

CVM-NET-MC POWER ANALYZER



CVM-NET-MC is an instrument that measures and calculates the primary electric parameters in three-phase industrial power grids (balanced or unbalanced). It is measured in true RMS values, using three AC voltage inputs, and three AC current inputs (through current transformers $I_n/250\text{mA}$). The measured and calculated parameters are shown in the table of variables.



You can find this manual in electronic format on the website of CIRCUTOR: www.circutor.com



Before performing any maintenance operations, connection modifications, repairs, etc., you must disconnect the unit from the power supply. If you suspect an operational fault in the unit or in its protection system, remove the unit from service. The design of the unit makes it easy to replace in the event of a fault.

1.- KEYPAD

CVM-NET-MC has a single button; it can be used to functionally reset the unit or to restore default communication parameters.

- To functionally reset the unit, press the button  for at least one second, and the unit will reset its system within 5 s.
- To restore the default communication parameters (19200/8N/1 see section 2.1.-), disconnect the auxiliary power, then press the button , and, while holding the button down, switch the unit back on. After 5 s, the unit restores its factory settings.

2.- CONFIGURATION

As the unit has no keypad, the configuration settings must be sent to the device via Modbus/RTU commands, or using the CIRCUTOR PowerStudio Software, which can be downloaded for free from the website: www.circutor.com

2.1.- Configuration of configuration settings

Two options are available for this:

2.1.1.- Using the peripheral number

By default, the unit has the following parameters: 3/19200/8N/1. The following records are available for changing the peripheral number or speed of communications:

Modbus Address	Variable	Valid data window
03E8 Hi	Protocol	0 - Modbus
03E8 Lo	Peripheral number	00 to FF (0 to 255 dec)
03E9 Hi	Speed (Baud)	0- 1200, 1- 2400, 2- 4800, 3- 9600, 4- 19200
03E9 Low	Parity	0- No
03EA Hi	Length in bits	1- 8 bits
03EA Low	Stop bits	0- 1 bit

Example of a write command. Changing the peripheral number. From 03 (3 decimal) to 0F (15 decimal), at 9600 bps.

TX: NP 10 03E8000306 000F 0300 0100 CRC
RX: NP 10 03E80003 CRC

After editing the registers with the new communications parameters, must be **reset** the device with the next sentence, entering in the peripheral number the original slave address (in this case the number 03).

TX: NP 05 07D01100 CRC
RX: NP 05 07D01100 CRC

2.1.2.- Using the serial number (broadcast)

The serial number of the unit can be found on the side label of the device (e.g.:3104200679). This number must be translated into hexadecimal language so that the sentence can be sent to the unit:

3104200679 (Decimal) → B90657E7 (Hexadecimal)

The parameters to be set using the "broadcast" format to the 00 peripheral are restricted, as they are only for configuring the communication settings:

Modbus Address	Variable	Valid data window
0BB8,0BB9	Unit serial number	0 to FFFFFFFF (N)
0BBA Hi	Peripheral number	0 to FF (P)
0BBA Low	Port speed	0- 9600, 1-19200 (V)

Example of a write command. Changing the peripheral number. From 03 (3 decimal) to 0F (15 decimal), at 9600 bps.

TX: 00 10 0BB8000306 B90657E7 0F 00 CRC
RX: Time Out

2.2.- Transformation ratio settings

The CVM-NET-MC analyzer can perform indirect measurements (using voltage and current transformers). For this reason, it has an input table for setting the voltage and current transformation ratios. If the voltage measurement is performed directly, the ratio is 1/1.

Modbus Address	Variable	Valid data window
044C,044D	Primary voltage	0 to 000186A0 (100,000)
044E	Secondary voltage	0 to 03E7 (999)
044F	Primary current	0 to 2710 (10,000)
0450 Hi	Not used	00
0450 Low	Not used	00
0451 Hi	Harmonic calculation	00 - THD / 01 - D
0451 Low	Not used	00

Example of programming voltage ratios; Direct voltage measurement (230 ph-N), and current transformers with primary ratio of 63 A.

Primary voltage 1(Dec) 00000001 (Hex)
Secondary voltage 1(Dec) 0001 (Hex)
Primary current 63 (Dec) 003F (Hex)
Calculating harmonics 00 with regard to the Effective Value

TX: NP 10 044C00060C 000000010001003F00000000 CRC
RX: NP 10 044C00060C CRC

Next, reset the unit (see section 2.1.1.-).

2.2.1.- Reading transformation ratios settings

As additional information, the user has a Modbus command, for reading the transformation ratios setting in th device:

TX: NP 04 044C0006 CRC
RX: NP 04 0C 00000001 0001 003F 00000000 CRC

2.3.- Maximum demand settings

The power analyzer can calculate the maximum value, using the sliding window method. This calculation can be associated to one of the three available variables, as shown below.

