

EMM-4

DIGITAL MULTIMETER

EMM-D4

GENERAL INFORMATION

The EMM digital multimeters allow the measurement of the main electric quantities in the distribution networks. The local display of more than 30 measurable quantities is performed by means of four red LED displays, thus providing an easy legibility and the simultaneous display of several measures. A simple front panel easier the intuitive selection of several electric quantities, supplying a great number of information.

These instruments, besides the instantaneous measures, display the maximum peak of the main parameters (maximum peak and maximum demand or maximum average value).

The EMM multimeters group in a single instrument the functions of voltmeters, ammeters, power factor meters, wattmeters, varmeters, frequency meters, thermometers, allowing remarkable financial savings, a reduction of the dimensions and of the time required for the wiring; also the purchase and the management of this instrument is easier, as all the above functions can be performed by one product only, which can be used for all local measurement requirements in switchboards, machines etc.



AVAILABLE MODELS

They are available in 4 types:

- EMM-4 in flush mounted version for panel DIN 96X96mm with minimize depth
- EMM-D4 in modular version, for DIN rail35mm mounting

ACCESSORIES AND OPTIONS

accessories: protection transparent cover **COP-96** type.

options: currents measure inputs with internal current transformer (-t)

MEASURED ELECTRIC QUANTITIES

Electric quantities	measurement unit	identification initials			
phase and three phase system voltages	[V-kV]	V L1-N	V L2-N	V L3-N	Σ V L-N
voltages between lines and three phase system voltages	[V-kV]	V L1-L2	V L2-L3	V L3-L1	Σ V L-L
phase and three phase system currents	[A-kA]	I L1	I L2	I L3	Σ I
phase and three phase system power factors		PF L1	PF L2	PF L3	Σ PF
phase and three phase system active powers	[W-kW-MW]	W L1	W L2	W L3	Σ W
phase and three phase system reactive powers	[VAr-kVAr-MVAr]	VAr L1	VAr L2	VAr L3	Σ VAr
phase and three phase system apparent powers	[VA-kVA-MVA]	VA L1	VA L2	VA L3	Σ VA
frequency	[Hz]	Hz L1			
temperature	[°C]	T1			
peak values (maximum):					
phase voltages	[V-kV]	V L1-N max	V L2-N max	V L3-N max	
phase currents	[A-kA]	I L1 max	I L2 max	I L3 max	
average phase currents (maximum demand)	[A-kA]	I L1 max (avg)	I L2 max (avg)	I L3 max (avg)	
three phase system powers	[W-VAr-VA (k-M)]	Σ W max	Σ VAr max	Σ VA max	
average three phase system powers (maximum demand)	[W-VAr-VA (k-M)]	Σ W max (avg)	Σ VAr max (avg)	Σ VA max (avg)	

INSTALLATION

INSTRUCTIONS FOR THE USER

Read carefully the instructions contained in the present manual before installing and using the instrument.

The instrument described in this manual is intended for the use by properly trained staff only.

SAFETY

This instrument has been manufactured and tested in compliance with EN 61010-1 standards. In order to maintain these conditions and to ensure safe operation, we recommend that you follow the instructions contained in the present manual. When you receive the instrument, before carrying out the installation, make sure that it has not suffered any damage during the transport.

Before starting the installation, make also sure that the supply voltage of the product and the rated voltage correspond to the values prescribed for the instrument. The instrument power supply must not be earthed. Maintenance and/or repair must be carried out only by qualified and authorized technicians. If, during the operation, the instrument should become unsafe, it will be necessary to disconnect it and to make sure that it is not used until fault removal.

Operation is no longer safe when: - The measured value are obviously wrong or unreasonable. / - The instrument doesn't work anymore. / - The instrument bears clearly visible damages. / - After serious damages occurred during the transport. / - After a storage in unfavourable conditions

CONNECTIONS

For a correct use of the device it is important to respect the wiring diagram contained in the present manual.

The connections are available on the side terminal board:

- auxiliary power supply:

There are 4 screw terminals for the auxiliary supply:

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

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

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

it's possible, for example, to get the auxiliary supply from a phase to neutral, in a 4 wires system, or phase to phase in a 3 wires system, without neutral or from a VT in a MV application (only for EMM-4et).

