

// ENG // User Manual // PFC ControllerPCRJ8/14



Automatic PFC systems all Series

REVISION INDEX

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INDEX

- 1. INTRODUCTION 5
- **1.1. Purpose of the Instruction Manual 5**
- 1.2. Recipients 6
- **1.3. Storage of the Instruction Manual 6**
- 1.4. Definitions and pictograms 6 ... 7
- 2. SAFETY INSTRUCTIONS 8
- 2.1. Transport and storage 9
- 2.2. Positioning 9
- 2.3. Installation 9
- 2.4. Operation and Maintenance 10
- **3. GENERAL INFORMATION 10**
- 3.1. Manufacturer Identification 10
- **3.2. Product Identification 10**
- 3.3. Statement 11
- 3.4. Safety Standards 12
- 3.5. Warranty 12
- 4. GENERAL DESCRIPTION OF THE PANEL 13
- 4.1. Environmental conditions 13
- 4.2. Electromagnetic environment 13
- 4.3. Technical data of the equipment 14
- 4.4. Sound emissions 14
- **5. INSTALLATION 14**
- 5.1. Inspection of the unit 14
- 5.2. Connection 14 ... 14
- 6. ADJUSTMENTS 17
- 6.1. Operating instructions for the PCRJ8 controller 18 ... 59
- 7. DISPOSAL 60
- 8. USE OF THE DEVICE 61
- 8.1. Intended use 61
- 8.2. Contraindications for use 61
- 9. MAINTENANCE 62
- 9.1 Ordinary and extraordinary maintenance 62..64
- 9.2 Assistance 65
- **10. EMERGENCY SITUATIONS 65**



ANNEX

Wiring Diagram Declarations of conformity Test certificate Warranty certificate

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1. INTRODUCTION

1.1. Purpose of the Instruction Manual

This instruction manual is an integral part of the entire range of automatic power factor correction panels and is intended to provide all the information necessary for:

- □ Know the product and its operation
- □ Know the expected operating modes and limits of use
- □ To sensitize operators correctly to security issues;
- \Box The correct installation;
- $\hfill\square$ Its correct and in safety conditions;
- □ Perform scheduled maintenance operations correctly and safely;

□ To dismantle the product in safety conditions and in compliance with the regulations in force to protect the health of workers and the environment

The managers of the company departments, where this machine will be installed, have the obligation, according to current regulations, to read carefully the contents of this document and to make it read to the conductors and maintenance workers, for the parts that to them



compete. The time spent for this purpose will be largely rewarded by the correct operation of the machine and its use in safety conditions

This document assumes that in the places, where the product has been destined, the current rules of safety and hygiene of the work are observed.

The instructions, drawings and documentation contained in this Manual are of a reserved technical nature, strictly owned by the manufacturer and can not be reproduced in any way, either fully or partially.

The Instruction Manual must accompany the product for its life time in all the passages of property that the same may have therefore must be favored a good conservation handling it with care, avoiding contact with fats, dirt and aggressive substances.

The manual must be kept intact, must not be removed, torn or arbitrarily modified any of its parts, must be stored in an environment protected from moisture and heat, in the vicinity of the product to which it refers.

The first page shows the revision index of the instruction manual with the descriptions of the changes made in the various revisions.

The sequence of the chapters responds to the temporal logic of the product life.

Telegroup S.r.l. having the responsibility to ensure that they are actually present in the points of use, only the updated versions of the Manual make available the updated versions of the manual on the Site <u>www.telegroup.it</u>.

1.2 Recipients

The manual in question is addressed to Installers, Operators, Maintenance Managers and to all personnel who can intervene or interface with the machine at any level.

It is divided into autonomous chapters aimed at specific figures for which the skills have been defined, necessary to operate on the machine in safe conditions.

The machine is an appliance intended for industrial use, and therefore professional and not generalized, so its use can only be entrusted to qualified technical personnel who:

- \Box has reached the age of majority (18),
- □ both physically and mentally fit to perform work of particular technical difficulty,
- $\hfill\square$ has been adequately instructed on the use and maintenance of the machine,
- $\hfill\square$ has been judged by the entrepreneur to perform the task assigned to him,
- □ be able to understand and interpret the operator's manual and safety instructions,
- □ know the emergency procedures and their implementation,
- □ possess the ability to operate the specific type of equipment,
- $\hfill\square$ is familiar with the specific rules of the case,
- $\hfill\square$ understood the operating procedures outlined by the manufacturer.

1.3 Storage of the instruction manual

The Instruction Manual must be kept with care and must accompany the product in all the steps of ownership.

Storage should be taken care of with dirty care.

They must be removed, torn or arbitrarily modified from the parts.

The Manual should be stored in an environment protected from humidity and heat and in the vicinity of the product to which it refers.

1.4 Definitions and pictograms

To facilitate the immediacy of the comprehension of the text in this paragraph the meaning of terms, abbreviations and pictograms used in the manual is clarified. Their use allows to quickly and univocally provide the information necessary for the correct use of the machine in safety conditions.

INSTALLER: One who mounts and installs a machine and follows the entire process that goes from the arrival to the destination of the components to the subsequent installation at the customer, to final testing and signing of acceptance documents, possibly coordinating a team of men with specializations different. The figure, in detail, has the task of:

- □ assemble the machine following the drawing and using the components at its disposal;
- □ provide, during installation at the customer's site, the setting up and adjustment of the machine or system;

OPERATOR: The person in charge of installing, operating, regulating, cleaning, repairing and moving a machine and carrying out its maintenance;

DANGER: A potential source of injury or damage to health;

HAZARDOUS AREA: Any area inside and / or near a machine where the presence of a person constitutes a risk to the safety and health of that person;

EXPOSED PERSON: Any person who is completely or partially in a dangerous area;

RISK: Combination of the likelihood and severity of an injury or damage to health that may arise in a dangerous situation;

PROTECTIVE DEVICE: Device (other than a guard) which reduces the risk, alone or associated with a guard; **INTENDED USE:** Use of the machine according to the information provided in the instructions for use;

USE INCORRECTLY REASONABLE FORCE: Use of the machine in a manner different from that indicated in the instructions for use, but which may derive from easily predictable human behavior.

RESIDUAL RISK: Risks that remain, despite the integrated protection measures adopted in the machine design and in spite of the protections and protection measures

complementary measures adopted.

SAFETY COMPONENT: Component:

 \Box intended to perform a security function;

□ whose failure and / or malfunction jeopardizes the safety of persons. (eg lifting gear, fixed, movable, adjustable, etc. protector, electrical, electronic, optical, pneumatic, hydraulic device, which asserts, ie interlock, a protector, etc.).

PICTOGRAMS



The descriptions preceded by this symbol contain very important information / requirements, particularly with regard to safety. Failure to comply may result in dangers for the safety of the operators;

PICTOGRAMS RELATED TO SECURITY

- The pictograms in a triangle indicate DANGER.
- The pictograms contained in a circle impose a PROHIBITION / OBLIGATION.



2. SAFETY INSTRUCTIONS

Before installing and starting the unit, carefully read the following user manual and safety instructions



To reduce the risk of an electric shock, perform assembly in a controlled temperature and humidity area free of conduction contaminants.

Disconnect all connections before maintenance or repair. Before maintenance, repair or transport, completely unplug the unit and disconnect all plugs or connectors.

2.1 Transportation and storage

Telegroup S.r.l. assumes no responsibility if the equipment is moved without the appropriate packaging, which however does not ensure impermeability to water, dust and aggressive chemical agents

- □ Transport the machine with lifting equipment suitable for the dimensions and weight of the machine.
- □ Always keep in vertical position.
- □ The appliance must always be stored inside.

 \Box During transport and storage refers to the following temperature range: -20 to + 50 ° C and, for short periods not exceeding 24 hours, up to + 70 ° C.

2.2 Positioning

- Transferring the panel directly from a cold to a warm environment can cause condensation. Before being installed it must be absolutely dry. Please allow an acclimatization time of at least two hours.
- > Do not install near water or in damp environments.
- > Do not install in places near heat sources.
- At least 40 cm must be left to promote heat dissipation. of free space around the walls of the equipment, naturally excluding the rear one. It is also necessary to allow the natural circulation of air inside the cabinets, avoiding carefully placing anything against the cooling openings.

2.3 Installation

Do not operate the equipment in the presence of flammable gases or fumes. The activation of any electrical equipment in such an environment constitutes a safety risk. Do not place the machine in an unventilated area.

The power factor correction panel must be installed according to the instructions in this manual. Failure to recognize the risks related to electricity could prove fatal. Please keep this instruction manual for future reference.

