



PFC R8

ETHERNET INTERFACE USER'S MANUAL



Vers. 0 Rev. B

REVISIONS

VER.	Rev.	DATE	REASON
0	A	02/03/18	First issue
0	B	29/10/18	Path from Main menu to Ethernet menu added. Display strings revision.

TABLE OF CONTENTS

1.	GENERAL DESCRIPTION	5
1.1	... ETHERNET CONNECTION.....	5
2.	INSTRUMENT SETUP	6
2.1	... DEFAULT SETTINGS	7
2.2	... INSTRUMENT CONFIGURATION.....	8
3.	WEBSERVER.....	9
3.1	... RESETTING PASSWORD	21
4.	MODBUS-TCP	22
4.1	... READ HOLDING REGISTERS FUNCTION (03h)	22
4.2	... WRITE MULTIPLE REGISTERS FUNCTION (10h).....	38
4.3	... REPORT SLAVE ID FUNCTION (11h)	51

TABLE OF PICTURES

Picture 1 – PC network configuration.....	9
Picture 2 – First visualisation page	10
Picture 3 – Global analyzer values summary table	11
Picture 4 – Parameter summary table	12
Picture 5 – Alarms summary table	13
Picture 6 – Statistics summary table	14
Picture 7 – Harmonics summary table	15
Picture 8 – Username and Password setting	16
Picture 9 – Modbus TCP configuration	17
Picture 10 – Webserver language selection	18
Picture 11 – Network configuration with enabled DHCP.....	18
Picture 12 – Network configuration with disabled DHCP.....	19
Picture 13 – Online Help.....	20
Picture 14 – Communication error.....	20

1. GENERAL DESCRIPTION

The models of power factor regulator in the R8 family with Ethernet interface are:

- **R8 ETH (P/N 415986080ENNN) – R8 ETH INT (P/N 315986090ENNN)**
- **R8 ETH USB (P/N 415986080ESNN) - R8 ETH USB INT(P/N 315986090ESNN)**
- **R8 ETH BT (P/N 415986080EBNN) - R8 ETH BT INT (P/N 315986090EBNN)**
- **R8 ETH RADIO (P/N 415986080ENDN) - R8 ETH RADIO INT (P/N 315986090ENDN)**
- **R8 ETH USB RADIO (P/N 415986080ESDN) - R8 ETH USB RADIO INT(P/N 315986090ESDN)**
- **R8 ETH BT RADIO (P/N 415986080EBDN) - R8 ETH BT RADIO INT (P/N 315986090EBDN)**

The following main features available:

- Webservice functionality (that can handle multiple simultaneous accesses from different browsers) – http protocol;
- MODBUS-TCP communication protocol.

Both features are available simultaneously.

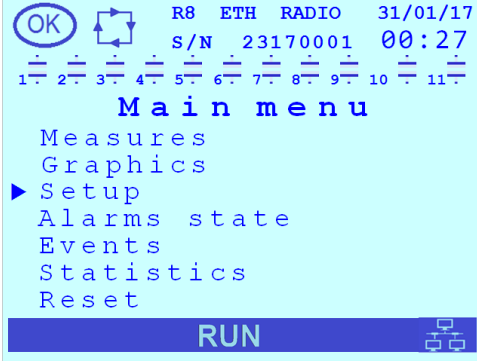
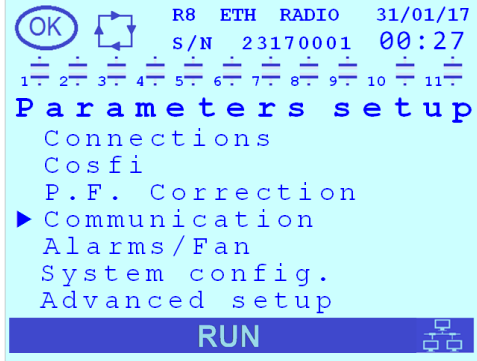

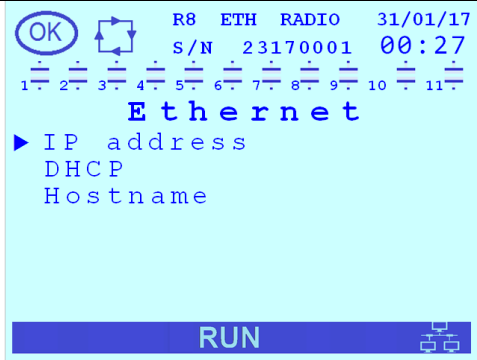
1.1 ETHERNET CONNECTION

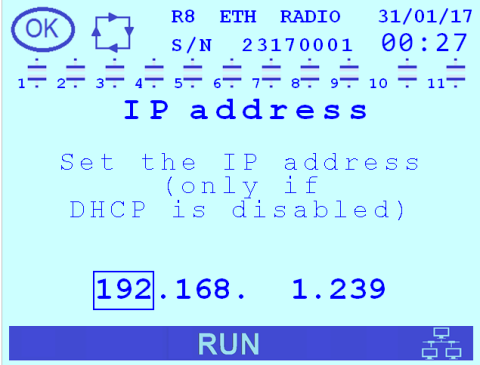
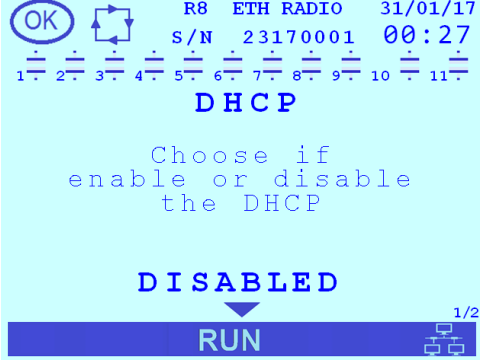

The R8 interfacing to the Ethernet network is made via an RJ45 female insulated connector located on the back of the instrument.

The Ethernet interface is also equipped with the MDI/MDX auto-crossover functionality, for this reason the user can use any of both cables types, “patch” or “cross”.

2. INSTRUMENT SETUP

From the setup menu of the instrument is possible to perform the following settings:

<p>From “Main menu” page select “Setup”.</p>	 <p>The screenshot shows the 'Main menu' of the instrument. At the top, it displays 'R8 ETH RADIO 31/01/17' and 'S/N 23170001 00:27'. Below this, there are 11 numbered buttons (1-11). The menu items listed are: Measures, Graphics, Setup (highlighted with a right-pointing arrow), Alarms state, Events, Statistics, and Reset. At the bottom, there is a blue bar with the word 'RUN' and a small icon.</p>
<p>Select “Communication”.</p>	 <p>The screenshot shows the 'Parameters setup' menu. It displays the same header information as the previous menu. The menu items listed are: Connections, Cosfi, P.F. Correction, Communication (highlighted with a right-pointing arrow), Alarms/Fan, System config., and Advanced setup. At the bottom, there is a blue bar with the word 'RUN' and a small icon.</p>
<p>Select “Ethernet”.</p>	 <p>The screenshot shows the 'Communication' menu. It displays the same header information. The menu items listed are: Protocol, Address, Baudrate, NFC information, USB, and Ethernet (highlighted with a right-pointing arrow). At the bottom, there is a blue bar with the word 'RUN' and a small icon.</p>
<p>In “Ethernet” menu is possible to select three parameters: “IP address”, “DHCP” and “Hostname”.</p>	 <p>The screenshot shows the 'Ethernet' menu. It displays the same header information. The menu items listed are: IP address (highlighted with a right-pointing arrow), DHCP, and Hostname. At the bottom, there is a blue bar with the word 'RUN' and a small icon.</p>

<p>It's possible to set the IP address of the device (only if DHCP is disabled).</p> <p>When DHCP is enabled, this page shows instead the IP address obtained from DHCP.</p>	
<p>It's possible to enable/disable the <i>DHCP</i> (Dynamic Host Configuration Protocol), selecting: "ENABLED" or "DISABLED"</p>	
<p>It's possible to set the host name of the device. Only the last 3 digits can be set within the range 001 ÷ 999; so the Host name will be REGO_ETH-xxx (where xxx = 001 ÷ 999).</p> <p>The host name is used to access the device by name rather than by IP address, useful especially when the address is obtained dynamically (DHCP enabled).</p>	

NOTES:

- The device doesn't accept an IP address like: 0.0.0.0
- Whenever the network cable is disconnected from the instrument, or when DHCP is enabled and it is not reachable or as long as it has not assigned an address, the IP address is automatically set to 255.255.25.255
- The host name is managed by the NetBios service. In networks where NetBios isn't available, it will be possible to access the device only using its IP address.

All previous configurations are also possible via the Ethernet interface, accessing the "NETWORK" menu of the Webserver.

2.1 DEFAULT SETTINGS

The default settings of the instrument are as follows:

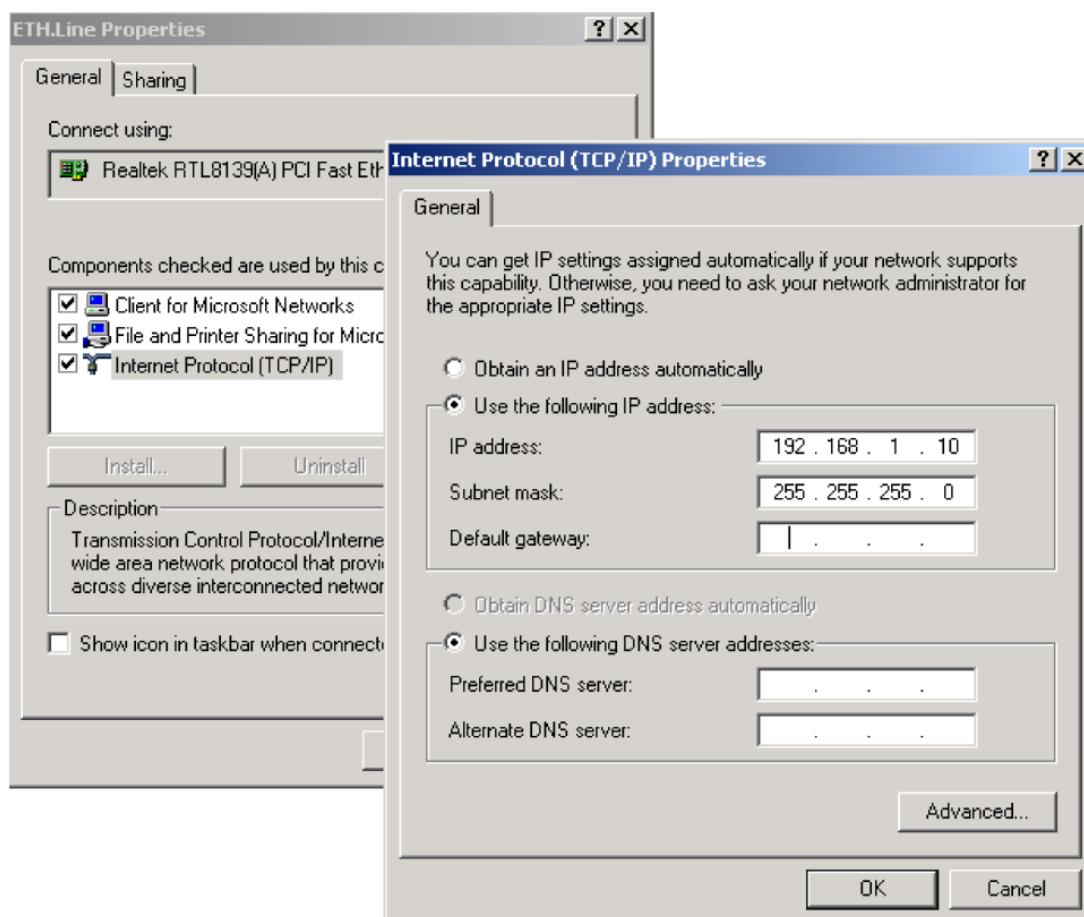
- DHCP = *Disabled*
- IP address = *192.168.1.239*
- Hostname = *REGO_ETH-001*

2.2 INSTRUMENT CONFIGURATION

To configure the instrument for the first time, you can alternatively proceed in one of the following ways:

1. Enable the DHCP from the setup menu of the instrument, connect the R8 to the Ethernet network and then, from a PC also connected to the network, access the device with any browser (Internet Explorer, Mozilla Firefox, etc.) typing http://REGO_ETH-001 (default *Host name*ⁱ). At this point is possible to change appropriately all the configuration parameters. Should the Host name be not available, read from the setup menu of the instrument the IP address assigned (page “*IP Address*” of the menu “*Ethernet*”) and use it to access.
2. First configure the PC with an IP = 192.168.1.xxx, with xxx other than 239, and with Subnet Mask = 255.255.255.0. To do this start from *Settings* → *Control Panel* → *Network Connections* → *Local Area Connection (LAN)* → *Properties* → *Internet Protocol (TCP / IP) (Properties)*, select “*Use the following IP address*” and set IP and Subnet mask with the previous mentioned parameters (see next picture for more details). Then press “*OK*” and confirm all the settings, then restart the PC to activate any changes made

ⁱ The access to the instrument through its Host name will be possible only if the NetBios service is enabled.



