INSTALLATION MANUAL PFC R8

Introduction

The R8 automatic power factor controllers are extremely adaptable to any application context in the field of power factor correction systems for both single-phase and three-phase networks of low and medium voltage thanks to the compactness, the latest technology and the complete range of features. The connectivity options allow the local data exchange and the remote monitoring. A LCD display with text messages translated into 8 languages makes the instrument easy to use during commissioning and normal operation.

Description

- Automatic power factor controller with 8 relay outputs (11 for models "USB" and "BT") for driving capacitor banks.
- Graphic LCD display 128x128 pixel with white LED backlight, 5-button keypad for navigation and setting functions. Text messages and user guide translated into 8 languages.
- Connectivity options: Bluetooth, USB, Radio 868MHz, NFC, RS485 and Ethernet. Integrated event memory with historical data up to 1 year and RTC battery powered sensor.
- Voltage and current measurements precision: 1%±0,5 digit. Fully user definable alarms that can be associated to relay outputs.

Warnings

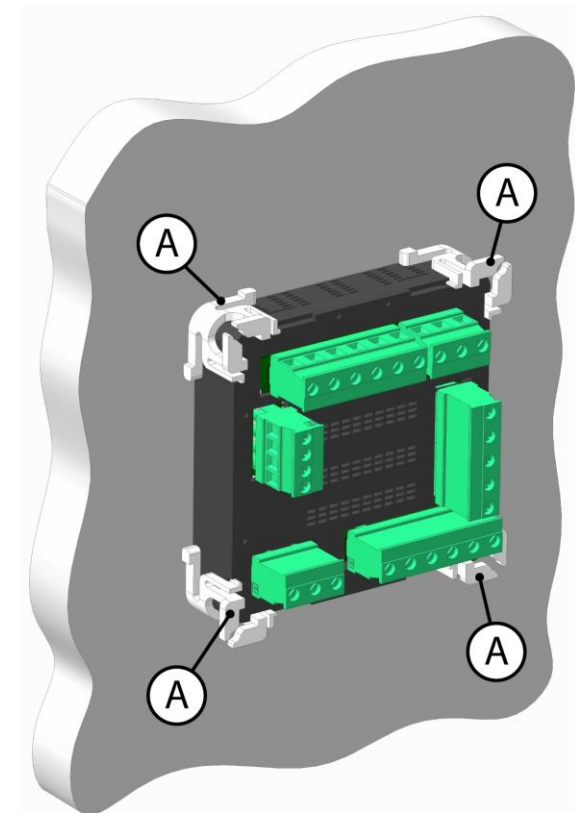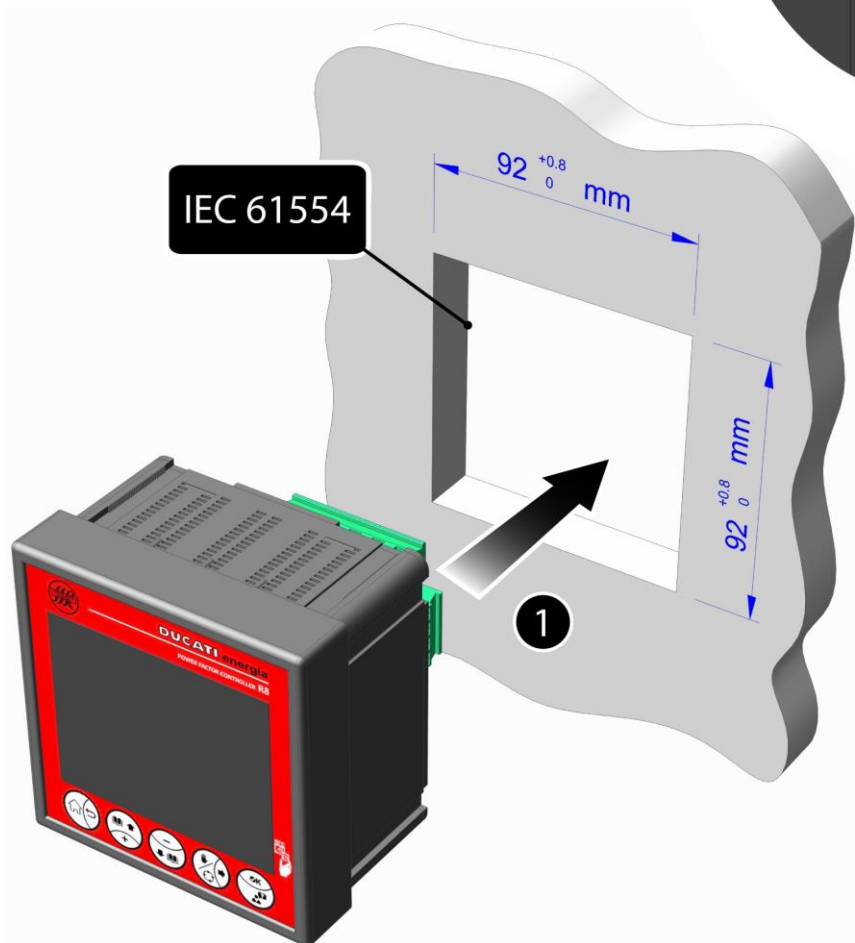| |
|---|
| Carefully read this guide before using the Power Factor Controller. |
| The purpose of this guide is to provide the quickest way to install and start using the models of the range of R8 Power Factor Controllers listed in the complete manual available on line at the link https://www.ducatienergia.com/product.php?lang=en&id=8&cat=13&product=91 . |
| The device must be installed and wired by qualified personnel. |
| A circuit breaker must be included in the electrical installation and must be installed close to 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 |
| Risk of electrocution, burns and electric arc. Obtain the personal protective equipment appropriate to fulfil the current electrical safety standards. |
| Before making the connections, check the power supply disconnection with a voltage detection device that must be placed close to the Power Factor Controller or, however, be easily accessed by the operator. |
| If necessary, clean the instrument using only a damp cloth. |
| The updated version of this manual and the complete operating manual are available on line at the link https://www.ducatienergia.com/product.php?lang=en&id=8&cat=13&product=91 |
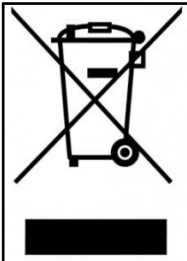
Do not dispose of the device as mixed municipal waste
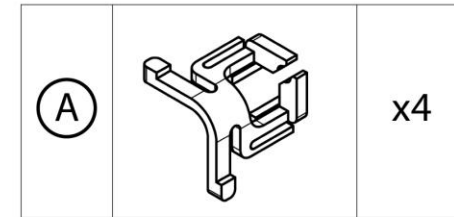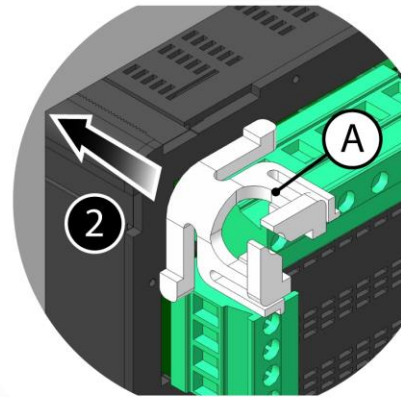
The manufacturer, Ducati energia S.p.A. declares that R5 Controllers comply with the 2014/53/EU directive.
The complete text of the EU declaration of conformity is available at the following internet address:

