# EMM-4hp-LON ELECTRICAL MULTIFUNCTION METER

**ELECTRICAL MULTIFUNCTION METER with LON communication**

## GENERALITY

These digital multimeters allow to monitor all the electrical parameters present on a distribution line. The local display of 30 electrical parameters is carried out by 4 display with red LED guaranteeing a good and contemporary reading of more measures. A simple front panel completes the intuitive selection of several electrical parameters, with a great quantity of information. These instruments, over of the instantaneous measures, display the maximum peak of the main parameters (maximum peak and maximum demand).

These multimeters replace in a unique device, all the functions of voltmeters, ammeters, energy meters, cosphimeters, wattmeters, varmeters, frequency meters permitting a great economic saving, a reduction of dimension and the wiring energy and a simplification in the purchase and management of the instruments because this is a model usable at all of need of local measure in the electrical panel, machine, etc.

## AVAILABLE MODELS

It's available only a model for flush mounting for panel.
-EMM-4hp-LON        basic version in execution for flush mounting DIN 96x96mm

## ACCESSORIES AND OPTIONS

**accessories**: frontal protection transparent cover IP65
**options**:        analog output (alternative to digital input option)
        insulated current inputs
        neutral current input (or residual current input)
        digital input (alternative to analog output option)

## MEASURED PARAMETERS

| parameters | unit of measurement | initial identification | | | |
|---|---|---|---|---|---|
| phase and three phase voltages | [V-kV] | $V_{L1-N}$ | $V_{L2-N}$ | $V_{L3-N}$ | $\Sigma V_{L-N}$ |
| phase to phase and three phase system voltages | [V-kV] | $V_{L1-L2}$ | $V_{L2-L3}$ | $V_{L3-L1}$ | $\Sigma V_{L-L}$ |
| phase and three phase currents | [A-kA] | $A_{L1}$ | $A_{L2}$ | $A_{L3}$ | $\Sigma A$ |
| neutral current | [A-kA] | $A_n$ | | | |
| phase and three phase power factors | | $PF_{L1}$ | $PF_{L2}$ | $PF_{L3}$ | $\Sigma PF$ |
| phase and three phase active powers | [W-kW-MW] | $W_{L1}$ | $W_{L2}$ | $W_{L3}$ | $\Sigma W$ |
| phase and three phase system reactive powers | [VAr-kVAr-MVAr] | $VAr_{L1}$ | $VAr_{L2}$ | $VAr_{L3}$ | $\Sigma VAr$ |
| phase and three-phase system apparent powers | [VA-kVA-MVA] | $VA_{L1}$ | $VA_{L2}$ | $VA_{L3}$ | $\Sigma VA$ |
| frequency | [Hz] | $Hz_{L1}$ | | | |
| temperature | [°C] | T | | | |
| three phase system active energy | [kWh] | $\Sigma kWh$ | | | |
| three phase system reactive energy | [kVArh] | $\Sigma kVArh$ | | | |
| three phase system apparent energy | [kVAh] | $\Sigma kVAh$ | | | |
| hour counter | [hr] | h | | | |
| **average and peak values (maximums):** | | | | | |
| maximum phase voltages | [V-kV] | $V_{L1-N\ max}$ | $V_{L2-N\ max}$ | $V_{L3-N\ max}$ | |
| maximum phase currents | [A-kA] | $A_{L1\ max}$ | $A_{L2\ max}$ | $A_{L3\ max}$ | |
| maximum neutral current | [A-kA] | $A_{n\ max}$ | | | |
| maximum three-phase powers | [W-VAr-VA (k-M)] | $\Sigma W_{max}$ | $\Sigma VAr_{max}$ | $\Sigma VA_{max}$ | |
| maximum average phase currents (maximum demand) | [A-kA] | $I_{L1\ max\ (avg)}$ | $I_{L2\ max\ (avg)}$ | $I_{L3\ max\ (avg)}$ | |
| maximum average neutral current (maximum demand) | [A-kA] | $A_{n\ max\ (avg)}$ | | | |
| maximum average three-phase powers (maximum demand) | [W-VAr-VA (k-M)] | $\Sigma W_{max\ (avg)}$ | $\Sigma VAr_{max\ (avg)}$ | $\Sigma VA_{max\ (avg)}$ | |
| average phase currents | [A-kA] | $A_{L1\ avg}$ | $A_{L2\ avg}$ | $A_{L3\ avg}$ | |
| average neutral current | [A-kA] | $A_{n\ avg}$ | | | |
| average three-phase powers | [W-VAr-VA (k-M)] | $\Sigma W_{avg}$ | $\Sigma VAr_{avg}$ | $\Sigma VA_{avg}$ | |

## INSTALLATION

### WARNING FOR THE USER

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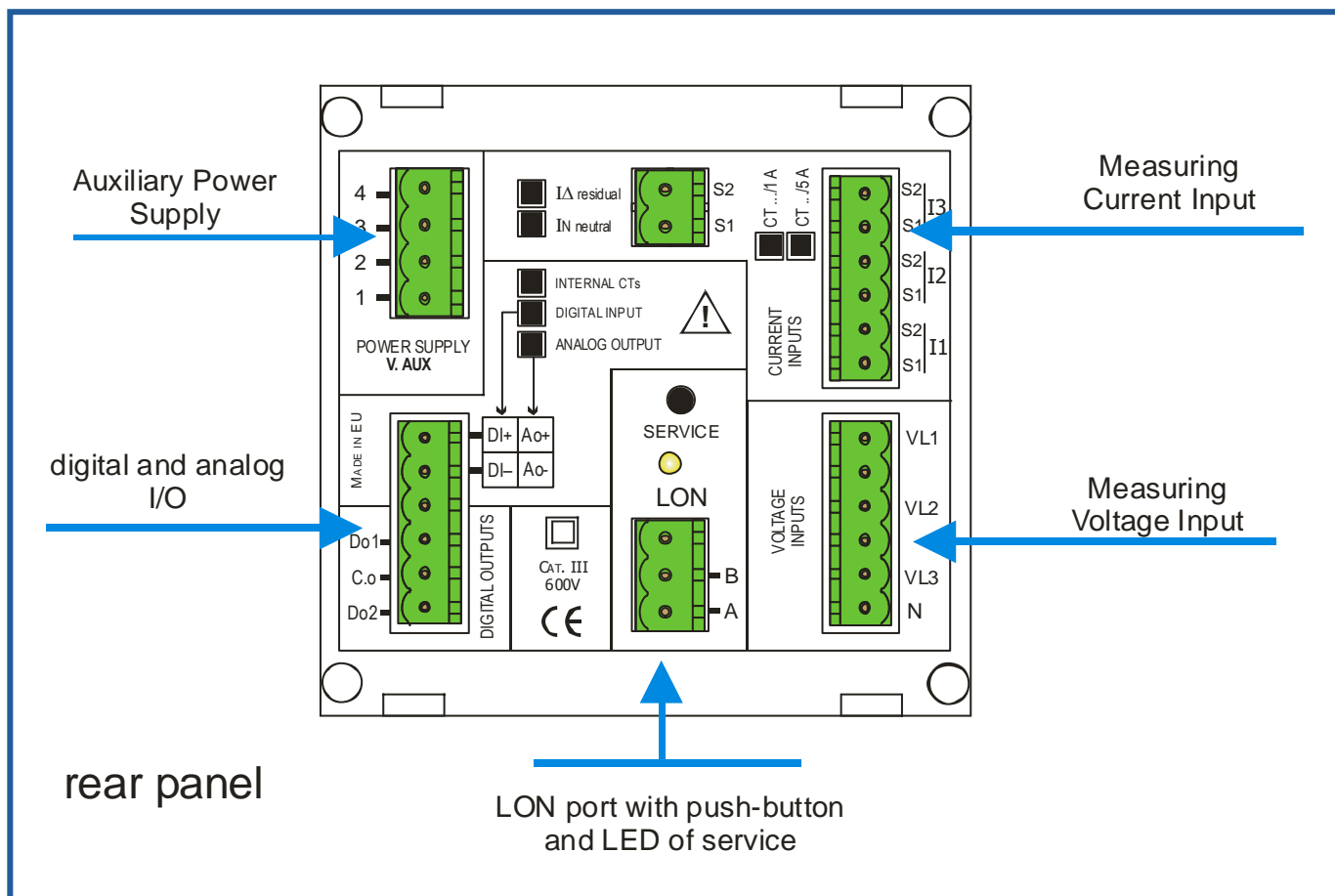The instrument described in this manual is intended for use by properly trained staff only.

### SAFETY

This instrument has been manufactured and tested in compliance with EN 61010-1standards. In order to maintain these conditions and to ensure safe operation, the person must comply with the indications and markings contained in the manual. When the instrument is received, before beginning installation, check that it's O.K. And it has not suffered any damage during transport. When starting installation make sure that the operating voltage and mains voltage are compatible with the device instructions. The instrument power supply must not be earthed. Maintenance and/or repair must be carried out only by qualified and authorized personnel. If there is ever the suspicious that, that there is a lack of safety ,during operation, the instrument must be disconnected and cautions taken against accidental use.