Picture 1 – PC network configuration

Afterwards, still leaving the DHCP of the instrument disabled, alternatively proceed as follows:

- Connect the PC directly to the R8 using a network cable
- Alternatively, connect the PC directly to the Ethernet network. This option is only possible if there aren't already present on the network other devices with IP address 192.168.1.239 and = 192.168.1.xxx (where xxx = address previously set on the PC)

After that, it will be possible to access the instrument via any browser (Internet Explorer, Mozilla Firefox, etc.) typing <http://192.168.1.239> or http://REGO_ETH-001ⁱ. At this point it's possible to change the various configuration parameters appropriately.

NOTE: if you have problems opening the Web page, check that the proxy server should be disabled.

3. WEBSERVER

The instrument has an internal Web server, making available to the user some pages of visualisation and configuration. In this way the Web server makes available a **virtual instrument** on the remote user's PC. Is possible to access the device via any browser (Internet Explorer, Mozilla Firefox, etc.) typing <http://instrument-IP-address> or <http://instrument-host-name>ⁱ.

After logging the device, the first page displayed will be the following (menu **PFC R8**):



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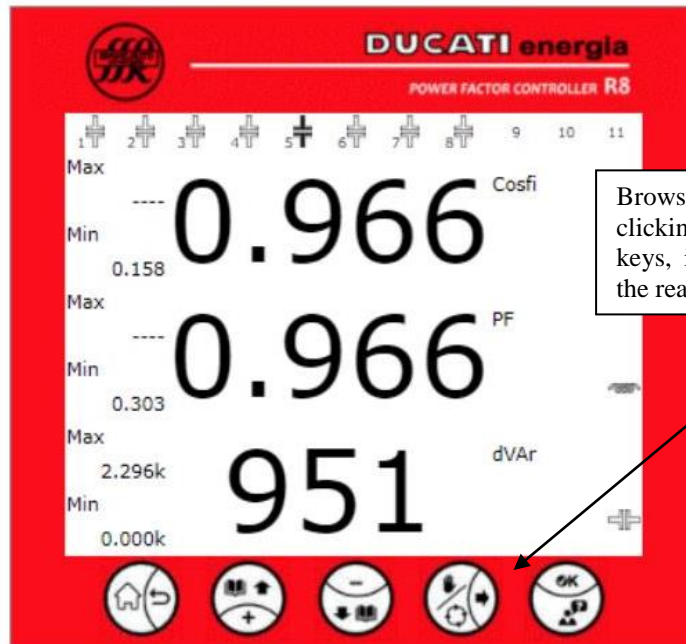
PFC R8

- PFC R8**
- MEASURES
- PARAMETERS
- ALARMS
- STATISTICS
- HARMONICS
- PASSWORD ACCESS
- MODBUS TCP
- LANGUAGE
- NETWORK
- HELP

PFC R8

Model R8 ETH RADIO - S/N 44160001 - RB FW ver. 0.65 - ETH-FW ver. 1.1 - RB Lang. ver. 3.33

Click on the buttons to navigate through the pages.

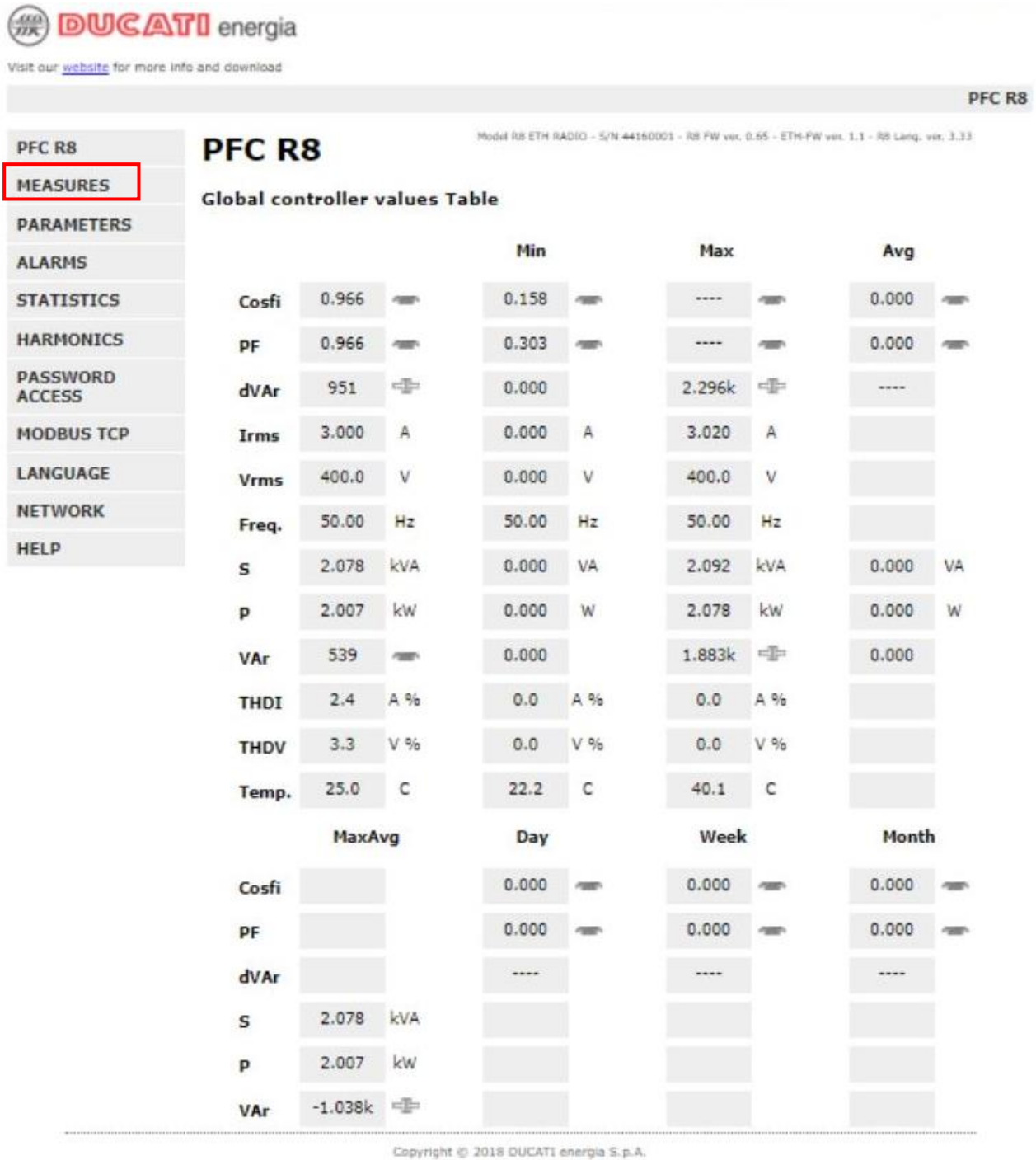


Browse the visualization pages by clicking on the virtual instrument keys, in the same way used as on the real instrument.

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Picture 2 – First visualisation page

Selecting the **MEASURES** menu located in the top left, allows to see some of the measured values shown in tabular format.



The screenshot shows the PFC R8 web interface. On the left is a navigation menu with 'MEASURES' highlighted in red. The main content area is titled 'PFC R8 Global controller values Table'. It features a table with columns for 'Min', 'Max', and 'Avg'. Below this, there are sections for 'MaxAvg', 'Day', 'Week', and 'Month' with corresponding data for various parameters like Cosfi, PF, dVAr, S, p, and VAr.

			Min	Max	Avg
Cosfi	0.966		0.158	----	0.000
PF	0.966		0.303	----	0.000
dVAr	951		0.000	2.296k	----
Irms	3.000	A	0.000	3.020	
Vrms	400.0	V	0.000	400.0	
Freq.	50.00	Hz	50.00	50.00	
S	2.078	kVA	0.000	2.092	0.000
p	2.007	kW	0.000	2.078	0.000
VAr	539		0.000	1.883k	0.000
THDI	2.4	A %	0.0	0.0	
THDV	3.3	V %	0.0	0.0	
Temp.	25.0	C	22.2	40.1	

	MaxAvg	Day	Week	Month
Cosfi		0.000	0.000	0.000
PF		0.000	0.000	0.000
dVAr		----	----	----
S	2.078 kVA			
p	2.007 kW			
VAr	-1.038k			

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Picture 3 – Global analyzer values summary table

Selecting the **PARAMETERS** menu located in the top left, allows to see some of the parameter values shown in tabular format.



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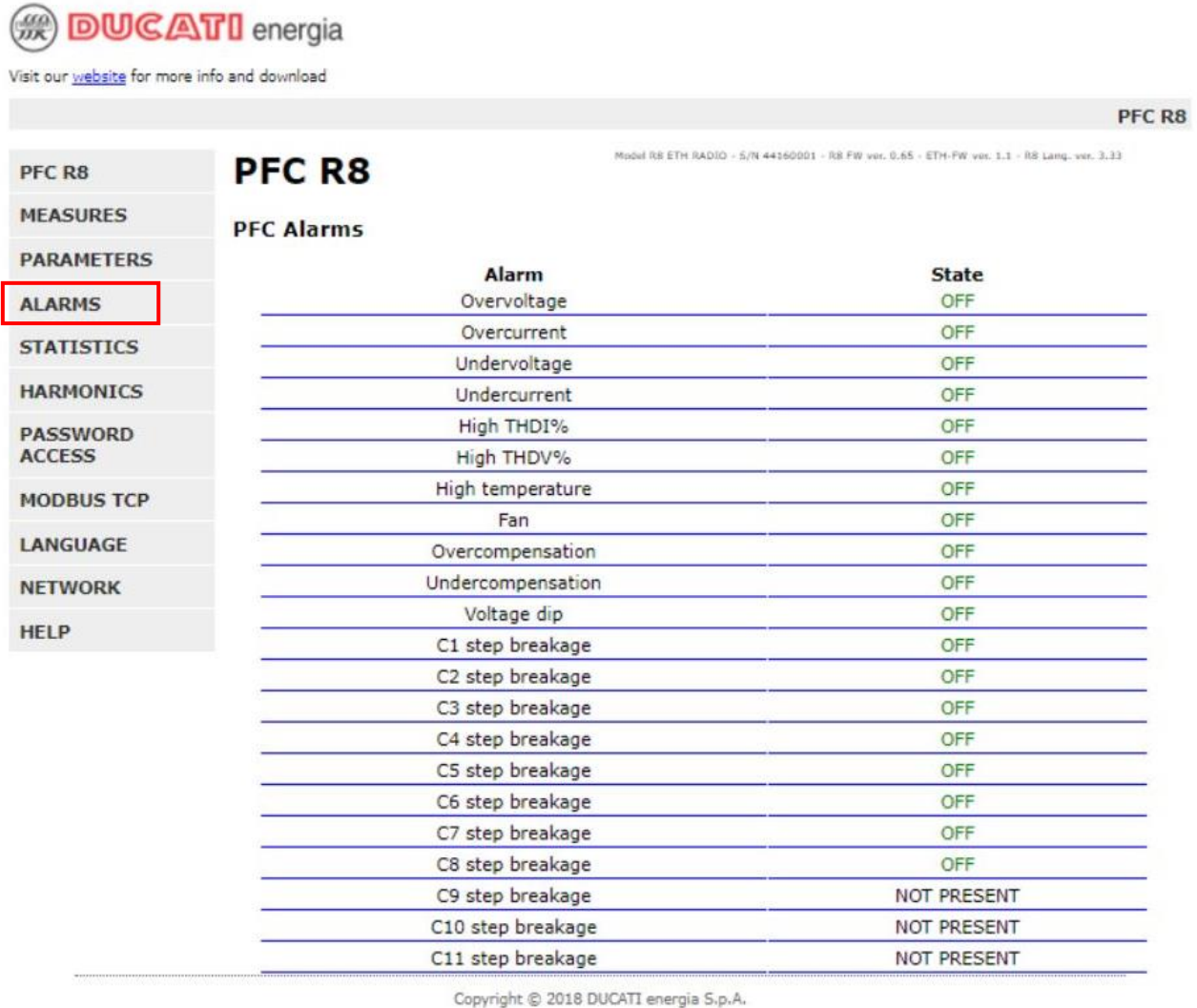
PFC R8