https://www.ducatienergia.com/product.php?lang=en&id=8&cat=13&product=91

CE

Installation

IEC 61554

$92 \, {}^{+0.8}_{0} \, mm$

$92 \, {}^{+0.8}_{0} \, mm$

A   x4

Electrical Connection

This figure shows the connection in FF1 mode. The device allows other network connection configurations.

www.ducatienergia.com
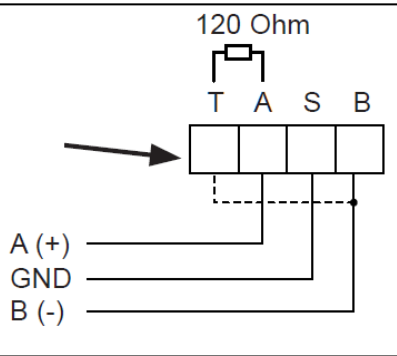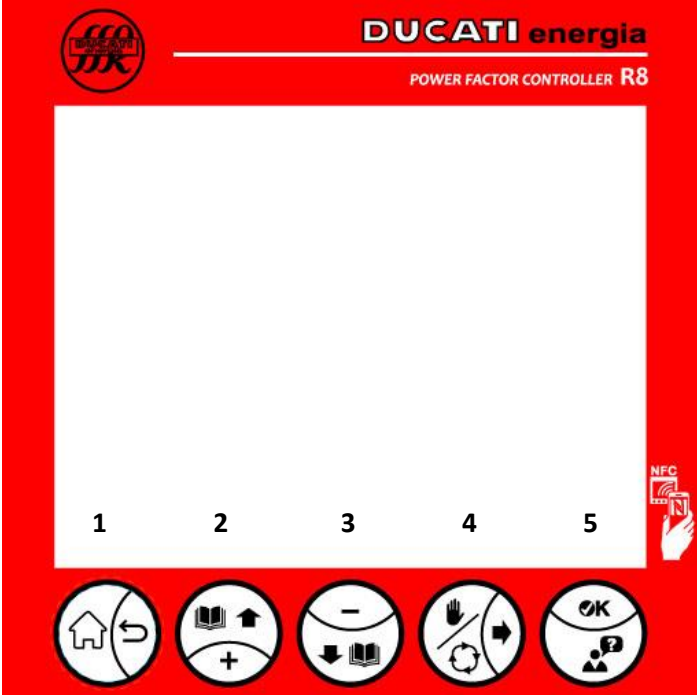
Connect B and T for termination resistance inside.

Mod. "485"

Mod. "USB" and "BT"

120 Ohm

T   A   S   B

A (+)
GND
B (-)
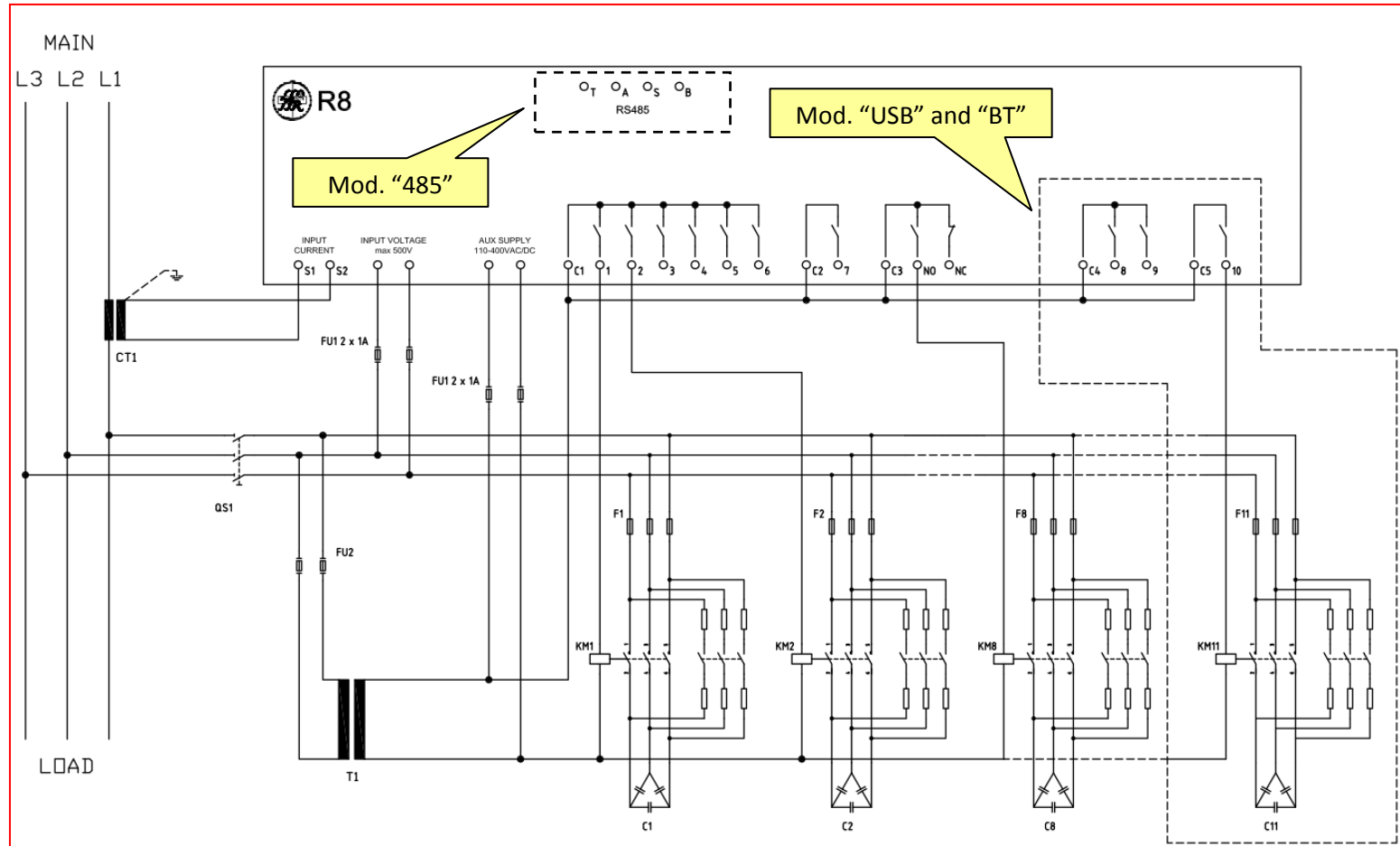
ATTENTION! A circuit breaker must be included in the electrical installation and must be installed close to the equipment and within easy reach of the operator. It must be marked as the disconnecting device of the equipment: IEC/EN 61010-1 § 6.11.2

