



SUPPLY NETWORK ANALYZER

CVM-BDM SERIES

INSTRUCTION MANUAL

(M 981 530 / 02A)

(c) CIRCUTOR S.A.

USER'S MANUAL

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1.-BASIC INSTRUCTIONS

1.1.- Delivery spot check

This manual is issued to help all the CVM-BDM users to install and use it in order to get the best from it. After receiving the unit please check the following points:

- (a) Does this device corresponds to your order specifications?
- (b) Check if any damage was done during the shipment process.
- (c) Verify that it includes *One instruction manual .
- (d) CD with PC software (Power-Vision).

1.2.- Connection procedures



The manual you hold in your hands contains information and warnings about the **CVM-BDM** that the user should respect in order to guarantee a proper operation of all the instrument functions and keep its safety conditions.

Before connecting the instrument to the mains verify the following:

(a) **Power supply :**

- 230 V a.c.** Power supply Va.c. (Single phase) 50 ... 60 Hz

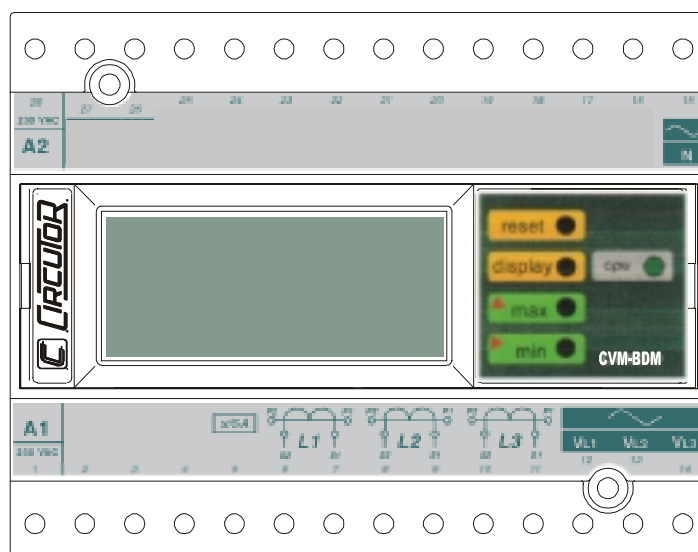
(b) Maximum measuring voltage:

- Standard: 500 V a.c. phase-neutral / 866 V a.c. between phases**
- A special model for 110 V measuring is available:*

100 V a.c. phase-neutral / 173 V a.c. between phases

(c) Maximum measuring current: Transformer of In / 5 A a.c.

2.-MAIN CHARACTERISTICS



The CVM-BDM power meter is a programmable measuring instrument, offering several operation possibilities selectable in its SETUP option.

This analyzer is also equipped with an internal memory to record main electrical parameters of the monitored power system.

Before power supplying the instrument, read the **CONNECTIONS** and **SETUP** sections and choose the most suitable operation mode for getting your desired data.

The CVM-BDM is an instrument which measures, calculates, displays and memorizes all the main electrical parameters at any electrical network (balanced or not). The measuring is true RMS value, through three a.c. Voltage inputs and three a.c. Current inputs (from Current Transformers .../ 5A).

By means of an internal microprocessor it simultaneously measures:

Parameter	L1	L2	L3	III
Voltage (phase-neutral)	X	X	X	X
Voltage (phase-phase)	X	X	X	X
Current	X	X	X	X
Active power	X	X	X	X
Reactive power L	X	X	X	X
Reactive power C	X	X	X	X
Power factor	X	X	X	X
Apparent power				X
Frequency	X			
Power demand				X
Voltage THD	X	X	X	
Current THD	X	X	X	
Individual harmonic current content (Up to the 15 th)	XX	XX	XX	
Individual harmonic voltage content (Up to the 15 th)	XX	XX	XX	

Available: **x**: Display and communications **xx**: Communications

Parameter	CVM-BDM
Date/Time dd/mm/yy hh:mm:ss	TIME
Active energy (two indep. meters: demanded energy (+) and generated energy (--))	kWh (+) and (--)
Reactive energy (inductive), two indep. meters	kvarh.L (+) and (--)
Reactive energy (capacitive), two indep. meters	kvarh.C (+) and (--)

CVM-BDM permits above enumerated parameters to be view in a three-line alphanumeric display. Three parameters are shown in every screen.


- (a) Phase-to-neutral or phase-to-phase voltage of every phase.
- (b) User-selectable parameters according to the model (see attached table).

 And also the **MAXIMUM POWER DEMAND**: The power demand is integrated during a prefixed period.

You can select:

- a) The parameter to be controlled (it can measure active power **kW**, apparent power **kVA** or three phase average current **AIII**).
- b) The demand period (1 to 60 min.).

This power demand function works with sliding window: shows the accumulated demand over the last period from "now".

 CVM-BDM is equipped with an internal memory for the collection of main parameters from the electric network.

By means of the PC see, the user can select the parameters to be save into memory among all measured by the power meter (instantaneous, maximum and minimum values). You can also set the data recording period.

2.1.- Other features

- DIN rail mounting device with low dimensions.
- True RMS value measurements.
- Internal memory (1Mbyte)
- Measurements in all four quadrants.
- Power demand
- Memorizes Maximum and Minimum values.
- 2 leds for the indication of CPU and communications performance.
- Harmonic distortion measurement (THD-V & THD-A).
- Individual harmonic current content (Up to the 15th)

2.2.- Types of CVM-BDM

Available standard CVM-BDM types are:

CVM-BDM	Type	Description
7 70 290	CVM-BDM	Communications, internal memory and data display
7 70 291	CVM-BDM-C2	CVM-BDM +2 relay outputs
7 70 292	CVM-BDM-C420	CVM-BDM +1 relay output + 1 analog output
7 70 293	<i>CVM-BDM-420</i>	CVM-BDM + 2 analog outputs

Different CVM-BDM... provide more parameters to be displayed (additional SETUP).

3.-INSTALLATION AND STARTUP



The manual you hold in your hands contains information and warnings that the user should respect in order to guarantee a proper operation of all the instrument functions and keep its safety conditions.

The instrument must not be powered and used until its definitive assembly on the cabinet's door.

Whether the instrument is not used as manufacturer's specifications, the protection of the instrument can be damaged.

When any protection failure is suspected to exist (for example, it presents external visible damages), the instrument must be immediately powered off. In this case contact a qualified service representative.

3.1.- Installation

Before applying AC power to the, check following points :

a.- **Supply voltage :**

- Power supply Va.c. (Single phase) 50 ...60 Hz

230 V a.c.

- *Frequency* : 50 ... 60 Hz
- *Supply tolerance* : + 10 % / --15 %
- *Connection terminals* : *Terminals* 1 - 28
- *Instrument burden* : 6 VA

b.- Maximum voltage at the voltage measuring circuit:

Standard: 500 V a.c. phase-neutral / 866 V c.a. between phases

A special model CVM-BDM for 110 V measurement is also available:


100 V a.c. phase-neutral / 173 V a.c. between phases

c.- Maximum admissible current : Transformer of $I_n / 5$ A a.c.

d.- Operation conditions :

- Operating temperature : 0 to 50°C
- Humidity : 25 to 80 % R.H. not-condensing

e.- Safety : Designed to meet protection class II as per EN 61010.

Installation : 

The instrument is to be fit onto a DIN 46277 (EN 50022) rail . All connections keep inside the cabinet.

Note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. Therefore, the instrument must not be used until this is completely installed.

The instrument must be connected to a power supply circuit protected with gl type (IEC 269) or M type fuses rated between 0.5 and 2 A. This circuit should be provided with a circuit breaker or any equivalent element to connect or disconnect the instrument from the power supply network. The supply and measuring voltage circuits will be both connected through a wire with a minimum cross-section of 1 mm².

The line of the current transformer secondary will have a minimum cross-section of 2,5 mm².