Model R8 ETH RAD10 - S/N 44160001 - R8 FW ver. 0.65 - ETH-FW ver. 1.1 - R8 Lang. ver. 3.33

PFC R8	PFC R8	
MEASURES	PFC Parameters	
PARAMETERS	Parameter	Value
ALARMS	Avg. integrat. time	15
STATISTICS	CT primary	5
HARMONICS	CT secondary	5
PASSWORD ACCESS	CT phase	0
MODBUS TCP	CT inversion	0
LANGUAGE	Cogeneration	1
NETWORK	Frequency	2
HELP	VT primary	400
	VT secondary	400
	Voltage phase	4
	Step voltage	400
	Manual mode	0
	Target cosfi	-950
	Cosfi Time band 2	980
	Cosfi Time band 3	980
	Cosfi TB4 / GEN	980
	Cosfi tolerance	30
	Discharge time	60
	Connection time	60
	Step C1 power	0
	Relay output 1	0
	Alarm output 1	0
	Step C2 power	0
	Relay output 2	0
	Alarm output 2	0
	Step C3 power	0

Picture 4 – Parameter summary table

Selecting the **ALARMS** menu located in the top left, allows to see the alarms status.



The screenshot shows the PFC R8 web interface. On the left is a navigation menu with 'ALARMS' highlighted in a red box. The main content area is titled 'PFC R8' and 'PFC Alarms'. It contains a table with two columns: 'Alarm' and 'State'. The table lists various alarms and their current status.

Alarm	State
Overvoltage	OFF
Overcurrent	OFF
Undervoltage	OFF
Undercurrent	OFF
High THDI%	OFF
High THDV%	OFF
High temperature	OFF
Fan	OFF
Overcompensation	OFF
Undercompensation	OFF
Voltage dip	OFF
C1 step breakage	OFF
C2 step breakage	OFF
C3 step breakage	OFF
C4 step breakage	OFF
C5 step breakage	OFF
C6 step breakage	OFF
C7 step breakage	OFF
C8 step breakage	OFF
C9 step breakage	NOT PRESENT
C10 step breakage	NOT PRESENT
C11 step breakage	NOT PRESENT

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Picture 5 – Alarms summary table

Selecting the **STATISTICS** menu located in the top left, allows to see some of the statistic values shown in tabular format.



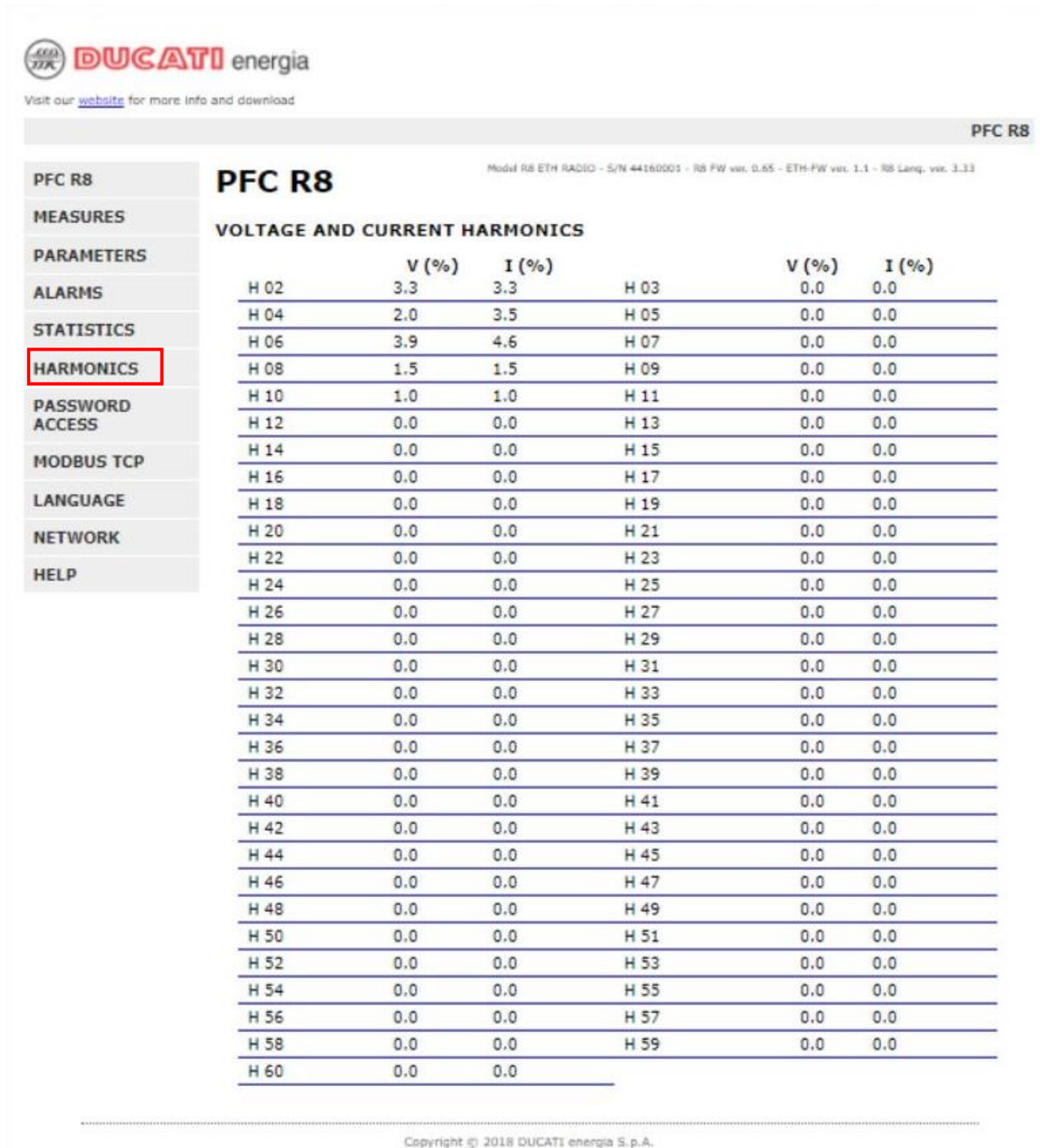
The screenshot shows the PFC R8 web interface. On the left is a navigation menu with the following items: PFC R8, MEASURES, PARAMETERS, ALARMS, **STATISTICS** (highlighted with a red box), HARMONICS, PASSWORD ACCESS, MODBUS TCP, LANGUAGE, NETWORK, and HELP. The main content area displays the title "PFC R8" and "PFC Statistics". Below this is a table with the following data:

	Working time	Contactors operation	Step status	Real power	Insertions
C1	0h 00m	4 op.	OFF	0.1 kVAr	2 ins.
C2	0h 00m	4 op.	OFF	0.1 kVAr	2 ins.
C3	0h 00m	4 op.	OFF	0.1 kVAr	2 ins.
C4	0h 00m	4 op.	OFF	0.1 kVAr	2 ins.
C5	0h 00m	4 op.	OFF	0.2 kVAr	2 ins.
C6	0h 00m	4 op.	OFF	0.2 kVAr	2 ins.
C7	0h 00m	4 op.	OFF	0.2 kVAr	2 ins.
C8	0h 00m	4 op.	OFF	0.4 kVAr	2 ins.

At the bottom of the interface, it says "Copyright © 2018 DUCATI energia S.p.A."

Picture 6 – Statistics summary table

Selecting the **HARMONICS** menu located in the top left, allows to see the voltage and the current harmonic values shown in tabular format.



The screenshot shows the PFC R8 web interface. On the left is a navigation menu with the 'HARMONICS' option highlighted in red. The main content area displays the 'PFC R8' title and a table titled 'VOLTAGE AND CURRENT HARMONICS'. The table lists harmonics from H 02 to H 60, with columns for V (%) and I (%). The data shows H 02 with 3.3% V and 3.3% I, H 04 with 2.0% V and 3.5% I, H 06 with 3.9% V and 4.6% I, and H 08 with 1.5% V and 1.5% I. All other harmonics (H 03, H 05, H 07, H 09, H 10, H 11, H 12, H 13, H 14, H 15, H 16, H 17, H 18, H 19, H 20, H 21, H 22, H 23, H 24, H 25, H 26, H 27, H 28, H 29, H 30, H 31, H 32, H 33, H 34, H 35, H 36, H 37, H 38, H 39, H 40, H 41, H 42, H 43, H 44, H 45, H 46, H 47, H 48, H 49, H 50, H 51, H 52, H 53, H 54, H 55, H 56, H 57, H 58, H 59, H 60) show 0.0% for both V and I.

	V (%)	I (%)		V (%)	I (%)
H 02	3.3	3.3	H 03	0.0	0.0
H 04	2.0	3.5	H 05	0.0	0.0
H 06	3.9	4.6	H 07	0.0	0.0
H 08	1.5	1.5	H 09	0.0	0.0
H 10	1.0	1.0	H 11	0.0	0.0
H 12	0.0	0.0	H 13	0.0	0.0
H 14	0.0	0.0	H 15	0.0	0.0
H 16	0.0	0.0	H 17	0.0	0.0
H 18	0.0	0.0	H 19	0.0	0.0
H 20	0.0	0.0	H 21	0.0	0.0
H 22	0.0	0.0	H 23	0.0	0.0
H 24	0.0	0.0	H 25	0.0	0.0
H 26	0.0	0.0	H 27	0.0	0.0
H 28	0.0	0.0	H 29	0.0	0.0
H 30	0.0	0.0	H 31	0.0	0.0
H 32	0.0	0.0	H 33	0.0	0.0
H 34	0.0	0.0	H 35	0.0	0.0
H 36	0.0	0.0	H 37	0.0	0.0
H 38	0.0	0.0	H 39	0.0	0.0
H 40	0.0	0.0	H 41	0.0	0.0
H 42	0.0	0.0	H 43	0.0	0.0
H 44	0.0	0.0	H 45	0.0	0.0
H 46	0.0	0.0	H 47	0.0	0.0
H 48	0.0	0.0	H 49	0.0	0.0
H 50	0.0	0.0	H 51	0.0	0.0
H 52	0.0	0.0	H 53	0.0	0.0
H 54	0.0	0.0	H 55	0.0	0.0
H 56	0.0	0.0	H 57	0.0	0.0
H 58	0.0	0.0	H 59	0.0	0.0
H 60	0.0	0.0			

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Picture 7 – Harmonics summary table

Selecting the **PASSWORD ACCESS** menu allows to enter the edit page of *Username* and *Password*. This page is access protected, the default values are the following:

- Username: **admin** (default)
- Password: **admin** (default)

Once valid access data have been inserted, these will remain valid for the overall browser session. From now on it will be possible to modify *Password* and *Username* and access other configuration menus.