Modbus Address	Variable	Valid data window
04E2	PD calculation variable	0000 - No Pd 0010 - Active power III 0022 - Apparent power III 0024 - Three-phase current
04E3	Integration time	0 to 003C (0-60 minutes)

Example of maximum demand programming by three-phase power, with a 15 minute period:

TX: NP 10 04E2000204 0010 000F CRC
RX: NP 10 04E20002 CRC

Next, reset the unit (see section 2.1.1.-).

2.3.1.- Reading maximum demand setting

As additional information, the user has a Modbus command, for reading the maximum demand setting:

TX: NP 04 04E20002 CRC
RX: NP 04 04 0010 000F CRC

2.4.- Deleting maximum and minimum values

The power analyzer records all the maximum and minimum values for each parameter measured in the Modbus/RTU variables table. A command is available for resetting these records:

TX: NP 05 0836 FF 00 CRC
RX: NP 05 0836 FF 00 CRC

2.5.- Deleting maximum demand

The maximum demand parameter, when calculated using the sliding window, can be reset, allowing the calculation to be restarted.

TX: NP 05 0838 FF 00 CRC
RX: NP 05 0838 FF 00 CRC

2.6.- Configuration and use of digital outputs

2.6.1.- Forcing digital outputs

The unit is fitted with two digital outputs, that can be remotely managed in both their opening and closing functions.

Forcing Digital Output number 1:

TX: NP 05 0000 XX 00 CRC
RX: NP 05 0000 XX 00 CRC
(Where XX → FF Close / 00 Open)

Forcing Digital Output number 2:

TX: NP 05 0001 XX 00 CRC
RX: NP 05 0001 XX 00 CRC
(Where XX → FF Close / 00 Open)

2.6.2.- Reading the digital output status

The user can request a reading of the digital output status via Modbus/RTU using the following sentence:

TX: NP 01 0000 0008 CRC
RX: NP 01 01 XX CRC

Where XX →
04 Both outputs open
05 Output 1 closed
06 Output 2 closed
07 Both outputs closed

2.6.3.- Digital output settings

Digital outputs, in addition to being remotely managed, can be used as alarm elements, associated with an electric variable by a maximum or minimum value, or fulfil the power pulse function associated with any power consumption parameter (active or reactive). The following input table is provided for programming them:

Modbus Address	Variable	Valid data window
047E, 047F	MAX value or W-h imp	Hexadecimal value
0480, 0481	MIN value	Hexadecimal value
0482	Delay	0 to 270F (9,999 Decimal)
0483 Hi	Variable number	00 (See table of variables)
0483 Low	Not used	00

*When a power variable is selected, the analyzer automatically recognises the power pulse function and applies the w-h value of the first record.

Example of alarm programming by maximum and minimum value with voltage VL1. A maximum value of 240 V, a minimum value of 200 V (the voltage value must be sent multiplied by 10 (as shown in the enclosed variables table), and delay of 10 s are programmed.

Maximum value 2400 (Decimal) → 00000960 (Hexadecimal)
Minimum value 2000 (Decimal) → 000007D0 (Hexadecimal)
Delay 10 (Decimal) → 000A (Hexadecimal)
Var number 01 (Decimal) → 01 (Hex)
Not used 00 (Decimal) → 00 (Hexadecimal)

TX: NP10047E00060C 00000960 000007D0 000A 0100 CRC
RX: 03 10 047E0006 CRC
Next, reset the unit (see section 2.1.1.-).

Modbus Address	Variable	Valid data window
04B0, 04B1	MAX value or W-h imp	Hexadecimal value
04B2, 04B3	MIN value	Hexadecimal value
04B4	Delay	0 to 270F (9,999 Decimal)
04B5 Hi	Variable number	00 (See table of variables)
04B5 Low	Not used	00

*When a power variable is selected, the analyzer automatically recognises the power pulse function and applies the w-h value of the first record.

Example of alarm programming by maximum and minimum value with voltage VL1. Maximum value: 240 V, minimum value: 200 V (Vx10), and a delay of 10 s.

Maximum value 2400 (Decimal) → 00000960 (Hexadecimal)
Minimum value 2000 (Decimal) → 000007D0 (Hexadecimal)
Delay 10 (Decimal) → 000A (Hexadecimal)
Var number 01 (Decimal) → 01 (Hex)
Not used 00 (Decimal) → 00 (Hexadecimal)

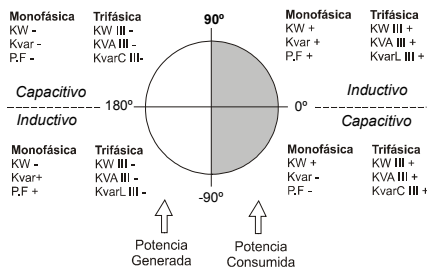
TX: NP1004B000060C 00000960 000007D0 000A 0100 CRC
RX: 03 10 04B00006 CRC

2.6.4.- Next, reset the unit (see 2.1.1.-).Reading digital output settings

TX: NP 04 04 047X 0006 CRC
RX: NP 04 0C 00000960 000007D0 000A 01 00 CRC

(X: value of the initial register for each digital output).