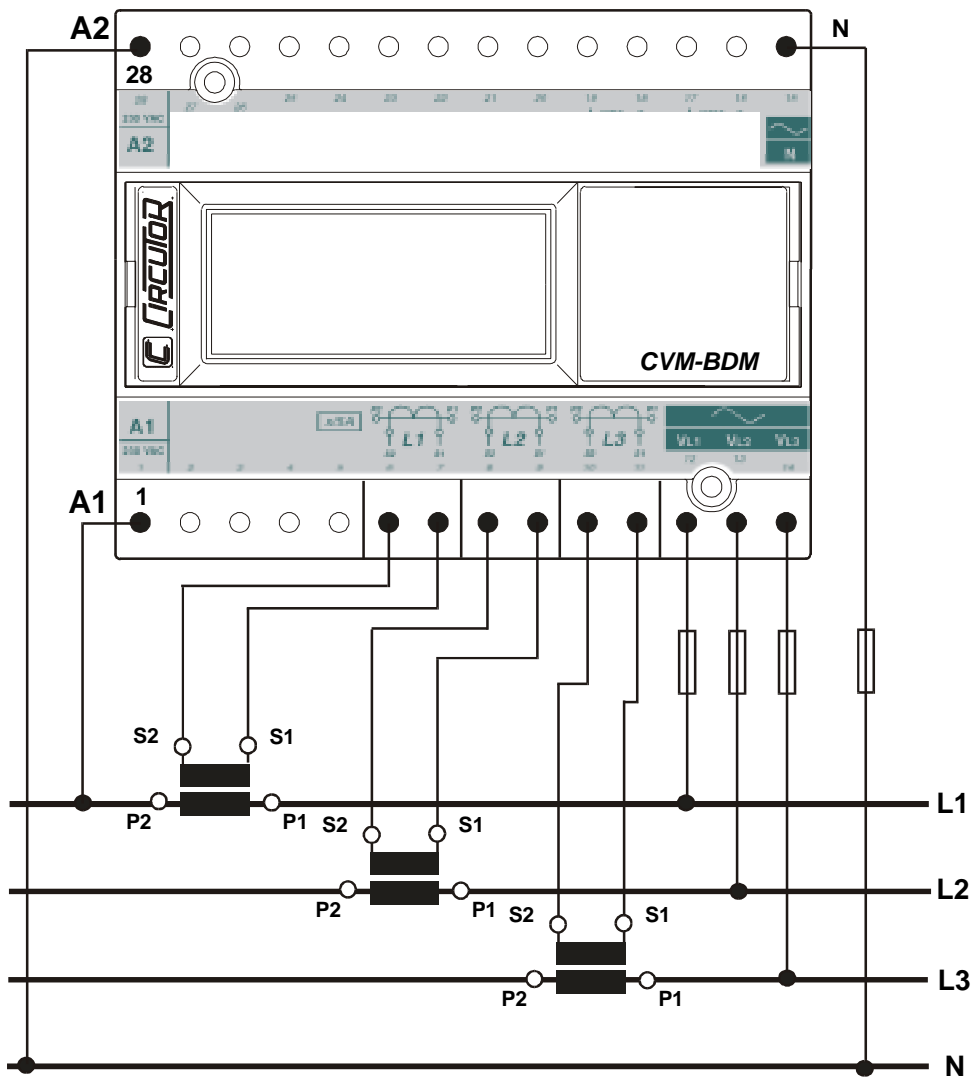
3.2.- CVM-BDM Connection terminal (see side labels)

Terminal No	Designation	Concept
1 - 28	A1 - A2	supply voltage : 230 V a.c.
27 - 26	dep. model	Relay output No. 1 / 1 output of 4- 20 mA
25 - 24	dep. model	Relay output No. 2 / 2 output of 4- 20 mA
23 - 19	Termination resistor (RT)	240 Ω resistor: adaptation of the line final impedance (bridge 23 -- 22 and 19 -- 20)
22	+	COM1 CVM-B : RS-485 connection to the PC 22 + -----> 1 (+)
21	GND	21 GND -----> 5 converter
20	--	20 -- -----> 2 (--) RS-485/RS-232
16		No used.
17		No used.
18		No used.
15	N	NEUTRAL
14	VL3	Voltage phase 3
13	VL2	Voltage phase 2
12	VL1	Voltage phase 1
11 - 10	I L3: s1 - s2	Current phase L3 ... / 5 A
9 - 8	I L2: s1 - s2	Current phase L2 ... / 5 A
7 - 6	I L1: s1 - s2	Current phase L1 ... / 5 A

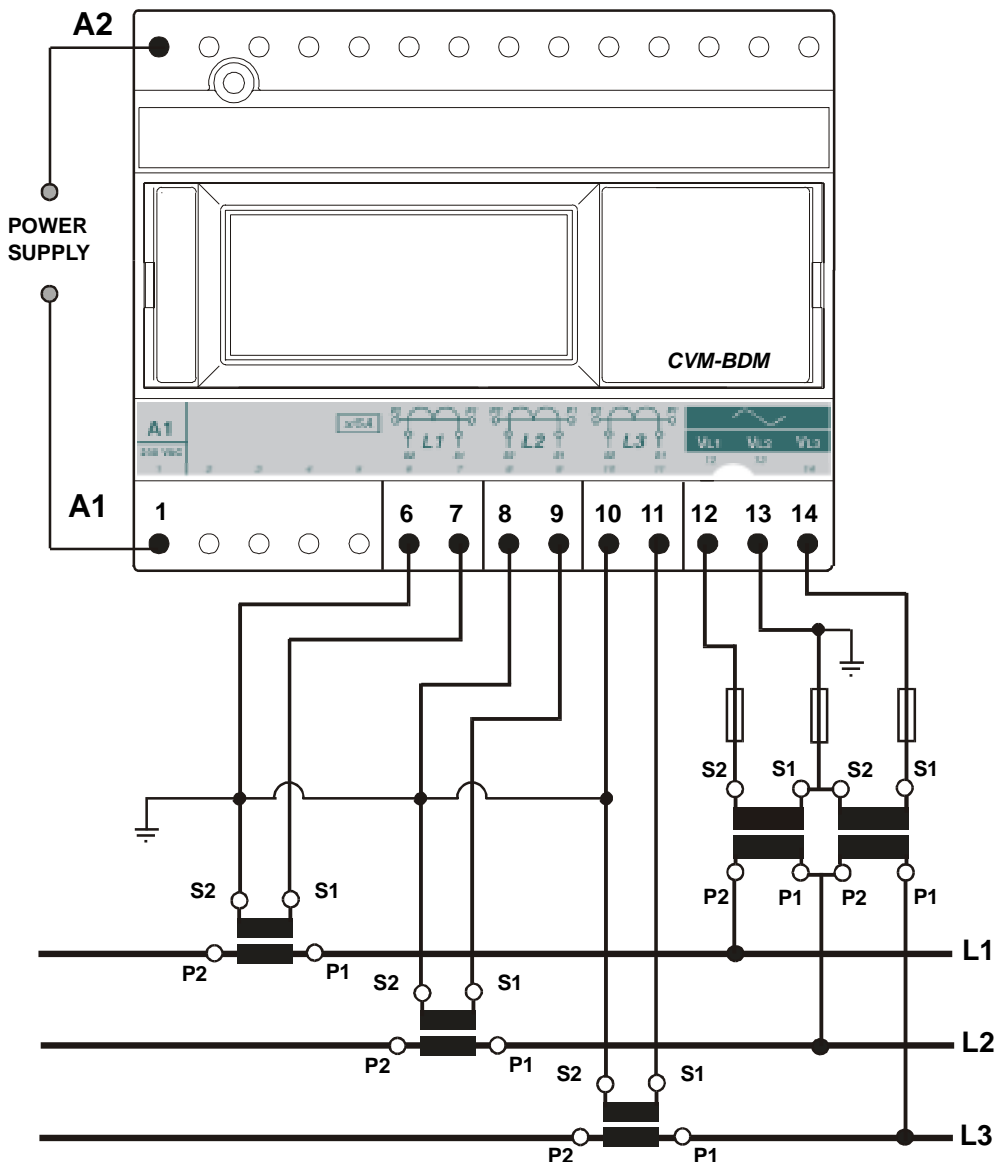
NOTE: Current inputs are isolated in the CVM-BDM model

3.3.- Connection drawing for the CVM-BDM:

a.- CVM-BDM: Three-phase network.- 4 wires (low voltage) :

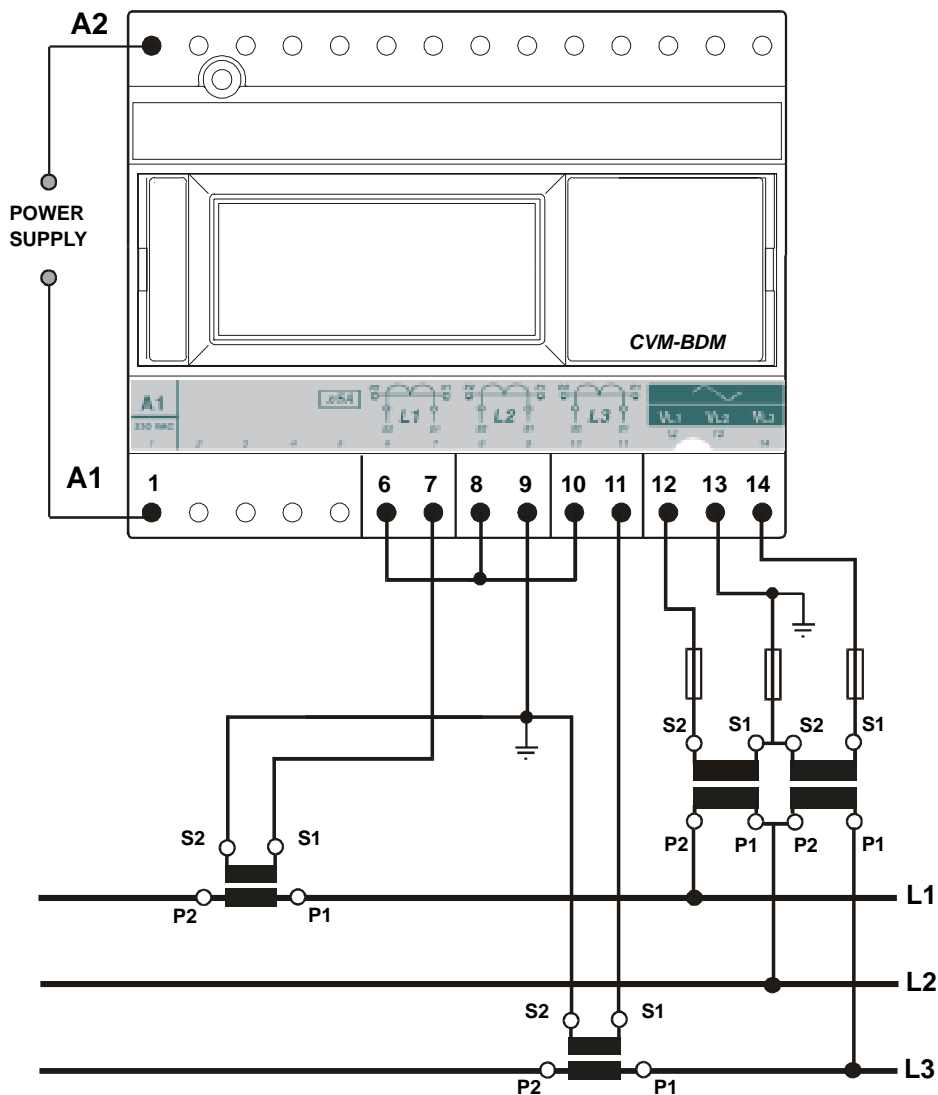


b.- CVM-BDM: 3 current transformers + 2 voltage transformer :

