

• 15P4600B100 •

BRIDGE MINI

ALL-IN-ONE DATALOGGER, DATA CONCENTRATOR, REMOTE CONNECTOR SOLUTION

USER MANUAL

Issued on 01/06/2018

R.01

English

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The Manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
- Enertronica Santerno S.p.A. is responsible for the device in its original setting.
- Any changes to the structure or operating cycle of the device must be performed or authorized by Enertronica Santerno S.p.A..
- Enertronica Santerno S.p.A. shall hold no responsibilities for any consequences caused by use of non-original spare-parts.
- Enertronica Santerno S.p.A. reserves the right to make any technical changes to this manual and to the device without prior notice. If printing errors or similar are detected, the corrections will be included in the new releases of the manual.
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Enertronica Santerno S.p.A.
Via della Concia, 7 - 40023 Castel Guelfo (BO)
Tel. +39 0542 489711 - Fax +39 0542 489722
santerno.com monitoring@santerno.com

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1. INTRODUCTION

Bridge Mini is a datalogger, designed for remote monitoring and assistance purposes, offering features such as the acquisition of measures and indicators, the graphical representation of energy production patterns, the upgrade of the connected inverter firmware and the log download, with a simple browser web interface.

Bridge Mini can manage devices of any brand and model, using standard IoT protocols and industrial protocols.

Compact and performing, it is available in two variants:

- Embedded: mounted inside a Santerno inverter and powered directly by the inverter itself, thus offering maximum convenience and an easy installation.
- Stand-alone: with DIN support.

Bridge Mini may be interconnected with the plant devices through two serial connections (RS485 ports), called COM1 and COM2 and an Ethernet port. Also, it allows to connect USB flash drives to download the logs.

It is connected to the Santerno Cloud through secure and encrypted connections through the Internet, to allow remote monitoring and remote assistance.



Figure 1: Bridge Mini Embedded



Figure 1 bis Bridge Mini Stand alone

There are various types of Bridge Mini, different per processor, RAM quantity and with integrated Wi-Fi.

2. ELECTRICAL AND MECHANICAL INTERFACE

2.1. Pinout of the serial port COM1 and COM2

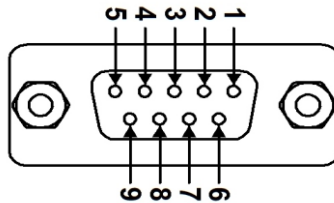


Figure 2 Serial port pinout

	COM 1	COM 2
+	pin 1	pin 1
-	pin 2	pin 2
GND	pin 5	pin 5

Terminators and polarisers can be configured for each serial port via dip switches.

- For the COM1, the dip switch SW2 is visible above the CN6 connector
- For the COM2, the dip switch SW1 is visible above the CN2 connector

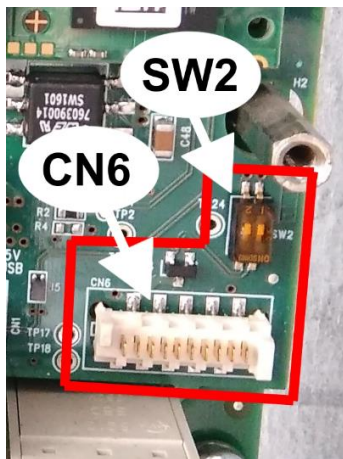


Figure 3 Configuration of the dip switch CN6-COM1

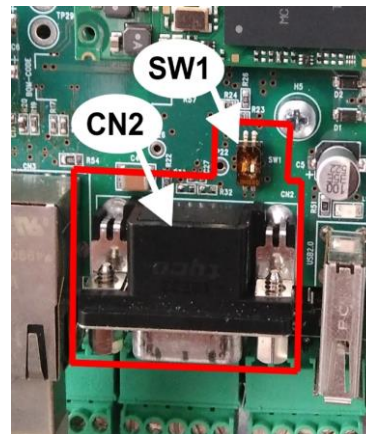


Figure 4 Configuration of the dip switch CN2-COM 2

The dip switches are:

DP switch	Function
1,2 [ON]	Terminator and polarizer active
1,2 [OFF]	Terminator and polarizer not active

Variants of this conFiguretion are not allowed.

When the termination is active, a 120 Ω resistance is inserted between the two signal lines of the RS485 port.

2.2. Installation

2.2.1. DIN-Rail mounting

Bridge Mini can be inserted on a DIN-Rail, placed on the back, which allows an easy hooking in any position of the cabinet.

To release Bridge Mini, push the tab and release the handle so that it clicks into place.