**Operation is no longer safe when: - The instrument  doesn't work. / - The measured value are obviously wrong or unreasonable / - There is clearly visible damage. / - After serious damage incurred during transport. / - After a storage under unfavourable conditions**

## CONNECTIONS



Auxiliary Power Supply

digital and analog I/O

rear panel

Measuring Current Input

Measuring Voltage Input

LON port with push-button and LED of service

For a correct use of the device, the wiring diagram contained in the present manual, must be respected.
The connections are the same for all models and are subdivided in five groups:

## - auxiliary power supply:
On the instrument are available 4 terminals to connect the auxiliary power supply to the instrument:

| Standard Vac version | | Optional Vac/cc version | | Optional Vac/cc version | |
|---|---|---|---|---|---|
| Terminals | Power Supply | Terminals | Power Supply | Terminals | Power Supply |
| 1-2 | 0-110V = 100-125Vac 50-60Hz | | | | |
| 1-3 | 0-230V = 220-240Vac 50-60Hz | 1-3 | 20-60Vac 24-72Vdc | 1-3 | 85-230Vac 90-250Vdc |
| 1-4 | 0-400V = 380-415Vac 50-60Hz | | | | |

It's possible, for example, to take the auxiliary power supply between phase and neutral, in a 4 wires system, or phase-phase in a 3 wires system, without neutral or from a VT in a medium voltage application.

## - measure voltage inputs:
4 terminals are available for the connection to the 3 phase and neutral of the network of measure, the maximum voltage phase to phase shouldn't be over 500 V rms.
In case of a 3 phase system without neutral, or non distributed neutral to leave terminal N free. In a single phase connection the phase input 2 and 3 must be connected to neutral.

## - measure current inputs:
6 terminals are available for the connection to 3 external amperometric transformers with secondary 5A, it's possible to use 2 TA on lines with 3 wires (insertion three phase Aron). **The utilization of external TA is obligatory.**
With the neutral current input option installed, the multimeter allows the measure of the neutral current, using a current transformer /5A; the secondary must be connected to the In S1 and S2 terminals available on the rear of the instrument (see the wiring diagram).
It's possible, on request, to have the CT input with 1A secondary and the residual (differential) current input using a specific toroidal current transformer.

## - input and outputs:
there are available 2 digital outputs (ON/OFF) and a digital input or an analog output 0/4÷20mA.
The changeover switch free voltage outputs with common terminal are used to emit pulse proportional to energy and alarms. It's possible to use loads up to 230Vac/dc and 150 mA.
The opto-isolated input 90÷250V ac/dc allows to manage the counters in the two time bands or to reset the partial counters. It's possible to read the status using the LON variable.
The analog output is completely programmable. The maximum load is 400 ohm.

## - communication LON output:
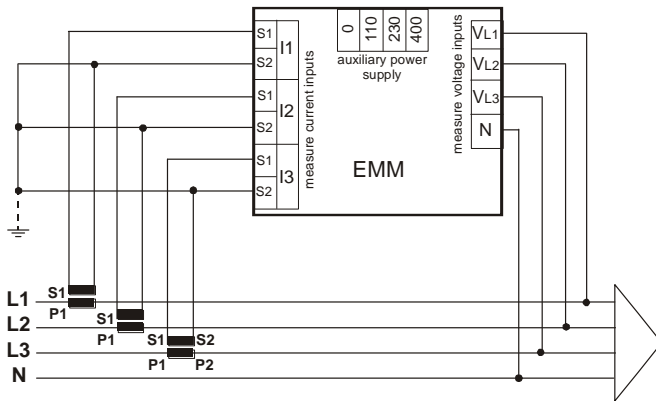FTT 10A communication channel

REMARKS: It's a must to respect the phase sequence. The connections between current and voltage phase inputs must not be inverted (for example, CT placed on phase L1 must correspond to the I1 input). So as it is not correct to invert S1 and S2 terminals, since power factors and powers might not be reliable.
For fixing the flush mount version instrument to the panel, use the fixing devices supplied, by inserting them in the side groves of the enclosure and tighten the screws.
For safety reasons, place an external fuse protection at the input voltages, and use adequate cables for the working voltages and currents, with a cross sections from 0,5 to 2,5 mm$^2$.
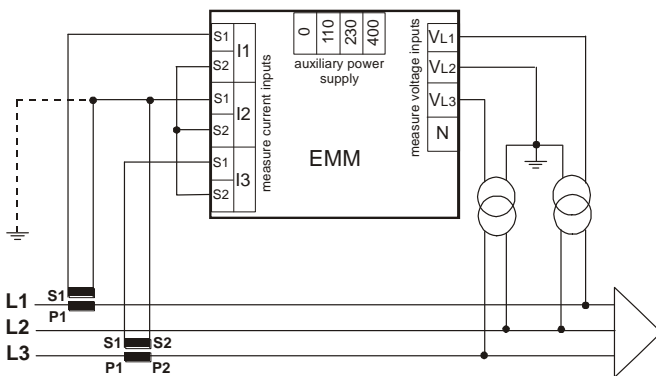
**WIRING DIAGRAMS**
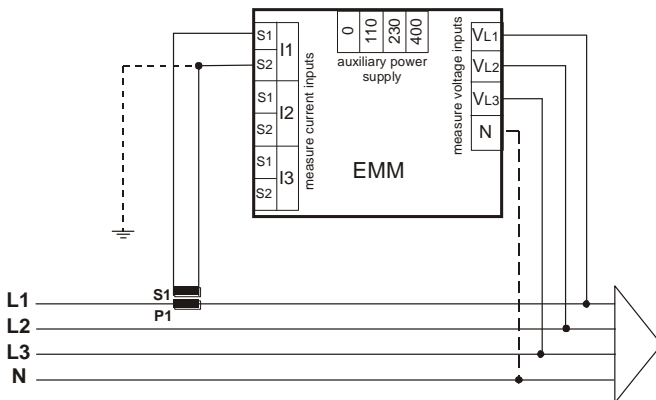
## INSERTION ON THREE-PHASE LINE WITH 4 WIRES



N.B. on line with 3 wires (without neutral or with neutral not supplied) the N terminaln must not be connected.

## INSERTION ON THREE PHASE LINE WITH 3 WIRES AND 2 CT
## (AARON insertion)
## (only for INSULATED CURRENT INPUTS option)
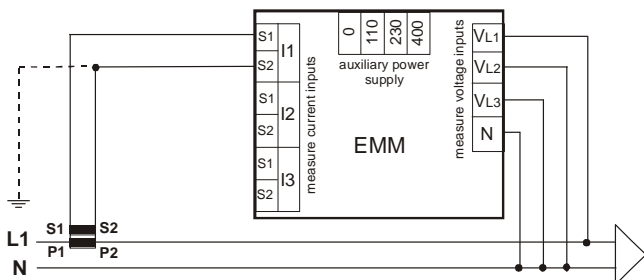


N.B. it's better, where possible, to use 3 CT (above all with unbalance loads)

### INSERTION ON THREE-PHASE BALANCED WITH 3 OR 4 WIRES



N.B. on line with 3 wires (without neutral or with neutral not supplied) the N terminaln must not be connected.

## INSERTION ON SINGLE PHASE



N.B. If the multimeters are used on single phase line, the measure are referred on the L1 phase. The others datadisplayed relatives at three phase system are not to consider.

Digital Input connection



it's better to put a fuse (50mA 250 V fast) on the digital input.
The maximum current absorbed is 1 mA.

EMM with internalCT with Ineutral option In



CT connection to read the neutral current

Voltage insertion with 3 VT

Digital Outputs:
DO1 output if used as PULSE is linked to the ACTIVE ENERGY counter,
DO2 output if used as PULSE is linked to the REACTIVE ENERGY counter.
DO1 and DO2 can be used as ALARM and they can be linked to a measure.



Max 150mA
Max 230Vac/dc

## DESCRIPTION FRONT PANEL– OPERATORS



**LEGEND:**

**A**: push-button for the visualization of electrical parameters of three-phase system with the corresponding LED indication. In modality programming (SETUP) it's used to confirm the parameter set.

**B**: push-button for the selection of the electrical parameter to be displayed on display **F**. In modality programming (SETUP) it's used to increase the value of the parameters to set.

**C**: push-button for the selection of the electrical parameter to be displayed on display **G**. In modality programming (SETUP) it's used to reduce the value of the parameters to set.