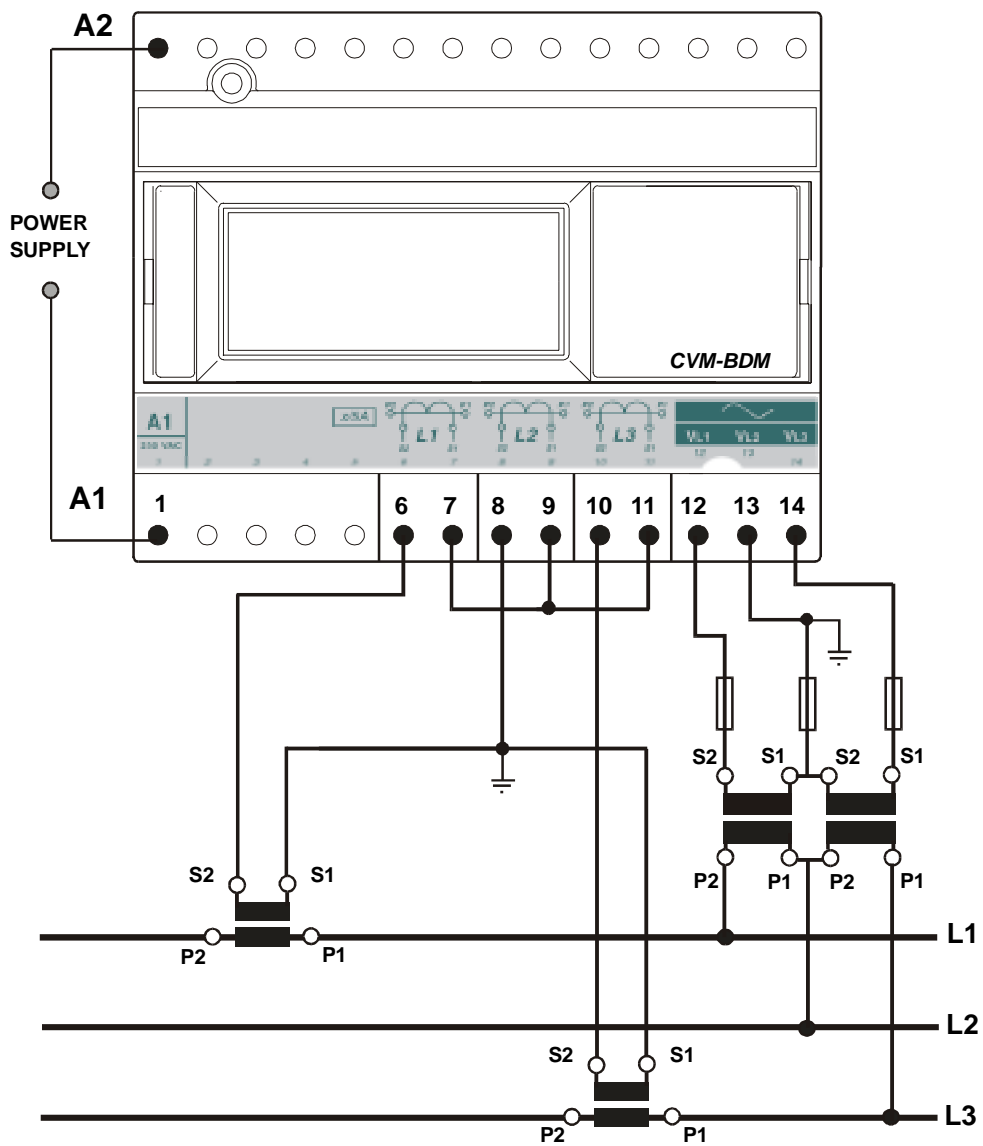


c.- CVM-BDM: 2 current transformers + 2 voltage transformer.

S2 of the current transformer grounded to earth



S1 of the current transformer grounded to earth



4.-OPERATION MODE

The instrument has a display with three lines (10 characters every line).

When you switch on the power supply of the CVM-BDM you will see on the display:

Card	Circ
xxxxx	utor
xxxx	yyy

Where:

xxxx = hardware configuration.

yyy = Versión software

After some seconds the instrument is ready to work, showing one of the possible screens. The display indicates the parameter presently shown.

display

The first display shows the voltage of phase L1 (V1), the voltage of phase L2 (V2) and the voltage of phase L3 (V3).

220	V1
220	V2
220	V3

If you press the "**display**" key, we are now reading the CURRENT values for each phase (A1, A2, A3). However, this screen can be configured in order to display other different parameters.

When pressing again the "**display**" key, we will see on display the three previously programmed parameters. If you press the "**display**" key again you can see from 1 to 15 screens depending of the previous setup.

max

Pressing the "**max**" key, the maximum values for the parameters being shown appear in the displays.

xxxx	MAX
xxxx	MAX
xxxx	MAX

This function is only valid while you keep pressing the "**max**" key. If you stop pressing the key the instantaneous values appear again.

min

Pressing the "**min**" key, the minimum values for the parameters being shown appear in the displays.

xxxx	MIN
xxxx	MIN
xxxx	MIN

This function is only valid while you keep pressing the "**min**" key. If you stop pressing the key the instantaneous values appear again.

Reset

Pressing the "**reset**" key the system is reset. This is equivalent to switch off the power supply of the instrument. The stored maximum and minimum values will be automatically deleted from the internal memory.

If you are in the setup process and press the "**reset**" key, you exit it without saving any modification that you have done and making a reset of the system.

5.-SETUP PROCEDURE

The setup procedure of the CVM-BDM is performed by means of several SETUP options.



For accessing the **setup menu** the keys **max & min** must be simultaneously pressed once the instrument is at the main screen.

When accessing the **SETUP**, the message "**SETUP unloc**" (1) is shown for some seconds on screen, or, otherwise, the message "**SETUP loc**" (2).

(1) **Setup UNLOC** (SETUP unlocked) : when the SETUP is accessed, configuration parameters can be either visualized and modified.

(2) **Setup LOC** (SETUP locked) : when the SETUP is accessed, configuration parameters can be visualized but cannot be modified .

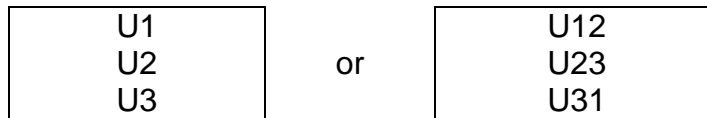
Once into the SETUP, use the keyboard to select different options and enter required variables:

- The key **Display** validates de value and pass to the next menu.
- The key **MAX** permits to select among different options in a menu, or to increase a digit when a variable is being entered.
- The key **MIN** permits to move the cursor along the digits.

Different options are following shown in a sequential mode:

5.1.- Phase-to-Phase or Phase-to-Neutral voltages

After the word "**set**" you will see on the three displays the voltages of the phases L1, L2, L3.



Phase to Neutral Voltages: U1 , U2 , U3

Phase to Phase Voltages : U12 , U23 , U31

- a) To select one of the voltage options just press the green key "**max**" and both options will appear alternately.
- b) b.- When you get in the display the wished option just press the "**display**" key to validate it and access to the next setup option.

5.2.- Voltage transformation ratio.

5.2.1.- Voltage Transformer Primary.

On the screen we read the word "SET U P" followed by 6 digits. They allow us setting the primary of the voltage transformer.

SET U
P ---

Last digit of the first display indicates "U" (Voltage) and first digit of the second display indicates "P" (Primary). It means that we can set the primary of the voltage transformer. To avoid mistakes the Voltage red leds remain lit on.

- To write or modify the value just repeatedly press the "**max**" key and the blinking digit value will be increased.
- When the value on screen is the proper one, we can pass to the next digit by pressing the "**min**" key in order to modify the other values.
- When the blinking digit is the last one, pressing the "**min**" key we go back to the initial value: set values can be again modified.
- Press "**display**" to pass to the next setup option.

Note: Maximum values of transformation ratios which are allowable to be set, depend on the full-scale value of the measuring instrument. (**see side labels**).

FULL-SCALE VALUE	MAXIMUM ALLOWABLE VALUE
110 V~	99,999
300 V~	70,000
500 V~	40,000

5.2.2.- Voltage Transformer Secondary

We can now set the value of the secondary of the voltage transformer. Only three digits are available:

```
SET U
S
---
```

The procedure is the same one done at the previous sections with the "**max**", "**min**" and "**display**" keys.

If the CVM-BDM is directly connected to the mains (without voltage transformer) the values of primary and secondary must be the same, for instance 000001/001.