Keyboard

	BUTTONS FUNCTIONALITY		
Button	**Short press Menu navigation**	**Short press Setup Menu**	**Long press Measure Menu**
	Previous Menu/ Home Page	Previous Menu/ Discard change	-
	Next Page/Label	Next Page/Label / Parameter increase	-
	Previous page	Previuos Page/Label / Parameter decrease	-
	Next Page/Label	Next Page/Parameter Digit	Enable - Disable manual mode
	Menu entering	Parameter confirmation	-

NFC antenna behind the display

Download the App for Android devices to simply interact via NFC with R8 controller

Display

Labels on first display screen: Model, Serial Number, Home Page

Main menu:
▶ Measures
  Graphics
  Setup
  Alarms state
  Events
  Statistics
  Reset

Labels on second display screen: Measure units
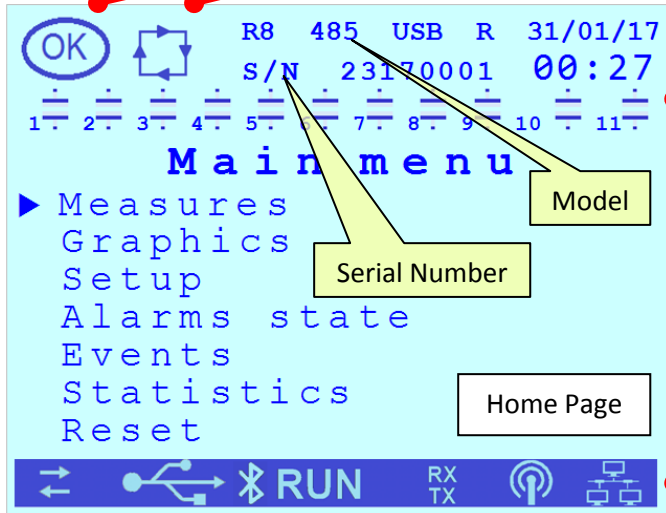
Icon	Description	
(available capacitor not inserted)	AVAILABLE CAPACITOR NOT INSERTED	CAPACITOR OUTPUT (As an alternative)
(capacitor inserted)	CAPACITOR INSERTED/ INSERTED IN A FIXED MANNER	
(capacitor not present)	CAPACITOR NOT PRESENT / NOT INSERTED IN A FIXED MANNER	
!	BROKEN CAPACITOR	
ON	ACTIVE	ALARM OUTPUT (As an alternative)
OFF	NOT ACTIVE	
(fan rotating)	ACTIVE (rotating)	DRIVE OUTPUT FAN (As an alternative)
(fan still)	NOT ACTIVE (still)	

Icon	Description	Notes
⚠	ALARM STATUS	As an alternative
OK	OK STATUS	
✋	MANUAL MODE	
✋⌚	MANUAL MODE WAITING FOR TECHNICAL TIME TO RUN OUT	As an alternative
⟳	AUTOMATIC MODE	
⟳⌚	AUTOMATIC MODE WAITING FOR TECHNICAL TIME TO RUN OUT	

Icon	Description
⇄	COGENERATION MODE ACTIVE
RUN	CONTROLLER OPERATION INDICATOR (If flashing)
⟜•	USB CONNECTION ACTIVE (If flashing, data exchange in progress)
✳	BLUETOOTH CONNECTION ACTIVE (If flashing, data exchange in progress)
RX TX	SERIAL COMMUNICATION ACTIVE (If flashing, data exchange in progress)
(((•)))	868 COMMUNICATION ACTIVE (If flashing, data exchange in progress)
🖥	ETH COMMUNICATION ACTIVE (If flashing, data exchange in progress)

Icon	Description
MONTH	Average monthly value
WEEK	Average weekly value
DAY	Average daily value
AVG	Average value in the average time set
MAX	Average monthly value
MAXAVG	Maximum average value
MIN	Minimum value

PFC R8 StartUP

When, switching on the controller, the RTC clock backup battery is not charged, the regulator will require you to set / confirm:

- Language (fig. 1); Date (fig. 2); Time (fig. 3); Summertime or Standard Time (fig. 4)