**D**: LED bar for the indication of the electrical parameter displayed on display **F**.

**E**: LED bar for the indication of the electrical parameter displayed on display **G**.
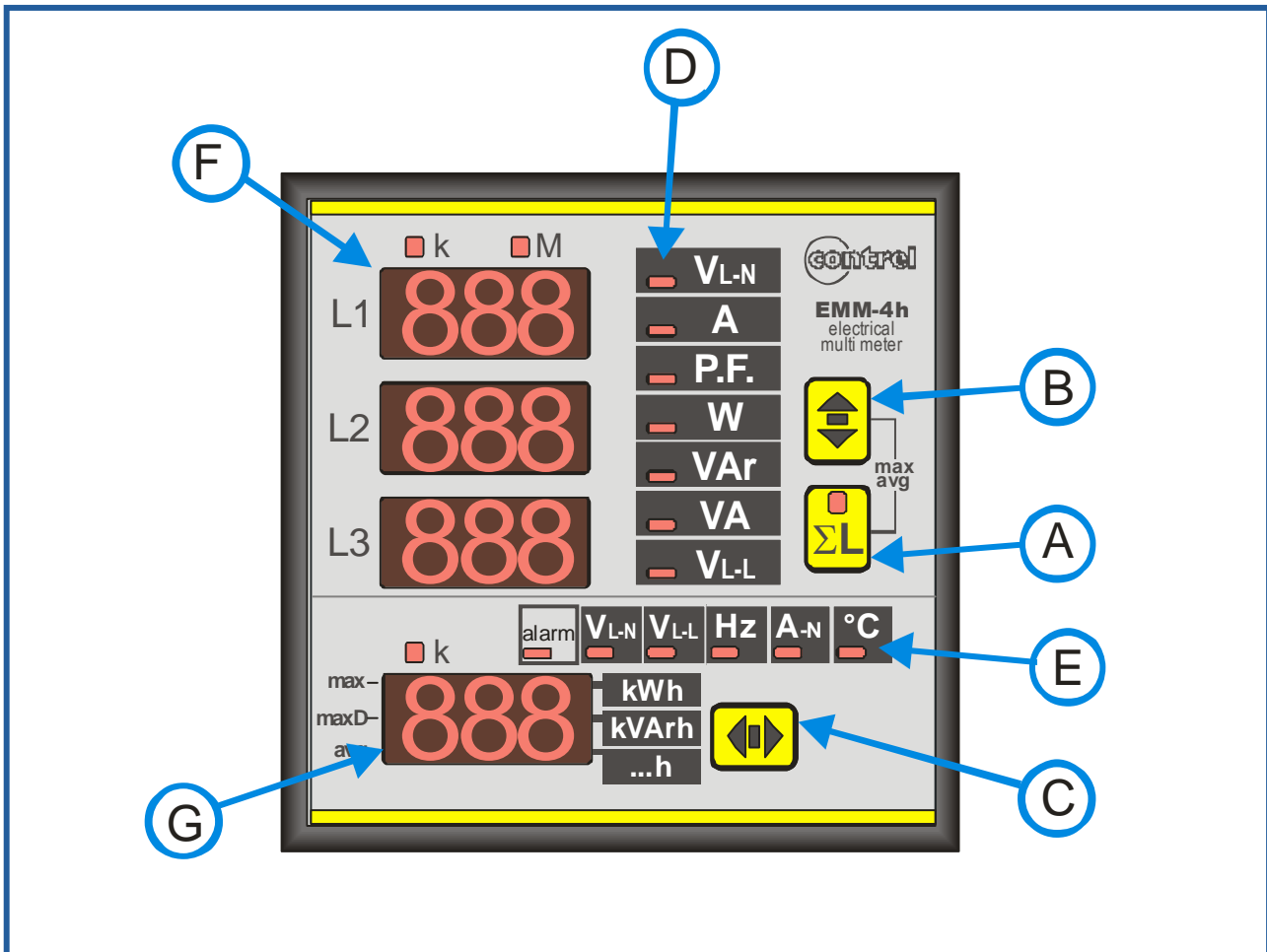
**F**: 3 displays for the visualization of electrical measures of every phase. When Σ**L** LED is ON, only the main display will be active showing the three-phase system value of the electrical measure selected.
LED **k** and **M** show the eventual multiplying factor (k = kilo=x 1.000, M =Mega= x 1.000.000)
Using the **C** key the display indicates also the values of the active and reactive energy counters.
Using the **A** and **B** keys the display indicates the maximum and average values.

**G**: display for the visualization of the electrical measure indicated in LED **E** (energy counters excluded).
The voltage values are referred to the three-phase system.
The **k** LED displays the reading in kilo (x 1000).
Using the **C** key the display indicates the type of the energy displayed.
Using the **A** and **B** keys the displays indicate the type of the value: average or maximum.

**A+C**: when pressing simultaneously the instrument pass to the following menu:
- instrument programming (**SETUP**)
- energy counters and peak values deleting (**RESET**)
- digital outputs programming (**SET DO1; SET DO 2**)
- analog output programming (**SET AN OUT**)
- hour counter programming (**HR_**)
- I/O diagnostic page

**A+B**: when pressing simultaneously the instrument pass to the visualization of average and maximum values stored.

## MENU OF INSTRUMENT PROGRAMMING (SETUP)

To enter in SETUP it's necessary to press at the same time **A** and **C** keys, on the **F** display will appear the message **SeTUp**. Pressing the **A** key on the **G** display will appear the message **SET** that will remain always displayed during the set of each parameter to highlight the setup phase in running.

The set values will be keep also in absence of auxiliary power supply.

## MAIN PARAMETERS SETTING (SET UP)

Entry to menu: seT UP →

seT Up
RESET
SET DO1
SET DO2
SET AN OUT
SET HR_
DO_ OFF OFF

**SET CT**
**Set CT ratio**
from **1** to **2000**

Increase

Decrease

**SET VT**
**Set VT ratio**
from **0.1** to **400.0**

Increase

Decrease

(version with $A_n$ input) **SET CTN**
**Set CT ratio of the neutral input** from 1 a **2000**

Increase

Decrease

**seT AV9 T**
**Set average time**
from **1** to **30** minutes

Increase

Decrease

**seT EN**
**Set Energy visualization type**

B1 TB2
TOT PAR
NORMAL

**seT 3pH**
**Set connection type**

BALANC
UN_BAL
1PH L1

**seT MDE**
**Set wiring connection type**

-3-

-4-

**seT SYN MDE**
**Set synchronism type**

1
50
60

(version with digital output) **seT PUL SE**
**Set pulse weight**

10.0 kW-kVAr / pulse
01.0 kW-kVAr / pulse
0.10 kW-kVAr / pulse
0.01 kW-kVAr / pulse

(version with digital output) **seT TPL**
from **100** to **500** mS
in step by 100 mS

Increase

Decrease

**SET PAS**
**Set Password**
OFF - 0002 ÷ 9999

Increase

Decrease

**Confirm and end of general settings**

**Programming of the transformation ratio of the external current transformers (SET CT)**

The programming of the CT ratio, intended as the ratio between the primary and the secondary circuit (example: with CT 1000/5 it must be set 200), has to be performed by using the front keys.

After the enter in the setup (message **SETUP** on **F** display) pressing the **C** key, the message **seT** will appear on the **G** display and the message **CT** (Current transformer ratio) on the first **F** display; the transformation ratio value (set to 1 by the manufacturer) on the second and the third **F** display. Press **B** or **C** keys to increase or decrease the value respectively (the variation is performed unit by unit). In order to speed up the operation, keep the **B** or **C** key pressed, the variation will be performed by tens and hundreds. To increase or decrease the value by unit, it is necessary to release and to press the button again. To confirm the set value, press the **A** button; in this way it is possible to enter the next programming. If none key is pressed for 10 seconds, the instrument will automatically leave the programming menu and the eventual setting SHALL NOT be stored.

**- Programming of the transformation ratio of the external voltage transformers (SET VT)**

After the precedent programming phase, on **F** display will appear the inscription **Vt** (voltage transformer) and the value of the transformation rate of the external TV (set to 1 from the constructor), considered as the rate between primary and secondary (example with TV 15/0.1 kV the value will be 150). In the same way at the programming of the CT rate will be possible to set this value. If the external TV are not used the value to set will be 1. To confirm the value press the **A** button.

If the instrument has not options the programming continues with the set of average time **AVG T'** and after with the password **PASS**, then it come back at the first page **SETUP**. The presence or the absence of the options, neutral current, digital output and serial output, will allow the visualization or not of the other settings.

**Programming of the transformation ratio of the current transformer for the neutral current input (CTN) (version with neutral current input)**

This setting is active only for the models with this option installed; the message **SET** will appear on **G** display; the message **CTN** (Current transformer neutral ratio) and the set value on the **F** display. In the same way at the programming of the CT rate will be possible to set this value (example with CT 1000/5 the value will be 200).
Pressing the **A** key, confirm and go away with the next setting.

**Programming of the average time (seT AVG T')**

After the programming phase previously described, pressing another time the **A** key, on the **F** display will appear the message **AVG T'** and the average time settable from 1 to 30 minutes.
To increase the value press the **B** key. To decrease it, press the **C** key. To confirm it press the **A** key.
The average time is the time used to calculate the average parameters (**avg**) and the maximum demand (**maxD**).

**Programming of the energy visualization type and the use of the digital input (seT EN)**

This setting allows to define the energy visualization type after the visualization of the temperature.
With **TB1 TB2** will have the separated visualization of the two bands of the active, reactive, and apparent energy; the digital input will select the band (tb1 if opened, tb2 if closed). The **TB1 TB2** function is not present if the digital input option is not installed. With **TOT PAR** will have the visualization of the partial and total energy counters; the digital input is used (when it's closed) to reset the partial counters. With **NORMAL** there will be only the visualization of total counters (that it's possible to reset from **RESET** menu). The status of the digital input is available as LON variable.

**Programming insertion mode (3PH)**

In a unbalance three phase system it's necessary to set **UN_BAL** (unbalance) while in a balance system (only one CT and only one VT) the correct set is **BALANC** (balance). For a single phase insertion it's necessary to set **1PH L1**.

**Programming wiring connection mode (MDE)**

This setting allows to definite the wiring type connection. It's possible to chose 3 wires or 4 wires. With the 4 wires connection the neutral parameter are displayed and enabled to use for the digital and analog outputs settings.

**Programming of the synchronism type (SYN MDE)**

In this setting for the synchronization type, it's possible to choose L1 to use the external frequency (on L1 phase) or 50, 60 Hz to use the internal clock.

**Programming of the weight of the active and reactive energy pulse (seT PULSE) (only for vers. with digital output)**

After the above mentioned programming, by pressing the **A** key again, the message **PUlse** will appear on the **F** display and the value of the weight of one pulse settable on three phase values: **0,01** - **0,1** - **1** - **10** kWh or kVArh (for each emitted pulse the instrument will have counted 0,01 - 0,1 - 1 - 10 kWh o kVArh).
Press the **B** key to increase the value or **C** key to decrease the value and **A** to confirm.

**Programming of the duration pulse (SET TPL) (only for vers. with digital output)**

The message **TPL** will appear together the value of the duration pulse expressed in mS. It's possible to select the value from 100 mS to 500 mS, with 100 ms steps by using **B** key (to increase the value) and **C** (to decrease the value).
Confirm the value pressing the **A** key.
This setting is used by all digital outputs.