5.3.- Current Transformer Primary

"SET A P" and five digits appear on screen allowing us to set the primary of the current transformer. The current green leds light on to avoid mistakes.

```
SET A
P --
---
```

The procedure is the same one done at the previous sections with the "**max**", "**min**" and "**display**" keys.

NOTES:

- The secondary of the current transformers is not programmable. It is automatically set at 5 A (... / 5 A ac)
- The primary current value to be set is also limited by the following condition: The maximum allowable primary current value which can be set is defined by the fact that the multiplication of the primary voltage value by this primary current value cannot exceed 20,000,000.

5.4.- Network specifications

5.4.1.- Rated voltage

The message "SET n" is on screen, together with three digits to set the rated voltage of the monitored power system. Whether the voltage measurement is carried out through the secondary of voltage transformers, then the rated voltage of the transformer secondary must be set. (Phase-to-neutral voltage).

```
S E T
n
- - -
```

Proceed as for previous sections when using "**max**", "**min**" & "**display**" keys.

Examples :

- Direct measurement: Transforming ratio 1/1 Set n = 230
- Through transformers: 22000/110 Set n = 110

5.4.2.- Rated frequency

The screens shows "SET freq" and two digits to set the rated frequency of the monitored power system.

```
S E T
Freq
- - -
```

Proceed similarly than for previous sections by means of the "**max**", "**min**" and "**display**" keys.

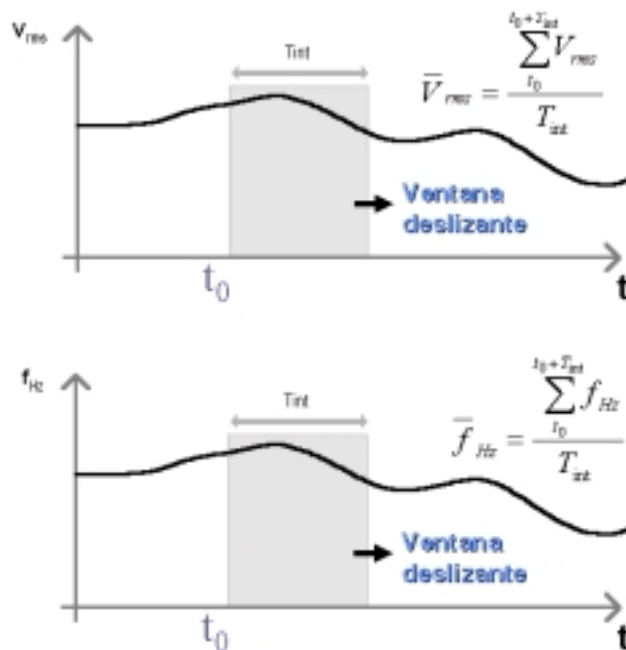
5.5.- Integration period of voltage and frequency signals

The screens shows ""SET int"" and two digits to set the desired integration period of voltage and current signals.

S E T	Allowable value: from 1 to 60 s
int	
- -	

Proceed similarly than for previous sections by means of the "**max**", "**min**" and "**display**" keys.


For the calculation of the average, maximum and minimum voltage and frequency values, the CVM-BDM obtains one value every second. These values equal the average of the values calculated within the time window set by the user (time constant). If the time value is 1 second, then the viewed value equals the instantaneous value.



5.6.- Parameter SETUP

This option allows to program until 45 optional parameters that you can see on 15 programmable pages (3 parameters every page).

The CVM-BDM asks first if you want to program the default parameters.

 "**max**" key : you can select YES or NO. The "**display**" key allows the validation of the selected option.

dEF
PAGE
YES

- Select "**YES**" to program the default parameters. It pass to the next option.
- If you select "**NO**", it allows programming the parameters that you want to see on the display. Every new page, it asks if you want to continue this setup .

SET
PAGE
NUMBER
YES xx

<--- page No.

- If you select "SET PAGE YES", you can program the desired parameters in this page:

xx	A1
xx	A2
xx	A3

Parameter code (setup) / Parameter symbol

Setup:

- "**max**" key: Allows us modifying the value of the blinking digit. Each time it is pressed the value is increased.
- "**min**" key: Allows us the validation of the blinking digit and going to the next one.

Each display has two digits to select the desired parameters among the ones in the attached code chart.

Parameter	Symbol phase L1	Code	Symbol phase L2	Code	Symbol phase L3	Code
Single voltage	V 1	01	V 2	07	V 3	13
Current	A 1	02	A 2	08	A 3	14
Active power	kW 1	03	kW 2	09	kW 3	15
Inductive power	kvarL 1	04	kvarL 2	10	kvarL 3	16
Capacitive power	kvarC 1	05	kvarC 2	11	kvarC 3	17
Power factor	PF 1	06	PF 2	12	PF 3	18

Three phase single voltage	Vav III	19	Frequency	Hz	25
Three phase current	Aav III	20	Three ph. apparent power	kVA III	26
Three phase active power	kW III	21	Ph-Ph voltage L1- L2	V 12	27
Three. ph. inductive power.	kvarL III	22	Ph-Ph voltage L2 - L3	V 23	28
Three ph. capacitive power	kvarC III	23	Ph-Ph voltage L3 - L1	V 31	29
Three ph. power factor.	PF III	24	Three ph. Ph-Ph voltage	Vc III	30

Date/ TIME	dd/mm/yy	hh:mm:ss	TIME	31
------------	----------	----------	------	----

Active energy	kW.h	32
Reactive energy (inductive)	kvarh.L	33
Reactive energy (capacitive)	kvarh.C	34
Demand power (kW, kVA, AIII)	Pd	35
Active energy generated	kW.h --	36
Reactive energy (inductive) gen.	kvarh.L --	37
Reactive energy (capacitive) gen.	kvarh.C --	38

Parameter	Symbol phase L1	Code	Symbol phase L2	Code	Symbol phase L3	Code
Voltage THD	% THD V1	54	% THD V2	55	% THD V3	56
Current THD	% THD I1	57	% THD I2	58	% THD I3	59

- For passing to the next page , press "**display**". In this case the CVM-BDM ask again:

SET	
PAGE NUMBER	
YES	xx

- If you select "SET PAGE YES" , you can setup a next page.

- If you don't want to setup more pages, **select "SET PAGE No"**, and it pass to the next setup option (5.7.-First Page SETUP). You can see the first page of voltages and all the programmed pages .

5.7.- First Page SETUP

This option allows selecting among **fixed or rotary page**:

a.- **Fixed page**: the page is changed pressing the "**display**" key. The page among the available ones that we want to see when the CVM-BDM is supplied (or a reset is made) can be selected.

b.- **Rotary pages**: the page changes to the next one automatically every 5 seconds. ("*SET AUTO PAGE : Rotate page select*" option).

Setup :

- The "**max**" key allows modifying the selected page. The display shows the different possible pages.

SET	xx
AUTO	xx
PAGE	xx

<-- *setup parameters*

- The "**display**" key allows the validation of the chosen option.

5.8.- Maximum power demand

Push the key "**display**" and the following screens will appear by display:

1) PARAMETER TO CONTROL ("SET Pd xx")

None		00
Three phase active power	kW III	21
Three phase apparent power	kVA III	26
Three phase average current	AavIII	20

Value of power integrated during the programmed demand period.

2) DEMAND PERIOD (**1 to 60 min.**) ("SET Per xx")

3) CLEAR MAXIMUM VALUE IN MEMORY

("CLr Pd xx") **no** or **YES**

PROGRAMMING MODE:

- "**max**" key: allows choosing the different available options.
- "**min**" key: allows the validation of the blinking digit and go forward to the next digit (only for the "SET Per xx" option).
- To pass to the next option press "**display**".

If you don't want to modify anything, just press the "**display**" key three times without modifying any value.

- **Display:** If you program the MAXIMUM POWER DEMAND option, **parameter 35**, the following appears by display (depending on the pressed key):

display	<i>Present value of the demand power meter (Sliding Window, according to the set demand period) updated every second.</i>
max	<i>MAXIMUM integrated value (since last reset)</i>
min	<i>HOUR : MINUTE DAY : MONTH ("HH.MM DD/MM") when this maximum has occurred</i>

OTHER SETUP SCREENS : THE ENERGY AND CLOCK MODULES**5.9.- DATE / TIME SETUP**

Pressing the "**display**" key we will see in the CVM-BDM screen the following:

- 1.- DAY : MONTH ("SET day dd:mm")
- 2.- YEAR ("SET YEAR xxxx ") 4 digits
- 3.- HOURS : MINUTES ("SET HOUR hh:mm")

For their setup:

- "**max**" key: Allows modifying the value of the blinking digit.
- "**min**" key: Allows the validation of the blinking digits and go to the next one.
- To pass to the next option press "**display**".

If you don't want to modify the time, just press three times "**display**" without making any modification.

- **Display**: If you select the parameter 31, following appears by display:

display	HOUR .MINUTES
max	DAY. MONTH
min	MINUTES . SEC.

5.10.- Clearing energy counters

On display we see "CLR ENER no" (Clear energy counters).

- "**max**" : To select "YES" or "no"
- "**display**" : To validate the selected option. Once finishing this option, all the modifications that we have done are saved into memory and the setup process is finished.
- **Display** : If any of the energies is programmed (kWh, kvarhL or kvarhC), it is displayed as follows:

[display]	XXXX kW.h	<i>4 meter digits (more significant) / units</i>
[max]	XXX XXX. XXX	<i>complete meter</i>
[min]	XXXX (1)	<i>4 digits / Tariff type (1, 2 or 3)</i>

Example: If the accumulated energy is 32.534,810 kWh, it will be displayed as follows:

[display]	2534 kW.h
[max]	32534. 810
[min]	2534 (1)

5.11.- Memory SETUP

Once the setup for the analyzer performance is completed, the memory is then configured.

