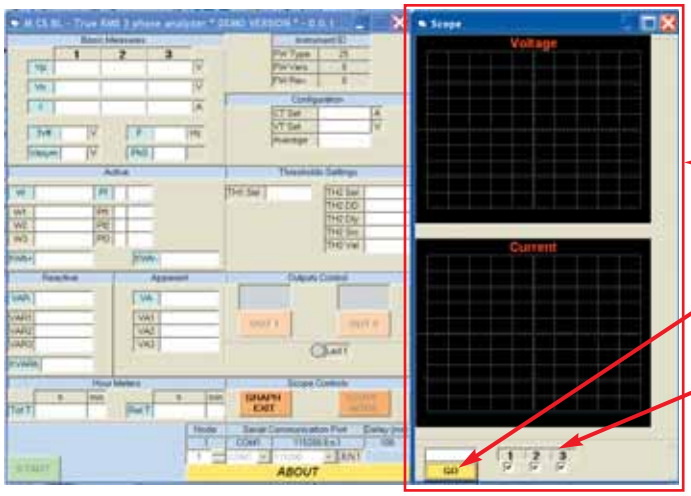

Connection to bluetooth port (example COM5); parametres become “AUTO”

Bluetooth connection

By pressing STOP button the word changes to START; the colour change (light green = stop). From the display the data disappear being the connection with the instrument suspended. In this condition it is possible to push one of the two graphic buttons. Press GRAPH MODE.




“Oscilloscope” visualization mode




The software visualizes contemporary the measurements in numerical form and their wave form like the oscilloscope. It is capable to manage the synchronism of phase L1 and to visualize by six different traces, the relative three voltages and currents.

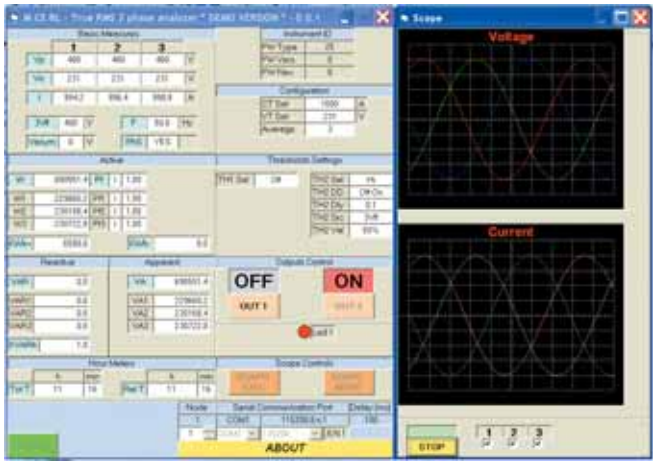
“Oscilloscope” visualization mode

“Start of communication “ button”

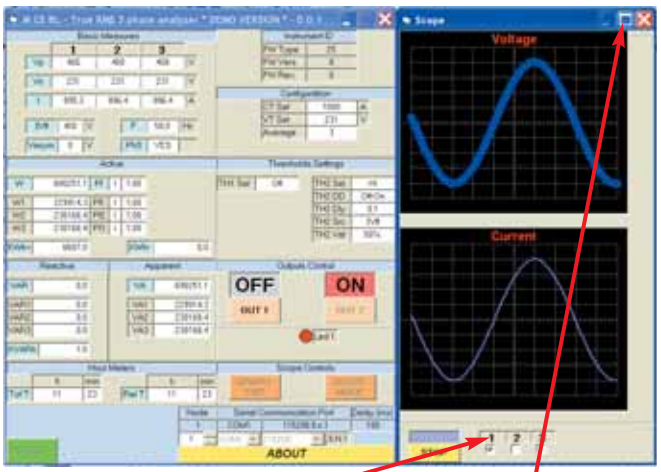
Insertion of phases to visualize(voltage and current)

Indipendently by the previous “Com” speed, it is forced and blocked on 115200 bps. The connection with the instrument continues in “MODBUS RTU” as before.

By pressing the “GO button, the connection with instrument starts.