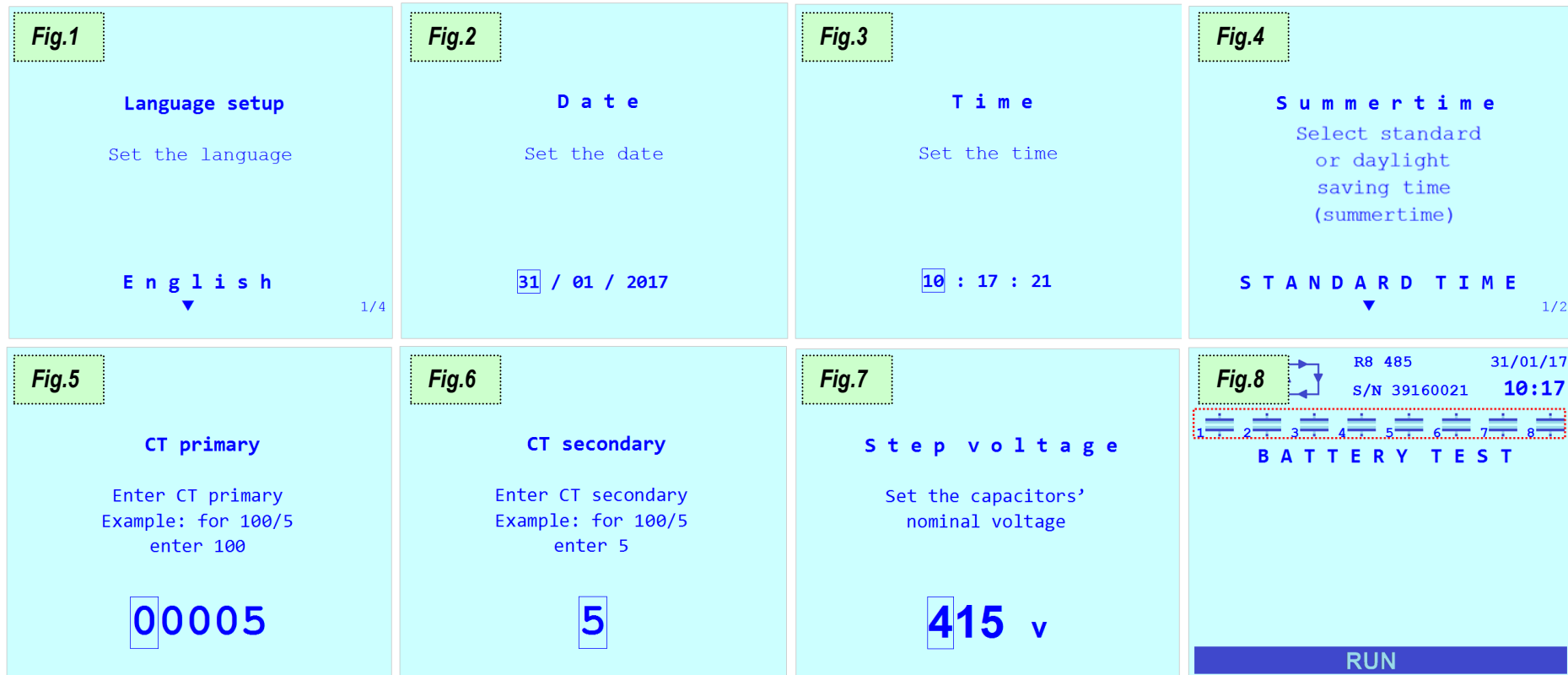At first turn-on of the system, the PFC R8 performs an automatic insertion of capacitor banks to check the connections and the amount of battery power. In order to perform properly these initial checks, before turning on the PFC, you must:

- ▶ <u>turn off</u> any generation plants (if present); ▶ make sure the plant load is stable and not too low in order to have a <u>non-zero</u> current measurement.

Before performing the automatic insertion of the capacitor the PFC will show the setting screens of the primary and secondary values of the CT (figg. 5,6) and of the nominal voltage of the capacitors (fig. 7); if the load current is too low the regulator will not show these screens and will move to the Home Page; in this latter case:

- the controller will indicate the presence of an alarm for low load current (the Alarm list is showed in the "Alarms Menu"); ▶ it is possible to access the "Setup Menu" in order to pre-set the operating parameters;
- it is still possible to switch to manual mode (long press of button 4) to arm / disarm the capacitor banks (e.g. for testing purposes);
- when the PFC measures a stable non-zero current, it will show the setting pages of Primary and Secondary of CT (figg. 5,6) and of the nominal voltage of the capacitors (fig. 7).

Fig.1 **Language setup** Set the language **English** ▼ 1/4	**Fig.2** **Date** Set the date **31** / **01** / **2017**	**Fig.3** **Time** Set the time **10** : **17** : **21**	**Fig.4** **Summertime** Select standard or daylight saving time (summertime) **STANDARD TIME** ▼ 1/2
Fig.5 **CT primary** Enter CT primary Example: for 100/5 enter 100 **00005**	**Fig.6** **CT secondary** Enter CT secondary Example: for 100/5 enter 5 **5**	**Fig.7** **Step voltage** Set the capacitors' nominal voltage **415** v	**Fig.8** R8 485 31/01/17 S/N 39160021 **10:17** 2 3 4 5 6 7 8 **BATTERY TEST** **RUN**

After the setting of the Primary and Secondary of the CT and of the nominal voltage of the capacitors, the PFC will check the current/voltage connections by cyclically inserting all the capacitor banks (figg. 8, 9, 10, 11, 12); a minimum of 2 to a maximum of 5 cycles of insertion cycles are needed, at the end of the cycles the PFC will set the detected connection type. The duration of a cycle is the shorter between the capacitors reconnection time and 1 minute. In the example, FF1 means a connection like the one shown in Chap. Electrical Connection (for further details refer to the complete operating manual available on line at the following link: https://www.ducatienergia.com/product.php?lang=en&id=8&cat=13&product=91. In case of connection error the PFC will show an error screen and then will show the CT phase setting page (fig. 13).

After checking the connections:

- if the power of at least one capacitor bank was already preset, the PFC will finish the boot process by showing the Home page;
- if the power of capacitor banks were NOT already been preset, the PFC will show a page for all the self-acquired values (figg. 14, 15): it is possible to confirm or modify the values to finish the boot process and to display the Home page.

After the startup procedure any generation plants present can be turned-on; in this case you must enter the Setup menu and set to "Enabled" the "Cogeneration" parameter (see the table on the next page and / or the complete manual available online).