Firstly set the recording period:

Set Per data 001 min.

 Recording period

Recording period must be set within 1 s & 240 min.

- Press the "**max**" key and the blinking digit value will be increased.
- Press the "**min**" key to pass to the next digit in order to modify the other values.
- Press "**display**" to access other options.

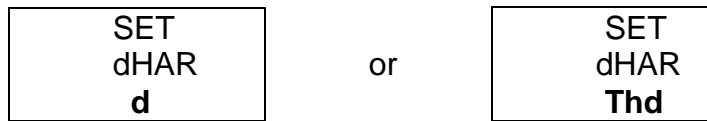
To ends the analyzer configuration, the user is inquired whether the internal memory of the analyzer is desired to be deleted.

Clr Data no/yes

 Memory clear

- Use the "**max**" key to select the memory data to be deleted (yes) or kept (no).
- Use the "**display**" key to validate the selected option. Once finishing this option, all the modifications that we have done are saved into memory and the setup process is finished.

5.12.- THD or D setting



Two modes for the harmonic distortion calculation can be selected:

- **d %** : total value of the harmonic distortion referred to the fundamental value.
- **Thd %** : total value of the harmonic distortion referred to the RMS value.

The selected option will be the one shown on screen.

a.- To select any option just press "**max**" to switch between the two available options.

b.- Press "**Display**" to validate the choice. Since all setup options have been completed, the setup is exited, all modifications are saved into memory, and the running mode automatically starts up.

5.13.- Additional screen with the relay output.

CVM-BDM-C2 (2 relays) & CVM-BDM-C420 (1 relay)

With these outputs the CVM-BDM can be configured for:

A.- **Pulse every certain kW.h or kvar.h (ENERGY).** You can define the value corresponding to the energy consumed for generating a pulse (0.5 sec. long): kW.h / 1 pulse or kvar.h / 1 pulse

B.- **ALARM conditions:** the parameter to be controlled, the maximum value, the minimum value and the "delay" are programmed for each relay output.

On the **CVM-BDM-C2 & CVM-BDM-C420** screen following messages appear at this SETUP point:

OUT 1 CODE 00	RELAY 1
	☞ Parameter No. (1)

☞ *Depending on the selected variable we will pass to a.- or b.- sections*

- In case that no parameter is wanted to be programmed set par. No. = 00.

a.- If an ENERGY parameter is chosen: 32, 33 or 34



(1) Value of energy in kW : four digits with floating decimal point

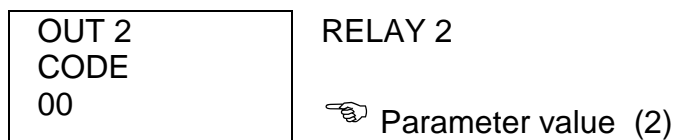
For configuration:

- "**max**" key: it allows modifying the value of the blinking value. Every time it is pressed the number is increased.
- "**min**" key: it allows validating the blinking value and go to the next digit.

NOTE : When you arrive at the last digit, you can move the position of the decimal point with the "**max**" key.

Example for setting a 500 W / 1 pulse: Firstly we enter the value, 0500, and following we place the decimal point at the right position with the "**max**" key → 0.500 kW.

- For passing to the next option, press "**display**": setup options for the second relay will appear (only with the CVM-BDM type **CVM-BDM-C2**).




Act as before. Pressing again "**display**" key you exit setup mode.

b.- ALARM conditions (1 condition for each relay): If any other parameter (1 to 30, 35 or 54 to 59) is selected in (1), two outputs can be configured as alarms. For each output it is possible to program:


① Any of the parameters measured by the CVM-BDM
② MAXIMUM value
③ MINIMUM value
④ Delay for the conditions

These screens are successively displayed by the CVM-BDM once the parameter has been selected (for the setup of each option proceed as in the Section a.-):


b.1.- Programming the maximum value to be controlled:

OUT 1	RELAY 1
AL HI	
0.000	 Maximum value


b.2.- Programming the minimum value to be controlled:

OUT 1	RELAY 1
AL LO	
0.000	 Minimum value

b.3.- Delay setup:

OUT 1	RELAY 1
SEC	Delay in seconds
0.000	 maximum 9999 sec.

- Press "**display**" to pass to the next option: the setup for the second relay appears (only with CVM-BDM type **CVM-BDM-C2**).

OUT 2	RELAY 2
CODE	
00	 Parameter No. (1)

Proceed as before. Pressing again "**display**" we exit the setup option.

ALARM ACTIVATION: The alarms depend on the programmed values of MAXIMUM and MINIMUM.

MIN +	MAX + max > min	<p style="text-align: center;">ON OFF ON</p> <p style="text-align: center;">----- -----}-----¹-----</p> <p style="text-align: center;">0 Min Max</p>
MIN +	MAX + max < min	<p style="text-align: center;">OFF ON OFF</p> <p style="text-align: center;">===== =====¹-----}-----</p> <p style="text-align: center;">0 Max Min</p>
MIN --	MAX +	<p style="text-align: center;">ON OFF ON</p> <p style="text-align: center;">-----}===== =====¹-----</p> <p style="text-align: center;">Min 0 Max</p>
MIN +	MAX --	<p style="text-align: center;">OFF ON OFF</p> <p style="text-align: center;">=====¹----- -----}=====</p> <p style="text-align: center;">Max 0 Min</p>
MIN --	MAX -- max > min	<p style="text-align: center;">ON OFF ON</p> <p style="text-align: center;">-----}-----¹----- -----</p> <p style="text-align: center;">Min Max 0</p>
MIN --	MAX -- max < min	<p style="text-align: center;">OFF ON OFF</p> <p style="text-align: center;">=====¹-----}----- =====</p> <p style="text-align: center;">Max Min 0</p>

ON = alarm activated -----> relay closed

OFF = alarm deactivated -----> relay open

The **DELAY** set value is applied either to the connection or the disconnection when the alarm conditions occur.

The programming units for the different parameters are:

Parameter	Format	Example
Voltage	Without decimals = V (xxxx) With decimals = kV (xxx.x)	0220 = 220 V 25.30 = 25.30 kV
Current	A	0150 = 150 A
Powers	kW, kvar, kVA	0.540 = 540 W 250.5 = 250.5 kW
Energies	kW.h, kvar.h	
Power factor	x.xx	- 0.7 = - 0.70
Frequency	xx.x	50.0 = 50 Hz

 **Connections of the RELAY OUTPUTS :**

a.- CVM-BDM-C2 (2 relays) :

Out1	Terminals	Signal	Out2	Terminals	Signal
RELAY1	27 - 26	N.O.	RELAY2	25- 24	N.O.

b.- CVM-BDM-C420 (1relay) :

Out2	Terminals	Signal
RELAY1	25 - 24	N.O.

- Maximum voltage between terminals = 250 V a.c.

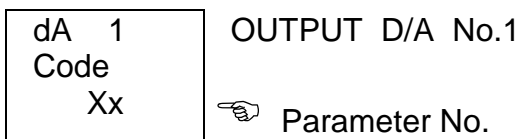
5.14.- Additional screen with the 4 - 20 mA outputs.

**4 - 20 mA outputs : CVM-BDM-420 (2 analog outputs) and
CVM-BDM-C420 (1 relay +1 analog output).**

With this outputs we can configure the CVM-BDM to give an output of **4 - 20 mA d.c. or of 0 - 20 mA d.c. (resolution of 4.000 points)** proportional to any of the parameters measured by the CVM-BDM, **with the ability of setting the scale (offset and full scale).**

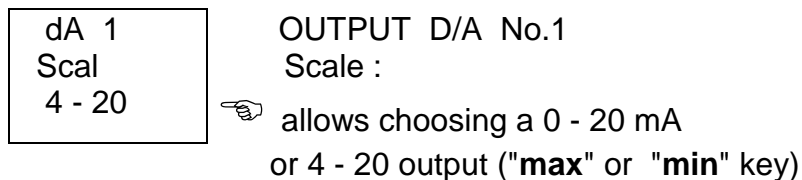
On the CVM-BDM screen following messages appear at this SETUP point (provided the right module is connected to the equipment):

a.- Parameter choosing:



- "max" -- "min" keys: allow the selection of any parameter from 01 to 30
- "display" key: validates the selected option and passes to the next setup screen.

b.- Election of 0 - 20 mA or 4 - 20 mA :



- "display": to validate the selected option and pass to the next setup screen.

c.- Scale offset:

Value of the parameter that we assign as the zero of the scale.

dA 1
Zero
x.XXX

OUTPUT D/A No.1
zero of the scale:



allows choosing the zero of the scale
(four digits with floating decimal point)

- "**max**" key: it allows modifying the value of the blinking value. Every time it is pressed the number is increased.
- "**min**" key: it allows validating the blinking value and go to the next digit.

NOTE : When you arrive at the last digit, you can move the position of the decimal point with the "**max**" key.

- "**display**": to validate the selected option and pass to the next setup screen.

d.- Full scale: Value of the parameter to which we assign the 20 mA.

dA 1
F.ESC
x.XXX

OUTPUT D/A No.1
Full scale:



allows choosing the full scale (20 mA)
(four digits with floating decimal point)

Proceed as in the previous section.