- measurement voltage inputs:

4 terminals are available for the connection to the 3 phases and neutral of the measurement network, the maximum voltage between one phase and the other should not exceed 500 V rms, according to the instrument's auxiliary power supply. In case of applications in three wire networks without neutral or with non distributed neutral, the "N" terminal must not be connected.

- measurement current inputs:

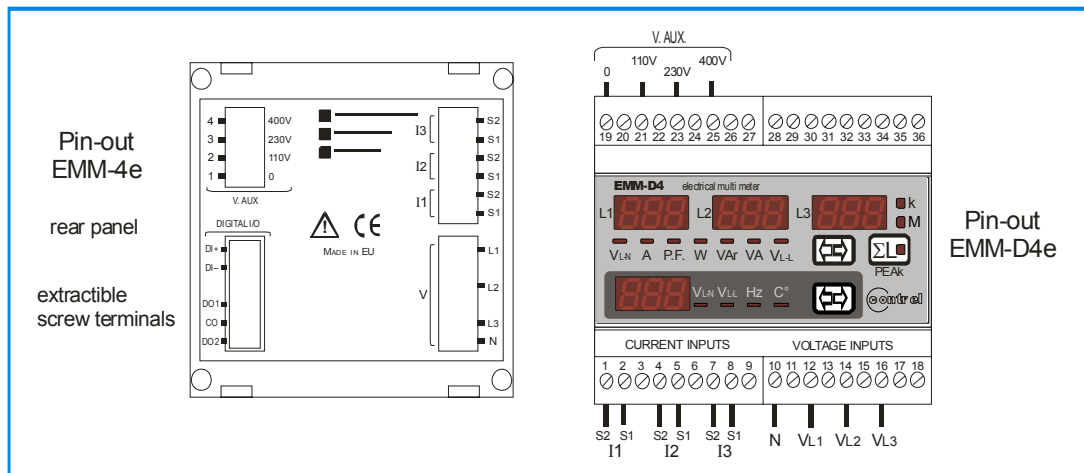
6 terminals are available for the connection to 3 external current transformers with 5A secondary circuit; it is moreover possible to use 2 CT on three wire lines (three phase Aaron connection). **The use of external CT is compulsory.** The transformation ratio of the external transducers can be set on the instrument by using the SETUP function and the display allows the reading of voltages up to 9,99 kA. Earthing the secondary of CT it's not mandatory; the instrument work correctly with or without earth connection.

REMARKS: It is important to respect the correct phase sequence, moreover do not invert the connections between the phases of the current and voltage inputs (for example, the CT set on the L1 phase must absolutely correspond to the L1 input) and do not invert S1 and S2 terminals of the CT, as the measurement of the power factors and the powers would not be reliable anymore.

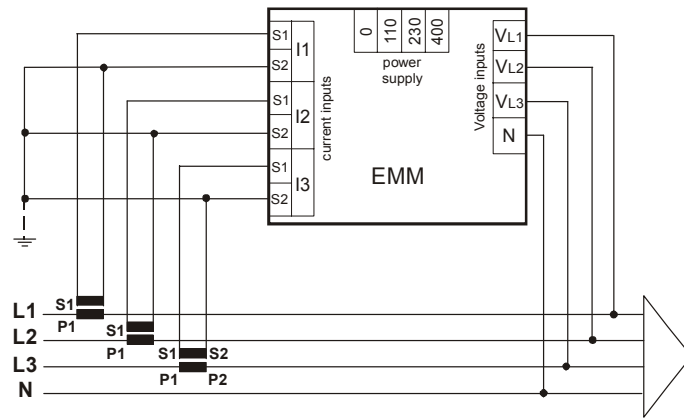
To fix the device on the panel, insert the two brackets into the proper slots on the enclosure sides and tighten the screws.

We suggest to provide an external protection with fuses for the voltage inputs and to use cables suitable for operating voltages and currents, with sections from 0,5 to 2,5 mm².

