

ANALIZADOR DE REDES ELECTRICAS

EMM-6

INTRODUCCIÓN

El analizador digital de redes eléctricas EMM-6 monitoriza todos los parámetros eléctricos presentes en la red. Permite visualizar más de 30 parámetros eléctricos gracias a sus 4 displays de LED que garantizan una perfecta y simultánea lectura. Un simple panel frontal completa la selección intuitiva de los diferentes parámetros eléctricos ofreciendo gran cantidad de información. Los analizadores de redes eléctricas EMM-6 sustituyen las funciones de voltímetros, amperímetros, fasímetros ($\cos \phi$), vatímetros (potencia activa, reactiva y aparente), frecuencímetros, termómetros, contadores de energía, etc... permitiendo un gran ahorro económico, una reducción de las dimensiones y una mayor sencillez de utilización, ya que un único aparato sustituye todas las necesidades de medición en un cuadro eléctrico. Viene preparado para montaje en panel y es de dimensiones reducidas (96x96 mm).

MEDICIONES

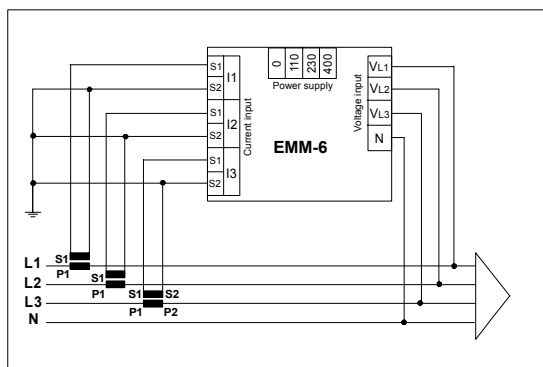
TENSION DE LINEA	(V-kV)	$V_{L1-N} - V_{L2-N} - V_{L3-N} - \Sigma V$
TENSION ENTRE FASES	(V-kV)	$V_{L1-L2} - V_{L2-L3} - V_{L3-L1} - \Sigma V_{L-L}$
INTENSIDAD	(A-kA)	$I_{L1} - I_{L2} - I_{L3} - \Sigma I_L$
FACTOR DE POTENCIA	($\cos \phi$)	$P.F._{L1} - P.F._{L2} - P.F._{L3} - \Sigma P.F._L$
POTENCIA ACTIVA	(W-kW-MW)	$P_{L1} - P_{L2} - P_{L3} - \Sigma P_L$
POTENCIA REACTIVA	(Var-kVar-MVar)	$Q_{L1} - Q_{L2} - Q_{L3} - \Sigma Q_L$
POTENCIA APARENTE	(VA-kVA-MVA)	$S_{L1} - S_{L2} - S_{L3} - \Sigma S_L$
FRECUENCIA	(Hz)	F_{L1}
TEMPERATURA	(°C)	T_1
ENERGIA ACTIVA	kWh	ΣkWh
ENERGIA REACTIVA	kVarh	$\Sigma kVarh$
VALORES MAXIMOS	Potencia activa media Potencia activa	$\Sigma P_{L \text{ max media (15')}}$ $\Sigma P_{L \text{ max}}$

INSTALACIÓN

Lea cuidadosamente las instrucciones de este manual antes de instalar el analizador de redes. El instrumento descrito en este manual ha sido diseñado para ser usado por personal cualificado. Este instrumento ha sido fabricado y diseñado de acuerdo a la norma IEC 1010. Con el fin de mantener estas condiciones y asegurar su correcto uso, el usuario debe seguir las instrucciones de este manual. Antes de la instalación, verificar que todo está intacto y no ha sufrido daño alguno durante su transporte. Asegúrese de que la tensión auxiliar y la tensión principal sean compatibles con las del aparato. La alimentación auxiliar del aparato no debe ser llevada a tierra. El mantenimiento y/o reparación debe ser realizado solo por personal cualificado y autorizado.

ESQUEMA DE CONEXIONES

SISTEMAS DE 4 HILOS: Para sistemas de 3 hilos (con o sin neutro no distribuido) no conectar el neutro N.