- For passing to the next option, press "**display**": the setup for the second output will appear (only with a CVM-BDM type CVM-BDM-420).

dA 2
code
XXXX

OUTPUT D/A No.2

Proceed as in the previous sections.

6.- DATA COLLECTION INTO MEMORY

6.1.- Characteristics

The CVM-BDM power meter is equipped with an internal memory to store some all the electrical parameters measured or calculated by the analyzer.

Data collection into memory is automatically carried out every user-defined period. Either this recording period as the parameters to be saved are defined through a PC set.

Point to consider

The internal memory is a rotary type memory: Once the internal memory of the **CVM-BDM** is full, newest values will replace oldest ones.

6.2.- File types

The **CVM-BDM** executes the integration of all measured values, calculates the average, maximum and minimum value of the defined period, and collects data into memory according to the set recording period (the available period can be set from 1 s to 240 min (4 hours)).

Following files are saved into memory:

<i>Extension</i>	<i>Register size</i>	<i>DATA saved into the file</i>
<i>xx.STD</i>	variable	Only saves into memory the selected parameters: instantaneous, maximum and or minimum values. Parameter selection is done via PC (maximum 130 parameters).
<i>xx.EVE</i>	6 bytes	Power ON - Power OFF (DATE - TIME): date/time of voltage supply loss, and restoring date/time

- The CVM-BDM... calculates every second values of all parameters, regardless its configuration.
- Internal values in the internal memory can be retrieved from a PC, via RS-485.

6.3.- Memory capacity

The quantity of records that can be saved into the internal memory will depend on the number of parameters selected to be stored. Memory capacity is indicated in the following table:

	Maximum size	Register size	No. of registers
*.STD	1 Mbyte	$6 + (4 * \text{no. parameters})$	$\frac{1000000}{6 + (4 * \text{no. parameters})}$
*.EVE	1 kbyte	6 bytes	170 events

xx.STD TYPE FILE:

This type of file permits the user to select the parameters to be saved into memory. The maximum number of parameters that the CVM-BDM can collect into memory is 130 variables (the energies count like two parameters).

The size of each register will depend on the number of parameters selected by the user to be stored. The number of registers that can be saved into the memory can be calculated just applying the following formula:

$$\text{No. of registers} = \frac{1000000}{6 + (4 * \text{No. Parameters})}$$

6.4.- Setting the memory up from PC.

The choice of parameters to be stored by the CVM-BDM must be carried out through a PC by means of the Power-Vision software.

This software permits to read the SETUP saved into the own **CVM-BDM**, and following operation parameters can be defined:

FIELD	DESCRIPTION
Recording period	between 1 second to 4 hours
Parameters to save into mmemory	Choice of the parameters to be saved into memory.

When the choice of parameters to be saved into memory by the CVM-BDM is modified in the SETUP options, the internal memory is completely deleted

7.-SPECIFICATIONS

Power supply : see specifications on the own CVM-BDM rear

- **CVM-BDM:** Single phase 230 V a.c.
 Voltage tolerance: +10 % / -15 %
 Frequency: 50 ... 60 Hz

Power consumption 6 VA
 Operation temperature 0 to 50° C

Internal memory : 1Mbyte Memory

Measuring Circuits :

Rated voltage 500 V a.c. Phase - Neutral / 866 V a.c. between phases
 Other voltagesThrough Voltage Transformers
 Rated currentIn / 5 A (**isolated input like ITF models**)
 Permanent overload1.2 In
 Current input power0.6 VA

Accuracy :

Voltage 0.5 % of readout ± 2 digits
 Current 0.5 % of readout ± 2 digits
 Powers 1 % of readout ± 2 digits

Test conditions :

- Errors due to C.T.'s not included and direct voltage
 - Temperature between + 5 °C and + 45 °C
 - Power factor between 0.5 and 1
 - Measured values between 5 % ... 100 %
-

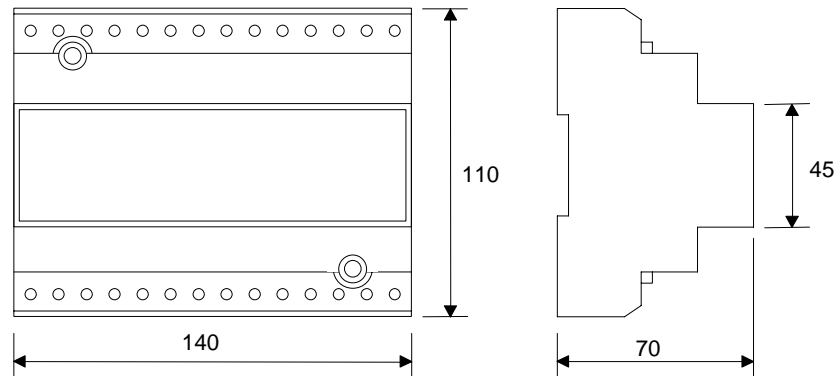
Constructive characteristics :

Box type : Self-extinguishing, plastic casing
 Connection : Metallic terminals with "posidraft" screws
 Fixing : Fitted onto symmetrical DIN 46277 (EN 50022) rail
 Screw fixing (Passing hole Ø 4,2 mm).
 Frontal cover : Lexan
 Protection : Built-in relay : IP 41
 Terminals : IP 20
 Dimensions 140 x 70 x 110 mm (8 modules relay as per DIN 43 880)

Safety..... Category II as per EN-61010

Standards : EN 60664, EN 61010-1, EN 61036, IEC 60801 ,IEC 60571-1,
EN 50081-1, EN 50082-1, VDE 110 , UL 94

Dimensions :



8.-SAFETY CONSIDERATIONS



All installation specification described at the previous chapters named INSTALLATION AND STARTUP, INSTALLATION MODES and SPECIFICATIONS.

Note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation condition.

9.- MAINTENANCE

The CVM-BDM does not require any special maintenance. No adjustment, maintenance or repairing action should be done over the instrument open and powered and, should those actions are essential, high-qualified operators must perform them.

Before any adjustment, replacement, maintenance or repairing operation is carried out, the instrument must be disconnected from any power supply source.

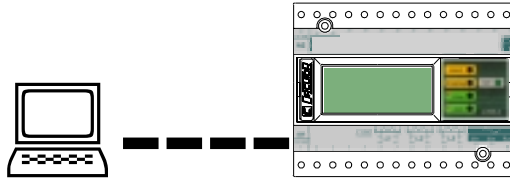
When any protection failure is suspected to exist, the instrument must be immediately put out of service. The instrument's design allow a quick replacement in case of any failure.

10.- TECHNICAL SERVICE

For any inquiry about the instrument performance or whether any failure happens, contact to CIRCUTOR's technical service.

*CIRCUTOR S.A. - After-sales Service
c/ Lepanto, 49
08223 - TERRASSA - SPAIN
Tel - + 34 -93 - 745 29 00
Fax - + 34 -93 - 745 29 14
e-mail: central@circutor.es*

11.- CVM-BDM... COMMUNICATIONS



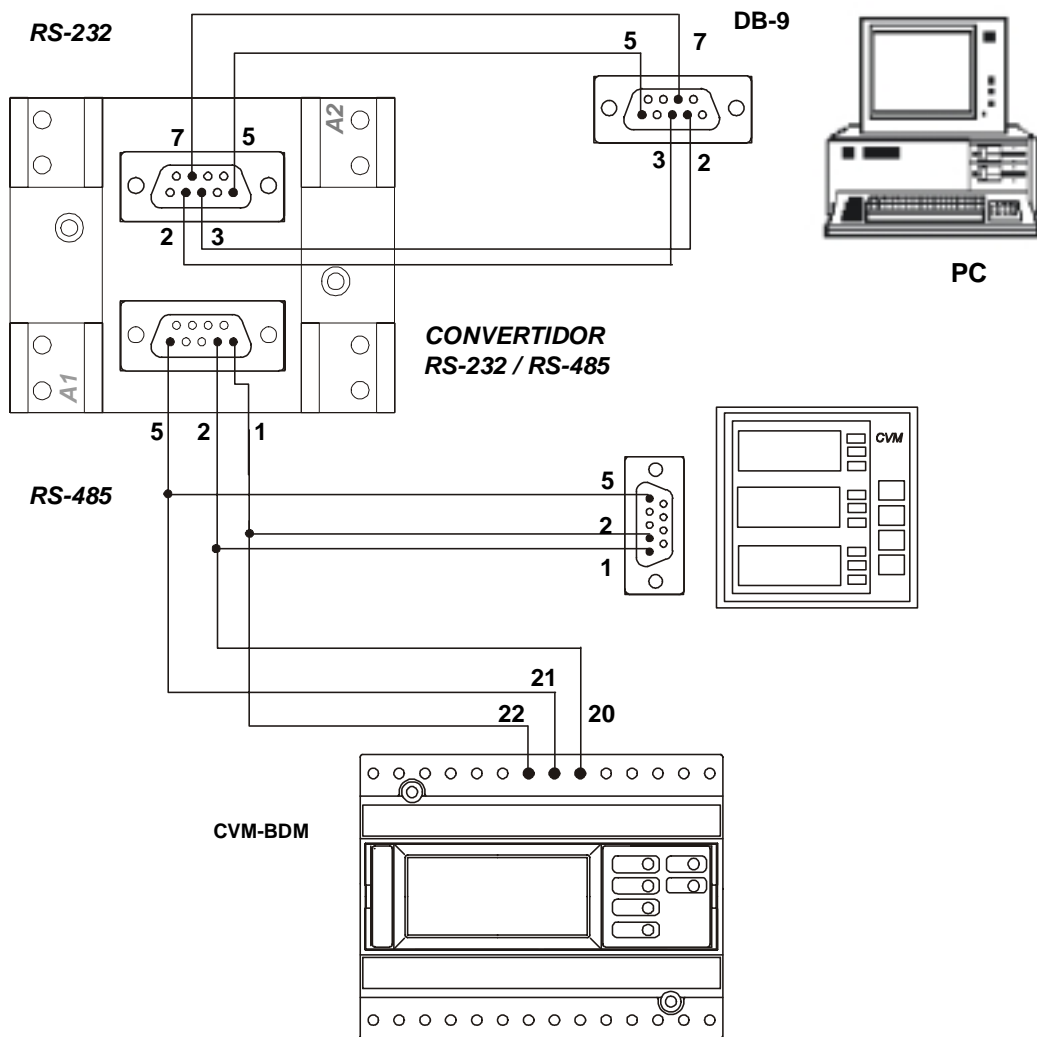
One or some CVM-BDM... can be connected to a P.C.. With this system we can get all the parameters in one central point of reading. The CVM-BDM..., has a serial RS-485 type output. If we connect more than one device to the same communication line, we have to assign to each of them a different code or direction (from 01 to 255), since the P.C. needs the identification of every measuring point

