

# Reactive power regulators and protections



The reactive power regulator is, together with the capacitors and reactors (in detuned filter cabinets), the key component of the automatic power factor correction system. It is in fact the "intelligent" element, responsible for the verification of the power factor of the load, in function of which controls the switching on and off of the capacitors batteries in order to maintain the power factor of the system beyond the target. The reactive power regulators RPC are designed to provide the desired power factor while minimizing the wearing on the banks of capacitors, accurate and reliable in measuring and control functions are simple and intuitive in installation and consultation. The flexibility of ICAR regulators allows you to modify all the parameters to customize its operation to fit the actual characteristics of the system to be corrected (threshold power factor, sensitivity of step switching, reconnecting time of the steps, presence of photovoltaics, etc.).

## RPC 8BGA reactive power regulator

The RPC 8BGA reactive power regulator equips MULTImatic automatic power factor correction systems.

It is a very innovative controller, with exclusive features:

- High electrical performance
- Extended Capabilities
- Graphic display
- Advanced communication
- Upgradability, even after installation
- Powerful supervision software

More details below, referring to the following page tables and manuals for further information.

**High electrical performance:** The 8BGA controller is equipped with powerful hardware, which allows a considerable electrical performances: it can be connected to the CT secondary 5A or 1A, it can work on networks with voltages from 100 to 600Vac with a measuring range from 75VAC to 760VAC, it can be connected to a single CT (typical configuration of the power factor correction) or three-CTs (for a more accurate measurement of the power factor, and this fact makes the 8BGA controller to refocus and to be a multimeter as well).

**Extended Capabilities:** The 8BGA reactive power regulator is controlled by a powerful microprocessor that allows a set of new functions to solve problems even in complex plant. 8BGA can work master-slave functions, handles up to 10 languages simultaneously, can be used in MV systems managing the transformation ratio of the VT, it can support multiple inputs and outputs via optional modules, it can handle target cos phi from 0.5 inductive to 0.5 capacitive. 8BGA can build a network of 4 wired units (one master three slaves) to be able to handle up to 32 steps of power factor correction in a consistent and uniform way.

**Graphical display with high readability:** forget the regulators with small displays and difficult to read: 8BGA will amaze you with its display matrix graphic LCD 128x80 pixels. The detail and sharpness allow intuitive navigation between the different menus, represented with text and icons.

**Advanced communication:** 8BGA born to be a regulator able to communicate in a manner in line with the latest technology: Ethernet, RS485, GSM / GPRS modem, USB, WIFI. Now you can see the information of the company cos phi, without having to go in front of the regulator. It will be the controller to inform you by posting, if you wish, SMS or email. Or you can consult a tablet, a smartphone, or PC. The information about the cos phi is important, because it impacts heavily on the company's income statement.

**Evolvutivity:** the "basic" 8BGA regulator can be enhanced with up to four additional modules "plug and play" which greatly expands its performance. And 'possible to add additional control relays (up to a total of 16), even for a static control (thyristors), digital and analog inputs, analog outputs, communication modules. Your controller can become a small PLC, and the PFC system can become a point of data aggregation, for remote communication.

## Measurement functions and help to maintain

8BGA is a real evolved multimeter, thanks also to the graphic display of excellent readability and to the powerful microprocessor . The measured parameters are the basic ones (cos phi, FP, V, I, P, Q, A, Ea, Er) with the addition of the distortion of the voltage and current (THD, histogram of the value of each harmonic, waveform graphic visualization).

If 8BGA is connected to three CT, the harmonic analysis is detailed for each phase, in order to identify any anomalies of single phase loads. 8BGA measure and count values that can help in ruling the PFC (temperature, number of switching of each step). 8BGA also suggests the maintenance to be carried out by means of simple messages on the display. Keep efficient capacitor becomes much easier.

8BGA stores the maximum values of current, voltage, temperature, each associated with the date and time of the event for a better analysis of what happened.

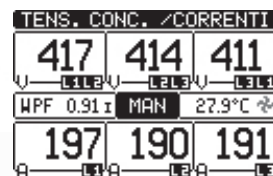
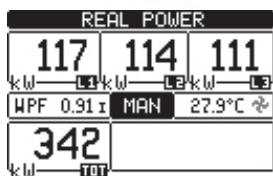
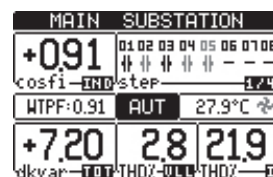
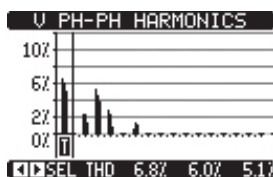
## Alarms

The set of alarms (maximum and minimum voltage, maximum and minimum current, over and under-compensation, overload of the capacitors, maximum temperature, microinterruption) associated with the readability of the messages on the display allows a better understanding of what happened. Even alarm programming (enable / disable, delay, relapse etc.) is easier and faster.

