AUTOMATIC POWER FACTOR CONTROLLER

RPC 8BGA

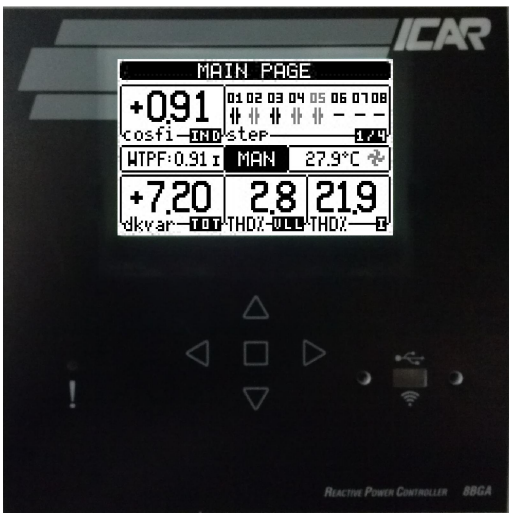
(Code A25060046411000)

GB Operating manual (full version)

WARNING!

- Carefully read the manual before the installation or use.
- This equipment is to be installed by qualified personnel, complying to current standards, to avoid damages or safety hazards.
- Before any maintenance operation on the device, remove all the voltages from measuring and supply inputs and short-circuit the CT input terminals.
- Products illustrated herein are subject to alteration and changes without prior notice.

- Technical data and descriptions in the documentation are accurate, to the best of our knowledge, but no liabilities for errors, omissions or contingencies arising there from are accepted.
- A circuit breaker must be included in the electrical installation of the building. It must be installed close by the equipment and within easy reach of the operator.
- It must be marked as the disconnecting device of the equipment: IEC /EN 61010-1 § 6.11.2.1.



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1. Introduction

The 8BGA automatic power factor controller unit has been designed to offer state-of-the-art functions for power factor compensation applications. Built with dedicated components and extremely compact, 8BGA combines the modern design of the front panel with practical installation and the possibility of expansion from the rear, where the modules with additional functions can be slotted. The LCD screen provides a clear and intuitive user interface.

2. Description

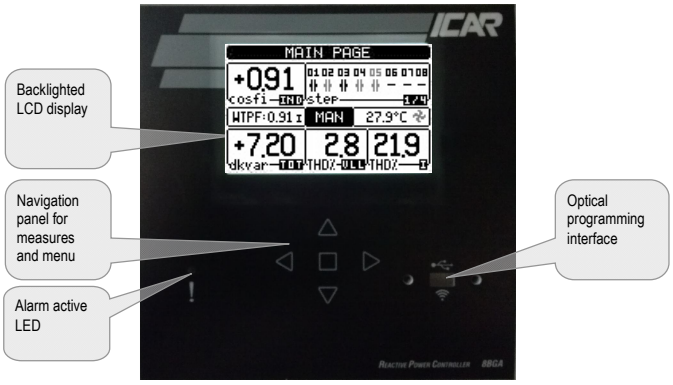
- Automatic power factor controller with 8 built-in relays for control/command of the capacitors banks, expandable to 16 relays.
- 128x80 pixel, backlit LCD screen with 4 grey levels.
- 5 navigation keys for function and settings.
- Red LED indicate alarm or abnormal status.
- 10-language text for measurements, settings and messages.
- Expansion bus with 4 slots for expansion modules:
  - RS232, RS485, USB, Ethernet, Profibus, GSM/GPRS communications interface
  - Additional digital I/O, static or relay outputs
  - Additional analog I/O for PT100 temperature, current, voltage.
- Capability to operate with several units interconnected in Master / Slave mode:
  - Maximum configuration: 1 Master + 8 slave.
  - Max 32 step total.
  - Max 16 step each unit.
  - Step can be paralleled.
- Advanced programmable I/O functions.
- Fully user-definable alarms.
- High accuracy TRMS measurement.
- 3-phase + neutral mains voltage reading inputs.
- 3-phase current reading inputs.
- Front optical programming interface: galvanically isolated, high speed, waterproof, USB and WiFi compatible.
- Calendar-clock with energy reserve.
- Memorization of last 250 events.

3. Front keyboard

Key ☐ - Used to call up the main menu and to confirm a choice.
▲ and ▼ keys - Used to scroll through the display pages or to select the list of options in a menu.
◄ key - Used to decrease a setting / selection or to exit a menu.
► key - Used to scroll through any sub-pages, or to increase a setting.

4. Front LEDs

4.1. Alarm LED (red) – Flashing, indicates an active alarm.



5. Operating modes

The currently selected mode is displayed in reverse at the center of the home page. There are three possible operating modes, listed below:

5.1. Manual mode (MAN)
- When the unit is brand new and has never been programmed, it automatically enters in MAN mode.
- When the unit is in manual mode, you can select one of the steps and manually connect or disconnect it, after necessary regulator parameters set-up
- From the home page, press ► . The step No. 1 is highlighted by a box. To select the step you want, press the ◄ and ► .
- Press ▲ or ▼ to enter to disconnect the selected step.
- If the number above step is light gray, it means that the step is not available because its reconnection time is not yet exhausted. In this case, sending a command to close the step number will flash to indicate that the operation has been confirmed and will be conducted as soon as possible.
- The manual configuration of steps is maintained even in the absence of supply voltage. When the power returns, the original state of the steps is restored.

5.2. Automatic mode (AUT)

- In automatic mode, the controller calculates the optimum configuration of capacitor steps in order to reach the set cos φ.
- The selection criteria takes into account many variables such as: the power of each step, the number of operations, the total time of use, the reconnection time etc.
- The controller displays the imminent connection or disconnection of the steps with the flashing of their identification number (above). The flashing can last in cases in which the insertion of a step is not possible due to the reconnection time (discharge time of the capacitor).
- If the number above step is light gray, it means that the step is not available because its reconnection time is not yet expired. The device then waits for the end of the reconnection time.

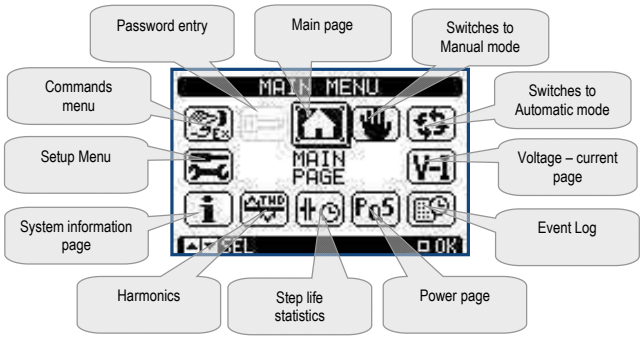
5.3. TEST Mode

- The activation and deactivation of the outputs is done as for the manual mode, but <u>without considering the reconnection time</u>.
- Once in programming and parameters are set, the unit will automatically exit the test mode.

If you need to enter TEST mode use the appropriate command in the Command menu.

6. Main menu

- The main menu is made up of a group of graphic icons (shortcuts) that allow rapid access to measurements and settings.
- Starting from normal viewing, press ☐ key. The main menu screen is displayed.
- Press ▲▼ to rotate clockwise/counter clockwise to select the required function. The selected icon is highlighted and the central part of the display shows the description of the function.
- Press ☐ to activate the selected function.
- If some functions are not available, the correspondent icon will be disabled, that is shown in a light grey colour.
- V-I etc. - Shortcuts that allow jumping to the first page of that group. Starting from that page it is still possible to move forward-backward in the usual way.
- - Switch the operation to manual or automatic mode.
- –Opens the password entry page, where it is possible to specify the numeric codes that unlock protected functions (parameter setting, commands menu).
- – Access point to the setup menu for parameter programming. See dedicated chapter.
- – Access point to the commands menu, where the authorised user can execute some clearing-restoring actions.



7. Password access

- The password is used to enable or lock the access to setting menu (setup) and to commands menu.
- For brand-new devices (factory default), the password management is disabled and the access is free. If instead the passwords have been enabled and defined, then to get access, it is necessary to enter the password first, specifying the numeric code through the keypad.
- To enable password management and to define numeric codes, see setup menu *M15 Password*.
- There are two access levels, depending on the code entered:
  - **User-Level access (Usr)** – Allows clearing of some recorded values and the editing of a restricted number of setup parameters.
  - **Advanced access level (Adv) –** Same rights of the user access plus full settings editing-restoring.
- From normal viewing, press ☐ to recall main menu, select the password icon and press ☐**.**(fig..1)
- The display shows the screen in picture (fig.2):
- Keys ▲ and ▼ change the selected digit (fig.3)
- Keys ◄ and ► move through the digits (fig.4)
- Enter all the digits of the numeric code, then move on the *key* icon.

- If the password code entered matches the *User access code (password:1000)* or the *Advanced access code (password:2000 Available value only if the controller is not installed on the ICAR cabinet)* , then the correspondent unlock message is shown.

- Once unlocked the password, the access rights last until:

  - the device is powered off.
  - the device is reset (after quitting the setup menu).
  - the timeout period of two minutes elapses without any keystroke.

- To quit the password entry screen press ☐ key.

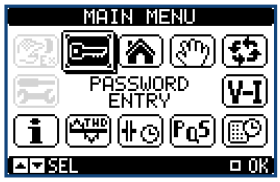


fig.1

fig.2

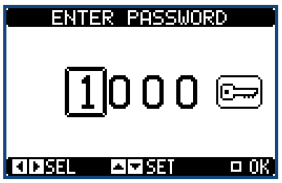


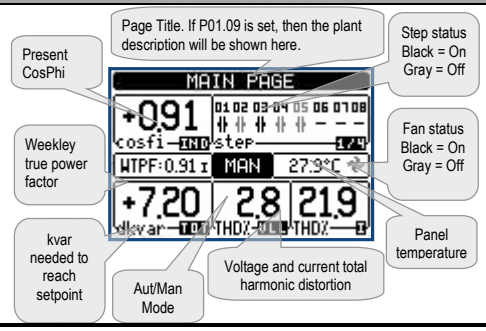
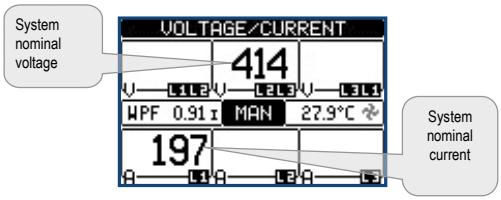
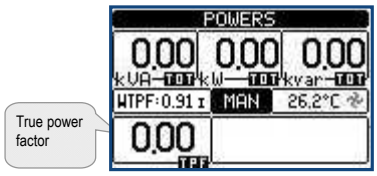
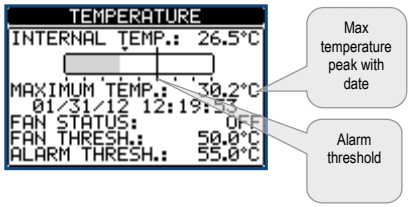
fig.3

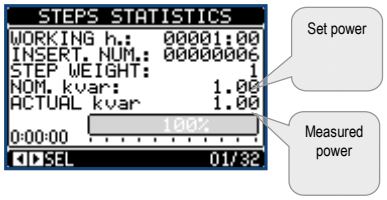
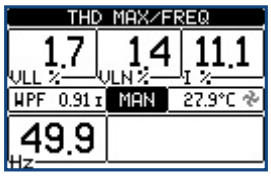
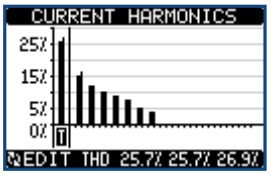
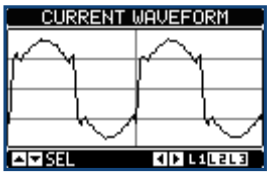
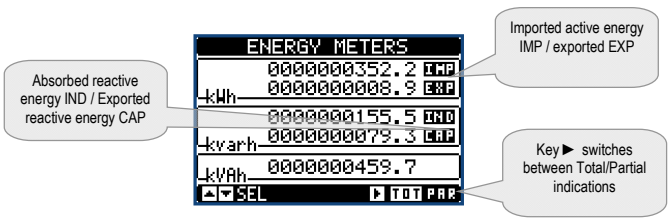
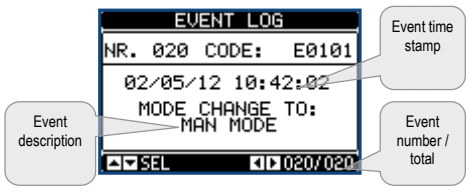
fig.4

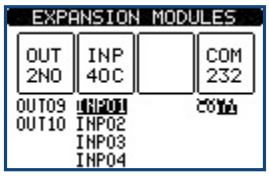
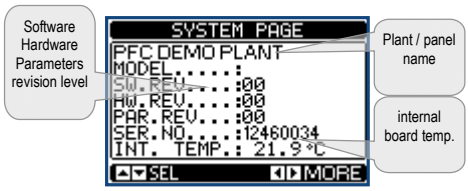
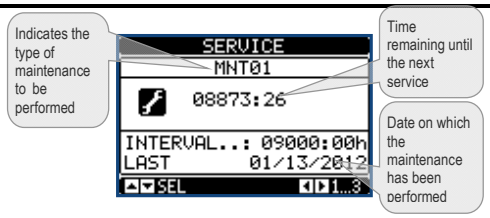
8. Display page navigation

- Keys ▲ and ▼ scroll through the measurements pages one by one. The title bar shows the current page.
- Some measurements may not be shown depending on the system programming and connections.
- Sub-pages, which can be opened with key ► , are also available on some pages (displaying voltages and currents in the form of bar graphs, for example).
- The user can specify which page and which sub-page the display should return to automatically when no keys have been pressed for a certain time.
- The system can also be programmed so the display remains were it was last.
- You can set this function in menu *M01 – Utility*.

Table of display pages

PAGES	EXAMPLE
Home page	
Push ▼	
Voltage and current	
Push ▼	
Power	
Push ▼	
Temperature	
Push ▼	

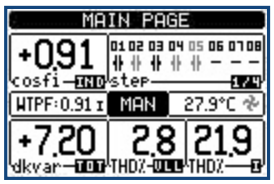
Step life statistics	
Push ▼	
Voltage/current distortion and frequency value	
Push ▼	
Harmonics (voltage and current)	
Push ▼	
Waveforms (voltage and current)	
Push ▼	
Energy meters	
Push ▼	
Event log	
Push ▼	

Expansion status	
Push ▼	
Real time clock	
Push ▼	
System info	
Push ▼	
Service	

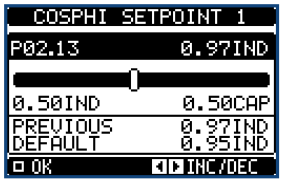
Note: Some of the pages listed above may not be displayed if the relevant function is disabled. For example, if the limit function is not programmed, the corresponding page won't be shown.

9. Target power factor set-up

To set the desired power factor from the main page



press twice the button ▲ appears the page of the setting of desired power factor:



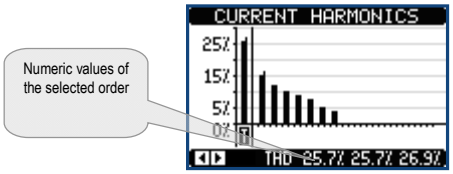
using the ◄ and ► buttons to increase or decrease the value of the desired power factor. To confirm press the ☐ button.

10. Harmonic analysis page

- In the power factor controller it is possible to enable the calculation of the FFT harmonic analysis up to the 31st order of the following measurements:

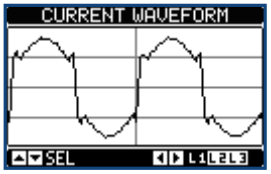
- phase-to-phase voltages
- phase-to-neutral voltages
- currents

- For each of these measurements, there is a display page that graphically represents the harmonic content (spectrum) through a bar graph.
- Every column is related to one harmonic order, even and odd. The first column shows the total harmonic distortion (THD).
- Every histogram bar is then divided into three parts, one each phase L1,L2, L3.
- The value of the harmonic content is expressed as a percentage with respect to the fundamental (system frequency).
- It is possible to show the harmonic content in numeric format, selecting the required order through ◄and►. The lower part of the screen will display a little arrow that points to the selected column, and the relative percentage value of the three phases.
- The vertical scale of the graph is automatically selected among four full-scale values, depending on the column with the highest value.



