

// ENG

// User Manual

// PFC Controller **PCRL5/7**



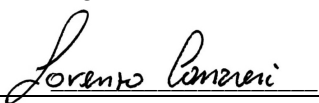


# Automatic PFC systems

## all Series

## REVISION INDEX

REVISION	DATE	DESCRIPTION
01	01/07/2007	REVISION UPDATE
02	17/09/2018	REVISION UPDATE



Identification	Technical editing	Verified by	Approved by
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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;
- ☐ The correct installation;
- ☐ 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 [www.telegroup.it](http://www.telegroup.it).

## 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:

- ☐ has reached the age of majority (18),
- ☐ both physically and mentally fit to perform work of particular technical difficulty,
- ☐ has been adequately instructed on the use and maintenance of the machine,
- ☐ 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,
- ☐ is familiar with the specific rules of the case,
- ☐ 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:

- ☐ 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.

SYMBOL	DESCRIPTION
	Dangerous electrical voltage
	Generic danger
	Read the instructions first

## 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.
- ☐ 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
- ☐ Use of user interfaces
- ☐ 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 or 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

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Fax 055-8071338  
e-mail: [telegroup@telegroup.it](mailto:telegroup@telegroup.it)  
[www.telegroup.it](http://www.telegroup.it)

### 3.2 Product Identification

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

<b>TELEGROUP S.r.l.</b> tel 0039 055 8071267 - 8071118 www.telegroup.it info@telegroup.it		
<b>MODELLO</b> <div style="border: 1px solid black; width: 100px; height: 15px; margin: 5px;"></div>	<b>MATRICOLA</b> <div style="border: 1px solid black; width: 100px; height: 15px; margin: 5px;"></div>	
<b>kVAR (415v)</b> <div style="border: 1px solid black; width: 100px; height: 15px; margin: 5px;"></div>	<b>DATA</b> <div style="border: 1px solid black; width: 100px; height: 15px; margin: 5px;"></div>	<b>TENSIONE DI RETE</b> <div style="border: 1px solid black; width: 100px; height: 15px; margin: 5px;"></div>
<b>CORRENTE NOMINALE</b> <div style="border: 1px solid black; width: 100px; height: 15px; margin: 5px;"></div>	<b>TIPO CONDENS.</b> <div style="border: 1px solid black; width: 100px; height: 15px; margin: 5px;"></div>	
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T.A. (a cura installatore) ...../SA		
PRIMA DI ACCEDERE ALL'APPARECCHIO 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:

<b>Directive 2014/35/UE</b>	Concerning the approximation of the laws of the Member States relating to electrical equipment intended to be used within certain voltage limits
<b>Directive 2014/30/UE</b>	Concerning the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336 / EEC
<b>CEI EN 61921</b>	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 Srl 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:

- ☐ 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.

**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. ;
- temperature between 0 ° C and + 40 ° 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  $I_{cc}$  is not known at the installation point, the short-circuit current at the transformer secondary can be roughly taken.

Power KVAR	Icc 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%	Icc 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.

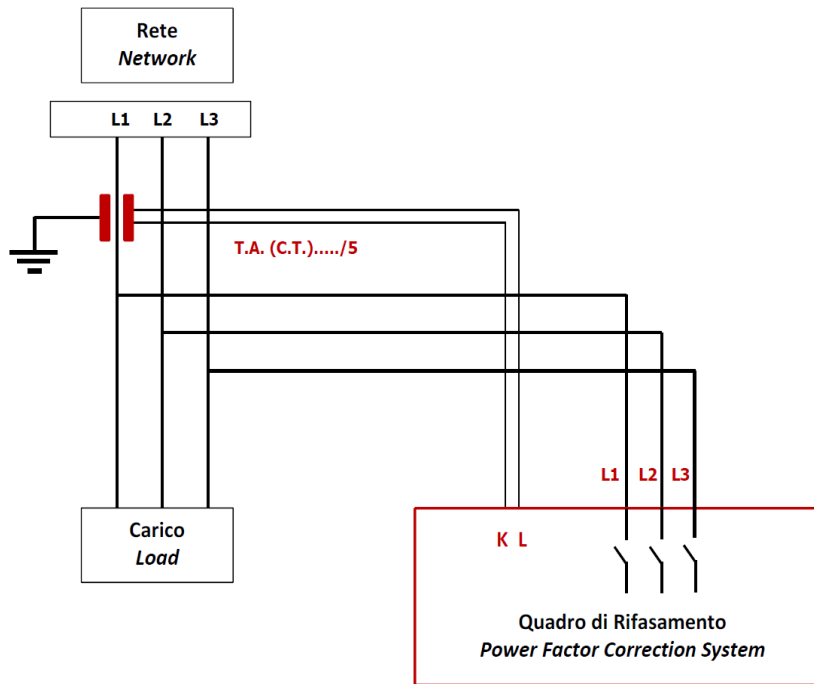
The sequence of the main operations necessary for this purpose can be summarized as follows:

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)

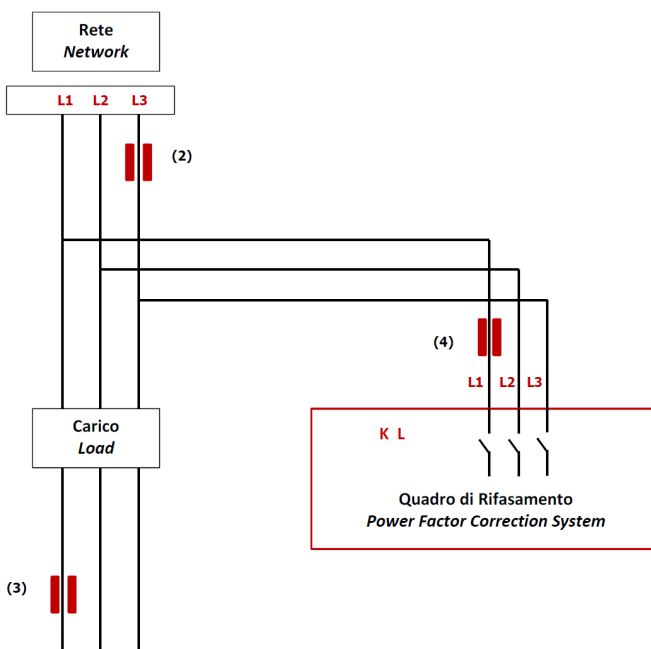
- The C.T. must be positioned on the **phase (R - L1), upstream of the loads and the line that feeds the power factor correction panel.**

- 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:

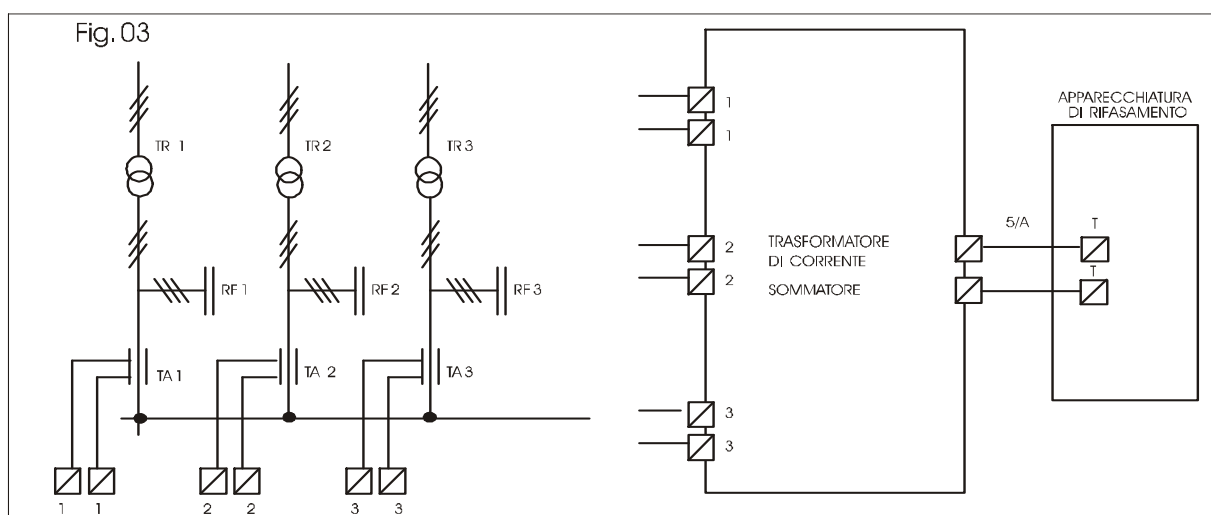


**Position 2:** despite being the C.T. installed upstream, and installed on phase L3 (T) instead of L1 (R)

**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 PCRL5/7 POWER FACTOR REGULATOR

The **PCRL5/7** 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 PCRL5 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.**



**PCRL5/7**

**Regolatore automatico  
del fattore di potenza**

**MANUALE OPERATIVO**



**PCRL5/7**

**Automatic Power Factor  
Controller**

**INSTRUCTIONS MANUAL**



1



**ATTENZIONE!**

- Leggere attentamente il manuale prima dell'utilizzo e l'installazione.
- Questi apparecchi devono essere installati da personale qualificato, nel rispetto delle vigenti normative impiantistiche, allo scopo di evitare danni a persone o cose.

- Prima di qualsiasi intervento sullo strumento, togliere tensione dagli ingressi di misura e di alimentazione e cortocircuitare i trasformatori di corrente.
- Il costruttore non si assume responsabilità in merito alla sicurezza elettrica in caso di utilizzo improprio del dispositivo.
- I prodotti descritti in questo documento sono suscettibili in qualsiasi momento di evoluzioni o di modifiche. Le descrizioni ed i dati a catalogo non possono pertanto avere alcun valore contrattuale.
- Un interruttore o disgiuntore va compreso nell'impianto elettrico dell'edificio. Esso deve trovarsi in stretta vicinanza dell'apparecchio ed essere facilmente raggiungibile da parte dell'operatore. Deve essere marchiato come il dispositivo di interruzione dell'apparecchio: IEC/EN 61010-1 § 6.11.2.1.
- Pulire lo strumento con panno morbido, non usare prodotti abrasivi, detergenti liquidi o solventi.

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**Introduzione**

Il regolatore automatico del fattore di potenza PCRL è stato progettato incorporando lo stato dell'arte delle funzioni richieste per le applicazioni di rifasamento. Realizzato con un contenitore dedicato, di dimensioni estremamente compatte, il PCRL unisce il moderno design del frontale alla praticità di montaggio e alla possibilità di espansione sul retro, dove è possibile alloggiare un modulo della serie EXP.... Il display LCD consente una interfaccia utente chiara ed intuitiva.



**WARNING!**

- Carefully read the manual before the installation or use.
- This equipment is to be installed by qualified personnel, complying to current standards, to avoid damages or safety hazards.

- Before any maintenance operation on the device, remove all the voltages from measuring and supply inputs and short-circuit the CT input terminals.
- Products illustrated herein are subject to alteration and changes without prior notice.
- Technical data and descriptions in the documentation are accurate, to the best of our knowledge, but no liabilities for errors, omissions or contingencies arising there from are accepted.
- A circuit breaker must be included in the electrical installation of the building. It must be installed close by the equipment and within easy reach of the operator. It must be marked as the disconnecting device of the equipment: IEC /EN 61010-1 § 6.11.2.1.
- Clean the instrument with a soft dry cloth; do not use abrasives, liquid detergents or solvents.

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**Introduction**

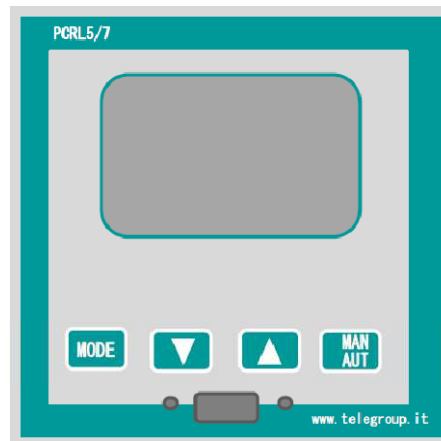
The PCRL automatic power factor control unit has been designed to offer state-of-the-art functions for power factor compensation applications. Built with dedicated components and extremely compact, the PCRL combines the modern design of the front panel with practical installation and the possibility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

## Descrizione

- Controllore automatico del fattore di potenza.
- Montaggio a pannello, contenitore standard 96x96mm.
- Display LCD retroilluminato.
- Versioni:
  - PCRL3 con 3 gradini, espandibile a 5 max.
  - PCRL5 con 5 gradini, espandibile a 7 max.
- 4 tasti di navigazione per funzioni ed impostazioni.
- Messaggi di allarme con testi in 6 lingue.
- Bus di espansione con 1 slot per moduli di espansione serie EXP:
  - Interfacce di comunicazione RS232, RS485, USB.
  - Uscite a relè aggiuntive
- Elevata accuratezza delle misure in vero valore efficace (TRMS).
- Vasta gamma di misure disponibili, inclusive di THD di tensione e di corrente con analisi delle singole armoniche fino al 15.mo ordine.
- Ingresso di misura tensione separato dalla alimentazione, utilizzabile con TV in applicazioni di media tensione.
- Alimentazione ausiliaria ad ampio range di tensione (100-440 VAC).
- Interfaccia di programmazione ottica frontale, isolata galvanicamente, alta velocità, impermeabile, compatibile con dongle USB e WiFi.
- Programmazione dal fronte, da PC o da tablet/smartphone.
- Protezione impostazioni via password a 2 livelli.
- Copia di salvataggio delle impostazioni originali.
- Sensore di temperatura incorporato.
- Montaggio senza necessità di utensili.