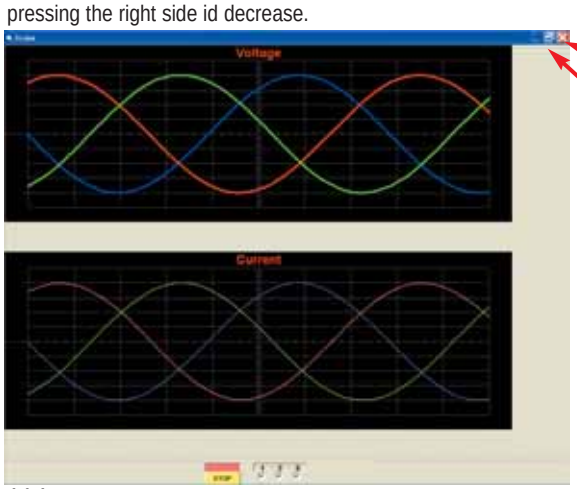

Measurements and curves are simultaneous. Colours are equal for the voltage phase and relative current. The n. 1 (relative to phase L1) is blue-light blue, the n. 2 (relative to phase L2) is red-light red, the n. 3(relative to phase L3) is green-light green By pressing the left side of the mouse on a graphic, the thickness of the line increase, by pressing the right side id decrease.




Line 1 only is selected

“Enlarge” the window.

By pressing the left side of the mouse on the graphic, thickness of line increase; by pressing the right side of the mouse it decrease.




Close

Reduce

It is possible tu visualize the curves on the big display using the “enlarge” button. By “Reduce” the display come back small, while the button “Close” the application is NOT CLOSED but it shows the original display with measurements and graphic (the graphic is setted up again as “Default”).

To stop, press “STOP”; to exit press “GRAPH EXIT” in meantime actived.

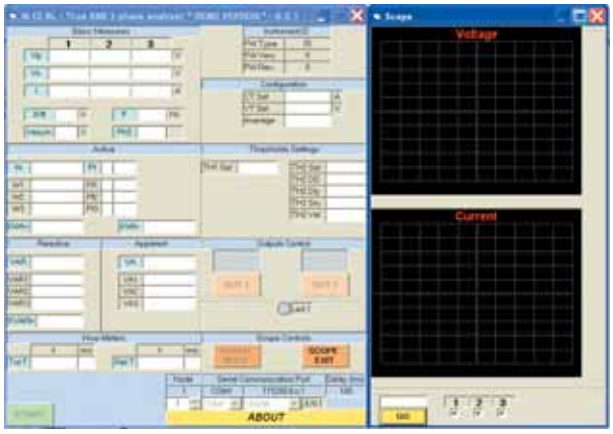

Coming back in measurement mode, when the button START/STOP is green, it is possible to use the output relay 1 (this is permitted when the output is not used as alarm).




It means that during the programm phase threshold 1 remains in “off” so it is possible to control it from remote as an available resource for generic use ( swith-on or switch-off lamps or machines etc.)

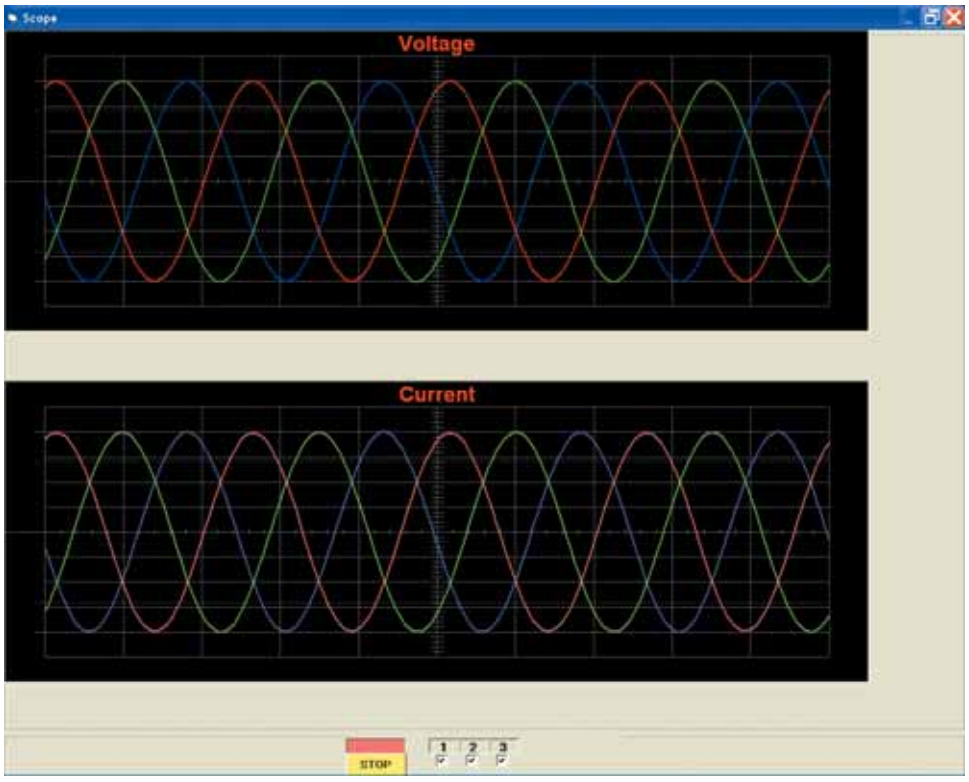
Push STOP to restore the graphic access keys .