Fig.9

Fig.10

Fig.11

Fig.12

Fig.13

Fig.14

Fig.15
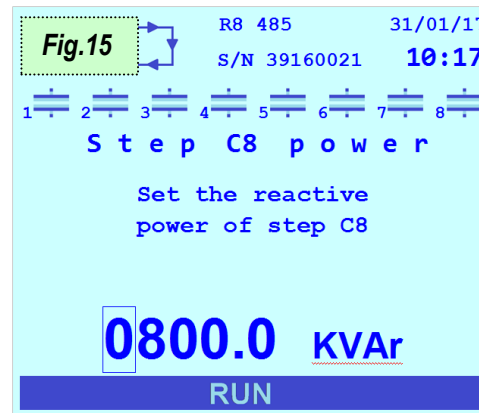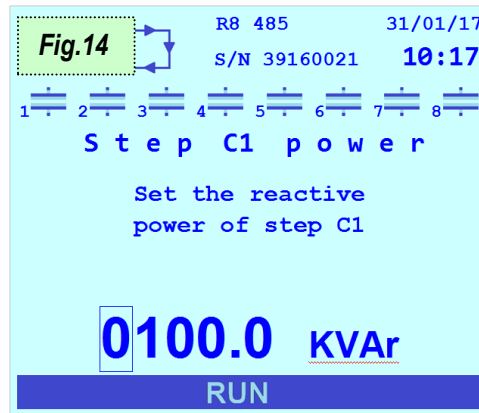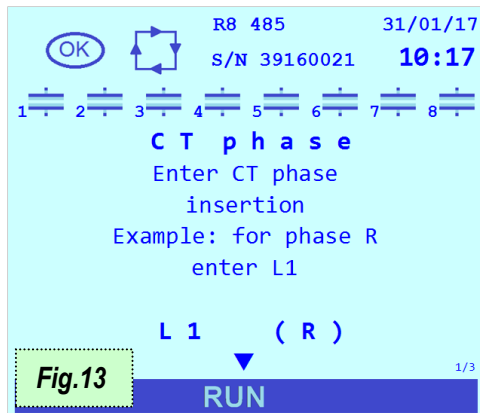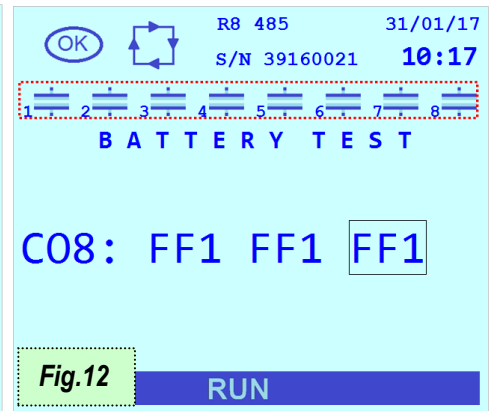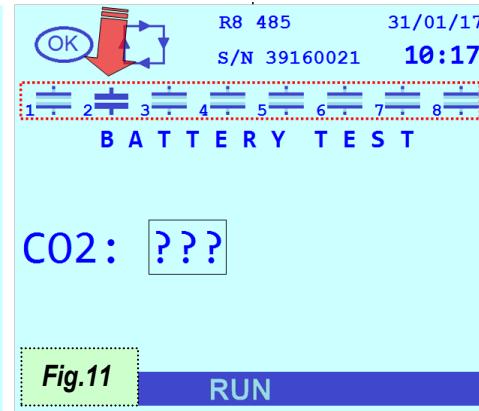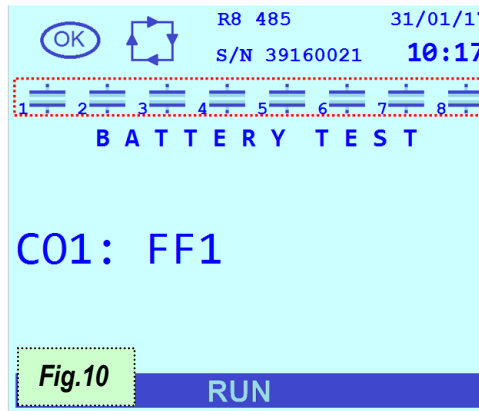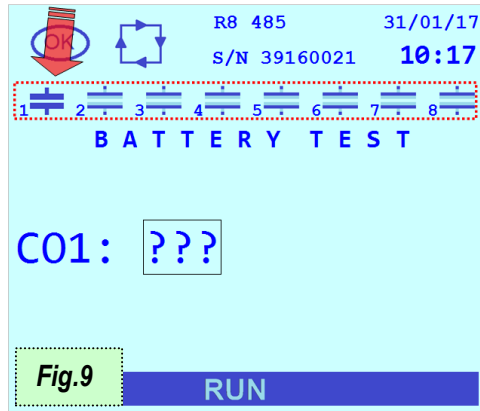
Technical features

- **Power supply**:
  - Nominal voltage: 400 or 230 or 110 VAC
  - Operating limits: 110÷415 V AC/DC ±10%
  - Frequency range: DC or 45÷66 Hz
  - Power Consumption: 2.5W
  - Maximum power consumption: 10W (for "USB ETH" model)
  - Fuses: fast 1A

- **Voltage input**:
  - Nominal voltage: 400 or 230 or 110 VAC
  - Measuring range: 50÷525 VAC
  - Accuracy: 1% ± 0.5 digits
  - Frequency range: 45÷400 Hz;
  - Measuring Type: True RMS (TRMS)

- **Current input:**
  - Input type: current shunt
  - Current Rating: 5A
  - Measuring range: 0.025÷6A
  - Accuracy: 1% ± 0.5 digits
  - Measuring Type: True RMS (TRMS)
  - Self-consumption: <1,8VA

- **Relay outputs:**
  - Total number of outputs: 8 (11 for "USB" and "BT" models)
  - Contacts type: 6 NO (common C1) + 1 NO (common C2) + 1 NO/NC (common C3)
  - Type of contacts for "USB" and "BT" models: 6 NO (common C1) + 1 NO (common C2) + 1 NO / NC (common C3) + 2 NO (common C4) + 1 NO (common C5)
  - Maximum operating voltage NO contacts: 440 VAC
  - Max working contact voltage NO / NC: 400 VAC
  - NO contacts Rated capacity: AC1 6A-250V~, AC15 1.5A-440V~
  - Nominal contact rating NO/NC: AC1 6A-250V~, AC15 1.5A-440V~
  - Contacts Mechanical / Electrical Life NO: $>30x10^6$ / $>2x10^5$ maneuvers
  - Contacts Mechanical / Electrical Life NO / NC:$> 1x10^7$ /$> 1x10^4$ maneuvers

- **User Interface:**
  - 5-button keypad
  - Display: LCD STN graphic matrix 128x128 pixel, white LED backlight
  - LCD display area Size: 72,3x57mm
  - Backlight and contrast: level regulation from Setup menu

- **Operating environment:**
  - Operating temperature: -20÷70 ° C
  - Storage temperature: -30÷80 ° C
  - Overvoltage category: |||
  - Measuring Category: 3
  - Insulation voltage: 600V~
  - Relative Humidity: <80%

- **Connection terminals:**
  - Type: Removable
  - Conductor section: 0.2÷2.5 mm2 (24÷12 AWG)
  - Torque: 0.5 Nm
  - Stripping length: 7 mm

- **Container:**
  - Format: 96x96
  - Material: PBT thermoplastic polyester
  - Degree of protection: IP51 on the front - IP20 on terminals
  - Weight: 350g.