## Description

- Automatic power factor controller.
- Flush-mount, standard 96x96mm housing.
- Backlit LCD screen.
- Versions:
  - PCRL3 with 3 relays, expandable to 5 max.
  - PCRL5 with 5 relays, expandable to 7 max.
- 4 navigation keys for function and settings.
- Alarm messages in 6 languages.
- Expansion bus with 1 slot for EXP series expansion modules:
  - RS232, RS485, USB communications interface.
  - Additional relay outputs.
- High accuracy TRMS measurements.
- Wide selection of electrical measures, including voltage and current THD with harmonic analysis up to 15<sup>th</sup> order.
- Voltage input separated from power supply, suitable for VT connection in medium voltage applications.
- Wide-range power supply (100-440VAC).
- Front optical programming interface: galvanically isolated, high speed, waterproof, USB and WiFi dongle compatible.
- Programming from front panel, from PC or from tablet/smartphone.
- 2-level password protection for settings.
- Backup copy of original commissioning settings.
- Built-in temperature sensor.
- Tool-less panel mount.



## Funzione dei tasti frontali

**Tasto MODE** – Selezione a rotazione fra le misure disponibili. Usato anche per l'accesso ai menu di programmazione.

**Tasti ▲ e ▼** – Servono per impostare valori e selezionare gradini.

**Tasto MAN-AUT** – Serve per selezionare la modalità operativa fra manuale ed automatico.

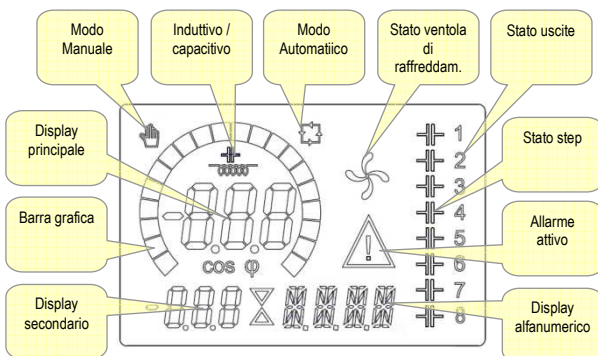
## Front keyboard

**MODE Key** - Used to select among available measurements. Used also to access programming menus.

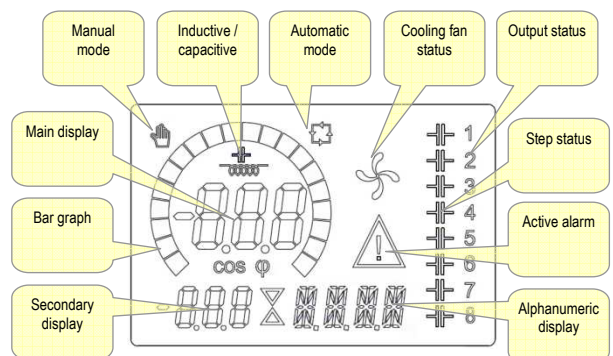
**▲ and ▼ keys** - Used to set values and to select steps.

**MAN-AUT key** - Used to select operating mode between manual and automatic.

## Indicazioni sul display



## Display indications

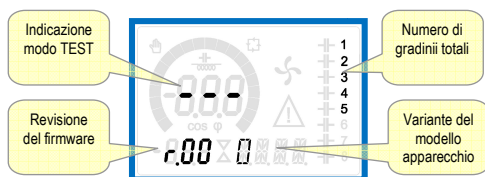


## Modi operativi

Esistono tre possibili modi operativi, elencati di seguito:

### Modo TEST

- Quando l'apparecchio è nuovo di fabbrica e non è mai stato programmato, entra automaticamente nel modo TEST che consente all'installatore di attivare manualmente le singole uscite a relè, in modo da poter verificare la correttezza del cablaggio del quadro.
- Il modo TEST è evidenziato dalla presenza di tre trattini --- sul display principale.
- L'attivazione e la disattivazione delle uscite avviene direttamente premendo i tasti ▲ e ▼, ma senza considerare il tempo di riconnessione.
- La modalità TEST viene abbandonata automaticamente dopo aver effettuato la programmazione dei parametri (vedere capitolo *Impostazione dei parametri*).

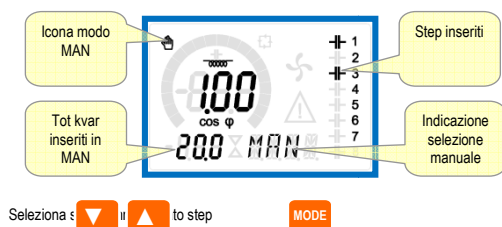


### Modi MAN e AUT

- Le icone AUT e MAN indicano la modalità di funzionamento automatica o manuale.
- Per cambiare modalità, premere il tasto **MAN/AUT** per 1 s consecutivo.
- La modalità di funzionamento rimane memorizzata anche in assenza della tensione di alimentazione.

### Modo MAN

- Quando l'apparecchio è in modalità manuale, è possibile selezionare uno degli step ed inserirlo o disinserirlo manualmente.
- Oltre alla apposita icona, il display alfanumerico visualizza **MAN** per evidenziare la modalità manuale. Premendo **MODE** è possibile scorrere le altre misure come di consueto.
- Mentre il display alfanumerico è posizionato su **MAN**, è possibile attivare/disattivare manualmente gli step. Per selezionare uno step utilizzare i tasti ▲ o ▼. Lo step selezionato lampeggia velocemente.
- Premere **MODE** per inserire o disinserire lo step selezionato.
- Se lo step selezionato non ha ancora esaurito il tempo di riconnessione, l'icona **MAN** lampeggerà ad indicare che l'operazione è stata accettata e che verrà eseguita non appena possibile.
- La configurazione manuale degli step viene mantenuta anche in assenza della tensione di alimentazione. Quando l'apparecchio viene rialimentato, lo stato originario dei gradini viene ripristinato.



### Modo AUT

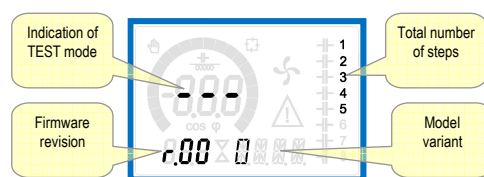
- In modalità automatico l'apparecchio calcola la configurazione di gradini ottimale per raggiungere il cosφ impostato.
- Il criterio di selezione tiene in considerazione molte variabili quali: la potenza dei singoli gradini, il numero di manovre, il tempo totale di utilizzo, il tempo di riconnessione, ecc.
- L'apparecchio evidenzia l'imminenza dell'inserzione o disinserzione dei gradini con il lampeggio del loro numero identificativo. Il lampeggio potrebbe protrarsi nei casi in cui l'inserimento di un gradino non è possibile a causa del tempo di riconnessione (tempo di scarica del condensatore).

## Operating modes

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 TEST mode is indicated by three dashes --- shown on the main display.
- The activation and deactivation of the outputs is done directly by pushing ▲ and ▼ buttons, but without considering the reconnection time.
- The TEST mode is automatically left after the parameter programming is done (see *Parameter setting* chapter).

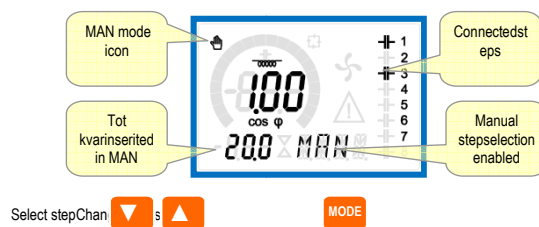


### MAN and AUT Modes

- The icons AUT and MAN indicate the operating mode automatic or manual.
- To change the mode, press the **MAN / AUT** button for 1 sec in a row.
- The operating mode remains stored even after removing and reapplying the power supply voltage.

### MAN Mode

- When the unit is in manual mode, you can select one of the steps and manually connected or disconnect it.
- In addition to the specific icon, the alphanumeric display shows **MAN** in order to highlight the manual mode condition. Press **MODE** to view the other measurements as usual.
- While the display shows **MAN**, it is possible to select the step to be switched on or off. To select a step, use the ▲ or ▼ buttons. The selected step will flash quickly.
- Press **MODE** to activate or deactivate the selected step.
- If the selected step has not yet exhausted the reconnection time, the **MAN** icon will flash to indicate that the transaction has been accepted and will be conducted as soon as possible.
- Manual configuration of the steps is maintained even when the power supply voltage is removed. 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 (left). 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).

- Affinchè l'apparecchio attui una correzione in automatico, deve essere presente una richiesta media di potenza reattiva (delta-kvar) maggiore del 50% dello step più piccolo, ed il cosphi misurato deve essere diverso dal quello impostato come setpoint.

## Misure

- La PCRL fornisce una serie di misure visualizzate sul display alfanumerico, in abbinamento al cosphi attuale che rimane sempre visualizzato sul display principale.
- Premendo il tasto **MODE** è possibile scorrere fra le misure a rotazione.
- Dopo 30 secondi senza premere tasti, la visualizzazione ritorna automaticamente alla misura di default definita con il parametro P.47.
- Se P.47 è impostato su ROT, allora le misure ruotano automaticamente ogni 5 secondi.
- In fondo alla lista delle misure è possibile impostare il setpoint del cosphi, agendo sullo stesso valore impostato con P.19.
- Di seguito viene riportata una tabella con le misure visualizzate.

Misura	Icona	Descrizione
Delta-kvar	$\Delta kvar$	Kvar necessari a raggiungere il setpoint. Se delta-kvar positivo condensatori da inserire, se negativo da disinserire.
	kvar	kvar totali dell'impianto
	$\Delta STEP$	Numero di step equivalenti necessari a raggiungere setpoint
<b>MODE</b>		
Tensione	V	Tensione RMS di linea dell'impianto.
	VHI	Picco massimo della misura.
<b>MODE</b>		
Corrente	A	Corrente RMS di linea dell' impianto.
	AHI	Massima corrente registrata
<b>MODE</b>		
PF medio	WPF	Power factor medio settimanale.
	PF	Power factor istantaneo
<b>MODE</b>		
Corr. Cond.	%C.CU	Corrente calcolata nei condensatori, in % della nominale.
	%C.HI	Picco massimo della misura.
<b>MODE</b>		
Temperatura	°C °F	Temperatura sensore interno.
	°CHI °FHI	Picco massimo della misura.
<b>MODE</b>		
THD tensione	THDV	Distorsione armonica % totale (THD) della tensione dell'impianto.
	VH02...VH15	Contenuto armonico % dal 2.0 al 15.mo ordine
<b>MODE</b>		
THD corrente	THDI	Distorsione armonica totale % (THD) della corrente dell'impianto.
	IH02...IH15	Contenuto armonico % di corrente dal 2.0 al 15.mo ordine
<b>MODE</b>		

- The device initiates automatic corrections when there is an average reactive power request (delta-kvar) higher than 50% of the smallest step, and the measured cosphi is different from the setpoint.

## Measures

- The PCRL provides a set of measurements displayed on the alphanumeric display, in conjunction with the current cosphi that is always displayed on the main display.
- Press the **MODE** key to scroll through the measures in rotation.
- After 30 seconds without pressing any buttons, the display automatically returns to the default measurement defined by P.47.
- If P.47 is set on the ROT, then the measures rotate automatically every 5 seconds.
- At the bottom of the list of measures it is possible to set the setpoint of the cosphi, acting on the same value set with P.19.
- Below is a table with the measurements displayed.