Press “SCOPE MODE”




After “SCOPE MODE” is pressed the graphic display works as before but:
1) The numerical measurements are not displayed
2) The connection with the instrument is not MODBUS RTU but propietary
3) The display shows frequently a lot of graphic informations


The scope of this software resource, is to obtain the visualization of temporary phenomena in real time having an “oscilloscope with six quick traces” .




This software version is FREEWARE.

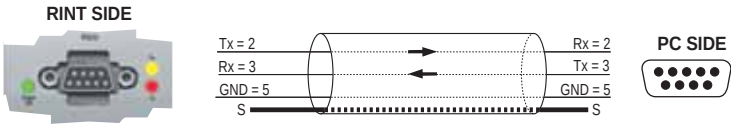
- In a next future, on the web site, you’ll find a PRO (professional) software to obtain a more complete electrical analysys of the data furnished by the instrument. It will be enriched by measurements as result of mathematical and geometrical the wave form analysys of the electrical signal.
  The PRO version will be under use’s licence and not Freeware

# COMPUTER INTERFACE

## 1RINT

Is an interface for use with personal computers compatible with IBM AT via a serial cable RS232 CANNON DB9 with the following characteristics:

- PC Entry, female connectors, nine pin
- Interface Entry, male connectors, nine pin
- In cases of Line Disturbance, connect the “S” wire (contained in the cable) to ground, on one side.




This converter can work with either 422 or 485 which are selectable by means of a switch located in the upper part of the device (under the slide).
The device works also as galvanic separation between serial lines.

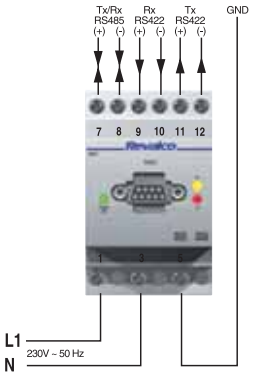


When the interface is powered, the working green led lights (Power ON), while during the comunication, the yellow led lights (Rx) for the input signal and the red led lights (Tx) for the output signal.
The speed of the serial comunication is selfconfigured, between 1200 baud and 19200 baud. It adapts to the speed of the instrument to which the converter is connected.

- **TEST VOLTAGE** 2 kV a 50Hz for 1 minute
- **POWER SUPPLY** 230V +/- 10% 50/60Hz
- **WORKING TEMPERATURE** -5°C...+ 50°C
- **STORAGE TEMPERATURE** - 20°C...+ 80°C
- **PROTECTION DEGREE** IP 20
- **CONSUMPTION** 3VA
- **BIDIRETIONAL SERIAL COMMUNICATION** selectable between RS 232 / RS 422 and RS 232 / 485
- **DIMENSIONS** 3 rail DIN modules

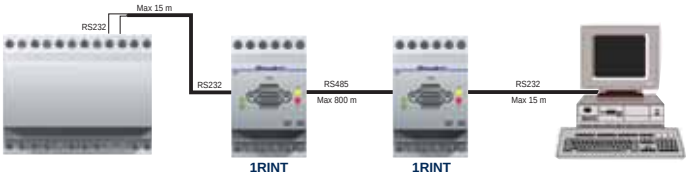
## DIMENSIONS in mm


## CONNECTION




## SERIAL COMMUNICATION

- **Example of application:** connection for distances more than 15 meters




## RINTC

The USB Serial Converter permits the installation of a virtual serial port (COM) by the use of a PC USB port.
New installed port will be “sen” by the operative Windows system as an additional COM port and it can be used in every application. This device is supplied in a standard kit which includes:
- 485 cable which permits the use as converter from RS232 to RS485 interface
- 2323 adapter cable able to create the virtual serial port starting from an USB port.