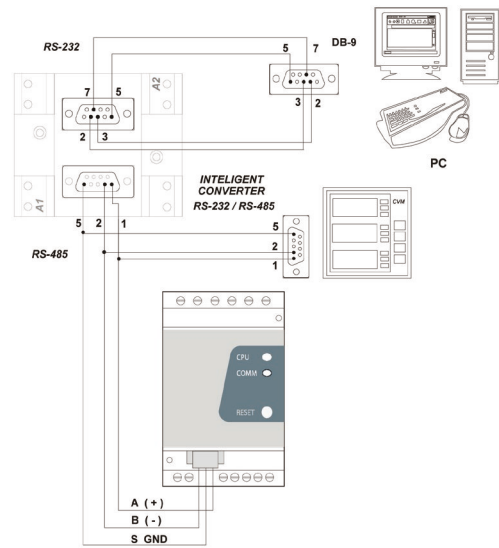
■ FOUR CVM-NET-MC QUADRANTS



2.7.- CVM-NET-MC COMMUNICATIONS

One or several CVM-NET-MC analyzers can be connected to a computer or PLC. This system makes it possible to centralise the data in a single record point, in addition to the normal operation of each of them (PowerStudio® System). The CVM-NET-MC has an RS-485 serial communication output. If more than one analyzer is connected to a serial communication bus (RS-485), each analyzer must be assigned a peripheral number or address (from 01 to 255), with a maximum of 32 units per communication bus, so that the central computer sends the queries from the various records measured or calculated to these addresses.

The CVM-NET-MC power analyzer communicates using the MODBUS RTU® protocol (Pulling Question / Answer).



3.- TECHNICAL SPECIFICATIONS

Power circuit: <ul style="list-style-type: none">- Single-phase:- Voltage tolerance:- Frequency:- Maximum consumption:- Working temperature:- Humidity (non-condensing):	AC version 230 V AC -15% / +10% 50 - 60 Hz 3.0 V-A -10+ 50 °C 5 95%	Plus version: C. & DC 85..265V AC /95..300V DC 50 - 60 Hz (AC mode.) 3.0 V-A -10+ 50 °C 5 95%	Metering circuit: <ul style="list-style-type: none">- Nominal voltage: phase-neutral / between phases- Frequency:- Nominal current:- Permanent overload:- Voltage consumption of the circuit:- Current consumption of the circuit: ITF / Shunt	300 V AC / 520 V AC 45 ~ 65 Hz <i>I_n</i> / 250mA 1.2 <i>I_n</i> 0.7 V-A 0,18 V-A
Mechanical characteristics: <ul style="list-style-type: none">- Case material:- Protection titted unit (frontal):- Protection non-fitted unit (sides and rear cover):- Dimensions (mm):- Weight:	V0 self-extinguishing plastic IP 51 IP 31 85 x 52 x 70 mm (3 modules) 0.210 kg			
Precisions Class: <ul style="list-style-type: none">- Voltage:- Current:- Power / Energy: Measurement sensors: Current / Voltage Power factor: Full-scale measurement margin: ITF / Shunt Temperature sensor: Precision / Working window <ul style="list-style-type: none">- Temperature measurement: with forced ventilation- Temperature measurement: without forced ventilation Maximum altitude operating:	0.5% ± 1 digit 0.5% ± 1 digit 1% ± 1 digit External transformers / direct voltage 0.5 to 1 0.2 120% / 2 120% ± 2 °C / -10 +50 °C + 14.0 °C + 3.5 °C 2000 meters			
Safety: Category III - 300 V AC / 520 V AC EN-61010 Class II double-insulated electric shock protection. The system should be connected to a power supply circuit protected by fuses gl or M type, with current ratings between 0.5 and 1 A. It should be provided with a MCCB or equivalent device to switch off the system from the power supply circuit. The power supply and voltage measuring circuit is connected with cable minimum cross section of 1 mm2 Standards: IEC 664, VDE 0110, UL 94, IEC 801, IEC 348, IEC 571-1, EN 61000-6-3, EN 61000-6-1, EN 61010-1, EN 61000-4-11, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 55011, CE				

4.- CONNECTIONS

4 wires / 3 wires (low voltage)	Detail of MC3 module connection	Detail of MC1 module connection – 4 wires / 3 wires
		<p>In case to use the MC1 modules, the S2 should be the same in all three current transformers</p>

5.- TECHNICAL SERVICE

In the event of any equipment failure or any operational queries please contact the technical service of CIRCUTOR S.A.

CIRCUTOR S.A. - After sales service

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