User operations

The only operations allowed to the user are the following:

- □ Activating and deactivating the unit
- \Box Use of user interfaces
- \Box Connecting the cables

These operations must be performed according to the instructions provided in this manual.

During any operation, the user must pay the utmost attention and perform only what is indicated in the instructions. Any deviation from the instructions can be dangerous for the operator.

□ Position any cables so that no one can step on them or trip over them.

- □ The machine must be operated by experienced personnel.
- □ Never intervene on the live device,
- □ if you also switch off without tension, use safety gloves.

□ Do not keep accumulated materials of any kind in the vicinity so as not to hinder the cooling of the equipment.

□ In case of maintenance or failure, report with a special sign that prohibits the insertion into the network.

2.4 Operation and Maintenance

- For complete disconnection of the system: if there are batteries of capacitors inserted, proceed with their disconnection, following the instructions of "MAN mode". Open the main switch and wait at least 3 minutes for a complete discharge of the capacitors
- > Ensure that no foreign objects or fluids can enter the equipment.
- This equipment operates at dangerous voltages, repairs must only be performed by qualified service personnel
- Disconnect the mains power supply before carrying out any service or repair. Check that there is no dangerous voltage inside.

3. GENERAL INFORMATION

3.1 Identification of the manufacturer

MANUFACTURER



Telegroup S.r.l. Via L. Da Vinci, 100 - Loc. Sambuca 50028 TAVARNELLE VAL DI PESA (FI) - ITALIA

CONTACTS

Tel. 055-8071267 / 8071118 Fax 055-8071338 e-mail: <u>telegroup@telegroup.it</u> <u>www.telegroup.it</u>

3.2 Product Identification

The panel is identified by a CE plate on which the reference data are indelibly marked.

TELEGROUP S.r.I. tel 0039 055 8071267 - 80711 www.telegroup.it info@telegrou	18 up.it CE		
MODELLO	MATRICOLA		
kVAR (415v) DATA	TENSIONE DI RETE		
CORRENTE NOMINALE	TIPO CONDENS.		
TENSIONE CONDENS.	TENSIONE AUSILIARI		
BATTERIE (v) 0	GRADO DI PROTEZIONE		
FREQUENZA	TEMP. AMBIENTE -10° +40° C		
T.A. (a cura istallatore)	/5A		
TOGLIERE TENSIONE ED ATTENDERE			

3.3 Statement

Telegroup S.r.l. has produced the product in compliance with the relevant Community Directives applicable at the time of its placing on the market / first commissioning, has satisfied the relevant requirements from the applicable directives and has provided the self-certification path for the affixing of the CE marking. Attached is a copy of the Machine Declaration of Conformity.

Commissioning

The product can only be put into service if properly installed, maintained in efficiency and used in accordance with the intended use. It is also forbidden to use it following constructive changes or additions

of other components that do not fall into ordinary or extraordinary maintenance without the product being declared again in compliance with the requirements of the reference directives and the regulations in force.

3.4 Safety Standards

The panel was created taking into account the indications given in the safety technical standards listed below:

Directive 2014/35/UE	tive 2014/35/UE Concerning the approximation of the laws of the Member States relating to electrical equipment intended to be used within certain voltage limits				
Directive 2014/30/UE	Concerning the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336 / EEC				
CEI EN 61921	Power capacitors. Low voltage PFC batteries				

3.5 Warranty

The product is covered by warranty, as provided for in the general sales conditions. If during the period of validity malfunctions or faults of parts of the product occur, which fall within the cases indicated by the warranty, the Manufacturer, after the appropriate checks, will repair or replace the defective parts.

In order to take advantage of repairs under warranty, the purchaser must in any case ship the appliance to the manufacturer (Telegroup SrI Loc. Sambuca 50028 Tavarnelle Val di Pesa (FI)). The costs for shipping the product to be repaired or replaced are the responsibility of the purchaser; these products are therefore supplied ex-works of the seller.

The warranty right lapses if the faults claimed result from incorrect behavior and operations that do not comply with the indications given in this manual, caused by the purchaser, by his employees, by third parties or by improper use of the product:

 $\hfill\square$ incorrect power supply

□ incorrect installation

□ natural events (Lightning etc. ..)

It is recalled that modifications to safety devices and systems and any intervention other than ordinary and extraordinary maintenance, carried out without the express written authorization of the manufacturer, render the warranty void and relieve the manufacturer from any liability for damage caused by the defective product. For all these reasons we advise our customers to always contact our Customer Service.

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For all components not manufactured by the Seller the warranty conditions of the manufacturers are valid. With the repair or replacement of any defective parts, the seller's obligation must be deemed to have been fulfilled, thus remaining exempt from any claim for damages.

4 GENERAL DESCRIPTION OF THE PANEL

Sheet metal cabinet FE P02 epoxy powder coated gray RAL7035 with smooth / textured finish, equipped with slots for forced cooling of the air.

Front door for access to the internal parts interlocked to the main switch by means of a door-locking handle; closing by locks.

Blind flange for cable passage located on the upper / lower part of the equipment.

Fixing of the equipment to the floor / wall.

General switch-disconnector with door lock and (pre-opening microswitch: switches the capacitors off, via contactors, before the isolator contacts open - optional -).

Other features see (APPENDIX).

4.1 Environmental Conditions

The machine is suitable for operating in environments that are:

• altitude not exceeding 1000 m s.l.m .;

 \bullet temperature between 0 $^{\circ}$ C and + 40 $^{\circ}$ C with relative humidity not higher than 85%

It is forbidden to use the machine in environments that are:

- Excessively dusty;
- in corrosive atmosphere;
- at risk of fire;
- in an explosive atmosphere.

4.2 Electromagnetic environment

The machine is designed to operate correctly in an industrial-type electromagnetic environment, within the limits of Emission and Immunity provided for by the following harmonized standards:

CEI EN 61000-6-2 Electromagnetic compatibility (EMC) Generic standards - Immunity for industrial environments

CEI EN 61000-6-4 Electromagnetic compatibility (EMC) Generic standards - Emission for industrial environments

4.3 Technical data of the equipment

On the product identification plate, the essential technical data are shown (General characteristics, Characteristics of capacitors Characteristics of power factor correction regulators),

4.4 Sound Emissions

The A-weighted equivalent continuous sound pressure level in the work stations does not exceed 45 db (A) during the working phase;

5 INSTALLATION

5.1 Inspection of the unit

Upon receipt of the equipment it is advisable to remove the product from the packaging and check for any damage caused by transport. If damage is found, inform the carrier responsible for the transport and your dealer. Keep the packing carton in case the product has to be sent back to the factory for repairs.

5.2 Connection

Caution!!! The correct connection and commissioning of an automatic power factor correction device is relatively simple, but must not in any way be entrusted to the case. As a result, the unit will not switch the capacitor banks on or off or it will function abnormally. Since the panels are all tested and tested on site, any operating anomalies will be due to incorrect connection and, in particular, to the incorrect positioning of the current transformer. Please therefore follow the instructions in this manual to be followed strictly in the sequence indicated.

Thanks for your collaboration

Place the panel in a ventilated position away from sources of heat: good air circulation is one of the most important characteristics for a correct and lasting operation. Leave a minimum space of 40 cm around the panel, so that the air can penetrate and exit freely. Do not place the equipment in humid and dusty places unless it has been requested with a particular degree of protection.

To assure the short-circuit withstand, it is necessary to install a three-phase fuse current regulators of the NH-aM



type, or other devices with similar characteristics, upstream of the power factor correction boards, both with fixed current and breaking capacity higher than the supposed short-circuit current.

When Icc is not known at the installation point, the short-circuit current at the transformer secondary can be roughly taken.

Power KVAR	lcc max kA
Da 7.5 a 40	1.5
Da 45 a 55	2.5
Da 65 a 75	8
Da 87.5 a 250	15
Da 275 a 400	20
Da 450 a 750	50

KVA	Vcc%	lcc kA
50	4	1,8
63	4	3,6
100	4	5,77
160	4	7,22
200	4	9,02
250	4	11,37
315	4	14,43
400	4	18,04
500	4	22,73
630	4	19,25
800	6	24,06
1000	6	30,07
1250	6	38,49
1600	6	48,11
2000	6	50,14



To connect an automatic PFC panel to the network, it is necessary to have a C.T. (current transformer) having a secondary rated current of 5 or 1 A not supplied with the product but charged to the customer.

The primary rated current of the C.T. must be chosen according to the rated current of the line regardless of the power of the power factor correction bearing in mind that the measuring range of the regulator current ranges from 8% to 110% of the current of the C.T. therefore, this condition must be met.

