

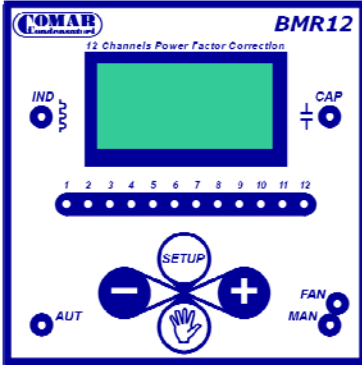
**OVERVIEW**

Please read this handbook carefully: it provides important information about safety, usage and maintenance of our product.

The BMR electronic regulator allows the control of the power factor (cosφ) on electric networks by measuring all the electrical values such as Voltage, Current, THDI(%),etc...

Using accurate diagnosis software, the regulator measures only the fundamental values by removing the harmonics components. A large LCD display allows all the data to be easily read.

Regulator operation is indicated by the LEDs on the front panel. All the user operations can be performed using the



four button keypad.

**INSTALLATION**

Mounting the regulator in a cut-out panel (138x138mm) by behind panel clamps.

The regulator is only suitable for an electrical network with a frequency of 50/60Hz through a Current Transformer placed on the phase L1 and connected between the K-L terminals.

The C.T. must measure all the currents (inductive and capacitive) to ensure correct operation.

Voltage references must be connected to lines <L2>-<L3> and the regulator power supply on terminals <S1>-<S2>;

for voltage supplies provide a fused supply in accordance with your technical standards. Connect the aux voltage to terminal <C>, which is common to the NO relay outputs, and connect the outputs 1 to 12 to control the banks of capacitors.

A volt-free contact on leads <C1>-<C2> is available to remote monitoring an alarm status or to control a cooling/fan system: for fan control, connect the included temperature probe on <P1>-<P2> leads.

**Be sure to know the harmonics characteristic of the network that must be compensated, then ensure the P.F.C. equipment or capacitors you are using are suitable for the network characteristics and, if necessary to avoid any safety problem on your equipment, adjust the THERM THDI% and OVER THDI% parameters.**

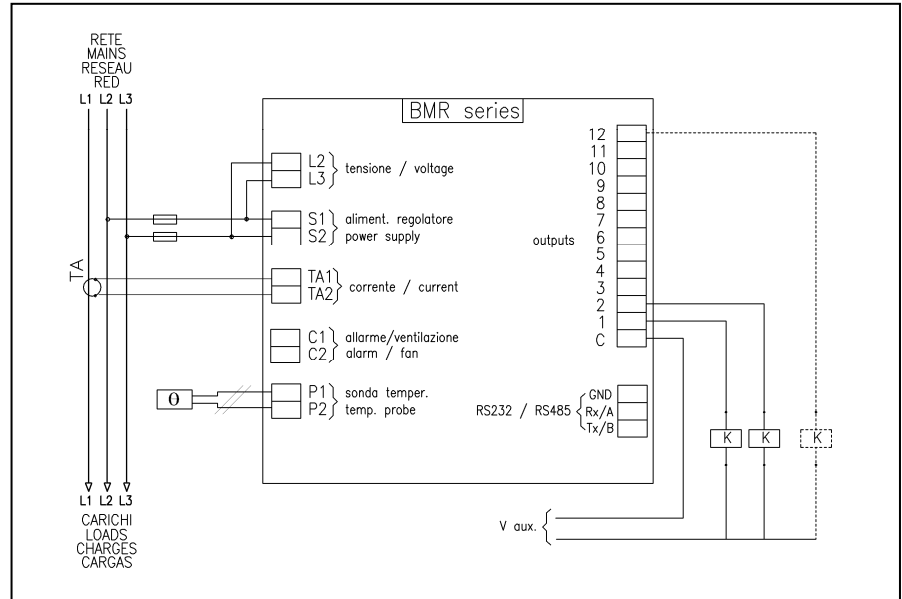
**PROGRAMMING**

The parameters can be set by two menus: a base menu ("PAR SETUP") and advanced ("MAIN SETUP"). To navigate between the setting parameters press the **SETUP** button; press **DOWN** or **UP** button to modify each parameter.

In the first menu ("PAR SETUP") the parameters to set are the minimum installation required and are shown below:  
PAR CT→SENS→OVER Temperature→THERM THD 1%→  
→OVER THD 1%→SENS THD I→SENS DOWN.

To access the basic ("PAR SETUP") menu:

- ❖ set the regulator on MANUAL mode by pressing the **MAN/AUT** button and disconnect all the banks (1)
- ❖ press and hold the **SETUP** button until to read "PAR SETUP" onto digital display (from the display page POWER FACTOR).