WIRING CONNECTION

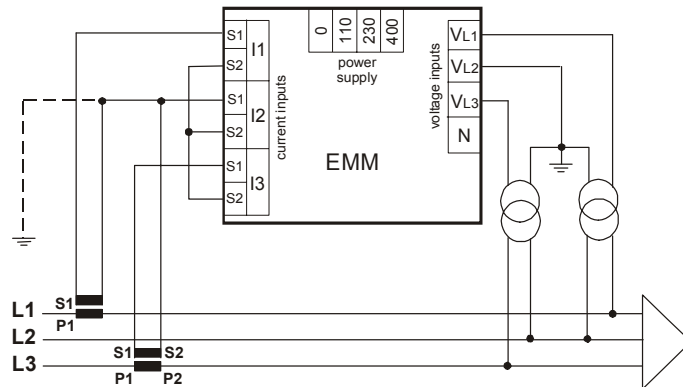


4 WIRES SYSTEM INSERTION

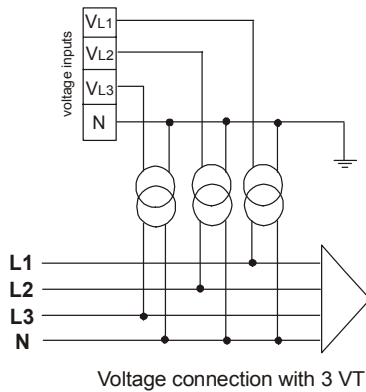


N.B. on 3 wires three-phase network (without neutral or not distributed neutral) leave terminal N free

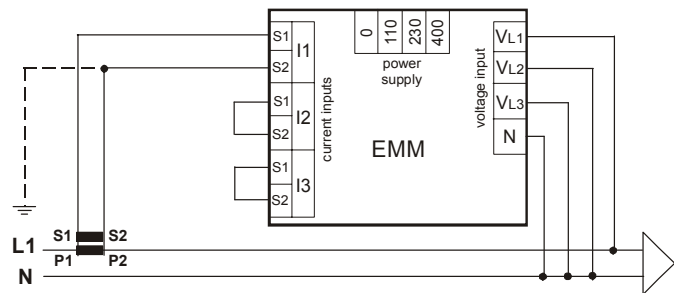
3 WIRES SYSTEM WITH 2 VT AND 2 CT (only for EMM-...t version)



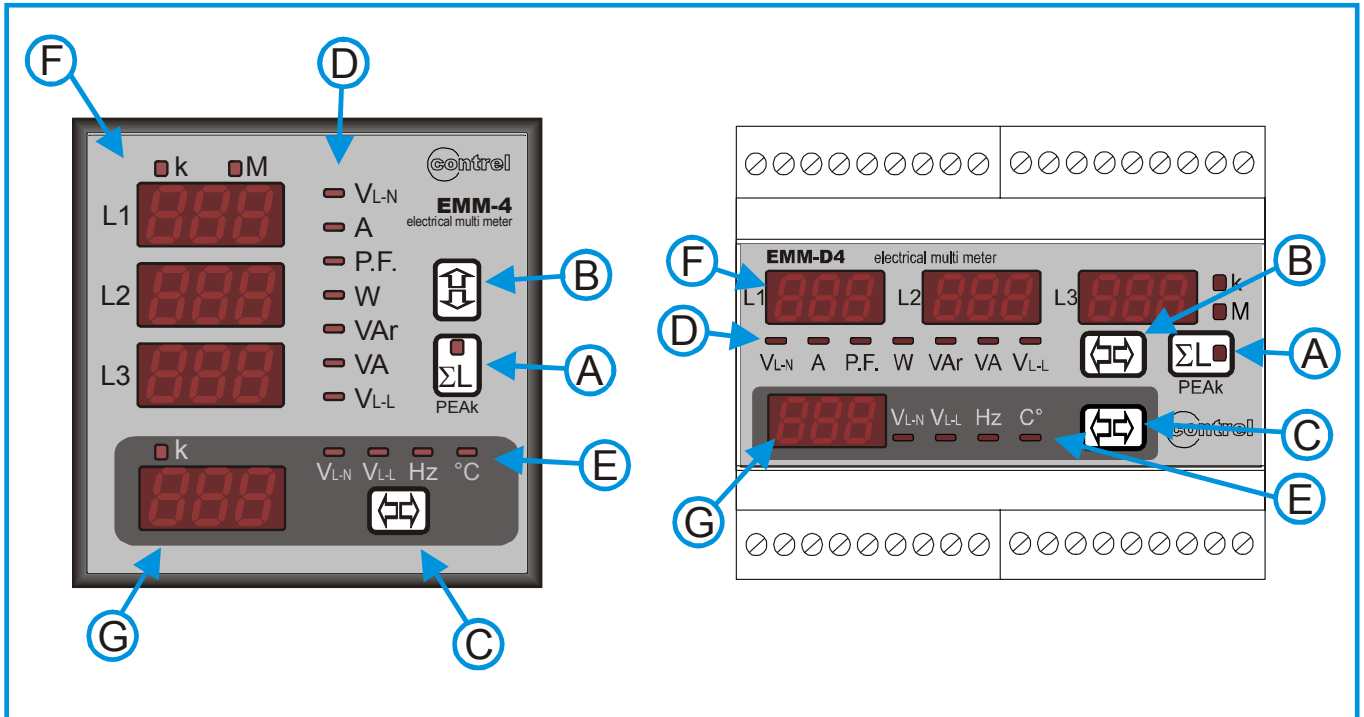
N.B. It's best, where possible, to use 3 CT (most of all for unbalanced loads)