Measure	Icon	Description
Delta-kvar	$\Delta kvar$	Kvars needed to reach the cosphi setpoint. If delta-kvar is positive capacitors need to be inserted, if negative to be disconnected.
	kvar	Total kvar of the plant.
	$\Delta STEP$	Number of equivalent steps.
<b>MODE</b>		
Voltage	V	RMS voltage of the plant current.
	VHI	Maximum peak of measure.
<b>MODE</b>		
Current	A	RMS current of the plant voltage.
	AHI	Maximum peak of measure.
<b>MODE</b>		
Weekly PF	WPF	Weekly average power factor.
	PF	Instantaneous total power factor.
<b>MODE</b>		
Cap. current	%C.CU	Calculated capacitor current, in % of their nominal.
	%C.HI	Maximum peak of measure.
<b>MODE</b>		
Temperature	°C °F	Temperature of internal sensor.
	°CHI °FHI	Maximum peak of measure.
<b>MODE</b>		
Voltage THD	THDV	Total harmonic distortion % (THD) of plant voltage.
	VH02...VH15	% voltage harmonic content from 2.nd up to 15.th order
<b>MODE</b>		
Current THD	THDI	Total harmonic distortion % (THD) of plant current.
	IH02...IH15	% Current harmonic content from 2.nd up to 15.th order
<b>MODE</b>		
Cosphi setpoint	IND CAP	Setting of desired cosphi setpoint (same as

<b>Setpoint cosfi</b> ▼ ▲	IND CAP	Impostazione del cosfi desiderato (come P.19).
MODE		
<b>Potenza step</b> ▼ ▲	%	❶ Potenza residua dello step in percentuale rispetto alla nominale impostata.
MODE		
<b>Manovre step</b> ▼ ▲	OPC	❶ Contatore delle manovre (numero di commutazioni) degli step.
MODE		
<b>Ore step</b> ▼ ▲	H	❶ Contatore di inserzione degli step.

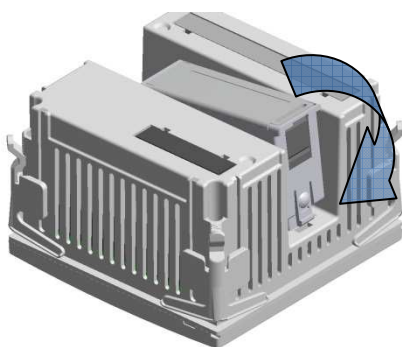
❶ Queste misure sono visualizzate solo se la funzione *Aggiustamento potenza step* è abilitata (P.25=ON) e la password avanzata è abilitata ed inserita.

#### Blocco tastiera

- È possibile attivare una funzione che impedisce la modifica dei parametri di funzionamento, ma che consente di accedere alle misure.
- Per bloccare o sbloccare la tastiera, premere e tenere premuto **MODE**, premere tre volte ▲, due volte ▼ e quindi rilasciare **MODE**.
- Il display mostrerà **LOC** quando la tastiera è bloccata e **UNL** quando è sbloccata.
- Quando è attivo il blocco impostazioni non sono possibili le seguenti operazioni:
  - Passaggio da automatico a manuale
  - Accesso ai menu di impostazione
  - Modifica setpoint cosφ
- Tentando di eseguire le suddette operazioni, il display visualizzerà **LOC** per indicare la condizione di blocco.

#### Espandibilità

- Grazie al suo bus di espansione, la PCRL può essere espansa con un modulo aggiuntivo della serie EXP...
- I moduli EXP... supportati dal PCRL si dividono nelle seguenti categorie:
  - step aggiuntivi
  - moduli di comunicazione
  - moduli di I/O digitale
- Per inserire un modulo di espansione:
  - togliere l'alimentazione alla PCRL.
  - rimuovere il coperchio protettivo dello slot di espansione.
  - inserire il gancio superiore del modulo nella apposita feritoia in alto nello slot.
  - ruotare il modulo verso il basso inserendo il connettore sul bus.
  - premere fino a che l'apposita clip sul lato inferiore del modulo si aggancia a scatto.



- Quando una PCRL viene alimentata, riconosce automaticamente il modulo EXP ad essa collegato.
- I moduli di espansione forniscono delle risorse aggiuntive che possono essere sfruttate tramite gli opportuni menu di impostazione.

▼ ▲		P.19).
MODE		
<b>Step power</b> ▼ ▲	%	❶ Step residual power, as a percentage of the set rated power.
MODE		
<b>Step counter</b> ▼ ▲	OPC	❶ Operation counter of the step.
MODE		
<b>Step hours</b> ▼ ▲	H	❶ Hour meter of the step insertion.

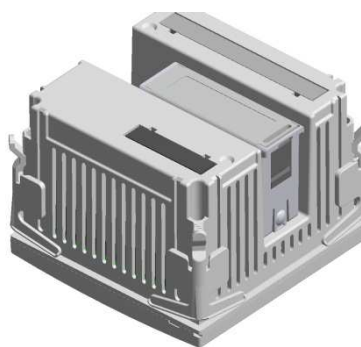
❶ These measures are shown only if the *Step trimming* function is enabled (P.25=ON) and the advanced password is enabled and entered.

#### Keypad lock

- A function to exclude all modification to operating parameters can be enabled; measurement viewing is still provided in any case.
- To lock and unlock the keypad, press and keep **MODE** key pressed. Then press the ▲ key three times and the ▼ key twice and after that release **MODE**.
- The display will show **LOC** when the keypad is locked and **UNL** when it is unlocked.
- When the lock is enabled, it is not possible to make the following operations:
  - Operation between automatic and manual mode
  - Access to set-up menus
  - Change of cosphi set-point
- By attempting to conduct the above operations, the display will view **LOC** to indicate the locked keypad state.

#### Expandability

- Thanks to expansion bus, the PCRL can be expanded with one EXP... series module.
- The supported EXP modules can be grouped in the following categories:
  - additional steps
  - communication modules
  - digital I/O modules
- To insert an expansion module:
  - remove the power supply to PCRL.
  - remove the protecting cover of the expansion slot.
  - 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 PCRL is powered on, it automatically recognises the EXP module that have been mounted.
- The expansion modules provide additional resources that can be used through the dedicated setup menus.



- I menu di impostazione che riguardano le espansioni sono disponibili anche se i moduli non sono fisicamente presenti.
- La seguente tabella riassume i modelli di moduli di espansione supportati:

TIPO MODULO	CODICE	FUNZIONE
STEP AGGIUNTIVI	EXP 10 06	2 STEP RELE'
I/O DIGITALI	EXP 10 03	2 RELE' IN SCAMBIO
COMUNICAZIONE	EXP 10 10	USB
	EXP 10 11	RS-232
	EXP 10 12	RS-485

- The setup menus related to the expansions are always accessible, even if the expansion modules are not physically fitted.
- The following table indicates which models of expansion modules are supported:

MODULE TYPE	CODE	FUNCTION
ADDITIONAL STEPS	EXP 10 06	2 STEP RELAYS
DIGITAL I/O	EXP 10 03	2 RELAY C/O
COMMUNICATION	EXP 10 10	USB
	EXP 10 11	RS-232
	EXP 10 12	RS-485

### Porta di programmazione IR

- La configurazione dei parametri della PCRL si può effettuare tramite la porta ottica frontale, attraverso la chiavetta di programmazione IR-USB codice CX01 oppure la chiavetta IR-WiFi codice CX02.
- Questa porta di programmazione ha i seguenti vantaggi:
  - Consente di effettuare la configurazione e la manutenzione della PCRL senza la necessità di accedere al retro dell' apparecchio e quindi di aprire il quadro elettrico.
  - E' galvanicamente isolata dalla circuiteria interna della PCRL, garantendo la massima sicurezza per l'operatore.
  - Consente una elevata velocità di trasferimento dei dati.
  - Consente una protezione frontale IP54.
  - Restringe la possibilità di accessi non autorizzati alla configurazione del dispositivo, in quanto richiede la presenza delle chiavette CX01 o CX02.
- Semplicemente avvicinando una chiavetta CX..alla porta frontale ed inserendo le spine negli appositi fori, si otterrà il vicendevole riconoscimento dei dispositivi evidenziato dal colore verde del LED LINK sulla chiavetta di programmazione.



Adattatore di programmazione USB cod. CX01  
 USB programming dongle code CX01

### Impostazione parametri da PC

- Mediante il software di set-up *DCRG Remote control* è possibile effettuare il trasferimento dei parametri di set-up (precedentemente impostati) da PCRL al disco del PC e viceversa.
- Il trasferimento dei parametri da PC a PCRL può essere parziale, cioè solo i parametri dei menu specificati.

### Impostazione dei parametri (setup) dal pannello frontale

Per accedere al menu di programmazione (setup):

- Per accedere alla impostazione la centralina si deve trovare in modalità **TEST** (prima impostazione) oppure in modalità **MAN**.
- Dalla normale visualizzazione misure, premere **MODE** per 3 secondi per richiamare il menu principale. Compare **SET** sul display principale.
- Se è stata impostata la password (P.21=ON), invece di **SET** compare **PAS**(richiesta immissione password). Impostare la password numerica con **▲ ▼** e poi premere **MAN-AUT** per spostarsi alla cifra successiva.
- Se la password è corretta verrà visualizzato **OK U** oppure **OK A** a seconda se la password è di livello utente o avanzato. Le password si definiscono con P.22 e P.23. Di default sono impostate a 001 e 002.
- Se si inserisce una password errata verrà visualizzato **ERR**.
- Dopo l'inserimento della password l'accesso è consentito fino a che l'apparecchio non viene resettato o fino a che non trascorrono 2 minuti senza pressioni sui tasti.
- Una volta inserita la password, ripetere la procedura di accesso alle impostazioni.
- Premere **▲ ▼** per selezionare il sottomenu desiderato (**BAS**→**ADV**→**ALA**...) che viene visualizzato sul display alfanumerico.

### IR programming port

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



Adattatore di programmazione WiFi cod. CX02  
 WiFi programming dongle code CX02

### Parameter setting with PC

- You can use the *DCRG Remote control* software to transfer (previously programmed) set-up parameters from the PCRL to the hard drive of the PC and vice versa.
- The parameter may be partially transferred from the PC to the PCRL, transferring only the parameters of the specified menus.

### Parameter setting (setup) from front panel

To access the programming menu (setup) :

- To enter parameter programming the unit must be in **TEST** mode (first programming) or in **MAN** mode.
- From the normal measurement display, press **MODE** for 3 seconds to recall the main menu. **SET** is displayed on the main display.
- If you have set the password (P.21 = ON) instead of **SET** the display shows **PAS**(password entry request). Set the numeric password using **▲ ▼** and then press **MAN-AUT** to move to next digit.
- If the password is correct the unit will show **OK U** or **OK A** depending on the entered password is user or the advanced level. The password can be defined with parameters P.22 and P.23. Factory default is 001 and 002 respectively.
- If the entered password is wrong the unit will show **ERR**.
- After having entered the password, the access is enabled until the unit is re-initialized or for 2 minutes without pressing any key.
- After having entered the password, repeat the procedure to access the parameter setting.
- Press **▲ ▼** to select the desired submenu (**BAS**→**ADV**→**ALA** ...) that is shown on the alphanumeric display.





- Nella seguente tabella sono elencati i sottomenu disponibili:

Cod	Descrizione
BAS	Accesso al menu Base
ADV	Accesso al menu Avanzato
ALA	Accesso al menu Allarmi
CMD	Accesso al menu Comandi
CUS	Accesso al menu Custom
SAVE	Uscita con salvataggio delle modifiche
EXIT	Uscita senza salvataggio (annulla)

- Premere **MAN-AUT** per accedere al sottomenu selezionato.
- Quando si è all'interno di un sottomenu, sul display principale viene visualizzato il codice del parametro selezionato (es. **P.01**), mentre sui display numerico ed alfanumerico in basso vengono visualizzati i valori del parametro e/o la descrizione.
- Premere **MAN-AUT** per avanzare nella selezione delle voci (ad esempio scorrere fra i parametri P.01 → P.02 → P.03...), oppure premere **MODE** per retrocedere.
- Mentre una parametro è selezionato, con ▲ ▼ se ne può impostare il valore.



Indietro Incrementa/decrementa Avanti

- Una volta raggiunta l'ultimo parametro del menu, premendo ancora **MAN-AUT** si ritorna alla selezione dei sottomenu.
- Con ▲ ▼ selezionare **SAVE** per salvare le modifiche o **EXIT** per annullare.