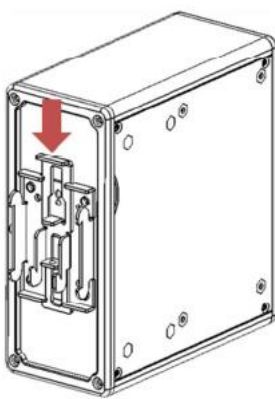


Figure 3 DIN-rail mounting

2.2.2. Direct mounting onto a Santerno inverter

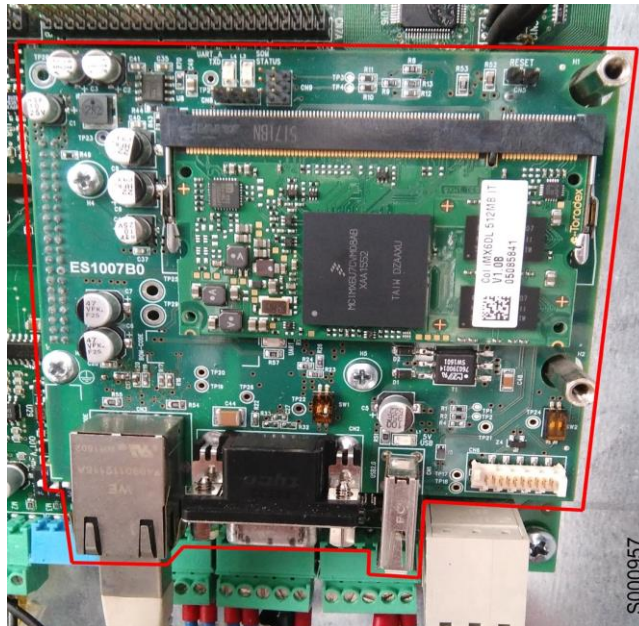


Figure 4 Embedded installation

Bridge Mini Embedded can be directly installed onto a Santerno inverter. The board is connected to the inverter control board (either a ES821 or a ES927) via the slot B, through the strip connection and fixed on the dedicated support.

Refer to the inverter's hardware manual for more information on mounting and power supply.

2.2 POWER CONNECTION DIAGRAM

2.2.3. Embedded power connection

It's directly connected to the inverter, so it doesn't need an external power supply.

2.2.4. Stand-alone power connection

The supply voltage for the stand-alone Mini Bridge is 24 V.

2.3 COMMUNICATIONS PORTS

Bridge Mini has:

- an Ethernet port
- an isolated RS485 port
- a serial port RS485
- an USB port

2.2.5. Ethernet Port

The Ethernet port, or LAN port, is a communication port which may be configured to work with either a static or a dynamic IP address. Integrated web interface is available through this port. Default configuration is static, with IP 10.16.0.254, netmask 255.255.0.0.

2.2.6. Serial ports

The two RS485 serial ports are used to acquire data from devices via Modbus RTU protocol. Bridge Mini is the Modbus master.

2.2.7. USB port

The USB port has two main purposes:

- communication: a USB/RS485 or USB/RS232 converter may be used. The drivers currently pre-installed are "Prolific" and "FTDI"
- service: the USB port allows performing application updates; this functionality is allowed to authorized Service personnel only.

3. BENEFITS

3.1.1. Datalogging

The main featured implemented by the Bridge Mini is the device logging.

Once configured, the datalogger will cyclically read from every logged device. Log records are regularly saved to file, default every 5 (five) minutes.

The log files are rotated and compressed daily: this means that a new log file is created every day, whilst the log file relating to the day before is saved in .zip format.

The available logging space is enough for a time span of several months, based on the number of devices that are logged at the same time. When the logging space is running out, Bridge Mini deletes the oldest files; in order not to lose data, it is recommended that the logs be periodically downloaded to a different PC.

3.1.2. Data concentrator

Bridge Mini is also a data concentrator: this means that any data item is stored to an internal cache until it is replaced by a new data item.

This operating mode is devised for integrated systems with external SCADAs performing high frequency queries; they are always returned the stored value and are not enabled for the readout of the actual device, in order to ensure the maximum throughput and the minimum latency for the external queries.

The protocol to be used for this service is the Modbus TCP/IP, using the proper commands depending on the device to query. Please refer to the Data Refresh Rate and External Queries section for further details.

3.1.3. Data proxying

Once the devices to be logged have been configured on Bridge Mini, this will act as a Modbus “router”, propagating read and write instances to the physical devices.

This service also enables local or remote changes to all the parameters of all the devices configured on Bridge Mini.

3.1.4. Download dei log

The datalogger is also a standard FTP server. The user and password to enter are “logreader”; you can use a popular FTP client (e.g. Filezilla) to easily download the stored logs.

3.1.5. Inverter Firmware Upgrade

The inverter firmware upgrade in local and/or remote mode is allowed to Santerno personnel only.

Each case is different and separate, we evaluate the feasibility case-by-case.

4. WEB INTERFACE

Data display and datalogger configuration is made available by a safe and handy web interface.

4.1.1. Login

The web interface allows configuring the datalogger and viewing its contents. You just need a browser to carry out any operation.