SINGLE PHASE INSERTION



N.B. In single-phase system the valid measuring are referred to the phase L1, others are not interesting.

**LEGEND:**

- A:** push button for the display of the electric quantities of the three-phase system, with relevant display LED: by pressing the push button for 5 seconds it is possible to display the maximum peak values.
- B:** push button for the selection of the measures to view on the **F** display.
- C:** push button for the selection of the measures to view on the **G** display.
- D:** LED bar to indicate the measures viewed on the **F** display.
- E:** LED bar to indicate the measures viewed on the **G** display.
- F:** 3 displays showing the measures per each phase.
If ΣL LED is ON, only the main display will remain active and it will indicate the three-phase system value of the selected measure. The **k** and **M** LEDs display the eventual multiplying factor (reading **k** = kilo= $\times 1.000$, reading **M** =Mega= $\times 1.000.000$).
- G:** display for viewing the electrical measure indicated by the **E** LED bar.
The voltages value is referred to the three-phase system.
The **k** LED displays the reading in kilo ($\times 1000$).
- A+C:** by pressing simultaneously these push buttons, it is possible:
- to program the instrument (SET UP)
 - to delete the peak values (RESET)

MEASURES DISPLAY

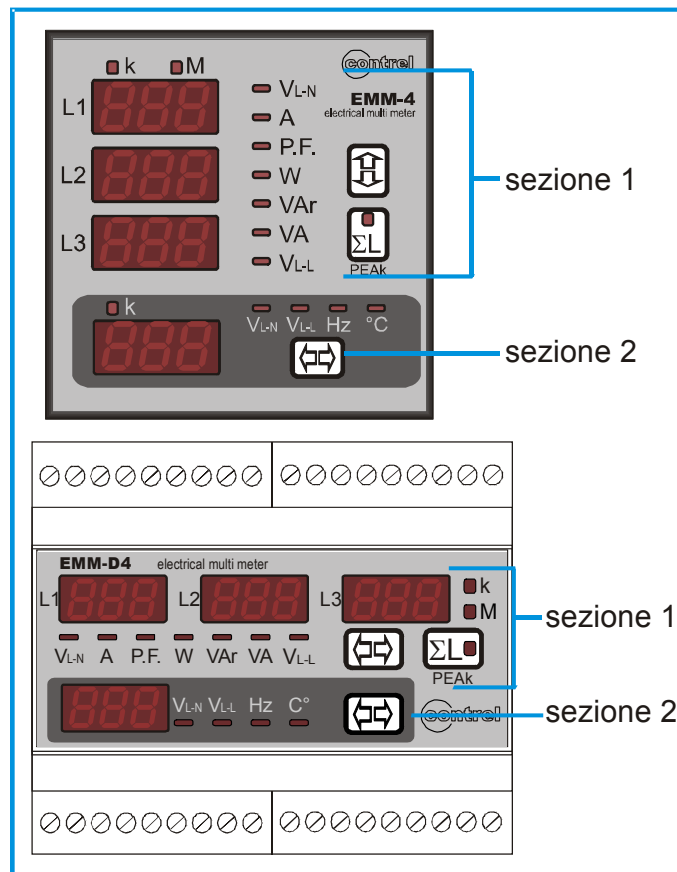
The EMM instrument is divided into two distinct sections: the first one is composed by three **F** displays, by the **A** and **B** keys and by the **D** LED bar; the second one (in the lower part) is composed by the **G** display, by the **C** key and by the **E** LED bar.