Eg: there is a circulating current of 200 / A. A T.A. will have to be chosen. whose current ranges from: 2500 A (8% of 2500 = 200 / A) and 180A (110% of 180 A = 200 / A). It is a good rule to install a C.T. with a double primary current that is actually circulating, therefore, in the case of the example, a C.T. will be selected. with primary current of 400 A.

To connect the equipment to the network some simple operations are necessary that must be absolutely respected.

The sequence of the main operations necessary for this purpose can be summarized as follows:

1. Ground the secondary of C.T ..

2. Supply the equipment with cables of adequate cross-section according to the rated power.

3. Power supply: three-phase + Pe (unless otherwise requested)

4. Anchor the power cables to the main switch according to the phase sequence.

If you want to switch off the panel during operation, make sure, before opening the main switch, that you have disconnected all the batteries, following the instructions (see MAN mode)

• The C.T. must be positioned on the phase (R - L1), upstream of the loads and the line that feeds the power factor correction panel.

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• The phase sequence (R (L1) - S (L2) -T (L3)) must be respected when connecting the line to the power factor correction panel.

• This condition can be easily checked with the aid of a voltmeter: by measuring, between the phase where the C.T. (the R) and the phase anchored on the R terminal of the automatic power factor correction switch, the voltage must be "0".



• The positioning of the C.T. It is essential for the correct functioning of the appliance. The relative diagram is shown in the figure alongside



The following are some possible positions of the C.T. wrong:

Position 2: despite being the C.T. installed upstream, and installed on phase L3 (T) instead of L1 (R)

Position 3: the C.T is installed on the load line!

Position 4: the C.T. it is installed on the phases that feed the pfc!



The insertion of an automatic power factor correction device in the presence of MV transformers. If there are batteries of capacitors of the fixed type, on the transformers, the C.T. necessary for the control of the automatic rephasing device to be placed downstream of the fixed capacitors.



The figure shows the connection of a power factor correction equipment in the presence of MV connected transformers in parallel

NOTE. It is necessary to use a C.T. adder with 2 or 3 inputs depending on whether there are 2 or 3 transformers, to which the cables coming from the C.T. must be connected. The output of the C.T. adder must be connected to the automatic rephasing.

Set the C.T. (the ways to set this parameter are described in Appendix B) as the sum of the two or three C.T.

6 ADJUSTMENTS

6.1 INSTRUCTIONS FOR USE OF THE PCRJ8 POWER FACTOR REGULATOR

The **PCRJ8** is an automatic rephasing controller based on a microprocessor control circuit, able to perform the insertion or disconnection of the capacitor banks necessary to reach and maintain the average power factor set. The instrument makes a measurement with RMS value that allows operation and correct display even in the presence of distorted waveforms. The central microprocessor unit manages all the regulation procedures

- Automatic microprocessor power factor regulator.
- LED display, 3-digit 7 segments.
- 4-button membrane keyboard.
- TTL-RS232 serial interface for set-up and automatic test by PC.
- Internal temperature sensor.

• Advanced functions (capacitor overload current measurement, average weekly power factor, maximum value storage).

The appliance is set up to recognize the current direction of the C.T .. In case of cogeneration plants it is necessary to disable this function (see advanced menu chapter) and to ensure the correct connection of the C.T ..

The secondary of C.T. it must be connected to the ground.

A. Attention: the parameters of the PCRJ8 controller are already preset and must not be changed.

B. The only parameters to be set by the installer are the language and the value of the primary of the amperometric transformer (C.T). Pay close attention to the setting before pressing the confirmation button.

First power-up

- At the time of first power up, the device may ask the user to set the clock and calendar, in case it is stopped.
- Then a window will appear asking to specify the language you want to use for navigation on the display. Press OK for direct access to the
 parameter P01.01 for the selection of the language.



Then the display will show a window asking to set the primary of the CT, which usually is the responsibility of the final installer. Even in this
case it activates a direct access to the setting of the relevant parameter P02.01.



• The above procedure will be repeated every time the device is powered on, until the CT primary setting is entered in parameter P02.01.

.6.2 Automatic power factor regulator REDUCED OPERATING MANUAL

Index Introduction Description Function of the keys front Front LED First tensioning Operating modes Main menu Password access Browsing the display pages Table of display pages Harmonic analysis page Waveforms page Expandability Additional resources Communication channels Inputs, outputs, internal variables, counters Limit thresholds Remote variables User alarms Master Slave configuration IR programming port Parameter setting by PC Parameter setting from front panel Table of parameters Alarms Description of the alarms Properties of alarms Alarm table Input function table Output function table Measure table for analog limits and outputs Command menu Installation Connection schemes Clamping arrangement Mechanical dimensions and panel drilling **Technical features**

Introduction

The PCRJ8 automatic power factor control unit has been designed to offer state-of-the-art functions for power factor compensation applications. Built with dedicated components and extremely compact, the PCRJ8 combines the modern design of the front panel with practical installation and the possibility of expansion from the rear, where EXP series modules can be slotted. The LCD screen provides a clear and intuitive user interface.

Description

- Automatic power factor controller with 8 built-in relays for capacitor steps, 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 EXP series expansion modules:
- RS232, RS485, USB, Ethernet, Profibus, GSM/GPRS communications interface
 - o 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: Master + 8 slave.
 - Max 32 step total.
 - o Max 16 step each unit.
 - o 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.



Front keyboard

Key \checkmark - Used to call up the main menu and to confirm a choice.

- \blacktriangle and \blacktriangledown 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.







PCRJ8 Front panel

First power-up

- At the time of first power up, the device may ask the user to set the clock and calendar, in case it is stopped.
- Then a window will appear asking to specify the language you want to use for navigation on the display. Press OK for direct access to the parameter P01.01 for the selection of the language.



• Then the display will show a window asking to set the primary of the CT, which usually is the responsibility of the final installer. Even in this case it activates a direct access to the setting of the relevant parameter P02.01.



• The above procedure will be repeated every time the device is powered on, until the CT primary setting is entered in parameter P02.01.

Operating modes

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

TEST Mode

- When the unit is brand new and has never been programmed, it automatically enters in TEST mode that allows the installer to manually activate the individual relay outputs, so you can verify the correct wiring of the panel.
- 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 after programming the unit, use the appropriate command in the command menu.

MAN Mode

- When the unit is in manual mode, you can select one of the steps and manually connect or disconnect it.
- 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.

AUT Mode

- 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.

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 screenis 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.
- (h) VI Fos etc. Shortcuts that allow jumping to the first page of that group. Starting from that page it is still possible to move forwardbackward in the usual way.
- 🖤 😰 Switch the operation to manual or automatic mode.
- E 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

ln F	serimento bassword	Pagina principale	Passa in mo manua	odalità le
Menu comandi			i con	Passa in modalità Automatico
Menu impostazioni (Setup)			V-I	Pagina tensioni - correnti
Informazioni sistema		₩@P <u>a</u> ş		Lista eventi
Am	noniche	Statistiche vita step	Pagina potenze	•

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 Allows clearing of recorded values and the editing of a restricted number of setup parameters.
- Advanced access level 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 ✓.
- The display shows the screen in picture:



- . Keys \blacktriangle and \blacktriangledown change the selected digit
- Keys \blacktriangleleft and \blacktriangleright move through the digits.
- Enter all the digits of the numeric code, then move on the key icon.
- If the password code entered matches the *User access code* or the *Advanced access code*, then the correspondent unlock message is shown.
- Once unlocked the password, the access rights last until:
 - o the device is powered off.
 - the device is reset (after quitting the setup menu).
 - o the timeout period of two minutes elapses without any keystroke.
- To quit the password entry screen press \checkmark key.

Display page navigation

- Keys \blacktriangle and \checkmark 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 bargraphs, 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 itwas last.
- You can set this function in menu M01 Utility.

Harmonic analysis page

• In the PCRJ8 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

- o phase-to-neutral voltages
- o 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



The vertical scale of the graph is automatically selected among four full- scale values, depending on the column with the highest value.

Waveform page

- This page graphically views the waveform of the voltage and current signals read by the PCRJ8.
- It is possible to see one phase at a time, selecting it with U 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



Expandability

- Thanks to expansion bus, the PCRJ8 can be expanded with EXP... series modules.
- It is possible to connect a maximum of 4 EXP... modules at the same time.
- The supported EXP modules can be grouped in the following categories:
 - o additional steps
 - o communication modules
 - o digital I/O modules
 - Analog I/O modules.
- To insert an expansion module:
- remove the power supply to PCRJ8
- o remove the protecting cover of one of the expansion slots
- insert the upper hook of the module into the fixing hole on the top of the expansion slot
- rotate down the module body, inserting the connector on the bus push until the bottom clip snaps into its housing.