11. Waveform page

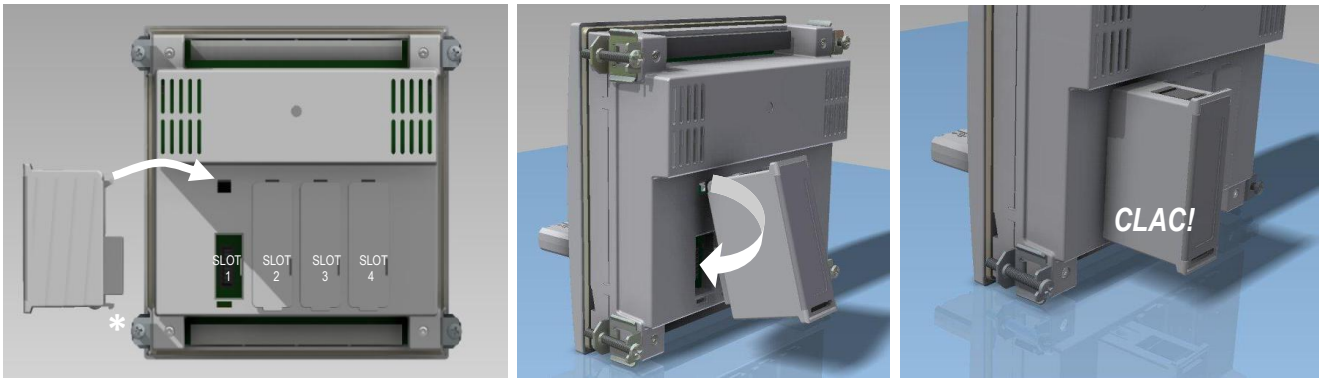
- This page graphically views the waveform of the voltage and current signals read by the power factor controller.
- It is possible to see one phase at a time, selecting it with ◄ and► key.
- The vertical scale (amplitude) is automatically scaled in order to fit the waveform on the screen in the best possible way.
- The horizontal axis (time) shows two consecutive periods referred to the fundamental frequency.
- The graph is automatically updated about every 1s.



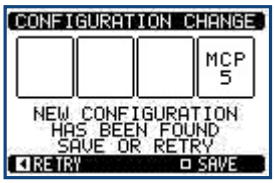
12. Expandability

- Thanks to expansion bus, the 8BGA power factor controller can be expanded with the modules (see table 1).
- It is possible to connect a maximum of 4 modules at the same time.
- The supported modules can be grouped in the following categories:
  - additional steps
  - communication modules
  - digital I/O modules
  - Analog I/O modules.

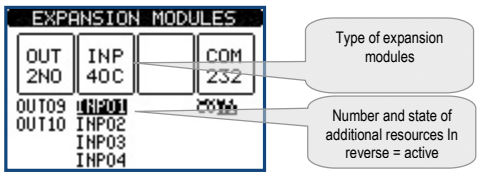
- To insert an expansion module:
  1. remove the power supply to power factor relay
  2. remove the protecting cover of one of the expansion slots
  3. insert the upper hook of the module into the fixing hole on the top of the expansion slot
  4. rotate down the module body, inserting the connector on the bus
  5. push until the bottom clip snaps into its housing.



- When the 8BGA power factor controller is powered on, it automatically recognises the modules that have been mounted.
- If the system configuration has changed with respect to the last saved, (one module has been added or removed), the base unit asks the user to confirm the new configuration. In case of confirmation, the new configuration will be saved and will become effective, otherwise the mismatch will be shown at every subsequent power-on of the system.



- The present system configuration is shown in the dedicated page of the display (expansion modules), where it is possible to see the number, the type and the status of the modules.
- The I/O numbering is shown under each module.
- The status (energised/de-energised) of every single I/O and communication channel is highlighted in reverse



NOTE: Remove any dangerous voltage and repeat the operations from step 5 to step 2 in the opposite direction. Press in the point indicated by the * in the picture in order to remove the module.

12.1. Additional resources

- The expansion modules provide additional resources that can be used through the dedicated setup menus.
- The setup menus related to the expansions are always accessible, even if the expansion modules are not physically fitted.
- Since it is possible to add more than one module of the same typology (for instance two communication interfaces), the setup menus are multiple, identified by a sequential number.
- The following table indicates how many modules of each group can be mounted at the same time. The total number of modules must be less or equal than 4.

MODULE TYPE	CODE	FUNCTION	MAX Nr.
ADDITIONAL STEPS	OUT 2NO	2 RELAY STEPS	4
	STR 4NO	4 STATIC STEPS (FAST)	2
COMMUNICATION	COM USB	USB	2
	COM 232	RS-232	2
	COM 485	RS-485	2
	WEB ETH	Ethernet	1
	COM PRO	Profibus® DP	1
	COM GSM	GSM-GPRS	1
DIGITAL I/O	INP 4OC	4 INPUTS	2
	2IN 2SO	2 INPUTS + 2 ST. OUTPUTS	4
ANALOG I/O	INP 2AN	2 ANALOG INPUTS	2
	OUT 2AN	2 ANALOG OUTPUTS	2
	MCP5	CAPACITOR HARMONIC PROTECTION	4

12.1.1. Communication

- The 8BGA power factor controller supports a maximum of 2 communication modules, indicated as COMn. The communication setup menu is thus divided into two sections (n=1 … 2) of parameters for the setting of the ports.
- The communication channels are completely independent, both for the hardware (physical interface) and for the communication protocol.
- The two channels can communicate at the same time.
- Activating the Gateway function it is possible to use a 8BGA power factor controller with both an Ethernet port and a RS485 port, that acts as a bridge over other power factor regulators equipped with RS-485 only, in order to achieve a more economic configuration (only one Ethernet port).
- In this network, the power factor controller with Ethernet port will be set with both communication channels (two among COM1, COM2) with *Gateway* function set to ON, while the other power factor relays will be configured normally with *Gateway* = OFF.

13. Inputs, outputs, internal variables, counters, analog inputs

- The inputs and outputs are identified by a code and a sequence number. For instance, the digital inputs are identified by code INPx, where x is the number of the input. In the same way, digital outputs are identified by code OUTx.
- The sequence number of I/Os is simply based on their mounting position, with a progressive numbering from left to right.
- It is possible to manage up to 4 analog inputs (AINx), connected to external analog sensors (temperature, pressure, flow etc). The value read from the sensors can be scaled to any unit of measure, visualized on the display and transmitted on the communication bus. The value read from analog inputs is shown on the dedicated display page. They can be used to drive LIMx limit thresholds, that can be linked to an internal or external output.
- The expansion I/O numbering starts from the last I/O installed on the base unit. For example, with OUT1…OUT8 digital outputs on the base unit, the first digital output on the expansion modules will be OUT9. See the following table for the I/O numbering:

COD	DESCRIPTION	BASE	EXP
INPx	Digital Inputs	-	1…8
OUTx	Digital Outputs	1…8	9…16
COMx	Communication ports	-	1…2
AINx	Analog Inputs	-	1…4
AOUx	Analog Outputs	-	1…4

- In a similar way, there are some internal bit-variables (markers) that can be associated to the outputs or combined between them. For instance, it is possible to apply some limit thresholds to the measurements done by the system (voltage, current, power, etc.). In this case, an internal variable named LIMx will be activated when the measurements will go outside the limits defined by the user through the dedicated setting menu.
- Furthermore, there are up to 8 counters (CNT1..CNT8) that can count pulses coming from an external source (through a digital input INPx) or the number of times that a certain condition as been verified. For instance, defining a limit threshold LIMx as the count source, it will be possible to count how many times one measurement has exceeded a certain limit.
- The following table groups all the I/O and the internal variables managed by the 8BGA power factor controller.

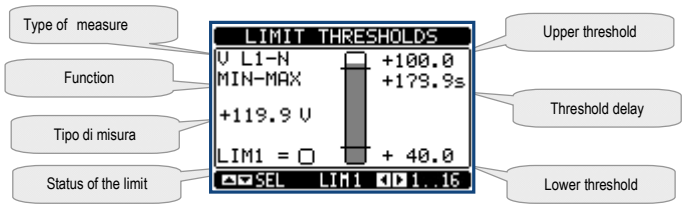
CODE	DESCRIPTION	RANGE
LIMx	Limit thresholds	1…16
REMx	Remote-controlled variables	1…16
UAx	User alarms	1…8
PULx	Energy consumption pulses	1…3
CNTx	Programmable counters	1…8

14. Limit thresholds (LIMx)

- The LIMn thresholds are internal variables whose status depends on the out-of-limits of one particular measurement set by the user (e.g. total active power higher than 25kW) among all those measured.
- To make the setting of the thresholds easier, since the limits can span in a very wide range, each of them can be set using a base number and a multiplier (for example: 25 x 1k = 25000).
- For each LIM, there are two thresholds (upper and lower). The upper threshold must always be set to a value higher than the lower threshold.
- The meaning of the thresholds depends on the following functions:

14.1. Min function: the lower threshold defines the trip point, while the upper threshold is for the resetting. The LIM trips when the selected measurement is less than the Lower threshold for the programmed delay. When the measured value becomes higher than the upper setpoint, after the set delay, the LIM status is reset.
14.2. Max function: the upper threshold defines the trip point, while the lower threshold is for the resetting. The LIM trips when the selected measurement is more than upper threshold for the programmed delay. When the measured value decreases below the lower setpoint, after the delay, the LIM status is reset.
14.3. Max+Min function: both thresholds are for tripping. When the measured value is less than lower or more than upper setpoints, then, after the respective delays, the LIM will trip. When the measured value returns within the limits, the LIM status will be immediately reset.

- Trip denotes either activation or de-activation of the LIM variable, depending on 'Normal status' setting.
- If the LIMn latch is enabled, the reset can be done only manually using the dedicated command in the commands menu.
- See setup menu M20.



15. Remote-controlled variables (REMx)

- The 8BGA power factor controller can manage up to 16 remote-controlled variables (REM1…REM16).
- Those are variables which status can be modified by the user through the communication protocol and that can be used in combination with outputs.
- Example: using a remote variable (REMx) as a source for an output (OUTx), it will be possible to freely energise or de-energise one relay through the supervision software. This allows to use the power factor relay exit relays to drive lighting or similar loads.

16. User Alarms (UAx)

- The user has the possibility to define a maximum of 8 programmable alarms (UA1…UA8).
- For each alarm, it is possible to define:
  - the *source* that is the condition that generates the alarm,
  - the *text* of the message that must appear on the screen when this condition is met.
  - The *properties* of the alarm (just like for standard alarms), that is in which way that alarms interacts with the power factor correction.
- The condition that generates the alarm can be, for instance, the overcoming of a threshold. In this case, the source will be one of the limit thresholds LIMx.
- If instead, the alarm must be displayed depending on the status of an external digital input, then the source will be an INPx.
- For every alarm, the user can define a free message that will appear on the alarm page.
- The properties of the user alarms can be defined in the same way as the normal alarms. You can choose whether a certain alarm will disconnect the steps, close the global alarm output, etc. See chapter 22.2 *Alarm properties*.
- When several alarms are active at the same time, they are displayed sequentially, and their total number is shown on the status bar.
- To reset one alarm that has been programmed with latch, use the dedicated command in the commands menu.

- For details on alarm programming and definition, refer to setup menu M26

17. Master-Slave configuration

- To further extend the flexibility of use of 8BGA power factor controller it is available the Master-Slave function, which allows, for plants with high installed power, to compose a series of panels in cascade, each with its own controller and associated capacitor banks.
- This solution allows to expand in a modular way the power factor correction system, in case it becomes necessary because of the increased needs of the plant.
- In this configuration, measurements are made only from the first controller (Master) which controls a maximum of 32 *logical* steps with commands that are then sent to all the slave units.
- The slave controllers drive their steps as indicated by the master, while performing the 'local' protections like panel or capacitor overtemperature, no-voltage release, harmonic protections etc.
- The maximum possible configuration is one master with 8 slaves.

Example 1 (application in series):
It is required to create a system with 18 step of 40kvar each, divided into three identical panels with 6 step (240kvar) each. For each panel, the 8 relay outputs of the controller are used as follows: the first six for the steps (OUT1. .6), the seventh for the cooling fan (OUT7) and the last for the alarm (OUT8). On the master panel we will define 18 logical step of 50kvar. The steps from 1 to 6 will be 'mapped' on the outputs OUT1 .. 6 of the master, those from 7 to 12 on the outputs OUT1 .. 6 of slave1 and finally the steps from 13 to 18 on the outputs OUT1 .. 6 of the slave 2. In this case, the parameter P02.07 Smallest step power *will have to be set (on the master) to 40kvar.*

Programming of the master:

PARAMETER	VALUE	DESCRIPTION
P02.07	40	40 kvar
P03.01.01...P03.18.01	1	All the 18 logic steps are 40kvar
P04.01.01…P04.06.01	Step 1…6	Outputs OUT1…OUT6 of the master are activated by logical steps 1…6.
P04.07101	Fan	OUT7 of the master controls the ventilation system
P04.08.01	All glb 1	OUT8 of the master controls global alarm 1
P05.01	COM1	COM port used for the link
P05.02	Master	Role of master
P05.03…P05.04	ON	Enables slave 1 and slave 2
P06.01.01…P06.06.01	Step 7…12	Outputs OUT1…OUT6 of slave 1 are activated by logical steps 7…12.
P06.07.01	Fan	OUT7 of slave 1 controls the ventilation system
P06.08.01	All glb 1	OUT8 of slave 1 controls global alarm 1
P07.01.01…P07.06.01	Step 13…18	Outputs OUT1…OUT6 of slave 2 are activated by logical steps 13…18.
P07.07.01	Fan	OUT7 of slave 2 controls the ventilation system
P07.08.01	All glb 1	OUT8 of slave 2 controls global alarm 1

Programming of slave 1:

P05.02	Slave1	Role: slave1

Programming of slave 2:

P05.02	Slave2	Role: slave2

Example 2 (application in parallel):
A system provides 8 logical step for 400 kvar total. The system is organized on two panels. Each panel has 8 steps of 25 kvar. The logical step are programmed as 8 banks of 50 kvar. The first step is 'mapped' on OUT1 both for the master and for slave1, same for step 2 mapped on OUT2 on the master and the slave, and so on. When step1 is activated, it will result in the activation of both the first bank of the master board (25kvar) and the first bank of the slave1 (25 kvar) for a total of 50kvar. In this case the parameter P02.07 Smallest step power *must be set (on the master) at the resulting value of 50kvar.*

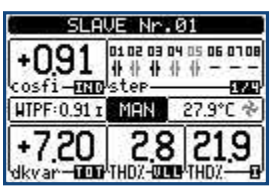
Programming of the master:

PARAMETER	VALUE	DESCRIPTION
P02.07	50	50 kvar, 25on the master and 25 on the slave for each step
P03.01.01...P03.08.01	1	All 8 logical steps are of 50kvar
P04.01.01…P04.08.01	Step 1…8	Outputs OUT1…OUT8 of the master are activated by logical steps 1…8.
P05.01	COMx	COM port used for the Master/Slave link
P05.02	Master	Role of master
P05.03	ON	Enable slave 1
P06.01.01…P06.08.01	Step 1…8	Outputs OUT1…OUT8 of the slave are activated by logical steps 1…8.

Programming of slave 1:

P05.02	Slave1	Role: slave1

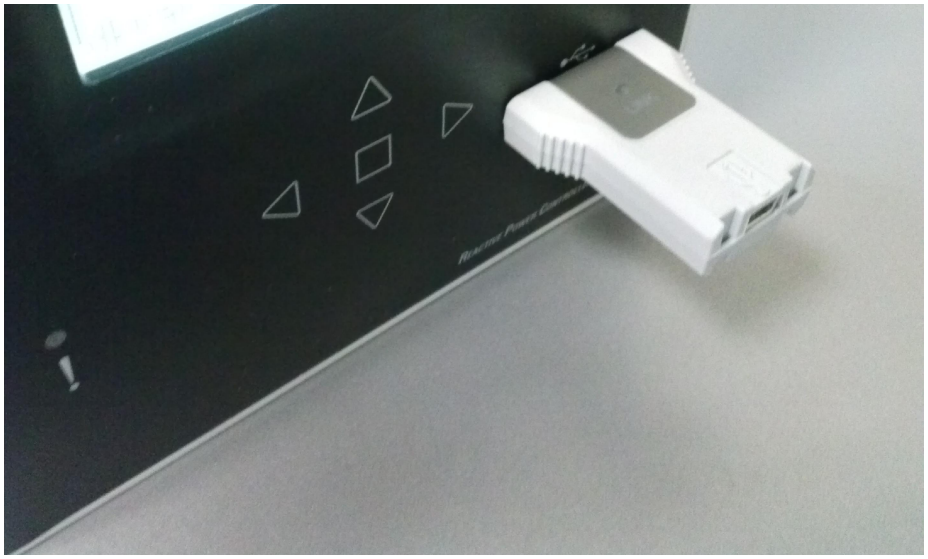
- The communication between master and slaves is via a isolated RS-485 communication module cod. COM 485 for each device. The maximum distance can reach 1000m.
- All programming is done on the master control unit: setting the type of system, the CT, the logical step and pairing step between logical and physical outputs of the master and the slave. The program is then automatically extended to the slaves.
- On the slave it is only necessary to set the slave role (with parameter P05.02).
- All parameters relating to this function are grouped in menu M05.
- If the communication between master and slave is broken, the anomalous situation is signaled by an alarm and all slave outputs are disconnected.
- To be sensitive to no-voltage release, the slaves must be connected to the line voltage, while it is not necessary to connect the current measuring inputs.
- Each slave displays the main power factor correction data sent by the master, with the state of the 32 logic steps of the entire system (in the usual window at the top right) and the states of its local output in the same window but in the pages after the page 4.