## 8BGA Power Factor Correction Controller: technical parameters

### CHARACTERISTICS

- Supply Voltage: 100÷440Vac
- Frequency: 50Hz/60Hz
- Voltage Measuring range: 100÷690V (-15% / +10%)
- Current Measuring range: 5A (1A selectable)
- Current incoming range: from 25mA to 6A (from 10mA to 1,2A)
- Automatic phase sequence reading: yes
- Compensation in cogeneration: yes
- Burden: 12 VA (10,5W)
- Output relay current: 5A – 250Vac
- Cos  $\phi$  range: from 0,5 ind to 0,5 cap
- Tan  $\phi$  range: from -1,732 to + 1,732
- Step switching time: 1s÷1000s (20ms in case of STR4NO)
- Alarm relay: yes
- Degree of protection: IP55
- Working temperature range: from -30°C to +70°C
- Storage temperature range: from -30°C to + 80°C
- USB optic communication port (with COMUSB)
- Temperature Control: from -30°C to +85°C
- Standards compliance: IEC EN 61010-1; IEC/EN 61000-6-2; IEC/EN 61000-6-3; UL508; CSA C22-2 n°14
- Step output relays: 8 (expandable till 16, see expandability table)
- Dimensions: 144x144mm
- Weight: 0,98kg
- Part number: A25060046411000



Selection, modification and enter push buttons.

LED watchdog and alarm

Graphic display 128x80 pixel

USB – WIFI Optic netport

new

## RPA 8BGA Power Factor Correction Controller: additional modules

The RPC 8BGA controller accommodates up to 4 additional modules "plug & play".

Once you have added an additional module, the controller recognizes and activates the menu for its programming.

Additional modules can also be installed in the rear.

### Digital inputs and outputs

These modules allow you to increase the contacts funding for control of the steps to contactors (OUT2NO form) or thyristors (module STR4NO) switched banks, or to add inputs and / or digital / analog acquisition of parameters and implementing simple logic by the regulator.

- OUT2NO module 2 digital outputs to control additional steps (two relays 5A 250 Vac)
- STR4NO module 4 static outputs for control steps thyristor (range SPEED)
- INP4OC module 4 digital inputs
- 2IN2SO module 2 digital inputs and 2 static outputs
- INP2AN module 2 analog inputs
- OUT2AN module 2 analog outputs



### Protection functions and data logging

The control and protection module MCP5 allows a more detailed inspection of the electrical parameter that can damage the capacitors, thanks to algorithms particularly suitable for equipment consisting of capacitors and inductors (detuned filters MULTImatic FH20, FH30, FD25, FD25V, FD35, FH70, FD70).

The data logging module adds the ability to record events, for a better understanding and diagnosis of troubled plant.

- MCP5 module for protection and control for additional security capacitors especially suitable in the banks detuned
- DATLOG data logger module with real time clock and battery backup for data retention

### Communication functions

RPC 8BGA regulator is very powerful in terms of communication.

The modules dedicated to these functions allow multiple solutions to remotely control the power factor of the system and all other variables measured, calculated or obtained from the instrument.

- COM232 isolated RS232 interface
- COM485 RS485 opto-isolated
- WEBETH Ethernet interface with webserver function
- COMPRO isolated Profibus-DP interface
- COMGSM GPRS / GSM modem
- CX01 cable connection from the RPC 8BGA optical port to the USB port of the computer for programming, downloading / uploading data, diagnostics etc..
- CX02 device to connect the optical port in the PRC 8BGA via WIFI: for programming, downloading / uploading data, diagnostics etc..
- CX03 antenna quad band GSM (800/900/1800)



### App<sup>1</sup>

App available for WIFI interfacing with the RPC 8BGA controller via tablet or smartphone. For iOS and Android.

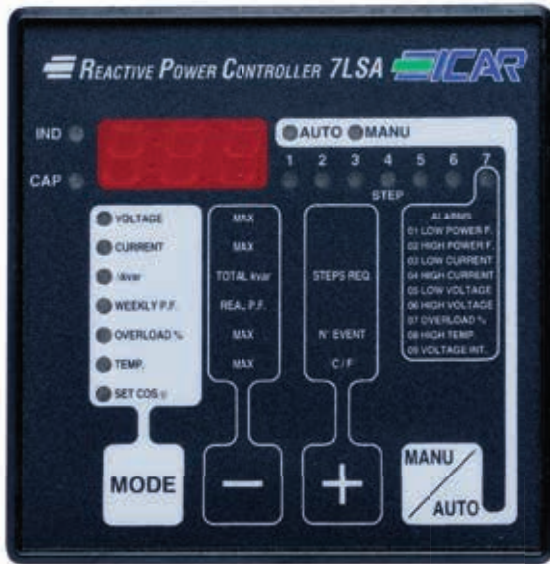
You have the following functions:

- Set of up regulator
- Sending commands
- Reading information
- Download information and data residing on board
- Calculation of the economic benefit brought by the capacitor in terms of penalties in the bill

1. Availability: January 2014







RPC 5LSA e 7LSA

## RPC 5LSA and 7LSA reactive power regulators

The RPC 5LSA/ 7LSA reactive power regulators equip MicroMatic, Minimatic, MIDimatic, automatic power factor correction systems. They are managed by a microprocessor and offer many features while maintaining a simple way of consultation, either locally or from a PC via RS232 serial port to which they are fitted as standard.