Please follow this procedure to access the web interface the first time:

- 1) configure your PC with a static IP, compatible with the network, example 10.16.0.10, with netmask 255.255.0.0 and connect it with an ethernet cable to the Bridge Mini LAN port.
- 2) Launch a browser, for example Firefox, and enter “https://10.16.0.254” in the address bar, press “Enter”, ignore the self-signed certificate warning and press “Enter” again.

The following mask appears:

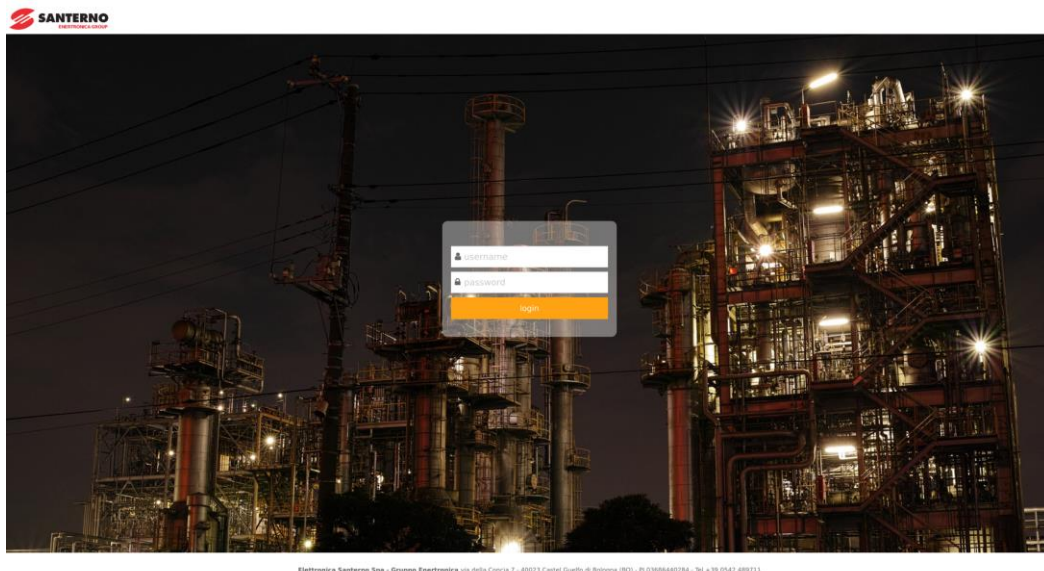
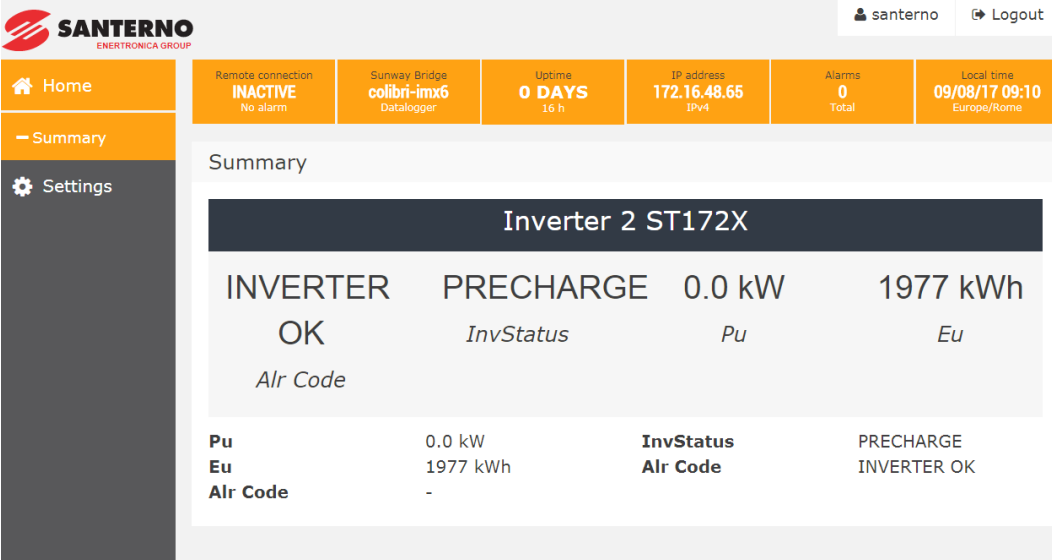


Figure 5 Login page

- 3) Enter “user” as the username and “user” as the password to log in.

4.2. Home

In this page all the useful information of the logged devices is shown.



The screenshot shows the Bridge Mini Home page interface. At the top, there is a navigation bar with the SANTERNO logo and user information (santerno, Logout). Below this is a summary row with six status indicators: Remote connection (INACTIVE), Sunway Bridge (colibri-1mx6), Uptime (0 DAYS), IP address (172.16.48.65), Alarms (0), and Local time (09/08/17 09:10). A left sidebar contains navigation options: Home, Summary, and Settings. The main content area displays a 'Summary' section for 'Inverter 2 ST172X' with a table of key metrics and their current values.