**Programming of the Password (SET PAS)**

The instrument is supplied without password. When a password (from 0002 to 9999) is set, using the **B** (to increase), **C** (to decrease) and **A** (to confirm) keys, only who know this value can to enter in the setup. The password, in fact, is required all the time that someone try to enter in the setup (pressing the **A** and **B** key at the same time). If the password is wrong, the message **PASS ERR** will appear on **F** display and the instrument go back to the measures visualization. To input the password, when required by the instrument, at the enter of the setup, use the **A**, **B** and **C** keys as the same way done previously.

The menu is cyclic. After the last setting, the instrument go back to the first page of Setup (SETUP). It's always possible to come back to measures visualization mode pressing at the same time the **A** and **C** keys.

## PEAK VALUES AND ENERGY COUNTERS RESET (RESET)

From the measures visualization mode, pressing the **A** and **C** keys simultaneously the message **SETUP** will appear on **F** display, press the key **C** until the message **RESET** appears on the same display. To accede to the menu, press the **A** key. Now it's possible to select the enabling of cancellation type, by pressing the **C** key, according with following types:
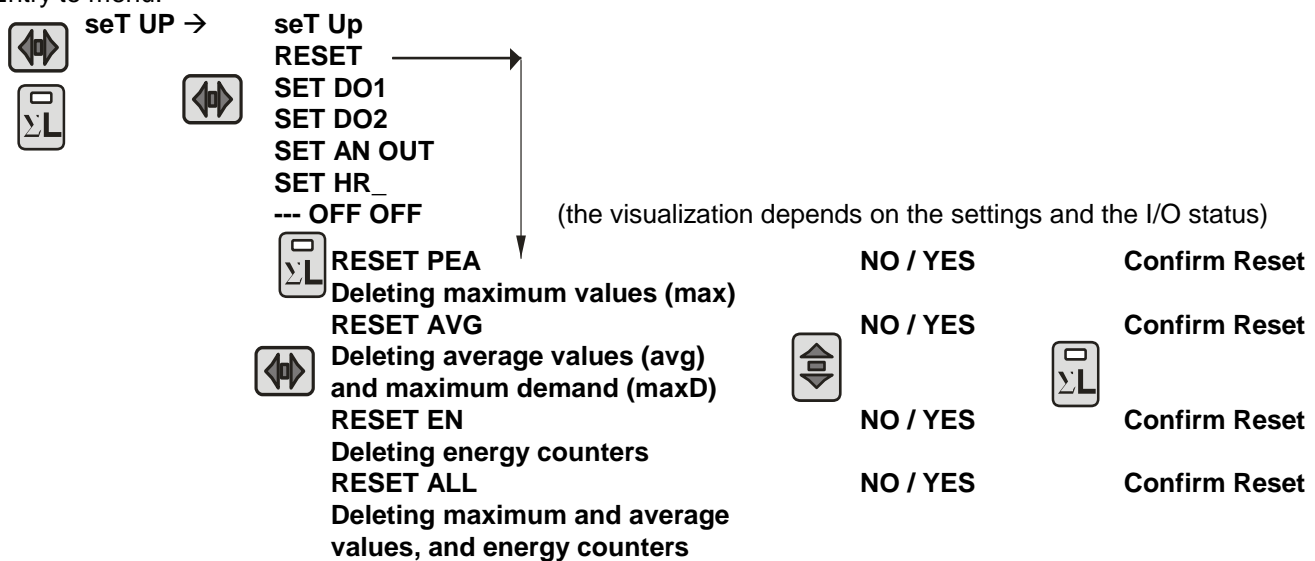
**RESET PEA**:   all maximum value will be delete.

**RESET AVG**:   all average and average maximum value (maximum demand) will be delete.

**RESET EN**:   with **NORMAL** as energy mode (**EN**) the total energy counters will be delete, with **TOT PAR** the partial energy counters will be delete (as when the digital input is closed) and with **TB1 TB2** the band counters will be delete.

**RESET ALL**:   to delete average maximum values and energy counters.

Entry to menu:



seT UP →     **seT Up**
            **RESET** ────────────▶
            **SET DO1**
            **SET DO2**
            **SET AN OUT**
            **SET HR_**
            **--- OFF OFF**        (the visualization depends on the settings and the I/O status)

**RESET PEA**                          NO / YES        **Confirm Reset**
**Deleting maximum values (max)**
**RESET AVG**                          NO / YES        **Confirm Reset**
**Deleting average values (avg)**
**and maximum demand (maxD)**
**RESET EN**                           NO / YES        **Confirm Reset**
**Deleting energy counters**
**RESET ALL**                          NO / YES        **Confirm Reset**
**Deleting maximum and average**
**values, and energy counters**

To enable the chosen type, press the **B** key to change the indication on display **G** from **NO** to **yes**.
Confirm enabling cancellation, by pressing the **A** key. The indication on display **G** change from **yes** to **---**.


## PROGRAMMING OF THE DIGITAL OUTPUT (SET DO1        SET DO2)

The DO1 and DO2 digital outputs have three modality of functioning: **PULSE**, alarm (**ALR**) and **REMOTE** command.
The DO1 modality setting is independent from DO2. For example it's possible to set DO1 on **PULSE** (pulse emission) and DO2 on alarm mode (**ALR**).

In the menu **SET DO1** and **SET DO2** it's possible to program the function of all digital outputs. In these menus are available the following modality: **PULSE**, **ALR** and **REMOTE**.
In **PULSE** mode the digital output DO1 will emit pulses proportional to the active energy counted while the digital output DO2 will emit pulses proportional to the reactive energy counted. The proportionality will depend from the **PULSE** set in the **SETUP** and the duration of the impulse is set in the **TPL** voice of the **SETUP**.
The **ALR** modality is divided in two parts: **ALR SYS 3PH** and **ALR SYS 123**. With **ALR SYS 3PH** the digital output will function as alarm verifying that the three phase value doesn't exceed the threshold set (**ALR HI** and **ALR LO**). With **ALR SYS 123** the digital output will function as alarm verifying that the maximum value of the single phases doesn't exceed the maximum threshold set (**ALR HI**) and that the minimum value of the single phases doesn't come down the minimum threshold set (**ALR LO**). The activation of the alarm output will come after some seconds of delay set(**ALR DL**).
In **REMOTE** mode, the LON variable define the status of the output.

Enter to menu:

seT UP →

| seT Up |
| RESET |
| SET DO1 ——————→ |
| SET DO2 |
| SET AN OUT |
| SET HR_ |
| --- OFF OFF (the visualization depends on the settings and the I/O status) |

**Pul se**
**ALR SYS 3PH**
**ALR PH_ 123**
**BY_ REMOTE**

**To choose the output modality** (selecting PULSE or BY_ REMOTE the setting finish)

**ALR SEI uLN**
**ALR SEI AMP**
**ALR SEI AN** (only for ALR SYS 3PH)
**ALR SEI P.f   To chose the parameter**
**ALR SEI ACT**
**ALR SEI REA**
**ALR SEI APP**
**ALR SEI VLL**
**ALR SEL FRE** (only for ALR SYS 3PH)
**Alr sel T°c** (only for ALR SYS 3PH)

**to control** (see variable list)

**Set maximum alarm threshold** — **Increase**

**ALR HI** — **Decrease** (after 0 there is OFF)

**Set minimum alarm threshold** — **Increase**

**ALR LO** — **Decrease** (after 0 there is OFF)

**Set delay** — **Increase**

**ALR DI** — **Decrease**

**Confirm and end of digital output settings.**

ENTER IN THE SETUP
From the measures visualization, press at the same time the **A** and **C** keys, the message **SeT Up** will appear on the **F** displays.
CHOOSE THE DIGITAL OUTPUT TO PROGRAM
Press repeatedly the **C** key until the message **SET DO1** (DO1 output) or **SET DO2** (DO2 output) appears on the **F** display. Press the **A** key to select this setting.
SELECT THE MODALITY OF FUNCTIONING OF THE DIGITAL OUTPUT
To select the functioning mode, using the **B** and **C** keys, it's possible to select: **PULSE** (pulse emission), **ALR SYS 3PH**, (alarm on three phase value), **ALR PH_ 123** (alarm on minimum and maximum single phase value) and **BY_ REMOTE** (the digital output is managed using serial output). Press **A** key to confirm.
CHOOSE THE PARAMETER TO LINK TO THE DIGITAL OUTPUT
With an alarm modality set, it's necessary to select the parameters associated to the alarm output; by pressing the **B** and **C** keys until the parameter choice appears on the third part (L3) of **F** display and the glowing the corresponding led on the **D** bar. Press **A** key to confirm the set.
SET THE HIGH AND THE LOW THRESHOLDS
On **F** display will appear the message **ALR Hi** with the high threshold value; confirming with the **A** key on the same display will appear the message **ALR LO** with low threshold value. The **B** (to increase) and **C** (to decrease) keys are used to set the high and the low thresholds values. The range depends by the parameter and it is linked to the CT and VT ratios. Pressing **A** key to confirm.
The threshold set is linked with CT and VT ratios, for this reason it's necessary to make this operation after the programming of the CT and VT. The end scale value must be confirmed when CT and VT ratios are modified.
The low threshold will be lower than high threshold. If the high threshold is set as OFF the low threshold will have the range of the high threshold.
SET THE DELAY TO THE DIGITAL OUTPUT ACTIVATION
Now it's possible to set the delay that will pass between the alarm condition set and the activation of digital output. On **F** display will appear **ALR DLY** and the value expressed in seconds (range 1÷900). The modification of the value is done in the same way of the threshold set. With the confirmation (**A** key) the set is complete.
The programming will be referred to the digital output indicated on **G** display (**DO1** o **DO2**).