CONEXIÓN

Para un correcto uso del analizador de redes EMM-6 el esquema de conexiones contenido en este manual debe ser respetado.

- ALIMENTACIÓN AUXILIAR

Dispone de 4 terminales para la conexión de la alimentación auxiliar siendo disponibles las siguientes tensiones:

0 - 110 = 100-125 V (50-60Hz)

0 - 230 = 220-240 V (50-60Hz)

0 - 400 = 380-415 V (50-60Hz)

- ENTRADAS DE MEDIDA DE TENSIÓN

Dispone de 4 terminales para la conexión de los 3 hilos del sistema mas neutro. La tensión máxima entre fases no debe ser superior a 500 Vrms.

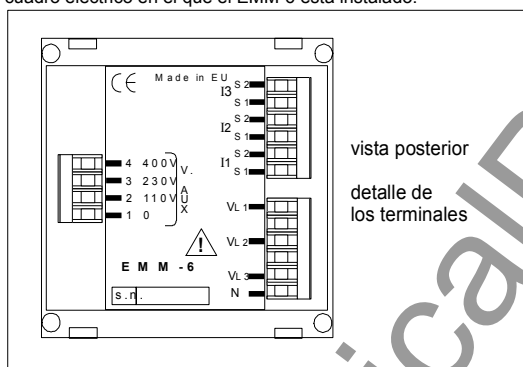
En el caso de sistemas de tres hilos (con o sin neutro no distribuido) simplemente no conectar el neutro N.

- ENTRADAS DE MEDIDA DE INTENSIDAD

Dispone de 6 terminales para la conexión de los transformadores de intensidad (TI) externos con secundario 5A.

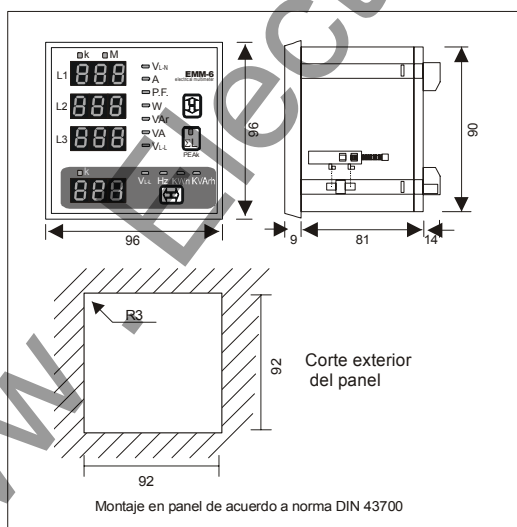
NOTA: Es fundamental respetar la secuencia de las fases, las conexiones entre las entradas de tensión e intensidad no deben ser invertidas (por ejemplo, el TI instalado en la fase L1 debe corresponder con la entrada I1) y al mismo tiempo no es correcto invertir los terminales S1 y S2 considerando que la medida del factor de potencia puede no ser fiable.

El sensor de compensación de temperatura está situado en la parte de atrás del aparato para controlar la temperatura del cuadro eléctrico en el que el EMM-6 está instalado.