PAR SETUP programming parameters description:

- PAR CT** => Current Transformer ratio (eg. 1000/5).
  - SENS** => tolerance sensibility to the cosφ regulation.
  - OVER TEMP** => maximum operating temperature (°C).
  - THERM THD 1%** => THD(1)% alarm value (see also the SENS THD 1% parameter). Passing this value, in function of the SENS THD% programmed, the regulator disconnects all the steps.(2)
  - OVER THD 1%** => instantaneous THD(1)% peak alarm value. Instantaneously all the steps are disconnected.
  - SENS THD 1%** => THD(1)% alarm value time (sec.).
  - SENS DOWN** => alarm reset time delay: if set to ON, resume instantaneously the normal operations when the alarm ends; if set to OFF, resume the normal operations with a delay time equals to the SENS THD 1% value;
- To modify these parameters, press and hold the **SETUP** button and change using the **UP** or **DOWN** buttons.

(1): To switch between AUTOMATIC and MANUAL mode, press the MAN/AUT button for 5 secs.

To switch ON or OFF a bank manually, press MAN/AUT for 5 secs. (the AUT led turns off and the MAN led lights), press UP or DOWN to select the capacitors bank desired then confirm with SETUP button. To verify the status of the bank selected, the power (in kvar) appears on the display.

(2): DETAILS ON THD protection function.

The setup of the THERM THD 1% parameter is connected at the technical characteristics of the installed capacitors.

Please, check the technical details supplied by the manufacturer for the maximum harmonic current level for witch the capacitors are designed.(Ex. 50% for 60 seconds).

The internal program of the regulator records the level of current harmonic distortion in the point where is installed the C.T.

If the instantaneous THD is higher then the programmed THERM level, the instrument abates the SENS value with step 1 second. Up to reach 0, where all the steps will be disconnected steps by steps.

The re-insertion of steps will be possible only when the THD measured is less than the programmed THERM level.

The internal regulator program is able to estimate the warm up of capacitor due at harmonics and so a permanent disconnection of capacitors banks if the bad condition lasts, avoiding huntings of capacitors banks. If you wish the regulator inserts instantaneously capacitors banks when the instantaneous THD level is under the programmed THERM, you have to setup the parameter SENS DOWN on "ON".

In the menu advanced ("MAIN SETUP") you configure the compensation equipment parameters like: kvar power banks, capacitors rating voltage, switching delay, network rating frequency, type of network (single or 3-phase), alarm mode relays (NC or NO). To enter in the MAIN SETUP:

- ❖ set the regulator on MANUAL mode (you should read the PF on the display);
- ❖ disconnect all the banks, press and hold the **SETUP** button until to read PAR SETUP onto digital display: press and hold again **SETUP** until "MAIN SETUP" is displayed.

MAIN SETUP parameters description:

**POWER CAP n°** => programming of each reactive power ratio (kVar) of each bank in the position "n" showed by means display;

to set a bank in **FIX** mode (3) (always connected) set the power to "0,0" and press again **DOWN** to read "**FIX**" on the display.

**CAP VOLTAGE** => voltage ratio (V) of the capacitors banks

**CAP RC TIME** => switch delay time (sec.)

----- CAUTION -----

Contact the capacitors manufacturer before modify this value.

**ALARM RELAY** => type of output contact relay (NC, NO or FAN mode) in alarm condition.

**EXTERNAL TV** => set the Voltage Transformer (primary and secondary value) if used. PRESENT allow to program the ratio TV and/or MT values.

**LINE FREQ** => network rating frequency (50 or 60Hz).

**LINE TYPE** => network system (single or 3-phase).

**SYSTEM MODE** => measurement on 2 or 4 quadrants.

When EXTERNAL TV is enabled it's possible to connect a voltage transformer at mountain of the voltage signals. In this case it's necessary to program the reduction ratio (RATIO-TV). This means the voltage read is related to the RATIO-TV, so if this value is not correct the regulator doesn't read the right voltage.


NOTE: the default programming is for a direct voltage measure, without transformer.

In the case the volt metric signal is read at mountain of the MV transformer (as previously described) and the connection of the compensation equipment is downstream of the MV transformer, is necessary to set up the MV/LV ratio by means the parameter RATIO-MT. On this way it's possible to program the nominal LV power values of each capacitor bank at LV nominal voltage.