## PROGRAMMING ANALOG OUTPUT (SET AN OUT)

*Note: This menu is active only if the instrument has this option.*
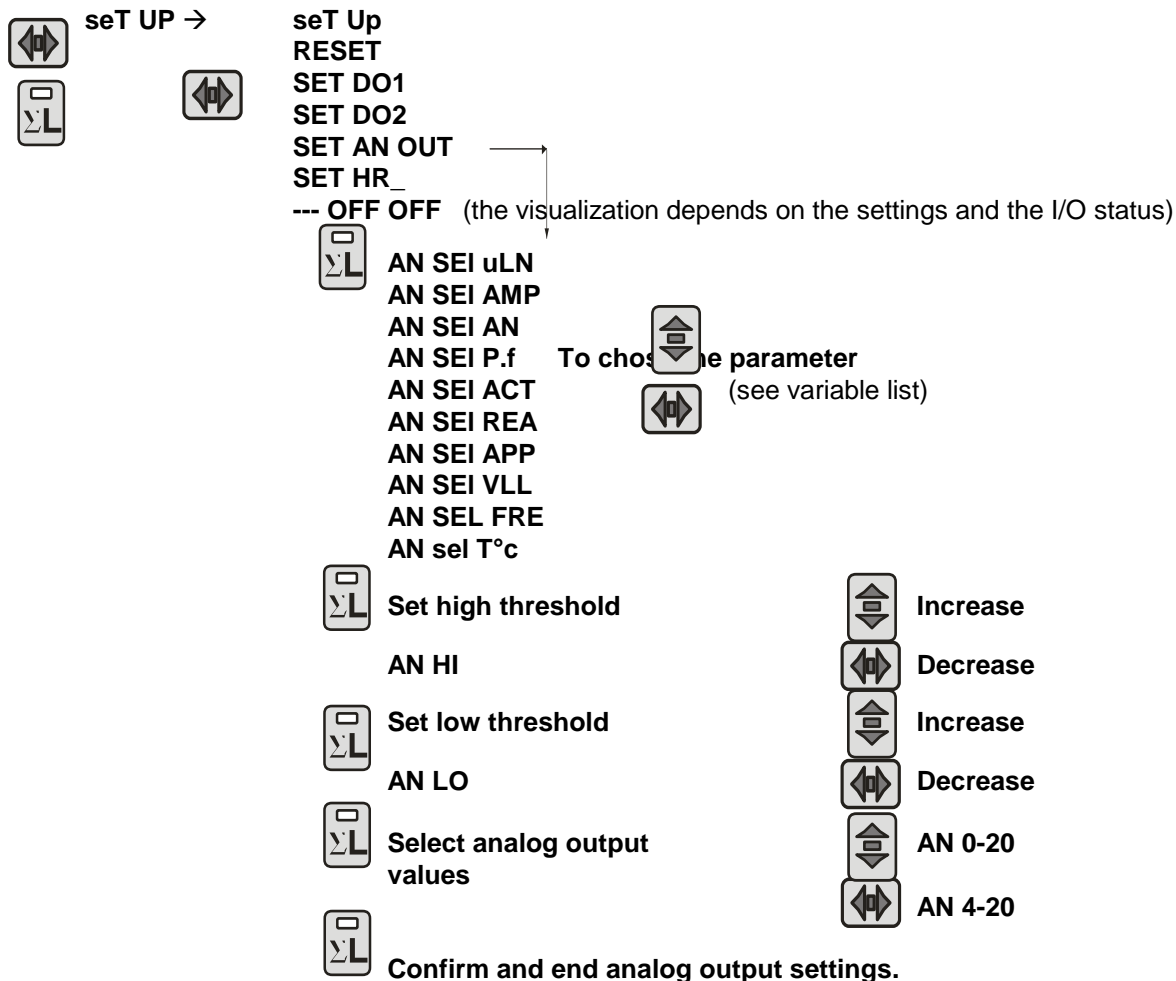
The connection of the analog output is on **AO+** and **AO-** terminals that replace the **DI+** and **DI-** terminals when this option is installed.

The maximum resistance of the load connected to the analog output is 400 ohm.

The analog output will supply a signal from 0 to 20 mA or from 4 to 20 mA (depending of the set) proportional to the measure of the parameter selected and the and-scale set.

The analog output refresh time is linked to the display refresh time.

Enter to menu:

**seT UP** →    **seT Up**
              **RESET**
              **SET DO1**
              **SET DO2**
              **SET AN OUT** ———→
              **SET HR_**
              **--- OFF OFF**   (the visualization depends on the settings and the I/O status)

       **AN SEI uLN**
       **AN SEI AMP**
       **AN SEI AN**
       **AN SEI P.f**    **To chose the parameter**
       **AN SEI ACT**          (see variable list)
       **AN SEI REA**
       **AN SEI APP**
       **AN SEI VLL**
       **AN SEL FRE**
       **AN sel T°c**

       **Set high threshold**         **Increase**

       **AN HI**                      **Decrease**

       **Set low threshold**          **Increase**

       **AN LO**                      **Decrease**

       **Select analog output**       **AN 0-20**
       **values**                     **AN 4-20**

       **Confirm and end analog output settings.**

### SELECT THE PARAMETER TO LINK TO THE ANALOG OUTPUT

After the digital outputs menu (**SET DO1** and **SET DO2**), pressing the **C** key the message **SET AN OUT** will appear on the **F** display. To accede to the menu programming press the **A** key, the message **SET** will appear on the **G** display, on the **F** display and on **D** led bar will appear the parameter to link to the analog output and selectable pressing more time the **B** key. Pressing the **A** key to confirm the parameter selected.

### SET THE HIGH AND THE LOW THRESHOLD

Now, it's necessary to set the end scale value (high limit) that will appear on **F** display preceded from the message **AN HI**. As in the previous setting this value is modifiable with **B** and **C** keys. The **k** or **M** led mean respectively $x10^3$ or $x10^6$. Confirming with **A** key.

The threshold set is linked with CT and VT ratios, for this reason it's necessary to make this operation after the programming of the CT and VT. The end scale value must be confirmed when CT and VT ratios are modified.

*Note: The P.F. scale is fixed from P.F. -0 capacitive (20mA) to +0 inductive (0mA); with P.F. 1 will have 10mA (0-20 scale), 12 mA (4-20mA scale).*

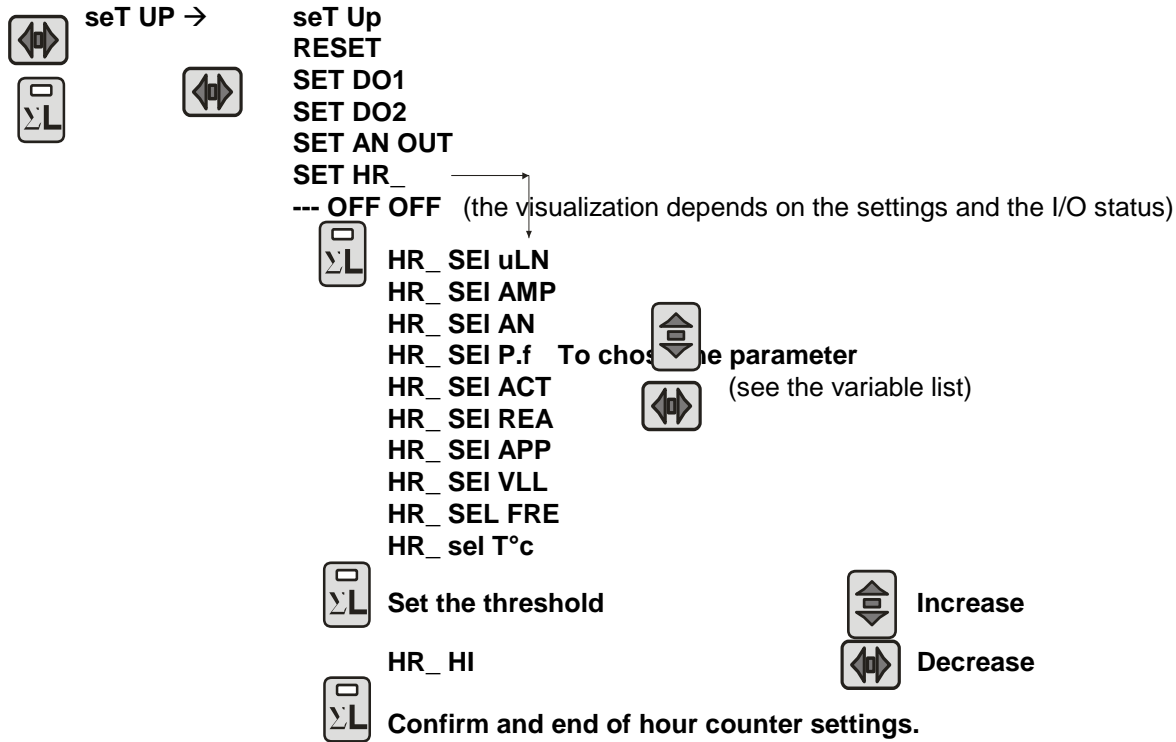At the same way of the high threshold setting, it's necessary to set the low threshold. The value must be lower then the maximum threshold.

### SET THE LIMIT VALUES OF THE ANALOG OUTPUT

After the confirmation of the end scale on **F** display will be displayed the message **AN** with the limit values of the analog output: **0-20** or **4-20** selectable with the **B** and **C** keys. Confirm with **A** key.