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PFC R8

PFC R8	<h2>Username and Password setting</h2> <p>This page allows to set/change the password for administration protect access.</p> <div style="border: 1px solid red; background-color: #ffe6e6; padding: 5px;"> <p>WARNING: if username and/or password are lost, you will not be allowed to access the configuration setup pages.</p> </div> <p>Insert new Username and Password</p> <div style="border: 1px solid gray; padding: 10px;"> <p>User Name: <input type="text" value="admin"/></p> <p>Password <input type="password"/></p> <p>Confirm Password <input type="password"/></p> <p style="text-align: right;"><input type="button" value="Save Configuration"/></p> </div>
MEASURES	
PARAMETERS	
ALARMS	
STATISTICS	
HARMONICS	
PASSWORD ACCESS	
MODBUS TCP	
LANGUAGE	
NETWORK	
HELP	

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Picture 8 – Username and Password setting

If case the **Password is forgotten**, it is possible to reset the password to the default value: for this, please refer to chapter 3.1.

Selecting the **MODBUS TCP** menu (menu protected by password, authentication required) allows to enable the protocol on the device and configure the TCP port address (default = 502).



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PFC R8

- PFC R8
- MEASURES
- PARAMETERS
- ALARMS
- STATISTICS
- HARMONICS
- PASSWORD ACCESS
- MODBUS TCP**
- LANGUAGE
- NETWORK
- HELP

Modbus TCP Configuration

Configuration page of the MODBUS TCP server

Enable Modbus TCP

TCP Port:

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Picture 9 – Modbus TCP configuration

Selecting the **LANGUAGE** menu (menu protected by password, authentication required) allows to change the web user interface language (default English) by loading the appropriate language files with the extension “.bin”. The Language files (Italian and English) are available on the **DUCATI** energia web site, at the link below: download the file of interest on your PC and then select it from the page indicated in the picture below.



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PFC R8

- PFC R8
- MEASURES
- PARAMETERS
- ALARMS
- STATISTICS
- HARMONICS
- PASSWORD ACCESS
- MODBUS TCP
- LANGUAGE**
- NETWORK
- HELP

Language selection for WEB Interface

Select the language file (*.bin) and press Load button

Nessun file selezionato

The Language files (*.bin) are available for download on DUCATI energia web site at the following link:

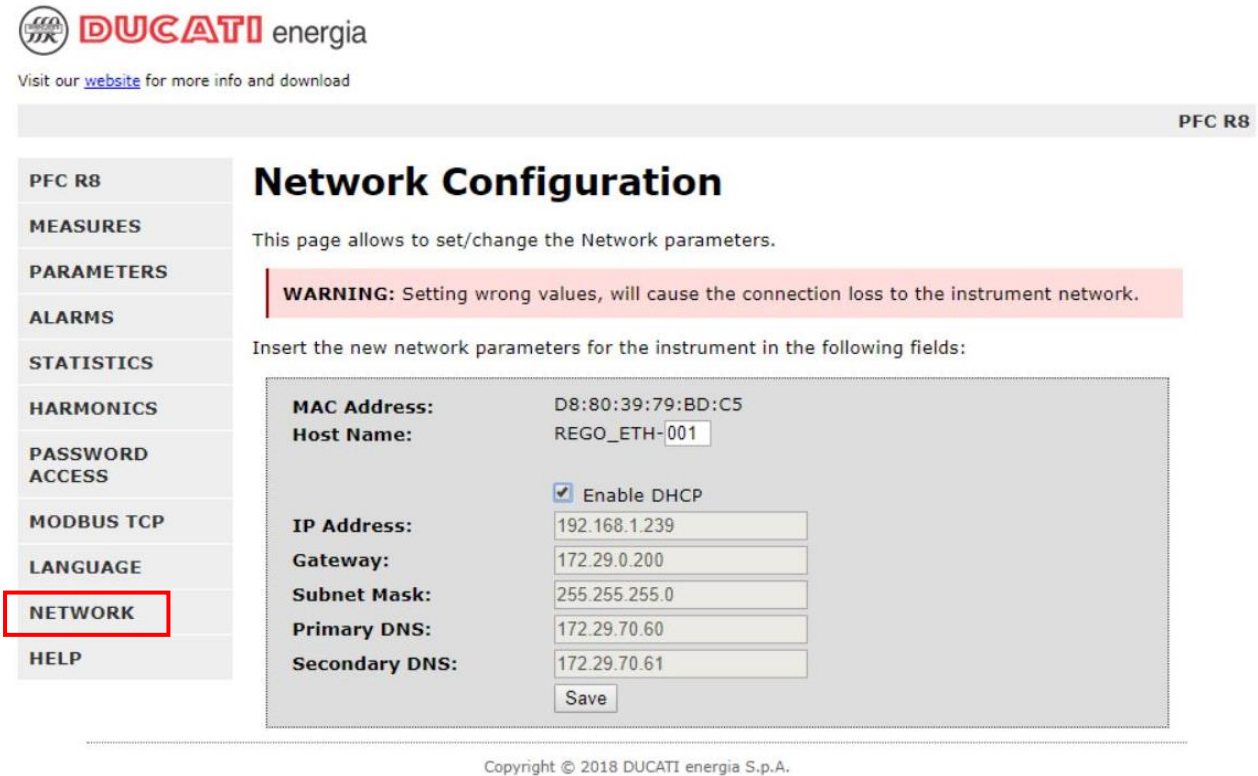
[R8 ETH WebServer Language](#)

Link for the download of the language files.

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Picture 10 – Webserver language selection

Selecting the **NETWORK** menu (menu protected by password, authentication required) allows to select or modify the instrument network interface parameters: *Host name, IP address, etc.*



Picture 11 – Network configuration with enabled DHCP

NOTE: the *Host name* is used to access the device by name rather than by IP address, useful especially when the IP address is obtained dynamically (DHCP enabled). The *Host name* is handled by the NetBios service; in networks where this service isn't present, it will be possible to access the device only using its IP address.

Disabling the DHCP, the configuration parameters must be insert manually.



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PFC R8

- PFC R8
- MEASURES
- PARAMETERS
- ALARMS
- STATISTICS
- HARMONICS
- PASSWORD ACCESS
- MODBUS TCP
- LANGUAGE
- NETWORK**
- HELP

Network Configuration

This page allows to set/change the Network parameters.

WARNING: Setting wrong values, will cause the connection loss to the instrument network.

Insert the new network parameters for the instrument in the following fields:

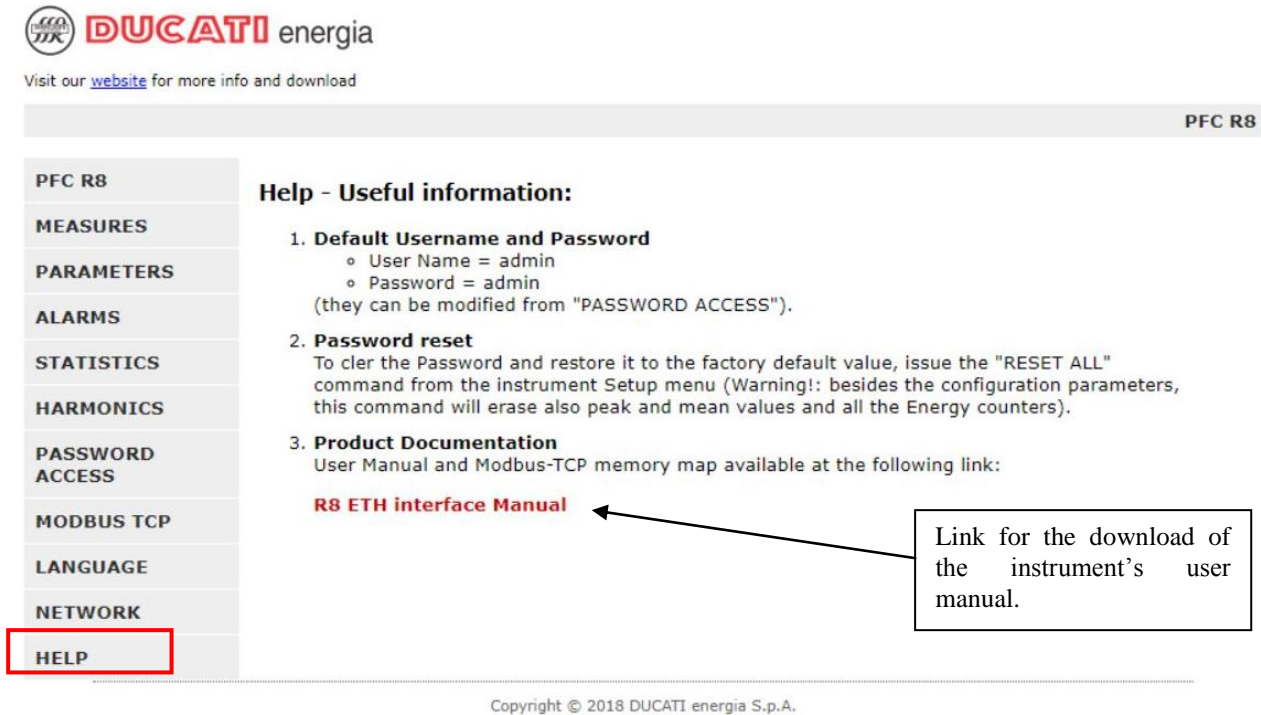
MAC Address:	D8:80:39:79:BD:C5
Host Name:	REGO_ETH-001
	<input type="checkbox"/> Enable DHCP
IP Address:	192.168.1.239
Gateway:	192.168.1.1
Subnet Mask:	255.255.255.0
Primary DNS:	0.0.0.0
Secondary DNS:	0.0.0.0
	<input type="button" value="Save"/>

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Picture 12 – Network configuration with disabled DHCP

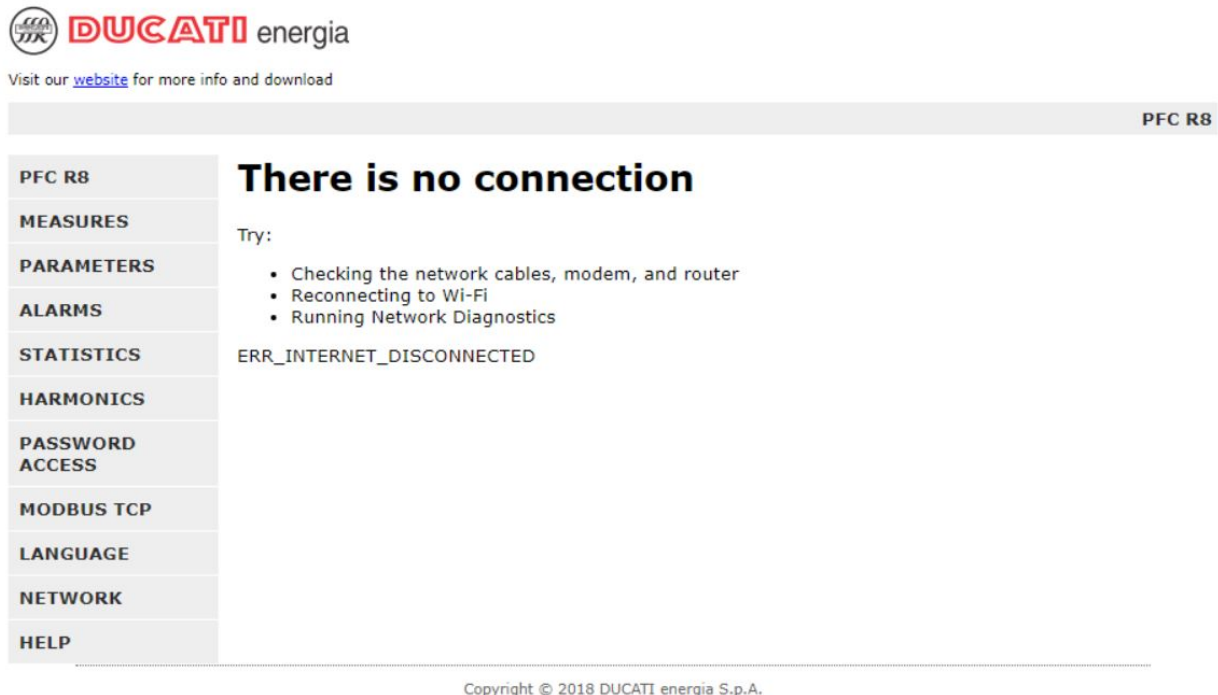
NOTE: the parameters *Primary DNS* and *Secondary DNS* are not used.