- If in the system there is an alarm that covers all the steps (eg lack of signal current, overvoltage, no-voltage release etc.) all the logical step are then disconnected that is all the outputs of both the master and the slaves.
- If instead an alarm occurs that affects only one of the panels (either a master or slave), such as temperature or harmonics protection, then only outputs that control the steps involved in the panel in alarm are de-energized, while the rest of the system continues to work, even if with a limited efficiency.
- Each alarm has a specific property called *Slave disconnection* that indicates if the alarm has implications for the entire system (property set to *General*) or only on the picture concerned (*Local*). See the table of alarms.

18. IR programming port

- The parameters of the 8BGA power factor controller can be configured through the front optical port, using the IR-USB code CX01 programming dongle, or with the IR-WiFi code CX02 dongle.
- This programming port has the following advantages:
  - You can configure and service the power factor realy without access to the rear of the power factor relay or having to open the electrical board.
  - It is galvanically isolated from the internal circuits of the power factor realy, guaranteeing the greatest safety for the operator.
  - High speed data transfer.
  - IP54 front panel.
  - Limits the possibility of unauthorized access with device config.
- Simply hold the CX dongle up to the front panel, connecting the plugs to the relevant connectors, and the device will be acknowledged as shown by the LINK LED on the programming dongle flashing green.



USB programming dongle code CX01

19. Parameter setting (setup) with PC

- You can use the *PFC Remote Monitoring* software to transfer (previously programmed) set-up parameters from the power factor realy to the hard drive of the PC and vice versa.
- The parameter may be partially transferred from the PC to the power factor controller, transferring only the parameters of the specified menus.
- The PC can be used to set parameters and also the following:
  - Info page where you can enter application information, characteristics, data, etc.

20. Parameter setting (setup) from front panel

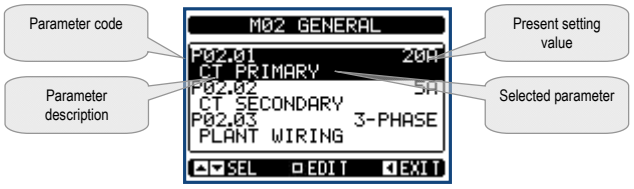
- To open the parameters programming menu (setup):
  - turn the power factor controller in **MAN** mode and disconnect all the steps
  - in normal measurements view, press □ to call up the main menu
  - select the icon. If it is disabled (displayed in grey) you must enter the password (see chapter 7. *Password access*).
  - press ☐ to open the setup menu.
- The table shown in the illustration is displayed, with the settings sub-menus of all the parameters on the basis of their function.
- Select the required menu with keys ▲ ▼ and confirm with ☐.
- Press ◄ to return to the values view.

Settings: menu selection

- The following table lists the available submenus:

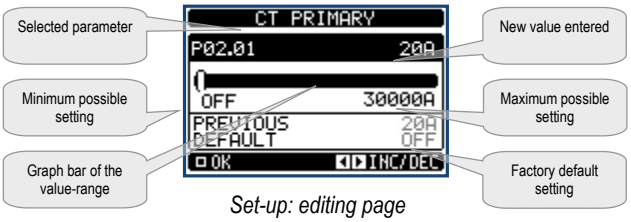
Cod	MENU	DESCRIPTION
M01	UTILITY	Language, brightness, display pages etc.
M02	GENERAL	Panel/plant data
M03	STEP	Capacitor step configuration
M04	MASTER OUTPUTS	Programmable outputs of master device
M05	MASTER / SLAVE	Device role (master or slave)
M06	SLAVE 01 OUTPUTS	Programmable outputs of slave device 01
…	…	
M13	SLAVE 08 OUTPUTS	Programmable outputs of slave device 08
M14	PROG. INPUTS	Programmable digital inputs
M15	PASSWORD	Password access management
M16	COMMUNICATION	Communication channels parameters
M17	BASE PROTECTIONS	Base protections of the panel
M18	HARMONIC PROT.	Harmonic protections (MCP5 module)
M19	MISCELLANEOUS	Various settings
M20	LIMIT THRESHOLDS	Limit thresholds on measurements
M21	COUNTERS	Generic programmable counters
M22	ANALOG INPUTS	Programmable analog inputs
M23	ANALOG OUTPUTS	Programmable analog outputs
M24	ENERGY PULSES	Pulses for energy meters increment
M25	USER ALARMS	Programmable user alarms
M26	ALARM PROPERTIES	Action caused by alarms

- Select the sub-menu and press ☐ to show the parameters.
- Each parameter is shown with code, description and actual setting value.



Set-up: parameter selection

- To modify the setting of one parameter, select it and then press ☐.
- If the Advanced level access code has not been entered, it will not be possible to enter editing page and an access denied message will be shown.
- If instead the access rights are confirmed, then the editing screen will be shown.



Set-up: editing page

- When the editing screen is displayed, the parameter setting can be modified with ◄ and ► keys. The screen shows the new setting, a graphic bar that shows the setting range, the maximum and minimum values, the previous setting and the factory default.
- Pressing ◄ + ▼ the value decreases faster, while with ▲ + ► the value grows faster.
- Pressing simultaneously ◄ + ► , the setting is set to factory default.
- During the entry of a text string, keys ▲ and ▼ are used to select the alphanumeric character while ◄ and ► are used to move the cursor along the text string. Pressing keys ▲ and ▼ simultaneously will move the character selection straight to character 'A'.
- Press ☐ to go back to the parameter selection. The entered value is stored.
- Press ◄ to save all the settings and to quit the setup menu. The controller executes a reset and returns to normal operation.
- If the user does not press any key for more than 2 minutes, the system leaves the setup automatically and goes back to normal viewing without saving the changes done on parameters.
- N.B.: a backup copy of the setup data (settings that can be modified using the keyboard) can be saved in the eeprom memory of the power factor controller. This data can be restored when necessary in the work memory. The data backup 'copy' and 'restore' commands can be found in the commands menu. (*see chapter 27. Command menu*)

21. Parameter table

- Below are listed all the programming parameters in tabular form. For each parameter are indicated the possible setting range and factory default, as well as a brief explanation of the function of the parameter. The description of the parameter shown on the display can in some cases be different from what is reported in the table because of the reduced number of characters available. The parameter code can be used however as a reference.
- **Note:** The parameters shown in the table with a shaded background are essential to the operation of the system, thus they represent the minimum programming required for operation.

M01 - UTILITY		Psw (M15)	UoM	Default	Range
P01.01	Language	Usr		English	English Italian French Spanish Portuguese German Polish Czech Russian Custom
P01.02	Set clock at system power on	Usr		OFF	OFF-ON
P01.03	LCD contrast	Usr	%	50	0-100
P01.04	Display backlight high intensity	Usr	%	100	0-100
P01.05	Display backlight low intensity	Usr	%	25	0-50
P01.06	Time to switch to low backlighting	Usr	s	180	5-600
P01.07	Return to default page	Usr	s	60	OFF / 10-600
P01.08	Default page	Usr		main	(page list)
P01.09	Plant description	Usr		(empty)	String 20 chr.

P01.01 – Select display text language.
P01.02 – Active automatic clock settings access after power-up.
P01.03 – Adjust LCD contrast.
P01.04 – Display backlight high adjustment.
P01.05 – Display backlight low adjustment.
P01.06 – Display backlight low delay.
P01.07 – Default page display restore delay when no key pressed. If set to OFF the display will always show the last page selected manually.
P01.08 – Default page displayed on power-up and after delay.
P01.09 – Free text with alphanumeric identifier name of specific panel/plant. If a description is set here, it will be shown as title of tha home page. The sme description will be used also for identification after remote reporting alarms/events via SMS/E-mail.

M02 – GENERAL		Psw (M15)	UoM	Default	Range
P02.01	CT primary	Usr	A	OFF	OFF/1-30000
P02.02	CT secondary	Usr	A	5	1 5
P02.03	Plant type	Usr		Three-ph	Three-phase Single phase
P02.04	Current reading phase	Usr		L1	L1 L2 L3 L1 L2 L3
P02.05	CT polarity	Usr		Aut	Aut Dir Rev
P02.06	Voltage reading phase	Usr		L1-L2-L3	L1-L2 L2-L3 L3-L1 L1-N L2-N L3-N L1-L2-L3 L1-L2-L3-N
P02.07	Smallest step power	Usr	kvar	1.00	0.10 – 10000
P02.08	System rated voltage	Usr	V	400	50 – 50000
P02.09	Rated frequency	Usr	Hz	Aut	Aut 50Hz 60Hz Variable
P02.10	Reconnection time	Usr	s	60	1-30000
P02.11	Sensitivity	Usr	s	60	1-1000
P02.12	Disconnection sensitivity	Usr	s	OFF	OFF / 1 – 600
P02.13	Setpoint cosphi 1 (standard)	Usr		0.95 IND	0.50 IND – 0.50 CAP
P02.14	Setpoint cosphi 2	Usr		0.95 IND	0.50 IND – 0.50 CAP
P02.15	Setpoint cosphi 3	Usr		0.95 IND	0.50 IND – 0.50 CAP
P02.16	Setpoint cosphi generating	Usr		0.95 IND	0.50 IND – 0.50 CAP
P02.17	Sepoint + clearance	Usr		0.00	0 – 0.10
P02.18	Setpoint - clearance	Usr		0.00	0 – 0.10
P02.19	Step disconnection when generating	Usr		OFF	OFF / ON
P02.20	System rated current	Usr	A	Aut	Aut / 1 – 30000

P02.22	Plant voltage type	Usr		LV	LV LV / MV MV
P02.23	VT usage	Usr		OFF	OFF ON
P02.24	VT1 primary	Usr	V	100	50-50000
P02.25	VT1 secondary	Usr	V	100	50-500
P02.26	VT2 primary	Usr	V	100	50-50000
P02.27	VT2 secondary	Usr	V	100	50-500
P02.28	Step insertion mode	Usr		Standard	Standard Linear Fast Lin.sing. OFF → ON
P02.29	Static switching delay	Usr	cycles	9	1-50
P02.30	Tanphi setpoint enable	Usr		OFF	OFF ON
P02.31	Tanphi setpoint	Usr		0.29	-1.732 - +1.732
P02.32	Sensitivity mode	Usr		Proport.	Proport. Fixed
P02.33	Setpoint Tanphi generating	Usr		0.29	-1.732 - +1.732
P02.34	Voltage/current angle correction	Usr	°	0	0-360°

P02.01 - The value of the primary current transformer. Example: with CT 800/5 set 800. If set to OFF, after the power-up the device will prompt you to set the TA and allow direct access to this parameter.
P02.02 - Value of the secondary of the current transformers. Example: with CT 800/5 set 5.
P02.03 – Plant typology Three-phase; single-phase
P02.04 - Defines on which and on how many phases the device reads the current signal. The wiring of current inputs must match the value set for this parameter. Supports all possible combinations of parameter P02.06.
P02.05 - Reading the connection polarity of the CT.
AUT = Polarity is automatically detected at power up. Can only be used when the system has no generator device.
Dir = Automatic detection disabled. Direct connection.
Rev = Automatic detection disabled. Reverse wiring.
P02.06 - Defines on which and on how many phases the device reads the voltage signal. The wiring of voltage inputs must match the setting for this parameter. Supports all possible combinations of parameter P02.04.
P02.07 - Value in kvar of the smallest step installed (equivalent to the step weight 1). Rated power of the capacitor bank provided at the rated voltage specified in P02.08 (exemple: step 10kvar-460V supplied 400V → 10 x $(400)^2/(460)^2$ → set 7,5kvar).
P02.08 – Plant rated voltage, which is delivered in specified power P02.07.
P02.09 - Working frequency of the system.
Auto = automatic selection between 50 and 60 Hz at power
50Hz = fixed at 50 Hz
60 Hz = Fixed to 60 Hz
Variable = measured continuously and adjusted.
P02.10 - Minimum time that must elapse between the disconnection of one step and the subsequent reconnection is that MAN AUT. During this time the number of the step on the main page is shown in light gray.
P02.11 - Connection sensitivity. This parameter sets the speed of reaction of the controller. With small values of P02.11 regulation is fast (more accurate around the setpoint but with more step swithchings). With high values instead we'll have slower reactions of regulation, with fewer switchings of the steps. The delay time of the reaction is inversely proportional to the request of steps to reach the setpoint: waiting time = (sensitivity / number of steps required).
Example: setting the sensitivity to 60s, if you request the insertion of one step of weight 1 are expected 60s (60/1 = 60). If instead serve a total of 4 steps will be expected 15s (60/4 = 15).
P02.12 - Disconnection sensitivity. Same as the previous parameter but related to disconnection. If set to OFF the disconnection has the same reaction time of connection set with the previous parameter.
P02.13-Setpoint (target value) of the power factor. Value In use of standard applications.
P02.14 - P02.15 - Alternative setpoints selectable with combinations of digital inputs programmed with the appropriate function.
P02.16 - Setpoint used when the system is generating active power to the supplier (with negative active power / negative power factor).
P02.17 - P02.18 - Tolerance around the setpoint. When the cosphi is within the range delimited by these parameters, in AUT mode the device does not connect / disconnect steps even if the delta-kvar is greater than the smallest step.
Note: + means "towards inductive", - means "towards capacitive".
P02.19 - If set to ON, when the system is giving active power provider (generation = active power and power factor negative) all steps are disconnected.
P02.20 - Rated current of the system. Value used for the full scale of the bar graphs and for setting the current thresholds expressed as a percentage. If set to Aut then the value of P02.01 (CT primary) is used.
P02.22 – System voltage type. Depending on the setting of this parameter, the appropriate wiring diagrams must be used. See at the end of the manual.
P02.23 .... P02.27 – Data of VTs eventually used in the wiring diagrams.
P02.28 - Selecting mode of steps insertion
Standard mode - Normal operation with free selection of the steps
Linear mode - the steps are connected in progression from left towards right only following the step number and according to the LIFO (Last In First Out) logic. The controller will not connect a step when the system steps are of different ratings and by connecting the next step, the set-point value would be exceeded.
Fast - Normal operation with free selection of the steps but with times to connect / disconnect selected at parameter P02.29.
Lin.sing. - As in the linear case, but the steps are connected one at a time.
OFF→ON – As in the Standard mode but with reduced time spent in capacitive
P02.29 - After having closed one step output, the measure acquisition is suspended for the number of periods (cycles) specified by this parameter, in order to allow the external static contactor to connect the capacitors. This function allows to avoid regulation oscillations. Set this value according to the technical characteristics (closing time) declared by the manufacturer of the static contactor.
P02.30 – Enables the setting of the setpoint as Tangent of displacement phase angle (Tanphi) instead of Cosinus (Cosphi). Used as a reference by the energy suppliers of some european countries.
P02.31 – Value of the Tanphi setpoint. Negative values of Tanphi correspond to capacitive Cosphi..
P02.32 - Time of switching on / off of the steps: Proport..: As described in parameter P02.11, Fixed: set as the parameters P02.12 and P02.11.
P02.33 - Setpoint used when the system is generating active power to the supplier (with negative active power / negative Tanphi).
P02.34 – Correction of the phase angle between voltage and current (current signal in MV and voltage signal in lv).