Kit is comprehensive of software driver for Windows XP and Windows Vista.

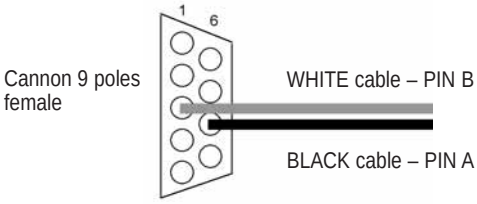
Software available on our web site www.revalco.it

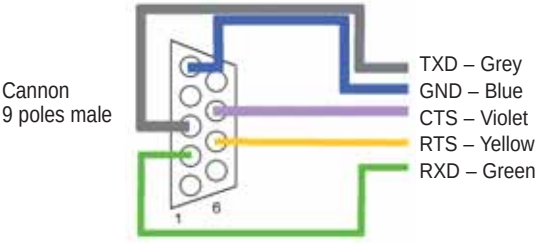
**PC side**
USB 2.0 interface full speed compatible
UART (Integrated serial interface) 7 or 8 bit with parity Odd/Even/Mark space/No parity
Hardware compatibility (RTS#/CTS#) or X-On/X-OFF software handshaking
Power supply from USB interface (max 50mA) only

**ADAPTER Side**
- Status indication “ FRAME TRANSMISSION ON AIR!”
- Two, not contemporaneous possibilities of use are possible:
  1) RS485 Serial Interface galvanically insulated (3kV) for conventional net, two wires
  2) RS232 Serial Interface for conventional net, 5 wires

**RS485 Communication data**
- Communication with hardware interface, 2 wires (A and B)
- Up to 32 devices contemporary
- Ring with 800 meters max extension
- 3kV galvanic insulation
- Baud rate from 1200 to 115200 bps

**RS232 Communication data**
- Communication with hardware interface, 5 wires (RX-TX-CTS-RTS-GND)
- Point-point Connection
- Ring with15 meters max extension
- No galvanic insulation
- Baud rate from 1200 to 115200 bps




**Ambient conditions**
Ambient temperature: nominal range 0….+45°C – extreme range: -5…+55°C – storage temp.: -10….+70°C
Relative humidity: 10….95% - Atmospheric pressure: 70…110 kPa

**Standards**
Safety:
Electromagnetic Compatibility (immunity): CEI EN 61000-6-2 (ex EN 50082-2) - Electromagnetic Compatibility (emission):: CEI EN 61000-6-4 (ex EN 50081-2)

## Ethernet connection

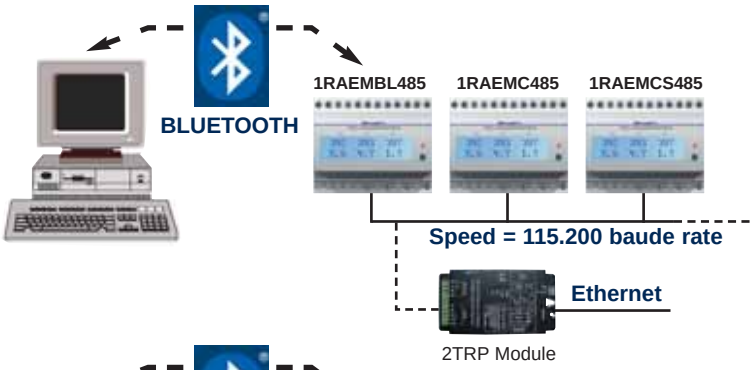
By the use of a TRP transducer, it is possible to connect the electrical measurement station in a more wide net of ethernet resources.