Inverter 2 ST172X			
INVERTER	PRECHARGE	0.0 kW	1977 kWh
OK	<i>InvStatus</i>	<i>Pu</i>	<i>Eu</i>
<i>Alr Code</i>			
Pu	0.0 kW	InvStatus	PRECHARGE
Eu	1977 kWh	Alr Code	INVERTER OK
Alr Code	-		

Figure 6 Home page Bridge Mini

4.3. Settings

Bridge Mini settings contain several pages:

- a) Measurements
- b) Time
- c) Network
- d) NTP
- e) Serial Ports
- f) VPN

4.3.1 Devices

This page shows the list of configured devices and lets the user to add or to remove them. For each device Virtual ID, Modbus ID, connection protocols, Endpoint, Model, and Storage parameters should be set. The picture below gives an example.

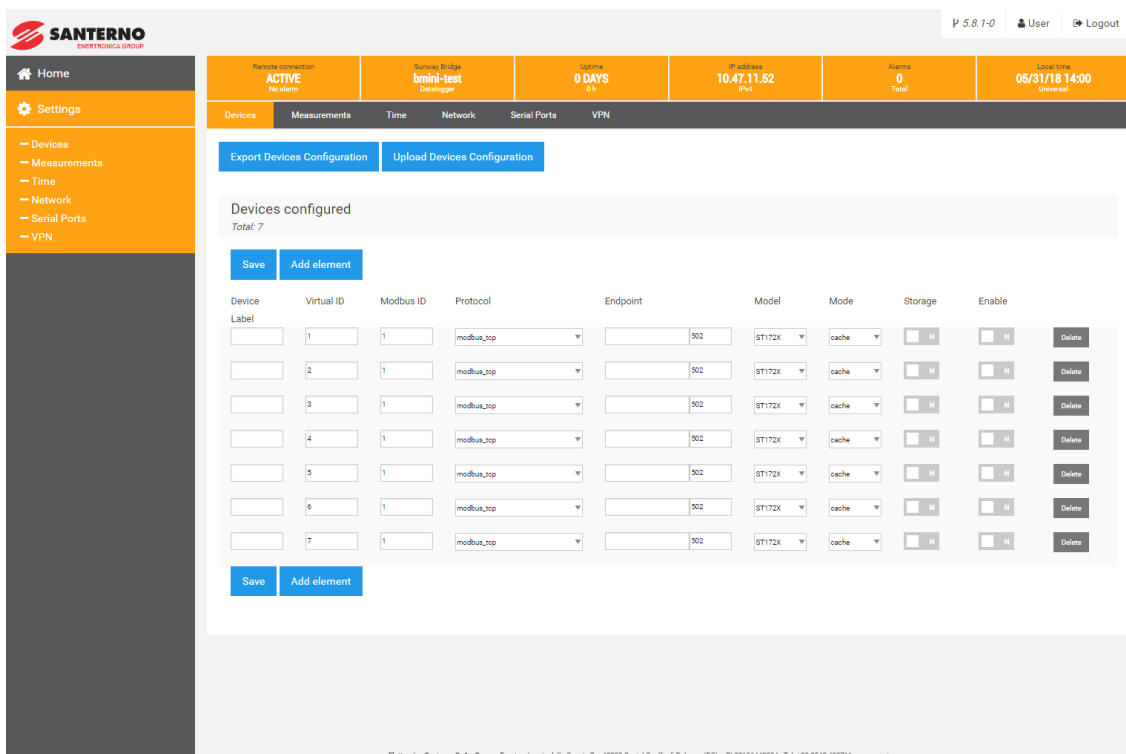


Figure 7 Device page

Device Label: It is possible to add the name of the logged device, for example: INV 23, QF105X.

Virtual ID: since the data logger is a data concentrator, the virtual ID corresponds to the “logical” ID Modbus that uniquely identify any device configured in the data logger. This ID is the ID external Modbus client must use to communicate

Modbus ID: the physical Modbus ID of the device

Protocol: In this list it's possible to choose between three variants:

Modbus rtu: In order to use this protocol, please fill the serial port details in the appropriate page.