M03 – STEP (STPn, n=1…32)		**Psw (M15)**	**UoM**	**Default**	**Range**
P03.n.01	Step weight	Usr		OFF	OFF/ 1 – 99
P03.n.02	Step insertion type	Usr		Contactor	Contactor Static
P03.n.03	Step type	Usr		L1-L2-L3	L1-L2-L3 L1 / L2 / L3

Note: This menu is divided into 32 sections that refer to 32 possible logical steps STP1…STP32 which can be managed by the 8BGA.
P03.n.01 - Weight of step n, referred to the value of the smallest step. A number that indicates the multiple of the power of the current step with reference to the smallest set by P02.07. If set to OFF the step is disabled and will not be used.
P03.n.02 - Type device delegated the insertion step.
Contactor = Switching with electromechanical contactor. On this step the time of reconnection is used.
Static = Electronic thyristor switching. On this step the time of reconnection is not considered . Used for Fast power factor correction.
P03.n.03 – Step type. L1-L2-L3 three phase step, L1 or L2 or L3 single phase step.

M04 –MASTER OUTPUTS (OUTn, n=1…24)	**Psw (M15)**	**UoM**	**Default**	**Range**

P04.n.01	Output OUTn function	Adv		n=1…8 Step x n=9…24 OFF	See Output function table
P04.n.02	Channel number x	Adv		n=1…8 x=1…8 n=9…24 x=1	1 – 99
P04.n.03	Output normal/reversed	Adv		NOR	NOR REV

Note: This menu is divided into 24 sections that refer to 16 possible digital outputs OUT1…OUT24, which can be managed by the master 8BGA; OUT81..OUT08 on the base board and OUT09…OUT24 on any installed expansion modules.

P04.n.1 – Selects the functions of the selected output (see programmable chapter *25. Outputs functions table*).

P04.n.2 – Index associated with the function programmed in the previous parameter. Example: if the output function is set to *Step x*, and you want this output to be energized when there is the step 10 insertion, then P04.n.02 should be set to value 10 or If the output function is set to *Alarm xx*, and you want this output to be energized for alarm A31, then P04.n.02 should be set to value 31.

P04.n.3 - Sets the state of the output when the function associated with the same is inactive: **NOR** = output de-energized, **REV** = output energized.

M05 – MASTER / SLAVE		Psw (M15)	UoM	Default	Range
P05.01	Master-Slave function	Usr		OFF	OFF COM1 COM2
P05.02	Device role	Usr		Master	Master Slave01 Slave02 Slave03 … Slave08
P05.03	Slave 1 enable	Usr		OFF	OFF-ON
P05.04	Slave 2 enable	Usr		OFF	OFF-ON
P05.05	Slave 3 enable	Usr		OFF	OFF-ON
P05.06	Slave 4 enable	Usr		OFF	OFF-ON
P05.07	Slave 5 enable	Usr		OFF	OFF-ON
P05.08	Slave 6 enable	Usr		OFF	OFF-ON
P05.09	Slave 7 enable	Usr		OFF	OFF-ON
P05.10	Slave 8 enable	Usr		OFF	OFF-ON

P05.01 - Defines whether the system is used in master-slave configuration or not. OFF the system works with a single controller (normal configuration). If you set COM1 or COM2, working in master mode and slave setting indicates which communication channel is used for communication between controllers.

P05.02 - Defines whether the current device is a master or a slave, and in this case, which is his number.

P05.03… P05.10 - Enables the operation of individual slaves.

M06 – SLAVE 01 OUTPUTS (n=1…16)		Psw (M15)	UoM	Default	Range
P06.n.01	Output OUTn function	Usr		n=1…8 Step x n=9…16 OFF	See Output function table
P06.n.02	Channel number x	Usr		n=1…8 x=1…8 n=9…16 x=1	1 – 99
P06.n.03	Output normal/reversed	Usr		NOR	NOR REV

Note: This menu is divided into 16 sections that refer to 16 possible digital outputs OUT1…OUT16, which can be managed by the 8BGA slave 2; OUT81..OUT08 on the base board and OUT09…OUT16 on any installed expansion modules.

P06.n.1 – Selects the functions of the selected output (see programmable outputs functions table).

P06.n.2 – Index associated with the function programmed in the previous parameter. Example: if the output function is set to *Step x*, and you want this output to be energized when there is the step 10 insertion, then P04.n.02 should be set to value 10 or If the output function is set to *Alarm xx*, and you want this output to be energized for alarm A31, then P04.n.02 should be set to value 31.

P06.n.3 - Sets the state of the output when the function associated with the same is inactive: **NOR** = output de-energized, **REV** = output energized.

M07 – SLAVE 02 OUTPUTS (n=1…16)		Psw (M15)	UoM	Default	Range
P07.n.01	Output OUTn function	Usr		n=1…8 Step x n=9…16 OFF	See Output function table
P07.n.02	Channel number x	Usr		n=1…8 x=1…8 n=9…16 x=1	1 – 99
P07.n.03	Output normal/reversed	Usr		NOR	NOR REV

See above, referred to slave 02

M13 – SLAVE 08 OUTPUTS (n=1…16)		Psw (M15)	UoM	Default	Range
P13.n.01	Output OUTn function	Usr		n=1…8 Step x n=9…16 OFF	See Output function table
P13.n.02	Channel number x	Usr		n=1…8 x=1…8 n=9…16 x=1	1 – 99
P13.n.03	Output normal/reversed	Usr		NOR	NOR REV

See above, referred to slave 08

M14- PROGRAMMABLE INPUTS (INPn, n=1…8)		Psw (M15)	UoM	Default	Range
P14.n.01	INPn input function	Adv		OFF	(see Input functions table)
P14.n.02	Function index (x)	Adv		OFF	OFF / 1…99
P14.n.03	Contact type	Adv		NO	NO/NC
P14.n.04	Delay ON	Adv	s	0.05	0.00-600.00
P14.n.05	Delay OFF	Adv	s	0.05	0.00-600.00

Note: This menu is divided into 8 sections that refer to 8 possible digital inputs
P14.n.01 – Selects the functions of the selected input (see chapter *24. Porgrammable inputs functions table*).
P14.n.02 – Index associated with the function programmed in the previous parameter. Example: If the input function is set to *Cxx commands menu execution*, and you want this input to perform command C.07 in the commands menu, P14.n.02 should be set to value 7.
P14.n.03 – Select type of contact: NO (Normally Open) or NC (Normally Closed).
P14.n.04 – Contact closing delay for selected input.
P14.n.05 – Contact opening delay for selected input.

M15 – PASSWORD		UoM	Default	Range
P15.01	Enable password		OFF	OFF-ON
P15.02	User level password		1000	0-9999
P15.03	Advanced level password		2000(*)	0-9999
P15.04	Remote access password		OFF	OFF/1-9999

P15.01 – If set to OFF, password management is disabled and anyone has access to the settings and commands menu.
P15.02 – With P15.01 enabled, this is the value to specify for activating user level access. See Password access chapter.
P15.03 – As for P15.02, with reference to Advanced level access.
P15.04 – If set to a numeric value, this becomes the code to specify via serial communication before sending commands from a remote control.
(*) Available value only if the controller is not installed on the ICAR cabinet

M16 –COMMUNICATION (COMn,n=1…2)		Psw (M15)	UoM	Default	Range
P16.n.01	Node serial address	Usr		01	01-255
P16.n.02	Serial speed	Usr	bps	9600	1200-2400-4800-9600-19200-38400-57600-115200
P16.n.03	Data format	Usr		8 bit – n	8 bit, no parity 8 bit, odd 8bit, even 7 bit, odd 7 bit, even
P16.n.04	Stop bits	Usr		1	1-2
P16.n.05	Protocol	Usr		(various)	Modbus RTU Modbus ASCII Modbus TCP
P16.n.06	IP address	Usr		192.168.1.1	000.000.000.000 – 255.255.255.255
P16.n.07	Subnet mask	Usr		255.255.255.0	000.000.000.000 – 255.255.255.255
P16.n.08	IP port	Usr		1001	0-9999
P16.n.09	Channel function	Usr		Slave	Slave Gateway Mirror
P16.n.10	Client/server	Usr		Server	Client Server
P16.n.11	Remote IP address	Usr		000.000.000.000	000.000.000.000-255.255.255.255
P16.n.12	Remote IP port	Usr		1001	0-9999
P16.n.13	IP gateway address	Usr		000.000.000.000	000.000.000.000-255.255.255.255

Note: this menu is divided into 2 sections for communication channels COM1..2.
The front IR communication port has fixed communication parameters, so no setup menu is required.
P16.n.01 – Serial (node) address of the communication protocol.
P16.n.02 – Communication port transmission speed.
P16.n.03 – Data format. 7 bit settings can only be used for ASCII protocol.
P16.n.04 – Stop bit number.
P16.n.05 – Select communication protocol.
P16.n.06, P16.n.07, P16.n.08 – TCP-IP coordinates for applications with Ethernet interface. Not used with other types of communication modules.
P16.n.09- Role of the communication channel. **Slave**=Slave Modbus. **Gateway**=Bridge between Ethernet and serial ports. **Mirror**=Remote panel mirror (reserved/function not operative yet)
P16.n.10- Enabling TCP-IP connection. **Server**=Awaits connection from a remote client. **Client**=Establishes a connection to the remote server.
P16.n.11...P16.n.13- Coordinates for the connection to remote server when P16.n.10 is set to Client.

M17 – BASIC PROTECTIONS		Psw (M15)	UoM	Default	Range
P17.01	Temperature unit of measure	Adv		°C	°C °F
P17.02	Panel interior temperature measurement source	Adv		Internal sensor	Internal sensor AINx NTCx
P17.03	Channel nr. (x)	Adv		1	1-99
P17.04	Fan start temperature	Adv	°C/°F	25	0-212
P17.05	Fan stop temperature	Adv	°C/°F	20	0-212
P17.06	Panel interior temperature alarm threshold	Adv	°C/°F	55	0-212
P17.07	Capacitor current overload	Adv		ON	OFF ON
P17.08	Capacitor current overload threshold	Adv	%	50	OFF / 0 – 150

P17.09	Immediate step disconnection threshold	Adv	%	83	OFF / 0 – 200
P17.10	Current overload alarm reset time	Adv	min	15	1 – 30
P17.11	Step trimming	Adv		ON	OFF / ON
P17.13	Maximum voltage threshold	Adv	%	110	OFF / 90...150
P17.14	Minimum voltage threshold	Adv	%	90	OFF / 60..110

P17.01 – Temperature unit: °C Celsius; °F Fahrenheit
P17.02 - Defines which sensor is providing the measure of the temperature inside the panel:
Internal sensor - Sensor built into the controller.
AINx - Temperature of PT100 expansion module with analog inputs.
NTCx - Temperature by NTC expansion module protection harmonics.
P17.03 – Channel number (x), relative to the previous parameter.
P17.04 - P17.05 - Start and stop temperature for the cooling fan of the panel, expressed in the unit set by P17.01.
P17.06 - Threshold for generation of alarm *A07 Panel temperature too high* .
P17.07 - Enables the measurement of the capacitor current overload, calculated from the waveform of the applied voltage. **Note**: You can use this protection only if the capacitors are not equipped with filtering devices such as inductors or similar.
P17.08 – Trip threshold for the capacitors overload protection (alarm A08), that will arise after a integral delay time, inversely proportional to the value of the overload.
P17.09 - Threshold beyond which the integral delay for tripping of the overload alarm is zeroed, causing the immediate intervention of the A08 alarm.
P17.10 - Delay time for the resetting of overload alarm.
P17.11 - Enables the measurement of the actual power of the step, performed each time they are switched in. The measure is calculated, as the current measurement is referred to the whole load of the plant. The measured power of the steps is adjusted (trimmed) after each switching and is displayed on the *step life statistic* page.
P17.13 - Maximum voltage alarm threshold, referred to the rated voltage set with P02.08, beyond which the alarm *A06 Voltage too high* is generated.
P17.14 - Undervoltage alarm threshold, referred to the rated voltage set with P02.08, below which the alarm *A05 voltage too low* is generated.

M18 – HARMONIC PROTECTION (HARn, n=1…4)		Psw (M15)	UoM	Default	Range
P18.n.01	CT primary	Adv	A	600	1 - 30000
P18.n.02	CT secondary	Adv	A	5	1-5
P18.n.03	CT wiring	Adv		2 Aron	2 Aron 1 bilanciato
P18.n.04	Nominal current	Adv	A	434	1 - 30000
P18.n.05	CT positioning	Adv		Global	Global Step 1 Step 2 …. Step 8
P18.n.06	Current limit	Adv	%	130	OFF / 100 - 200
P18.n.07	Current THD Limit	Adv	%	40	OFF / 1 – 100
P18.n.08	5rd Harmonic limit	Adv	%	OFF	OFF / 1 – 100
P18.n.09	7th Harmonic limit	Adv	%	OFF	OFF / 1 – 100
P18.n.10	11th Harmonic limit	Adv	%	OFF	OFF / 1 – 100
P18.n.11	13th Harmonic limit	Adv	%	OFF	OFF / 1 – 100
P18.n.12	Temperature alarm threshold 1	Adv	°	OFF	0-212
P18.n.13	Temperature alarm threshold 2	Adv	°	OFF	0-212

Note: Parameters in this menu are referred to protections that are available only when using the harmonic protection module MCP5.
P18.n.01 - P18.n.02 - Primary and secondary of the CT used for current measurement in power factor correction panel and connected to the harmonics protection module.
P18.n.03 - Current measurement wiring mode:
2 in Aron - Reading of three currents (three-phase) with two CT in Aron configuration.
1 balanced - Reading a single current from a single CT.
P18.n.04 - Rated current flowing in the power factor correction branch under normal conditions.
P18.n.05 - branch of the circuit where are located the CT for harmonic protection measure.
P18.n.06 - Max current threshold in the power factor correction branch, used for generation of alarm A11.
P18.n.07 - Current THD maximum threshold in the branch of power factor correction. Used for generation of alarm A12.
P18.n.08 - Threshold 5th harmonic content in the branch of power factor correction. Used for generation of alarm A13.
P18.n.09 - Threshold 7th harmonic content in the branch of power factor correction. Used for generation of alarm A14.
P18.n.10 - Threshold 11th harmonic content in the branch of power factor correction. Used for generation of alarm A15.
P18.n.11 - Threshold 13th harmonic content in the branch of power factor correction. Used for generation of alarm A16.
P18.n.12 - P18.n.13 - Maximum temperature thresholds 1 and 2 on the sensors connected to the harmonics protection module. Used to generate alerms A17 and A18.

M19 - MISCELLANEOUS		Psw (M15)	UoM	Default	Range
P19.01	Step disconnection passing in MAN mode	Usr		OFF	OFF/ON
P19.02	Maintenace interval 1	Adv	h	9000 2160 (*)	OFF/30000
P19.03	Count maintenance interval 1	Adv		Always	Always Step inserted
P19.04	Maintenace interval 2	Adv	h	9000 8760 (*)	OFF/30000
P19.05	Count maintenance interval 2	Adv		Step ins.	Always Step inserted
P19.06	Maintenace interval 3	Adv	h	9000 26280 (*)	OFF/30000
P19.07	Count maintenance interval 3	Adv		Step ins.	Always Step inserted
P19.08	Maintenance step insertion number	Adv	kcnt	120xxx	OFF / 1000…200000

P19.01 - If set to ON, when switching from AUT mode to MAN mode, steps are disconnected in sequence.
P19.02- Time interval after which it is necessary to perform maintenance.
P19.03 – If set to "Always" will count the time in which the controller 8BGA stay lit when set to "Step inserted " count the time in which a pleasant step is inserted.
P19.04-P19.06 – See P19.02
P19.05-P19.07 – See P19.03
P19.08 - It defines the number of operations of the steps (considering the step that has the highest count) beyond which the *A23 Contactor Maintenace alarm* is generated.

(*) If the controller is installed on the ICAR cabinet

M20 – LIMIT THRESHOLDS (LIMn,n=1…16)		Psw (M15)	UoM	Default	Range
P20.n.01	Reference measurement	Usr		OFF	OFF- (misure)
P20.n.02	Channel nr. (x)	Usr		1	OFF / 1-99
P20.n.03	Function	Usr		Max	Max – Min – Min+Max

P20.n.04	Upper threshold	Usr		0	-9999 - +9999
P20.n.05	Multiplier	Usr		x1	/100 – x10k
P20.n.06	Delay	Usr	s	0	0.0 – 600.0
P20.n.07	Lower threshold	Usr		0	-9999 - +9999
P20.n.08	Multiplier	Usr		x1	/100 – x10k
P20.n.09	Delay	Usr	s	0	0.0 – 600.0
P20.n.10	Idle state	Usr		OFF	OFF-ON
P20.n.11	Memeory	Usr		OFF	OFF-ON

Note: this menu is divided into 16 sections for the limit thresholds LIM1..16
P20.n.01 – Defines to which power factor controller measurements the limit threshold applies.
P20.n.02 – If the reference measurement is an internal multichannel measurement (AINx for example), the channel is defined.
P20.n.03 – Defines the operating mode of the limit threshold. **Max** = LIMn enabled when the measurement exceeds P20.n.04. P20.n.07 is the reset threshold. **Min** = LIMn enabled when the measurement is less than P20.n.07. P20.n.04 is the reset threshold. **Min+Max** = LIMn enabled when the measurement is greater than P20.n.04 or less than P20.n.07.
P20.n.04 and **P20.n.05 -** Define the upper threshold, obtained by multiplying value P20.n.04 by P20.n.05.
P20.n.06 - Upper threshold intervention delay.
P20.n.07, P08.n.08, P08.n.09 - As above, with reference to the lower threshold.
P20.n.10 - Inverts the state of limit LIMn.
P20.n.11 - Defines whether the threshold remains memorized and is reset manually through command menu (ON) or if it is reset automatically (OFF).