## PROGRAMMING OF THE HOURS COUNTER (SET HR_)

The hour counter will be increased when the measure of the parameter will exceed the set threshold value.

**seT UP →**

**seT Up**
**RESET**
**SET DO1**
**SET DO2**
**SET AN OUT**
**SET HR_**
**--- OFF OFF**   (the visualization depends on the settings and the I/O status)

**HR_ SEI uLN**
**HR_ SEI AMP**
**HR_ SEI AN**
**HR_ SEI P.f**   **To chose the parameter**
**HR_ SEI ACT**
**HR_ SEI REA**   (see the variable list)
**HR_ SEI APP**
**HR_ SEI VLL**
**HR_ SEL FRE**
**HR_ sel T°c**

**Set the threshold**                     **Increase**

**HR_ HI**                                **Decrease**

**Confirm and end of hour counter settings.**

SELECT THE PARAMETER TO LINK TO THE HOURS COUNTER
From the previous setting, pressing the **C** key it's possible to set the hours counter: the message **SET HR_** appears on the **F** display. Press the **A** key to define the parameter to link to the hours counter. Press more time the **B** key to select the parameter and the **A** key to confirm it.

SET THE THRESHOLD
Subsequently it's necessary to set the threshold using the **B** (to increase) and **C** (to decrease) keys. Confirm with **A** key.

**I/O INFO PAGE**
After the hour counter set, the I/O info page appears in F displays: on the first part (L1) the status of digital input, on the second part (L2) the status of the first digital output (DO1), on the third part (L3) the status of the second digital output (DO2).

The visualization of the digital input status (activated that is supplied and deactivated that is not supplied) depends of the type of energy visualization: **NORMAL**, **TOT PAR** e **TB1 TB2**. With **NORMAL** the digital input will be indicated with **ON** (activated) or **OFF** (deactivated). With **TOT PAR** the visualization will be **---** (deactivated) or **RES** (activated) to indicate the partial counter RESET execution. With **TB1 TB2** will be visualized **B1_** (input deactivated) or **B2_** (input activated) to indicate the band active.

The status of the two digital outputs is **ON** if the digital output is activated or **OFF** if deactivated.

Only if the instrument is "commissioned" on the **G** display will be displayed the communication status between the microprocessor and the LON interface.

**VARIABLE LIST**
**VLN**    three-phase voltage
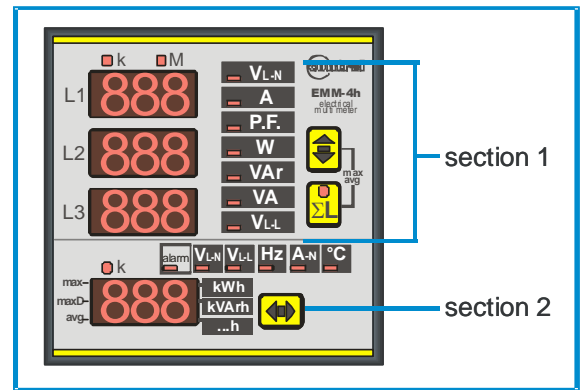**AMP**    three-phase current
**AN**     neutral current
**P.F**    three-phase power factor
**ACT**    active power
**REA**    reactive power
**APP**    apparent power
**VLL**    phase to phase voltage
**FRE**    frequency
**T°C**    temperature

## MEASURES VISUALIZATION

The instrument is divided in two distinct section:
the first is composed by three displays (**F**), by **A** and **B** keys and by LED bar **D**; the second (in the low part) is composed by **G** display, by **C** key and by LED bar **E**.
The two sections are to consider as two different instruments in a only one box, in fact it's possible to act in a zone without to modify the visualization in the other (peak value and energy counters visualization excluded).

### Visualization section 1

The three measures of phases (on L1, L2 and L3), of the parameter indicated from the led **D** on, appears on **F** display. For the measure of the phase to phase voltages (V L-L), the three measures are V $_{L1-L2}$, V $_{L2-L3}$, V $_{L3-L1}$.
It's necessary to press the **B** button to select the parameter that can be displayed and indicated from **D** LED.
Press **A** button to see on **F** display the three phase value (the average of the single phase of voltage, current, power factor and the sum of single phase for the power) of the parameter selected,: the led inside the **A** key is on.
To press another time the same key the visualization come back at the phase values.
The unit of measurement can be expressed in kilo or Mega, in the this case the relative LED is on.
A sign – on the first digit indicates the visualization of the capacitive power factor (example the reading -.95 indicates a power factor of 0.95 capacitive)
Note: If in the Setup the single phase mode (**1PH L1**) is set, all the measures appear on the L1 display.

### Visualization section 2

At the same way of the section 1, press the **C** button to select the parameter that can be displayed and indicated from **E** LED. The voltage values are of the three phase system, the frequency is of the L1 channel.

### Visualization energy and hours counters

With the **C** key it's possible to visualize on **F** display the active, reactive and apparent energy counters. One segment of the right digit of the **G** display, in correspondence of the **kWh** and **KVArh** on the front panel, turn on, to indicate the visualization of the active and reactive energy counters. The led **VA** and the segment of the right digit of the **G** display, in correspondence of **…h** on the front panel, turn on, to indicate the visualization of the apparent energy counter. To complete the visualization the led **k** over the **F** display could be on.
This is the visualization if **NORMAL** is the set in **EN** voice of the setup. Instead if the setting is **TOT PAR** on the **F** display will be visualized alternatively the partial and the total active, reactive and apparent energy counters; the first digit of the **G** display indicates the type of the counter: **P** for the partial (the user could be reset it) and **T** for the total (it's no possible to reset it). If the setting is **TB1 TB2** on F display will be visualized alternatively of the counters of the band 1 (**B1** on the first two digit of **G** display) and of the band 2 (**B1** on the first two digit of **G** display).

The right digit of **G** display, in correspondence of the **…h**, turn on, when the visualization of hours counters is active.

The reading of the counters use the 9 digits (maximum reading 99999999.9) of the **F** display: the measure is displayed in the way that the L1 display will indicate the first 3 digits, the display L2 the seconds 3 digits and the L3 display the last 3.
For example if: L1=000, L2=028, L3=53.2 the reading is 2853.2 kWh.
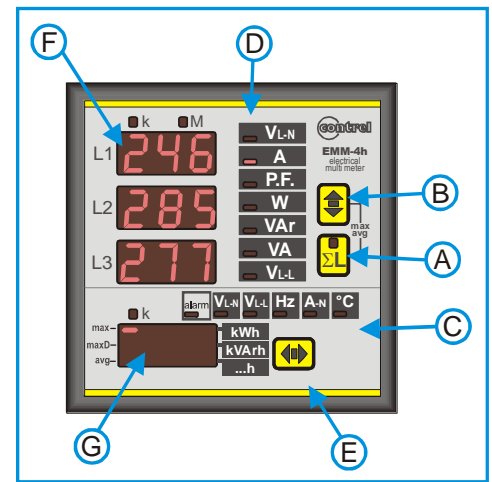
## VISUALIZATION PEAK AND AVERAGE VALUES

Pressing at the same time the **A** and **B** keys, on **F** display will appear the average and maximum stored value, that are selected using the **B** key while a luminous segment on the **G** display indicates the type of the maximum and/or average value.

**AVG**: the average values are calculated on a average time set. The calculation is at fixed window and it's sinchronized when the instrument turn on.

The stored maximum values are the two types:
**MAX**: the instantaneous maximum values store the maximum value achieved by the parameter of measure for at least one second.

**MAX AVG**: the average maximum values (maximum demand) store the maximum value achieved in the average time as set in the setup menu;

The integration for the calculating of the average values is synchronized all the time that the instrument turn on.
Press **A** and **B** keys another time to come back to the measures visualization. The instrument will come back to the measure visualization automatically if for 10 seconds no one button is pressed.
The average value, the maximum value and the maximum average value selectable with **B** key are the following:

| parameter | Identifications / description | | | G display |
|---|---|---|---|---|
| phase voltages | $V_{L1-N\ max}$ | $V_{L2-N\ max}$ | $V_{L3-N\ max}$ | max, maxD, avg |
| | maximum instantaneous phase voltages | | | |
| phase and neutral currents | $I_{L1\ max}$ $\quad$ $I_{L2\ max}$ | $I_{L3\ max}$ | $I_{N\ max}$ | max, maxD, avg |
| | maximum instantaneous phase currents | | | |
| three-phase power | $\Sigma W_{max}$ | $\Sigma VAr_{max}$ | $\Sigma VA_{max}$ | max, maxD, avg |
| | maximum three phase powers ($\Sigma$) | | | |
| phase and neutral currents | $I_{L1\ max\ avg}$ $\quad$ $I_{L2\ max\ avg}$ | $I_{L3\ max\ avg}$ | $I_{N\ max\ avg}$ | max, maxD, avg |
| | maximum of average phase and neutral currents (max. demand) | | | |
| three-phase power | $\Sigma W_{max\ avg}$ | $\Sigma VAr_{max\ avg}$ | $\Sigma VA_{max\ avg}$ | max, maxD, avg |
| | maximum of average three phase powers (maximum demand) | | | |
| phase and neutral currents | $I_{L1\ avg}$ $\quad$ $I_{L2\ avg}$ | $I_{L3\ avg}$ | $I_{N\ avg}$ | max, maxD, avg |
| | average phase and neutral currents | | | |
| three-phase power | $\Sigma W_{avg}$ | $\Sigma Var_{avg}$ | $\Sigma VA_{avg}$ | max, maxD, avg |
| | average three phase powers | | | |