Modbus tcp: It's similar to the rtu protocol but it uses Ethernet and transmits within TCP / IP, so the device IP address is needed

Modbus Santerno: This is a proprietary communication protocol and should not be used for monitoring purposes

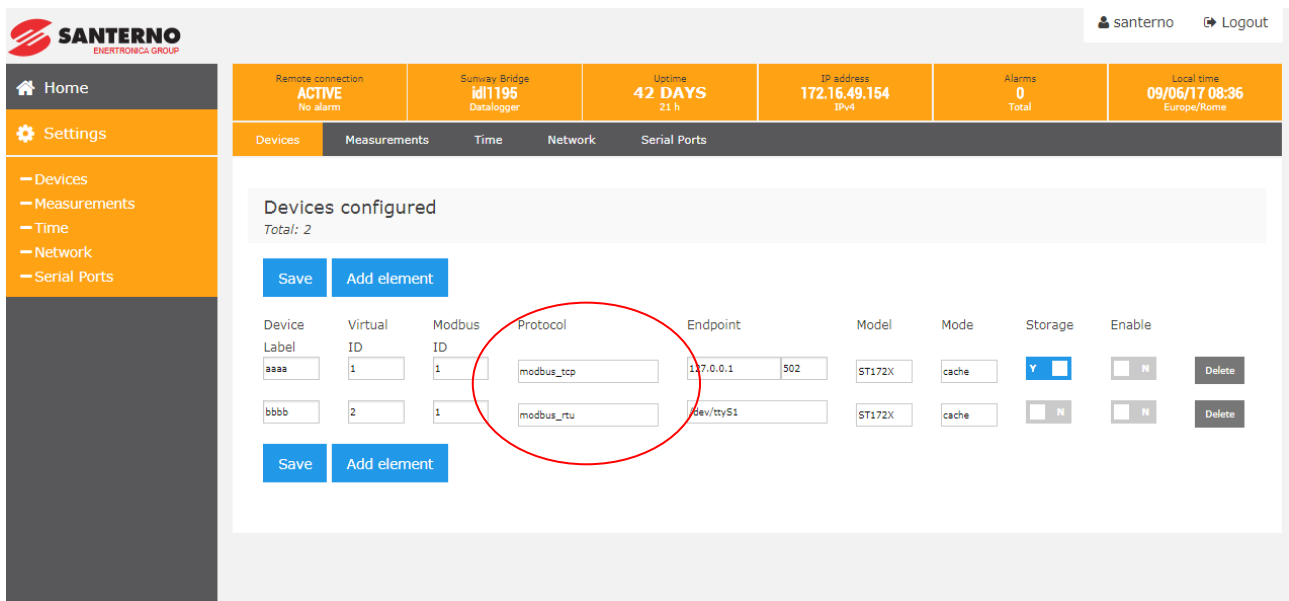


Figure 8 Device configuration

Endpoint: In this space it's possible to insert the serial port (defined in serial ports) or define an IP and a tcp port. To select the right serial port, please use:

- /dev/ttyxc0, COM2, that is the serial port with DB9 connector
- /dev/ttyxc1, COM1, that is the serial port with the fault serial cable
- /dev/ttyxc2, the serial port used by Bridge Mini Embedded to communicate with the inverter it's mounted onto

Model: Device profile, which contains all the variables

Mode: It is possible to choose between: Gateway and Cache.

If gateway is selected all the incoming requests will be routed to the target devices, synchronously, and returned to the client. With cache mode, Bridge Mini will return the last valid data available in its memory.

Storage: For each component it is possible to historicize the data logged by the device.

Enable: Enable or disable the device logging and external request management.

4.3.2 Measurements

When all the devices are defined, this page allows to select the measurements to be acquired.

In each device there may be Alarm, Logs and Warnings categories. By selecting the measure, its panel changes color, going from gray (non-logged measurement) to green or red. On the top-right page it's possible to add all measurements, deselect and enter a refresh time to all of them.

Measurements

Save

Inverter 2 : 2
selected measures: 5

[Select All](#)
[Deselect All](#)
[Set refresh time](#)