M21 – COUNTERS (CNTn,n=1…8)		Psw (M15)	UoM	Default	Range
P21.n.01	Count source	Usr		OFF	OFF-ON-INPx-OUTx-LIMx-REMx
P21.n.02	Channel number (x)	Usr		1	1-8
P21.n.03	Multiplier	Usr		1	1-1000
P21.n.04	Divisor	Usr		1	1-1000
P21.n.05	Description of the counter	Usr		CNTn	(Text – 16 characters)
P21.n.06	Unit of measurement	Usr		Umn	(Text – 6 characters)
P21.n.07	Reset source	Usr		OFF	OFF-ON-INPx-OUTx-LIMx-REMx
P21.n.08	Channel number (x)	Usr		1	1-8

Note: this menu is divided into 8 sections for counters CNT1..8
P21.n.01 - Signal that increments the count (on the output side). This may be the start-up of the 8BGA (ON), when a threshold is exceeded (LIMx), an external input is enabled (INPx), etc.
P21.n.02 - Channel number x with reference to the previous parameter.
P21.n.03 - Multiplier K. The counted pulses are multiplied by this value before being displayed.
P21.n.04 - Divisional K. The counted pulses are divided by this value before being displayed. If other than 1, the counter is displayed with 2 decimal points.
P21.n.05 - Counter description. 16-character free text.
P21.n.06 - Counter unit of measurement. 6-character free text.
P21.n.07 - Signal that resets the count. As long as this signal is enabled, the count remains zero.
P21.n.08 - Channel number x with reference to the previous parameter.

M22 – ANALOG INPUTS (AINn,n=1..4)		Psw (M15)	UoM	Default	Range
P22.n.01	Input type	Usr		OFF	OFF 0..20mA 4….20mA 0…10V -5V…+5V PT100
P22.n.02	Start of scale value	Usr		0	-9999 - +9999
P22.n.03	Multiplier	Usr		x1	/100 – x1k
P22.n.04	End of scale value	Usr		100	-9999 - +9999
P22.n.05	Multiplier	Usr		x1	/100 – x1k
P22.n.06	Description	Usr		AINn	(Testo – 16 caratteri)
P22.n.07	Unit of measurement	Usr		UMn	(Testo – 6 caratteri)

Note: this menu is divided into 4 sections for the analog inputs AIN1…AIN4, available with the INP 2AN expansion modules.
P22.n.01 - Specifies the type of sensor connected to analog input. The sensor should be connected to the appropriate terminal for the type selected. See input module manual.
P22.n.02 and P22.n.03 - Define the value to display for a min. sensor signal, in other words at the start of the range defined by the type (0mA, 4mA, 0V, -5V, etc.). Note: these parameters aren't used for a type PT100 sensor.
P22.n.04 and P22.n.05 - Define the value to display for a max. sensor signal, in other words at the end of scale of the range defined by the type (20ma, 10V, +5V, etc.). These parameters aren't used for a type PT100 sensor.
P22.n.06 - Description of measurements associated with analog input. 16-character free text.
P22.n.07 - Unit of measurement. 6-character free text. If the input is type PT100 and the text of the unit of measurement is *°F*, the temperature will be displayed in degrees Fahrenheit, otherwise it will be in degrees Celsius.

Example of application: The analog input AIN3 must read a 4…20mA signal from an electronic level sensor, that will have to be shown on the display with the descriprion 'Reserve fuel tank level', with a full scale of 1500 litres.
So, we must program section 3 of this menu, that is referred to AIN3.
P22.3.01 = 4…20mA
P22.3.02 = 0
P22.3.04 = 1500
P22.3.05 = x1
P22.3.06 = 'Reserve tank level'
P22.3.07 =' litres'

M23 – ANALOG OUTPUTS (AOUn,n=1..4)		Psw (M15)	UoM	Default	Range
P23.n.01	Output type	Usr		OFF	OFF 0..20mA 4….20mA 0…10V -5V…+5V
P23.n.02	Reference measurement	Usr		OFF	OFF- (misure)
P23.n.03	Channel number (x)	Usr		1	OFF / 1-99
P23.n.04	Start of scale value	Usr		0	-9999 - +9999
P23.n.05	Multiplier	Usr		x1	/100 – x10k
P23.n.06	End of scale value	Usr		0	-9999 - +9999
P23.n.07	Multiplier	Usr		x1	/100 – x10k

Note: this menu is divided into 4 sections for the analog outputs AOU1...AOU4
available with OUT 2AN expansion modules
P23.n.01 - Specifies the type of output analog signal. The sensor should be connected to the appropriate terminal on the basis of the type selected. See analog output module manual.
P23.n.02 - Measurement on which the analog output value depends.
P23.n.03 – If the reference measurement is an internal multichannel measurement (AINx for example), the channel is defined.
P23.n.04 and **P23.n.05** - Define the value of the measurement that corresponds to a min. output value in the range (0mA, 4mA, 0V, -5V, etc.).
P23.n.06 and **P23.n.07** - Define the value of the measurement that corresponds to a max. value in the range (20ma, 10V, +5V, etc.).

Application example: The analog output AOU2 must emit a 0..20mA signal proportional to tha total active power, form 0 to 500kW.
So, we must program section 2 of this menu, that is referred to AOU2.
P23.2.01 = 0…20mA
P23.2.02 = kW tot
P23.2.03 = 1 (not used)
P23.2.04 = 0
P23.2.05 = x1
P23.2.06 = 500
P23.2.07 = x1k

M24 – PULSES (PULn, n=1…6)		Psw (M15)	UoM	Default	Range
P24.n.01	Pulse source	Usr		OFF	OFF-Kwh-kvarh-kVAh
P24.n.02	Counting unit	Usr		100	10/100/1k/10k
P24.n.03	Pulse duration	Usr	s	0.1	0.1-1.00

Note: this menu is divided into 6 sections, for the generation of energy consumption pulse variables PUL1…PUL6.
P24.n.01 - Defines which energy meter should generate the pulse of the 6 possible meters managed by the 8BGA. **kWh =** Active energy. **Kvarh** = Reactive energy. **kVAh** = Apparent energy.
P24.n.02 - The quantity of energy which must accumulate for a pulse to be emitted (for example 10Wh, 100Wh, 1kWh, etc.).
P24.n.03 = Pulse duration.

Application example: For every 0,1 kWhoutput by generator, a pulse of 100ms ha sto be generated on output OUT10.
First of all we should generate an internal pulse variable, forinstance PUL1. So we must program section 1 of this menu as follows:
P24.1.01 = kWh G (active energy)
P24.1.02 = 100Wh (correspond to 0,1 kWh)
P24.1.03 = 0,5
Now we must set output OUT10 and link it to PUL1:
P04.10.01 = PULx
P04.10.02 = 1 (PUL1)
P04.10.03 = NOR

M25 – USER ALARMS (UAn, n=1…8)		Psw (M15)	UoM	Default	Range
P25.n.01	Alarm source	Usr		OFF	OFF-INPx-OUTx-LIMx-REMx
P25.n.02	Channel number (x)	Usr		1	1-8
P25.n.03	Text	Usr		UAn	(testo – 20 char)

Note: this menu is divided into 8 sections for user alarms UA1...UA8
P25.n.01 - Defines the digital input or internal variable that generates the user alarm when it is activated.
P25.n.02 - Channel number x with reference to the previous parameter.
P25.n.03 - Free text that appears in the alarm window.

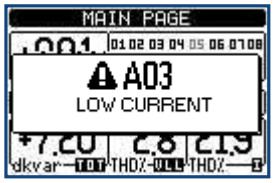
Example of application: User alarm UA3 must be generated by the closing of input INP5, and must display the message 'Panel door open'.
In this case, set the section of menu 3 (for alarm UA3):
P25.3.01 = INPx
P25.3.02 = 5
P25.3.03 = 'Door open'

M26 – ALARM PROPERTIES (ALAn, n=1…xxxx)		Psw (M15)	Default	Range
P26.n.01	Alarm enable	Adv	(see table)	OFF – ON
P26.n.02	Retnitive	Adv	(see table)	OFF - RIT
P26.n.03	Operating mode	Adv	(see table)	AUT-MAN AUT
P26.n.04	Global alarm 1	Adv	(see table)	OFF – GLB1
P26.n.05	Global alarm 2	Adv	(see table)	OFF – GLB2
P26.n.06	Global alarm 3	Adv	(see table)	OFF – GLB3
P26.n.07	Step disconnection	Adv	(see table)	OFF IMMEDIATE SLOW
P26.n.08	Slave disconnection mode	Adv	(see table)	GENERAL - LOCAL
P26.n.09	Inhibition from input	Adv	(see table)	OFF - ON
P26.n.10	Modem call	Adv	(see table)	OFF - MDM
P26.n.11	Not shown on LCD	Adv	(see table)	OFF - NOLCD
P26.n.12	Alarm delay	Adv	(see table)	OFF/ 1-120
P26.n.13	Delay UoM	Adv	(see table)	MIN-SEC

P26.n.01 - **Alarm enabled** - General enabling of the alarm. If the alarm isn't enabled, it's as if it doesn't exist.
P26.n.02 - **Retained alarm** - Remains in the memory even if the cause of the alarm has been eliminated.
P26.n.03 - Operating mode – Operating modes where the alarm can be generated.
Global alarm 1 -2 -3 - Activates the output assigned to this function.ù
P26.n.04-05-06 - Step disconnection mode – Defines whether and how the capacitor steps must be disconnected when the alarm is present. OFF = no disconnection, SLOW = gradual disconnection, FAST = Immediate disconnection.
P26.n.08 - Slave disconnection mode – Defines, for Master-Slave applications, if when this alarm arises, the disconnection is extended to all the step of the system (GENERAL) or only to the output of the interested panel (LOCAL).
P26.n.09 - Inhibition - The alarm can be temporarily disabled by activating an input that can be programmed with the Inhibit alarms function.
P26.n.10 - Modem call - A modem is connected as configured in setup.
P26.n.11 - No LCD - The alarm is managed normally, but not shown on the display.
P26.n.12-13 - **Delay time** – Time delay in minutes or seconds before the alarm is generated.

22. Alarms

- When an alarm is generated , the display will show an alarm icon, the code and the description of the alarm in the language selected.



- If the navigation keys in the pages are pressed, the pop-up window showing the alarm indications will disappear momentarily, to reappear again after a few seconds.
- The red LED near the alarm icon on the front panel will flash when an alarm is active.
- If enabled, the local and remote alarm buzzers will be activated.
- Alarms can be reset by pressing the key ☐ .
- If the alarm cannot be reset, the problem that generated the alarm must still be solved.
- In the case of one or more alarms, the behaviour of the 8BGA depends on the *properties* settings of the active alarms.

22.1. Alarm description

COD	ALARM	DESCRIPTION
A01	Undercompensation	All the available steps are connected but the cosphi is still more inductive than the setpoint.
A02	Overcompensation	All the steps are disconnected but the cosphi is still more capacitive than the setpoint.
A03	Current too low	The current flowing in the current inputs is lower than minimum measuring range. This condition can occour normally if the plant has no load.
A04	Current too high	The current flowing in the current inputs is higher than maximun measuring range.
A05	Voltage too low	The measured voltage is lower than the threshold set with P17.14.
A06	Voltage too high	The measured voltage is higher than the threshold set with P17.13.
A07	Panel temperature too high	The panel temperature is higher than threshold set with P17.06.
A08	Capacitor current overload	The calculated capacitor current overload is higher than threshold set with P17.08 and/or P17.09.
A09	No-Voltage release	A no-voltage release has occurred on the line voltage inputs, lasting more than 8ms.
A10	Not used	
A11	Harmonic protection Module nr. n Current too high	The RMS current measured by the MCP5 module n is higher than threshold set with P18.n.06.
A12	Harmonic protection Module nr. n THD-I too high	The current THD measured by the MCP5 module n is higher than threshold set with P18.n.07.
A13	Harmonic protection Module nr. n 5.th Harm too high	The percentage of 5.th harmonic content measured by MCP5 module is higher than threshold set with P18.n.08.
A14	Harmonic protection Module nr. n 7.th Harm too high	The percentage of 7.th harmonic content measured by MCP5 module is higher than threshold set with P18.n.09.
A15	Harmonic protection Module nr. n 11th. Harm too high	The percentage of 11.th harmonic content measured by MCP5 module is higher than threshold set with P18.n.10.
A16	Harmonic protection Module nr. n 13th. Harmonic too high	The percentage of 13.th harmonic content measured by MCP5 module is higher than threshold set with P18.n.11.
A17	Harmonic protection Module nr. n Temperature 1 too high	The temperature 1 measured by the MCP5 module is higher than threshold set with P18.n.12.
A18	Harmonic protection Module nr. n Temperature 2 too high	The temperature 2 measured by the MCP5 module is higher than threshold set with P18.n.13.
A19	Slave xx link error	The slave nr. X does not communicate with the master. Check the RS-485 wiring.
A20	Clean the air filter	Clean the air intake filter of the ventilation system.
A21	Routine maitenance	Check the currents for each step, the efficiency of the fuses and contactors.
A22	Extraord.maintenance	Perform the operations in A20 and A21 and check the capacitors conditions or contact technical support.
A23	Contactors maintenance	Perform the control of mechanical and electrical contactors.
UAx	User alarm x (x=1..8)	User-defined alarm, as specified by parameters of menu M25.

22.2. Alarm properties

Various properties can be assigned to each alarm, including user alarms (*User Alarms*, UAx):

- **Alarm enabled** - General enabling of the alarm. If the alarm isn't enabled, it's as if it doesn't exist.
- **Retained alarm** - Remains in the memory even if the cause of the alarm has been eliminated.

- **Operating mode** – Operating modes where the alarm is enabled.
- **Global alarm 1 -2 -3** - Activates the output assigned to this function.ù
- **Step disconnection mode** – Defines whether and how the capacitor steps must be disconnected when the alarm is present. OFF = no disconnection, SLOW = gradual disconnection, FAST = Immediate disconnection.
- **Slave disconnection mode** – Defines, for Master-Slave applications, if when this alarm arises, the disconnection is extended to all the step of the system (GENERAL) or only to the output of the interested panel (LOCAL).
- **Inhibition** - The alarm can be temporarily disabled by activating an input that can be programmed with the *Inhibit* function.
- **Modem call** – The alarm will be signalled remotely by sending a modem call under the conditions and modality defined in modem parameters.
- **No LCD** - The alarm is managed normally, but not shown on the display.
- **Delay time** – Time delay in minutes or seconds before the alarm is generated.