### NOTE relative to the measure
The refresh time of the display is lower of a second and it depends by the time of calculating of the measure and concerning the methodology of measure used in the way to allow a comfortable reading of value also in presence of fast variation of the measure parameter.
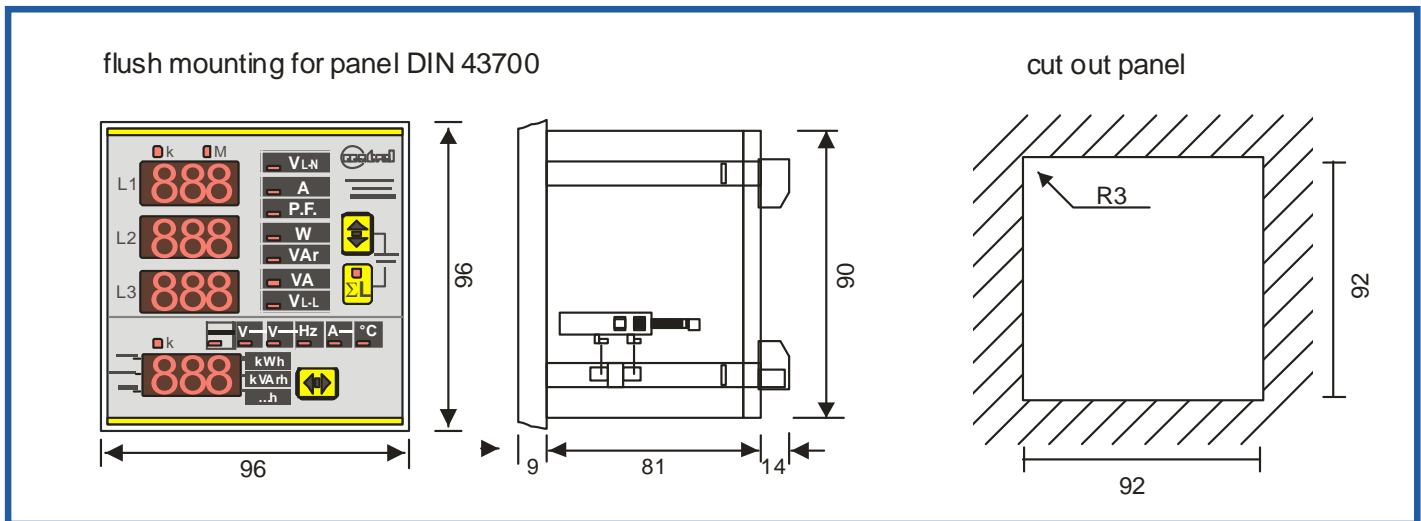If the multimeters are used on single phase lines, the measures are referred at the phase L3. The other data displayed and relative to the three-phase system must not considered.
If the measure indicated by the instrument are not reliable or absurd it's necessary to verify the connection of the measure inputs of currents and voltages because must be respected the sequence of the phase, the corresponding of the currents and voltages of the same phase (the L1 voltage phase and the TA located on L1 phase must be connected on the L1 input) and the sense of the current (the S1 terminals of the TA must be connected at the S1 terminals of the instrument).
In some application where the secondary is connected to other instruments apart from the EMM multimeter, some problems could happen concerning the typology of the amperometric inputs.
If there are some problem call the assistance service.

## DIMENSIONS

flush mounting for panel DIN 43700

cut out panel

## TECHNICAL FEATURES

| MEASURES, PRECISIONS | |
|---|---|
| voltage | true RMS of the phase voltages and the phase to phase voltages and values of three phase system<br>range of total measure: 20÷500V trms phase-phase - 290V rms phase-neutral<br>visualization (0,02÷50,0kV) - measure precision: ±0,5% ±1 digit– management maximum values |
| current | true RMS of the phase currents and of the value of three phase system<br>range of measure: 0,02÷5A trms - measure precision: ±0,5% ±1 digit - visualization 0,02÷9990A |
| frequency | frequency of the L1 phase –range of measure: 40÷500Hz - precision: ±0,5% ±1 digit |
| powers | phase and three phase system apparent, reactive and active power<br>range of measure: 0,001÷9990kW - 0,001÷9990kVAr - 0,001÷9990kVA - precision: ±1% ±1 digit |
| power factor | phase and three phase power factor - range of measure: -0,1÷0,1 / precision: ±1% ±1 digit |
| energy measure | three phase system apparent, active and reactive energy<br>range of measure: 0÷99999999,9 kWh / kVArh        class 2 ( IEC 1036) - precision: ±1 |
| hours counters | precision: ±1%; resolution 1/10 of hour |

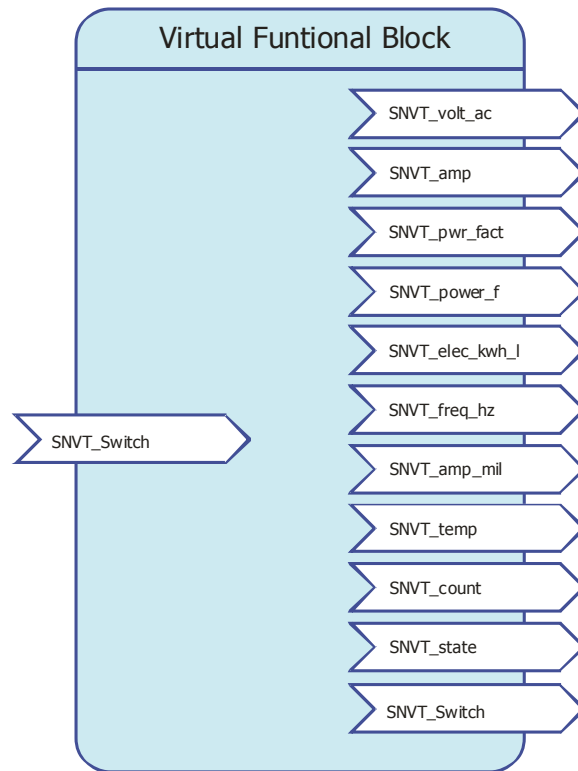| AUXILIARY POWER SUPPLY, INPUTS | |
|---|---|
| auxiliary power supply | Version Vac: 100-125V / 220-240V / 380-415V ±10% - frequency 50-60Hz<br>Version Vac/dc: 20-60Vac – 24-72Vdc<br>Version Vac/dc: 80-230Vac – 90-250Vdc<br>consumption max 4VA |
| voltage inputs | from 20 to 500V phase-phase; permanent overload +20% - input impedance: 1 MΩ<br>insertion on three phase line with 3 wires, 4 wires and single phase<br>insertion in MT with external TV and transforming rate programmable from 1 to 400 |
| current inputs | from 0,02 to 5A; permanent overload 30% - from external TA with secondary 5A,<br>primary programmable from 5 to 10000A  -  auto-consumption <0,5VA |

| INPUTS / OUTPUTS | |
|---|---|
| digital outputs | Two outputs with common, optomos 12÷230Vac/dc, max 150mA,<br>insulation: 3kV for 60 seconds<br>Pulse Function:<br>Weight programmable 0,01-0,1-1-10 kWh/pulse<br>Pulse duration 100-200-300 400 500 milliseconds selectable<br>DO1:     active energy pulse output (accumulated Tb1+Tb2)<br>DO2:     reactive energy pulse output (accumulated Tb1+Tb2) |
| digital Input | Changing time band function or reset partial counters<br>Opto-isolated input:  Insulation: 2500 Vrms 60 seconds<br>                        Impedance: 440 kohm<br>OFF voltage range  (Tb1 selected) - 0 a 20 V ca/cc<br>ON voltage range  (Tb2 selected or reset partial counters): - From 80 Vac to 250 Vac, 50/60Hz<br>                                                          - From 90 Vdc to 300Vcc, polarised. |
| analog output | Max load: 400Ω − Range 0-20mA; 4-20mA - Insulation: 3kV for 60 Seconds |
| LonWork communication | transceiver FTT10A |

| GENERAL | |
|---|---|
| display, operators | 4 displays with red LED 10mm everyone of 3 digit by 7 segments<br>3 push-button for selecting measure and programming |
| mechanic | protection degree: IP52 frontal  -  IP20 enclosure and terminals  -  weight: about 0,5 kg<br>connections with screw terminals for cable 2,5 mm$^2$<br>enclosure thermoplastic self-extinguishing  -  flush mounting DIN 96x96mm, depth 95mm |
| environmental | working temperature: -10÷60°C;  humidity <90%<br>storing temperature: -25÷70°C - insulation test: 3 kV for 1 minute |
| standards | EN 50081-2; EN 61000-6-2<br>EN 61036-1; EN 61010-1 |