- In alternativa, dall'interno della programmazione, tenendo premuto **MAN-AUT** per tre secondi, si salvano le modifiche e si esce direttamente.
- Se non vengono premuti tasti per 2 minuti consecutivi, il menu setup viene abbandonato automaticamente e il sistema torna alla visualizzazione normale senza salvare i parametri (come con EXIT).
- Rammentiamo che, per i soli dati di set-up modificabili da tastiera, è possibile fare una copia di sicurezza (backup) nella memoria eeprom della PCRL. Questi stessi dati all'occorrenza possono essere ripristinati (restore) nella memoria di lavoro. I comandi di copia di sicurezza e ripristino dei dati sono disponibili nel *Menu comandi*.



- The following table lists the available submenus:

Cod	Description
BAS	Access to Base menu
ADV	Access to Advanced menu
ALA	Access to Alarm menu
CMD	Access to Command menu
CUS	Access to Custom menu
SAVE	Exits saving modifications.
EXIT	Exits without saving (cancel)

- Press **MAN-AUT** to access the submenu.
- When you are in a submenu, the main display shows the code of the selected parameter (eg **P.01**), while the numeric/alphanumeric displays at the bottom of the screen show the parameter value and / or description.
- Press **MAN-AUT** to advance in the selection of items (such as scroll through parameters P.01 → P.02 → P.03...), or press **MODE** to go back to the previous parameter.
- While a parameter is selected, with ▲ ▼ you can increase/decrease its value.



Backward Increment/decrement Forward

- Once you reach the last parameter of the menu, by pressing **MAN-AUT** once more will return you to the submenu selection.
- Using ▲ ▼ select **SAVE** to save the changes or **EXIT** to cancel.



- Alternatively, from within the programming, holding **MAN-AUT** for three seconds will save the changes and exit directly.
- If the user does not press any key for more than 2 minutes, the system leaves the setup automatically and goes back to normal viewing without saving the changes done on parameters (like EXIT).
- N.B.: a backup copy of the setup data (settings that can be modified using the keyboard) can be saved in the eeprom memory of the PCRL. This data can be restored when necessary in the work memory. The data backup 'copy' and 'restore' commands can be found in the *Commands menu*.

### Impostazione rapida TA

- Nei casi in cui non è noto il TA che verrà utilizzato al momento dell'installazione, è possibile lasciare il parametro P.01 Primario TA impostato su OFF ed impostare tutti i rimanenti parametri.
- In questo caso, al momento dell'installazione dell'impianto, una volta alimentato l'apparecchio, il display visualizzerà CT (Current Transformer) lampeggiante. Premendo ▲ ▼ si imposterà, direttamente il valore del primario del TA.
- Ad impostazione avvenuta, premere **MAN/AUT** per confermare. L'apparecchio memorizza l'impostazione in P.01 e riparte direttamente in modalità automatica.



### Rapid CT set-up

- When the CT value is not known and only used at the moment of the installation, the P.01 parameter for CT primary can remain set at OFF while all the others can be programmed.
- In this case, during the system installation and once the controller is powered up, the display will show a flashing CT (Current Transformer). By pressing ▲ ▼ the CT primary can be set directly.
- Once programmed, press **MAN/AUT** to confirm. The unit will store the setting into P.01, and directly restart in automatic mode.



### Tabella dei parametri

- Di seguito vengono riportati tutti i parametri di programmazione disponibili in forma tabellare. Per ogni parametro sono indicati il range di impostazione possibile ed il default di fabbrica, oltre ad una spiegazione della funzionalità del parametro. La descrizione del parametro visibile sul display può in qualche caso differire da quanto riportato in tabella a causa del ridotto numero di caratteri disponibile. Il codice del parametro vale comunque come riferimento.
- **Nota:** i parametri evidenziati nella tabella con uno sfondo ombreggiato sono *essenziali* al funzionamento dell'impianto, rappresentano quindi la programmazione minima indispensabile per la messa in funzione.

#### MENU BASE

COD	DESCRIZIONE	ACC	UdM	DEF	RANGE
P.01	Primario TA	Usr	A	OFF	OFF / 1...10.000
P.02	Secondario TA	Usr	A	5	1 / 5
P.03	Fase lettura correnti TA	Usr		L1	L1 L2 L3
P.04	Verso collegamento TA	Usr		Aut	Aut Dir Inv
P.05	Fase lettura tensioni	Usr		L2-L3	L1-L2 L2-L3 L3-L1 L1-N L2-N L3-N
P.06	Potenza step più piccolo	Usr	Kvar	0.10	0.10 ... 10000
P.07	Tensione nominale condensatori	Usr	V	400V	50 ... 50000
P.08	Frequenza nominale	Usr	Hz	Aut	Aut 50Hz 60Hz Var
P.09	Tempo di riconnessione	Adv	sec	60	1 ... 30000
P.10	Sensibilità	Usr	sec	60	1 ... 1000
P.11	Funzione step 1	Usr		OFF	OFF 1...32 ON NOA NCA FAN MAN AUT A01...A13
P.12	Funzione step 2	Usr		OFF	=
P.13	Funzione step 3	Usr		OFF	=
P.14	Funzione step 4	Usr		OFF	=
P.15	Funzione step 5	Usr		OFF	=

### 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.

#### BASE MENU

COD	DESCRIPTION	ACC	UoM	DEF	RANGE
P.01	CT primary	Usr	A	OFF	OFF / 1...10.000
P.02	CT secondary	Usr	A	5	1 / 5
P.03	CT read phase	Usr		L1	L1 L2 L3
P.04	CT wiring polarity	Usr		Aut	Aut Dir Inv
P.05	Voltage read phase	Usr		L2-L3	L1-L2 L2-L3 L3-L1 L1-N L2-N L3-N
P.06	Smallest step power	Usr	Kvar	0.10	0.10 ... 10000
P.07	Rated capacitor voltage	Usr	V	400V	50 ... 50000
P.08	Nominal frequency	Usr	Hz	Aut	Aut 50Hz 60Hz Var
P.09	Reconnection time	Adv	sec	60	1 ... 30000
P.10	Sensitivity	Usr	sec	60	1 ... 1000
P.11	Step 1 function	Usr		OFF	OFF 1...32 ON NOA NCA FAN MAN AUT A01...A13
P.12	Step 2 function	Usr		OFF	=
P.13	Step 3 function	Usr		OFF	=
P.14	Step 4 function	Usr		OFF	=
P.15	Step 5 function	Usr		OFF	=

P.16	Funzione step 6	Usr		OFF	=
P.17	Funzione step 7	Usr		OFF	=
P.19	Setpoint cosfi	Usr		0.98 IND	0.50 Ind – 0.50 Cap
P.20	Lingua messaggi di allarme	Usr		ITA	ENG ITA FRA SPA POR DEU

**P.01** – Valore del primario dei trasformatori di corrente. Esempio: con TA 800/5 impostare 800. Se impostato su OFF, alla messa in tensione l'apparecchio richiederà di impostare il TA e permetterà l'accesso diretto a questo parametro.

**P.02** – Valore del secondario dei trasformatori di corrente. Esempio: con TA 800/5 impostare 5.

**P.03** – Definisce su quale fase l'apparecchio legge il segnale di corrente. Il collegamento degli ingressi amperometrici deve coincidere con quanto impostato in questo parametro. Sono supportate tutte le combinazioni con il parametro P.05.

**P.04** – Lettura della polarità di collegamento dei TA.

**AUT** = La polarità è riconosciuta automaticamente alla messa in tensione.

Utilizzabile solo quando l'impianto non ha alcun dispositivo generatore.

**Dir** = Riconoscimento automatico disabilitato. Collegamento diretto.

**Inv** = Riconoscimento automatico disabilitato. Collegamento inverso (incrociato).

**P.05** – Definisce su quali fasi l'apparecchio legge il segnale di tensione. Il collegamento degli ingressi voltmetrici deve coincidere con quanto impostato in questo parametro. Sono supportate tutte le combinazioni con il parametro P.03.

**P.06** – Valore in kvar dello step più piccolo installato (equivalente al peso 1).

Potenza di targa del banco di condensatori erogata alla tensione di targa specificata in P.07 e riferito al totale dei tre condensatori se in applicazione trifase.

**P.07** – Tensione nominale di targa dei condensatori, alla quale viene erogata la potenza specificata in P.06. Se i condensatori sono utilizzati ad una tensione diversa (inferiore) rispetto a quella nominale, la potenza risultante viene ricalcolata automaticamente dall'apparecchio.

**P.08** – Frequenza di lavoro dell'impianto:

**Aut** = selezione automatica fra 50 e 60 Hz alla messa in tensione

**50 Hz** = fissa a 50 Hz

**60 Hz** = fissa a 60 Hz

**Var** = variabile, misurata continuamente ed adattata.

**P.09** – Tempo minimo che deve trascorrere fra la disconnessione di uno step e la successiva riconnessione sia in MAN che in AUT. Durante questo tempo il numero dello step sulla pagina principale lampeggia.

**P.10** – Sensibilità alla connessione. Parametro che imposta la velocità di reazione della centralina. Con valori bassi di P.10 la regolazione è veloce (maggiore precisione intorno al setpoint ma maggior numero di manovre). Con valori alti invece si hanno reazioni più lente della regolazione, con minor numero di manovre degli step. Il tempo di ritardo alla reazione è inversamente proporzionale alla richiesta di step per raggiungere il setpoint: tempo attesa = (sensibilità / numero di step richiesti).

**Esempio**: impostando la sensibilità a 60s, se viene richiesta l'inserzione di uno step di peso 1 vengono attesi 60s (60/1 = 60). Se invece servono un totale di 4 step verranno attesi 15s (60 / 4 = 15).

**P.11 ... P.18** – Funzione dei relè di uscita 1...8:

**OFF** = Non utilizzato

**1...32** = Peso dello step. A questo relè è collegato un banco di condensatori di potenza n volte (n=1...32) quella del più piccolo, definita con P.06.

**ON** = Sempre attivato.

**NOA** = Allarme normalmente disattivato. Il relè si eccita in presenza di un qualsiasi allarme con la proprietà Allarme globale attiva.

**NCA** = Allarme normalmente eccitato. Il relè si diseccita in presenza di un qualsiasi allarme con la proprietà Allarme globale attiva.

**FAN** = Relè controlla la ventola di raffreddamento.

**MAN** = Relè eccitato quando centralina è in MAN.

**AUT** = Relè eccitato quando centralina è in AUT.

**A01...A13** = Il relè si eccita in presenza dell'allarme specificato.

**P.19** – Setpoint (valore da raggiungere) del cosfi. Utilizzato in applicazioni standard.

**P.20** – Lingua dei messaggi di allarme scorrevoli.

P.16	Step 6 function	Usr		OFF	=
P.17	Step 7 function	Usr		OFF	=
P.19	Cos-phi setpoint	Usr		0.95 IND	0.50 Ind – 0.50 Cap
P.20	Alarm messages language	Usr		ENG	ENG ITA FRA SPA POR DEU

**P.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 CT and allow direct access to this parameter.

**P.02** - Value of the secondary of the current transformers. Example: with CT 800/5 set 5.

**P.03** - It defines on which phase 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 P.05.

**P.04** - Reading the connection polarity of the CT.

**AUT** = Polarity is automatically detected at power up. Can only be used when working with only one CT and when the system has no generator device.

**Dir** = Automatic detection disabled. Direct connection.

**Inv** = Automatic detection disabled. Reverse wiring (crossover).

**P.05** - 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 P.03.

**P.06** - 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 P.07 and referred to the total of the three capacitors for three-phase applications.

**P.07** - Rated plate capacitor, which is delivered in specified power P.06. If the capacitors are used to a voltage different (lower) than nominal, the resulting power is automatically recalculated by the device.

**P.08** - Working frequency of the system:

**Aut** = automatic selection between 50 and 60 Hz at power on.

**50Hz** = fixed to 50 Hz.

**60Hz** = fixed to 60 Hz.

**Var** = variable, measured continuously and adjusted.

**P.09** - Minimum time that must elapse between the disconnection of one step and the subsequent reconnection both in MAN or AUT mode. During this time the number of the step on the main page is blinking.

**P.10** - Connection sensitivity. This parameter sets the speed of reaction of the controller. With small values of P.10 the regulation is fast (more accurate around the setpoint but with more step switchings). With high values instead we'll have slower reactions of the 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).

**P.11 ... P.18** - Function of output relays 1 ... 8:

**OFF** = Not used.

**1 ... 32** = Weight of the step. This relay drives a bank of capacitors which power is n times (n = 1...32) the smallest power defined with parameter P.06.