### (3): Explaining of the FIX step capacitor bank function.

To connect/disconnect the banks as FIX it's necessary repeat the same procedure followed to switch-on a bank in MANUAL function, note (1); and then to pass in AUTOMATIC function. On this way the regulator uses the others capacitors banks for automatic compensation forgetting the FIX batteries (previously programmed in the "MAIN SETUP"). The automatic compensation is done calculating the remaining steps not programmed as FIX banks. Using this function is possible create a mix-system AUTOMATIC and FIX compensation.

### USER INTERFACE OPERATION

After the setting procedure, the PF (cosφ) appears on the display. Besaid on the model of regulator it shows the follow the follow informations pushing the button SET UP 

#### BMR 4 and 6

Page	Menu	Display
1	<b>Power Factor</b>	PF (cosφ)
2	<b>VOLTAGE</b>	Voltage RMS
	<b>CURRENT</b>	Current RMS
3	<b>Delta Power</b>	Reactive power exceeding or necessary in function of the programmed SET COSφ

4	<b>THD I%</b>	Total Harmonic Distortion in current
	<b>Week cosφ</b>	Average PF per week
5	<b>Ifo</b>	Current at nominal frequency
	<b>Iharm</b>	Harmonic current
6	<b>SET COSφ</b>	Setup of the requested cosφ in automatic function (this parameter is adjustable only in manual function)
7	<b>THD I% MAX(3)</b>	Maximum pick distortion current
8	<b>Vrms MAX(4)</b>	Maximum value had of Voltage Vrms
	<b>Irms MAX(4)</b>	Maximum value had of Irms
9	<b>TEMP</b>	Instantaneous temperature
	<b>T MAX(4)</b>	Maximum temperature recorded
10	<b>T. START FAN</b>	It's enable the fan ventilation (it switch-on the relay dedicated at the fans)

#### BMR 8 and 12

Page	Menu	Display
1	<b>Power Factor</b>	PF (cosφ)
	<b>VOLTAGE</b>	Voltage RMS
	<b>CURRENT</b>	Current RMS
	<b>Delta Power</b>	Reactive power exceeding or necessary in function of the programmed SET COSφ
2	<b>THD I%</b>	Total Harmonic Distortion in current
	<b>Week cosφ</b>	Average PF per week
	<b>Ifo</b>	Current at nominal frequency
	<b>Iharm</b>	Harmonic current
3	<b>TEMP</b>	Instantaneous temperature
	<b>T. START FAN</b>	It's enable the fan ventilation (it switch-on the relay dedicated at the fans)
4	<b>SET COSφ</b>	Setup of the requested cosφ in automatic function (this parameter is adjustable only in manual function)
5	<b>P</b>	Active Power
	<b>Q</b>	Reactive Power
	<b>A</b>	Apparent Power
6	<b>THD I% MAX(3)</b>	Maximum pick distortion current
	<b>Vrms MAX(4)</b>	Maximum value had of Voltage Vrms
	<b>Irms MAX(4)</b>	Maximum value had of Irms
	<b>T. MAX(4)</b>	Maximum temperature recorded
7	<b>P MAX(4)</b>	Maximum value had of active power
	<b>Q MAX(4)</b>	Maximum value had of reactive power
	<b>A MAX(4)</b>	Maximum value had of apparent power

Note:if the POWER FACTOR value on the display is not stable, reverse the K-L (C.T. signal) connections.

(4): All the history measurements can be reset by pressing the **UP** and **DOWN** buttons at same time.

The display of the parameter is 30sec., after this time the regulator come back to the main display page.

During the manual control of the banks, the AUTOMATIC control is inhibited but the others control are operating (measurements and alarms). Moreover, if the voltage supply is interrupted, the bank status set in MANUAL mode is stored in a non-volatile memory: when the voltage supply is restored, the regulator switches in the memorised banks.

**ALARMS:** The output relay <C1>-<C2> (see settings of the ALARM RELAY contact), switches when any of following conditions occur:

**HIGH VOLTAGE:** the voltage measured to the <L2>-<L3> terminals exceeds the 110%Un for 15 min.; the alarm relay operates in the programmed mode disconnecting all the capacitors banks.

**LOW VOLTAGE:** the voltage supply is less than 85%Un; and the alarm relay operates in the programmed mode.

**HIGH CURRENT:** the current measured from the C.T. exceeds the 110% In. the alarm relay operates in the programmed mode.

**LOW CURRENT:** the current measured from the C.T. is less than 6%In for 5secs.: if this conditions during more than 2 min. the regulator switch OFF all the capacitors banks, and the alarm relay operates in the programmed mode.