CE

**LonWorks communication port**
The  EMM-4h-LON is supplyed of FTT-10 standard interface

**VIRTUAL FUNCTIONAL BLOCK**



**Output variable list**

| SNVT_volt_ac | SNVT_amp | SNVT_pwr_fact | SNVT_power_f | SNVT_elec_kwh_l |
|---|---|---|---|---|
| nvo_3phase_volt | nvo_3phase_curr | nvo_3ph_pwr_fac | nvo_3ph_Apwr | nvo_3ph_Wh_T1 |
| nvo_voltage_ph1 | nvo_current_ph1 | nvo_pwr_fac_ph1 | nvo_Apwr_ph1 | nvo_3ph_Wh_T2 |
| nvo_voltage_ph2 | nvo_current_ph2 | nvo_pwr_fac_ph2 | nvo_Apwr_ph2 | nvo_3ph_RVAh_T1 |
| nvo_voltage_ph3 | nvo_current_ph3 | nvo_pwr_fac_ph3 | nvo_Apwr_ph3 | nvo_3ph_RVAh_T2 |
| nvo_voltage_l12 | | nvo_3ph_cos | nvo_3ph_pwr; | nvo_3ph_AVAh_T1 |
| nvo_voltage_l23 | | nvo_cos_ph1 | nvo_pwr_ph1; | nvo_3ph_AVAh_T2 |
| nvo_voltage_l31 | | nvo_cos_ph2 | nvo_pwr_ph2; | |
| | | nvo_cos_ph3 | nvo_pwr_ph3; | |
| | | | nvo_3ph_Rpwr | |
| | | | nvo_Rpwr_ph1 | |
| | | | nvo_Rpwr_ph2 | |
| | | | nvo_Rpwr_ph3 | |
| | | | nvo_MaxAvg3PhAP | |
| | | | nvo_MaxAvg3PhRP | |
| | | | nvo_MaxAvg3PhApP | |
| | | | nvo_LastAv3PhAcP | |
| | | | nvo_LastAv3PhRP | |
| | | | nvo_LastAv3PhApP | |

| SNVT_switch | SNVT_freq_hz | SNVT_amp_mil | SNVT_temp | SNVT_count | SNVT_state |
|---|---|---|---|---|---|
| nvo_Debug | nvo_Frequency | nvo_N_Current | nvo_temperature | nvo_hours_cnt | nvo_IO_State |
| | | nvo_MaxAvgCurrL1 | | | |
| | | nvo_MaxAvgCurrL2 | | | |
| | | nvo_MaxAvgCurrL3 | | | |
| | | nvo_MaxAvCurrN; | | | |
| | | nvo_LastAvCurrN; | | | |
| | | nvo_LastAvCurrL1 | | | |
| | | nvo_LastAvCurrL2 | | | |
| | | nvo_LastAvCurrL3 | | | |

**Input variable list**

| SNVT_switch |
|---|
| nvi_Out1 |
| nvi_Out2 |
| nvi_REC; |
| nvi_RMA; |

**Output variable list**

| Type | Name | Content |
|---|---|---|
| SNVT_volt_ac | nvo_3phase_volt | 3-PHASE SYSTEM VOLTAGE [V] |
| SNVT_volt_ac | nvo_voltage_ph1 | PHASE VOLTAGE L1-N [V] |
| SNVT_volt_ac | nvo_voltage_ph2 | PHASE VOLTAGE L2-N [V] |
| SNVT_volt_ac | nvo_voltage_ph3 | PHASE VOLTAGE L3-N [V] |
| SNVT_volt_ac | nvo_voltage_l12 | LINE VOLTAGE L1-2 [V] |
| SNVT_volt_ac | nvo_voltage_l23 | LINE VOLTAGE L2-3 [V] |
| SNVT_volt_ac | nvo_voltage_l31 | LINE VOLTAGE L3-1 [V] |
| SNVT_amp | nvo_3phase_curr | 3-PHASE SYSTEM CURRENT [A] |
| SNVT_amp | nvo_current_ph1 | LINE CURRENT L1 [A] |
| SNVT_amp | nvo_current_ph2 | LINE CURRENT L2 [A] |
| SNVT_amp | nvo_current_ph3 | LINE CURRENT L3 [A] |
| SNVT_pwr_fact | nvo_3ph_pwr_fac | 3-PHASE SYS. POWER FACTOR [-] |
| SNVT_pwr_fact | nvo_pwr_fac_ph1 | POWER FACTOR L1 [-] |
| SNVT_pwr_fact | nvo_pwr_fac_ph2 | POWER FACTOR L2 [-] |
| SNVT_pwr_fact | nvo_pwr_fac_ph3 | POWER FACTOR L3 [-] |
| SNVT_power_f | nvo_3ph_Apwr | 3-PHASE S. APPARENT POWER [kVA] |
| SNVT_power_f | nvo_Apwr_ph1 | APPARENT POWER L1 [kVA] |
| SNVT_power_f | nvo_Apwr_ph2 | APPARENT POWER L2 [kVA] |
| SNVT_power_f | nvo_Apwr_ph3 | APPARENT POWER L3 [kVA] |
| SNVT_power_f | nvo_3ph_pwr | 3-PHASE SYS. ACTIVE POWER [kW] |
| SNVT_power_f | nvo_pwr_ph1 | ACTIVE POWER L1 [kW] |
| SNVT_power_f | nvo_pwr_ph2 | ACTIVE POWER L2 [kW] |
| SNVT_power_f | nvo_pwr_ph3 | ACTIVE POWER L3 [kW] |
| SNVT_power_f | nvo_3ph_Rpwr | 3-PHASE S. REACTIVE POWER [kVAr] |
| SNVT_power_f | nvo_Rpwr_ph1 | REACTIVE POWER L1 [kVAr] |
| SNVT_power_f | nvo_Rpwr_ph2 | REACTIVE POWER L2 [kVAr] |
| SNVT_power_f | nvo_Rpwr_ph3 | REACTIVE POWER L3 [kVAr] |
| SNVT_elec_kwh_l | nvo_3ph_Wh_T1 | 3-PHASE SYS. ACTIVE ENERGY T1 [kWh] |
| SNVT_elec_kwh_l | nvo_3ph_RVAh_T1 | 3-PHASE S. REACTIVE ENERGY T1 [kVArh] |
| SNVT_elec_kwh_l | nvo_3ph_Wh_T2 | 3-PHASE SYS. ACTIVE ENERGY T2 [kWh] |
| SNVT_elec_kwh_l | nvo_3ph_RVAh_T2 | 3-PHASE S. REACTIVE ENERGY T2 [kVArh] |
| SNVT_freq_hz | nvo_Frequency | FREQUENCY [Hz] |
| SNVT_amp_mil | nvo_N_Current | NEUTRAL CURRENT [A] |
| SNVT_elec_kwh_l | nvo_3ph_AVAh_T1 | 3-PHASE S. APPARENT ENERGY T1 [kVAh] |
| SNVT_elec_kwh_l | nvo_3ph_AVAh_T2 | 3-PHASE S. APPARENT ENERGY T1 [kVAh] |
| SNVT_temp | nvo_temperature | TEMPERATURE [°C] |
| SNVT_count | nvo_hours_cnt | HOURS COUNTER [h] |
| SNVT_amp_mil | nvo_MaxAvgCurrL1 | MAX AVG CURRENT  L1 [A] |
| SNVT_amp_mil | nvo_MaxAvgCurrL2 | MAX AVG CURRENT  L2 [A] |
| SNVT_amp_mil | nvo_MaxAvgCurrL3 | MAX AVG CURRENT  L3 [A] |
| SNVT_power_f | nvo_MaxAvg3PhAP | MAX AVG 3-PH. ACTIVE POWER [kW] |
| SNVT_power_f | nvo_MaxAvg3PhRP | MAX AVG 3-PH. REACTIVE POWER [kVAr] |
| SNVT_power_f | nvo_MaxAvg3PhApP | MAX AVG 3-PH. APPARENT POWER [kVA] |
| SNVT_power_f | nvo_LastAv3PhAcP | LAST AVERAGE 3-PHASE ACTIVE POWER [kW] |
| SNVT_power_f | nvo_LastAv3PhRP | LAST AVERAGE 3-PHASE REACTIVE POWER [kVAr] |
| SNVT_power_f | nvo_LastAv3PhApP | LAST AVERAGE 3-PHASE  APPARENT POWER [kVA] |
| SNVT_amp_mil | nvo_MaxAvCurrN | MAX AVG CURRENT NEUTRAL [A] |
| SNVT_amp_mil | nvo_LastAvCurrN | LAST AVERAGE CURRENT NEUTRAL [A] |
| SNVT_amp_mil | nvo_LastAvCurrL1 | LAST AVERAGE CURRENT L1 [A] |
| SNVT_amp_mil | nvo_LastAvCurrL2 | LAST AVERAGE CURRENT L2 [A] |
| SNVT_amp_mil | nvo_LastAvCurrL3 | LAST AVERAGE CURRENT L3 [A] |
| SNVT_state | nvo_IO_State | DIGITAL OUTPUT DO1, DO2, INPUT STATUS |

**Input variable list**

| Type | Name | Content |
|---|---|---|
| SNVT_switch | nvi_Out1 | DIGITAL OUTPUT DO1 CONTROL REGISTER |
| SNVT_switch | nvi_Out2 | DIGITAL OUTPUT DO2 CONTROL REGISTER |
| SNVT_switch | nvi_REC | RESET ENERGY COUNTERS |
| SNVT_switch | nvi_RMA | RESET MAX AVG (max demand) VALUES |

**NOTE**
(*)
The **nvo_IO_State** is a 16 bit variable. The bit have the following meaning:
- Bit 0                DO1 state
- Bit 1                DO2 state
- Bit 2                Input state

**Service Led**: If the "decommission" instrument will be connected to a LON network, the *Service Led* must have a regular blink (the time with Led ON it's similar to the time with Led OFF). After the "commission" operation, during the normal functioning, the Led must remain OFF. If the Led works in a different way, the instrument could have some problem. In this case it's better to send the instrument to the Service Center.

**Service Push-Button**: It's used to "commission" the instrument. "Commission" mean to give a logic address in the LON network in the way to allow the communication with other instrument connected. The program that managed the network will communicate when the push-button must be pressed.

NOTE
At reason of the evolution of standards and products, the company reserves to modify in every time  the features of the product described in this document, that it's necessary to verify preventively.
The liability of the producer for damage caused by defect of the product "can be reduced or deleted (…) when the damage is caused joint by a defect of product or for blame of the damaged or a person of which the damaged is responsible" (Article 8, 85/374/CEE).

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