alarms

M090

Alr Code

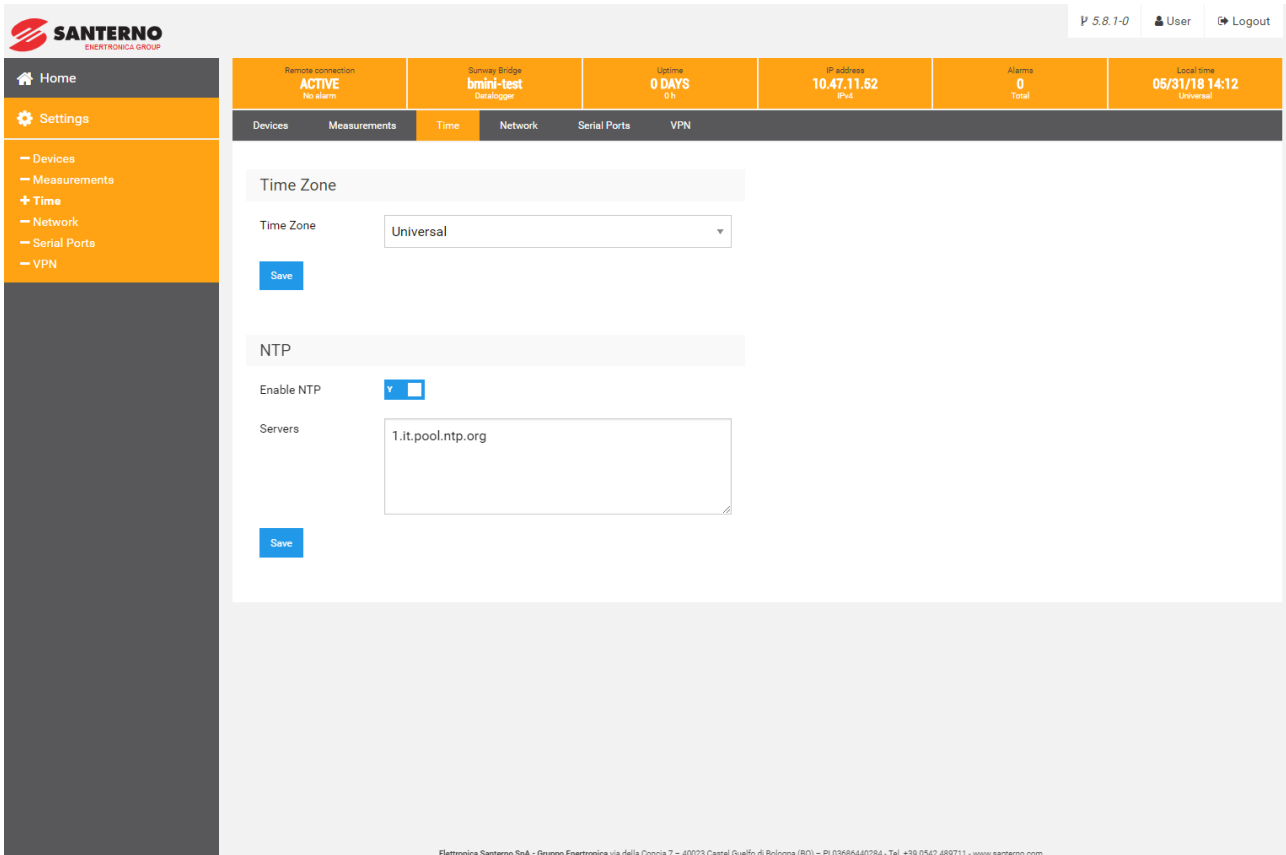
logs

M130 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M089 <input style="width: 20px; text-align: center;" type="text" value="2"/>	M000 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M001 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M002 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M003 <input style="width: 20px; text-align: center;" type="text" value="2"/>
der_status	InvStatus	Vf_Ref R	Freq	Cosfi	Pu
M004 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M006 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M007 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M009 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M010 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M011 <input style="width: 20px; text-align: center;" type="text" value="60"/>
Qu	Vi	Vu	Iu	Vdc	Idc
M012 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M013 <input style="width: 20px; text-align: center;" type="text" value="2"/>	M015 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M090 <input style="width: 20px; text-align: center;" type="text" value="2"/>	M097 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M098 <input style="width: 20px; text-align: center;" type="text" value="60"/>
Pdc	Eu	En2	Alr Code	LimitT.	OT.
M099 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M008 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M021 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M022 <input style="width: 20px; text-align: center;" type="text" value="60"/>	M023esa <input style="width: 20px; text-align: center;" type="text" value="60"/>	M023esb <input style="width: 20px; text-align: center;" type="text" value="60"/>
ST.	Iinv	wng_system	wng_system	Id	Iq

Figure 9 Measurements configuration

4.3.3 Time Zone

Here it's possible to set the correct Time Zone where the system is located. NTP is used to synchronize the internal clock with Santerno cloud. The user may specify other NTP servers.



The screenshot displays the Santerno web interface for configuring the Time Zone and NTP settings. The interface includes a top navigation bar with the Santerno logo, version 5.8.1-0, and user information. A dashboard at the top shows system status: Remote connection (ACTIVE), Summary Bridge (bmini-test), Uptime (0 DAYS), IP address (10.47.11.52), Alarms (0 Total), and Local time (05/31/18 14:12). Below this is a menu with options: Devices, Measurements, Time (selected), Network, Serial Ports, and VPN. The main content area is divided into two sections: 'Time Zone' and 'NTP'. In the 'Time Zone' section, there is a dropdown menu set to 'Universal' and a 'Save' button. In the 'NTP' section, there is a checkbox for 'Enable NTP' which is checked, and a text input field containing '1.it.pool.ntp.org' with a 'Save' button below it. At the bottom of the page, there is a footer with contact information for Elettronica Santerno SpA.

Figure 10 Time zone configuration

4.3.4 Network

The user can change the ethernet port and the DNS settings in the network configuration page. With DHCP mode, Bridge Mini will try to get the network configuration automatically from a local DHCP server. To ensure the right functionality, this server must provide the local gateway and DNS as well.