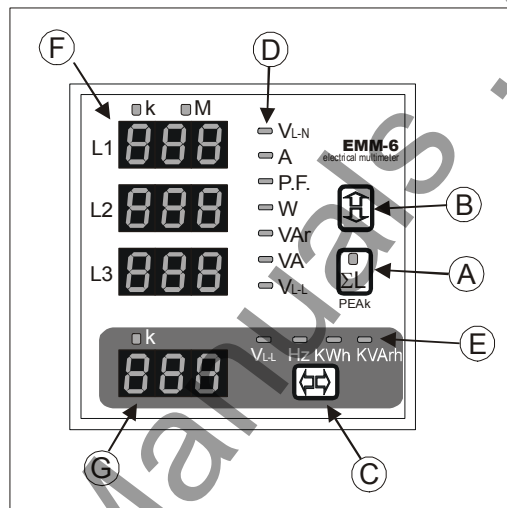


vista posterior
detalle de los terminales

DIMENSIONES



DESCRIPCIÓN DEL PANEL FRONTAL



CONTROL Y VISUALIZACIÓN

- A** botón para la visualización de los parámetros eléctricos del sistema trifásico ó valores de pico con el correspondiente LED de indicación..
- B** botón para la selección de los parámetros eléctricos a visualizar en el display F.
- C** botón para la selección del parámetro eléctrico a visualizar en el display G.
- D** LED de indicación del parámetro eléctrico visualizado en el display F.
- E** LED de indicación del parámetro eléctrico visualizado en el display G
- F** 3 displays para la visualización de las mediciones eléctricas realizadas en cada fase.
Cuando el LED ΣL está encendido, solo el display principal estará activo mostrando los valores de las mediciones eléctricas seleccionadas del sistema trifásico.
El LED k y M muestran el factor de multiplicación eventual (k = 1.000, M = 1.000.000)
Si se selecciona, indica también los valores de los contadores de energía activa y reactiva.
- G** display para la visualización de la medición eléctrica indicada por el LED E.
Los valores de tensión son referidos a un sistema trifásico.
El LED k indica si la lectura es en kilos (x1.000).
- A+C** Presionando ambos simultáneamente, se pasa al modo de programación
- A+B** Presionar ambos simultáneamente para resetear los valores de pico y del contador de energía.

CARACTERÍSTICAS TÉCNICAS

MEDICIONES Y PRECISIÓN

Tensión	Valor eficaz RMS de la tensión de fase y la tensión entre fases del sistema Rango de medida: 20 – 500 Vrms entre fases (290 Vrms entre fase y neutro) Precisión: $\pm 0.5\%$ ± 1 dígito
Intensidad	Valor eficaz de la intensidad y valor medio de la intensidad del sistema Rango de medida: 0.02 – 5 Arms Precisión: $\pm 0.5\%$ ± 1 dígito Visualización: 0.02 – 9.99 kA
Frecuencia	Frecuencia de la fase L1 Rango de medida: 40 – 500 Hz Precisión: $\pm 0.5\%$
Potencia	Potencia activa, reactiva y aparente del sistema Rango de medida: 0.01 – 9990 kW, 0.01 – 9990 kVAr, 0.01 – 9990 kVA Precisión: $\pm 1\%$ ± 1 dígito
Factor de potencia	Factor de potencia de cada fase y del sistema (media) Rango de medida: -0.1 +0.1 Precisión: $\pm 1\%$ ± 1 dígito
Temperatura	Temperatura medida por un sensor interno Rango de medida: 0 – 70°C Precisión: $\pm 2^\circ\text{C}$
Energía	Energía activa y reactiva del sistema trifásico Rango de medida: 0 – 99999999.9 kWh (kVArh) Clase 2 (IEC 1036)

ALIMENTACIÓN AUXILIAR, ENTRADAS

Alimentación auxiliar	100-125 / 220-240 / 380-415 V (50-60 Hz) Autoconsumo: 3 VA
Entradas de medida de tensión	De 20 a 500 V entre fases Sobrecarga permanente: -20% Impedancia de entrada: 1M Ω
Entradas de medida de intensidad	De 0.02 a 5 A Sobrecarga permanente: 30% Para TI externos con secundario /5A, primario programable de 5 a 10.000A.

ESPECIFICACIONES GENERALES

Displays	4 displays con LED rojos de 3 dígitos de 8 segmentos 3 botones para la selección de la medición y la programación de ratio de transformación de los TI
Datos mecánicos	Grado de protección: IP52 (en el frontal) Tamaño del frontal: DIN 96 x 96 Peso: 0.5 kg. Máxima sección para embornar: 2.5 mm ²
Ambiente	Temperatura de funcionamiento: -10 +60°C Temperatura de almacenaje: -10 +60°C Humedad: <90% Aislamiento: 3 kV (1 min)
Normativas y marcados	CEI EN 50081-2, CEI EN 50082-1 CEI EN 61010-1 CE

Para cualquier duda o problema no reflejado en este manual, contacte con nuestro servicio de asistencia técnica.

El fabricante declina cualquier responsabilidad por daños ocasionales en personas o cosas como resultado del uso erróneo o indebido del aparato.