The two sections are to be considered as two separate instruments in one container only, in fact it is possible to act on one zone without modifying the display of the other one (excluding the display of peak or maximum values).

Display of section 1

On the **F** displays are displayed the three phase measures (respectively L1, L2 and L3) of the electric quantity indicated by the lighting of a **D** LED. As regards the measurement of the voltages between lines (V L-L), the three measures are respectively V L1-L2, V L2-L3, V L3-L1. By pressing the **B** key, it is possible to select the various electric quantities to be displayed (always indicated by the **D** LED). By pressing the **A** key on the **F** display, it is possible to view the three phase values (the average of the single phases regarding voltages, currents, power factors and sum of the single phases for the powers), with consequent lighting of the LED inside the key. By pressing the same key, it is possible to get back to the display of the phase electric quantities.

The measurement unit can be expressed in kilo or Mega. The display of the capacitive power factor is represented by a sign - appearing on the first digit of the display (for example the reading -.95 indicates a capacitive power factor of 0.95).



Display of section 2

As it happens in section 1, by the **C** key it is possible to select the electric quantities to be displayed and indicated by the **E** LED (the voltage and energy values are referred to the three phase system, the frequency to the L1 channel).

DISPLAY OF THE INSTANTANEOUS AND AVERAGE (MAXIMUM) PEAK VALUES (PEA)

From the modality measure visualization, press the **A** keys for at least 5 second, on the **F** displays will appear the message PEA; press the **A** key to activate the visualization of the quantities stored. Pressing the **B** key, it's possible to visualize on the **F** display the (maximum) peak value stored with this following sequence with the turn on the LED corresponding of measure displayed:

electric quantity	identification initials			display G
phase voltages	V L1-N max	V L2-N max	V L3-N max	PEA
phase currents	I L1 max	I L2 max	I L3 max	PEA
average phase current s	I L1 max avg	I L2 max avg	I L3 max avg	15'
three phase system powers	Σ W max	Σ VAr max	Σ VA max	PEA
average maximum three phase system powers	Σ W max avg	Σ VAr max avg	Σ VA max avg	15'
average three phase system powers	Σ W avg	Σ Var avg	Σ VA max avg	avg

To escape from setting and returning to measure visualisation, at any time, press the **A** and **C** keys simultaneously. The integration of the average current calculation on 15' time comes synchronised at every switching on of the instrument.

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

Remarks on the measures

The refresh time of the display is less than one second and it corresponds anyhow to the calculation time of the measures, according to the measuring methodology used, thus providing an easy reading of the values also in presence of sudden variations of the measure parameters.

In case the measures indicated by the instrument should not be reliable, it is necessary to verify the connection of the currents and voltages measure inputs, as it is absolutely important to respect the phases sequence, the compliance of currents and voltages of the same phase (on the L1 input must be connected the L1 phase voltage and the CT set on the L1 phase) as well as the current direction flow (the S1 terminals of the CT must be connected to the relevant S1 terminals on the instrument).

In some applications, where the CT secondary circuit is connected to other instruments, besides the EMM multimeter, there might be some measurement problems regarding the typology of the current inputs. In this case it is advisable to use the optional version with internal current transformers.











Should you have any problem, please contact the Technical Assistance.

INSTRUMENT PROGRAMMING (SETUP) MENU

For a correct use of the multimeters, it is necessary to program the transformation ratio of the used current transformers and the transformation ratio of the eventual external voltage transformer. The set values are kept stored also in absence of the auxiliary power supply.

SET GENERAL PARAMETER (SET UP)

To enter the menu:

 set UP →	set Up RESET
	
 setup	Confirm to enter setup menu
 set ct Set CT ratio from 1 to 2000	 Increase value  Decrease value
 set ut Set VT ratio from 0.1 to 400.0	 Increase value  Decrease value
 Confirm and end 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 push buttons on the front panel. After having turned on the instrument, you should wait a few seconds (when the device is turned on, all LEDs and displays will flash alternatively with the indication of the firmware version), then press simultaneously the **A** and **C** push buttons; on the **G** display it will appear the set (**SETUP**) writing, on the **F** display the CT (current transformer) writing and the transformation ratio value (set to 1 by the manufacturer).