11.1.- ! To take into account:

- **PROTOCOL:** MODBUS © (Question / Answer)
- **CVM-BDM DEFAULT CONFIGURATION :** 001 / 9.600 / 8 bits / N / 1 bit
- Available baud rates: 1.200 - 2.400 - 4.800 - 9.600 - 19.200 bauds

- **RS-485 type output:**
 - RS-485 connection will be carried out by means of a **twisted and screened cable**, with a minimum of 3 wires, with a maximum distance between the CVM-BDM and the last peripheral of 1.200 m. The CVM-BDM uses a RS-485 communication bus allowing up to a **maximum of 32 devices in parallel (Multi-point bus) per port used in the PC.**

11.2.- RS-485 type connection to a RS-232 type input of a PC



***If the RS485/232 converter with RTS control ability (code 770208) is used, then the pin 7 connection in the 232 side is not necessary to be done.**

11.3.- MODBUS © protocol

The CVM-BDM analyzer can communicate by means of the **MODBUS ©** protocol, as it is following described:

When the CVM-BDM communicates with MODBUS protocol, it uses the **RTU mode** (Remote Terminal Unit). Each 8-bits byte in a message contains two 4-bits hexadecimal characters.

The format for each byte in RTU mode is :

- * *Code* : **8-bits binary**, hexadecimal 0-9, A-F
Two hexadecimal characters
contained in each 8-bits field of the message.
- * *Bits per Byte* : 8 data bits
- * *Error Check Field* : Cyclical Redundancy Check (**CRC**).

MODBUS FUNCTIONS:

- FUNCTION 01** Reading of relay state
- FUNCTION 3 or 4** Reading of n Words (16 bits-2 bytes). This function permits to read all the electrical parameters of the CVM-BDM. Each parameters is a 32-bits long, hence two words are required to inquiry for a parameter.
- FUNCTION 05** Writing one relay

a.- Registers assigned to different parameters measured by the **CVM-BDM**:

PARAMETER	Units	MODBUS REGISTERS HEXA-DECIMAL (longs)		
		PRESENT Value	MAXIMUM Value	MINIMUM Value
Phase voltage - V 1	V x 10	00-01	100-101	200-201
Current - A 1	mA	02-03	102-103	202-203
Active power - kW1	W	04-05	104-105	204-205
inductive power-kvar L 1	var L	06-07	106-107	206-207
Capacitive power – kvarC 1	var C	08-09	108-109	208-209
Power factor - PF1	PF x 100	0A-0B	10A-10B	20A-20B
Phase voltage - V 2	V x 10	0C-0D	10C-10D	20C-20D
Current - A 2	mA	0E-0F	10E-10F	20E-20F
Active power - kW2	W	10-11	110-111	210-211
Inductive power-kvarL 2	var L	12-13	112-113	212-213
Capacitive power – kvarC 2	var C	14-15	114-115	214-215
Power factor - PF2	PF x 100	16-17	116-117	216-217
Phase voltage - V 3	V x 10	18-19	118-119	218-219
Current - A 3	mA	1A-1B	11A-11B	21A-21B
Active power - kW3	W	1C-1D	11C-11D	21C-21D
Inductive power– kvarL 3	var L	1E-1F	11E-11F	21E-21F
Capacitive power – kvarC 3	var C	20-21	120-121	220-221
Power factor - PF3	PF x 100	22-23	122-123	222-223
Phase voltage - V III	V x 10	24-25	124-125	224-225
Current - A III	mA	26-27	126-127	226-227
Three-phase active power - kW III	W	28-29	128-129	228-229
Three-phase inductive power– kvarL III	var	2A-2B	12A-12B	22A-22B
Three-phase capacitive power – kvarC III	var	2C-2D	12C-12D	22C-22D
Three-phase power factor - PF III	PF x 100	2E-2F	12E-12F	22E-22F

PARAMETER	Units	MODBUS REGISTERS HEXA-DECIMAL (longs)		
		PRESENT Value	MAXIMUM Value	MINIMUM Value
Frequency (L1) - Hz	Hz x 10	30-31	130-131	230-231
Three-phase apparent power kVA III	VA	32-33	132-133	232-233
Line-to-line voltage L1-L2 - V12	V x 10	34-35	134-135	234-235
Line-to-line voltage L2-L3 - V23	V x 10	36-37	136-137	236-237
Line-to-line voltage L3-L1 - V31	V x 10	38-39	138-139	238-239
Line-to-line voltage III	V x 10	3A-3B	13A-13B	23A-23B
Hours / minutes		3C-3D		
Month / day			13C-13D	
Minutes / seconds				23C-23D
Active energy (+) kW.h	W. h	3E-3F		
Inductive reactive energy (+) kvar.h L	var.h L	40-41		
Capacitive reactive energy (+) kvar.h C	var.h C	42-43		
Maximum power demand	Md (Pd)	44-45	144-145	
Active energy (-) kW.h	W. h	46-47		
Inductive reactive energy (-) kvar.h L	var.h L	48-49		
Capacitive reactive energy (-) kvar.h C	var.h C	4A-4B		
Neutral current	I _N	68-69	168-169	268-269
%THD V 1	% x 10	6A-6B	16A-16B	26A-26B
%THD V 2	% x 10	6C-6D	16C-16D	26C-26D
%THD V 3	% x 10	6E-6F	16E-16F	26E-26F
%THD I 1	% x 10	70-71	170-171	270-271
%THD I 2	% x 10	72-73	172-173	272-273
%THD I 3	% x 10	74-75	174-175	274-275
Date/Time *		2A94-2A95-2A96-2A97-2A98-2A99		

*** NOTE : DATE/TIME FORMAT**

Register	2A94	2A95	2A96	2A97	2A98	2A99
	Day	Month	Year	Hours	Minutes	Seconds

PARAMETER	Units	MODBUS REGISTERS HEXA-DECIMAL (longs)					
		Current			Voltage		
		L1	L2	L3	L1	L2	L3
Fundamental	A	320-321	33E-33F	35C-35D			
	V x10				37A-37B	398-399	3B6-3B7
Harmonic 2	% x10	322-323	340-341	35E-35F	37C-37D	39A-39B	3B8-3B9
Harmonic 3	% x10	324-325	342-343	360-361	37E-37F	39C-39D	3BA-3BB
Harmonic 4	% x10	326-327	344-345	362-363	380-381	39E-39F	3BC-3BD
Harmonic 5	% x10	328-329	346-347	364-365	382-383	3A0-3A1	3BE-3BF
Harmonic 6	% x10	32A-32B	348-349	366-367	384-385	3A2-3A3	3C0-3C1
Harmonic 7	% x10	32C-32D	34A-34B	368-369	386-387	3A4-3A5	3C2-3C3
Harmonic 8	% x10	32E-32F	34C-34D	36A-36B	388-389	3A6-3A7	3C4-3C5
Harmonic 9	% x10	330-331	34E-34F	36C-36D	38A-38B	3A8-3A9	3C6-3C7
Harmonic 10	% x10	332-333	350-351	36E-36F	38C-38D	3AA-3AB	3C8-3C9
Harmonic 11	% x10	334-335	352-353	370-371	38E-38F	3AC-3AD	3CA-3CB
Harmonic 12	% x10	336-337	354-355	372-373	390-391	3AE-3AF	3CC-3CD
Harmonic 13	% x10	338-339	356-357	374-375	392-393	3B0-3B1	3CE-3CF
Harmonic 14	% x10	33A-33B	358-359	376-377	394-395	3B2-3B3	3D0-3D1
Harmonic 15	% x10	33C-33D	35A-35B	378-379	396-397	3B4-3B5	3D2-3D3

EXAMPLE**QUESTION****0A 03 00 24 00 10 05 76**

0A	CVMk number, 10 in decimal
03	Reading function
00 24	Starting address (first register)
00 10	Number of registers for reading
05 76	CRC character

