

- Where the parallel connection of two (or more) loads are being controlled, one CT per load should be used, with a summing CT having a secondary current of 5 amps and a primary current of 5 + 5 Amps. In these cases, the transformer ratio will be the sum of the individual CT's. Example : nr. 3 x CT 500/5 =1500/5

**Note.** EMR regulators are able to detect automatically the current phasing of the CT. It will not be necessary to ensure correct polarity connections as with other Power Factor Regulators.

**POWER OF CONTROLLED BANKS:** the regulator works according to binary logic sequence; the switching on and off of capacitors banks always start from the first bank.

For correct operation of the automatic bank, the power ratio per bank should be:

- equal to each other (1.1.1.1.1.1.1)
- double of the previous bank (1.2.4.8.16.32)
- equal or double of the previous bank (1.1.2.2.4.4)

**NUMBER OF STEPS:** is determined by the power combination which has been used on single capacitors bank:


Examples: 6 banks in the sequence 1.1.1.1.1.1 make 6 steps  
 6 banks in the sequence 1.1.2.4.4.4 make 16 steps  
 6 banks in the sequence 1.2.4.8.16.32 make 63 steps





Note. Where the step sequence is uneven too high a number of steps will result in a high number of switching operations which will considerably reduce the life of the equipment. With the first step too high hunting may occur which again would produce excessive wear and reduced life of the components.


- NORMALLY 8-16 REGULATING STEPS IS THE BEST SOLUTION TO ADOPT

**WORKING SITUATION**

The AUTOMATIC (default condition when switching on the regulator) or MANUAL working condition are obtained



by pushing the button .


- AUTOMATIC working: this is the standard condition when switching on the regulator. When the network is inductive (motors, transformers, fluorescent lamps, ecc.), the red led  is on and the regulator begin to connect capacitors banks. If too many capacitor banks are connected, the red led  will be on and the regulator will begin to switch off banks. The preset PF value will be achieved when both Led's  and  will be off.

- MANUAL working: press button . When the regulator is in the manual mode the red Led on the button will be on. In manual mode, the regulator will not operate without an external control (both inductive and capacitive Led's are off). By pressing either the "+" or "-" buttons all banks will be connected or disconnected one step at a time. Each button must be pressed for at least 25 secs. Operating banks will be shown by the red Led's corresponding to numbers 1 - 2 - 3 ..... When a power loss occurs, all capacitor banks will be switched off automatically. When the power returns, the regulator will again insert all banks step by step.


**SETTINGS ON REGULATOR:** after making the required connections to the regulator, the following adjustments should be made. Note: In the presence of alarms, the settings mode is forbidden.




• **C/K setting**

By pressing the  button for 4 secs in AUTOMATIC mode, the "SETTING MODE" will be entered. The red led  will illuminate and, at the same time, a number (0.1÷0.5) will appear in the digital

display. To release the  button and use the "+" or "-" buttons to change the selection. The suggested value to set is given on the table "C/K VALUES" (see table on the next page). The number will represent the range (positive/negative) of the PF values possible to obtain.

• **PF setting**



After setting the C/K value, press the  button again for 4 secs to indicate the selected PF required.


At the same the red led's  and  will illuminate. To release the  button and use the "+" or "-" buttons to change the selection. A PF of 0.95 is recommended.

Example: setted C/K = "0.2" setted PF = "0.95"  
 The regulator will switch bank to achieve a PF value within 0.93 and 0.97 (0.95 ± 0.02)


The "-" led near the two numbers display is illuminate if the P.F. value is more than 1.00.  
 If the P.F. is equal 1.00 the value indicate on two numbers display is "-.00"

• **FREQUENCY setting**

After setting the P.F. value, press the  button again for 4 secs to indicate the selected FREQUENCY. The red led  will illuminate and, at the same time, a number (50) will appear in

the digital display. To leave again the  button and use the "+" or "-" buttons to regulate the value 60Hz.

**SAVING THE SET VALUES**

By pressing the  button the C/K, P.F. values and frequency which have been selected will be saved and the P.F.Regulator works in AUTOMATIC condition.

