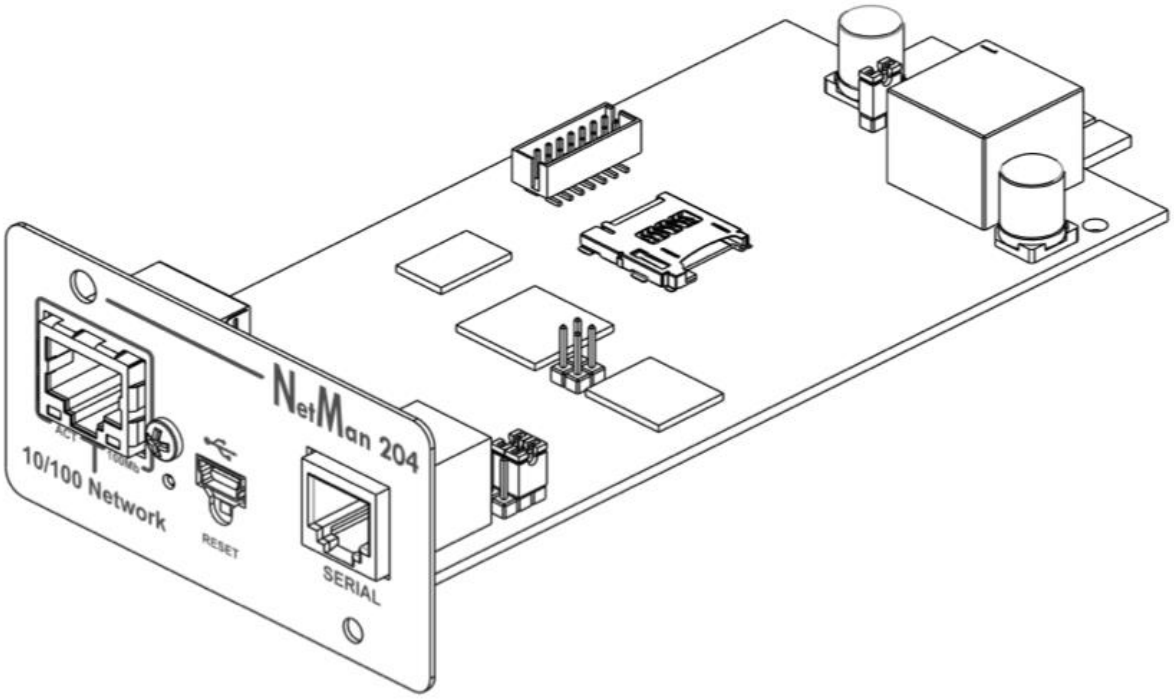
NetMan 204

SOLAR

Network Adapter



Installation and User Manual

Summary

INTRODUCTION

Thank you for choosing our product.

The accessories described in this manual are of the highest quality, carefully designed and built in order to ensure excellent performance.

This manual contains detailed instructions on how to install and use the product.
This manual must be stored in a safe place and CONSULTED BEFORE USING THE DEVICE for proper usage instructions as well as maximum performance from the device itself.

NOTE: Some images contained in this document are for informational purposes only and may not faithfully demonstrate the parts of the product they represent.

Symbols used in this manual:

Warning Indicates important information that must not be ignored.

Information Provides notes and useful suggestions for the User.

SAFETY

This part of the manual contains SAFETY precautions that must be followed scrupulously.

- The device has been designed for professional use and is therefore not suitable for use in the home.
- The device has been designed to operate only in closed environments. It should be installed in rooms where there are no inflammable liquids, gas or other harmful substances.
- Take care that no water or liquids and/or foreign bodies fall into the device.
- In the event of a fault and/or impaired operation of the device, do not attempt to repair it but contact the authorized service centre.
- The device must be used exclusively for the purpose for which it was designed. Any other use is to be considered improper and as such dangerous. The manufacturer declines all responsibility for damage caused by improper, wrong and unreasonable use.

ENVIRONMENTAL PROTECTION

Our company devotes significant resources to analyzing environmental aspects in the development of its products. All our products pursue the objectives defined in the environmental management system developed by the company in compliance with applicable standards.

Hazardous materials such as CFCs, HCFCs or asbestos have not been used in this product.

When evaluating packaging, the choice of material has been made favoring recyclable materials.
Please separate the different material of which the packaging is made and dispose of all material in compliance with applicable standards in the country in which the product is used.

Disposing of the product

The device contains internal material which (in case of dismantling/disposal) are considered TOXIC, such as electronic circuit boards. Treat these materials according to the laws in force, contacting qualified centers. Proper disposal contributes to respect for the environment and human health.

DESCRIPTION

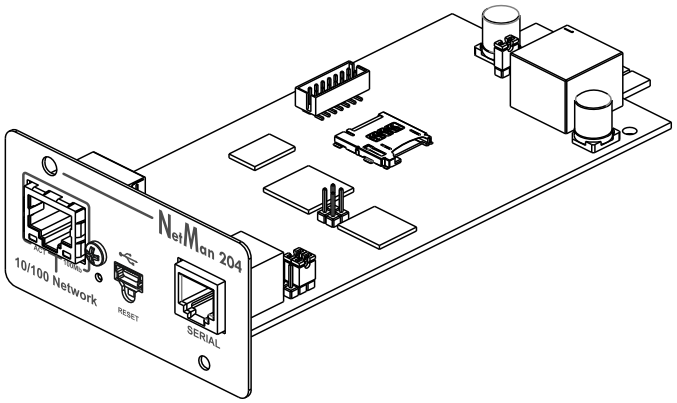
Overview

NetMan 204 Solar is a device that allows inverter management through a LAN (Local Area Network); the accessory supports all the main network protocols (TCP/IP, Modbus/TCP, RFB and so on) and is compatible with Ethernet 10/100Mbps IPv4/6 networks. The inverter can therefore be integrated easily into small, medium and large-sized networks.
The device also records inverter values and events in history log archives. To view historical data, you can use the **SirioDataControl** software or **Sunvision 2** software.

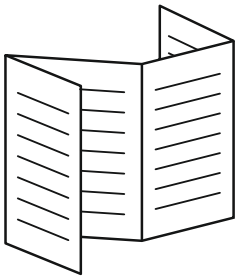
NetMan 204 Solar can be used with AROS StringBox product, making the AROS StringBox visible on LAN networks, too. Differences of behavior with Inverter will be highlighted when necessary.

Package contents

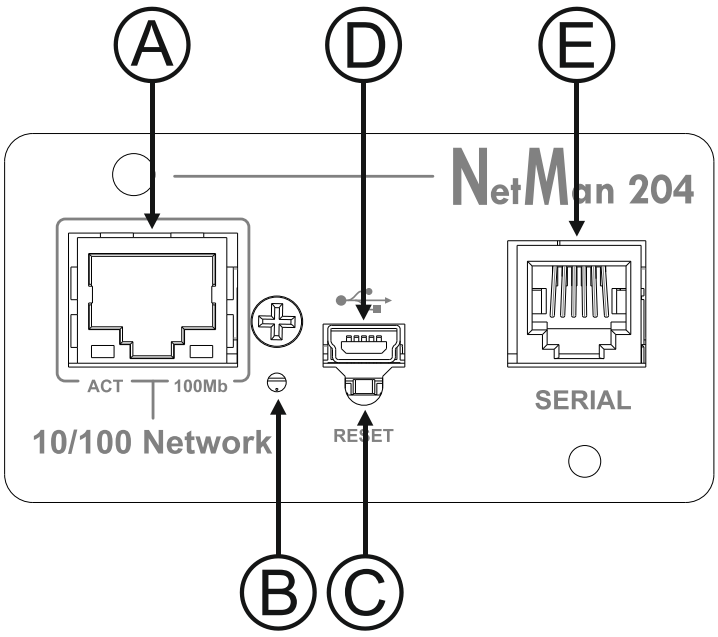
NetMan 204 Solar



Quick start guide



Front panel



A: Network port

B: Led

C: Reset button

D: Micro-USB port

E: Serial port

Ethernet port

NetMan 204 Solar connects to 10/100 Mbps Ethernet networks by means of connector RJ45. The LEDs built into the connector describe the status of the network:

- Left LED:
  SOLID YELLOW: NetMan 204 Solar has detected a valid link.
  FLASHING YELLOW: NetMan 204 Solar is receiving or transmitting data packets.
- Right LED
  SOLID GREEN: NetMan 204 Solar is connected to a network operating at 100 Megabits per second.