With static mode, all the fields must be filled manually.

Please, make sure to have a continuous Internet connection available to guarantee a constant time alignment with Santerno cloud; this ensures maximum accuracy in log records.

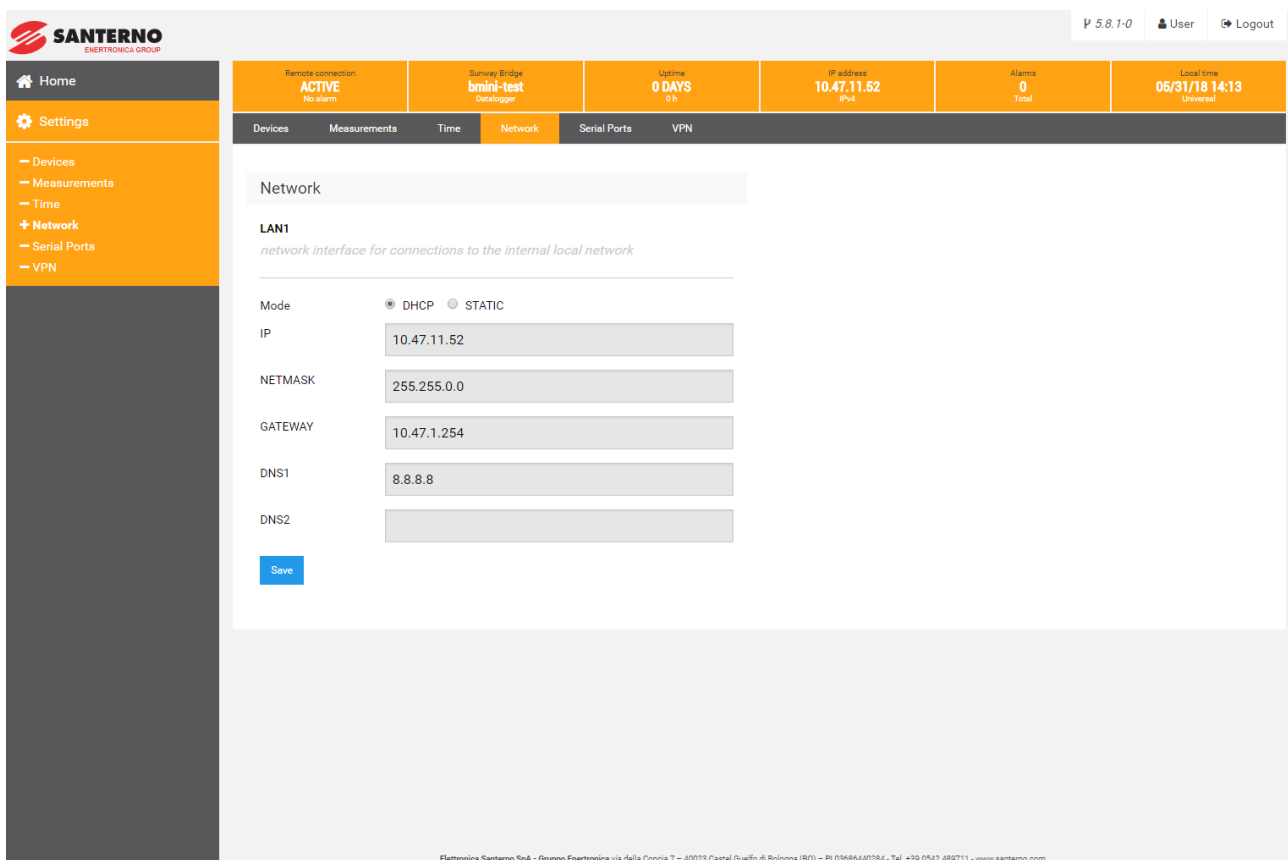


Figure 11 Networking page configuration

The default configuration for the Ethernet port is IP 10.16.0.254, netmask 255.255.0.0.

4.3.5 Serial Ports

In this page it is possible to configure the serial ports communication details.

The "Master" flag must be enabled for all the ports the Bridge may use to acquire data via Modbus RTU protocol.