**DIGITAL DISPLAY**

It is possible to read the values of PF and the working banks on the digital display. Starting the P.F. Regulator indicates the value of P.F. ; **to read the number of working banks it need to push at the same time the buttons “+” and “-”.**

## ALARMS

- **No Supply voltage alarm:** when the voltage supply is lost, the digital display is off.
- **Min current alarm:** when the current on the amperometrical circuit is less than 500mA, the P.F. Regulator is only able to switch off the capacitor banks if the PF value is more than 1.00. The MANUAL functioning is possible. Improved the working normal conditions, the P.F. Regulator works normally. The alarm causes the visualization of charge state (  $\_000\_$  or  $\_0\_-$  ) and “EE” on the display.
- **Zero current signal (lower than 10 mA):** when the current on the amperometrical circuit is less than 10mA, the P.F. Regulator will only operate in MANUAL mode. The alarm causes the visualization of capacitive charge state (  $\_0\_-$  ) and “CA” on the display.
- **Supply interrupts:** to avoid dangerous operating condition on contactors when the supply voltage is interrupted, the EMR switches off all capacitors banks until reconnection. Micro breaks trouble on network must be solved by the client.

When alarm condition disappears, the regulator will reset itself automatically.

<b>WORKING TROUBLES AND SOLUTIONS:</b> most malfunctions are caused by incorrect connections.	
TROUBLE	SOLUTION
All banks on with a low inductive load on the network	<b>The CT is connected upstream the load but not of capacitors.</b> Connect the CT as shown in the connection diagram
Continuous switching on and off of one bank (hunting phenomena)	a) <b>The C/K value is not correct.</b> Check in the table "C/K VALUES" for the right value b) <b>The power of the first bank is too high for the selected PF requirements:</b> reduce the first bank power according to paragraphs "BANKS POWER" and "NUMBER OF STEPS" Increase the selected PF value
Displayed PF values not correct	a) <b>CT installed in the wrong phase:</b> connect to phase L1 b) <b>Wrong regulation of rated frequency</b> Read "Settings on regulator"
IND and CAP leds off	a) <b>Possible stand-by condition:</b> at least one capacitor bank on. Check the PF value of the network on the display b) <b>Possible MANUAL working condition</b> Choose the AUTOMATIC operation
CAP led is ON without capacitor banks working	a) <b>Zero current signal:</b> check the C.T. and its connection and ensure the minimum secondary current level is least 10mA. b) <b>C.T. connected on the supply cable of the PFC equipment</b> Connect according to electrical scheme at page 2. c) <b>CT installed in the wrong phase :</b> Connect to phase L1
Display off, regulator not working	a) <b>Check if supply voltage is present</b> b) <b>Check if supply voltage is equal to the rated voltage of the regulator</b>
Display on, banks Led's on but capacitors not working	a) <b>Check if supply voltage is equal to the rated voltage of the regulator</b> b) <b>Check the "0" connection on contactors</b> c) <b>Check if "220V" has been connected on "C" terminal</b> d) <b>Check the state of the tree-pole contactors</b>
Displayed "CA" on display	a) <b>Possible capacitive load condition</b> b) <b>CT installed in the wrong phase :</b> Connect to phase L1 c) <b>Zero current alarm</b>
Displayed "EE" on display	<b>Minimum current alarm</b>
Displayed " -00" on display	<b>Main P.F. equal 1,00</b>

**IF PROBLEMS PERSIST AFTER ALL ABOVE MENTIONED SOLUTIONS SWITCH OFF THE REGULATOR FOR AT LEAST 20 SECS AND THEN SWITCH ON AGAIN.  
IF THE PROBLEM IS STILL PRESENT PLEASE CALL OUR TECHNICAL DEPARTMENT**

## TECHNICAL DATA

Rated supply voltage	220-230/380-415 V a.c. $\pm$ 10% (440 Vac on request)
Rated consumption	10 VA
Rated supply current	by means of CT secondary side 5A max. (Imin. = 500mA)
Current circuit consumption	2VA
Rated frequency	50Hz - 60Hz
Output relays	5 A 250 Va.c. resistive loads
Max current on relays common circuit	5A at 40°C resistive load
Switching steps delay	25" (5" on request)
Digital display	two numbers display
Alarm delay	10" $\pm$ 1"
Digital display	three numbers display
Regulator meas. precision :	$\pm$ 2% f.s. on PF measurement (cos $\phi$ )
Display accuracy :	$\pm$ 2 digits
Mechanical dimensions	144x144 mm FRONT according to DIN43700 85mm. thickness
Plastic case	insulating self-extinguishing material
Cut out dimension	138x138 mm. ( tolerance -0mm. /+ 1mm.)