Selecting the **HELP** menu allows to access to a short online Help of the instrument, in which is also available the link to download this manual and other documents.



Picture 13 – Online Help

NOTE: during the access to the device and the visualization of the different menu pages, should communication's errors occur, it will displayed a screen as shown below (with no measured values).



Picture 14 – Communication error

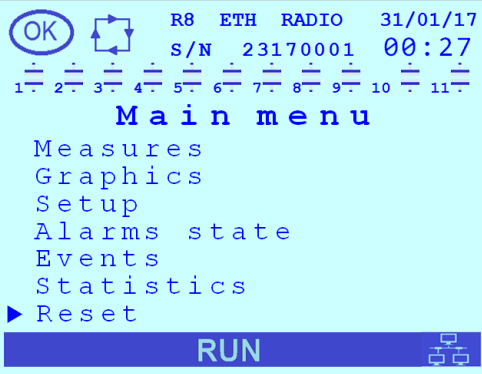
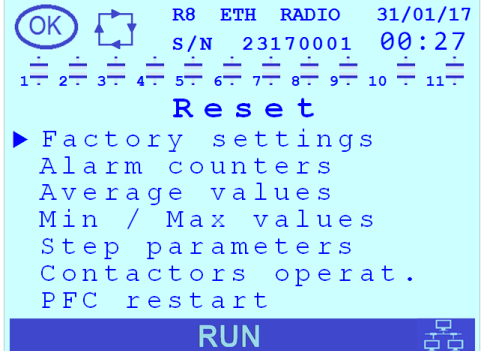
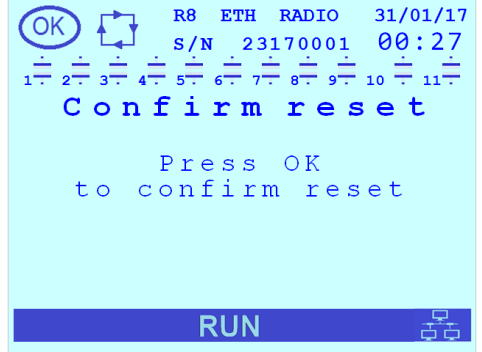
3.1 RESETTING PASSWORD

The default values for accessing the protected Webserver pages, are the following:

- Username = *admin*
- Password = *admin*

In case your password and username are forgotten, to reset them to the default values, is necessary to use a command to “Factory settings ” in the setup menu of the instrument (please take care, as well as all the configuration parameters of the instrument, the command also resets the peak values, mean values and all statistics).

To reset, enter the setup menu of the instrument

<p>From menu “Reset” →</p>	 <p>The screenshot shows the 'Main menu' with the following options: Measures, Graphics, Setup, Alarms state, Events, Statistics, and Reset (highlighted with a blue arrow). At the top, it displays 'R8 ETH RADIO 31/01/17' and 'S/N 23170001 00:27'. A 'RUN' button is visible at the bottom.</p>
<p>Select “Factory settings”.</p>	 <p>The screenshot shows the 'Reset' menu with the following options: Factory settings (highlighted with a blue arrow), Alarm counters, Average values, Min / Max values, Step parameters, Contactors operat., and PFC restart. At the top, it displays 'R8 ETH RADIO 31/01/17' and 'S/N 23170001 00:27'. A 'RUN' button is visible at the bottom.</p>
<p>Then confirm.</p>	 <p>The screenshot shows the 'Confirm reset' screen with the text: 'Press OK to confirm reset'. At the top, it displays 'R8 ETH RADIO 31/01/17' and 'S/N 23170001 00:27'. A 'RUN' button is visible at the bottom.</p>

4. MODBUS-TCP

4.1 READ HOLDING REGISTERS FUNCTION (03h)

The following table describes the **measurements** that the user can **read** from the instrument using the function READ HOLDING REGISTERS – function 3 (03h); this function reads in WORDs, so “Signed/Unsigned Long are 2 consecutive WORDs.

Indirizzo MODBUS-TCP	Grandezza	Unità di misura	Tipo
1000h	Three-phase Equivalent Voltage	Volt	Unsigned Long
1002h ... 100Ch	Not used	-	-
100Eh	Three-phase Equivalent Current	mA	Unsigned Long
1010h ... 1014h	Not used	-	-
1016h	Three-phase equivalent power factor (*2)	Millesimi	Signed Long
1018h	Not used	-	-
101Eh	Three-phase equivalent cosfi (*2)	Millesimi	Signed Long
1020h ... 1024h	Not used	-	-
1026h	Three-phase equivalent apparent power	VA	Unsigned Long
1028h ... 102Ch	Not used	-	-
102Eh	Three-phase equivalent active power	W	Signed Long
1030h ... 1034h	Not used	-	-
1036h	Three-phase equivalent reactive power	VAr	Signed Long
1038h ... 1042h	Not used	-	-
1046h	Frequency	mHz	Unsigned Long
1048h ... 1064h	Not used	-	-
1066h	Maximum three-phase equivalent active power	W	Signed Long
1068h	Maximum three-phase equivalent apparent power	VA	Unsigned Long
106Ah ... 106Eh	Not used	-	-

1070h	Average three-phase equivalent active power	W	Signed Long
1072h	Average three-phase equivalent apparent power	VA	Unsigned Long
1074h ... 107Eh	Not used	-	-
1080h	Max. average three-phase active power	W	Signed Long
1082h	Three-phase equivalent Total Harmonic Distortion voltage (THDV) (*3)	thousandths	Unsigned Long
1084h ... 1086h	Not used	-	-
1088h	Three-phase equivalent Total Harmonic Distortion current (THDI) (*3)	thousandths	Unsigned Long
108Ah ... 1092h	Not used	-	-
1094h	Max. average three-phase Apparent Power	VA	Unsigned Long
1096h ... 1212h	Not used	-	-
1214h	Average three-phase equivalent reactive power	VAr	Signed Long
1216h ... 1236h	Not used	-	-
1238h	Maximum Three-phase Equivalent Current	mA	Unsigned Long
123Ah	Minimum Three-phase Equivalent Current	mA	Unsigned Long
123Ch ... 1240h	Not used	-	-
1242h	Maximum Three-phase Equivalent Voltage	V	Unsigned Long
1244h ... 1248h	Not used	-	-
124Ah	Minimum Three-phase Equivalent Voltage	V	Unsigned Long
124Ch ... 1256h	Not used	-	-
1258h	Average Three-phase Equivalent Current	mA	Unsigned Long
125Ah ...1266h	Not used	-	-
1268h	Maximum Three-phase Equivalent Apparent Power	VA	Unsigned Long
126Ah	Minimum Three-phase Equivalent Apparent Power	VA	Unsigned Long
126Ch ... 1270h	Not used	-	-
1272h	Minimum Three-phase Equivalent Active Power	W	Signed Long
1274h ... 1278h	Not used	-	-
127Ah	Maximum Three-phase Equivalent Reactive Power	VAr	Signed Long
127Ch ... 1280h	Not used	-	-

1282h	Minimum Three-phase Equivalent Reactive Power	VAr	Signed Long
1284h ... 1288h	Not used	-	-
128Ah	Maximum Three-phase Equivalent Average Reactive Power	VAr	Signed Long
128Ch ... 1290h	Not used	-	-
1292h	Maximum Three-phase Equivalent Power Factor (*2)	thousandths	Signed Long
1294h ... 1298h	Not used	-	-
129Ah	Minimum Three-phase Equivalent Power Factor (*2)	thousandths	Signed Long
129Ch ... 12A0h	Not used	-	-
12A2h	Average Three-phase Equivalent Power Factor (*2)	thousandths	Signed Long
12A4h ... 12A8h	Not used	-	-
12AAh	Daily Average Three-phase Equivalent Power Factor (*2)	thousandths	Signed Long
12ACh	Weekly Average Three-phase Equivalent Power Factor (*2)	thousandths	Signed Long
12AEh	Monthly Average Three-phase Equivalent Power Factor (*2)	thousandths	Signed Long
12B0h	Maximum Three-phase Equivalent Cosfi (*2)	thousandths	Signed Long
12B2h ... 12B6h	Not used	-	-
12B8h	Minimum Three-phase Equivalent Cosfi (*2)	thousandths	Signed Long
12BAh... 12BEh	Not used	-	-
12C0h	Average Three-phase Equivalent Cosfi (*2)	thousandths	Signed Long
12C2h ... 12C6h	Not used	-	-
12C8h	Daily Average Three-phase Equivalent Cosfi (*2)	thousandths	Signed Long
12CAh	Weekly Average Three-phase Equivalent Cosfi (*2)	thousandths	Signed Long
12CCCh	Monthly Average Three-phase Equivalent Cosfi (*2)	thousandths	Signed Long
12CEh	Maximum Frequency	mHz	Unsigned Long
12D0h	Minimum Frequency	mHz	Unsigned Long
12D2h	Temperature	Decimi di °C	Signed Long
12D4h	Maximum Temperature	Decimi di °C	Signed Long
12D6h	Minimum Temperature	Decimi di °C	Signed Long
12D8h	Delta-kVAr	VAr	Signed Long
12DAh	Maximum Three-phase equivalent Total Harmonic Distortion current (THDI) (*3)	%	Unsigned Long

12DCh	Maximum Three-phase equivalent Total Harmonic Distortion voltage (THDV) (*3)	%	Unsigned Long
12DEh	Minimum Three-phase equivalent Total Harmonic Distortion current (THDI) (*3)	%	Unsigned Long
12E0h	Minimum Three-phase equivalent Total Harmonic Distortion voltage (THDV) (*3)	%	Unsigned Long
12E2h	Maximum Delta-kVAr	VAr	Signed Long
12E4h	Minimum Delta-kVAr	VAr	Signed Long
12E6h	Average Delta-kVAr	VAr	Signed Long
12E8h	Maximum Average Delta-kVAr	VAr	Signed Long
12EAh	Daily Average Delta-kVAr	VAr	Signed Long
12ECh	Weekly Average Delta-kVAr	VAr	Signed Long
12EEh	Monthly Average Delta-kVAr	VAr	Signed Long
12F0h ... 1FFEh	Not used	-	-
2000h	Number of insertion C1	Unit	Unsigned Long
2002h	Number of insertion C2	Unit	Unsigned Long
2004h	Number of insertion C3	Unit	Unsigned Long
2006h	Number of insertion C4	Unit	Unsigned Long
2008h	Number of insertion C5	Unit	Unsigned Long
200Ah	Number of insertion C6	Unit	Unsigned Long
200Ch	Number of insertion C7	Unit	Unsigned Long
200Eh	Number of insertion C8 (*1)	Unit	Unsigned Long
2010h	Number of insertion C9 (*1)	Unit	Unsigned Long
2012h	Number of insertion C10 (*1)	Unit	Unsigned Long
2014h	Number of insertion C11	Unit	Unsigned Long
2016h ... 203Eh	Not used	-	-
2040h	Contact operation C1	Unit	Unsigned Long
2042h	Contact operation C2	Unit	Unsigned Long
2044h	Contact operation C3	Unit	Unsigned Long
2046h	Contact operation C4	Unit	Unsigned Long
2048h	Contact operation C5	Unit	Unsigned Long
204Ah	Contact operation C6	Unit	Unsigned Long
204Ch	Contact operation C7	Unit	Unsigned Long
204Eh	Contact operation C8 (*1)	Unit	Unsigned Long
2050h	Contact operation C9 (*1)	Unit	Unsigned Long
2052h	Contact operation C10 (*1)	Unit	Unsigned Long
2054h	Contact operation C11	Unit	Unsigned Long