**ON** = Always on.

**NOA** = Alarm normally de-energized. The relay is energized when any alarm with the *Global alarm* property arises.

**NCA** = Alarm normally energized. The relay is de-energized when any alarm with the *Global alarm* property arises.

**FAN** = The relay controls the cooling fan.

**MAN** = Relay is energized when device is in MAN mode.

**AUT** = Relay is energized when device is in AUT mode.

**A01 ... A13** = The relay is energized when the alarm specified is active.

**P.19** - Setpoint (target value) of the cosphi. Used for standard applications.

**P.20** - Language of scrolling alarm messages.

## MENU AVANZATO

COD	DESCRIZIONE	ACC	UdM	DEF	RANGE
P.21	Abilitazione password	Adv		OFF	OFF ON
P.22	Password utente	Usr		100	0-999
P.23	Password avanzata	Adv		200	0-999
P.24	Tipo di collegamento	Usr		3PH	3PH Trifase 1PH Monofase

## ADVANCED MENU

COD	DESCRIPTION	ACC	UoM	DEF	RANGE
P.21	Password enable	Adv		OFF	OFF ON
P.22	User password	Usr		100	0-999
P.23	Advanced password	Adv		200	0-999
P.24	Wiring type	Usr		3PH	3PH three-phase 1PH single-phase

P.25	Aggiustamento potenza step	Usr		OFF	ON Abilitato OFF Disabilitato
P.26	Tolleranza + su setpoint	Usr		0.00	0 – 0.10
P.27	Tolleranza - su setpoint	Usr		0.00	0 – 0.10
P.28	Modo inserzione step	Usr		STD	STD Standard Lin Lineare
P.29	Setpoint cosφ cogenerazione	Usr		OFF	OFF / 0.50 IND – 0.50 CAP
P.30	Sensibilità alla disconnessione	Usr	sec	OFF	OFF / 1 – 600
P.31	Disconnessione steps passando in MAN	Usr		ON	OFF Disabilitato ON Abilitato
P.32	Soglia allarme sovraccarico corrente condensatori	Adv	%	125	OFF / 100...150
P.33	Soglia sovraccarico per disconnessione immediata step	Adv	%	150	OFF / 100.. 200
P.34	Primario TV	Usr	V	OFF	OFF / 50-50000
P.35	Secondario TV	Usr	V	100	50-500
P.36	Unità di misura temperatura	Usr		°C	°C °Celsius °F °Fahrenheit
P.37	Temperatura di start ventilatore	Adv	°	OFF	0...212
P.38	Temperatura di stop ventilatore	Adv	°	OFF	0...212
P.39	Soglia di allarme temperatura	Adv	°	50	0...212
P.40	Soglia allarme step difettoso	Adv	%	50	OFF / 25...100
P.41	Soglia allarme tensione massima	Adv	%	120	OFF / 90...150
P.42	Soglia allarme tensione minima	Adv	%	OFF	OFF / 60..110
P.43	Soglia allarme THD V	Adv	%	OFF	OFF / 1..250
P.44	Soglia allarme THD I	Adv	%	OFF	OFF / 1..250
P.45	Intervallo manutenzione	Adv	h	9000	1 - 30000
P.46	Funzione barra grafica	Usr		Kvar ins/tot	Kvar ins/tot Corr att/nom Delta kvar att/tot
P.47	Misura ausiliaria di default	Usr		Delta kvar	Deltakvar V A TPF settimanale % Corr Cond. Temp THDV THDI ROT
P.48	Lampeggio back light su allarme	Usr		ON	OFF ON
P.49	Indirizzo seriale nodo	Usr		01	01-255
P.50	Velocità seriale	Usr	bps	9.6k	1.2k 2.4k 4.8k 9.6k 19.2k 38.4k
P.51	Formato dati	Usr		8 bit – n	8 bit, no parity 8 bit, dispari 8bit, pari 7 bit, dispari 7 bit, pari
P.52	Bit di stop	Usr		1	1-2
P.53	Protocollo	Usr		Modbus RTU	Modbus RTU Modbus ASCII

P.21 – Se impostato ad OFF, la gestione delle password è disabilitata e l'accesso alle impostazioni e al menu comandi è libero.  
P.22 – Con P.21 attivo, valore da specificare per attivare l'accesso a livello utente. Vedere capitolo Accesso tramite password.  
P.23 – Come P.22, riferito all'accesso livello Avanzato.  
P.24 – Numero di fasi dell'impianto di rifasamento.

P.25	Step trimming	Usr		OFF	ON Enabled OFF Disabled
P.26	Setpoint clearance +	Usr		0.00	0 – 0.10
P.27	Setpoint clearance -	Usr		0.00	0 – 0.10
P.28	Step insertion mode	Usr		STD	STD Standard Lin Linear
P.29	Cogeneration cosφ setpoint	Usr		OFF	OFF / 0.50 IND – 0.50 CAP
P.30	Disconnection sensitivity	Usr	sec	OFF	OFF / 1 – 600
P.31	Step disconnection passing in MAN	Usr		ON	OFF Disabled ON Enabled
P.32	Capacitor current overload alarm threshold	Adv	%	125	OFF / 100...150
P.33	Capacitor overload immediate disconnection threshold	Adv	%	150	OFF / 100.. 200
P.34	VT primary	Usr	V	OFF	OFF / 50-50000
P.35	VT secondary	Usr	V	100	50-500
P.36	Temperature UoM	Usr		°C	°C °Celsius °F °Fahrenheit
P.37	Fan start temperature	Adv	°	OFF	0...212
P.38	Fan stop temperature	Adv	°	OFF	0...212
P.39	Temperature alarm threshold	Adv	°	50	0...212
P.40	Step failure alarm threshold	Adv	%	50	OFF / 25...100
P.41	Maximum voltage alarm threshold	Adv	%	120	OFF / 90...150
P.42	Minimum voltage alarm threshold	Adv	%	OFF	OFF / 60..110
P.43	THD V alarm threshold	Adv	%	OFF	OFF / 1..250
P.44	THD I alarm threshold	Adv	%	OFF	OFF / 1..250
P.45	Maintenance interval	Adv	h	9000	1 - 30000
P.46	Bar-graph function	Usr		Kvar ins/tot	Kvar ins/tot Corr att/nom Delta kvar att/tot
P.47	Default auxiliary measure	Usr		Delta kvar	Deltakvar V A Week TPF Cap. Current Temp THDV THDI ROT
P.48	Backlight flashing on alarm	Usr		ON	OFF ON
P.49	Serial node address	Usr		01	01-255
P.50	Serial speed	Usr	bps	9.6k	1.2k 2.4k 4.8k 9.6k 19.2k 38.4k
P.51	Data format	Usr		8 bit – n	8 bit, no parity 8 bit, odd 8bit, even 7 bit, odd 7 bit, even
P.52	Stop bits	Usr		1	1-2
P.53	Protocol	Usr		Modbus RTU	Modbus RTU Modbus ASCII

P.21 – If set to OFF, password management is disabled and anyone has access to the settings and commands menu.  
P.22 – With P.21 enabled, this is the value to specify for activating user level access. See Password access chapter.  
P.23 – As for P.22, with reference to Advanced level access  
P.24 – Number of phases of the power correction panel.

**P.25** – Abilita la misurazione della potenza effettiva degli step, effettuata in occasione della loro inserzione. La misura viene dedotta, essendo la corrente prelevata sulla totale dell'impianto. La potenza misurata degli step viene 'aggiustata' dopo ogni manovra ed è visualizzata sulla pagina 'statistiche vita step'. Quando questa funzione è abilitata, viene inserita una pausa di 15sec fra l'inserzione di uno step ed il successivo, necessaria a misurare la variazione di potenza.

**P.26 – P.27** – Tolleranza intorno al setpoint. Quando il cosphi si trova all'interno della fascia delimitata da questi parametri, in AUT non vengono fatte inserzioni/disinserzioni di step anche se il delta-kvar è maggiore dello step più piccolo.

Nota: + significa "verso induttivo", - significa "verso capacitivo".

**P.28** - Selezione modalità inserzione step.

**Standard** – Funzionamento normale con selezione libera degli step

**Lineare** - i gradini vengono inseriti solo in progressione da sinistra verso destra seguendo il numero di step, per poi essere disconnessi in modo inverso, secondo una logica LIFO (Last In, First Out). In caso di gradini di potenza diversa, se l'inserzione di un ulteriore gradino comporta il superamento del setpoint, il regolatore non lo inserisce.

**P.29** – Setpoint utilizzato quando l'impianto sta generando potenza attiva verso il fornitore (con potenza attiva/ cosfi di segno negativo).

**P.30** – Sensibilità alla disconnessione. Come parametro precedente ma riferita alla disconnessione. Se impostata ad OFF la disconnessione ha gli stessi tempi di reazione della connessione regolata con il parametro precedente.

**P.31** – Se impostato ad ON, quando si passa da modalità AUT a modalità MAN gli step vengono disconnessi in sequenza.

**P.32** – Soglia oltre la quale interviene la protezione di sovraccarico condensatori (allarme A08), dopo un tempo di ritardo integrale, inversamente proporzionale all'entità del sovraccarico.

Nota: E' possibile utilizzare questa protezione solo se i condensatori non hanno dispositivi di filtro quali induttanze o altro.

**P.33** - Soglia oltre la quale il ritardo integrale di intervento del sovraccarico viene azzerato, provocando l'intervento immediato dell'allarme.

**P.34 – P.35** – Dati dei TV eventualmente utilizzati negli schemi di collegamento.

**P.36** – Unità di misura temperatura.

**P.37 – P.38** – Temperature di start e stop ventola di raffreddamento del quadro, espresse nell'unità di misura impostata con P.36. La ventola viene avviata quando la temperatura è >= a P37, e viene arrestata quando è < di P.38.

**P.39** – Soglia di allarme per la generazione dell'allarme *A08 temperatura troppo alta*.

**P.40** – Soglia percentuale della potenza residua degli step, confrontata con quella originale programmata. Sotto questa soglia viene generato l'allarme *A10 step difettoso*.

**P.41** – Soglia di allarme di massima tensione, riferita alla tensione nominale impostata con P.07, oltre la quale viene generato l'allarme *A06 Tensione troppo alta*.

**P.42** – Soglia di allarme di minima tensione, riferita alla tensione nominale impostata con P.07, oltre la quale viene generato l'allarme *A05 Tensione troppo bassa*.

**P.43** – Soglia di allarme di massimo THD di tensione impianto, oltre la quale viene generato l'allarme *A10 THDV troppo alto*.

**P.44** – Soglia di allarme di massimo THD di corrente impianto, oltre la quale viene generato l'allarme *A11 THDI troppo alto*.

**P.45** – Intervallo di manutenzione in ore esaurito il quale viene generato l'allarme *A12 Richiesta manutenzione*. Il conteggio è attivo per tutto il tempo in cui l'apparecchio rimane alimentato.

**P.46** – Funzione della barra grafica semicircolare.

**Kvar ins/tot** : la barra rappresenta quanta potenza rifasante è attualmente inserita in rapporto alla totale installata nel quadro.

**Corr att/nom**: Percentuale di corrente attuale rispetto alla nominale del TA.

**Delta kvar**: Barra con zero centrale. Rappresenta il delta-kvar positivo/negativo necessario a raggiungere il setpoint riferito alla potenza totale installata.

**P.47** – Misura di default visualizzata sul display secondario. Impostando ROT le misure vengono visualizzate a rotazione.

**P.48** – Se impostato ad ON, la retroilluminazione del display lampeggia in presenza di un allarme.

**P.49** – Indirizzo seriale (nodo) del protocollo di comunicazione.

**P.50** – Velocità di trasmissione della porta di comunicazione.

**P.51** – Formato dati. Impostazioni a 7 bit possibili solo per protocollo ASCII.

**P.52** – Numero bit di stop.

**P.53** – Scelta del protocollo di comunicazione.

**P.25** - Enables the measurement of the actual power of the step, performed each time they are switched in. The measure is calculated, as the current measurement is referred to the whole load of the plant. The measured power of the steps is adjusted (trimmed) after each switching and is displayed on the step life statistic page. When this function is enabled, a 15 sec pause is inserted between the switching of one step and the following, necessary to measure the reactive power variation.

**P.26 – P.27** - Tolerance around the setpoint. When the cosphi is within the range delimited by these parameters, in AUT mode the device does not connect / disconnect steps even if the delta-kvar is greater than the smallest step.

Note: + means 'towards inductive', while – means 'towards capacitive'.

**P.28** - Selecting mode of steps insertion.

**Standard mode** - Normal operation with free selection of the steps

**Linear mode** - the steps are connected in progression from left towards right only following the step number and according to the LIFO (Last In First Out) logic. The controller will not connect a step when the system steps are of different ratings and by connecting the next step, the set-point value would be exceeded.

**P.29** - Setpoint used when the system is generating active power to the supplier (with negative active power / power factor ).