22.3. Alarm properties table

COD	DEFAULT ALARM PROPERTIES													
	ENABLE	RETENTIVE	ONLY IN AUT MODE	GLOBAL ALRAM 1	GLOBAL ALARM 2	GLOBAL ALARM 3	STEP DISCONNECTION MODE	SLAVE DISCONNECTION MODE	INHIBITION	MODEM	NO LCD	DELAY TIME	min	sec
A01	ON	OFF	A/M	GLB1	OFF	OFF	OFF	GEN	OFF	OFF	OFF	15	•	
A02	OFF	OFF	AUT	GLB1	OFF	OFF	OFF	GEN	OFF	OFF	OFF	5	•	
A03	ON	OFF	AUT	GLB1	OFF	OFF	IMM	GEN	OFF	OFF	OFF	30		•
A04	ON	OFF	A/M	GLB1	OFF	OFF	OFF	GEN	OFF	OFF	OFF	60		•
A05	ON	OFF	AUT	GLB1	OFF	OFF	IMM	GEN	OFF	OFF	OFF	60		•
A06	ON	OFF	AUT	GLB1	OFF	OFF	IMM	GEN	OFF	OFF	OFF	15	•	
A07	ON	RIT	AUT	GLB1	OFF	OFF	IMM	LOC	OFF	OFF	OFF	60		•
A08	ON	OFF	AUT	GLB1	OFF	OFF	SLOW	GEN	OFF	OFF	OFF	3	•	
A09	ON	OFF	AUT	GLB1	OFF	OFF	IMM	GEN	OFF	OFF	OFF	OFF		
A10	**NOT USED**													
A11	ON	OFF	A/M	GLB1	OFF	OFF	IMM	LOC	OFF	OFF	OFF	3		•
A12	ON	OFF	A/M	GLB1	OFF	OFF	SLOW	LOC	OFF	OFF	OFF	3	•	
A13	OFF	OFF	A/M	GLB1	OFF	OFF	IMM	LOC	OFF	OFF	OFF	3	•	
A14	OFF	OFF	A/M	GLB1	OFF	OFF	IMM	LOC	OFF	OFF	OFF	3	•	
A15	OFF	OFF	A/M	GLB1	OFF	OFF	IMM	LOC	OFF	OFF	OFF	3	•	
A16	OFF	OFF	A/M	GLB1	OFF	OFF	IMM	LOC	OFF	OFF	OFF	3	•	
A17	OFF	RIT	A/M	GLB1	OFF	OFF	IMM	LOC	OFF	OFF	OFF	60		•
A18	OFF	RIT	AUT	GLB1	OFF	OFF	IMM	LOC	OFF	OFF	OFF	60		•
A19	ON	RIT	AUT	GLB1	OFF	OFF	IMM	GEN	OFF	OFF	OFF	30		•
A20	ON	RIT	A/M	GLB1	OFF	OFF	OFF	GEN	OFF	OFF	OFF	OFF		
A21	ON	RIT	A/M	GLB1	OFF	OFF	OFF	GEN	OFF	OFF	OFF	OFF		
A22	ON	RIT	A/M	GLB1	OFF	OFF	OFF	GEN	OFF	OFF	OFF	OFF		
A23	OFF	OFF	A/M	GLB1	OFF	OFF	OFF	GEN	OFF	MDM	OFF	OFF		
UAx	OFF	OFF	A/M	OFF	OFF	OFF	OFF	GEN	OFF	OFF	OFF	OFF		

24. Input function table

- The following table shows all the functions that can be attributed to the INPn programmable digital inputs.
- Each input can be set for an reverse function (NA - NC), delayed energizing or de-energizing at independently set times.
- Some functions require another numeric parameter, defined in the index (x) specified by parameter **P14.n.02**.
- See menu *M14 Programmable inputs* for more details.

FUNCITON	DESCRIPTION
OFF	Disabled input
Configurable	Free user configurable input INPx. Used for instance to generate a user alarm UA or to count on a CNT counter.
Automatic mode	When active, switches system to AUT mode
Manual mode	When active, switches system to MAN mode
Select cosphi setpoint x	When active, selects the cosphi setpoint x (x=1…3).
Keyboard lock	Locks front keyboard.
Settings lock	Locks access to setup menu and command menu.
Alarm Inhibition	Selectively disables alarms that have *inhibit* property set to ON.

25. Output function table

- The following table shows all the functions that can be attributed to the OUTn programmable digital inputs.
- Each output can be configured so it has a normal or reverse (NOR or REV) function.
- Some functions require another numeric parameter, defined in the index (x) specified by parameter **P04.n.02**.
- See menu *M04 Master outputs* and *M06…M13 Slave outputs* for more details.

FUNCTION	DESCRIPTION
OFF	Output always de-energized
ON	Output always energized
Step x	Capacitor step nr.x
Global alarm 1	Energised when global alarm 1 is active
Global alarm 2	Energised when global alarm 2 is active
Global alarm 3	Energised when global alarm 3 is active
Fan	Panel ventilation fan

Manual mode	Active when the regulator is in MAN mode
Automatic mode	Active when the regulator is in AUT mode
Limit threshold LIM x	Output driven by LIM limits
Pulse PULx	Output driven by PUL pulses
Remote variable REM x	Output is remote controller by REM variable
Alarms A01-Axx	When the selected Axx alarmi s present, the output ias activated (x=1… alarm number)
Alarms UA1..UAx	When the selected UAx user alarm is present, the output is activated (x=1… 8)

26. Measure table for Limits / analog outputs

- The following table lists all measures that can be associated with the limits (menu M20) and outputs (menu M23).
- The codes selected in the parameters P20.n.01 and P23.n.02 correspond to the measures below.
- To facilitate comparison with the three-phase measures, some 'virtual' measures are provided, that contain the highest measurements across the three phases. These measures are identified by the presence of the word MAX in the measure code.
- *Example: If you want to apply a maximum limit of 10% on the content of 5.harmonics in the current of the system, when you have a three-phase current, set LIM1 with H. I MAX, with channel no. set to 5. The device will consider the highest of the harmonic content of the 5.o order among the three currents I L1, I L2 and I L3.*

Settings:
P20.1.01 = H. I MAX (highest current harmonic among 3 phases)
P20.1.02 = 5 (5.th harmonic)
P20.1.03 = max (compare with max threshold)
P.20.1.04 = 10 (threshold = 10%)
….

Nr	Measure code	Description
00	OFF	Measure disabled
01	V L1-N	Phase voltage L1-N
02	V L2-N	Phase voltage L2-N
03	V L3-N	Phase voltage L3-N
04	I L1	Phase current L1
05	I L2	Phase current L2
06	I L3	Phase current L3
07	V L1-L2	Phase-to-phase voltage L1-L2
08	V L2-L3	Phase-to-phase voltage L2-L3
09	V L3-L1	Phase-to-phase voltage L3-L1
10	W L1	Active power L1
11	W L2	Active power L2
12	W L3	Active power L3
13	var L1	Reactive power L1
14	var L2	Reactive power L2
15	var L3	Reactive power L3
16	VA L1	Apparent power L1
17	VA L2	Apparent power L2
18	VA L3	Apparent power L3
19	Hz	Frequency
20	Cosphi L1	Cosphi L1
21	Senphi L1	Senphi L1
22	Cosphi L2	Cosphi L2
23	Senphi L2	Senphi L2
24	Cosphi L3	Cosphi L3
25	Senphi L3	Senphi L3
26	W TOT	Total active power
27	var TOT	Total reactive power
28	VA TOT	Total apparent power
29	Cosphi TOT	Cosphi (balanced three-phase system)
30	Senphi TOT	Senphi (balanced three-phase system)
31	THD VLN MAX	THD phase voltage (max among phases)
32	THD I MAX	THD phase current (max among phases)
33	THD VLL MAX	THD phase-phase voltage (max among phases)
34	H. VLN MAX	Harmonic content of order n of phase voltage (maximum among phases)
35	H. I MAX	Harmonic content of order n of phase current (maximum among phases)
36	H. VLL MAX	Harmonic content of order n of phase-phase voltage (maximum among phases)
37	Cosphi MAX	Cos-phi (max among phases)
38	Senphi MAX	Sen-phi (max among phases)
39	VLN MAX	Phase voltage (max among phases)
40	I MAX	Current (max among phases)
41	VLL MAX	Phase-phase voltage (max among phases)
42	VLN MIN	Phase voltage (min among phases)
43	VLL MIN	Phase-phase voltage (min among phases)
44	Cosphi MIN	Cos-phi (min among phases)
45	AIN	Measure from analog inputs
46	CNT	Programmable counter

27. Commands menu

- The commands menu allows executing some occasional operations like reading peaks resetting, counters clearing, alarms reset, etc.
- If the Advanced level password has been entered, then the commands menu allows executing the automatic operations useful for the device configuration.
- The following table lists the functions available in the commands menu, divided by the access level required.

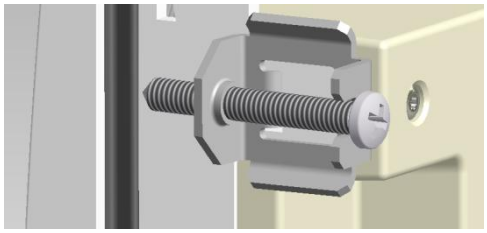
COD.	COMMAND	ACCESS LEVEL	DESCRIPTION
C01	Reset partial Energy meter	Usr	Resets partial energy meter
C02	Reset CNTx counters	Usr	Reset programmable counters CNTx
C03	Reset LIMx status	Usr	Reset status of latched LIMx variables

C04	Reset max temperature	Adv	Reset maximum temperature peak value
C05	Reset max overload	Adv	Reset maximum overload peak value
C06	Reset step hour meter	Adv	Reset step operation hour meters
C07	Reset step switching counters	Adv	Reset step operation counters
C08	Step power restore	Adv	Reload originally programmed power into step trimming
C09	Reset total Energy meter	Adv	Resets total energy meters
C10	TEST mode activation	Adv	Enables the TEST mode operation for output operation verifying
C11	Event log reset	Adv	Clears the event history log
C12	Setup to default	Adv	Resets setup programming to default
C13	Backup setup	Adv	Makes a backup copy of factory or user setup parameters settings
C14	Restore setup	Usr	Reloads setup parameters with the backup of factory or user settings.
C15	Reset weekly TPF	Usr	Reset weekly true power factor value
C16	Reset maintenance interval 1 counter	Usr	Resets maintenance interval 1 counter
C17	Reset maintenance interval 2 counter	Usr	Resets maintenance interval 2 counter
C18	Reset maintenance interval 3 counter	Usr	Resets maintenance interval 3 counter

- Once the required command has been selected, press ☐ to execute it. The device will prompt for a confirmation. Pressing ☐ again, the command will be executed.
- To cancel the command execution press ◄.
- To quit command menu press ◄.

28. Installation

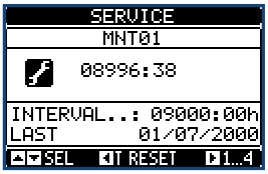
- 8BGA is designed for flush-mount installation. With proper mounting, it guarantees IP54 front protection.
- Insert the device into the panel hole, making sure that the gasket is properly positioned between the panel and the device front frame.
- From inside the panel, for each four of the fixing clips, position the clip in its square hole on the housing side,then move it backwards in order to position the hook.



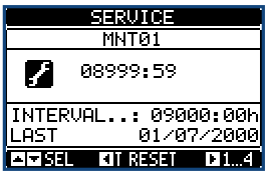
- Repeat the same operation for the four clips.
- Tighten the fixing screw with a maximum torque of 0,5Nm.
- In case it is necessary to dismount the system, repeat the steps in opposite order.
- For the electrical connection, see the wiring diagrams in the dedicated chapter and the requirements reported in the technical characteristics table.

29. A20 alarm reset procedure

From the main page press one time the ▲ button to access at the page “SERVICE”:

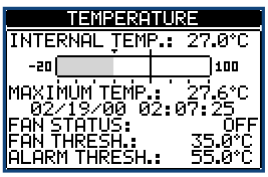


Press and hold the ◄ button until the hours of maintenance will not return to be 9000.

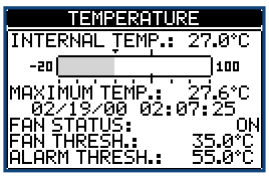


30. Ventilation system test

From the main page, press three times the ▼ button to access at the page TEMPERATURE:



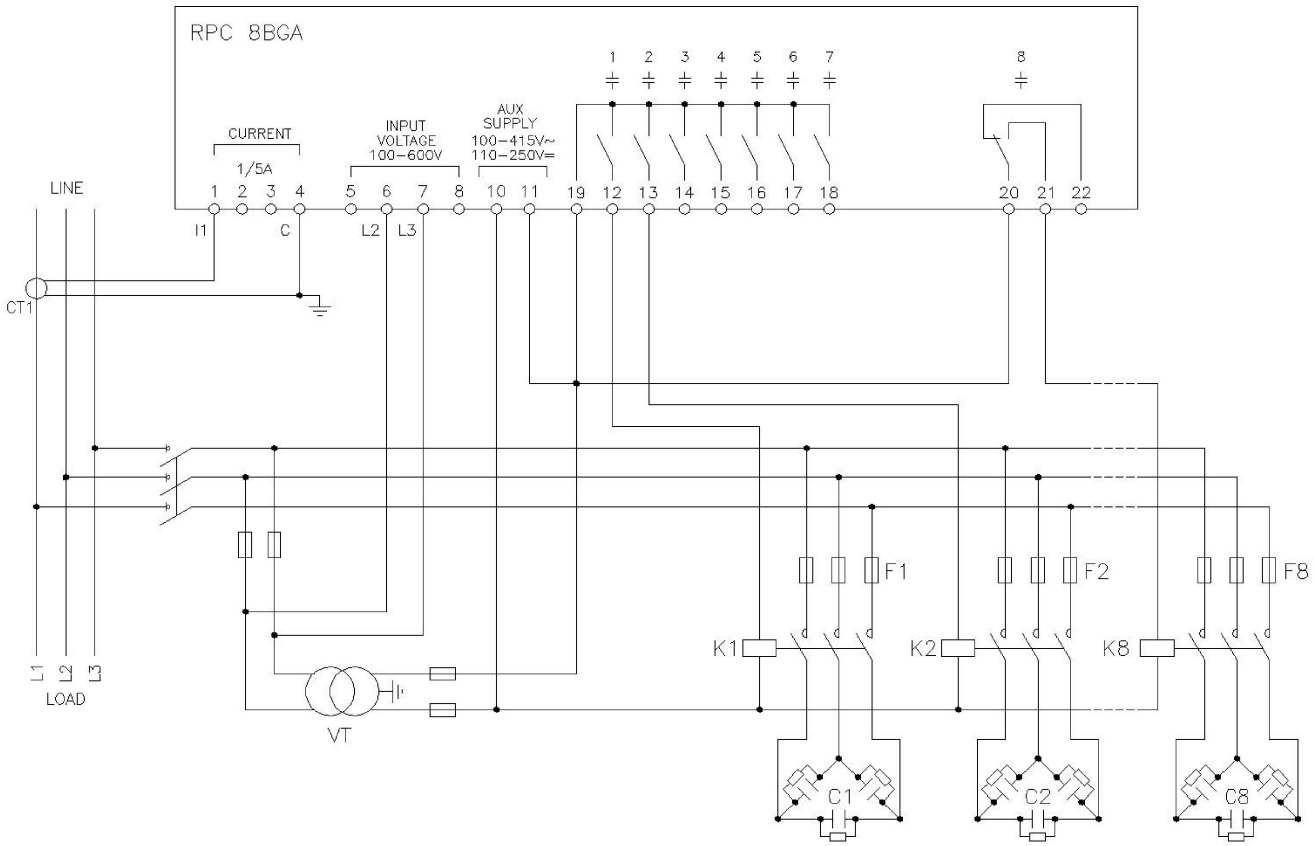
From the page TEMPERATURE press and hold the ◄ button until the indication “FAN STATUS” changes from “OFF” to “ON”.



After 30 seconds the ventilation system will stop.