They offer a flexibility of use, are in fact able to adjust the power factor between 0,8 inductive to 0,8 capacitive, and to operate in cogeneration plants; offer standard temperature control and the ability to set one of available output relays for activating visual alarms/sound at distance.

The RPC 5LSA 7LSA regulators can operate in automatic or manual mode.

In the first case acting in complete autonomy switching on and disconnecting the steps available until reaching the desired power factor; in the second case will be the operator to force the switching and disconnection of the steps: the regulator, however, will monitor operations to prevent potential damage to the capacitors (such as verifying compliance with the discharge times before a new switching).

### Measurement functions

The PRC 5LSA and 7LSA regulators provide numerous standard measurements to verify and monitor the proper electrical and climatic conditions of the power factor correction system.

On the front panel display shows the following parameters: voltage, current, delta kvar (reactive power missing to achieve the target power factor), average weekly power factor, current harmonic distortion rate in% (THDi%) of the capacitors, temperature inside the bank.

The controller stores and makes available for browsing the maximum value of each of these variables, to assess the most severe stress suffered by the automatic power factor correction system since the last reset: the temperature, voltage, and the total harmonic distortion have a strong impact on capacitors because if kept beyond the nominal values can drastically reduce the life expectancy.

The 5LSA and 7LSA regulators are able to measure the actual reactive power supplied by the individual batteries, in order to adapt to their value in the choice of the exploitation logic: this feature is very useful for power factor correction systems in operation for several years and then with worn capacitors that provide a reactive power lower than the nominal value.

By connecting the RS232 serial port, you can have access to other important information relevant to the assessment of the system state and to schedule routine or extraordinary maintenance such as checking / replacement of contactors. These parameters are:

- the number of operations performed by each step
- the number of hours of operation for each bank

### Alarms

The PRC 5LSA and 7LSA regulators offer as standard nine different alarms, which help in the proper running of the system. These are set on the following metrics:

- Under-compensation: The alarm is activated if, with all the steps of power factor correction are on, the power factor is less than the desired value
- Overcompensation: The alarm is activated if, with all the steps of power factor correction switched off, the power factor is greater than the desired value
- Minimum and maximum current: to assess the condition of the system load
- Minimum and maximum voltage: to evaluate the stresses due to the variations of the supply voltage
- Maximum THD%: to assess the pollution of network as regards to harmonic currents
- Maximum temperature in the enclosure: to monitor the capacitor climatic conditions
- Microinterruption of the mains voltage.

For the interpretation of the meaning of each alarm, refer to the technical info n ° 5 available on the website [www.icar.com](http://www.icar.com) in the download section dedicated to industrial LV power factor correction.

### LED Indications

The LEDs on the controller display provide the following information for quick identification of the operating status of the system:

- operating mode automatic / manual
- status of each step (on / off)
- recognition lagging leading power factor
- type of value displayed
- Active alarm code.

### Contacts

The regulators have the output contacts for control of the steps, for the control of cooling fan, and for triggering remote alarms; contacts can be programmed with logic NO or NC and have a capacity of 5A at 250Vac or 1.3 at 415 Vac.

# RPC 5LSA and 7LSA Power Factor Correction Controller: Data sheet

## COMMON CHARACTERISTICS

- Control: microprocessor
- Supply voltage: 380-415Vac (others upon request)
- Frequency: 50Hz/60Hz
- Voltage measuring input: same as supply voltage
- Current measuring input: 5A (1A upon request)
- Automatic current way sensing: yes
- Compensation in cogeneration plants: yes
- Burden: 6,2 VA
- Output relay current: 1,3A – 415Vac; 5A – 250Vac
- Cos  $\phi$  range: from 0,8 ind to 0,8 cap
- Step Switching time: 5s ÷ 600s
- Alarm relay: yes
- Front degree of protection: IP54
- Temperature working range: from -20°C to +60°C
- Storage Temperature: from -30°C to + 80°C
- Communication: port RS232-TTL
- Integrated temperature sensor and control
- Compliance: IEC 61010-1; IEC 50081-2; IEC 50082-2



RPC 5LSA e 7LSA

OTHER CHARACTERISTICS	RPC 5LSA	RPC 7LSA
Number of output relays	5	7
Weight	0,44 kg	0,46kg
Part number	A25060046413052	A25060046413070