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ELECTRICAL MULTIMETER

EMM-6

INTRODUCTION

The digital multimeter EMM-6 allows to monitor all the electrical parameters present on a distribution line. The local display of more than 30 electrical parameters is carried out by 4 displays with red LED. In this way, you are granted a good reading of many parameters at the same time. A simple front panel completes the intuitive selection of several electrical parameters, supplying a great deal of information. On top of measuring all parameters instantaneously, these instruments display the maximum value of currents, active power and thermal currents. The EMM-6 multimeter replaces in an unique device all the functions of: Voltmeters, ammeters, cosphimeters, wattmeters, varmeters, frequency-meters, thermometers, and energy-meters allowing a great energy saving, and overall dimensions and wiring decrease. An easier purchase and a better management in instruments is achieved considering that the same model satisfies all the options of the local measure in electrical board instruments.

EMM-6 is flush mounted in panel DIN 96x96 with extreme depth.

MEASURES

PHASE VOLTAGE	(V-kV)	$V_{L1-N} - V_{L2-N} - V_{L3-N} - \Sigma V$
PHASE TO PHASE VOLTAGE	(V-kV)	$V_{L1-L2} - V_{L2-L3} - V_{L3-L1} - \Sigma V_{L-L}$
PHASE CURRENT	(A-kA)	$I_{L1} - I_{L2} - I_{L3} - \Sigma I_L$
POWER FACTOR	(cos ϕ)	$P.F._{L1} - P.F._{L2} - P.F._{L3} - \Sigma P.F._L$
ACTIVE POWER	(W-kW-MW)	$P_{L1} - P_{L2} - P_{L3} - \Sigma P_L$
REACTIVE POWER	(Var-kVar-MVar)	$Q_{L1} - Q_{L2} - Q_{L3} - \Sigma Q_L$
APPARENT POWER	(VA-kVA-MVA)	$S_{L1} - S_{L2} - S_{L3} - \Sigma S_L$
FREQUENCY	(Hz)	F_{L1}
TEMPERATURE	(°C)	T_1
ACTIVE ENERGY	kWh	ΣkWh
REACTIVE ENERGY	kVarh	$\Sigma kVarh$
MAX. VALUE	Active power Active power (average)	$\Sigma P_{L \max}$ $\Sigma P_{L \max \text{ average}} (15')$

INSTALLATION

Read carefully the instructions in this manual before installing the digital multimeter.

The instrument described in this manual is intended for being used only by properly trained staff.

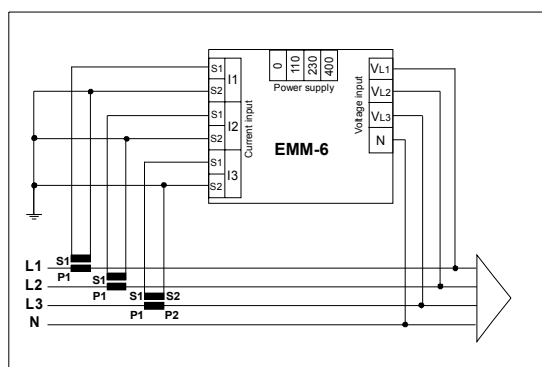
This instrument has been manufactured and tested according to IEC 1010 standards. In order to maintain these conditions and to ensure safe operation, the users must follow the instructions of this manual.

Before the installation, check that it's still intact and no damage has been suffered during transport and make sure that the operating voltage and main voltage are compatible with the device instructions.

The instrument power supply must not be earthen. Maintenance and/or repair must be carried out only by qualified and authorised staff. Should it be considered that there is a safety loss during operation, the instrument must be disconnected and precautions taken against accidental use.

WIRING DIAGRAMS

4 WIRES SYSTEM: On 3 wires insertion (with or without neutral not distributed) don't connect the terminal N.



CONNECTIONS

For a correct use of the EMM-6 the wiring diagram is contained in the present manual and it must be respected.

- POWER SUPPLY

4 screw terminals are available for the auxiliary supply in order to use the following voltages:

- 0 – 110 = 100-125 V (50-60Hz)
- 0 – 230 = 220-240 V (50-60Hz)
- 0 – 400 = 380-415 V (50-60Hz)

- VOLTAGE INPUT MEASURE

4 screw terminals are available for the 3 phase plus neutral system network. The maximum voltage between phase to phase must not overcome 500 Vrms.