- When the PCRJ8 is powered on, it automatically recognises the EXP 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.

CONFIGURATION CHANGE					
00	т∥	4IN		RS	
REI				232	
NEW CONFIGURATION					
SAVE OR RETRY					
KIRETRY SAVE					

- 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

MODULI DI	ESPANSIONE	
OUT 4IN REL	RS 232	Tipo dei moduli di espansione
OUTO9 <u>UNIDO</u> OUTIO INPO2 INPO3 INPO4	50 1 0	Numerazione e stato delle risorse acciuntive.
		In reverse = attive

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 and in which slot they can be inserted. The total number of modules must be less or equal than 4.

.

MODULE TYPE	CODE	FUNCTION	MAX Nr.	SLOT POS.
ADDITIONAL STEPS	EXP 10 06	2 RELAY STEPS	4	Any
	EXP 10 01	4 STATIC STEPS (FAST)	2	Any
COMMUNICATION	EXP 10 10	USB	2	1,2
	EXP 10 11	RS-232	2	1,2
	EXP 10 12	RS-485	2	1,2
	EXP 10 13	Ethernet	1	1,2
	EXP 10 14	Profibus® DP	TBD	TBD
	EXP10 15	GSM-GPRS	1	2
DIGITAL I/O	EXP 10 00	4 INPUTS	2	1,2
	EXP 10 02	2 INPUTS + 2 ST. OUTPUTS	4	1,2
	EXP 10 03	2 C/O RELAYS	4	Any
ANALOG I/O	EXP 10 04	2 ANALOG INPUTS	2	1,2
	EXP 10 05	2 ANALOG OUTPUTS	2	1,2
	EXP 10 16	CAPACITOR HARMONIC PROTECTION	2	1,2

Communication channels

- The PCRJ8 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 PCRJ8 with both an Ethernet port and a RS485 port, that acts as a bridge over other PCRJ8s equipped with RS-485 only, in order to achieve a more economic configuration (only one Ethernet port).
- In this network, the PCRJ8 with Ethernet port will be set with both communication channels (two among COM1, COM2 and and COM3) with *Gateway* function set to ON, while the other PCRJ8s will be configured normally with *Gateway* = OFF.

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 8 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	DESCRIZIONE	BASE	EXP
INPx	Digital Inputs	-	18
OUTx	Digital Outputs	18	916
COMx	Communication ports	-	12
AINx	Analog Inputs	-	14
AOUx	Analog Outputs	-	14

- 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 PCRJ8.

CODE	DESCRIPTION	RANGE
LIMx	Limit thresholds	116
REMx	Remote-controlled variables	116
UAx	User alarms	18
PULx	Energy consumption pulses	13
CNTx	Programmable counters	18

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: $25 \times 1k = 25000$).
- 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:

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.

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.

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 M24.



Remote-controlled variables (REMx)

- PCRJ8 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 deenergise one relay through the supervision software. This allows to use the PCRJ8 relays to drive lighting or similar loads.

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 *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.



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 - UTI	LITY	UoM	Default	Range	
P01.01	Language		English	English Italian French Spanish Portuguese German Polish Czech Russian Custom	
P01.02	Set clock at system power on		OFF	OFF-ON	
P01.03	LCD contrast	%	50	0-100	
P01.04	Display backlight high intensity	%	100	0-100	
P01.05	Display backlight low intensity	%	25	0-50	
P01.06	Time to switch to low backlighting	S	180	5-600	
P01.07	Return to default page	S	60	OFF / 10-600	
P01.08	Default page		main	(page list)	
P01.09	Plant description		(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 description will be used also for identification after remote reporting alarms/events via SMS/E-mail.

M02 – GE	NERAL	UoM	Default	Range
P02.01	CT primary	A	OFF	OFF/1-30000
P02.02	CT secondary	A	5	1 5
P02.03	Plant type		3-phase	3-phase 1 phase
P02.04	Current reading phase		L3	L1 L2 L3 L1 L2 L3
P02.05	CT polarity		Aut	Aut Dir Rev
P02.06	Voltage reading phase		L1-L2	L1-L2 L2-L3 L3-L1 L1-N L2-N L3-N L1-L2-L3 L1-L2-L3-N
P02.07	Smallest step power	kvar	1.00	0.01 - 10000
P02.08	Capacitor rated voltage	V	400	50 – 50000



		1		
P02.09	Rated frequency	Hz	Aut	Aut
				50Hz
				60Hz
				Variable
P02.10	Reconnection time	S	60	1-30000
P02.11	Sensitivity	S	60	1-1000
P02.12	Disconnection	S	OFF	OFF / 1 – 600
	sensitivity			
P02.13	Setpoint cosphi 1 (standard)		0.95 IND	0.50 IND – 0.50 CAP
P02.14	Setpoint cosphi 2		0.95 IND	0.50 IND – 0.50 CAP
P02.15	Setpoint cosphi 3		0.95 IND	0.50 IND – 0.50 CAP
P02.16	Setpoint cosphi generating		0.95 IND	0.50 IND – 0.50 CAP
P02.17	Sepoint + clearance		0.00	0-0.10
P02.18	Setpoint - clearance		0.00	0-0.10
P02.19	Step disconnection when		OFF	OFF / ON
	generating			
P02.20	Plant rated current	Α	Aut	Aut / 1 – 30000
P02.21	Plant rated voltage	V	Aut	Aut / 100 – 60000
P02.22	Plant voltage type		LV	LV
				MV/LV
				MV
P02.23	VT usage		OFF	OFF
				ON
P02.24	VT1 primary	V	100	50-50000
P02.25	VT1 secondary	V	100	50-500
P02.26	VT2 primary	V	100	50-50000
P02.27	VT2 secondary	V	100	50-500
P02.28	Step insertion mode		Standard	Standard
				Linear
				Fast
P02.29	Static switching delay	cycles	3	1-20
P02.30	Tanphi setpoint enable		OFF	OFF
				ON
P02.31	Tanphi setpoint		0	-1.732 - +1.732



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.
P02.04	 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 working with agive and CT and when the output mean polarization device.
	Dir = Automatic detection disabled. Direct connection. Rev = Automatic detection disabled. Reverse wiring (crossover)
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 and referred to the total of the three capacitors for three-phase applications.
P02.08	 Rated plate capacitor, which is delivered in specified power P02.07. If the capacitors are used to a tansione different (lower) than nominal, the resulting power is automatically recalculated by the device.
P02.09	- Working frequency of the system. Auto = automatic selection between 50 and 60 Hz at power 50Hz = fixed at 50 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 well 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 P02.14	Setpoint (target value) of the power factor. Value In use of standard applications. - 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 / 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.
P02.19	Note: + means "towards inductive", - means "towards capacitive". - 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
P02.21	 - Rated voltage of the system. Value used for the full scale of the bar graphs and setting the voltage thresholds expressed as a percentage. If set to Aut then the value of P02.08 (nominal voltage capacitors) 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 P02.28	P02.27 – Data of VTs eventually used in the wiring diagrams. - 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.
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 Tnaphi setpoint. Negative values of Tanphi correspond to capacitive Cophi



M03 – STI (STPn, n=	EP :13	2)	UoM	Default	Range
P03.n.0	1	Step weight		OFF	OFF/ 1 – 99
P03.n.0	2	Step insertion type		Contactor	Contactor Static
Note: This P03.n.01 - P03.n.02 - M04MA3 (OUTn, n= P04.n.0	s me STP: - Wei the n P02.1 - Typ Conta recor Statio consi Statio consi Statio consi Statio 1	nu is divided into 32 sectio STP32 which can be mar- ght of step n, referred to the vi- ultiple of the power of the cu 17. If set to OFF the step is di e device delegated the inserti- actor = Switching with electro- nection is used. E Electronic thyristor switching dered . Used for Fast power COUTPUTS (6) Output OUTn function	ns that r naged by value of t rrent step sabled a ion step. mechani ng. On tt factor co	efer to 32 pos the PCRJ8. he smallest st o with reference nd will not be cal contactor. his step the time rection. Default n=18	ep. A number that indicates e to the smallest set by used. On this step the time of ne of reconnection is not Range See
		•		Step x n=916 OFF	Output function table
P04.n.0	2	Channel number x		n=18 x=18 n=916 x=1	OFF/1 – 99
P04.n.0	3	Output normal/reversed		NOR	NOR REV
 Note: This menu is divided into 16 sections that refer to 16 possible digital outputs OUT1OUT16, which can be managed by the master PCRJ8; OUT81OUT08 on the base board and OUT09OUT16 on any installed expansion modules. P04.n.1 – Selects the functions of the selected output (see programmable outputs functions table). P04.n.2 – Index associated with the function programmed in the previous parameter. Example: If the output function is set to Alarm Axx, 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 – MA	STE	R / SLAVE	lloM	Default	Pango
P05.01	Ма	ster-Slave function		OFF	OFF COM1 COM2
P05.02	De	vice role		Master	Master Slave01 Slave02 Slave03 Slave08