**P.30** - 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.

**P.31** - If set to ON, when switching from AUT mode to MAN mode, steps are disconnected in sequence.

**P.32** – Trip threshold for the capacitors overload protection (alarm A08), that will arise after a integral delay time, inversely proportional to the value of the overload.

Note: You can use this protection only if the capacitors are not equipped with filtering devices such as inductors or similar.

**P.33** - Threshold beyond which the integral delay for tripping of the overload alarm is zeroed, causing the immediate intervention of the A08 alarm.

**P.34 – P.35** – Data of VTs eventually used in the wiring diagrams.

**P.36** – Unit of measure for temperature.

**P.37 – P.38** - Start and stop temperature for the cooling fan of the panel, expressed in the unit set by P.36. The cooling fan is started when the temperature is >= to P.37 and it is stopped when it is < than P.38.

**P.39** - Threshold for generation of alarm *A08 Panel temperature too high*.

**P.40** - Percentage threshold of the residual power of the steps, compared with the original power programmed in general menu. Below this threshold the alarm *A10 step failure* is generated.

**P.41** - Maximum voltage alarm threshold, referred to the rated voltage set with P.07, beyond which the alarm *A06 Voltage too high* is generated.

**P.42** - Undervoltage alarm threshold, referred to the rated voltage set with P.07, below which the alarm *A05 voltage too low* is generated.

**P.43** - Maximum plant voltage THD alarm threshold, beyond which the alarm *A10 THDV too high* is generated.

**P.44** – Maximum plant current THD alarm threshold beyond which the alarm *A05 voltage too low* is generated.

**P.45** – Maintenance interval in hours. When it is elapsed, the alarm *A12 maintenance interval* will be generated. The hour count increments as long as the device is powered.

**P.46** – Function of the semi-circular bar-graph.

**Kvar ins/tot**: The bar graph represents the amount of kvar actually inserted, with reference to the total reactive power installed in the panel.

**Curr act/nom**: Percentage of actual plant current with reference to the maximum current of the CT.

**Delta kvar**: bar graph with central zero. It represents the positive/negative delta-kvar needed to reach the setpoint, compared to the total kvar installed.

**P.47** – Default measure shown on the secondary display. Setting the parameter to ROT, the different measures will be shown with a sequential rotation.

**P.48** – If set to ON, the display backlight flashes in presence of one or more active alarms.

**P.49** – Serial (node) address of the communication protocol.

**P.50** – Communication port transmission speed.

**P.51** – Data format. 7 bit settings can only be used for ASCII protocol.

**P.52** – Stop bit number.

**P.53** – Select communication protocol.



## MENU ALLARMI

COD	DESCRIZIONE	ACC	UdM	DEF	RANGE
P.61	Abilitazione allarme A01	Adv		ALA	OFF ON ALA DISC A+D
P.62	Ritardo allarme A01	Adv		15	0-240
P.63	Udm ritardo A01	Adv		min	Min Sec
...	....	...	...	...	...
P.97	Abilitazione allarme A13	Adv		ALA	OFF ON ALA DISC A+D
P.98	Ritardo allarme A13	Adv		15	0-240
P.99	Udm ritardo A13	Adv		min	Min Sec

**P.61** – Abilita l'allarme A01 e definisce il comportamento della centralina quando l'allarme è attivo:  
**OFF** – Allarme disabilitato  
**ON** – Allarme abilitato, solo visivo  
**ALA** – Allarme abilitato, attivazione relè di allarme globale (se impostato)  
**DISC** – Allarme abilitato, disconnessione degli step  
**A + D** = Eccitazione relè di allarme e disconnessione degli step.

**Nota: quando si accede ai parametri P61, P.64, P67 ecc, il display ausiliario indica il codice dell'allarme relativo.**

**P.62** – Tempo di ritardo allarme A01.  
**P.63** – Unità di misura ritardo allarme A01.

**P.64** – Come P.61, per allarme A02.  
**P.65** – Come P.62 per allarme A02.  
**P.66** – Come P.63, per allarme A02.  
 ...

**P.97** – Come P.61, per allarme A13.  
**P.98** – Come P.62 per allarme A13.  
**P.99** – Come P.63, per allarme A13.

## Allarmi

- Al sorgere di un allarme, il display mostra una icona di allarme, un codice identificativo e la descrizione dell'allarme nella lingua selezionata.
- Se vengono premuti dei tasti di navigazione delle pagine, la scritta scorrevole con le indicazioni di allarme scompare momentaneamente per poi ricomparire dopo 30 secondi.
- Il reset degli allarmi è automatico quando scompaiono le condizioni che li hanno generati.
- In seguito al verificarsi di uno o più allarmi, la PCRL ha un comportamento dipendente dalla impostazione delle *proprietà* degli allarmi attivi.

## ALARM MENU

COD	DESCRIPTION	ACC	UoM	DEF	RANGE
P.61	A01 Alarm enable	Adv		ALA	OFF ON ALA DISC A+D
P.62	A01 alarm delay	Adv		15	0-240
P.63	A01 delay uom	Adv		min	Min Sec
...	....	...	...	...	...
P.97	A13 Alarm enable	Adv		ALA	OFF ON ALA DISC A+D
P.98	A13 alarm delay	Adv		120	0-240
P.99	A13 delay uom	Adv		sec	Min Sec

**P.61** - Enable alarm A01 and defines the behavior of the controller when the alarm is active:  
**OFF** - Alarm disabled  
**ON** - Alarm enabled, only visual  
**ALA** - Alarm enabled, global alarm relay energized (if set)  
**DISC** - Alarm enabled, logoff step  
**A + D** = Alarm relay energized and disconnection of the steps.

**Note: When you access the parameters P61, P.64, P67, etc., the auxiliary display shows the relative alarm code.**

**P.62** - Delay alarm A01.  
**P.63** - Unit of delay alarm A01.

**P.64**–Like P.61 for alarm A02.  
**P.65**–Like P.62 for alarm A02.  
**P.66**–Like P.63 for alarm A02.  
 ...

**P.97**–Like P.61 for alarm A13.  
**P.98**–Like P.62 for alarm A13.  
**P.99**–Like P.63 for alarm A13.

## 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 scrolling message showing the alarm indications will disappear momentarily, to reappear again after 30 seconds.
- Alarms are automatically reset as soon as the alarm conditions that have generated them disappear.
- In the case of one or more alarms, the behaviour of the PCRL depends on the *properties* settings of the active alarms.

## Descrizione allarmi

COD	ALLARME	DESCRIZIONE
A01	Sottocompensazione	In modo automatico, tutti gli step disponibili sono inseriti, ma il cosfi rimane più induttivo del setpoint.
A02	Sovracompensazione	In modo automatico, tutti gli step sono disinseriti, ed il cosfi misurato è più capacitivo del setpoint.
A03	Corrente impianto troppo bassa	La corrente circolante sugli ingressi amperometrici è inferiore alla minima consentita dal range di misura. Condizione che si può verificare normalmente se l'impianto non ha carico.
A04	Corrente impianto troppo alta	La corrente circolante sugli ingressi amperometrici è superiore alla massima consentita dal range di misura.
A05	Tensione impianto troppo bassa	La tensione misurata è inferiore alla soglia impostata con P.42.
A06	Tensione impianto troppo alta	La tensione misurata è superiore alla soglia impostata con P.41.
A07	Sovraccarico corrente condensatori	Il sovraccarico dei condensatori calcolato è superiore alle soglie impostate con P.32 e P.33. Quando le condizioni sono cessate, la visualizzazione dell'allarme permane per i successivi 5min oppure fino a che si preme un tasto.
A08	Temperatura troppo alta	La temperatura del quadro è superiore alla soglia impostata con P.39.
A09	Microinterruzione	Si è verificata una microinterruzione sugli ingressi voltmetrici di durata superiore a 8ms.
A10	THD tensione troppo alto	Il THD della tensione dell'impianto è superiore alla soglia impostata con P.43.
A11	THD corrente impianto troppo alto	Il THD della corrente dell'impianto è superiore alla soglia impostata con P.44.
A12	Richiesta manutenzione	L'intervallo di manutenzione impostato con P.45 è scaduto. Per azzerare l'allarme utilizzare il comando C.01 (vedere menu comandi).
A13	Step difettoso	La potenza residua percentuale di uno o più step è inferiore alla soglia minima impostata con P.40.

## Alarm description

COD	ALLARME	DESCRIZIONE
A01	Undercompensation	In automatic mode, all the available steps are connected but the cosphi is still more inductive than the setpoint.
A02	Overcompensation	In automatic mode, 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 occur normally if the plant has no load.
A04	Current too high	The current flowing in the current inputs is higher than maximum measuring range.
A05	Voltage too low	The measured voltage is lower than the threshold set with P.42.
A06	Voltage too high	The measured voltage is higher than the threshold set with P.41.
A07	Capacitor current overload	The calculated capacitor current overload is higher than threshold set with P.32 and P.33. After the alarm conditions have disappeared, the alarm message remains shown for the following 5 min or until the user presses a key on the front.
A08	Temperature too high	The panel temperature is higher than threshold set with P.39.
A09	No-Voltage release	A no-voltage release has occurred on the line voltage inputs, lasting more than 8ms.
A10	Voltage THD too high	The THD of the plant voltage is higher than the threshold set with P.43.
A11	Current THD too high	The THD of the plant current is higher than the threshold set with P.44.
A12	Maintenance requested	The maintenance interval set with P.45 has elapsed. To reset the alarm use the command C.01 (see Command menu).
A13	Step failure	The residual power of one or more steps is lower than minimum threshold set with P.40.

#### Proprietà di default allarmi

Cod.	Descrizione	Abilitazione	Relè allarme	Disconness.	Ritardo interv.
A01	Sottocompensazione	●	●		15 min
A02	Sovracompensazione	●			120 s
A03	Corrente impianto troppo bassa	●		●	5 s
A04	Corrente impianto troppo alta	●			120 s
A05	Tensione impianto troppo bassa	●	●		5 s
A06	Tensione impianto troppo alta	●	●		15 min
A07	Sovraccarico corrente condensatori	●	●	●	180 s
A08	Temperatura troppo alta	●	●	●	30 s
A09	Microinterruzione	●		●	0 s
A10	THD tensione troppo alto	●	●	●	120 s
A11	THD corrente impianto troppo alto	●	●	●	120 s
A12	Richiesta manutenzione	●			0s
A13	Step difettoso	●	●		0s

#### Default alarm properties

Cod.	Description	Enable	Alarm relay	Disconnection	Delay
A01	Undercompensation	●	●		15 min
A02	Overcompensation	●			120 s
A03	Current too low	●		●	5 s
A04	Current too high	●			120 s
A05	Voltage too low	●	●		5 s
A06	Voltage too high	●	●		15 min
A07	Capacitor current overload	●	●	●	180 s
A08	Temperature too high	●	●	●	30 s
A09	No-Voltage release	●		●	0 s
A10	Voltage THD too high	●	●	●	120 s
A11	Current THD too high	●	●	●	120 s
A12	Maintenance requested	●			0s
A13	Step failure	●	●		0s



## Menu comandi

- Il menu comandi permette di eseguire operazioni saltuarie quali azzeramenti di misure, contatori, allarmi, ecc.
- Se è stata immessa la password per accesso avanzato, allora tramite il menu comandi è anche possibile effettuare delle operazioni automatiche utili ai fini della configurazione dello strumento.
- Con centralina in modalità **MAN**, premere **MODE** per 5s.
- Premere **▲** fino a selezionare **CMD**.
- Premere **MAN-AUT** per accedere al *Menu comandi*.
- Selezionare comando desiderato con **MODE** o **MAN-AUT**.
- Premere e tenere premuto **▲** per tre secondi se si vuole eseguire comando. PCRL mostra **OK?** con countdown.
- Se si tiene premuto **▲** fino alla fine del countdown il comando viene eseguito, mentre se si rilascia prima il tasto il comando viene annullato.

COD.	COMANDO	LIVELLO ACCESSO	DESCRIZIONE
<b>C01</b>	Azz. manutenzione	Avanzato	Azzera intervallo di manutenzione.
<b>C02</b>	AZZ. MANOIVRE STEP	Avanzato	Azzera i contatore di manovre step.
<b>C03</b>	AZZ. STEP TRIMMING	Avanzato	Ripristina le potenze originali nell'aggiustamento step.
<b>C04</b>	AZZ. ORE STEP	Avanzato	Azzera i contaore di funzionamento step.
<b>C05</b>	AZZ. VALORI MASSIMI	Avanzato	Azzera i picchi massimi registrati delle misure.
<b>C06</b>	AZZ. TPF SETTIMANALE	Avanzato	Azzera memoria TPF settimanale.
<b>C07</b>	SETUP a DEFAULT	Avanzato	Ripristina i parametri al default di fabbrica.
<b>C08</b>	SALVA COPIA SETUP	Avanzato	Salva una copia di backup delle impostazioni di setup dell' utente .
<b>C09</b>	RIPRIS. COPIA SETUP	Avanzato	Ripristina i parametri al valore della copia utente.