2056h ... 207Eh	Not used	-	-
2080h	Real power step C1	VAr	Unsigned Long
2082h	Real power step C2	VAr	Unsigned Long
2084h	Real power step C3	VAr	Unsigned Long
2086h	Real power step C4	VAr	Unsigned Long
2088h	Real power step C5	VAr	Unsigned Long
208Ah	Real power step C6	VAr	Unsigned Long
208Ch	Real power step C7	VAr	Unsigned Long
208Eh	Real power step C8 (*1)	VAr	Unsigned Long
2090h	Real power step C9 (*1)	VAr	Unsigned Long
2092h	Real power step C10 (*1)	VAr	Unsigned Long
2094h	Real power step C11	VAr	Unsigned Long
2096h ... 20BEh	Not used	-	-
20C0h	Working time C1	Unit	Unsigned Long
20C2h	Working time C2	Unit	Unsigned Long
20C4h	Working time C3	Unit	Unsigned Long
20C6h	Working time C4	Unit	Unsigned Long
20C8h	Working time C5	Unit	Unsigned Long
20CAh	Working time C6	Unit	Unsigned Long
20CCh	Working time C7	Unit	Unsigned Long
20CEh	Working time C8 (*1)	Unit	Unsigned Long
20D0h	Working time C9 (*1)	Unit	Unsigned Long
20D2h	Working time C10 (*1)	Unit	Unsigned Long
20D4h	Working time C11	Unit	Unsigned Long
20D6h ... 20FEh	Not used	-	-
2100h	High voltage alarm number	Unit	Unsigned Long
2102h	High current alarm number	Unit	Unsigned Long
2104h	Low voltage alarm number	Unit	Unsigned Long
2106h	Low current alarm number	Unit	Unsigned Long
2108h	THDI% alarm number	Unit	Unsigned Long
210Ah	THDV% alarm number	Unit	Unsigned Long
210Ch	Temperature alarm number	Unit	Unsigned Long
210Eh	High cosfi alarm number	Unit	Unsigned Long
2110h	Low cosfi alarm number	Unit	Unsigned Long
2112h	Voltage dip alarm number	Unit	Unsigned Long

2114h	Fan dip alarm number	Unit	Unsigned Long
2112h ... 2FFEh	Not used	-	-
3000h	Alarm Status (*5)	-	Unsigned Long
3002h	Battery Breakage Status (*6)	-	Unsigned Long
3004h	Maximum Battery Insertion Status (*7)	-	Unsigned Long
3006h	Battery Status (*8)	-	Unsigned Long
3008h	Relay status (*9)	-	Unsigned Long
300Ah	Instrument ID	-	Unsigned Long
300Ch	Serial number (*10)	-	Unsigned Long
300Eh	FW version (*11)	-	Unsigned Long
3010h	BL version (*11)	-	Unsigned Long
3012h	Language version (*11)	-	Unsigned Long
3014h ... 4002h	Not used	-	-
4004h	Harmonic module H2 current	%o	Unsigned Long
4006h	Harmonic module H3 current	%o	Unsigned Long
4008h	Harmonic module H4 current	%o	Unsigned Long
400Ah	Harmonic module H5 current	%o	Unsigned Long
400Ch	Harmonic module H6 current	%o	Unsigned Long
400Eh	Harmonic module H7 current	%o	Unsigned Long
4010h	Harmonic module H8 current	%o	Unsigned Long
4012h	Harmonic module H9 current	%o	Unsigned Long
4014h	Harmonic module H10 current	%o	Unsigned Long
4016h	Harmonic module H11 current	%o	Unsigned Long
4018h	Harmonic module H12 current	%o	Unsigned Long
401Ah	Harmonic module H13 current	%o	Unsigned Long
401Ch	Harmonic module H14 current	%o	Unsigned Long
401Eh	Harmonic module H15 current	%o	Unsigned Long
4020h	Harmonic module H16 current	%o	Unsigned Long
4022h	Harmonic module H17 current	%o	Unsigned Long
4024h	Harmonic module H18 current	%o	Unsigned Long
4026h	Harmonic module H19 current	%o	Unsigned Long
4028h	Harmonic module H20 current	%o	Unsigned Long
402Ah	Harmonic module H21 current	%o	Unsigned Long
402Ch	Harmonic module H22 current	%o	Unsigned Long
402Eh	Harmonic module H23 current	%o	Unsigned Long
4030h	Harmonic module H24 current	%o	Unsigned Long

4032h	Harmonic module H25 current	%	Unsigned Long
4034h	Harmonic module H26 current	%	Unsigned Long
4036h	Harmonic module H27 current	%	Unsigned Long
4038h	Harmonic module H28 current	%	Unsigned Long
403Ah	Harmonic module H29 current	%	Unsigned Long
403Ch	Harmonic module H30 current	%	Unsigned Long
403Eh	Harmonic module H31 current	%	Unsigned Long
4040h	Harmonic module H32 current	%	Unsigned Long
4042h	Harmonic module H33 current	%	Unsigned Long
4044h	Harmonic module H34 current	%	Unsigned Long
4046h	Harmonic module H35 current	%	Unsigned Long
4048h	Harmonic module H36 current	%	Unsigned Long
404Ah	Harmonic module H37 current	%	Unsigned Long
404Ch	Harmonic module H38 current	%	Unsigned Long
404Eh	Harmonic module H39 current	%	Unsigned Long
4050h	Harmonic module H40 current	%	Unsigned Long
4052h	Harmonic module H41 current	%	Unsigned Long
4054h	Harmonic module H42 current	%	Unsigned Long
4056h	Harmonic module H43 current	%	Unsigned Long
4058h	Harmonic module H44 current	%	Unsigned Long
405Ah	Harmonic module H45 current	%	Unsigned Long
405Ch	Harmonic module H46 current	%	Unsigned Long
405Eh	Harmonic module H47 current	%	Unsigned Long
4060h	Harmonic module H48 current	%	Unsigned Long
4062h	Harmonic module H49 current	%	Unsigned Long
4064h	Harmonic module H50 current	%	Unsigned Long
4066h	Harmonic module H51 current	%	Unsigned Long
4068h	Harmonic module H52 current	%	Unsigned Long
406Ah	Harmonic module H53 current	%	Unsigned Long
406Ch	Harmonic module H54 current	%	Unsigned Long
406Eh	Harmonic module H55 current	%	Unsigned Long
4070h	Harmonic module H56 current	%	Unsigned Long
4072h	Harmonic module H57 current	%	Unsigned Long
4074h	Harmonic module H58 current	%	Unsigned Long
4076h	Harmonic module H59 current	%	Unsigned Long
4078h	Harmonic module H60 current	%	Unsigned Long
407Ah ... 4102h	Not used	-	-

4104h	Harmonic module H2 voltage	%	Unsigned Long
4106h	Harmonic module H3 voltage	%	Unsigned Long
4108h	Harmonic module H4 voltage	%	Unsigned Long
410Ah	Harmonic module H5 voltage	%	Unsigned Long
410Ch	Harmonic module H6 voltage	%	Unsigned Long
410Eh	Harmonic module H7 voltage	%	Unsigned Long
4110h	Harmonic module H8 voltage	%	Unsigned Long
4112h	Harmonic module H9 voltage	%	Unsigned Long
4114h	Harmonic module H10 voltage	%	Unsigned Long
4116h	Harmonic module H11 voltage	%	Unsigned Long
4118h	Harmonic module H12 voltage	%	Unsigned Long
411Ah	Harmonic module H13 voltage	%	Unsigned Long
411Ch	Harmonic module H14 voltage	%	Unsigned Long
411Eh	Harmonic module H15 voltage	%	Unsigned Long
4120h	Harmonic module H16 voltage	%	Unsigned Long
4122h	Harmonic module H17 voltage	%	Unsigned Long
4124h	Harmonic module H18 voltage	%	Unsigned Long
4126h	Harmonic module H19 voltage	%	Unsigned Long
4128h	Harmonic module H20 voltage	%	Unsigned Long
412Ah	Harmonic module H21 voltage	%	Unsigned Long
412Ch	Harmonic module H22 voltage	%	Unsigned Long
412Eh	Harmonic module H23 voltage	%	Unsigned Long
4130h	Harmonic module H24 voltage	%	Unsigned Long
4132h	Harmonic module H25 voltage	%	Unsigned Long
4134h	Harmonic module H26 voltage	%	Unsigned Long
4136h	Harmonic module H27 voltage	%	Unsigned Long
4138h	Harmonic module H28 voltage	%	Unsigned Long
413Ah	Harmonic module H29 voltage	%	Unsigned Long
413Ch	Harmonic module H30 voltage	%	Unsigned Long
413Eh	Harmonic module H31 voltage	%	Unsigned Long
4140h	Harmonic module H32 voltage	%	Unsigned Long
4142h	Harmonic module H33 voltage	%	Unsigned Long
4144h	Harmonic module H34 voltage	%	Unsigned Long
4146h	Harmonic module H35 voltage	%	Unsigned Long
4148h	Harmonic module H36 voltage	%	Unsigned Long
414Ah	Harmonic module H37 voltage	%	Unsigned Long
414Ch	Harmonic module H38 voltage	%	Unsigned Long

414Eh	Harmonic module H39 voltage	%o	Unsigned Long
4150h	Harmonic module H40 voltage	%o	Unsigned Long
4152h	Harmonic module H41 voltage	%o	Unsigned Long
4154h	Harmonic module H42 voltage	%o	Unsigned Long
4156h	Harmonic module H43 voltage	%o	Unsigned Long
4158h	Harmonic module H44 voltage	%o	Unsigned Long
415Ah	Harmonic module H45 voltage	%o	Unsigned Long
415Ch	Harmonic module H46 voltage	%o	Unsigned Long
415Eh	Harmonic module H47 voltage	%o	Unsigned Long
4160h	Harmonic module H48 voltage	%o	Unsigned Long
4162h	Harmonic module H49 voltage	%o	Unsigned Long
4164h	Harmonic module H50 voltage	%o	Unsigned Long
4166h	Harmonic module H51 voltage	%o	Unsigned Long
4168h	Harmonic module H52 voltage	%o	Unsigned Long
416Ah	Harmonic module H53 voltage	%o	Unsigned Long
416Ch	Harmonic module H54 voltage	%o	Unsigned Long
416Eh	Harmonic module H55 voltage	%o	Unsigned Long
4170h	Harmonic module H56 voltage	%o	Unsigned Long
4172h	Harmonic module H57 voltage	%o	Unsigned Long
4174h	Harmonic module H58 voltage	%o	Unsigned Long
4176h	Harmonic module H59 voltage	%o	Unsigned Long
4178h	Harmonic module H59 voltage	%o	Unsigned Long
417Ah ... 5000h	Not used	-	-
5002h	Time of Average	min	Unsigned Long
5004h	CT primary	A	Unsigned Long
5006h	CT secondary	A	Unsigned Long
5008h	CT phase insertion	Unit	Unsigned Long
500Ah	Enable CT inversion	Unit	Unsigned Long
500Ch	Enable cogeneration	Unit	Unsigned Long
500Eh	Frequency mode	Unit	Unsigned Long
5010h	VT primary	V	Unsigned Long
5012h	VT secondary	V	Unsigned Long
5014h	Voltage phase	Unit	Unsigned Long
5016h	Step voltage	V	Unsigned Long
5018h	Not used	-	-
501Ah	Target cosfi	thousandths	Signed Long
501Ch	Target cosfi 2	thousandths	Signed Long

501Eh	Target cosfi 3	thousandths	Signed Long
5020h	Target cosfi 4	thousandths	Signed Long
5022h	Cosfi tolerance	thousandths	Unsigned Long
5024h	Capacitor discharge time	sec	Unsigned Long
5026h	Connection time: connection/disconnection time between consecutive switching	sec	Unsigned Long
5028h	Step C1 power	VAr	Unsigned Long
502Ah	Relay Output 1 function	Unit	Unsigned Long
502Ch	Alarm type for output 1	Unit	Unsigned Long
502Eh	Step C2 power	VAr	Unsigned Long
5030h	Relay Output 2 function	Unit	Unsigned Long
5032h	Alarm type for output 2	Unit	Unsigned Long
5034h	Step C3 power	VAr	Unsigned Long
5036h	Relay Output 3 function	Unit	Unsigned Long
5038h	Alarm type for output 3	Unit	Unsigned Long
503Ah	Step C4 power	VAr	Unsigned Long
503Ch	Relay Output 4 function	Unit	Unsigned Long
503Eh	Alarm type for output 4	Unit	Unsigned Long
5040h	Step C5 power	VAr	Unsigned Long
5042h	Relay Output 5 function	Unit	Unsigned Long
5044h	Alarm type for output 5	Unit	Unsigned Long
5046h	Step C6 power	VAr	Unsigned Long
5048h	Relay Output 6 function	Unit	Unsigned Long
504Ah	Alarm type for output 6	Unit	Unsigned Long
504Ch	Step C7 power	VAr	Unsigned Long
504Eh	Relay Output 7 function	Unit	Unsigned Long
5050h	Alarm type for output 7	Unit	Unsigned Long
5052h	Step C8 power (*1)	VAr	Unsigned Long
5054h	Relay Output 8 function (*1)	Unit	Unsigned Long
5056h	Alarm type for output 8 (*1)	Unit	Unsigned Long
5058h	Step C9 power (*1)	VAr	Unsigned Long
505Ah	Relay Output 9 function (*1)	Unit	Unsigned Long
505Ch	Alarm type for output 9 (*1)	Unit	Unsigned Long
505Eh	Step C10 power (*1)	VAr	Unsigned Long
5060h	Relay Output 10 function (*1)	Unit	Unsigned Long
5062h	Alarm type for output 10 (*1)	Unit	Unsigned Long
50E0h	Step C11 power	VAr	Unsigned Long