				Slave08
P05.03	Slave 1 enable		OFF	OFF-ON
P05.04	Slave 2 enable		OFF	OFF-ON
P05.05	Slave 3 enable		OFF	OFF-ON
P05.06	Slave 4 enable		OFF	OFF-ON
P05.07	Slave 5 enable		OFF	OFF-ON
P05.08	Slave 6 enable		OFF	OFF-ON
P05.09	Slave 7 enable		OFF	OFF-ON
P05.10	Slave 8 enable		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 – SLA\ (n=116)	/E 1 OUTPUTS	UoM	Default	Range
P06.n.01	Output OUTn function		n=18 Step x n=916 OFF	See Output function table
P06.n.02	Channel number x		n=18 x=18 n=916 x=1	OFF/1 – 99
P06.n.03	Output normal/reversed		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 PCRJ8 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 *Alarm Axx*, and you want this output to be energized for alarm A31, then P06.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 – SLA\ (n=116)	/E 2 OUTPUTS	UoM	Default	Range
P07.n.01	Output OUTn function		n=18 Step x n=916 OFF	See Output function table
P07.n.02	Channel number x		n=18 x=18 n=916 x=1	OFF/1 – 99
P07.n.03	Output normal/reversed		NOR	NOR REV
See above,	referred to slave 2			

M13 – SLAV (n=116)	E 8 OUTPUTS	UoM	Default	Range
P13.n.01	Output OUTn function		n=18 Step x n=916	See Output function table
			OFF	
P13.n.02	Channel number x		n=18 x=18	1 – 99
			n=916 x=1	
P13.n.03	Output normal/reversed		NOR	NOR REV
See above, i	referred to slave 8			

M14- PROGI (INPn, n=1	RAMMABLE INPUTS .8)	UdM	Default	Range	
P14.n.01	INPn input function		OFF	(see Input functions table)	
P14.n.02	Channel number x		OFF	OFF / 199	
P14.n.03	Contact type		NO	NO/NC	
P14.n.04	Delay ON	S	0.05	0.00-600.00	
P14.n.05	Delay OFF	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 programmable inputs functions table). P14.n.02 – Index associated with the function programmed in the previous parameter. Example: If the input function is set to <i>Cxx commands menu execution</i>, 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. 					

....



M15 – PA	SSWORD	UoM	Default	Range	
P15.01	Enable password		OFF	OFF-ON	
P15.02	User level password		1000	0-9999	
P15.03	Advanced level password			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.					
D45.02	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.



M16 - COM	MUNICATION	UoM	Default	Range
(COMn. n=1	2)	00m	Doradit	nango
P16.n.01	Node serial address		01	01-255
P16.n.02	Serial speed	bps	9600	1200
				2400
				4800
				9600
				19200
				38400
				57600
				115200
P16.n.03	Data format		8 bit – n	8 bit, no parity
				8 bit, odd
				8bit, even
				7 bit, odd
				7 bit, even
P16.n.04	Stop bits		1	1-2
P16.n.05	Protocol		Modbus RTU	Modbus RTU
				Modbus ASCII
				Modbus TCP
P16.n.06	IP address		192.168.1.1	000.000.000.000 -
				255.255.255.255
P16.n.07	Subnet mask		255.255.255.0	000.000.000.000 -
				255.255.255.255
P16.n.08	TCP-IP port		1001	0-9999
P16.n.09	Channel function		Slave	Slave
				Gateway
				Mirror
P16.n.10	Client / server		Server	Client
				Server
P16.n.11	Remote IP address		000.000.000.000	000.000.000.000 -
				255.255.255.255
P16.n.12	Remote IP port		1001	0-9999
P16.n.13	IP gateway address		000.000.000.000	000.000.000.000 -
1				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

Plan.10 - Enabling TCP-IP connection. Server = Awaits connection from a remote customers.

Client = Establishes a connection to the remote server. P16.n.11 - P16.n.12 - P16.n.13 - Coordinates for the connection to the remote server when P16.n.10 is set to the client.


M17 – BA	SE PROTECTIONS	UoM	Default	Range	
P17 01	Temperature unit of measure		°C	°C	
1 11.01	remperature unit or measure		Ŭ	°Ĕ	
P17.02	Panel interior temperature		Internal	Internal sensor	
	measurement source		sensor	AINx	
D47.02			1	NTCx 1 00	
P17.03	Channel nr. (X)	0	50	I-99 0_212	
P17.05	Fall Start temperature	•	45	0-212	
P17.06	Panel interior temperature	•	55	0-212	
	alarm threshold			0212	
P17.07	Capacitor current overload		ON	OFF	
B47.00		0/	405	ON	
P17.08	Capacitor current overload threshold	%	125	OFF / 100 – 150	
P17.09	Immediate step disconnection threshold	%	150	OFF / 100 – 200	
P17.10	Current overload alarm reset time	min	5	1 – 30	
P17.11	Step trimming		OFF	OFF / ON	
P17.12	Faulty step alarm threshold	%	OFF	OFF / 25100	
P17.13	Maximum voltage threshold	%	120	OFF / 90150	
P17.14	Minimum voltage threshold	%	OFF	OFF / 60110	
P17.02 - [Defines which sensor is providing t	he meas	ure of the tem	perature inside the panel:	
	Internal sensor - Sensor built into t	the contro	oller.		
	AINx - Temperature of PT100 expansion module with analog inputs.				
P17.03 - 0	NTCX - Tempertaura by NTC expansion module protection harmonics.				
P17.04 - F	17.05 - Start and stop temperatur unit set by P17.01.	e for the	cooling fan of	the panel, expressed in the	
P17.06 - T	Threshold for generation of alarm A	A07 Pane	el temperature	too high .	
P17.07 - E	Enables the measurement of the ca	apacitor of	current overloa	ad, calculated from the	
	waveform of the applied voltage.				
P17.08 –	Trip threshold for the capacitors ov	/erload p	rotection (alari	m A08), that will arise atter a	
	integral delay time, inversely prop	ortional t	o the value of	the overload.	
P17.09 - T	Threshold beyond which the integra	al delay f	or tripping of t	he overload alarm is zeroed,	
	causing the immediate intervention	n of the A	08 alarm.		
P17.10 - D	Delay time for the resetting of over	load alar	m.	Conservation and Alinear Alinear	
P17.11 - c	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 steps is adjusted				
P17.12 - F	Percentage threshold of the residuation	al power	of the steps, c	ompared with the original	
	power programmed in general me	nu. Belov	w this threshol	d the alarm A10 step failure	
D47 12 A	is generated.	-oforrod	to the rated w	liers act with DO2 21	
P1/.13-N	AXIMUM VOILage alarm threshold, beyond which the alarm Δ06 Volts	reieneu	to the fateu vo	Mage set with Fuz.zi,	
P17.14 - U	Indervoltage alarm threshold, refe	rred to th	e rated voltad	e set with P02.21. below	
which the alarm A05 voltage too low is generated.					