Press **B** or **C** push buttons to increase or decrease respectively the value (the variation is performed unit by unit). In order to speed up the operation, keep the **B** or **C** push buttons pressed, the variation will be performed by dozen 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 no push-button 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 UT)

After the previous programming step, on the **F** display it will appear the Ut (voltage transformer) writing, and the value indicating the transformation ratio of the external VT (set to 1 by the Manufacturer), intended as the ratio between the primary and the secondary circuit (example with VT 15/0.1 kV the value to be set will be 150). This value can be set in the same way as it is done for the programming of the CT ratio. In case no external VT should be used, the value to be set will be 1.

REMARKS: When the set transformation ratio exceeds 999 in the setting of CT ratio or 99.9 in the VT ratio, also the display L2 is used to set the value. The digit of display L2 plus the digit of display L3 arrange the value set.

DELETING OF THE PEAK VALUES (RESET)

To enter in RESET menu:

	set UP →	set Up RESET
		
		Select Reset menu item
	Reset	Confirm to enter reset menu
	PEA 15' ALL	Select cancellation mode
	no es	Change from NO to YES to enable the reset
	- - -	Confirm the reset.

Pressing the **A** and **C** keys simultaneously the message SET-UP will appear on display **F**, press the key **C** until the message RESET appears on display **F**. To reach the menu, press the **A** key.

It is possible now to select the enabling of cancellation type, by pressing the **C** key, according with following types:

- RESET PEA instantaneous values cancellation only
- RESET 15' average values in 15' cancellation only
- RESET ALL cancellation of instantaneous values and average

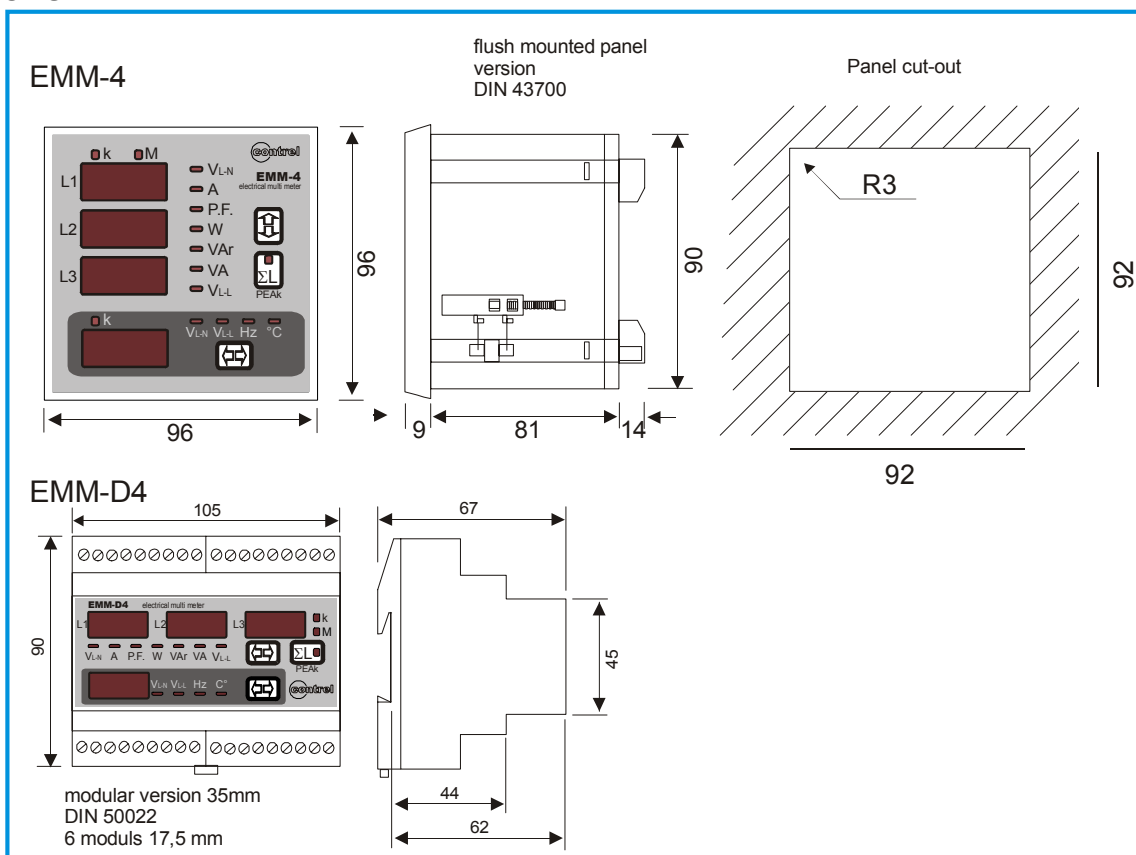
To enable the chosen type, press the **B** key to change the indication on display **G** from no to yes.