Micro-USB port

NetMan 204 Solar doesn't currently use the Micro-USB port.

Serial port

NetMan 204 Solar makes available a serial communication port to which you can connect a RS-485/Modbus power meter for special functions.

Led

This led describes the status of *NetMan 204 Solar*:

- FLASHING RED: the board is currently updating software.
- OFF: regular working.
- SOLID RED: *NetMan 204 Solar* has failed to update software.

Reset button

The reset button allows to restart the *NetMan 204 Solar*.

To reset *NetMan 204 Solar*: keep the reset button pressed until the red led starts to flash (ca. 2 seconds) and then release it.

Users

It is possible to access to *NetMan 204* Solar with the following users:

Username	Default password	Privileges
ftpuser	arosftp	This is the FTP user that can access the log files (see SirioDataControl and Sunvision 2 software)
-	secret	This is the password that can be used to access the virtual screen of *NetMan 204 Solar* using an RFB compatible software like VNC.

Network services

NetMan 204 Solar implements a series of services based on the main network protocols.

SSH

Ssh is supported, but it's reserved for service operations only.

RFB protocol

NetMan 204 Solar supports RFB protocol (version 3.8). This means that the user can connect with an application like **VNC**[1], adding a virtual display to your inverter. The default password, asked when you try to connect, is "secret".

UDP

UDP (User Datagram Protocol) is a low level network protocol that guarantees speed in the exchange of data and low network congestion. It is the protocol used by **Sunvision 2** and **SirioDataControl** software, for fast data read and configuration.
The UDP connection uses the UDP 33000 port by default but can be configured on other port values according to requirements.

Modbus/TCP

The inverter status can be monitored by means of the standard network protocol MODBUS/TCP. Modbus/TCP is simply the Modbus RTU protocol with a TCP interface that runs on Ethernet.

FTP

FTP (File Transfer Protocol) is a network protocol used for file exchange. *NetMan 204 Solar* uses this protocol for:

1. download of files of the inverter values and events history log archive.
2. firmware upgrade (using **SirioDataControl** software)

The FTP configuration is:

- Host: hostname or *NetMan 204 Solar* IP address;
- Port: default port is 21; this can be changed, if needed
- User: ftpuser
- Password: ***arosftp***

SMTP

SMTP (Simple Mail Transfer Protocol) is the protocol used to send e-mails. They are sent to an SMTP server on port 25 (port 25 is the default port, but it can be changed).
NetMan 204 Solar can send a notification e-mail if one or more alarm or status conditions occur. The e-mails can be sent to up to three recipients and they can be sent for five different alarm kinds. *NetMan 204 Solar* can send periodic e-mails with an attachment containing the files of the inverter values and events history log archives.
This service can be used to periodically save the history log archives.
The e-mail service must be enabled and correctly configured in order to send reports; the reports are sent to all the addresses configured for this service (for more details see paragraph **Configuration**).

[1] A program like TightVnc works great with NetMan 204 Solar: http://www.tightvnc.com/

History log archive (inverter only)

NetMan 204 Solar records the inverter values in a history log archive every day. The data are saved to a file in text format.
The date is contained in the name of the log file itself; for example:

DP_2016_07_14.log

This file contains all the available data of year 2016, July, 14th. Each record is saved into the log file every 5 minutes, starting at 05:00 until 22:00. Each log file contains a header that contains the version of the software that has produced the log and data information; the file can be imported in Excel for graphs and analysis. The values are semicolon separated.
The record, namely a single line of the file, has the following fields:

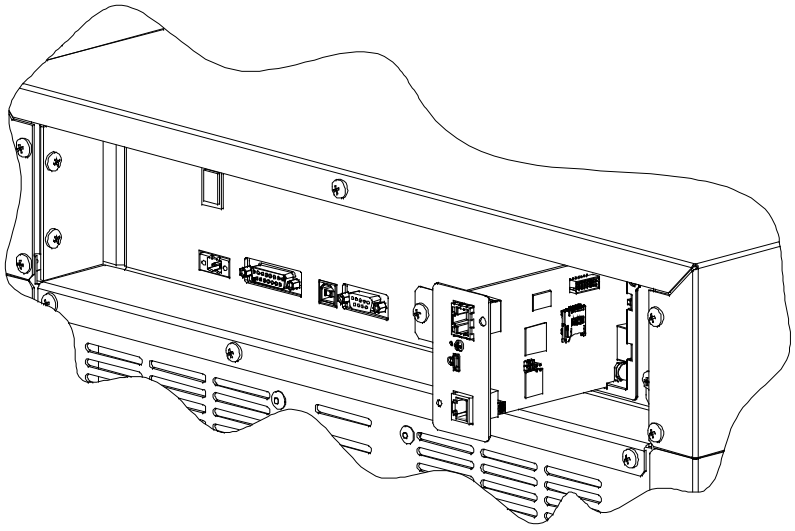
1. Time information, in HH:MM (hour:minute)
2. Instant power, in KW.
3. Reactive instant power, in KW
4. Active instant power, in KW
5. External measure
6. Inverter module temperature, in Celsius
7. Daily energy, in KWh
8. Grid frequency, in Hz
9. Grid phase R instant power, in W
10. Grid phase S instant power, in W
11. Grid phase T instant power, in W
12. Grid phase R reactive power, in W
13. Grid phase S reactive power, in W
14. Grid phase T reactive power, in W
15. Grid voltage, phase R, in V
16. Grid voltage, phase S, in V
17. Grid voltage, phase T, in V
18. PV voltage input 1, in V
19. PV voltage input 2, in V
20. PV voltage input 3, in V
21. PV current input 1, in A
22. PV current input 2, in A
23. PV current input 3, in A
24. Latched alarms 1
25. Latched alarms 2
26. Latched alarms 3
27. Latched alarms 4
28. Latched alarms 5
29. Boost temperature, in °C
30. Spare 1
31. Spare 2
32. Spare 3
33. Spare 4

All the measures values are average values, calculated in a five minutes' period of time.
This file can be sent by e-mail on a daily, weekly or monthly basis. See configuration for details.

INSTALLATION

INVERTER

- Remove the cover of the inverter expansion slot by removing the two retaining screws.
- Insert *NetMan 204 Solar* in the slot.
- Secure *NetMan 204 Solar* in the slot using the two screws removed previously.
- Connect the device to the network by means of connector RJ-45 (see “Specifications for the cabling of the network cable”)



STRING BOX

- Open the StringBox with the specific key
- Insert *NetMan 204 Solar* in the slot.
- Secure *NetMan 204 Solar* in the slot using the two screws.
- Connect the device to the network by means of connector RJ-45 (see “Specifications for the cabling of the network cable”)
- Close the StringBox with the key

CONFIGURATION

OVERVIEW

NetMan 204 Solar comes provided as factory default with DHCP disabled and with a fixed IP network configuration as:

- IP address = 192.168.1.100
- Netmask = 255.255.255.0
- Gateway = 192.168.1.254

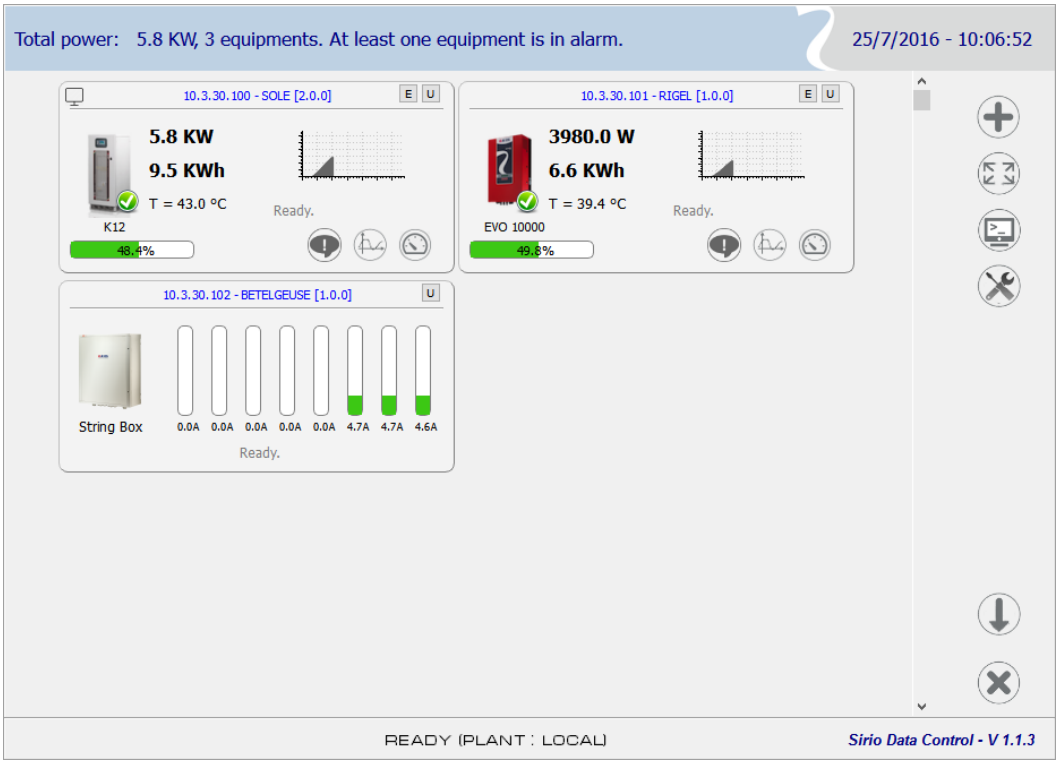
In order to change the network configuration of the Netman 204 solar for the first time there is no need to set your PC IP address to the same network. Install the free SirioDataControl software and simply change the IP address. The details will follow in this section.
This method can be used to change the network configuration (and other parameters) as many times as the user needs to.

When the IP address of the *NetMan 204 Solar* has been changed so that the inverter is reachable, you can connect to the virtual display using a VNC-like software; when connected, the user can see values, examine historical data and configure *NetMan 204 Solar* parameters.

CONFIGURATION OF NETWORK VIA SIRIODATACONTROL

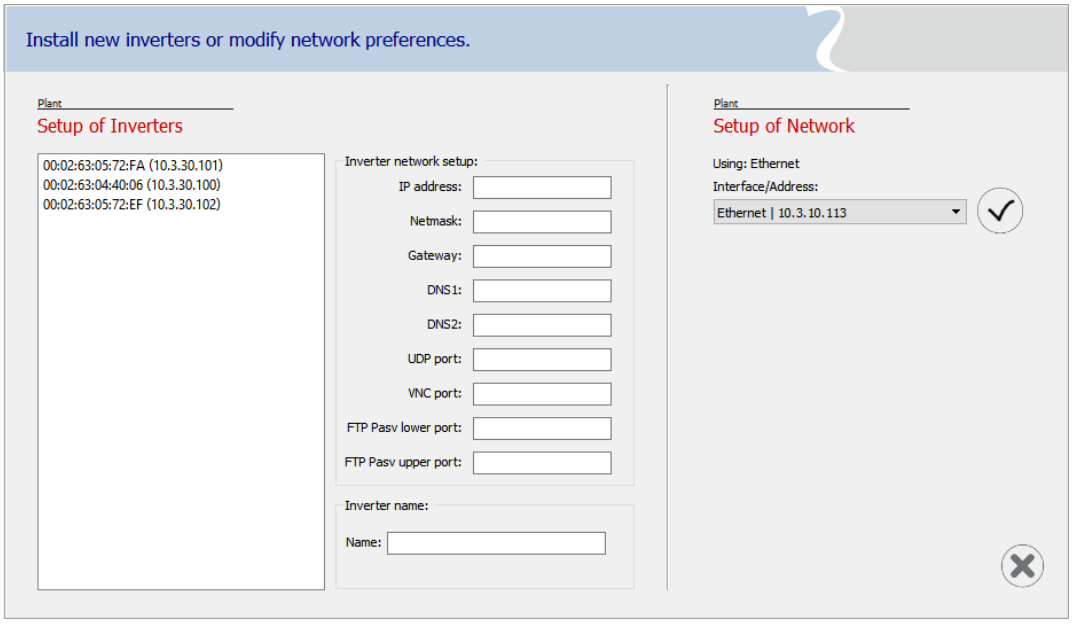
In order to change the configuration via SirioDataControl, the user must download and install SirioDataControl software from www.aros-solar.com.

After installation of SirioDataControl, connect your pc and the *NetMan 204 Solar* to the same network and run SirioDataControl. Depending on if there are other inverters/StringBox or not in the network, the user should get a window like this:



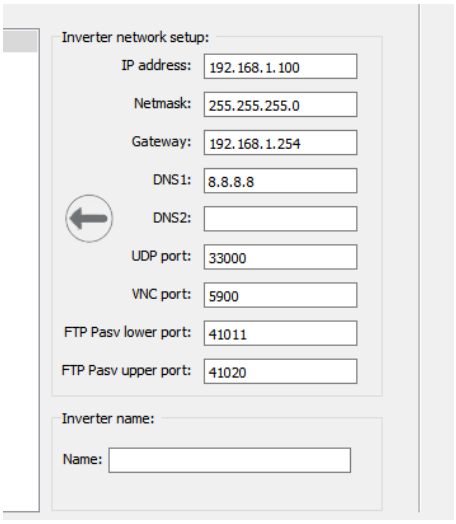
Now just pay attention to the column of buttons on the right. To configure parameters of *NetMan 204 Solar*, the user needs to push the Tools button 

A new window will open:



On the left side there are the equipments compatible with SirioDataControl connected to the network. The number within parenthesis is the IP address.

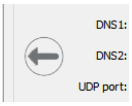
The user has to select the inverter to change the parameters:



It's possible to change the following parameters:

- IP address/Netmask/Gateway
- DNS1 and DNS2 (DNS = Domain Name Server)
- UDP port (leave as 33000 if you don't know what to do)
- VNC port (default: 5900)
- FTP PASV lower/upper port (leave as default values if you don't know what to do
- Name (leave blank if the user wants to leave it unchanged).

Pushing the arrow key

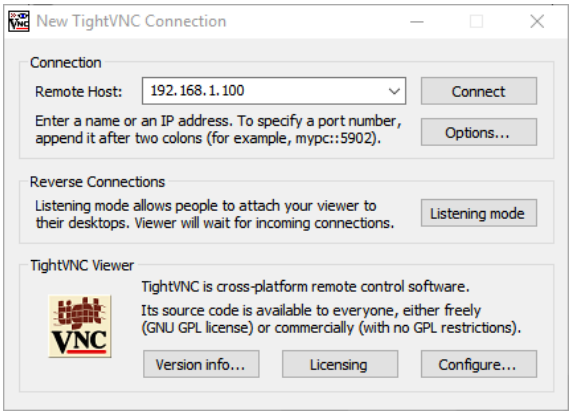


will apply values to *NetMan 204 Solar*.

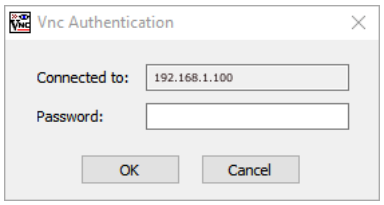
After this window is closed, the equipment (Inverter or StringBox) with the newly configured *NetMan 204 Solar* board should appear. See SirioDataControl software manual for the details.