M18 – HAR		lloM	Default	Range	
(HARn, n=1	4)	00111	Delault	Kange	
P18.n.01	CT primary	Α	5	1 - 30000	
P18.n.02	CT secondary	A	5	1-5	
P18.n.03	CT cabling type		2 in Aron	2 in Aron 1 balanced	
P18.n.04	Nominal current	Α	5	1 - 30000	
P18.n.05	CT positioning		Global	Global	
				Step 1	
				Step 2	
D18 p 06	Current limit	0/,	OFF	Step o	
P18 n 07	Current THD Limit	/0 %	OFF	OFF / 1 - 200	
P18 n 08	5rd Harmonic limit	%	OFF	OFF / 1 - 200	
P18 n 09	7th Harmonic limit	%	OFF	OFF / 1 - 200	
P18.n.10	11th Harmonic limit	%	OFF	OFF / 1 – 200	
P18.n.11	13th Harmonic limit	%	OFF	OFF / 1 – 200	
P18.n.12	Temperature alarm	•	55	OFF / 0-212	
	threshold 1				
P18.n.13	Temperature alarm	۰	55	OFF / 0-212	
	threshold 2				
Note: Parar	neters in this menu are referre	ed to pro	tections that	are available only when	
us Dia ai us	sing the harmonic protection r	nodule E	EXP1016.		
P18.n.01 - F	P18.n.01 - P18.n.02 - Primary and secondary of the CT used for current measurement in				
P18 n 03 - (power factor correction panel and connected to the harmonics protection module.				
2	2 in Aron - Reading of three currents (three-phase) with two CT in Aron configuration				
1	1 balanced - Reading a single current from a single CT.				
P18.n.04 - F	P18.n.04 - Rated current flowing in the power factor correction branch under normal conditions.				
P18.n.05 - b	pranch of the circuit where are lo	cated the	e CT for harmo	onic protection measure.	
P18.n.06 - N	Max current threshold in the pow	er factor	correction bra	nch, used for generation of	
ala	arm A11.				
P18.n.07 - Current THD maximum threshold in the branch of power factor correction. Used for					
D10 0 00 1	generation of alarm A12.				
rio.n.uo - Threshold oth harmonic content in the branch of power factor correction. Used for dependent of alarm A13					
yeneration of ald III ATS. P18 n 09 - Threshold 7th harmonic content in the branch of nower factor correction. Used for					
generation of alarm A14.					
P18.n.10 - 1	P18.n.10 - Threshold 11th harmonic content in the branch of power factor correction. Used for				
ge	eneration of alarm A15.				
P18.n.11 - 1	Threshold 13th harmonic content	t in the bi	ranch of power	r factor correction. Used for	
ge	eneration of alarm A16.				
P18.n.12 - F	18.n.13 - Maximum temperatur	e thresho	olds 1 and 2 or	the sensors connected to	
the harmonics protection module. Used to generate alerms A17 and A18.					

M19 - MISCE	LLANEOUS	UoM	Default	Range
P19.01	Step disconnection passing in MAN mode		OFF	OFF/ON
P19.02	Maintenance interval 1		9000	1 - 30000
P19.03	Maintenance mode 1		Always	Always Step inserted
P19.04	Maintenance interval 2		9000	1 - 30000
P19.05	Maintenance mode 2		Step ins.	Always Step inserted
P19.06	Maintenance interval 3		9000	1 - 30000
P19.07	Maintenance mode 3		Step ins.	Always Step inserted
P19.01 - If set to ON, when switching from AUT mode to MAN mode, steps are disconnected in sequence.				
P19.02-P19.0 inte alw inco ala	07 - define three intervals of sch ervals you can set the duration in ays active when the controller i remented only when one or mor rms are generated respectively.	neduled r n hours a s powere re steps a A20, A2	maintenance. F and the countir ed Step ins = F are inserted. W 1. A22 (the ala)	For each of the three Ig mode. Always = Count hour counter is /hen the time runs out rms must be enabled)



M20 – LIMIT	THRESHOLDS	UoM	Default	Range
(LIMn, n=1	.16)			-
P20.n.01	Reference measurement		OFF	OFF- (misure)
P20.n.02	Channel nr. (x)		1	OFF / 1-99
P20.n.03	Function		Max	Max – Min – Min+Max
P20.n.04	Upper threshold		0	-9999 - +9999
P20.n.05	Multiplier		x1	/100 – x10k
P20.n.06	Delay	S	0	0.0 - 600.0
P20.n.07	Lower threshold		0	-9999 - +9999
P20.n.08	Multiplier		x1	/100 – x10k
P20.n.09	Delay	S	0	0.0 - 600.0
P20.n.10	Idle state		OFF	OFF-ON
P20.n.11	Memeory		OFF	OFF-ON
Note: this menu is divided into 16 sections for the limit thresholds LIM116				
P20.n.01 – Defines to which PCRJ8 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 – COUN (CNTn, n=1	ITERS 8)	UoM	Default	Range
P21.n.01	Count source		OFF	OFF-ON-INPx-OUTx-LIMx- REMx
P21.n.02	Channel number (x)		1	OFF / 1-99
P21.n.03	Multiplier		1	1-1000
P21.n.04	Divisor		1	1-1000
P21.n.05	Description of the counter		CNTn	(Text – 16 characters)
P21.n.06	Unit of measurement		Umn	(Text – 6 characters)
P21.n.07	Reset source		OFF	OFF-ON-INPx-OUTx-LIMx- REMx
P21.n.08	Channel number (x)		1	OFF / 1-99
Note: this menu is divided into 8 sections for counters CNT18 P21.n.01 - Signal that increments the count (on the output side). This may be the start-up of the PCRJ8 (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.02 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 - ANAL		UoM	Default	Range		
P22.n.01	Input type		OFF	OFF 020mA 420mA 010V -5V+5V PT100		
P22.n.02	Start of scale value		0	-9999 - +9999		
P22.n.03	Multiplier		x1	/100 – x1k		
P22.n.04	End of scale value		100	-9999 - +9999		
P22.n.05	Multiplier		x1	/100 – x1k		
P22.n.06	Description		AlNn	(Testo – 16 caratteri)		
P22.n.07	Unit of measurement		UMn	(Testo – 6 caratteri)		
 with the EXP10V4 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 measurements "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 420mA signal from an electronic level sensor, that will have to be shown on the display with the description '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 = 420mA P22.3.02 = 0						
P22.3.03 = x	P22.3.03 = x1					
P22.3.04 = 1	500					
P22.3.05 = x	1					
P22.3.06 = 'F level' P22.3.0	P22.3.06 = 'Reserve tank level' P22.3.07 =' litres'					

M23 – ANAL	OG OUTPUTS	UoM	Default	Range
P23.n.01	Output type		OFF	OFF 020mA 420mA 010V -5V+5V
P23.n.02	Reference measurement		OFF	OFF- (misure)
P23.n.03	Channel number (x)		1	OFF / 1-99
P23.n.04	Start of scale value		0	-9999 - +9999
P23.n.05	Multiplier		x1	/100 – x100k
P23.n.06	End of scale value		0	-9999 - +9999
P23.n.07	Multiplier		x1	/100 – x100k
 available with EXP1005 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.). 				
Approximation example. The analog output AO2 inust entry a 0.20th A signal proportional to that total active power, form 0 to 500kW. So, we must program section 2 of this menu, that is referred to AOU2. P23.2.01 = 020mA P23.2.02 = kW tot P23.2.03 = 1 (not used) P23.2.05 = x1 P23.2.06 = 500 P23.2.07 = x1k				



M24 – PULS	ES 6)	UoM	Default	Range
P24.n.01	Pulse source		OFF	OFF-kWh-kvarh-kVAh
P24.n.02	Counting unit		100	10/100/1k/10k
P24.n.03	Pulse duration	S	0.1	0.1-1.00
 pulse variables PUL1PUL6. P24.n.01 - Defines which energy meter should generate the pulse of the 6 possible meters managed by the PCRJ8. kWh = Active energy. Kvarh = Reactive energy. kVA = 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	M25 – USER ALARMS		Default	Range
P25.n.01	Alarm source		OFF	OFF-INPx-OUTx-LIMx- REMx
P25.n.02	Channel number (x)		1	OFF / 1-99
P25.n.03	Text		UAn	(testo – 20 char)
 Note: this menu is divided into a sections for user alarms UA1UA8 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 – ALAR	M PROPERTIES	Default	Range	
(ALAn, n=1.	30)			
P26.n.01	Alarm enable	(see table)	OFF – ON	
P26.n.02	Retnitive	(see table)	OFF - RIT	
P26.n.03	Operating mode	(see table)	AUT-MAN AUT	
P26.n.04	Global alarm 1	(see table)	OFF – GLB1	
P26.n.05	Global alarm 2	(see table)	OFF – GLB2	
P26.n.06	Global alarm 3	(see table)	OFF – GLB3	
P26.n.07	Step disconnection	(see table)	OFF IMMEDIATE SLOW	
P26.n.08	Slave disconnection mode	(see table)	GENERAL - LOCAL	
P26.n.09	Inhibition from input	(see table)	OFF - INH	
P26.n.10	Modem call	(see table)	OFF - MDM	
P26.n.11	Not shown on LCD	(see table)	OFF - NOLCD	
P26.n.12	Alarm delay	(see table)	OFF/ 1-120	
P26.n.13	Delay UoM	(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				

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.

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 PCRJ8 depends on the properties settings of the active alarms.

Alarm description

COD	ALLARME	DESCRIZIONE
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 lower than minimum 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 occoured on the line voltage inputs, lasting more than 8ms.
A10	Step xx failure	The residual power of step xx is lower than minimum threshold set with P17.12.
A11	Harmonic protection Module nr. n Current too high	The RMS current measured by the harmonic protection 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 harmonic protection 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 harmonic protection 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 harmonic protection 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 harmonic protection 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 harmonic protection 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 harmonic protection 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 harmonic protection 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.
UAx	User alarm x (x=18)	User-defined alarm, as specified by parameters of menu M25.
A20	Maintenance interval 1 elapsed	The maintenance 1 interval hours are elapsed. After maintenance service, reset counter with command menu C.16.
A21	Maintenance interval 2 elapsed	The maintenance 2 interval hours are elapsed. After maintenance service, reset counter with command menu C.17.
A22	Maintenance interval 3 elapsed	The maintenance 3 interval hours are elapsed. After maintenance service, reset counter with command menu C.18.