- **868Mhz Radio interface:**
  - Carrier frequency: 868MHz
  - Frequency range: 868.0 – 868.6 MHz
  - Maximum emitted power: 12.5mW
  - Protocol: Modbus

- **13.56Mhz NFC interface:**
  - Smartphone data-exchange via antenna behind the display
  - use Android app Ducati Smart Energy: https://play.google.com/store/apps/details?id=it.ducatienergia.smartenergy

- **RS485 Interface:**
  - Insulation voltage: 600V~
  - Protocols: Modbus RTU, Ascii-Ducbus
  - Baud rate: 9600÷115200 bps
  - Termination resistance: 120 Ohm - Integrated (activated by a jumper on the connection terminal)

- **Ethernet Interface:**
  - Network interface 10/100Base-T
  - Galvanically isolated RJ45 connector with auto-crossover MDI/MDX function
  - Insulation voltage: 600V~
  - Integrated Webserver
  - Modbus-TCP protocol

- **USB Interface: USB 2.0 Host-type**

- **Bluetooth Interface: type Bluetooth Low Energy (BLE)**

- **Standards compliance**: EN 61010-1, EN 61000-6-2, EN 61000-6-4, EN 61326-1, EN 62311, EN 301-489-1, EN 301-489-3, EN 300-220-2, EN 300-330, EN 300-328-1

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 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. – Pulire lo strumento con panno morbido, non usare prodotti abrasivi, detergenti liquidi o solventi.
ATTENTION!	– Lire attentivement le manuel avant toute utilisation et installation. – Ces appareils doivent être installés par un personnel qualifié, conformément aux normes en vigueur en matière d'installations, afin d'éviter de causer des dommages à des personnes ou choses. – Avant toute intervention sur l'instrument, mettre les entrées de mesure et d'alimentation hors tension et court-circuiter les transformateurs de courant. – Le constructeur n'assume aucune responsabilité quant à la sécurité électrique en cas d'utilisation impropre du dispositif. – Les produits décrits dans ce document sont susceptibles d'évoluer ou de subir des modifications à n'importe quel moment. Les descriptions et caractéristiques techniques du catalogue ne peuvent donc avoir aucune valeur contractuelle. – Nettoyer l'appareil avec un chiffon doux, ne pas utiliser de produits abrasifs, détergents liquides ou solvants.
ACHTUNG!	– Dieses Handbuch vor Gebrauch und Installation aufmerksam lesen. – Zur Vermeidung von Personen- und Sachschäden dürfen diese Geräte nur von qualifiziertem Fachpersonal und unter Befolgung der einschlägigen Vorschriften installiert werden. – Vor jedem Eingriff am Instrument die Spannungszufuhr zu den Messeingängen trennen und die Stromwandler kurzschließen. – Bei zweckwidrigem Gebrauch der Vorrichtung übernimmt der Hersteller keine Haftung für die elektrische Sicherheit. – Die in dieser Broschüre beschriebenen Produkte können jederzeit weiterentwickelt und geändert werden. Die im Katalog enthaltenen Beschreibungen und Daten sind daher unverbindlich und ohne Gewähr. – Das Gerät mit einem weichen Tuch reinigen, keine Scheuermittel, Flüssigreiniger oder Lösungsmittel verwenden.
ADVERTENCIA!	– Leer atentamente el manual antes de instalar y utilizar el regulador. – Este dispositivo debe ser instalado por personal cualificado conforme a la normativa de instalación vigente a fin de evitar daños personales o materiales. – Antes de realizar cualquier operación en el dispositivo, desconectar la corriente de las entradas de alimentación y medida, y cortocircuitar los transformadores de corriente. – El fabricante no se responsabilizará de la seguridad eléctrica en caso de que el dispositivo no se utilice de forma adecuada. – Los productos descritos en este documento se pueden actualizar o modificar en cualquier momento. Por consiguiente, las descripciones y los datos técnicos aquí contenidos no tienen valor contractual. – Limpiar el dispositivo con un trapo suave; no utilizar productos abrasivos, detergentes líquidos ni disolventes.