50E2h	Relay Output 11 function	Unit	Unsigned Long
50E4h	Alarm type for output 11	Unit	Unsigned Long
50E6h ... 5162h	Not used	-	-
5164h	High voltage alarm threshold	% of VT primary	Unsigned Long
5166h	High voltage alarm delay	sec	Unsigned Long
5168h	High current alarm threshold	% of CT primary	Unsigned Long
516Ah	High current alarm delay	sec	Unsigned Long
516Ch	Low voltage alarm threshold	% of VT primary	Unsigned Long
516Eh	Low voltage alarm delay	sec	Unsigned Long
5170h	Low current alarm threshold	(% of CT primary) x 2	Unsigned Long
5172h	Low current alarm delay	sec	Unsigned Long
5174h	THDV% alarm threshold	%	Unsigned Long
5176h	THDV% alarm delay	sec	Unsigned Long
5178h	THDI% alarm threshold	%	Unsigned Long
517Ah	THDI% alarm delay	sec	Unsigned Long
517Ch	Temperature alarm threshold	%	Unsigned Long
517Eh	Temperature alarm delay	sec	Unsigned Long
5180h	Enable disconnection time	Unit	Unsigned Long
5182h	Disconnection time	sec	Unsigned Long
5184h	PFC algorithm evaluation time	Unit	Unsigned Long
5186h	Transient exhaustion time for disinsertion	Unit	Unsigned Long
5188h	Transient exhaustion time for insertion	Unit	Unsigned Long
518Ah	Enable stability control for sliding win. avg.	Unit	Unsigned Long
518Ch	Percentage deviation for sliding win.	Unit	Unsigned Long
518Eh	Inductors presence	Unit	Unsigned Long
5190h	Degradation threshold 1 (without inductors)	Unit	Unsigned Long
5192h	Breakage threshold 1 (without inductors)	Unit	Unsigned Long
5194h	Degradation threshold 2 (with inductors)	Unit	Unsigned Long
5196h	Breakage threshold 2 (with inductors)	Unit	Unsigned Long
5198h	Enable alarm reset	Unit	Unsigned Long
519Ah	Enable harmonic analisys	Unit	Unsigned Long
519Ch	Autodiagnostic threshold	Unit	Unsigned Long
519Eh	868MHz address	Unit	Unsigned Long
51A0h	868MHz channel	Unit	Unsigned Long
51A2h ... 51A6h	Not used	-	-
51A8h	Network type	Unit	Unsigned Long

51AAh	Voltage dip duration	msec	Unsigned Long
51ACh	Manual status C1	Unit	Unsigned Long
51AEh	Manual status C2	Unit	Unsigned Long
51B0h	Manual status C3	Unit	Unsigned Long
51B4h	Manual status C4	Unit	Unsigned Long
51B6h	Manual status C5	Unit	Unsigned Long
51B8h	Manual status C6	Unit	Unsigned Long
51BAh	Manual status C7	Unit	Unsigned Long
51BCh	Manual status C8 (*1)	Unit	Unsigned Long
51BEh	Manual status C9 (*1)	Unit	Unsigned Long
51C0h	Manual status C10 (*1)	Unit	Unsigned Long
51C2h	Manual status C11	Unit	Unsigned Long
51C4h ... 51F2h	Not used	-	-
51F4h	Fan control threshold	°C	Unsigned Long
51F6h	Fan control delay	sec	Unsigned Long
51F8h	High cosfi alarm delay	min	Unsigned Long
51FAh	Low cosfi alarm delay	min	Unsigned Long
51FCh	Phase offset	°	Signed Long
51FEh	Band B1	Unit	Unsigned Long
5200h	Band B2	Unit	Unsigned Long
5202h	Band B3	Unit	Unsigned Long
5204h	Band B4	Unit	Unsigned Long
5206h	Step disconnection	Unit	Unsigned Long
5208h	Language	Unit	Unsigned Long
520Ah	Temperature measurement unit	Unit	Unsigned Long
520Ch	Backlight level	Unit	Unsigned Long
520Eh	Automatic backlight turn-off	Unit	Unsigned Long
5210h	LCD display contrast	Unit	Unsigned Long
5212h	Summertime	Unit	Unsigned Long
5214h	I _{max} harmonic	mA	Unsigned Long
5216h	Alarm mask	Unit	Unsigned Long
5218h	Max connection time	hours	Unsigned Long
521Ah	IP address (*4)	-	Unsigned Long
521Ch	Host name	Unit	Unsigned Long
521Eh	Abilitazione DHCP	Unit	Unsigned Long

DATA FORMAT:

- **Unsigned Long:** it means a binary number of 2 unsigned words (32 bits)
- **Signed Long:** it means a binary number of 2 words (32 bit); when this number is negative it is expressed in 2's complement format.

NOTES:

(*1) Only for **R8 ETH USB, R8 ETH BT, R8 ETH USB RADIO, R8 ETH BT RADIO, R8 ETH USB INT, R8 ETH BT INT, R8 ETH USB RADIO INT** and **R8 ETH BT RADIO INT** models.

(*2) Regarding the lines **Power Factor** and **Cosfi**, please note that:

- in case of inductive Power Factor, its value will be positive; viceversa in case of capacitive Power Factor/Cosfi its value will be negative
- when the Power Factor/Cosfi is undefined (current is zero), the instruments returns the value "2000" to report about this situation (it is the condition in which the instrument displays three dashes "- - -")

(*3) Regarding Current and Voltage **Thd%** please take note that:

- in case the Thd is not computable (e.g. when current = 0), the instrument provides two words equal to 0xFFFFFFFF, corresponding to an invalid data (it is the condition in which the instrument displays three dashes "- - -")
- Total harmonic distortion (THDI% e THDV%) are expressed as ‰ of the fundamental:

$$THDI(\%) = \frac{\sqrt{\sum_{n=2}^{60} |Hi_n|^2}}{|Hi_1|} * 1000$$

$$THDV(\%) = \frac{\sqrt{\sum_{n=2}^{60} |Hv_n|^2}}{|Hv_1|} * 1000$$

With:

$$|Hi_n| = \frac{\sqrt{(\text{Re } i_n^2 + \text{Im } i_n^2)}}{\sqrt{2} * 2^8 * 10^5} \text{ [A]}$$

$$|Hv_n| = \frac{\sqrt{(\text{Re } v_n^2 + \text{Im } v_n^2)}}{\sqrt{2} * 2^8 * 10^3} \text{ [V]}$$

Con $n = 2, \dots, 60$

$|Hi_n|$ = module of the n-th current harmonic

Re i_n = real part of the n-th current harmonic

Im i_n = imaginary of the n-th current harmonic

$|Hv_n|$ = module of the n-th voltage harmonic

Re v_n = real part of the n-th voltage harmonic

$\text{Im } v_n$ = imaginary of the n-th voltage harmonic

(*4) **IP address**: returned on 4 byte, each describing an IP-address filed.

Example: 192.168.1.10 will be reported in:

Byte 3 (MSB) = 192;

Byte 2 = 168;

Byte 1 = 1;

Byte 0 (LSB) = 10;

(*5) Reading the Alarms status, please note that:the value is to convert in bit-field (1 = ON and 0 = OFF) and the meaning of the bit are shown below.

Bit0: High voltage alarm status

Bit1: High current alarm status

Bit2: Low voltage alarm status

Bit3: Low current alarm status

Bit4: THDI% alarm status

Bit5: THDV% alarm status

Bit6: Temperature alarm status

Bit7: Fan alarm status

Bit8: High cosfi alarm status

Bit9: Low cosfi alarm status

Bit10: Voltage dip alarm status

(*6) Reading the battery breakage status, please note that:the value is to convert in bit-field (1 = BROKEN and 0 = OK) and the meaning of the bit are shown below.

Bit0: C1 step breakage status

Bit1: C2 step breakage status

Bit2: C3 step breakage status

Bit3: C4 step breakage status

Bit4: C5 step breakage status

Bit5: C6 step breakage status

Bit6: C7 step breakage status

Bit7: C8 step breakage status

Bit8: C9 step breakage status

Bit9: C10 step breakage status

Bit10: C11 step breakage status

(*7) Reading the maximum battery insertion status, please note that: the value is to convert in bit-field (1 = EXCEEDED and 0 = OK) and the meaning of the bit are shown in the table below.

- Bit0: C1 maximum battery insertion status
- Bit1: C2 maximum battery insertion status
- Bit2: C3 maximum battery insertion status
- Bit3: C4 maximum battery insertion status
- Bit4: C5 maximum battery insertion status
- Bit5: C6 maximum battery insertion status
- Bit6: C7 maximum battery insertion status
- Bit7: C8 maximum battery insertion status
- Bit8: C9 maximum battery insertion status
- Bit9: C10 maximum battery insertion status
- Bit10: C11 maximum battery insertion status

(*8) Reading the battery status, please note that: the value is to convert in bit-field (1 = INSERTED and 0 = NOT INSERTED) and the meaning of the bit are shown in the table below.

- Bit0: C1 battery status
- Bit1: C2 battery status
- Bit2: C3 battery status
- Bit3: C4 battery status
- Bit4: C5 battery status
- Bit5: C6 battery status
- Bit6: C7 battery status
- Bit7: C8 battery status
- Bit8: C9 battery status
- Bit9: C10 battery status
- Bit10: C11 battery status

(*9) Reading the relay status, please note that: the value is to convert in bit-field (1 = CLOSED and 0 = OPEN) and the meaning of the bit are shown in the table below.

- Bit0: C1 relay status
- Bit1: C2 relay status
- Bit2: C3 relay status
- Bit3: C4 relay status
- Bit4: C5 relay status
- Bit5: C6 relay status

Bit6: C7 relay status

Bit7: C8 relay status

Bit8: C9 relay status

Bit9: C10 relay status

Bit10: C11 relay status

(*10)Regarding serial number : returned on 4 byte, each describing:.

Byte 3 (MSB) and Byte 2 = progressive number;

Byte 1 = year;

Byte 0 (LSB) = week;

(*11)Regarding FW version, BL version and LANG version : returned on 4 byte, each describing:.

Byte 3 (MSB) and Byte 2 = not used;

Byte 1 = sub version number;

Byte 0 (LSB) = major version number;

In general, a part from the above mentioned case regarding Power Factor, when a value is not computable or exceeds its admitted input measurement range, the **null/invalid** value is **0xFFFFFFFFh** for **Unsigned Long** data type and **0x7FFFFFFFh** for **Signed Long** data type, that is the condition in which the instrument displays dashes “- -”

4.2 WRITE MULTIPLE REGISTERS FUNCTION (10h)

The following table describes the possible **commands** the user can send to the instrument, using the function WRITE MULTIPLE REGISTERS – function 16 (10h).