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.

Alarm properties table

		DEFAULT ALARM PROPERTIES												
COD	Enable	Retenitive	Only in AUT mode	Global alarm 1	Global alarm 2	Glo al alarm 3	Step disconnection mode	Slave disconnection mode	Inhibit	Modem	No LCD	Delay time	min	sec
A01	•		٠	•			OFF	GEN		٠		15	•	
A02	•		•				OFF	GEN		•		120		٠
A03	•		•				SLOW	GEN		•		5		٠
A04	•		•	•			OFF	GEN		•		120		•
A05	•		•	•			OFF	GEN		•		5		•
A06	•		•	•			OFF	GEN		•		15	•	
A07	•		•	•			SLOW	LOC		•		30		•
A08	•		•	•			SLOW	LOC		•		30		•
A09	•						IMM	GEN		•		0		•
A10	•	•	•	•			OFF	GEN		•		0		•
A11	•		•	•			SLOW	LOC		•		3	•	
A12	•		•	•			SLOW	LOC		•		3	•	
A13	•		•	•			SLOW	LOC		•		3	•	
A14	•		•	•			SLOW	LOC		•		3	•	
A15	•		٠	•			SLOW	LOC		•		3	٠	
A16	•		•	•			SLOW	LOC		•		3	•	
A17	•		•	•			SLOW	LOC		•		10		•
A18	•		•	•			SLOW	LOC		•		10		•
A19	•			•			SLOW	GEN		•		0		•
UA1							OFF	GEN				0		•
UA2							OFF	GEN				0		•
UA3							OFF	GEN				0		•
UA4							OFF	GEN				0		•
UA5							OFF	GEN				0		•
UA6							OFF	GEN				0		•
UA7							OFF	GEN				0		•
UA8							OFF	GEN				0		٠
A20				•			OFF	GEN		•		0	•	
A21				•			OFF	GEN		٠		0	٠	
A22				•			OFF	GEN		•		0	•	



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.

Function	Description
T directori	Description
OFF	Disabled input
Configurable	Free user configurable input INPx. Used for instance to
5	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=13).
Keyboard lock	Locks front keyboard.
Settings lock	Locks access to setup menu and command menu.
Alarm Inhibition	Selectively disables alarms that have <i>inhibit</i> property set

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 M06M13 Slave outputs for more detail 	ails.
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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 UA1UAx	When the selected UAx user alarm is present, the output is activated (x=1 8)



....

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	IL1	Phase current L1
05	1 L2	Phase current L2
06	1 L 3	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	WIOI	I otal active power
27	Var IUI	Total reactive power
28	VA IUI	Total apparent power
29	Cosphi TOT	Cosphi (balanced three-phase system)
30		Senphi (balanced three-phase system)
22		THD phase voltage (max among phases)
32		THD phase current (max among phases)
33		Hormonia content of order a of above veltage (maximum emong
34		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
27	Coophi MAY	among phases)
20	Cosphi MAX	Cos-pril (max among phases)
20		Dease voltage (max among phases)
39		Current (max among phases)
40		Dease phase voltage (may among phases)
41		Phase-yndse volldye (max among phases)
42		Phase-phase voltage (min among phases)
40		Cos_phi (min among phases)
44		Measure from analog inputs
46	CNT	Programmable counter
70		





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 meters	Usr	Resets partial energy meters
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 meters	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 factory default
C13	Backup setup	Adv	Makes a backup copy of user setup parameters settings
C14	Restore setup	Adv	Reloads setup parameters with the backup of user settings.
C.15	Reset week TPF	Usr	Resets week total power factor history
C.16	Reset sevice interval 1	Adv	Reset maintenance service interval 1
C.17	Reset sevice interval 2	Adv	Reset maintenance service interval 2
C.18	Reset sevice interval 2	Adv	Reset maintenance service interval 3

- 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 ◀.

Installation

- PCRJ8 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.
- Make sure the tongue of the custom label doesn't get trapped under the gasket and break the seal. It should be positioned inside the board.
- 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.



Wiring diagrams

Standard Three-phase wiring



THREE-PHASE CONNECTION TYPE -A - P.11 set to A.con (default) Default wiring configuration for standard applications.			
Voltage measure	1 ph-to-ph voltage reading	L1-L2	
Current measure	L3 phase		
Phase angle offset	Between V (L1-L2) and I (L3) ⇔ 90°	
Capacitor overload current measure	1 reading calculated on L1-	-L2	
Parameter setting	P02.03 = Three-phase P02.04 = L3 P02.06 = L1-L2	P02.22 = LV	

Single-phase wiring





SINGLE-PHASE CONNECTION

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

Full three-phase wiring, without neutral		
Parameter setting	P02.03 = Single-phase	P02.22 = LV
	P02.04 = L1 P02.06 = L1 N	
	FU2.00 - LI-IN	



Full three-phase wiring, with neutral

1





Voltage measure	e 3 ph-to-n and 3 ph-to-ph voltage readir 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 L1-L2 on MV side
Current measure	L3 phase
Phase angle offset	90°
Capacitor overload current measure	1 reading on L1-L3, LV side



Impostazione parametri	P02.03 = Trifase P02.04 = L3 P02.06 = L1-L2	P02.22 = BT/MT P02.23 = ON		Parameter setting	P02.03 = Three-phase P02.04 = L3 P02.06 = L1-L2	P02.22 = LV/MV P02.23 = ON
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Steps on expansion modules









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	P02.22 = LV	
	P02.04 = L1-L2-L3	<mark>P02.28</mark> = Fast	
	P02.06 = L1-L2-L3		







P05.01 = COM1	P05.01 = COM1	P05.01 = COM1	P05.01 = COM1
P05.02 = Master	P05.02 = Slave01	P05.02 = Slave02	P05.02 = Slave03
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			

Terminals position



Mechanical dimensions and front panel cutout (mm)





35.00



Technical characteristics	
Supply	
Rated voltage Us 0	100 - 415V~
5	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
Recommended fuses	F1A (fast)
Voltage Inputs	
Maximum rated voltage Ue	600VAC L-L (346VAC L-N)
	50720V L-L (415VAC L-N)
Frequency range	4565HZ - 360440HZ
Measuring method	
Measuring input impedance	> 0.55MS2 L-N
\&/· · · ·	> 1, TOMS2 L-L
wiring mode	Single-phase, two-phase, three-phase with or
Recommended fuese	F1A (feet)000
Current inpute	1 IA (IdSI)555
Pated current lo	10~ or 50~
	TA~ 01 DA~
weasuring range	101 5A SCALE: 0.025 - 6A~
Type of input	Shunt supplied by an external surront
i ype of illput	transformer (low voltage) May 54
Measuring method	True RMS
Overload capacity	+20% le
Overload peak	50A for 1 second
Power consumption	<0.6VA
Measuring accuracy	
Line voltage	+0.5% fs +1digit
Relay output OUT 1 - 7	
Contact type	7 x 1 NO + contact common
	B300
of roang	30V= 1A Pilot Duty
Max rated voltage	415V~
Rated current	AC1-5A 250V~ AC15-1.5A 415V~
Maximum current at contact common	10A
Relay output OUT 8	
Contact type	1 changeover
UL Rating	B300
02.100.19	30V= 1A Pilot Duty
Max rated voltage	415V~
Rated current	AC1-5A 250V~ AC15-1,5A 415V~
Real time clock	
Energy storage	Back-up capacitors
Operating time without supply voltage	About 1215 days
Insulation voltage	
Rated insulation voltage Ui	600V~
Rated impulse withstand voltage Uimp	9.5kV
Power frequency withstand voltage	5,2kV
Ambient operating conditions	
Operating temperature	-20 - +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)	0.22.5 mm ² (2412 AWG)
UL Rating	0,752.5 mm ² (1812 AWG)
Cable cross section (min max)	.,
Tightening torque	0.56 Nm (5 lbin)
Housing	
Version	Flush mount
Material	Polycarbonate
Degree of protection	IP54 on front - IP20 terminals
Weight	680g
Certifications and compliance	
Certification	
	cULus
Reference standards	CULus IEC/EN 61010-1. IEC/EN 61000-6-2
Reference standards	CULus IEC/EN 61010-1, IEC/EN 61000-6-2 IEC/ EN 61000-6-3
Reference standards	CULUS 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: 18 - 12 AWG stranded or solid Field Wiring Terminals Tightening Torque: 4.5lb.in Flat panel mounting on a Type 1 enclosure
O Auxiliary supply connected to a line with a phase-neutral voltage ≤300V	

Manual revision history

Rev	Date	Notes
00	30/10/2012	First release
01	28/01/2013	Added Tanfi parameters (P02.30 e P02.31)
02	10/07/2013	 Manual aligned to device SW rev. 05
		First power-on messages
		Additional re source table
		 Parameters added in Communication menu
		Range changed in harmonic protection menu
		Maintenance service parameters in miscellaneous menu
		 Alarms and commands for maintenance management



7 DISPOSAL

Do not dispose of electrical or electronic equipment in household waste.