Setup menu parameters table

Rif.	Parameter	U.o.M.	Minimum value	Maximum value	Default value (1)	Description
1	CT primary	A	5	10000	5	Current full scale of primary winding of the Current Transformer (CT). If, for example, the transformer size is 200/5 enter the value *200*.
2	CT secondary	A	1	5	5	Current full scale of secondary winding of the Current Transformer (CT). If, for example, the transformer size is 200/5 enter the value *5*.
3	CT phase	-		L1, L2, L3	L1	Phase line to which the CT is connected. If the CT was connected to the R phase select *L1*; if the CT was connected to the S phase select *L2*; if the CT was connected to the T phase select *L3*.
4	CT inversion	-		ENABLED / DISABLED	DISABLED	Reversal of CT direction via SW. When *Cogeneration = Enabled* it is necessary to respect the correct CT direction. In case of error, setting the parameter to *Enabled*, will be done a CT inversion via SW without any further changes in the wiring.
5	Cogeneration	-		ENABLED / DISABLED	DISABLED	Cogeneration mode (4-Quadrants). Select *Enabled* when the CT is mounted on a line on which the current is generated by cogeneration systems and is absorbed by the load; if this parameter is *Disabled*, the CT direction will be automatically corrected via SW.
6	Frequency	Hz		50HZ / 60HZ / AUTO	AUTO	Mains rated frequency. Setting the value to *AUTO*, the frequency value will be automatically selected at power-on.
7	VT primary	V	50	200000	400	Voltage full scale of primary winding of the Voltage Transformer (VT). If the VT is not present, set the value of the wired mains voltage (*400* or *230*). If the VT is present and, for example, the transformer size is 690/400 enter the value *690*.
8	VT secondary	V	50	525	400	Voltage full scale of secondary winding of the Voltage Transformer (VT). If the VT is not present, set the value of the wired mains voltage (*400* or *230*). If the VT is present and, for example, the transformer size is 690/100 enter the value *100*.
9	Voltage phase	-		L1n / L2n / L3n / L12 / L23 / L31	L23	Phase voltage or linked voltage to which input voltage signal (VOLT INPUT) is connected. If, for example, the input voltage signal (or the VT) was connected between the S and T phases select *L23*.If, for example, the input voltage signal (or the VT) was connected between the R phase and the neutral select *L1n*.
10	Phase offset	°	-180	180	0	Voltage-current additional phase offset correction. Set the phase offset value (in degrees) added to voltage signal (due, for example, to a medium voltage transformer).
11	Target cosfi	-	0.50 CAP	0.50 IND	0.98 IND	Cosfi target value (in the first time slot *Band B1*). Set the value to be reached for the cosfi with the available power factor correction equipment.
12	Cosfi tolerance	-	0.01	0.1	0.03	Tolerance expressed in absolute value and symmetrically (+/-) applied with respect to cosfi target. This parameter and *cosfi target* define the range of values within which the PFC will consider the system corrected. For example, with *cosfi target = 0.97 IND* and *cosfi tolerance = 0.02* the PFC will try to reach a cosfi value between 0.95 inductive and 0.99 inductive.
13	Cosfi time band 2	-	0.50 CAP	0.50 IND	0.98 IND	Cosfi target value in the 2nd time slot *Band B2*. Set the value to be reached in *Band B2* for the cosfi with the available power factor correction equipment.
14	Cosfi time band 3	-	0.50 CAP	0.50 IND	0.98 IND	Cosfi target value in the 3rd time slot *Band B3*. Set the value to be reached in *Band B3* for the cosfi with the available power factor correction equipment.
15	Cosfi TB4 / GEN	-	0.50 CAP	0.50 IND	0.98 IND	Cosfi target value in the 4th time slot *Band B4* or cosfi target value when the system is generating power. If the parameter *Cogeneration = Disabled* the value is the target for *Band B4*. If the parameter *Cogeneration = Enabled* and *Step disconnection = Disabled*, the value is the target to reach when the system is generating power.
16	Band B1	hh:mm:ss	00:00:00	23:59:00	00:00:00	1st time slot starting time. Note that the starting time coincides with the previous ending time.
17	Band B2	hh:mm:ss	00:00:00	23:59:00	99:99:00 (*)	2nd time slot starting time. (*) set the value *99:99:00* to disable the time slot. Note that the starting time coincides with the previous ending time.
18	Band B3	hh:mm:ss	00:00:00	23:59:00	99:99:00 (*)	3rd time slot starting time. (*) set the value *99:99:00* to disable the time slot. Note that the starting time coincides with the previous ending time.
19	Band B4	hh:mm:ss	00:00:00	23:59:00	99:99:00 (*)	4th time slot starting time. (*) set the value *99:99:00* to disable the time slot. Note that the starting time coincides with the previous ending time. *Band B4* is valid only if *Cogeneration = Disabled*
20	Avg. integrat. time	min	1	60	15	Average time of measurements expressed in minutes. If, for example, to obtain the average value of power every 5 minutes, set the value to *5*
21	Step voltage	V	50	5000	400	Rated operating voltage of capacitors. If, for example, the working voltage of the capacitors is 415V enter *415*. Note: in general, this parameter is not the mains voltage. In presence of barrier inductors (or equivalent devices), the parameter should be set to the nominal voltage of the mains voltage (eg 400V); in this case, the reactive power of the batteries should also be set to the same value as the mains voltage (and not the nominal voltage).
22	Manual mode	-		ENABLED / DISABLED	DISABLED	Manual power factor correction mode. If you want to manually set the relay status of the steps set this parameter to *Enabled*. Note: by setting *Manual mode* at *Enabled* the status of all outputs will be not changed and the user must confirm or modify it in the pages that will be subsequently displayed.
23	Connection time	s	1	30000	60	Minimum time (seconds) between switches (connection or disconnection) on different steps. Set a lower value if the reactive power to be corrected varies quickly. Set a higher value if the reactive power to be corrected varies slowly.
24	Discharge time	s	1	30000	60	Wait time (seconds) for the reconnection of the same bank. If, for example, the capacitor discharge time is 30 seconds, set the value *30*.
25	Step n function *(n = 1, 2, 3, …, 8, 9, 10, 11)*	-	1. STEP; 2. ALWAYS ON STEP; 3. ALWAYS OFF STEP; 4. N.O. CONTACT ALARM 5. N.C. CONTACT ALARM; 6. FAN OUTPUT 7. MAN/AUTO OUTPUT; 8. R8 RUNNING(RUN)		STEP	Relay output function n (n = 1, .., 8 for relays models; n = 1, ..., 11 for 11 relays models). 1.STEP: the output is connected to a capacitor step and automatically controlled; 2.ALWAYS ON STEP: the output is associated to a capacitor step that is always connected. 3. ALWAYS OFF STEP: the output is not used or associated to a not used or broken capacitor step; 4. N.O. CONTACT ALARM: the output is associated to an alarm (the contact is closed if the alarm is not present); 5. N.C. CONTACT ALARM: the output is associated to an alarm (the contact is open if the alarm is not present); 6.FAN OUTPUT: the relay output drives a fan when the temperature is higher than the threshold; 7. MAN / AUTO OUTPUT: the output contact will close in manual regulation mode or will open in automatic regulation mode. 8. R8 RUNNING: the output contact is closed when the PFC works properly. NOTE: for 8 relays models the SPDT (Form C - NO/NC contacts) relay is the n.8, for 11 relays models is the n.11. Note: the "R8 RUNNING (RUN)" can be associated only with the SPDT relay with NO/NC contacts and common C3 (*relay output 8* for 8 relays models or *relay output 11* for 11 relays models). Setting the value "MAN / AUTO OUTPUT" and the parameter *Manual mode = Enabled* will be applied a NO logic.