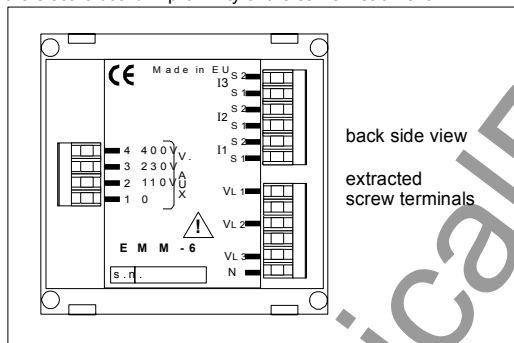
In case of three phase application with or without neutral not distributed, it's enough not to connect the terminal N.

- CURRENT INPUT MEASURE

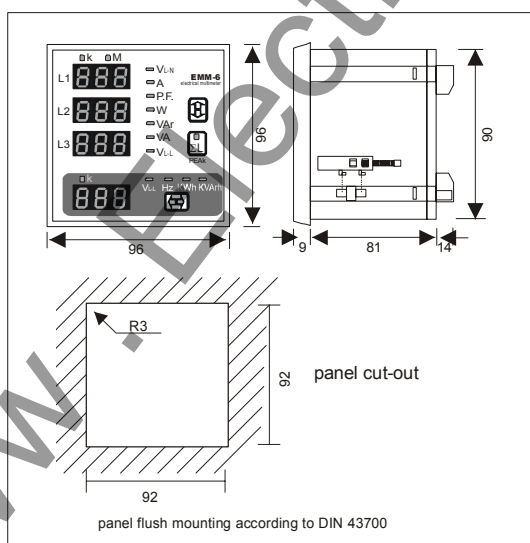
6 screw terminals are available for the connection of the external CT with secondary 5A. It's compulsory to use external CT's.

NOTE: It's fundamental to respect the correct phase sequence, the connections between current and voltage inputs phase must not be inverted (for example, CT placed on phase L1 must correspond to the I1 input) and at the same time it's not correct to invert the S1 and S2 terminals considering that the power factor measure could not be reliable.

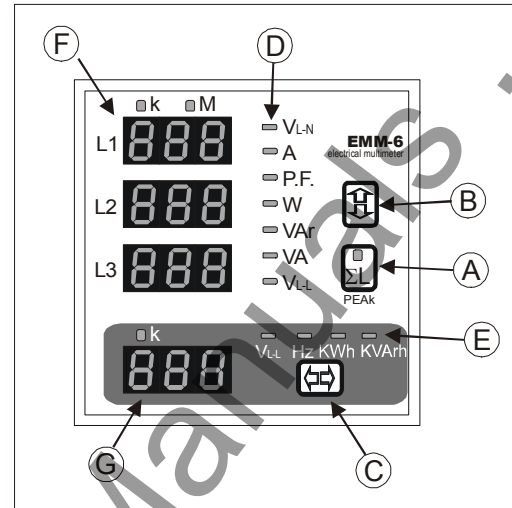
The temperature sensor, duly compensated, is placed inside and at the back of the instrument in order to test the temperature in the electric board in proximity of the same instrument.



DIMENSIONS



FRONT PANEL DESCRIPTION



CONTROL AND DISPLAY

- A push-button for the visualisation of electrical parameters of three-phase system and peak values with the corresponding LED indication.
- B push-button for the selection of the electrical parameter to be displayed on display F.
- C push-button for the selection of the electrical parameter to be displayed on display G.
- 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 visualisation of electrical measures of every phase.
When ΣL 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 = 1.000, M = 1.000.000)
If so selected they also indicate the active and reactive energy-meters.
- G display for the visualisation of the electrical measure indicated in LED E.
The voltage values are referred to the three phase system.
The k LED displays the reading in kilo (x 1000).
- A+C When pressing simultaneously the instrument pass to the program setup.
- A+B press simultaneously to reset the peak value and the reset of the energy-meter feature.