Confirm enabling cancellation, by pressing the **A** key.

The indication on display **G** change from yes to ---

To escape from the cancellation menu and to return to the measures visualising, press the **A** and **C** keys simultaneously.

DIMENSIONS



TECHNICAL FEATURES

MEASURES, PRECISIONS

voltage	true RMS of the phase voltages and voltages between lines and values of the three phase system; total measurement range : 20÷500V trms phase-phase - 290V rms phase-neutral, according to the auxiliary power supply voltage; display (0,02÷50,0kV) - measure precision: $\pm 0,5\%$ ± 1 digit
current	true RMS of the phase currents and of the three phase system value; measurement range : 0,02÷5A trms - measure precision: $\pm 0,5\%$ ± 1 digit display 0,02÷9990A
frequency	frequency of the L3 phase – measurement range: 40÷500Hz precision: $\pm 0,5\%$ ± 1 digit
powers	Active, reactive, apparent phase power, three-phase system power; measurement range : 0,001÷9990kW - 0,001÷9990kVAr - 0,001÷9990kVA precision: $\pm 1\%$ ± 1 digit
power factor	phase and three phase system power factor; measurement range : -0,1÷0,1 / precision: $\pm 1\%$ ± 1 digit
temperature	measured with compensated internal sensor measuring range: 0÷70°C, accuracy: $\pm 2^\circ\text{C}$ temperature settling time at the turning on: 15 minutes

AUXILIARY POWER SUPPLY, INPUTS

auxiliary power supply	100-125 / 220-240V / 380-415V $\pm 10\%$ (others voltage on request) frequency 50-60Hz - consumption 3VA
voltage inputs	from 20 to 500V phase-phase (according to the auxiliary power supply voltage); permanent overload +20% - input impedance: 1 M Ω connection on three phase lines with 3 wires, three phase lines with 4 wires and single phase lines, MV (medium voltage) connection with external VT and programmable transformation ratio from 0.1 to 400
current inputs	from 0,02 to 5A; permanent overload 30% - from external CT with secondary circuit 5A, programmable primary circuit from 5 to 10000A - auto-consumption <0,5VA

GENERAL INFORMATION

display, operators	4 red LED displays (10mm each one) composed by 3 digits / 7 segments 3 push buttons for the selection of measures and programming
mechanical	EMM-4: protection degree: IP52 frontal side - IP20 enclosure and terminal board - weight: about 0,5 kg - connections with terminal boards for cable 2,5 mm ² thermoplastic self-extinguishing enclosure - built-in mounting DIN 96x96mm, depth 95mm EMM-D4: protection degree: IP50 frontal side - IP20 enclosure and terminal board - weight: about 0,5 kg - connections with terminal boards for cable 2,5 mm ² thermoplastic self-extinguishing enclosure - built-in mounting on DIN 35mm, dimension 6 modules from 17,5mm
environmental	operating temperature: -10÷60°C; humidity <90% storage temperature: -25÷80°C insulation test: 3 kV for 1 minute
standards	CEI EN 50081-2; CEI EN 61000-6-2; CEI EN 61036-1; CEI EN 61010-1



Remark

In consideration of the evolution of the products and standards, the company reserves the right to modify at any time the features of the product described in this literature, therefore we recommend to always verify them beforehand .

The manufacturer's liability for damages resulting from product defects "may be reduced or deleted (...) when the damage is attributable jointly to a product defect and to the negligence of the injured party or of a third party for whom the injured party is responsible" (Article 8, 85/374/CEE).



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