CONFIGURATION VIA VNC

After you have configured *NetMan 204 Solar* network parameters the first time, you will be able to see the live values using SirioDataControl software, but there is another way to configure your *NetMan 204 Solar* board, using VNC viewer compatible software:



At the moment of the connection the user will be prompted with a window asking a password:



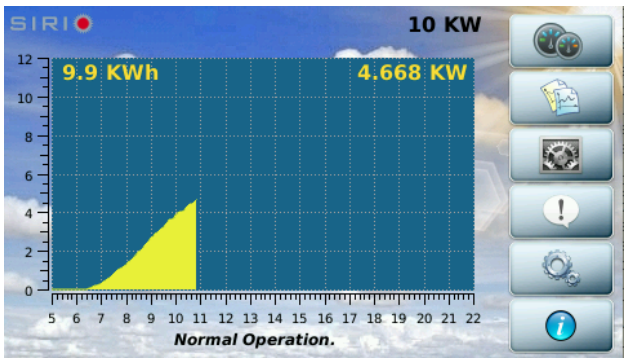
The default password is ‘secret’ (the password can be changed).

StringBox

The StringBox shows only the configuration of IP address and relative parameters; refer to following relevant Inverter sections.

Inverter

You should obtain a screen as the following one:



A graph of the instant power is presented, as well as a column of buttons, that will drive the user throughout all the available menus. But for the moment we’re focused on Configuration, so if the user hits the gears button,

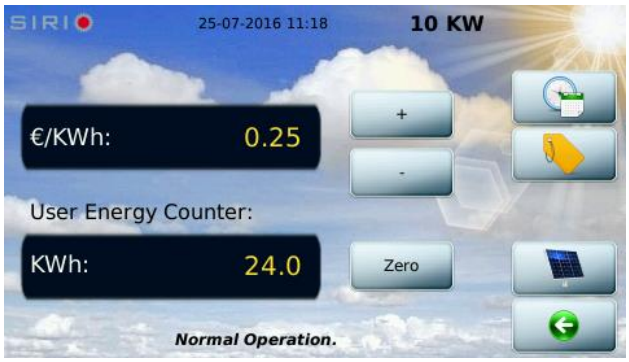
this will show him/her a new screen (see above), with a description of the functions and a column of buttons. The upper button is a User Configuration button; this will lead the user to the configuration of €/KWh rate value, to the set of a user energy counter, to set date and time, name of plant, ID and KWp/KWac rate (in %).

This last parameter allows the user to balance the power given by solar panels and the effective power the inverter can manage to deliver.

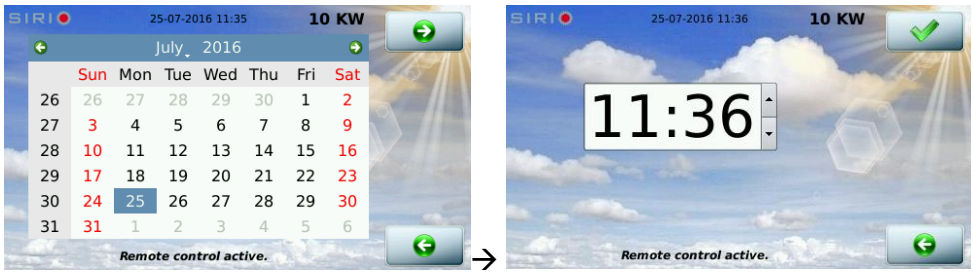
The Second button allows the user to change Administrator parameters such as network configuration, e-mail configuration, as well as language of the virtual screen, the management of an external measure, and the possible source of external commands.

The third button is for accessing service functions, the fourth one shows you the sending e-mail settings. But let's see in the details.

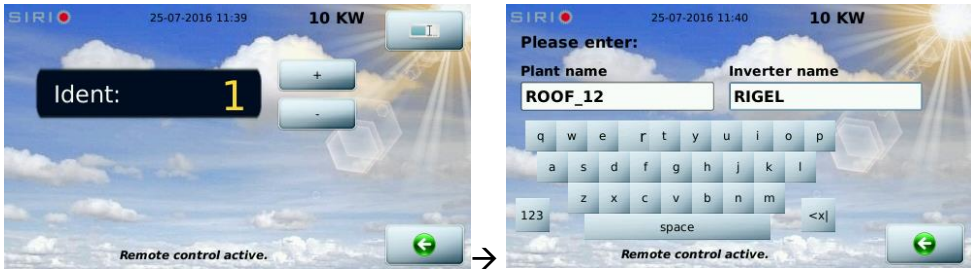
User parameters



The €/KWh parameter allows the owner to know the money saving of his/her inverter. The value will be shown on the Info page, accessible from virtual display main screen.
The *User Energy Counter* can be used like as a personal tripmeter to measure the energy produced since a particular moment on. This value can be zeroed with the “Zero” button to start counting from the beginning again.
The user can change date/time with the upper button on the right:



Hitting the Apply button on the upper right corner of the time window will set date time as chosen by the user.
The second button allows to change the ID of the *NetMan 204 Solar* and its name and plant name:



The third button will change the KWp/KWac rate (in %) parameter.

In the case reported above, only the 80% of the available nominal power has been connected to the inverter.

Example: let's suppose we have a PV set of panels for a total of 8KWp to an inverter that has a nominal power of 10KW; than the parameter will be

$$k = \frac{8}{10} * 100 = 80\%$$

Administrator parameters

From this screen the user can change network and network-related parameters, the language of the virtual screen, the settings of the external measure and the source of the commands for driving the behavior of the inverter from an external source.

Hitting the first upper button the user can change the network parameters, as seen here:

The user can choose DCHP or a static IP configuration. Please note that invalid addresses will be shown with a special symbol close to the parameter involved. Please also note that the only way to change IP/Netmask/Gateway parameters is to tap the corresponding cell with the mouse cursor and click the numeric keypad numbers (and dot).

In the following examples, you'll see a wrong configuration (the Apply button does not appear) and a correct configuration (the Apply button is available to reconfigure network):

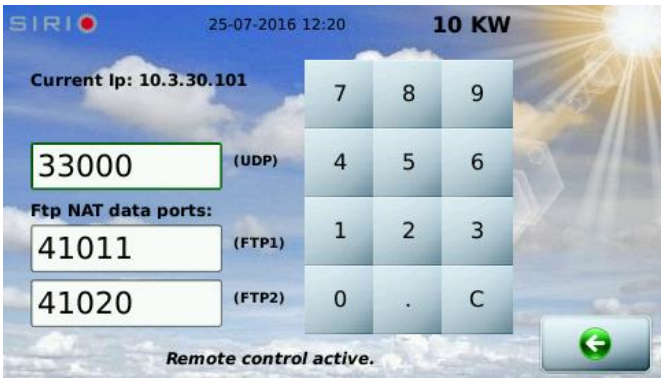
←KO

←OK!

The other configuration buttons are:

- UDP+FTP, for changing ports of the corresponding services
- SMTP, to configure e-mail settings
- DNS, to configure Domain Name server(s) addresses(es)
- VNC, to change port and password of the virtual screen function

The use of the UDP+FTP settings is straightforward; the ftp NAT data ports has to be set in those cases where the user router has to be configured with NAT to allow PASV mode from external ftp access.



In order to configure e-mail settings, you will need to insert SMTP server address and port:

a “From” and “To” fields, as well as a “Cc” field. The “To” field can be filled with multiple e-mail addresses, separated by commas.

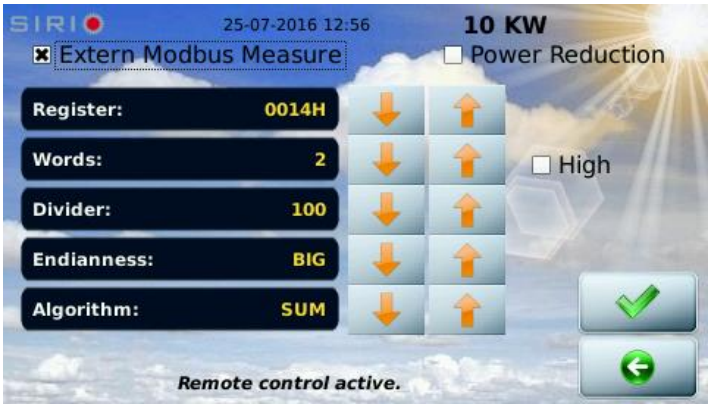
In the last page of e-mail configuration, you can use or not authentication and/or TLS/SSL encryption.