INSTRUMENT SET UP

For a good and right use of the EMM-6 it's necessary to program the transformation ratio of the current transformers used.

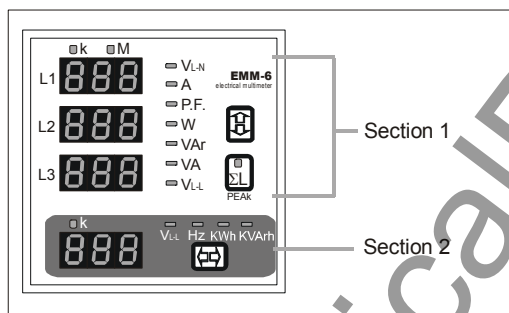
The transformation ratio of the CT is considered like the ratio between primary and secondary (example: with CT 1000/5, we must carry in 200).

The ratio has to be programmed through front buttons: After the auxiliary supply of the instrument and after some seconds (during the switch, all LED and displays will flash alternatively to the firmware indication), press at the same time buttons A and C, on display G will appear the inscription SET and the inscription Ct on the first F display. On main display F the value of the transformer ratio (set up on 1 by the manufacturer). Keep on pressing the button B to increase the value or pressing C to decrease the value (the variation is 1 unit for unit). To speed up the operation, keep on pressing the button B or C, and the variation will appear successively by tens and hundreds, releasing and pressing again the button we will return to increase or decrease the value for each unit. To confirm the program we must press again the button A (if we don't press any button for 10 seconds, the instrument will automatically go out of the program).

NOTE: When the transformation ratio programmed is over 999, the value is indicated with the LED K turned on (for example: to set up the value 1200, it will display 1.20 on main display F with the LED K turned on).

The values programmed will be kept on also without auxiliary supply.

Other programs are not necessary, considering that the instrument is completely autorange (automatic commutation of displaying scale and floating point).



MEASURES – DISPLAY

The digital multimeter EMM-6 is divided into 2 sections:

- The first one is composed by 3 displays F, buttons A and B, and D LED.
- The second one (in the green zone) is composed by the display G, button C and E LED.

The two sections can be considered as two separated instruments in a unique device. In fact, it's possible to work in any section without modifying the display of the other one (excluding the displaying of peak values and the energy-meter)

DISPLAYING SECTION 1

The measure is visualised on displays F (respectively L1, L2 and L3) and the D LED indicates the parameter. About the phase to phase voltage (V_{L-L}), V_{L1-L2} - V_{L2-L3} - V_{L3-L1} correspond to the three parameters considered. Select the different parameters by pressing the button B (it will always signalised by LED D).

Pressing the button A, on main display (L2) will be visualised the selected parameter in three phase value (average of the single phase for voltages, currents, power factor and single phase addition to powers) with the consequent switching of the LED. Pressing again the same button we will return on phase measure displaying.

Please note that the units of the measure can be expressed in kilo or Mega in case of the relative switching LED. The capacitive power factor displaying is represented by a mark on the first display digit (for example: the reading -.95 represents a capacitive power factor of 0.95)

The temperature will be displayed on display F with the °C indication.

DISPLAYING SECTION 2

As considered in section 1 with the button C you can select the parameter to display, indicated by LED E (three phase voltage values, the frequency of L1).

DISPLAYING OF THE ENERGY-METER

The active and the reactive energy-meter reading appears on the display F, selecting this feature with the push-button C (in this case, the display G remains without any function).

The reading of the energy-meters use the 9 digits (maximum reading 99999999,9) of the display F: the measure is made in the way that the L1 will show the first 3 digits, the display L2 will show the second 3 digits, and the display L3 the last 3 digits. For example, if: L1=000, L2=028, L3=53.2 the reading is equivalent to 2853.2 kWh.

DISPLAYING OF PEAK VALUES

Keep on pressing button A for 3 seconds, we can activate the maximum peak values display of the three phase active power with instantaneous and average values.

This condition is indicated by display G that will switch on the mark PEA (PEAK) together with LED of displayed parameter. A further peak value is represented by peak average current (the maximum value calculated on average value integrated each 15 minutes). After 10 seconds from the last press on the buttons, the EMM-6 return automatically to display the instantaneous values.