**UNDER COMPENS:** this alarm appears when the PFC equipment does not reach the target  $\cos\phi$  for 15min; and the alarm relay operates in the programmed mode.

**OVER COMPENS:** this alarm appears when the  $\cos\phi$  is Capacitive for 2 min; the regulator switches OFF all the capacitors banks and the alarm relay operates in the programmed mode.

**HIGH THD%:** the harmonic distortion value is more than the THERM THD% value set on the PAR SETUP menu; the regulator switches OFF all the banks and the alarm relay operates in the programmed mode.

**OVER THD%:** the harmonic distortion value is over the instantaneous OVER THD% value set on the PAR SETUP menu; the regulator switches OFF all the banks and the alarm relay operates in the programmed mode.

**OVER TEMPERATURE:** the temperature measured by the probe (if connected) is over the value set in the PAR SETUP menu the regulator switches OFF all the banks and the alarm relay operates in the programmed mode.

**MAIN FAILURE:** no supply voltage or less then the minimum limit on the volt signal input gate. The ALARM relay switch-on end disconnection of all the capacitors banks (alarm displayed only in BMR8 and 12)

The normal functions resume when the alarm condition ends and the alarm relay is reset.

## MAIN FEATURES

- ABS enclosure of dimensions:
  - 144x144x57mm for BMR 8 and 12
  - 96x96x57mm for BMR 4 and 6
- Voltage supply 380V-415V ( on request 230V)
- Measuring input voltage max 525Vac
- Measuring input current by C.T. xx /5A
- Main current setting range 5A to 10000A
- Voltage/current true RMS measurement
- Current THD% distortion up to 32° harmonic
- Power factor measurement ( $\cos\phi$ )
- Measurement system based on 2 of 4 quadrants
- External voltage transformer settings
- Start ventilation temperature setting (FAN)
- Max. operating temperature for Alarm (OVERTEMP)
- Power factor setting range 0.85 Ind to 0.95 Cap
- Single step reactive power setting (kvar) 0.1 to 6000
- Switching time between steps 5 to 240s ( default 30 )
- Rating voltage capacitors setting 80 to 650V
- $\cos\phi$  visualization on fundamental voltage/current measure
- Sensibility on delay time range set
- Max. Continuous THDI set value (THERM THDI%)
- Max. Instant. THDI set value (OVER THERM THDI%)
- THDI% sensibility time delay setting
- Measurements:
  - True RMS line current and voltage
  - Fundamental current value
  - Harmonic current
  - Power factor based on RMS values
  - Current THD% value
  - Operating temperature in °C (by probe)

- Max. current/voltage measured

## TECHNICAL DATA

Operating voltage:	380-415 V c.a. + - 10%
Operating frequency:	50/60 Hz
Consumption:	5VA
Voltage input:	maximum 525V
Current input:	2.5 – 110% Ie
Power Factor range:	0.85 Ind a 0.95 Cap
Measures:	Voltage, Current, $\cos\phi$ , THDI%, Inductive, Reactive and
LCD Display:	16 characters 4 rows backlight
Led:	Relay step; MAN/AUT mode; IND/CAP; FAN
Switching banks relay:	4 (BMR4) - 6 (BMR6)- 8 (BMR8) – 12 (BMR12)
Alarm output relay:	1 (programmable)
Output contacts rating:	8A 250V (AC1), max switching 440V
Interface connector:	Standard
Operating temperature:	-20°C + 55°C
External degree protection:	IP41 ; optional IP54-IP65
Communication protocol:	MODBUS RTU – RS232 or RS485

- Active, reactive and Apparent Power (only for BMR 8 and 12)
- Difference between the operating reactive power and his setting
- Weekly power factor value (medium)
- Active/reactive power measured on 4 quadrants

## WARRANTY

Comar Condensatori s.p.a. guarantees its products for 12 months from purchase date.

Technical specifications are valid under normal operating conditions as specified in this document. We do not accept any responsibility for any misuse of the product and cannot be held liable for indirect or consequential damages.

## IMPORTANT:

**Be sure to know the harmonics characteristic of the network that must be compensated, then ensure the P.F.C. equipment or capacitors you are using are suitable for the network characteristics.**

## REFERENCES

CEE 73/23 e 93/68 (bassa tensione - low voltage)  
CEE 89/336 e 93/68 (EMC)  
EN 61000-6-1 – EN 61000-6-2  
EN 61000-6-3 – EN 61000-6-4  
EN 60335-1