If you choose to use authentication, a username and password are required. An Apply button is present to confirm the settings. Before to do so, it's better to try to test the email settings with the second button.
A text with OK or KO should appear just below this second button if the test passes or fails.

To change the language of the interface, the user must push the corresponding radio button:

Pushing the button

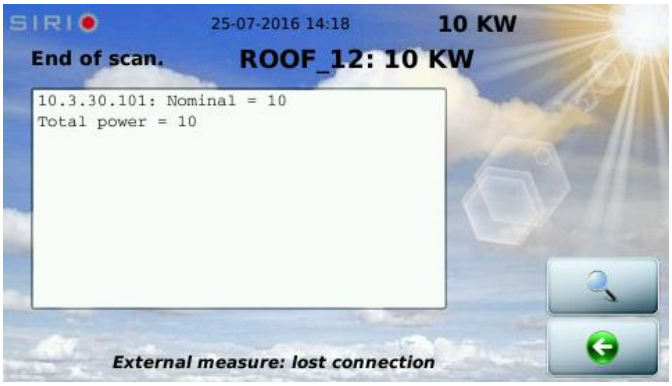
is possible to connect an external RS-485 Modbus device:



It's easy to adapt virtually to any external RS-485 device, as you can change the register address, the number of words necessary to get the value, the endianness and the divider. You can also select the power reduction function; this will allow the user to scan the network and look for inverters in the same plant to make the external measure drive them all as a whole.
Let's make an example.
If we have three inverters on a network and they have the same plant name, they will be found by the master device (the one that has the external measure).
Once the master has defined:

1. The inverters in the same plant
2. The total power of the plant

it will send the percentage of power that each inverter has to inject to the grid to fulfill the requested power from the external measure. The percentage of power is sent on the LAN ten (10) times each second, so that the slave inverters can almost instantly adapt to the conditions required.
To activate the Power Reduction Function, the user has to select "Power Reduction" checkbox and hit the Apply button. A Radar button is now present on the screen, pressing this one the user can access the scan function:



The user has to press the scan button on the right to activate this function (button with magnifying lens).
In this simple case, only one inverter has been found. If more inverters have the same plant name, they will appear in the list and the sum of the total power will be shown.
From this moment on, this scan will be done by the master automatically in background; this means that if in the future a new inverter is added and has the same plant name, the total power is recalculated on the fly and the value of the percentage will be adequately broadcasted.
Likewise, if an inverter is shut down or has its plant name changed, the master will change the percentage to face the new situation. See the Power Reduction Kit manual for the details.

Service button and mail parameters

The service button is reserved to Company Service and its functions are password protected. The e-mail configuration button allows the user to change times of messages if e-mail settings are correctly configured.

If you want to activate a function, just press the leftmost button, just as in the following screen:

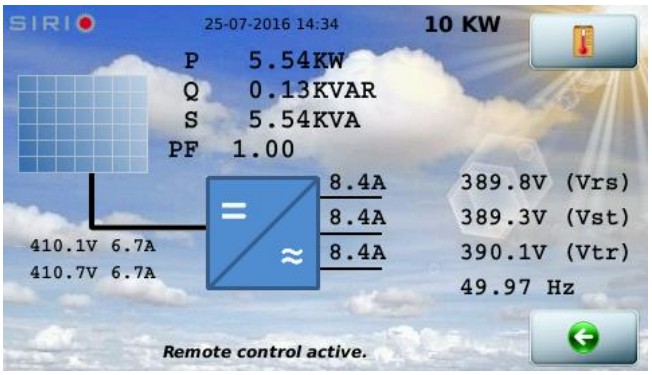
In this example, a mail will be sent to the configured e-mail addresses after 5 minutes. Push on the arrows to change these time values. The periodic log can be sent on a daily, weekly or monthly basis.

In case of permanent fail, an e-mail will be sent instantly.

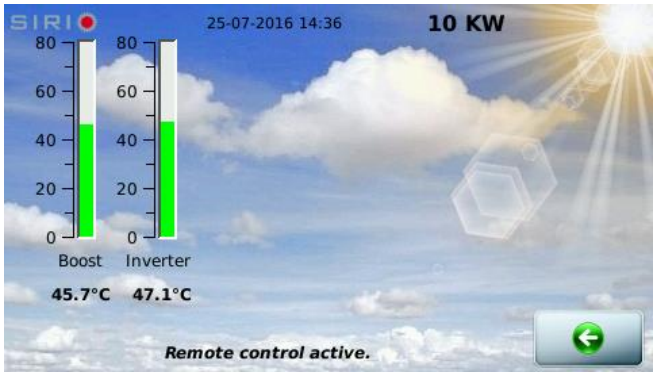
OTHER FUNCTIONS

MEASURES

From the main page of the virtual screen the user can see live values of the inverter; it's the first button on the top right side of the screen, and will drive the user to the following screen:



This schematic view shows most of the significant values as seen from the inverter. In the top right of this screen it's possible to push the button to see the inverter temperature(s):



The number of temperatures shown could be different, depending on the model of the inverter monitored by *NetMan 204 Solar*.

VIEWING THE LOG DATA

One of the most useful functions of *NetMan 204 Solar* is to save historical data in time. As we have seen, it stores 5 minutes of a set of average values on a file each day, starting from 5am up to 10pm. These value, saved by *NetMan 204 Solar* in a text file, can be downloaded to a pc for off-line analysis using MS Excel, for example.
As much as useful, maybe more, is the function of viewing log data directly on the *NetMan 204 Solar* virtual screen, with VNC.
The user can hit the second button from top and he /she gets the following screen:

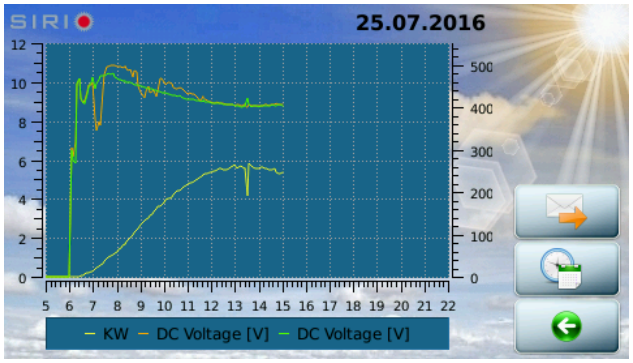
From here, the user can view log data (upper button) or manage log data, having the means to delete undesired yearly data from past years (eraser button).
The screen related to the first function is the following:

The user can choose up two measures; some choices lead to multiple measures, like Vac, but the maximum selectable buttons are two. The measures are:

- KW: the active power
- VAR: the reactive power
- KVA: the apparent power
- KWh: the energy produced
- Idc: solar panel currents
- Vdc: solar panel voltages
- Iac: grid currents
- Vac: grid voltages
- Hz: grid frequency
- °C(I): inverter temperature
- °C(B): booster temperature
- Ext: the external measure

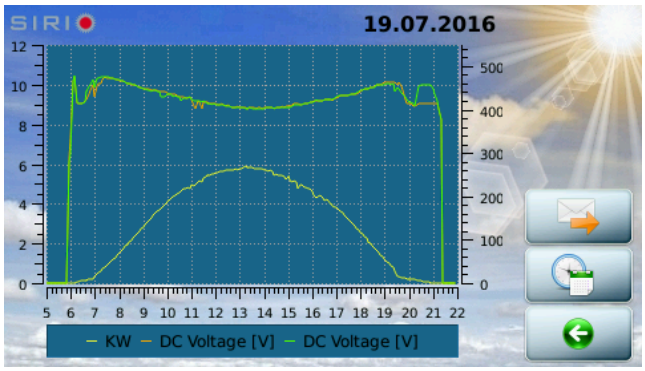
Let’s see an example. We choose to see the instant power and the two (in this case) DC voltages

and hitting the next button the user can see the graph of the involved measures:



In this case the data are incomplete because still not present. The user can choose a different day using the Calendar button or can send the snapshot of the graph with the e-mail button on the right. The user can also drag the mouse cursor on the graph from right to left and from left to right to go forward in time and to go back in time, respectively.