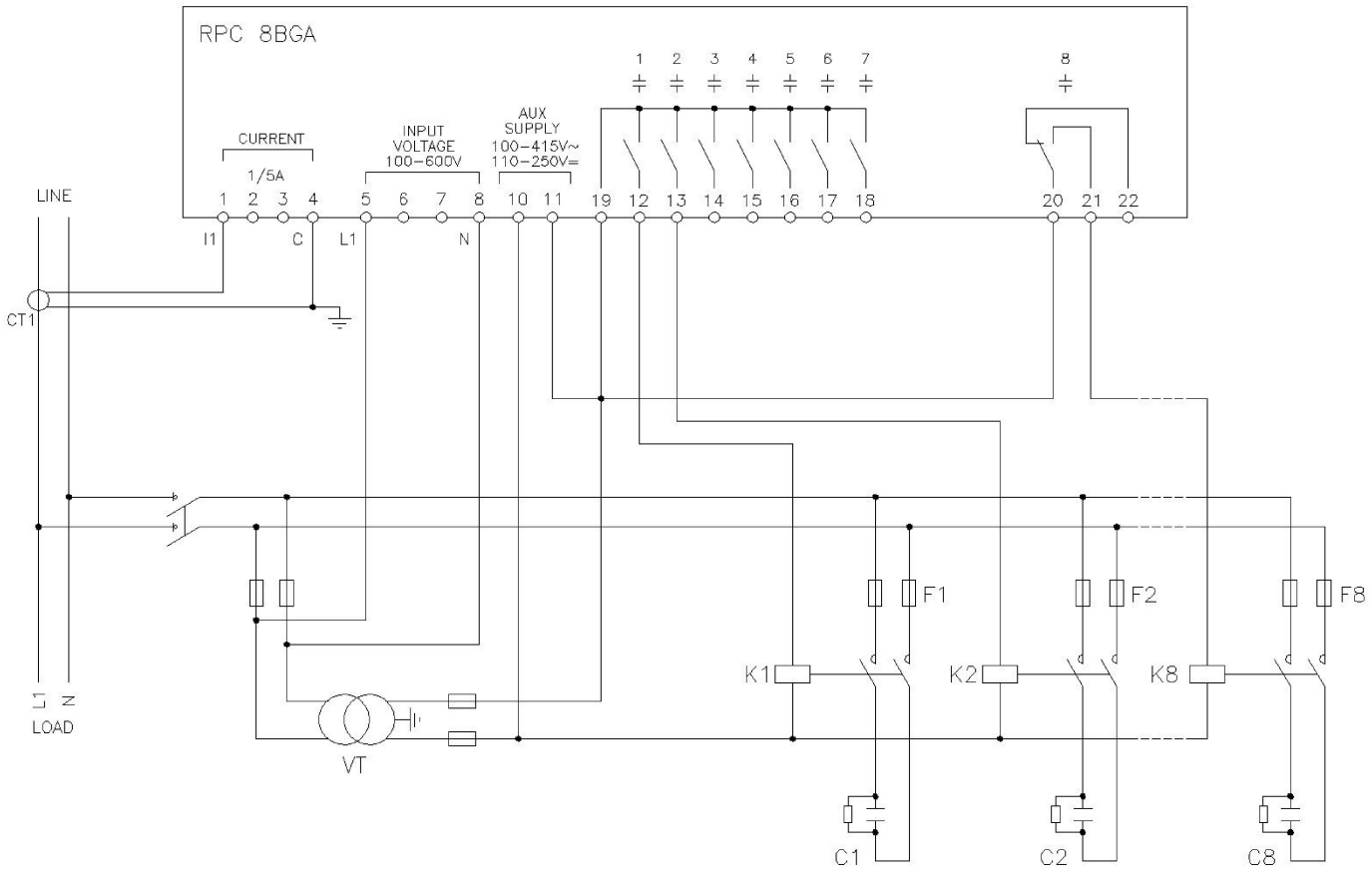
Wring diagrams

Standard Three-phase wiring



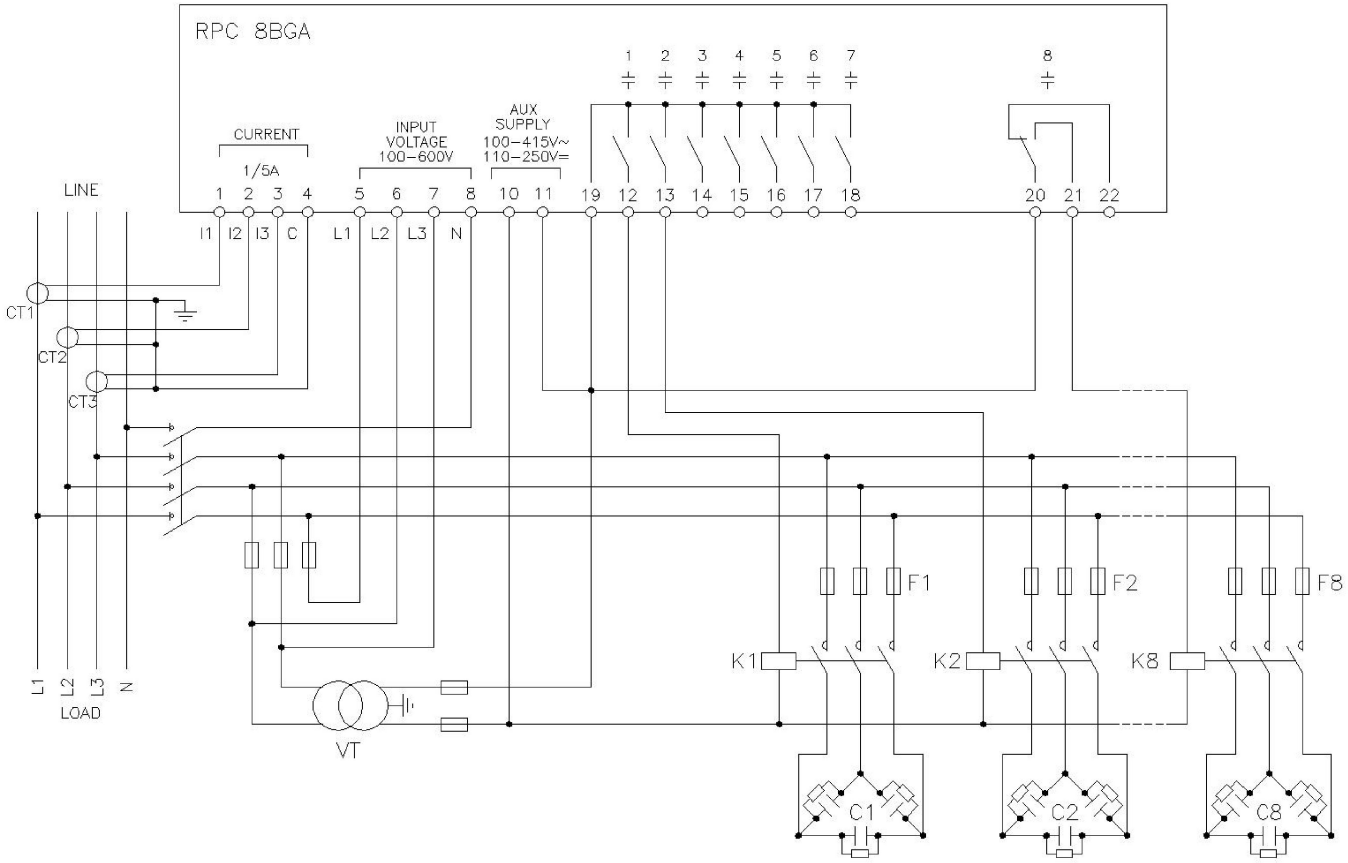
THREE-PHASE CONNECTION (typical). Wiring configuration to use for standard applications.		
Voltage measure	1 ph-to-ph voltage reading L2-L3	
Current measure	L1 phase	
Phase angle offset	Between V (L2-L3) and I (L1) ⇨ 90°	
Capacitor overload current measure	1 reading calculated on L2-L3	
Parameter setting	P02.03 = Three-phase P02.04 = L1 P02.06 = L2-L3	P02.22 = LV

Full three-phase wiring, without neutral



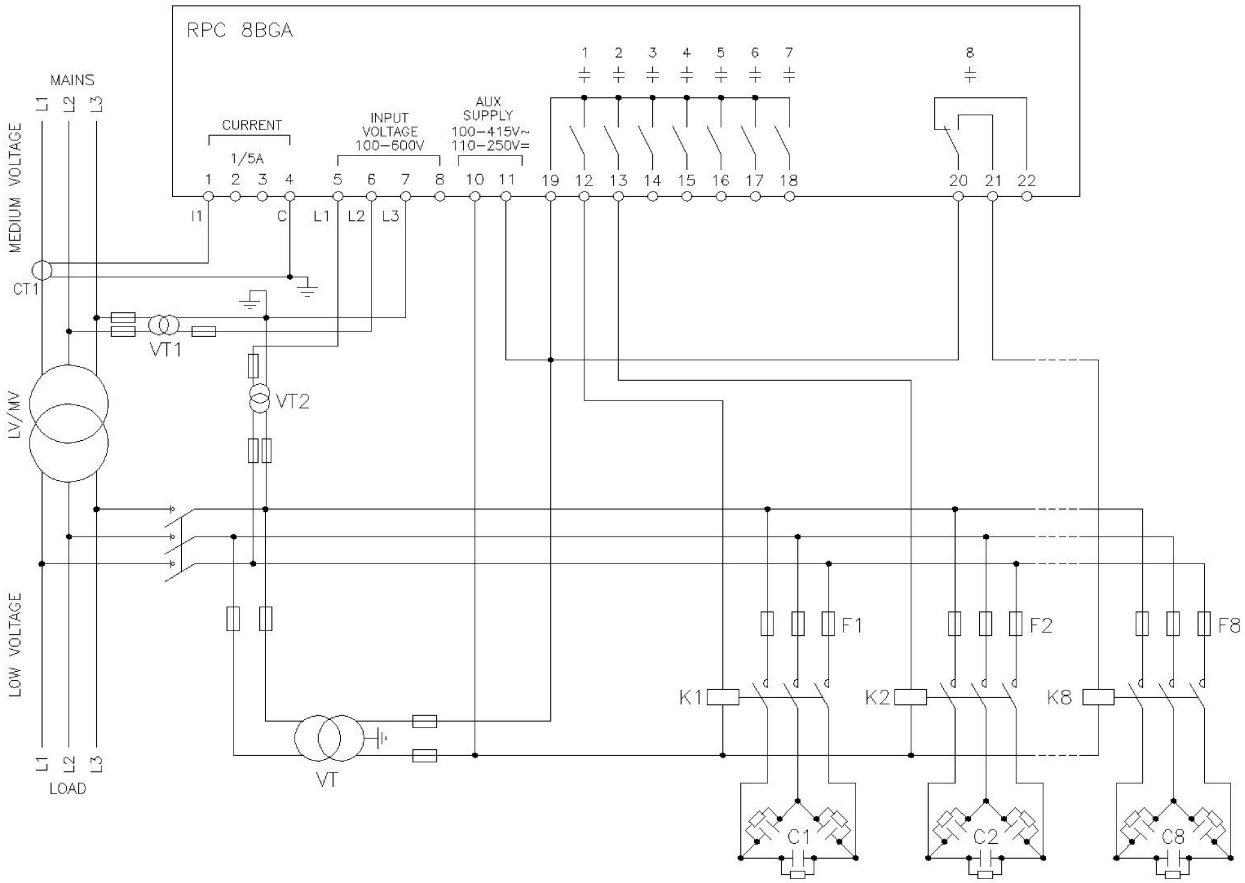
SINGLE-PHASE CONNECTION . Wiring configuration for single-phase applications		
Voltage measure	1 phase voltage reading L1-N	
Current measure	L1 phase	
Phase angle offset	Between V (L1-N) and I (L1) ⇨ 0°	
Capacitor overload current measure	1 reading calculated on L1-N	
Parameter setting	P02.03 = Single-phase P02.04 = L1 P02.06 = L1-N	P02.22 = LV

Full three-phase wiring, with neutral



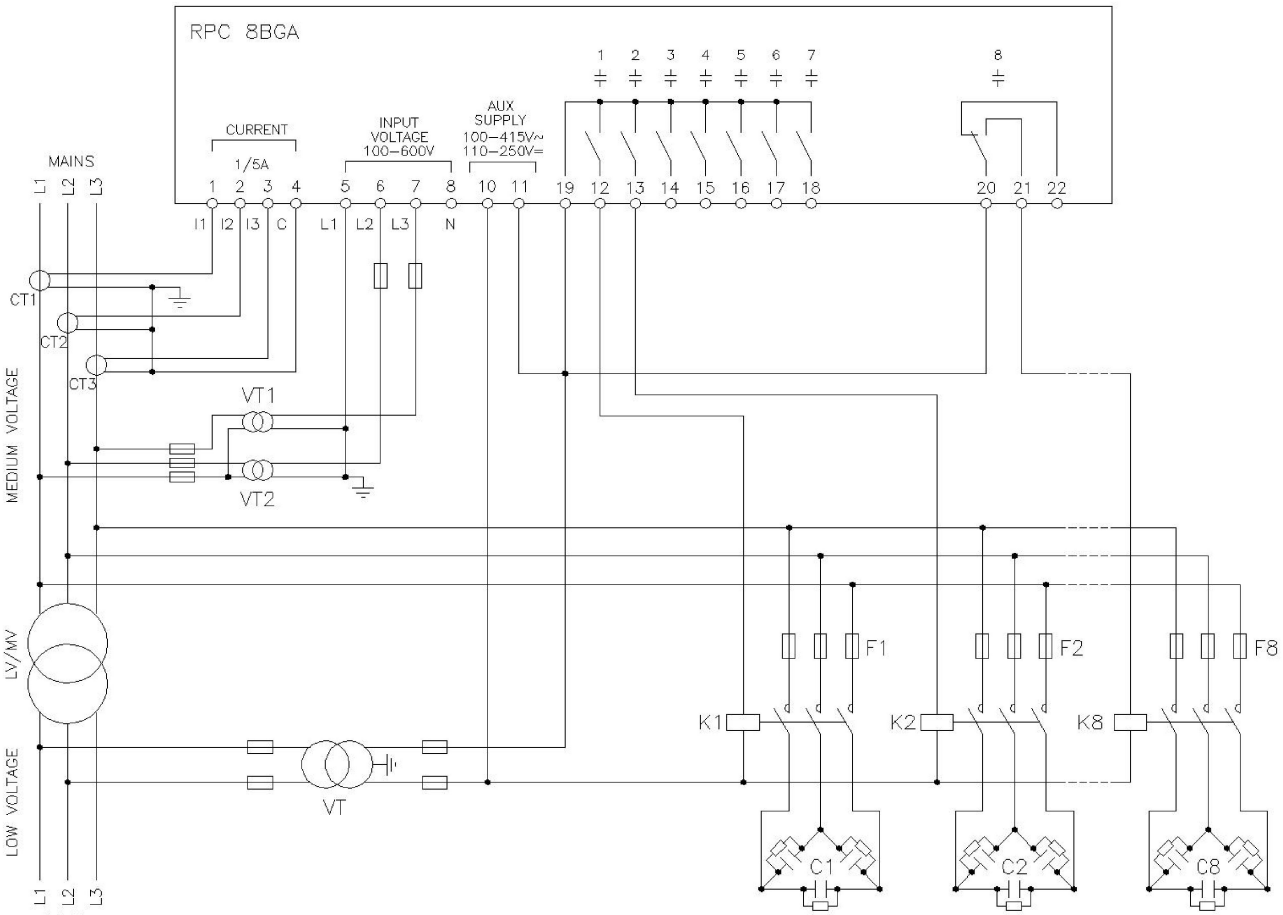
FULL THREE-PHASE CONNECTION, WITH NEUTRAL . Wiring configuration used for standard applications with full three-phase voltage control.		
Voltage measure	3 ph-to-n and 3 ph-to-ph voltage readings L1-N, L2-N, L3-N, L1-L2, L2-L3, L3-L1	
Current measure	L1-L2-L3 phase	
Phase angle offset	0°	
Capacitor overload current measure	3 readings on L1-L2,L2-L3,L3-L1	
Parameter setting	P02.03 = Three-phase P02.04 = L1-L2-L3 P02.06 = L1-L2-L3-N	P02.22 = LV

Configuration with MV measurement and correction on LV side



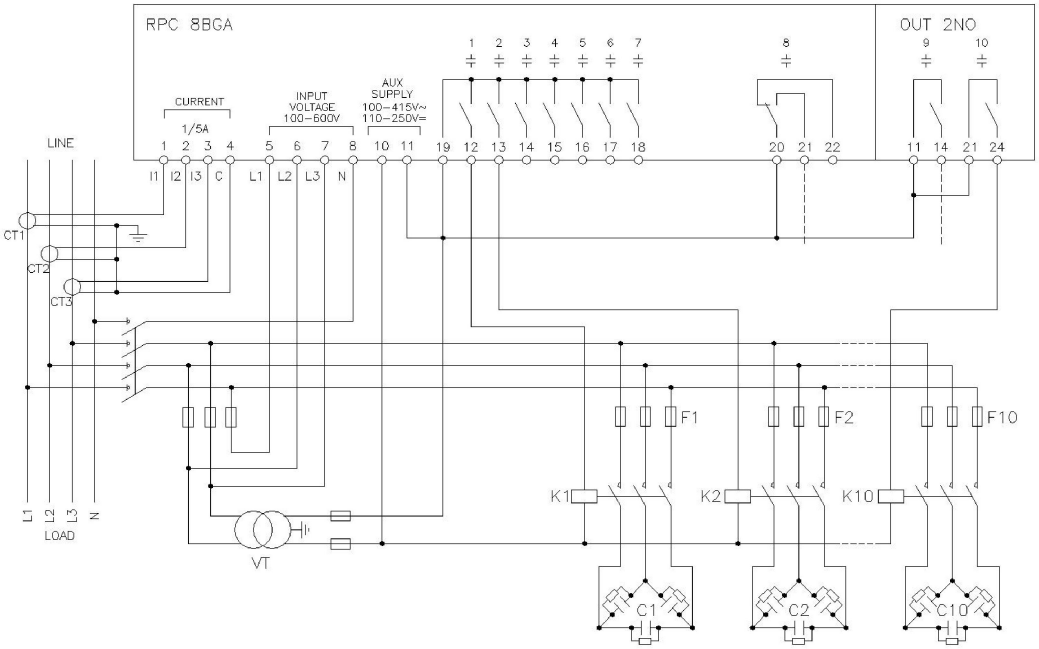
CONFIGURATION WITH MV MEASUREMENT AND CORRECTION ON LV SIDE		
Voltage measure	1 ph-to-ph voltage reading L2-L3 on MV side	
Current measure	L1 phase	
Phase angle offset	90°	
Capacitor overload current measure	1 reading on L1-L3, LV side	
Parameter setting	P02.03 = Three-phase P02.04 = L1 P02.06 = L2-L3	P02.22 = LV/MV P02.23 = ON