## Utilizzo dongle CX02

- La chiavetta (dongle) CX02 oltre a fornire la funzionalità di collegamento WiFi con PC, Tablet o Smartphone ha anche la possibilità di poter memorizzare e trasferire un blocco di dati da e per la PCRL.
- Inserire l'interfaccia CX02 nell'apposita sede sul fronte della PCRL.
- Accendere CX02 premendo il pulsante per 2 sec.
- Attendere che il led **LINK** diventi di colore arancio lampeggiante.
- Premere per 3 volte consecutivamente e velocemente il tasto della CX02.
- A questo punto il display della PCRL visualizza il primo dei possibili comandi (D1...D6).
- Premere i tasti **▲ ▼** per selezionare il comando voluto.
- Premere **MAN-AUT** per eseguire il comando selezionato. Verrà richiesta una conferma (OK?). Premere di nuovo **AUT-MAN** per confermare, o **MODE** per annullare.
- Di seguito la lista dei comandi disponibili:

COD	COMANDO	DESCRIZIONE
<b>D1</b>	SETUP DEVICE → CX02	Copia le impostazioni del setup dalla PCRL alla CX02
<b>D2</b>	SETUP CX02 → DEVICE	Copia le impostazioni del setup dalla CX02 alla PCRL
<b>D3</b>	CLONE DEVICE → CX02	Copia setup e dati di lavoro (dalla PCRL alla CX02)
<b>D4</b>	CLONE CX02 → DEVICE	Copia setup e dati di lavoro dalla CX02 alla PCRL
<b>D5</b>	INFO DATA CX02	Visualizza informazioni circa i dati contenuti nella CX02

## 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.
- With controller in MAN mode, press the MODE button for 5 seconds.
- Press **▲** to select **CMD**.
- Press **MAN-AUT** to access the *Commands menu*.
- Select the desired command with **MODE** or **MAN-AUT**.
- Press and hold for three seconds **▲** if you want to execute the selected command. PCRL shows **OK?** with a countdown.
- If you press and hold **▲** until the end of the countdown the command is executed, while if you release the key before the end, the command is canceled.

COD	COMMAND	PWD. ACCESS LEVEL	DESCRIPTION
<b>C01</b>	RESET MAINTENANCE	Advanced	Reset maintenance service interval.
<b>C02</b>	RESET STEP COUNT	Advanced	Reset step operation counters.
<b>C03</b>	RESET STEP TRIMMING	Advanced	Reload originally programmed power into step trimming.
<b>C04</b>	RESET STEP HOURS	Advanced	Reset step operation hour meters.
<b>C05</b>	Reset max VALUES	Advanced	Reset maximum peak values.
<b>C06</b>	RESET WEEKLY TPF	Advanced	Resets weekly total power factor history.
<b>C07</b>	SETUP TO DEFAULT	Advanced	Resets setup programming to factory default.
<b>C08</b>	SETUP BACKUP	Advanced	Makes a backup copy of user setup parameters settings.
<b>C09</b>	SETUP RESTORE	Advanced	Reloads setup parameters with the backup of user settings.

## CX02 Dongle usage

- The CX02 dongle offers WiFi Access point capability for connection to PC, Tablet or smartphones. In addition to this function it also offer the possibility to store and transfer a block of data from/to the PCRL.
- Insert the interface CX02 into the IR port of PCRL on the front plate.
- Switch CX02 on by pressing the button for 2 sec.
- Wait until the **LINK** LED becomes orange flashing.
- Press 3 times consecutively and fast the dongle button.
- At this point the display of the PCRL shows the first of the 6 possible commands (D1...D6).
- Press **▲ ▼** to select the desired command.
- Press **MAN-AUT** to execute the selected command. The unit will prompt for a confirmation (OK?). Press once again **MAN-AUT** to confirm or **MODE** to cancel.
- The following table lists the possible commands:

COD	COMANDO	DESCRIZIONE
<b>D1</b>	SETUP DEVICE → CX02	Copies Setup settings from PCRL to CX02.
<b>D2</b>	SETUP CX02 → DEVICE	Copies Setup settings from CX02 to PCRL.
<b>D3</b>	CLONE DEVICE → CX02	Copies Setup settings and working data from PCRL to CX02.
<b>D4</b>	CLONE CX02 → DEVICE	Copies Setup settings and working data from CX02 to PCRL.
<b>D5</b>	INFO DATA CX02	Shows information about data stored into CX02.
<b>D6</b>	EXIT	Exits from dongle menu.

D6	EXIT	Esce dal menu dongle.
----	------	-----------------------

### Installazione

- PCRL è destinata al montaggio da incasso. Con il corretto montaggio garantisce una protezione frontale IP54.
- Dall'interno del quadro, per ciascuna delle quattro clips di fissaggio, posizionare la clip in una delle due guide laterali, premendo successivamente sullo spigolo della clip in modo da agganciare a scatto anche la seconda guida.
- Spingere la clip in avanti facendo pressione sulle sue pareti laterali e facendole scorrere sulle guide fino che le apposite alette deformabili premono al massimo possibile contro la superficie interna del pannello



- Per i collegamenti elettrici fare riferimento agli schemi di connessione riportati nell'apposito capitolo e alle prescrizioni riportate nella tabella delle caratteristiche tecniche.

### Installation

- PCRL is designed for flush-mount installation. With proper mounting, it guarantees IP54 front protection.
- From inside the panel, for each four of the fixing clips, position the clip in one of the two sliding guide, then press on the clip corner until the second guide snaps in.
- Push the clip forward pressing on its side and making it slide on the guides until it presses completely on the internal surface of the panel.

- For the electrical connection see the wiring diagrams in the dedicated chapter and the requirements reported in the technical characteristics table.

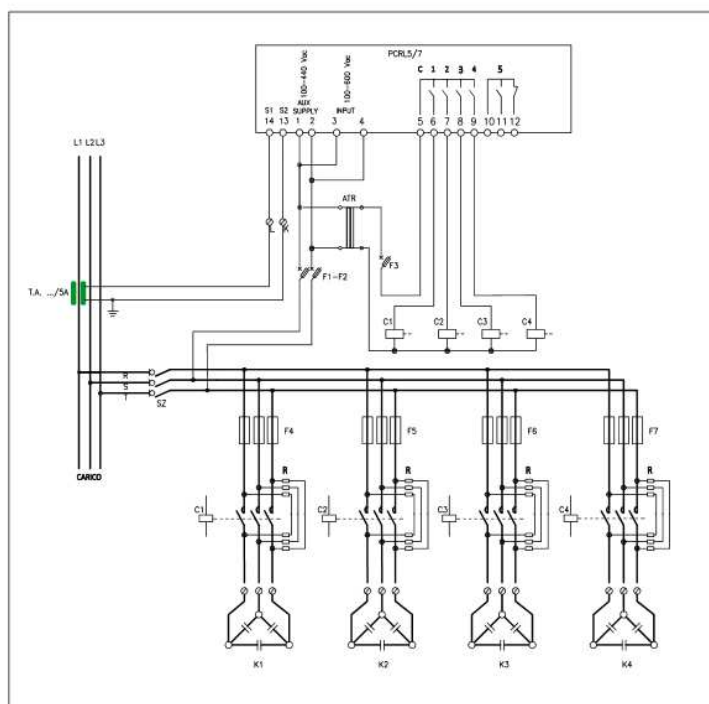
### Schemi di collegamento

### Wiring diagrams

	<b>ATTENZIONE!!</b>	<b>WARNING!</b>
	Togliere sempre tensione quando si opera sui morsetti.	Disconnect the line and the supply when operating on terminals.

#### Inserzione trifase standard

#### Standard Three-phase wiring



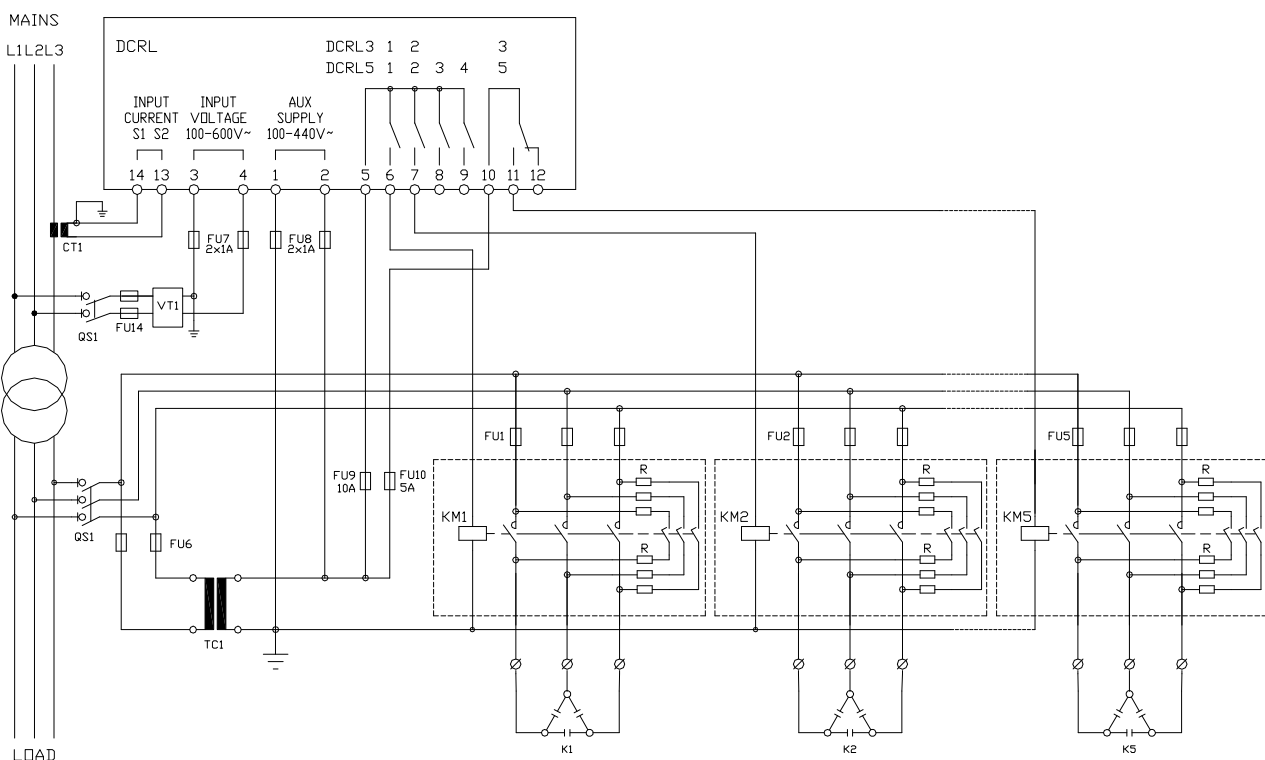
INSERZIONE TRIFASE STANDARD (default)		
Configurazione di default per applicazioni standard		
Misura tensione	1 misura di tensione concatenata L1-L2	
Misura corrente	Fase L1	
Angolo di sfasamento	Fra V (L2-L3) e I (L1) $\Rightarrow 90^\circ$	
Misura sovraccarico condensatori	1 misura calcolata su L1-L2	
Impostazione parametri	P.03 = L1 P.05 = L2-L3 P.24 = 3PH	

THREE-PHASE STANDARD CONNECTION (default)		
Default wiring configuration for standard applications.		
Voltage measure	1 ph-to-ph voltage reading L1-L2	
Current measure	L1 phase	
Phase angle offset	Between V (L2-L3) and I (L3) $\Rightarrow 90^\circ$	
Capacitor overload current measure	1 reading calculated on L1-L2	
Parameter setting	P.03 = L1 P.05 = L2-L3 P.24 = 3PH	

	NOTE	NOTES
	<ul style="list-style-type: none"> <li>Per inserzionetrifase, l'ingresso voltmetrico deve essere connesso a due fasi; il T.A. di linea deve essere inserito sulla rimanente fase e.</li> <li>La polarità dell'ingresso amperometrico è influente.</li> </ul>	<ul style="list-style-type: none"> <li>For three-phase connection, the voltage input must be connected phase to phase; the current transformer must be connected on the remaining phase.</li> <li>The polarity of the current/voltage input is indifferent.</li> </ul>