Weight 1,1 Kg  
 Protection degree IP 54 front panel - IP20 rear panel  
 Working temperature -5°C / + 50°C (indoor service)  
 Relative humidity max. 90% at 20°C  
 Altitude max. 2000 meters

C/K TABLE for medium current values of 2,5Amps

C/K (d.)		First bank power expressed in Kvar (400v)									
T.A.	K	2,5	5	6	10	12,5	20	25	40	50	
30/5	6	0.5	0.5	0.5	-	-	-	-	-	-	
50/5	10	0.4	0.3	0.4	0.5	-	-	-	-	-	
60/5	12	0.3	0.3	0.4	0.5	0.5	-	-	-	-	
80/5	16	0.2	0.3	0.3	0.5	0.5	-	-	-	-	
100/5	20	0.2	0.3	0.3	0.3	0.4	0.5	-	-	-	
150/5	30	0.2	0.2	0.3	0.3	0.3	0.5	0.5	-	-	
200/5	40	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.5	-	
250/5	50	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.5	0.5	
300/5	60	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.5	
400/5	80	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	
500/5	100	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	
600/5	120	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	
800/5	160	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	
1000/5	200	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	
1200/5	240	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	
1500/5	300	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	
2000/5	400	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	
2500/5	500	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	
3000/5	600	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	
4000/5	800	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	

- When the C.T. secondary current signal is lower than 2Amps, the C/K value should be risen of 1.
- When using the regulator on 220/230Va.c. networks the C/K values should be doubled.
- The symbol “-” means that the C.T. is too small in relationship to the power of the first bank.

**GENERAL INSTRUCTION**

Recommendations of the makers associated to the ANIE ( *Electrical and ElElectronic Companies National Association* )

- Read the instructions in this handbook because they furnish important indications about the safety of installation, use and maintenance. Take carefully this handbook for any information.
- Check the integrity of the equipment after unpacking it. In case of doubt, don't use the P.F.Corrector and ask for skilled staff.

N.B. If the equipment has fallen or has violently shaken during shipping, it could suffer internal damage, which may be dangerous.

- Before connectly the equipment, check the data card; this has to be in conformity with the network ( the alluminium card is fixed to the right side of the P.F.Corrector).
- This equipment will be assigned only to the use for which it has been specifically made. Each other use has to be considered improper and therefore dangerous.
- In order for the correct functioning of the equipment the limits of voltage, current and temperature, imposed by the CEI and IEC standards, must never be exceeded.
- The equipment has to be protected from atmosferic condition. No type of tampering is permitted on the electronic circuits of P.F.Corrector.
- Possible interventions will be performed by COMAR staff.

**WARRANTY**

Comar Condensatori S.p.A. guaranties own products for twelve months from purchase date. The warranty covers the faults of materials and manufacture and it has to be understand for goods ex-works. Before the equipment works, all instructions, present on this handbook, have to be meticulously followed. Breakdowns, caused from imprope use and/or not conformity to enclosed instructions, and faults, caused from tampering by of not qualified technicians, aren't covered. **The not respect also of a one of the precedent points make to decady the right of warranty.**

**LIABILITY**

**Comar Condensatori S.p.A. are not liable for direct or indirect damages consequent the been missing or the wrong operation.**

In any case and for any reason COMAR Condensatori S.p.A. can not be considered liable for possible direct or indirect damages, consequent the malfunctioning of P.F.Corrector, caused from mistakes of assembly or from inadequate use of the same.

Above data and dimensions are not binding and may be modified without any notice.