For proper disposal, contact the local center for collection / recycling / reuse, or handling of hazardous waste, and act in accordance with local laws.

The following symbols on the product indicate:



The treatment of waste from electrical and electronic equipment must take place at appropriate local collection centers that comply with local laws.



TELEGROUP capacitors are made without PCBs, in compliance with decree n. 216 of 24.05.88. Capacitors not in use and out of service must be disposed of according to the local laws and regulations in force in each country and in accordance with the European Directives. The condensers must be disposed of in compliance with the European Waste Identification Code (CER 2002).

8. USE OF THE DEVICE

8.1 Intended use

Any use of the equipment of parts different from that described above must be considered an incorrect or improper use of the same.



The use of products / materials other than those specified by the Manufacturer, which may cause damage to the product and dangerous situations for the user, is considered incorrect

or improper.

Power factor correction of three-phase, symmetrical and balanced electrical systems, with voltages and currents (almost sinusoidal, therefore with a very modest content of harmonious currents and voltages OR with a high content of currents and harmonic voltages) and with a correct short-circuit coordination between the network Electrical and the Equipment

For the choice of the most suitable type of equipment for your system contact Telegroup TECHNICAL ASSISTANCE. S.r.I ..

The Equipment must be used correctly in order to ensure the initial degree of safety.

After use, at the end of its life, the equipment must be disposed of, taking into account the laws, of the place, which regulate the disposal of this type of waste.

8.2 Contraindications of use

The equipment must not be used for purposes other than those shown in this manual;

- \Box In an explosive, corrosive or high concentration of combustible dust or gas;
- \Box In a flammable atmosphere;
- \Box Exposed to the weather;
- \Box With safety devices excluded or not working;

9. MAINTENANCE

9.1 Ordinary and extraordinary maintenance

Premise

The information in this paragraph is given in compliance with CEI EN 61439-1 prf. 6.2.2.

Maintenance and repair must be carried out by SPECIALIZED personnel and "TRAINED PERSONS". Maintenance and repair that are not carried out properly can be a source of serious danger to the user.

Before starting maintenance and repair operations, carefully read the instructions in this Technical Manual to avoid damage to people, pets and property.

Regular maintenance ensures the equipment level of safety and perfect initial operation.

Operator safety

It is essential that the persons in charge of maintenance are professionally qualified and follow normal safety procedures.

Incorrect maintenance can cause damage to persons or property, for which the manufacturer can not be held responsible.

The automatic rephasing device is equipped with an operating element, so it is necessary to disconnect all the capacitor batteries before disconnecting the panel from the mains.

WARNING! Before accessing the appliance, wait at least three minutes after having disconnected the voltage, then short-circuiting and grounding all the capacitors (CEI EN 60831-1 / prf.22 standard).

Avoid disconnecting a battery and re-insert it manually, in a shorter time than 30 s necessary for the discharge of the capacitors

Maintenance notes

The standardization of the components and the circuit part, as well as the rational arrangement of the elements used, facilitate at any time the operations of maintenance and control of the efficiency of the panel.

Automatic power factor correction equipment is designed and implemented with the aim of minimizing maintenance interventions, however it is necessary to carry out some periodic checks every year:

□ check the tightening of the screws of all power connections (operation to be carried out also during commissioning).

□ check the efficiency of the ventilation system. It is advisable to use a heater and blow hot air on the control thermostats: at a temperature of about 35 ° C the fans must become operative, then at about 50 ° C, the interruption of the auxiliary circuits that determine the block must be detected of the rephaser. Wait for the protections to cool down for a few minutes and check for normal operation.

 \Box check the integrity of the protections (fuses, etc.).

□ clean the ventilation ducts of the panel. In the rephasing units with external protection class IP 40 - 54, clean or replace the filters.

□ clean the panel from dust or other, taking particular care of all those components that could create insulation problems (busbar supports, capacitor plates, etc.).

□ check the absence of condensation on the live components.

□ check the integrity of the insulation relative to the power and auxiliary cables.

□ ascertain the correct functioning of the electronic regulator, by performing the manual insertion of the batteries and checking the closing of the contactors corresponding to the individual outputs. Return the regulator to Automatic mode and make sure that the inductive LED lights up and the appropriate batteries are inserted at regular intervals when inductive loads (motors, transformers, discharge lamps, etc.) are present. Make sure that the controller calibration does not determine a "rolling" condition (repeated switching on / off of the batteries).

□ check that the discharge resistors mounted on the individual capacitors are not interrupted or burned.

□ check that the condenser overpressure devices have not intervened.

□ control the current absorption of the individual drawers, by performing the measurement on each of the three phases, recording the values and comparing them with the nominal ones. In case of variation greater than 20% check each individual capacitor and replace it if out of service. We recommend consulting the Ns. Technical Office if the currents absorbed by the single groups exceed, due to the network harmonics, the nominal values.

It is good practice to note on a "MAINTENANCE CARD" any actions taken with the DATE of execution and relative observations.

□ check the efficiency of the pre-insertion resistors mounted on the single contactors (if present). If interruptions are found, it will be necessary to replace the entire contactor since the operation in the absence of resistances, causes a deterioration on the corresponding power contacts.

□ check the status of the electrical contacts of the contactors, in order to avoid damage to the capacitors as a result of the operation of contactors with completely worn contacts. Traces of soot in the screw housing or near the output terminals (power cables) indicate wear. Pay particular attention to the contactors of batteries 1 and 2, as they are more susceptible to on / off. Never work on the contacts with abrasive materials.

□ removing the power contacts from their housing (eg contactor replacement), mark them and reassemble them in exactly the same position.

□ check that there is no oxidation and / or corrosion of the components, in particular of raw copper.

□ check that there are no deformations in the insulation of the power cables, caused by excessively high working temperatures, in particular on the output poles of the blocking inductances and on the connections of the fuse bases.

□ check the condition of surfaces: painting or other treatments.

Before proceeding, in the search for the fault that determines the total or partial non-functioning, remember to check that the connections, related to the wiring of the current circuit and power, have been performed as we indicated.

In fact, by not respecting the phase of the voltage and / or of the current, the apparatus does not work properly and can even stop after a certain period of apparently regular function

a) Replacing the fuses.

- Before replacing a power fuse or auxiliary fuse remove the causes that caused the event.
- Replace them with types congruent with the original

b) replacement of contactors.

• The contactors have a useful life of around 100,000 operations and must therefore be replaced after reaching this number. If you are not able to evaluate the number of maneuvers reached, you must periodically inspect the contacts and take the necessary measures.

- Replace them with types that are completely congruent with the originals.
- c) Replacing the capacitors

The capacitors must be replaced, with others of the same SERIES, whenever the following anomalies are found:

- \Box Loss of liquid.
- $\hfill\square$ Case throat raised.

 \Box Absorbed fundamental current of less than 20% of the rated voltage at the rated voltage.

Perform accurate maintenance whenever the equipment is subject to unusual and unpredictable phenomena. (Eg Intervention of fuses, accidental bumps, exceptional presence of powders or liquids).

9.2 Assistance

For questions and / or problems, call the After Sales assistance office at one of the following telephone numbers, asking for a technical representative:

Tel. 055-8071267

Tel. 055-8071118

Or send an email to the following address: service@telegroup.it

Please keep the following information at hand:

- Model number and serial number
- Date of the Fault or the Problem
- Symptoms of the failure or problem
- Customer contact information

For more information, visit our website www.telegroup.it

10. EMERGENCY SITUATIONS

To switch off the equipment quickly, use the circuit breaker located on the distribution board never the main switch-off of the power factor correction equipment.

In the event of a fire in the environment where the appliance is installed, do not use water or any means that could compromise the integrity of the appliance (such as dust extinguishers).

In case of fire of the appliance the use of water is strictly prohibited.





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