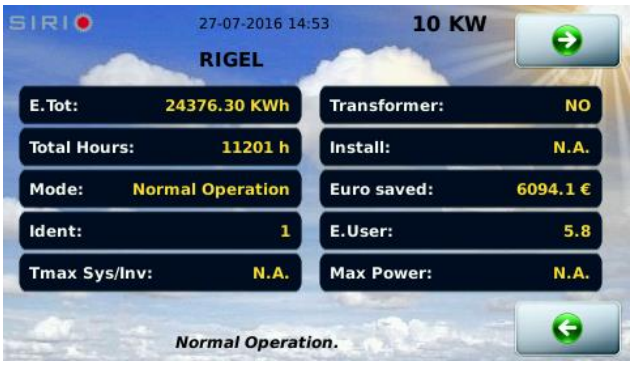
Dragging back to another good day for the inverter, we can see the same values of almost a week before:



ALARMS AND INFO BUTTONS

When the user hits the Alarms button, he/she can see a list of the outstanding alarms. If there are no alarms, and most of the time this will be the case, you'll see an empty list:

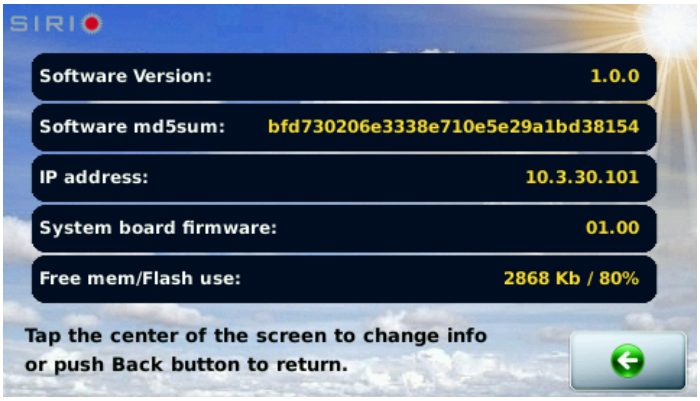
The Info button, at the lowest position on the right side of the main page leads the user to the following screen:



On this screen the user will find, when available:

- The total energy produced by the inverter
- The total hours of operation
- The actual operating mode
- The identification number
- The maximum temperatures seen (when available)
- If there is a transformer or not
- Date/time of installation (when available)
- The total money saved (in €)
- The actual user energy
- The maximum power reached by the inverter (when available)

A second screen is available:



The available info is:

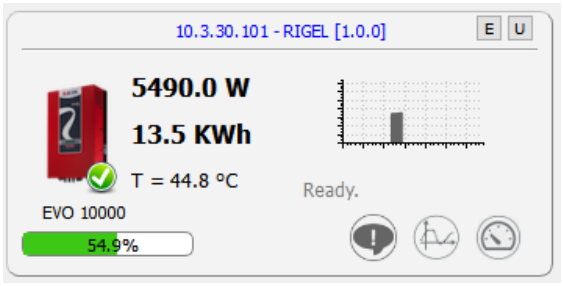
- The actual software version of the *NetMan 204 Solar* board
- The software md5 checksum
- The actual IP address
- The system board firmware version
- The free RAM and flash memory occupancy, in Kb and %.

Touching the center of the screen brings the user to another screen:

This screen gives the user more info on the communications line; in the case of this inverter, we have only the RS-485 line an Ethernet.
The Ethernet information shows the kind of connections and how many connections are established for Modbus/TCP.

FIRMWARE UPGRADE

The *NetMan 204 Solar* firmware can be updated using SirioDataControl. In order to update a *NetMan 204 Solar* board firmware, the user has to open SirioDataControl and hit the small “U” button in higher right corner of the inverter or StringBox symbol:



The user should choose the update file and hit the Open button; the file will be transferred to the *NetMan 204 Solar* board. After the update, the board will reboot.
The user should be careful to choose the correct update file. As an example the file could have following name:

Update-NETMAN204-1.0.0-20160726-0844.tgz

In this case the update is for NETMAN 204, has version 1.0.0 and it has produced on July, 26th, 2016 @ 8:44. Be sure that **NETMAN204** string is contained in the name of the file.

Modbus TCP/IP protocol

This service is always active on the TCP port 502.
The supported functions are listed below, with related registers.

SUPPORTED FUNCTIONS

Function	*Modbus name*	*Description*	*Accessible data areas*
1 (0x01) 2 (0x02)	Read coil Read discrete input	Bitwise read	Alarms & statuses
3 (0x03) 4 (0x04)	Read holding registers Read input registers	Registers read	All
6 (0x06)	Write single register	Register write (single)	Power reducer commands
16 (0x10)	Write multiple registers	Registers write (multiple)	Power reducer commands

In the following map tables two columns indicate what is the version number from which that particular register was introduced.
The tables of the register maps contain also reference to the versions of other inverters. The column Evo/Easy has to be used to access correctly data on *NetMan 204 Solar*.

Alarm & status registers map

REGISTRO	BIT	ALLARMI	Vers. Centr.	Evo Easy	DESCRIZIONE
1÷6					
7	16	Master-Slave-Fail			Inter-processors communication fail
	15	EEPROM-Fail			The EEPROM memory is not accessible
	14	Fac-Master-Fail			The frequency measured from master is out of range
	13				
	12	Zac-Master-fail			The impedance measured from master is out of range
	11				
	10	Rly1-Fail			Relays anomaly
	9				
	8	ENS-Vac-Fail			Voltage values measured by two processors differ
	7	ENS-Fac-Fail			Frequency values measured by two processors differ
	6	ENS-Zac-Fail			Impedance values measured by two processors differ
	5	ENS-Mess-Fail			Fac, Vac or Zac values measured by two processors differ
	4	Offset-Iac-Fail;			Measure of DC current injected into grid fault
	3	Zpv-PE-Fail			Insulation resistance between DC inputs and ground has a wrong value
	2	Vac-Master-Fail			Grid voltage value measured by master fail
	1				
8	16	VpvMax-Fail			Input voltage too high
	15	Test Fail			Self-test failed
	14	Temperature -Fail			Overtemperature
	13	Reserved			Reserved
	12	Bus-Fail			DC bus fail
	11	GFCI-Fail			Ground dispersion current is too high
	10	No-Utility			Grid voltage not present
	9	Delta Z Fault			Grid impedance variation of DeltaZ error
	8	Device Fault			Generic fault
	7	Bus_High-Fail			DC bus voltage too high
	6	Bus –Low Fail			DC bus voltage too low
	5	ENS-GFCI-Fault			Master and slave GFCI circuit readings differ
	4	ENS-DCI- Fault			Master and slave DC current injected into grid readings differ
	3	Ref 2.5V Fault			Internal 2.5V voltage anomaly
	2	DC Sensor Fault			DC current injected into grid sensor anomaly
	1	GFCI Failure			GFCI sensor failure
9	16	Spare			
	15				
	14				
	13				
	12				
	11	SYS_TMOUT	1.3.3	1.0.0.	Bit = 1; No communication with system board
	10	PowerReducer timeout	1.3.3	1.0.0	Bit = 1; Kit not connected or failure
	9	PowerReducer	1.3.3	1.0.0	Bit = 1; PowerReducer configured
	8	Remote control active	1.3.0	1.0.0	Bit = 1; Inverter is remotely controlled by VNC software
	7	ComEn Ethernet	1.2.5	1.0.0	Bit = 1: Ethernet port enabled for commands[2]
	6	ComEn RS232-2	1.2.5	No	Bit = 1: RS-232 port enabled for commands
	5	ComEn Slot 2	1.2.5	No	Bit = 1: Slot 2 enabled for commands
	4	ComEn Slot 1	1.2.5	No	Bit = 1: Slot 1 enabled for commands
	3	Reread static	1.2.5	1.0.0	Bit = 1: Static characterization registers changed.[3]

[2] These for bits are mutually exclusive. If all four bits are to zero, inverter is in “local mode” and doesn’t accept any command.
[3] Static characterization registers should be read again.