PEAK VALUES RESET

During the peak values display, pressing at the same time the buttons A and B we will arrive to cancel the peak values. During this operation, it will appear the inscription RES on display F. The peak values stored are hold in memory even if there is no auxiliary supply.

NOTE: The acquisition time of instantaneous peak values corresponds to 1 second.

During each switching of the device, the integration time for the average active power calculation is synchronised over 15 minutes.

The cooling time of display is lower than 1 second and it corresponds to the processing time of measure according to the methodology of measure used, allowing a comfortable reading values also in presence of unexpected parameter measures deviation.

In case of the indicated measures of EMM-6 aren't reliable or absurd, it's important to check carefully the current and voltage input connection as the phase sequence, the current and voltage correspondence of the same phase (on input L1 will be connected phase voltage L1 and CT placed on phase L1) and current reverse connect the terminal S1 of CT to the relative terminals S1 on the instrument.

ENERGY-METERS RESET

The same as to reset the peak values, the active and reactive energy-meters might be reset. Whilst displaying the active or reactive energy-meter, selected by the push-button C, the A and B push-buttons have to be pressed simultaneously during 3 seconds, then it will appear the notice **en res** on the display F and the notice **no** on the display G. If the push-buttons are released at this time, the meter will return to its meter function in 3 seconds without resetting; But if the push-buttons are still kept pressed for 3 seconds the notice **yes** will appear on the display G resetting the energy-meter function and returning automatically to display the measures.

TECHNICAL CHARACTERISTICS

MEASURE, ACCURACY

Voltage	Effective value of phase voltage and phase to phase voltage of the system (average) Measuring range: 20 – 500 Vrms phase to phase (290 Vrms phase to neutral) Accuracy: $\pm 0.5\%$ ± 1 digit
Current	Effective value of current and system value average Measuring range: 0.02 – 5 Arms Accuracy: $\pm 0.5\%$ ± 1 digit Displaying: 0.02 – 9.99 kA
Frequency	Phase L1 frequency Measuring range: 40 – 500 Hz Accuracy: $\pm 0.5\%$ ± 1 digit
Power	Phase and three phase active power system, phase and three phase reactive power, phase and three phase apparent power (addition) Measuring range: 0.01 – 9990 kW, 0.01 – 9990 kVA, 0.01 – 9990 kVA Accuracy: $\pm 1\%$ ± 1 digit
Power Factor	Phase and three phase power factor system (average) Measuring range: -0.1 +0.1 Accuracy: $\pm 1\%$ ± 1 digit
Temperature	Temperature sensed by internal sensor Measuring range: 0 – 70°C Accuracy: $\pm 2^\circ\text{C}$ (time delay to measure 15 minutes)
Energy-meter	Active and reactive energy in the three phase system Measuring range: 0 – 99999999,9 kWh (kVAh) Class 2 (IEC 1036)

POWER SUPPLY, INPUTS

Auxiliary supply	100-125 / 220-240 / 380-415 V (50-60 Hz) Selfconsumption: 3 VA
Voltage input	From 20 to 500 V phase to phase Continuous overload: +20% Input impedance: 1M Ω Connection on single phase, 3 or 4 wires system
Current input	From 0.02 to 5 A Continuous overload: 30% From external CT with secondary /5A, primary programmable from 5 to 10.000A (self consumption <0.5VA)

GENERAL SPECIFICATIONS

Display	4 displays with red LED composed by 3 digits of 8 segments 3 buttons to select measuring and programming of CT transformation ratio
Mechanicals	Degree of protection: IP52 front, IP20 enclosure and terminals Weight: 0.5 kg Maximum terminal section: 2.5 mm ²
Environment	Operational temperature: -10 +60°C Humidity: <90% Stocking temperature -25 +80°C Insulation: 3 kV (1 min.)
Normatives and Markings	CEI EN 50081-2, CEI EN 50082-1 CEI EN 61010-1 CE

For each application and functional problems not treated in the present manual, it's possible to contact our technical assistance service.
The manufacturer declines any responsibility for eventual injury or damage to persons or things as result caused by misuse or improper use of the instrument.

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