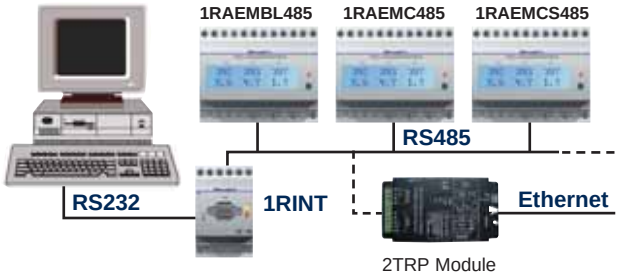
From one side TRP will communicate in MODBUS RTU RS485 with the station or with the ring of stations present in the net

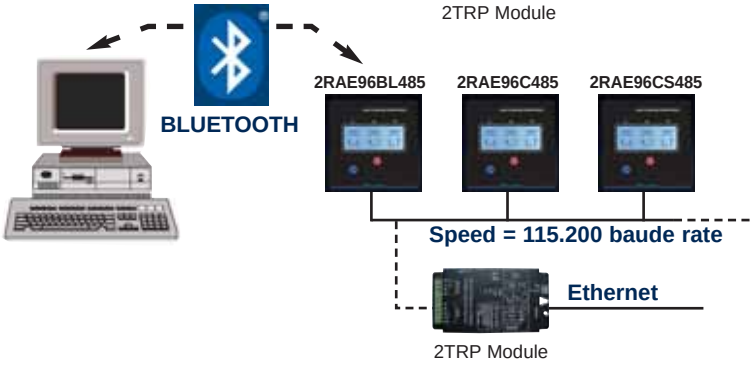
From the other it will be inserted by a RJ45 connector in an ethernet ring.IP address is settable on the TRP transducer.

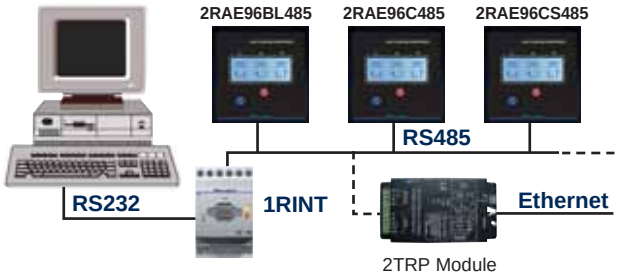

The transducer is galvanically insulated up to 3kV DC between two interfaces and it is protected by the surge of interface RS422/485. It is therefore recommanded in case of long wires connection and/or in case on whichit is possible to have differences of potential between the devices.

This TRP transducer has the I/F ethernet on the connector RJ45 and terminals for connection of I/F RS232/422/485 and power supply. It incorporate an "http" server; it permits to enter on all function's (communication parameters set also), directly through the ethernet way from a normal browser (example: Internet Explorer).

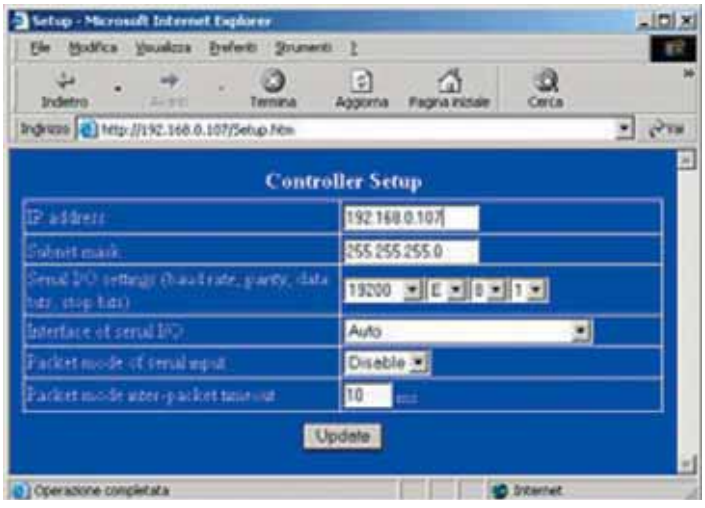



## SCREEN SETUP




## TECHNICAL CHARACTERISTICS

| | |
|---|---|
| Auxiliary power supply | 10-30Vdc 1.2W |
| Interface data | Ethernet RJ45 10Mbps<br>RS232<br>RS422/485 |
| Baud rate | from 1200bps to 115Kbps |
| Protocols | ARP,UDP, TCP, ICMP, HTTP, DHCP, IP |
| Status indicators | Power ON<br>Link<br>RX/TX Activity |
| Galvanic insulation | 3000Vdc |
| Working temperature | from -20 to +75°C<br>Humidity: 10-95% |
| Dimensions | 75x150x25mm |
| Weight | 240g |
| Standards | EN 55022<br>EN 55024<br>EN 61000-3-2<br>EN 61000-3-3 |