	2	Q_P Active	1.2.5	No	Bit = 1: Q(P) function is active
	1	Dc Box	1.2.5	No	Bit = 1; DC Box function active.

Measure registers map

Register	Name	Vers. Centr.	EVO EASY	Description	UNITA'
9÷10					
11	Temp	1.2.5	1.0.0	Inverter temperature (0.1 °C units)	0.1 °C
12	Vpv1	1.2.5	1.0.0	Voltage PV1 (0.1 V units)	0.1V
13	Vpv2	1.2.5	1.0.0	Voltage PV2 (0.1 V units)	0.1V
14	Vpv3	1.2.5	1.0.0	Voltage PV3 (0.1 V units)[4]	0.1V
15	Ipv1	1.2.5	1.0.0	Current PV1 (0.1 A units)	01.A
16	Ipv2	1.2.5	1.0.0	Current PV2 (0.1 A units)	0.1A
17	Ipv3	1.2.5	1.0.0	Current PV3 (0.1 A units)[4]	0.1A
18	Iac_R	1.2.5	1.0.0	R phase output current (0.1 A units)	0.1A
19	Iac_S	1.2.5	1.0.0	S phase output current (0.1 A units)	0.1A
20	Iac_T	1.2.5	1.0.0	T phase output current (0.1 A units)	0.1A
21	Vac_R	1.2.5	1.0.0	R phase output voltage (0.1 V units)	0.1V
22	Vac_S	1.2.5	1.0.0	S phase output voltage (0.1 V units)	0.1V
23	Vac_T	1.2.5	1.0.0	T phase output voltage (0.1 V units)	0.1V
24	Fac	1.2.5	1.0.0	Grid frequency (0.01 Hz units)	0.01Hz
25	Pac_R	1.2.5	1.0.0	R phase output power (10W units)	10W
26	Pac_S	1.2.5	1.0.0	S phase output power (10W units)	10W
27	Pac_T	1.2.5	1.0.0	T phase output power (10W units)	10W
28	Zac_R	No	No	R phase grid impedance	mΩ
29	Zac_S	No	No	S phase grid impedance	mΩ
30	Zac_T	No	No	T phase grid impedance	mΩ
31	E-Total H	1.2.5	1.0.0	Total output energy (high register) (0.1 KWh units)	0.1KW.Hr
32	E-Total L	1.2.5	1.0.0	Total output energy (low register)	0.1KW.Hr
33	h-Total H	1.2.5	1.0.0	Operation hours (high register)	Hr
34	h-Total L	1.2.5	1.0.0	Operation hours (low register)	Hr
35	Mode	1.2.5	1.0.0	Operating mode	
36	GVFaultValue	No	No	Value of the grid voltage in the moment of fault	0.1V
37	GFFaultValue	No	No	Value of the grid frequency in the moment of fault	0.01Hz
38	GZFaultValue	No	No	Value of the grid impedance in the moment of fault	0.001Ω
39	TmpFaultValue	No	No	Value of the temperature in the moment of fault	0.1 °C
40	PVFaultValue	No	No	Value of the PV voltage in the moment of fault	0.1V
41	GFCIFaultValue	No	No	Value of the dispersion current in the moment of fault	0.001A
42	PowReactive R	1.2.5	1.0.0	R phase reactive power (0.01 KVAR units)	10 VAR
43	PowReactive S	1.2.5	1.0.0	S phase reactive power (0.01 KVAR units)	10 VAR
44	PowReactive T	1.2.5	1.0.0	T phase reactive power (0.01 KVAR units)	10 VAR
45	Probe1value	1.2.5	No	Probe 1 value	Decimi
46	Probe2value	1.2.5	No	Probe 2 value	Decimi
47	Probe3value	1.2.5	No	Probe 3 value	Decimi
48	Probe4value	1.2.5	No	Probe 4 value	Decimi[5]
49	DAILY_ENERGY_H	1.2.5	1.0.0	Daily energy (high register) (0.1 KWh units)	0.1 KWh

[4] When not in use, 0xFFFF is the value of the measure.

50	DAILY_ENERGY_L	1.2.5	1.0.0	Daily energy (low register)	0.1 KWh
51	MAX_PERC	1.2.6	No	Maximum power deliverable (in %)	%
52	RES_ISOL_PV	1.3.0	No	PV resistance vs ground.	KΩ
53	PV_VOLT_UMB	1.3.0	No	DC voltage imbalance vs. ground	%

Identification register map

Register	Name	Vers. Centr.	EVO EASY	Description
73÷79				
80	Phase number	1.2.5	1.0.0	0031h: 1-phase / 0033h: 3-phase
81÷83	VA rating	1.2.5	1.0.0	1KVA = '30h 30h 31h 30h 30h 30h', 3KVA= '30h 30h 33h 30h 30h 30h'
84÷85	Nom_Vpv	1.2.5	1.0.0	PV nominal voltage: example 360.0V= '33h 36h 30h 30h' (0.1 V units)
86÷88	Firmware Ver.	1.2.5	1.0.0	Firmware version; example '01.00' = '30h 31h 2Eh 30h 30h'
89÷96	Serial number	1.2.5	1.0.0	
97÷104	Model Name	1.2.5	1.0.0	
105÷112	Manufacturer	1.2.5	1.0.0	

Command register map

Register	Name	Vers. Centr.	EVO EASY	Description	
113	Cmd_code	1.2.5	1.0.0	Command code register Supported commands: 40 (0x0028): Reset E-total and h-Total record 50 (0x0032): Apply power reducer settings 60 (0x003C) Reserved 61 (0x003D) Reserved	
114					
115					
116					
117	Cmd_res	1.2.5	1.0.0	0x0000+Cmd_code	Command is executing
				0x0100+Cmd_code	Command is wrong or Power Reducer parameters are wrong or Q and CP have been enabled together.
				0x0200+Cmd_code	The command is not managed from this inverter
				0x0400+Cmd_code	The command has been executed, but with possible local restrictions.
				0x0F00+Cmd_code	The command has been executed
118					

Utility register map

Register	Name	Vers. Centr.	EVO EASY	Description
119	Correct_msg	1.2.5	1.0.0	Number of messages correctly processed
120	Err_msg	1.2.5	1.0.0	Number of messages not correctly processed
121÷128				
129	Fw_ver	1.2.5	1.0.0	Firmware version – 120 stands for 1.2.0
130÷140				

Power reducer register map

Register	Name	Vers. Centr..	EVO EASY	Description	Numeric Range
141	M1/M0	1.2.5	1.0.0	Validation mask (big endian) for commands and parameters of registers 142÷157. Bit = 1, register is valid. Il bit 0 is for register 142; Il bit 5 is for register 147;	
142	P	1.2.5	1.0.0	Power reduction [0%÷100%]	[0÷100][6]
143	Q	1.2.5	1.0.0	Reactive power generation [-100%;+100%]	[0÷200][7]
144	CP	1.2.5	1.0.0	Cos(phi) working value with precision 0.01, valid in interval [-0.99;-0.7]U[0.7;1]	[1÷200][8]
145	CO	1.2.5	1.0.0	Command 0x0001=Turn off inverter 0x0002=Turn on inverter	
146	RU	1.2.5	1.0.0	Ramp up of power gradient [0%÷100%]	[0÷100][6]
147	RD	1.2.5	1.0.0	Ramp down of power gradient [0%÷100%]	[0÷100][6]
148	BP	1.4.1	No	Battery power	[0÷200][7]
149÷157					

How power reducing is managed by Modbus

The procedure for setting of parameters and/or execution of commands should be the following:

1. The Modbus master executes one or more write operations (with both single or multiple registers write) on registers from 141 to 147
2. The Modbus master writes code 50 (0x0032) in register 113. When the inverter receives this command, it makes the parameters operative.
3. The Modbus master can read register 117, checking the result.