26	Step Cn power *(n = 1, 2, 3, …, 8, 9, 10, 11)*	kVAr	0	9999,9	0	Reactive power associated to Cn capacitor step (n = 1, .., 8 for 8 relays models; n = 1, ..., 11 for 11 relays models). Example: for a 0.7kVAr step set 0.7. This parameter is shown only if the *Relay output* parameter is one of the following: 1. STEP; 2. ALWAYS ON STEP; 3. ALWAYS OFF STEP
27	Alarm output n *(n = 1, 2, 3, …, 8, 9, 10, 11)*	-	1. OVERVOLTAGE; 2. OVERCURRENT 3. LOW VOLTAGE; 4. LOW CURRENT; 5. OVERCOMPENSATION; 6.UNDERCOMPENSATION; 7. HIGH TEMPERATURE; 8.HIGH THDV%; 9. HIGH THDI%; 10. GENERIC		OVERVOLTAGE	Logic alarm associated to output n (n = 1, .., 8 for 8 relays models; n = 1, ..., 11 for 11 relays models). 1. OVERVOLTAGE: the output n will be associated to the overvoltage alarm. 2. OVERCURRENT: the output n will be associated to the overcurrent alarm. 3. LOW VOLTAGE: the output n will be associated to the low voltage alarm. 4. LOW CURRENT: the output n will be associated to the low current alarm. 5. OVERCOMPESATION: the output n will be associated to the cosfi overcompensation alarm. 6. UNDERCOMPENSATION: the output n will be associated to the cosfi undercompensation alarm . 7. HIGH TEMPERATURE: the output n will be associated to the high temperature alarm. 8. HIGH THDV%: the output n will be associated to the high THDV% alarm. 9. HIGH THDI%: the output n will be associated to the high THDI% alarm. 10. GENERIC: the output n will be associated to the presence of al least one of the previous alarms.
28	Manual status Cn *(n=1,2,3,…,8,9,10,11)*	-		ON / OFF	OFF	Manual status associated to output n (n = 1, .., 8 for 8 relays models; n = 1, ..., 11 for 11 relays models) if *Manual mode = Enabled*. Note: the status will be applied regardless the *Step n function* parameter except if *Step n function =* is "MAN / AUTO OUTPUT" for which the status is fixed to OFF.
29	Step disconnection	-		ENABLED / DISABLED	DISABLED	This parameter enables the step disconnection when the system generates power. Enabling this parameter the PFC will disconnect all the steps in case of the system generates power.
30	Protocol	-		MODBUS; ASCII DUCBUS.	MODBUS	Protocol type used for RS485 serial communication (ONLY FOR MODELS WITH RS485 OPTION)
31	Address	-		247	31	Address of RS485 network device (ONLY FOR MODELS WITH RS485 OPTION). If *Protocol = Modbus* set an address between 1 and 247; if *Protocol = ASCII Ducbus* set an address between 1 and 98 (otherwise will be shown an Error Message).
32	Baudrate	bps		9600 / 19200 / 38400 / 57600 / 115200	9600	RS485 serial communication baudrate (ONLY FOR MODELS WITH RS485 OPTION).
33	NFC information	-		read-only parameter	-	Information's about the use of Ducati Smart Energy App for data exchange via NFC interface.
34	HV Alarm Thres.	V	90% (**)	110% (**)	110% (**)	Threshold voltage for overvoltage alarm. (**) percentage values are referred to the parameter *VT primary*
35	HV Alarm Delay	s	1	255	10	Delay in seconds for overvoltage alarm. For example, to set and reset the alarm in 10 seconds, select the value *10*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
36	HI Alarm Thres.	A	90% (§)	120% (§)	120% (§)	Threshold current for overcurrent alarm. (§) percentage values are referred to the parameter *CT primary*
37	HI Alarm Delay	s	1	255	10	Delay in seconds for overcurrent alarm. For example, to set and reset the alarm in 10 seconds, select the value *10*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
38	LV Alarm Thres.	V	90% (**)	110% (**)	OFF	Threshold voltage for low voltage alarm. (**) percentage values are referred to the parameter *VT primary*
39	LV Alarm Delay	s	1	255	10	Delay in seconds for low voltage alarm. For example, to set and reset the alarm in 10 seconds, select the value *10*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
40	LI Alarm Thres.	A	0,7% (§)	10% (§)	0,7% (§)	Threshold current for low current alarm. (§) percentage values are referred to the parameter *CT primary*
41	LI Alarm Delay	s	1	255	10	Delay in seconds for low current alarm. For example, to set and reset the alarm in 10 seconds, select the value *10*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
42	THDV% Alarm Thres.	%	1	100	999 (@)	Threshold for high voltage harmonic distortion (THDV%) alarm. (@) Set the value *999* to disable the alarm.
43	THDV% Alarm Delay	s	1	255	10	Delay in seconds for high THDV% alarm. will disable the alarm. For example, to set and reset the alarm in 10 seconds, select the value *10*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
44	THDI% Alarm Thres.	%	1	100	999 (@)	Threshold for high current harmonic distortion (THDI%) alarm.(@) the value *999* to disable the alarm.
45	THDI% Alarm Delay	s	1	255	10	Delay in seconds for high THDI% alarm. will disable the alarm. For example, to set and reset the alarm in 10 seconds, select the value *10*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
46	Temp. Alarm	°C (°F)	0 (32)	80 (176)	60 (140)	Threshold current for high temperature alarm.
47	Temp. Alarm Delay	s	1	255	10	Delay in seconds for high temperature alarm. For example, to set and reset the alarm in 10 seconds, select the value *10*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
48	Fan A. Thres.	°C (°F)	0 (32)	80 (176)	35 (95)	Temperature threshold for fan activation.
49	Fan A. Delay	s	1	255	10	Delay in seconds for fan activation. For example, to activate and deactivate the fan in 10 seconds, select the value *10*. fan will activate or deactivate only if the measurements are stably over or under threshold till the delay ends.
50	Hcosfi Alarm Delay	min	1	255	60	Delay in minutes for cosfi overcompensation alarm. For example, to set and reset the alarm in 60 minutes, select the value *60*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
51	Lcosfi Alarm Delay	min	1	255	60	Delay in minutes for cosfi undercompensation alarm. For example, to set and reset the alarm in 60 minutes, select the value *60*. Note: alarm will set or reset only if the measurements are stably over or under threshold till the delay ends.
52	Language	-	ENGLISH / ITALIANO / ESPANOL / DEUTSCH / FRANÇAIS / PORTUGUÊS / 中文		ENGLISH	User's messages language. Set the language for the display messages.
53	Temperature unit	-	1. ° CELSIUS; 2. °FAHRENHEIT		°CELSIUS	Temperature unit.
54	Enable password	-		ENABLED / DISABLED	DISABLED	Password enabling. Password enabling prevents parameters changes in all the pages of the Setup menu.
55	Password	-	0000	9999	0000	User' password value.
56	Firmware rel.	-		read-only parameter	-	Firmware version.
57	Bootloader rel.	-		read-only parameter	-	Bootloader version.
58	Language rel.	-		read-only parameter	-	Language version.
59	Backlight	-		OFF / ON	ON	Display backlight level.
60	Backlight auto	-		ENABLED / DISABLED	DISABLED	Display auto-off enabling.
61	Contrast	-	0	10	4	Display contrast regulation parameter. Set the value depending on the backlight level and the viewing angle.
62	Reset	-	FACTORY SETTINGS / ALARM COUNTERS AVERAGE VALUES / MIN/MAX VALUES/ STEP PARAMETERS (C01 ... C11) / CONTACTORS OPERAT.(C01 ... C11) / PFC RESTART / ARCHIVES		-	Reset commands. Selecting "*Step Parameters*" (Cn=1,…,11) will be reset all the step parameters except the *Step Cn power* parameter. Selecting "PFC Restart" the regulator will repeat the start-up procedure without any changes in *Step Cn power* parameters. To perform the reset, select an item and confirm in the next page.
63	Date	-	01/01/1970	31/12/2099	01/01/2017	Date setting.
64	Time	-	00:00:00	23:59:00	00:00:00	Time setting.
65	Summertime	-	1.STANDARD TIME; 2.D.L.SAVING TIME		STANDARD TIME	Setting standard or daylight saving time (summertime).

(1) In case of R8 regulators installed in a DUCATI energia equipment, please refer to the equipment documentation for the parameters default values.