#### Inserzione su MT

#### MV wiring



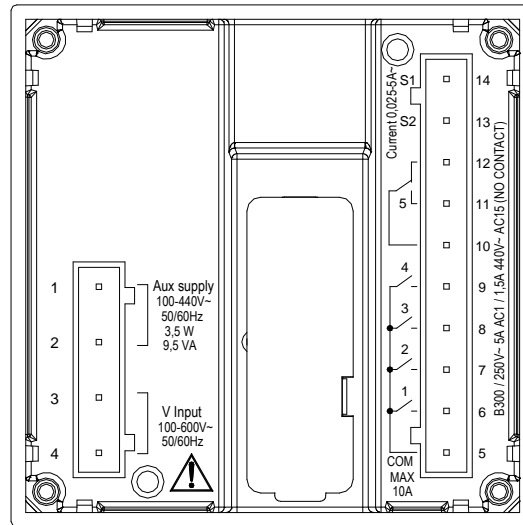
Inserzione con misure e rifasamento su MT		
Misura tensione	3 misure di tensione concatenata L1-L2, L2-L3, L3-L1 su media tensione	
Misura corrente	Fasi L1-L2-L3 su media tensione	
Angolo di sfasamento	90°	
Sovraccarico condensatori	disabilitato	
Impostazione parametri	P.03 = L1 P.05 = L2-L3 P.24 = 3PH	P34 = Primario TV P35 = Secondario TV

Configuration with MV measurement and correction		
Voltage measure	3 ph-to-ph voltage reading L1-L2, L2-L3, L3-L1 on MV side	
Current measure	L1-L2-L3 phase	
Phase angle offset	90°	
Capacitor overload current measure	disabilitato	
Parameter setting	P.03 = L1 P.05 = L2-L3 P.24 = 3PH	P.34 = VT primary P.35 = VT secondary

## Disposizione morsetti

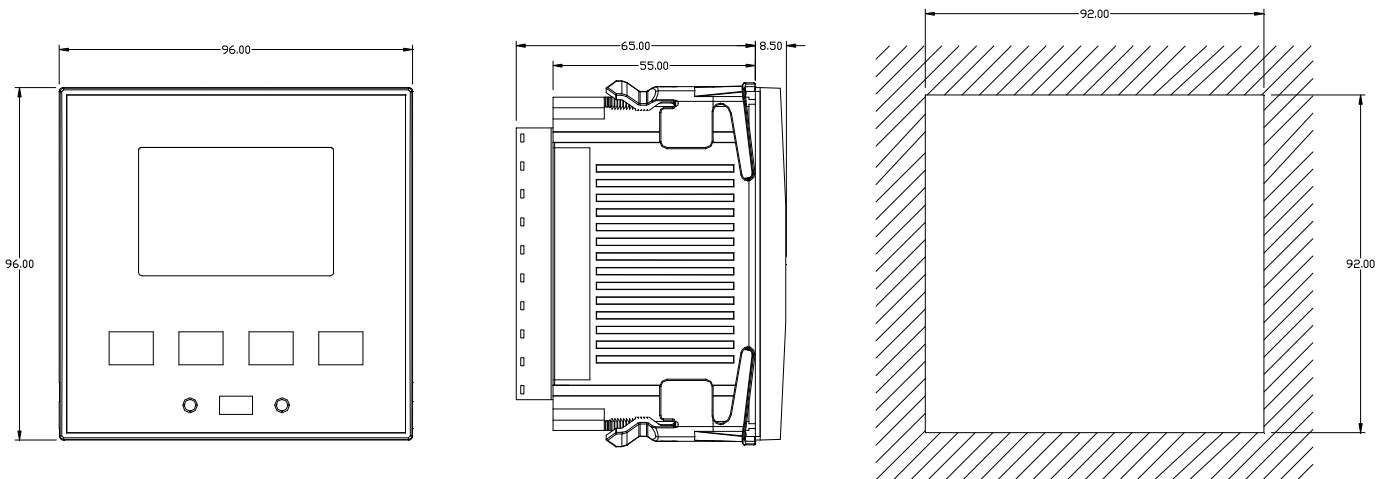
## Terminals position

### PCRL5



## Dimensioni meccaniche e foratura pannello (mm)

## Mechanical dimensions and front panel cutout (mm)



## Caratteristiche tecniche

## Technical characteristics

Alimentazione		Supply	
Tensione nominale Us ①	100 - 440V~ 110 - 250V=	Rated voltage Us ①	100 - 440V~ 110 - 250V=
Limiti di funzionamento	90 - 484V~ 93,5 - 300V=	Operating voltage range	90 - 484V~ 93,5 - 300V=
Frequenza	45 - 66Hz	Frequency	45 - 66Hz
Potenza assorbita/dissipata	3,5W - 9,5VA	Power consumption/dissipation	3,5W - 9,5VA
Rilascio relé alla microinterruzione	>= 8ms	No-voltage release	>= 8ms
Tempo di immunità alla microinterruzione	<= 25ms	Immunity time for microbreakings	<= 25ms
Fusibili raccomandati	F1A (rapidi)	Recommended fuses	F1A (fast)
Ingresso voltmetrico		Voltage inputs	
Tensione nominale Ue max	600VAC L-L (346VAC L-N)	Maximum rated voltage Ue	600VAC L-L (346VAC L-N)
Campo di misura	50...720V L-L (415VAC L-N)	Measuring range	50...720V L-L (415VAC L-N)
Campo di frequenza	45...65Hz	Frequency range	45...65Hz
Tipo di misura	Vero valore efficace (TRMS)	Measuring method	True RMS
Impedenza dell'ingresso di misura	> 0,55MΩ L-N > 1,10MΩ L-L	Measuring input impedance	> 0,55MΩ L-N > 1,10MΩ L-L
Modalità di collegamento	Linea monofase, bifase, trifase con o senza neutro e trifase bilanciato	Wiring mode	Single-phase, two-phase, three-phase with or without neutral or balanced three-phase system.
Accuratezza misura	±1% ±0,5 digit	Accuracy of measurement	1% ±0,5 digit
Fusibili raccomandati	F1A (rapidi)	Recommended fuses	F1A (fast)

Ingressi amperometrici		Current inputs	
Corrente nominale Ie	1A~ o 5A~	Rated current Ie	1A~ or 5A~
Campo di misura	Per scala 5A: 0,025 - 6A~ Per scala 1A: 0,025 - 1,2A~	Measuring range	For 5A scale: 0.025 - 6A~ For 1A scale: 0.025 - 1.2A~
Tipo di ingresso	Shunt alimentati mediante trasformatore di corrente esterno (bassa tensione) 5A max.	Type of input	Shunt supplied by an external current transformer (low voltage). Max. 5A
Tipo di misura	Vero valore efficace (RMS)	Measuring method	True RMS
Limite termico permanente	+20% Ie	Overload capacity	+20% Ie
Limite termico di breve durata	50A per 1 secondo	Overload peak	50A for 1 second
Accuratezza misura	± 1% (0,1...1,2In) ±0,5 digit	Accuracy of measurement	± 1% (0,1...1,2In) ±0,5 digit
Autoconsumo	<0,6VA	Power consumption	<0.6VA
Precisione misure		Measuring accuracy	
Tensione di linea	±0,5% f.s. ±1digit	Line voltage	±0.5% f.s. ±1digit
Uscite a relè: PCRL3 OUT 1 - 2 / PCRL5 OUT 1 - 4		Relay output: PCRL3 OUT 1 - 2 / PCRL5 OUT 1 - 4	
Tipo di contatto	PCRL3 2 x 1 NO + comune contatti PCRL5 4 x 1 NO + comune contatti	Contact type	PCRL3 2 x 1 NO + contact common PCRL5 4 x 1 NO + contact common
Dati d'impiego UL	B300 30V= 1A Servizio ausiliario	UL Rating	B300 30V= 1A Pilot Duty
Massima tensione d'impiego	440V~	Max rated voltage	440V~
Portata nominale	AC1-5A 250V~ AC15-1,5A 440V~	Rated current	AC1-5A 250V~ AC15-1,5A 440V~
Corrente massima al terminale comune dei contatti	10A	Maximum current at contact common	10A
Durata meccanica / elettrica	1x10 <sup>7</sup> / 1x10 <sup>5</sup> operazioni	Mechanical / electrical endurance	1x10 <sup>7</sup> / 1x10 <sup>5</sup> ops
Uscite a relè: PCRL3 OUT 3 / PCRL5 OUT 5		Relay output: PCRL3 OUT 3 / PCRL5 OUT 5	
Tipo di contatto	1 contatto scambio	Contact type	1 changeover
Dati d'impiego UL	B300 / 30V= 1A servizio ausiliario	UL Rating	B300 / 30V= 1A pilot duty
Massima tensione d'impiego	415V~	Max rated voltage	415V~
Portata nominale	AC1-5A 250V~ AC15-1,5A 440V~ (solo NO)	Rated current	AC1-5A 250V~ AC15-1,5A 440V~ (NO only)
Durata meccanica / elettrica	1x10 <sup>7</sup> / 1x10 <sup>5</sup> operazioni	Mechanical / electrical endurance	1x10 <sup>7</sup> / 1x10 <sup>5</sup> ops
Tensione di isolamento		Insulation voltage	
Tensione nominale d'isolamento Ui	600V~	Rated insulation voltage Ui	600V~
Tensione nomi. di tenuta a impulso Uimp	9,5kV	Rated impulse withstand voltage Uimp	9.5kV
Tensione di tenuta a frequenza d'esercizio	5,2kV	Power frequency withstand voltage	5,2kV
Condizioni ambientali di funzionamento		Ambient operating conditions	
Temperatura d'impiego	-20 - +60°C	Operating temperature	-20 - +60°C
Temperatura di stoccaggio	-30 - +80°C	Storage temperature	-30 - +80°C
Umidità relativa	<80% (IEC/EN 60068-2-78)	Relative humidity	<80% (IEC/EN 60068-2-78)
Inquinamento ambiente massimo	Grado 2	Maximum pollution degree	2
Categoria di sovratensione	3	Overvoltage category	3
Categoria di misura	III	Measurement category	III
Sequenza climatica	Z/ABDM (IEC/EN 60068-2-61)	Climatic sequence	Z/ABDM (IEC/EN 60068-2-61)
Resistenza agli urti	15g (IEC/EN 60068-2-27)	Shock resistance	15g (IEC/EN 60068-2-27)
Resistenza alle vibrazioni	0.7g (IEC/EN 60068-2-6)	Vibration resistance	0.7g (IEC/EN 60068-2-6)
Conessioni		Connections	
Tipo di morsetti	Estraibili	Terminal type	Plug-in / removable
Sezione conduttori (min e max)	0,2...2,5 mmq (24÷12 AWG)	Cable cross section (min... max)	0.2...2.5 mm² (24...12 AWG)
Dati d'impiego UL	0,75...2,5 mm² (18-12 AWG)	UL Rating	0,75...2,5 mm² (18...12 AWG)
Sezione conduttori (min e max)		Cable cross section (min... max)	
Coppia di serraggio	0,56 Nm (5 LBin)	Tightening torque	0.56 Nm (5 LBin)
Contenitore		Housing	
Esecuzione	Da incasso	Version	Flush mount
Materiale	Polycarbonato	Material	Polycarbonate
Grado di protezione frontale	IP54 sul fronte – IP20 sui morsetti	Degree of protection	IP54 on front - IP20 terminals
Peso	320g	Weight	320g
Omologazioni e conformità		Certifications and compliance	
cULus	In corso	cULus	Pending
Conformità a norme	IEC/EN 61010-1, IEC/EN 61000-6-2 IEC/EN 61000-6-4 UL508 e CSA C22.2-N°14	Reference standards	IEC/EN 61010-1, IEC/EN 61000-6-2 IEC/EN 61000-6-4 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	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

● Alimentazione ausiliaria prelevata da un sistema con tensione fase-neutro ≤300V

● Auxiliary supply connected to a line with a phase-neutral voltage ≤300V

#### Cronologia revisioni manuale

Rev	Data	Note
00	04/03/2014	• Prima versione

#### Manual revision history

Rev	Date	Notes
00	04/03/2014	• First release









## 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.l ..

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;

- ☐ In an explosive, corrosive or high concentration of combustible dust or gas;
- ☐ In a flammable atmosphere;
- ☐ Exposed to the weather;
- ☐ 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.
- ☐ 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:

- ☐ Loss of liquid.
- ☐ Case throat raised.
- ☐ 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](mailto: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](http://www.telegroup.it)



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