ANSWER**0A 03 20 00 00 00 D4 00 00 23 28 00 00 0F A0 00 00 00
00 00 00 00 00 00 00 00 00 60 00 00 01 F4 00 00 0F A0
B7 8B**

0A	CVM-BD number , 10 in decimal
03	Reading function (03 or 04).
20	Data response bytes
00 00 00 D4	Vav III (register 26 Hex) in decimal 212 V
00 00 23 28	mA av III in decimal 9000 mA
00 00 0F A0	W III in decimal 4000 W
00 00 00 00	varL III in decimal 0 varL
00 00 00 00	varC III in decimal 0 varC
00 00 00 60	PF in decimal 96 PF
00 00 01 F4	Hz in decimal 50 x 10 -> 50 Hz
00 00 0F A0	VA III in decimal 4000 mA
B7 B8	CRC character

b.- Reading of digital outputs - Function 01 :

Question : PP0100000008CRC (PP = Peripheral No.)
 Answer : PP0101XXCRC

where XX (hexadecimal byte) → translated to binary

b7	b6	b5	b4	b3	b2	b1	b0
----	----	----	----	----	----	----	----

bit **b0** = relay 1 (1 = ON ; 0 = OFF)

bit **b1** = relay 2 (1 = ON ; 0 = OFF)

c.- Writing relay parameters - Function 05 :

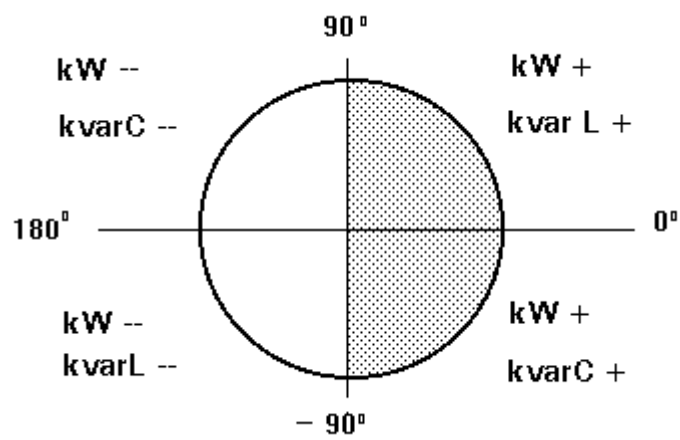
PARAMETER	FUNCTION	COMMAND
Relay 1 output	Force to OFF	NP0500000000+ <i>CRC</i>
	Force to ON	NP050000FF00+ <i>CRC</i>
Relay 1 output	Force to OFF	NP0500010000+ <i>CRC</i>
	Force to ON	NP050001FF00+ <i>CRC</i>

FUNCTION	COMMAND
Power meter reset	NP0507D0FF00+ <i>CRC</i>
Energy value deleting	NP050834FF00+ <i>CRC</i>
Power demand deleting	NP050835FF00+ <i>CRC</i>
Maximum and minimum value deleting	NP050836FF00+ <i>CRC</i>
Energy, power demand and maximum/minimum values deleting	NP050837FF00+ <i>CRC</i>

12.- APPENDIX

12.1.- Appendix A: Four quadrant measuring method in the CVM-BDM

Example of the phase difference between voltage and current	Active power kW or kW.h	Reactive power kvar or kvar. h	P. F.
30°	kW +	kvar L +	+
300°	kW +	kvar C +	--
210°	kW --	kvar L --	+
120°	kW --	kvar C --	--



12.2.- Appendix B: Second SETUP of the CVM-BDM

A second SETUP menu is accessible in order to perform the configuration of the CVM-BDM with other features different from factory-supplied ones.

To access this menu proceed as follows:

- Being the CVM-BDM powered off, simultaneously press "**display**", "**max**" and "**min**" keys.

- Holding these keys pressed, power the CVM-BDM on.

Following messages will be then shown on display:

a.- COMMUNICATION PROTOCOL : MODBUS

SET
PROT
BUS

Protocol :



MODBUS (c) (BUS) protocol

- "**display**" key: to validate the choice and pass to the next setup screen:

b.- Setting communication parameters

SET
Cdef
NO

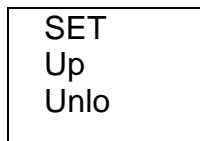
default configuration



"**max**" key to switch from NO / YES

- If YES is chosen: the configuration is set at **001 / 9600 / 8 bits / N / 1 bit**
- If NO is chosen, then following options successively appear on display:
 - n PER : Peripheral No. 001 to 255
 - Baud 1 : Baud rate 1200 – 2400 – 4800 – 9600 – 19200
 - Parity : No, even, odd
 - LEN : (length) 8 bits
 - Stop bits : 1 or 2

c.- SETUP locking or unlocking



Loc (locked SETUP) or **Unloc** (unlocked)

Use the key "**max**" to modify the choice.

- If **LOC** is set, when the SETUP is accessed configuration parameters can be then visualized but cannot be modified.
- To modify the previously set option a **4-digit password** is required to be entered (in case that this password is not correct, this blinks and the previous menu is again accessed).

CVM-BDM PASSWORD : 1234

To exit this setup mode, the key RESET can be pressed at any moment (WARNING: if the setup is exited by pressing the key RESET some latest modifications might not be saved into memory) or reach the end of this setup mode.

12.3.- Appendix C: Internal memory reading and setting procedures

12.3.1.- Description

The **CVM-BDM** is equipped with an **1Mbyte internal memory**. So, the different information recorded by the **CVM-BDM** into its on-board memory is distributed between two file types:

- **STD** file: 1 Mbyte capacity. This file contains all values which are periodically recorded (V, I, W, Hz ...).
- **EVE** file: 1 kbyte capacity. File which contains all incidents referred to the **CVM-BDM** power supply (power supply on/off)

Parameters to be recorded by the **CVM-BDM** into the STD file are user-programmable, thus, the memory autonomy will depend both on the number of parameters to be saved (up to a maximum of 130 parameters) and the recording period

The below table shows the method to calculate the memory autonomy according to the number of parameters selected to be saved:

File type	Maximum size	Register size	Register No.
*.STD	1 Mbyte	$6 + (4 * \text{Parameter No.})$	$\frac{1000000}{6 + (4 * \text{Parameter No.})}$
*.EVE	1 kbyte	6 bytes	170 Events

* The energies count like two parameters

Example of STD file length: For 20 parameters and 15-minute recording period.

$$\text{Register No.} = \frac{1000000}{6 + (4 * \text{Parameter No.})} = \frac{1000000}{6 + (4 * 20)} = 11627$$

$$\text{Length} = \frac{11627}{4} = 2906 \text{ hours} = 121 \text{ days}$$

12.3.2.- Internal memory setting for data collection purposes

The PC software permits the user to precisely set the power meter to optimize the use of its internal memory for data collection purposes.

Thus, below listed user-programmable fields can be defined to establish the recording process into the STD file:

- Recording period.
- Parameters to be saved into memory.
- Trigger conditions.

Regardless the configuration of the recording process, this will never affect the EVE file recording actions.

12.3.2.1.- Recording period

Integration period for data recording into memory of all user-selected parameters (1-240 minutes).

Values will be saved at the end of the recording period together with the time/date of the period beginning moment.

12.3.2.2.- Parameters to be saved into memory

The memory autonomy greatly depends on the number of parameters selected to be saved (up to a maximum of 130 parameters).

By means of the Power-Vision software, every discrete parameter to be saved into memory can be particularly chosen.

File type	Maximum size	Register size	Register No.
*.STD	1 Mbyte	$6 + (4 * \textit{Parameter No.})$	$\frac{1000000}{6 + (4 * \textit{Parameter No.})}$

For the right calculation of the memory autonomy, the user must take into account that every energy parameter count like two parameters, since its information fills 8 bytes instead of 4 bytes.

12.3.2.3.- Trigger

You can set certain conditions (Trigger) so that values are saved into memory only when these conditions are met.

Two types of trigger conditions are available:

1. **Level trigger:** Setting of a parameter to be used as a trigger condition, as well as its **maximum** and **minimum** range-limiting values.
2. **Time trigger (Start/ End date):** Setting of dates and times for the starting and ending actions of the recording process.

Note:

- To record values into memory, the two user-defined TRIGGER conditions must be simultaneously met, if any condition is not met, then no data will be saved into memory. If the trigger conditions are disabled, then values will be always saved into memory according the user-defined recording period.
- If the trigger conditions are simultaneously met at any moment within the selected recording period, then average values over all the period will be saved into memory.

- **LEVEL TRIGGER:**

Setting of a parameter to be used as a trigger condition, as well as its maximum and minimum range-limiting values.

- Parameter: Choice of the parameter to be used as the trigger condition for data recording actions:
Vp-p, Vp-n, A, kW, kvarL, kvarC, PF, Hz, kVA... and None.
- Maximum: Setting the maximum value to be controlled.
- Minimum: Setting the minimum value to be controlled.

Note:

- *Maximum and minimum values set are only enabled if any trigger parameter has been previously selected.*
- *Values will be saved into memory when either the instantaneous value of any of the three phases (L1, L2 or L3) or the three phase value of the selected parameter is higher than the maximum or lower than the minimum set value.*

- TIME TRIGGER:

Setting of dates and times for the starting and ending actions of the recording process

- Start: Starting date for the recording process into the STD file.
- End: Ending date for the recording process into the STD file.

Note:

- *If only START/END times are set (two dates set to zero), then the defined recording period will be daily repeated.*

**All required information about the Software operation
can be found in the CD**