MODBUS-TCP address	Parameter	Min	Max	Type
5000h	Reset command: “5” resets max, min and avg measure; “20” reset to factory; “30” reset C1; “31” reset C2; “32” reset C3; “33” reset C4; “34” reset C5; “35” reset C6; “36” reset C7; “37” reset C8; “38” reset C9; “39” reset C10; “40” reset C11; “60” reset contact operation C1; “61” reset contact operation C2; “62” reset contact operation C3; “63” reset contact operation C4; “64” reset contact operation C5; “65” reset contact operation C6; “66” reset contact operation C7; “67” reset contact operation C8; “68” reset contact operation C9; “69” reset contact operation C10; “70” reset contact operation C11; “90” reset ACQ;	-	-	Unsigned Long
5002h	Time of Average	1	60	Unsigned Long
5004h	CT primary	1	10000	Unsigned Long
5006h	CT secondary	1	5	Unsigned Long
5008h	CT phase insertion 0 = L1 (R);	0	2	Unsigned Long

	1 = L2 (S); 2 = L3 (T) ;			
500Ah	Enable CT inversion 0 = Disabled; 1 = Enabled;	0	1	Unsigned Long
500Ch	Enable cogeneration 0 = Disabled; 1 = Enabled;	0	1	Unsigned Long
500Eh	Frequency mode 0 = 50Hz; 1 = 60Hz; 2 = Auto;	0	2	Unsigned Long
5010h	VT primary	50	200000	Unsigned Long
5012h	VT secondary	50	525	Unsigned Long
5014h	Voltage phase 0 = L1n; 1 = L2n; 2 = L3n; 3 = L12; 4 = L23; 5 = L31;	0	5	Unsigned Long
5016h	Step voltage	50	5000	Unsigned Long
5018h	Enable manual mode 0 = Disabled; 1 = Enabled;	0	1	Unsigned Long
501Ah	Target cosfi	(-500;-999) e (500;1000)		Signed Long
501Ch	Target cosfi 2	(-500;-999) e (500;1000)		Signed Long
501Eh	Target cosfi 3	(-500;-999) e (500;1000)		Signed Long
5020h	Target cosfi 4	(-500;-999) e (500;1000)		Signed Long
5022h	Cosfi tolerance	10	100	Unsigned Long
5024h	Capacitor discharge time	1	600	Unsigned Long
5026h	Connection time: connection/disconnection time between consecutive switching	1	30000	Unsigned Long
5028h	Step C1 power	0	999000	Unsigned Long
502Ah	Relay Output 1 function	0	6	Unsigned Long

	0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;			
502Ch	Alarm type for output 1 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic	0	10	Unsigned Long
502Eh	Step C2 power	0	999000	Unsigned Long
5030h	Relay Output 2 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;	0	6	Unsigned Long
5032h	Alarm type for output 2 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi;	0	10	Unsigned Long

	9 = High cosfi; 10 = Generic			
5034h	Step C3 power	0	999000	Unsigned Long
5036h	Relay Output 3 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;	0	6	Unsigned Long
5038h	Alarm type for output 3 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic	0	10	Unsigned Long
503Ah	Step C4 power	0	999000	Unsigned Long
503Ch	Relay Output 4 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;	0	6	Unsigned Long
503Eh	Alarm type for output 4 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%;	0	10	Unsigned Long

	5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic			
5040h	Step C5 power	0	999000	Unsigned Long
5042h	Relay Output 5 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;	0	6	Unsigned Long
5044h	Alarm type for output 5 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic	0	10	Unsigned Long
5046h	Step C6 power	0	999000	Unsigned Long
5048h	Relay Output 6 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;	0	6	Unsigned Long
504Ah	Alarm type for output 6 0 = High voltage;	0	10	Unsigned Long

	1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic			
504Ch	Step C7 power	0	999000	Unsigned Long
504Eh	Relay Output 7 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;	0	6	Unsigned Long
5050h	Alarm type for output 7 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic	0	10	Unsigned Long
5052h	Step C8 power	0	999000	Unsigned Long
5054h	Relay Output 8 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm;	0	6	Unsigned Long

	5 = FAN output; 6 = MAN/AUTO output;			
5056h	Alarm type for output 8 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic	0	10	Unsigned Long
5058h	Step C9 power	0	999000	Unsigned Long
505Ah	Relay Output 9 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;	0	6	Unsigned Long
505Ch	Alarm type for output 9 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic	0	10	Unsigned Long
505Eh	Step C10 power	0	999000	Unsigned Long
5060h	Relay Output 10 function 0 = Step;	0	6	Unsigned Long

	1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output;			
5062h	Alarm type for output 10 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi; 9 = High cosfi; 10 = Generic	0	10	Unsigned Long
50E0h	Step C11 power	0	999000	Unsigned Long
50E2h	Relay Output 11 function 0 = Step; 1 = Always off step; 2 = Always on step; 3 = N.O. contact alarm; 4 = N.C. contact alarm; 5 = FAN output; 6 = MAN/AUTO output; 7 = RUN output;	0	6	Unsigned Long
50E4h	Alarm type for output 11 0 = High voltage; 1 = High current; 2 = Low voltage; 3 = Low current; 4 = High THDV%; 5 = High THDI%; 6 = High temperature; 7 = Not valid; 8 = Low cosfi;	0	10	Unsigned Long

	9 = High cosfi; 10 = Generic			
50E6h ... 5162h	Not used	-	-	-
5164h	High voltage alarm threshold	90	110 (111= disab.)	Unsigned Long
5166h	High voltage alarm delay	1	255	Unsigned Long
5168h	High current alarm threshold	90	120 (121= disab.)	Unsigned Long
516Ah	High current alarm delay	1	255	Unsigned Long
516Ch	Low voltage alarm threshold	90	110 (111= disab.)	Unsigned Long
516Eh	Low voltage alarm delay	1	255	Unsigned Long
5170h	Low current alarm threshold	1	21	Unsigned Long
5172h	Low current alarm delay	1	255	Unsigned Long
5174h	THDV% alarm threshold	0	100 (999 = disabled)	Unsigned Long
5176h	THDV% alarm delay	1	255	Unsigned Long
5178h	THDI% alarm threshold	0	100 (999 = disabled)	Unsigned Long
517Ah	THDI% alarm delay	1	255	Unsigned Long
517Ch	Temperature alarm threshold	0	80 (999 = disabled)	Unsigned Long
517Eh	Temperature alarm delay	1	255	Unsigned Long
5180h	Enable disconnection time 0 = Disabled; 1 = Enabled;	0	1	Unsigned Long
5182h	Disconnection time	1	30000	Unsigned Long
5184h	PFC algorithm evaluation time	10	1500	Unsigned Long
5186h	Transient exhaustion time for disinsertion	5	250	Unsigned Long
5188h	Transient exhaustion time for insertion	5	250	Unsigned Long
518Ah	Enable stability control for sliding win. avg. 0 = Disabled; 1 = Enabled;	0	1	Unsigned Long
518Ch	Percentage deviation for sliding win.	1	50	Unsigned Long
518Eh	Inductors presence 0= Not present; 1 = Present;	0	1	Unsigned Long

5190h	Degradation threshold 1 (without inductors) 1= 5% of degradation; 2= 10% of degradation; 3= 15% of degradation; 4= 20% of degradation; 5= 25% of degradation; 6= 30% of degradation; 7= 35% of degradation; 8= 40% of degradation; 9= 45% of degradation; 10= 50% of degradation; 11= 55% of degradation; 12= 60% of degradation; 13= 65% of degradation; 14= 70% of degradation; 15= 75% of degradation; 16= 80% of degradation; 17= 85% of degradation; 18= 90% of degradation; 19= 95% of degradation; 20= 100% of degradation;	1	20	Unsigned Long
5192h	Breakage threshold 1(without inductors) (see Degradation threshold 1 for the value meaning)	1	20	Unsigned Long
5194h	Degradation threshold 2 (with inductors) (see Degradation threshold 1 for the value meaning)	1	20	Unsigned Long
5196h	Breakage threshold 2 (with inductors) (see Degradation threshold 1 for the value meaning)	1	20	Unsigned Long
5198h	Enable alarm reset 0 = Disabled; 1 = Enabled;	0	1	Unsigned Long
519Ah	Enable harmonic analisys 0 = Disabled; 1 = Enabled;	0	1	Unsigned Long
519Ch	Autodiagnostic threshold	0	200	Unsigned Long
519Eh	868MHz address	1	247	Unsigned Long
51A0h	868MHz channel	0	5	Unsigned Long

51A2h ... 51A6h	Not used			-
51A8h	Network type 0= Three-phase; 1 = Single-phase;	0	1	Unsigned Long
51AAh	Voltage dip duration	5	40	Unsigned Long
51ACh	Manual status C1 0= Off; 1= On;	0	1	Unsigned Long
51AEh	Manual status C2 0= Off; 1= On;	0	1	Unsigned Long
51B0h	Manual status C3 0= Off; 1= On;	0	1	Unsigned Long
51B4h	Manual status C4 0= Off; 1= On;	0	1	Unsigned Long
51B6h	Manual status C5 0= Off; 1= On;	0	1	Unsigned Long
51B8h	Manual status C6 0= Off; 1= On;	0	1	Unsigned Long
51BAh	Manual status C7 0= Off; 1= On;	0	1	Unsigned Long
51BCh	Manual status C8 0= Off; 1= On;	0	1	Unsigned Long
51BEh	Manual status C9 0= Off; 1= On;	0	1	Unsigned Long
51C0h	Manual status C10 0= Off; 1= On;	0	1	Unsigned Long
51C2h	Manual status C11 0= Off;	0	1	Unsigned Long

	1= On;			
51C4h ... 51F2h	Not used	-	-	-
51F4h	Fan control threshold	0	80 (999=disab.)	Unsigned Long
51F6h	Fan control delay	1	255	Unsigned Long
51F8h	High cosfi alarm delay	1	255	Unsigned Long
51FAh	Low cosfi alarm delay	1	255	Unsigned Long
51FCh	Phase offset	-180	180	Signed Long
51FEh	Band B1	(*12)	(*12)	Unsigned Long
5200h	Band B2	(*12)	(*12)	Unsigned Long
5202h	Band B3	(*12)	(*12)	Unsigned Long
5204h	Band B4	(*12)	(*12)	Unsigned Long
5206h	Step disconnection	0	1	Unsigned Long
5208h	Not used	-	-	-
520Ah	Temperature measurement unit 0= Celsius; 1 = Fahrenheit	0	1	Unsigned Long
520Ch	Backlight level 0 = Off; 1 = Not valid; 2= Max level;	0	2	Unsigned Long
520Eh	Automatic backlight turn-off	0	1	Unsigned Long
5210h	LCD display contrast	0	10	Unsigned Long
5212h	Summertime 0 = Standard time; 1= Daylight saving time	0	1	Unsigned Long
5214h	Imax harmonic	35	5000	Unsigned Long
5216h	Alarm mask	0	3	Unsigned Long
5218h	Max connection time	0	999	Unsigned Long
521Ah	IP address (*13)	-	-	Unsigned Long
521Ch	Host name	1	999	Unsigned Long
521Eh	Abilitazione DHCP	0	1	Unsigned Long

NOTES:

(*12) The B1, B2, B3 and B4 bands value must be specified using this formula:

$$Bn_value = \text{hour} * 256 + \text{minute}$$

The bands B2, B3, B4 can be disabled using: hour = 99 and minute = 99. Moreover, the values of B1, B2, B3 and B4 must be monotonically increasing.

(*13) **IP address** format:

Example: 192.168.1.10 will be reported in:

Byte 3 (MSB) = 192;

Byte 2 = 168;

Byte 1 = 1;

Byte 0 (LSB) = 1;

4.3 REPORT SLAVE ID FUNCTION (11h)

It is possible to get the instrument identifier (ID) using the function REPORT SLAVE ID – function 17 (11h). This function returns the instrument ID and the internal Firmware Version.

The answer format has 4 bytes:

Byte 3 (MSB) and byte Byte 2: instrument ID;

Byte 1: FW major version number;

Byte 0 (LSB): FW sub version number.

The R8 family has the following **Slave ID**:

142 (0x008E) = R8 ETH (R8 ETH INT)

147 (0x0093) = R8 ETH USB (R8 ETH USB INT)

148 (0x0094) = R8 ETH BT (R8 ETH BT INT)

342 (0x0156) = R8 ETH RADIO (R8 ETH RADIO INT)

347 (0x015B) = R8 ETH USB RADIO (R8 ETH USB RADIO INT)

348 (0x015C) = R8 ETH BT RADIO (R8 ETH BT RADIO INT)

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