Full MV wiring configuration

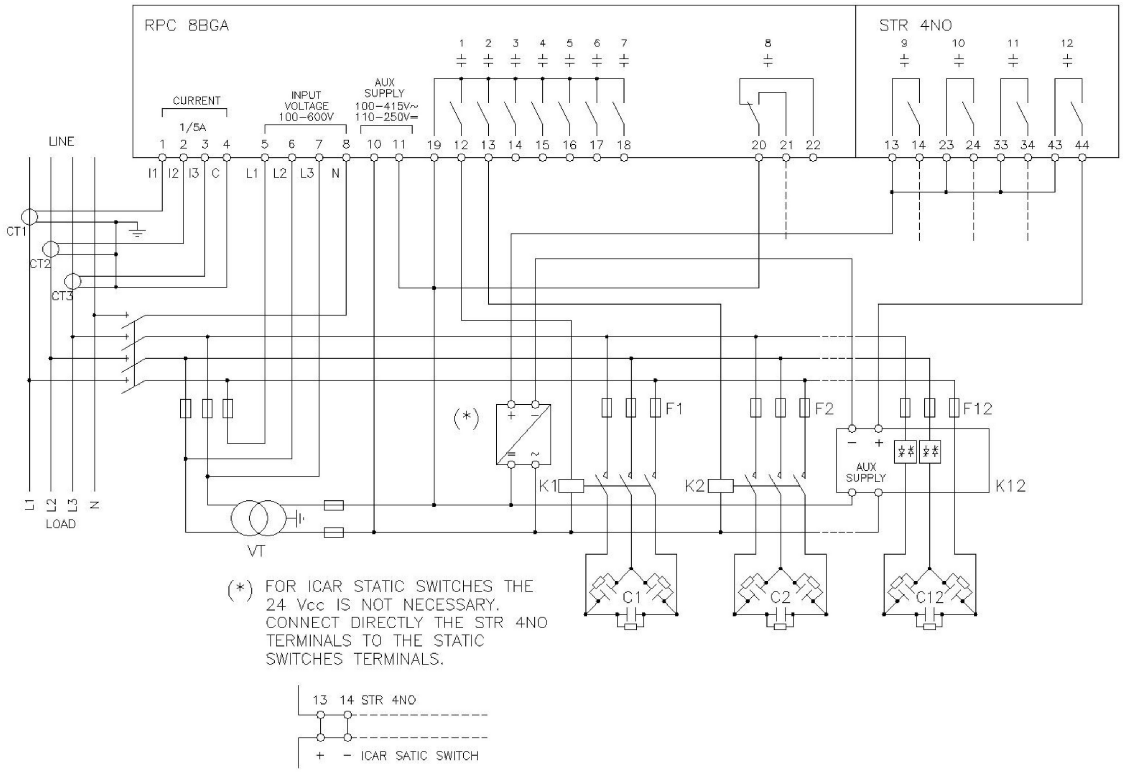


Configuration with MV measurement and correction		
Voltage measure	3 ph-to-ph voltage reading L1-L2, L2-L3, L3-L1 on MV side	
Current measure	L1-L2-L3 phase	
Phase angle offset	90°	
Capacitor overload current measure	1 reading on L1-L3, LV side	
Parameter setting	P02.03 = Three-phase P02.04 = L1-L2-L3 P02.06 = L1-L2-L3	P02.22 = MV P02.23 = ON

Steps on expansion modules

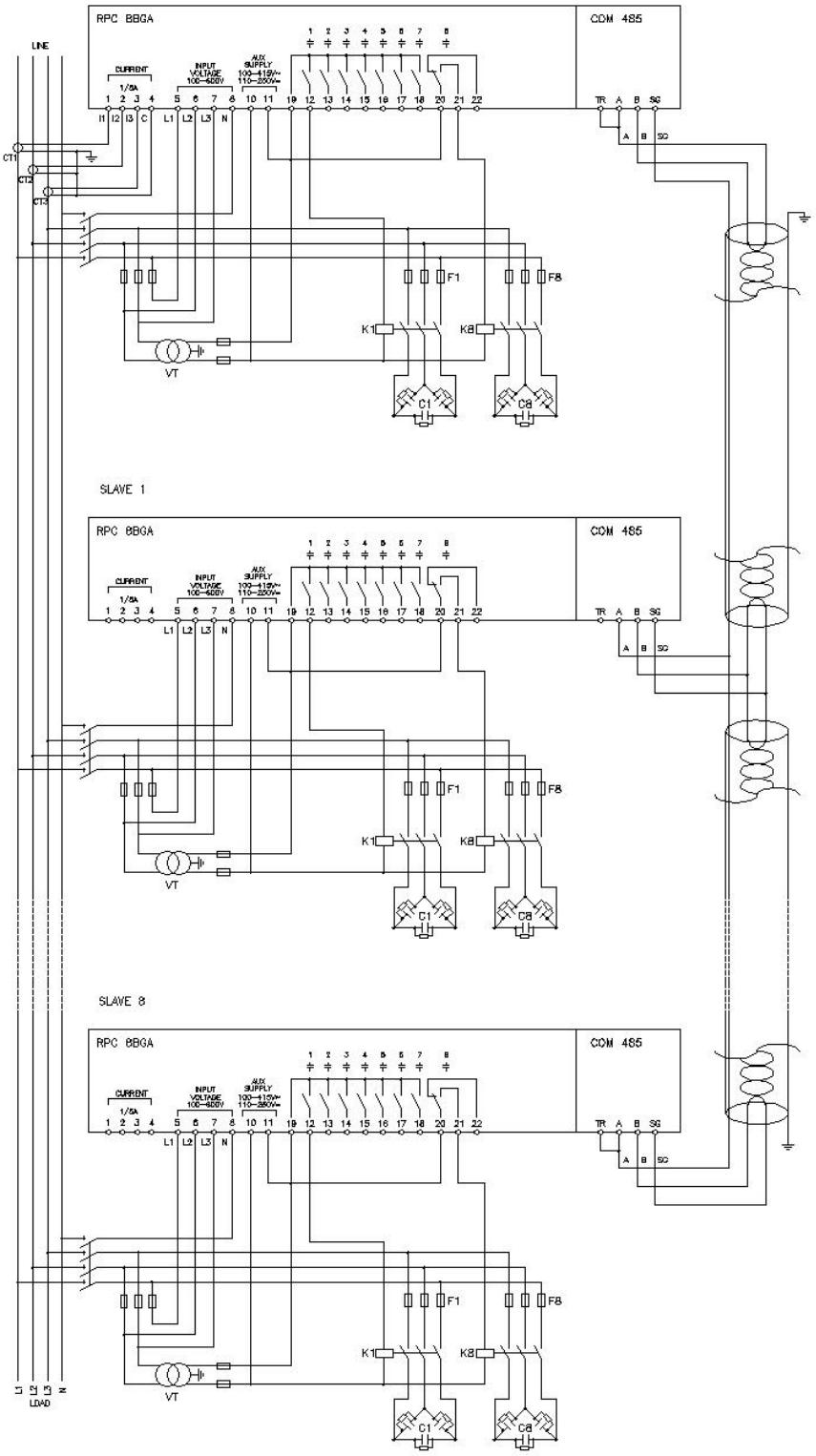


Fast regulation configuration



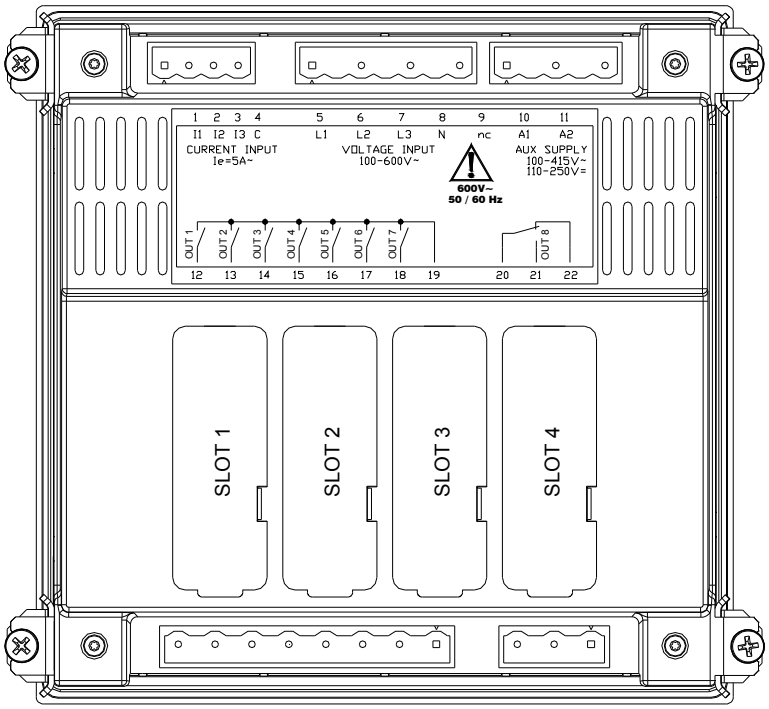
Static correction		
Voltage measure	3 ph-to-ph voltage reading L1-L2, L2-L3, L3-L1	
Current measure	L1-L2-L3 phase	
Phase angle offset	90°	
Capacitor overload current measure	3 Readings on L1-L2, L2-L3, L3-L1	
Parameter setting	P02.03 = Three-phase P02.04 = L1-L2-L3 P02.06 = L1-L2-L3	P02.22 = LV P02.29 = Fast

Master-Slave configuration

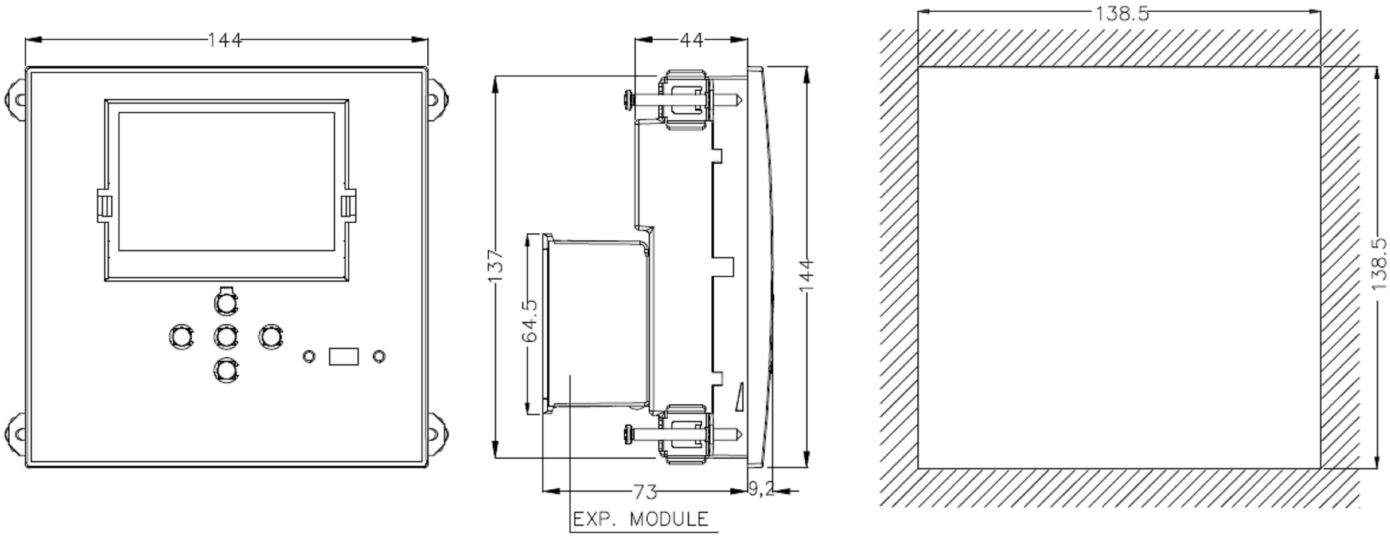


MASTER	SLAVE 01	SLAVE 02…	SLAVE 08
P05.01 = COM1 P05.02 = Master P05.03=ON P05.04 = ON P05.05 = ON P04.1.01 = Stepx …. P06.1.01 = Stepx … P07.1.01 = Stepx …. P08.1.02 = Stepx	P05.01 = OFF P05.02 = Slave01	P05.01 = OFF P05.02 = Slave02	P05.01 = OFF P05.02 = Slave08

Terminals position



Mechanical dimensions and front panel cutout (mm)



Technical characteristics

SUPPLY	
Auxiliary voltage Us	100 - 415V~ 110 - 250V=
Operating voltage range	90 - 456V~ 93,5 - 300V=
Frequency	45 - 66Hz
Power consumption/dissipation	10.5W – 27VA
Immunity time for microbreakings	110V~ ≥35ms 220V – 415V~ ≥80ms
VOLTAGE INPUTS	
Maximum rated voltage Ue	600VAC L-L (346VAC L-N)
Measuring range	50…720V L-L (415VAC L-N)
Frequency range	45…65Hz – 360…440Hz
Measuring method	True RMS
Measuring input impedance	> 0.55MΩ L-N > 1,10MΩ L-L
Wiring mode	Single-phase, two-phase, three-phase with or without neutral or balanced three-phase system.
Rated current Ie	1A~ or 5A~
Measuring range	for 5A scale: 0.025 - 6A~ for 1A scale: 0.025 – 1.2A~
Type of input	Shunt supplied by an external current transformer (low voltage). Max. 5A
Measuring method	True RMS
Overload capacity	+20% Ie
Overload peak	50A for 1 second
Power consumption	<0.6VA
Line voltage	±0.5% f.s. ±1digit
Contact type	7 x 1 NO + contact common
UL Rating	B300 30V= 1A Pilot Duty
Max rated voltage	415V~
Rated current	AC1-5A 250V~ AC15-1,5A 415V~
Maximum current at contact common	10A
Contact type	1 changeover
UL Rating	B300 30V= 1A Pilot Duty
Max rated voltage	415V~
Rated current	AC1-5A 250V~ AC15-1,5A 415V~
Energy storage	Back-up capacitors
Operating time without supply voltage	About 12...15 days
INSULATION VOLTAGE	
Rated insulation voltage Ui	600V~
Rated impulse withstand voltage Uimp	9.5kV
Power frequency withstand voltage	5,2kV
AMBIENTOPERATING CONDITIONS	
Operating temperature	-30 - +70°C
Storage temperature	-30 - +80°C
Relative humidity	<80% (IEC/EN 60068-2-78)
Maximum pollution degree	2
Overvoltage category	3
Measurement category	III
Climatic sequence	Z/ABDM (IEC/EN 60068-2-61)
Shock resistance	15g (IEC/EN 60068-2-27)
Vibration resistance	0.7g (IEC/EN 60068-2-6)
CONNECTIONS	
Terminal type	Plug-in / removable
Cable cross section (min… max)	0.2…2.5 mm² (24…12 AWG)
UL Rating Cable cross section (min… max)	0,75…2.5 mm² (18…12 AWG)
Tightening torque	0.56 Nm
HOUSING	
Version	Flush mount
Material	Polycarbonate
Degree of protection	IP54 on front - IP20 terminals
Weight	680g
Certification	cULus
Reference standards	IEC/EN 61010-1, IEC/EN 61000-6-2 IEC/ EN 61000-6-3 UL508 and CSA C22.2-N°14
UL Marking	Use 60°C/75°C copper (CU) conductor only AWG Range: 0,2mm² – 1,5mm² stranded or solid Field Wiring Terminals Tightening Torque: 0,18Nm

INFORMATION AND TECHNICAL SERVICE

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