Notice:

i. The register 141 it's the bitmask that enables the parameters, as reported in the table
ii. The register write on register 113 could be disabled if a local or remote operator has disabled this function on purpose. This status can be read in bit 0 of register 8. In any case, if the write operation is inhibited, every attempt to write register 113 will lead to a value of 0x8032 in register 117

[6] 0 = 0%, 100 = 100%
[7] 0 = -100%,100 = 0%, 200 = 100%
[8] 1 = -0.99 … 199 = 0.99, 200 = 1.00

Date/Time register map

Register	Name	Vers. Centr.	EVO EASY	Description
161	YEAR	1.2.6	1.0.0	Year[9]
162	MONTH	1.2.6	1.0.0	Month
163	DAY	1.2.6	1.0.0	Day
164	HOUR	1.2.6	1.0.0	Hour
165	MINUTE	1.2.6	1.0.0	Minute
166	SECOND	1.2.6	1.0.0	Second

These values can be written with function 0x10 only; they can't be read[10].

Autoconsumo[11] register map

Register	Name	Vers. Centr.	EVO EASY	Description
201	LOAD_POWER_1	1.3.3	1.0.0	Autoconsumo kit, phase 1 (100W unit)
202	LOAD_POWER_2	1.3.3	1.0.0	Autoconsumo kit, phase 2 (100W unit)
203	LOAD_POWER_3	1.3.3	1.0.0	Autoconsumo kit, phase 3 (100W unit)

Daily Data[12] register map

Register	Name	Vers. Centr.	EVO EASY	Description
501	DAILY-1	1.2.5	1.0.0	First value of average power of the current day (10W unit)
…	…			…
703	DAILY-203	1.2.5	1.0.0	Last value of average power of the current day (10W unit)

Every register contains the average power (on 5 minutes), starting from 5:05 up to 21:55.

[9] In the form 0014 for 2014.
[10] Date/time values must be written in a single write. Date/time are applied instantly.
[11] "Autoconsumo" is a word that refers to a set of rules of the spanish market; using an external measure in a special kit as a reference, the inverter can deliver only the power requested by the load.
[12] Modbus/TCP only

Characterization register map

Register	Name	Vers. Centr.	EVO EASY	Description
801	INVTYPE	1.2.5	1.0.0	Lower nibble: HHV/HV/Standard Standard=1, HV=2, HHV=3 bit 15 (0x8000) = 1 -> Transformer. bit 14 (0x4000) = 1 -> Easy/Evo Model bit 13 (0x2000) = 1-> Battery charger
802	AC_PRO	1.2.5	No	Active probes, lower nibble, bit = 1, active probe
803-818	P1_UNIT	1.2.5	No	Probe #1 identification string
819-834	P2_UNIT	1.2.5	No	Probe #2 identification string
835-850	P3_UNIT	1.2.5	No	Probe #3 identification string
851-866	P4_UNIT	1.2.5	No	Probe #4 identification string
867	P1_MAX	1.2.5	No	Maximum value of probe #1
868	P2_MAX	1.2.5	No	Maximum value of probe #2
869	P3_MAX	1.2.5	No	Maximum value of probe #3
870	P4_MAX	1.2.5	No	Maximum value of probe #4
871	KPV_AC	1.2.5	No	Value of Kpv/Ac (%)

DC-box register map

Register	Name	Vers. Centr.	EVO EASY	Description
901	NUM_DC	1.2.5	No	Number of Dc-box configured.[13]
902	DC_A1M1	1.2.5	No	First current of first module[14] (0.1A units)
903	DC_A2M1	1.2.5	No	Second current of first module (0.1A units)
…	…	1.2.5	No	…
909	DC_A8M1	1.2.5	No	Eight current of first module (0.1A units)
910	DC_A1M2	1.2.5	No	First current of second module (0.1A units)
…	…	1.2.5	No	…
917	DC_A8M2	1.2.5	No	Eight current of second module (0.1A units)
918	DC_A1M3	1.2.5	No	First current of third module (0.1A units)
…	…	1.2.5	No	…
925	DC_A8M3	1.2.5	No	Eight current of third module (0.1A units)
926	DC_A1M4	1.2.5	No	First current of fourth module (0.1A units)
…	…	…		…
933	DC_A8M4	1.2.5	No	Eight current of fourth module (0.1A units)
934	DC_ALM1	1.2.5	No	Alarms of first module[15]
935	DC_ALM2	1.2.5	No	Alarms of second module
936	DC_ALM3	1.2.5	No	Alarms of third module
937	DC_ALM4	1.2.5	No	Alarms of fourth module
938	DC_W1M1	1.2.5	No	First weight of first module (%)
939	DC_W2M1	1.2.5	No	Second weight of first module (%)
…				
945	DC_W8M1	1.2.5	No	Eight weight of first module (%)
946	DC_W1M2	1.2.5	No	First weight of second module (%)
…				
953	DC_W8M2	1.2.5	No	Eight weight of second module (%)
954	DC_W1M3	1.2.5	No	First weight of third module (%)
…				
961	DC_W8M3	1.2.5	No	Eight weight of third module (%)
962	DC_W1M4	1.2.5	No	First weight of fourth module (%)
…				
969	DC_W8M4	1.2.5	No	Eight weight of fourth module

[13] The number of modules ranges from 1 to 4. The maximum number of measures is 32, 8 for each module.
[14] If the value is positive, it's a valid measure. If the value is 0xFFFF, the measure belongs to a non-configured module; if the measure belongs to a configured module, but it's in timeout, the value is 0xFEFE.
[15] If the value is zero, there are no alarms on the corresponding module. If the value is different from zero, please contact Service.

Measures

Register	Bit	Name	Description	Units
20		I_String_1	String current, input 1	0.1 A
21		I_String_2	String current, input 2	0.1 A
22		I_String_3	String current, input 3	0.1 A
23		I_String_4	String current, input 4	0.1 A
24		I_String_5	String current, input 5	0.1 A
25		I_String_6	String current, input 6	0.1 A
26		I_String_7	String current, input 7	0.1 A
27		I_String_8	String current, input 8	0.1 A
28				
29				
30				
31				
32				
33				
34				
35				
36		V_REF	Reference voltage	0.001 V
37		V_IN	Input voltage	0.1 V
38		Analog1	Generic analog	
39		Analog2	Generic analog	
40		HwConfig	(Internal use)	
41		Temp1	Probe 1 temperature	0.1 K
42		Temp2	Probe 2 temperature	0.1 K
43		4_20MA low[16]		0.001 mA
44		4_20MA high		
45		0_10V low		0.001 V
46		0_10V high		
47				
48				
49				
50		Dip-switch	dip-switch reading	Lower 8 bits
51		Generic I/O	I/O generic reading	Lower 8 bits
52		NumAlarms	Number of alarms	N in [0:65535]
53				
54				
55				
56				
57				
58				
59				

[16] The values of the two probes are transmitted on two words.

TECHNICAL DATA

NETWORK CABLE

To connect the device to the Ethernet (10Base-T) or Fast Ethernet (100Base-T) network, a UTP (Unshielded Twisted Pair) or STP (Shielded Twisted Pair) cable with RJ45 connectors is required. The cable must conform to the standard IEEE 802.3u 100Base-T with 2 pairs of UTP cables of category 5 or higher. The cable between the adaptor and the hub must not be more than 100m and not less than 2.5m.

OPERATING AND STORAGE CONDITIONS

Operating temperature range	[°C]	0 ÷ +40
Storage temperature range	[°C]	-5 ÷ +50
Maximum operating relative humidity	[%]	80
Maximum storage relative humidity	[%]	90

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