You may use:

- /dev/ttyMC0, COM2, that is the serial port with DB9 connector
- /dev/ttyMC1, COM1, that is the serial port with the flat serial cable
- /dev/ttyMC2, the serial port used by Bridge Mini Embedded to communicate with the inverter it's mounted onto

Serial Ports
Total: 1

Serial Port	Baudrate	Databits	Stopbits	Parity	Read Timeout	Write Timeout	Master	
<input type="text" value="/dev/ttyS1"/>	<input type="text" value="38400"/>	<input type="text" value="8"/>	<input type="text" value="2"/>	<input type="text" value="N"/>	<input type="text" value="0.4"/>	<input type="text" value="0.4"/>	<input checked="" type="checkbox"/>	<input type="button" value="Delete"/>
<input type="button" value="Save"/> <input type="button" value="Add element"/>								

Figure 12 Serial Ports configuration

4.4 Alarms

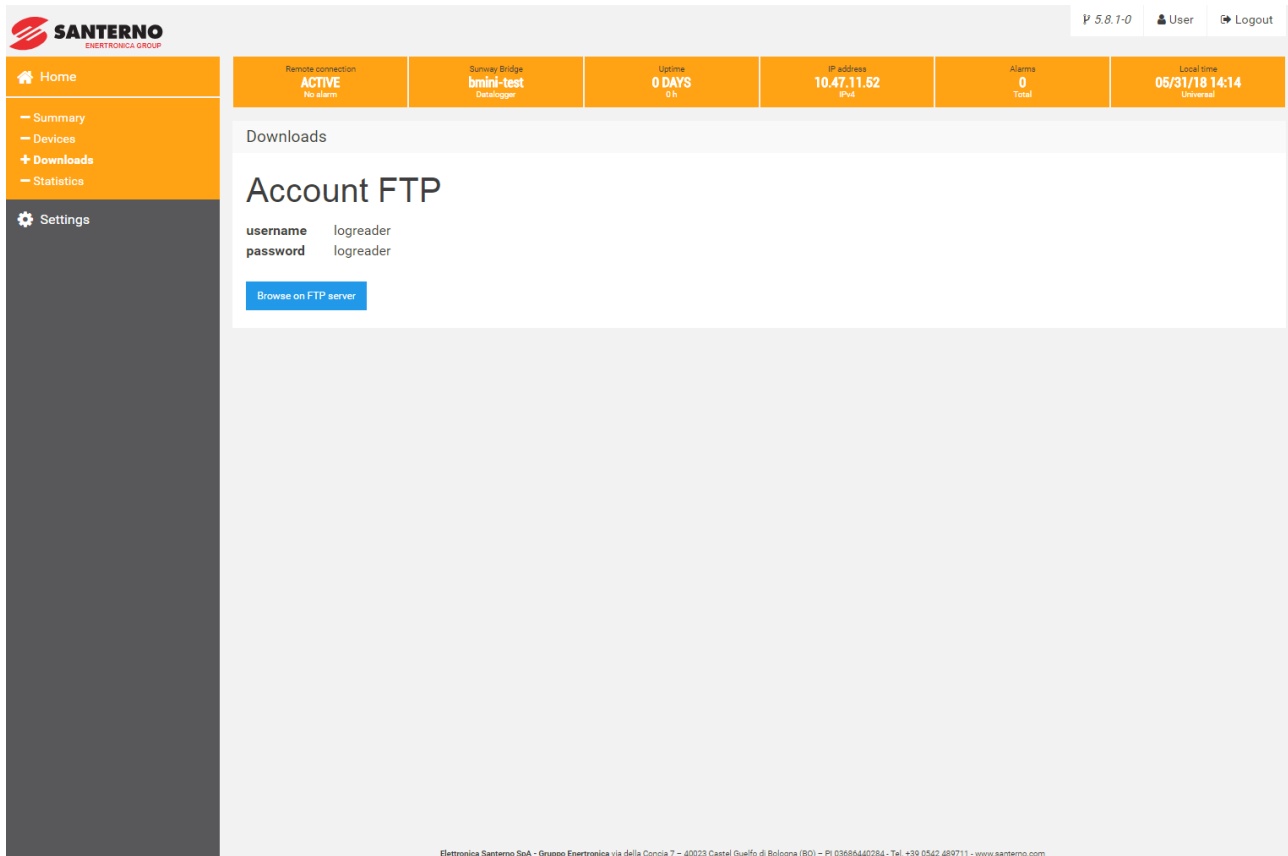
This page summarizes the events currently active on the logged devices. Each active alarm will be described on this page in order to allow a fast intervention.

It is also reported if the inverters are offline or have anomalies.

4.5 Downloads

This page shows the link to the FTP site provided by the Bridge Mini: just click the Downloads menu to be redirected to the logs, that can be downloaded from the browser as well.

An external client is recommended for quicker download. (for example FileZilla).



The screenshot shows the Bridge Mini web interface. At the top, there is a status bar with the SANTERNO logo, version 5.0.7-0, and user information. Below this is a navigation menu with options: Home, Summary, Devices, Downloads (highlighted), and Statistics. A settings gear icon is also visible. The main content area displays 'Downloads' and 'Account FTP' with the following details:

Remote connection	ACTIVE No alarm	Survey Bridge	bmini-test Data logger	Uptime	0 DAYS 0 h	IP address	10.47.11.52 IPv4	Alarms	0 Total	Local time	05/31/18 14:14 Universal
-------------------	--------------------	---------------	---------------------------	--------	---------------	------------	---------------------	--------	------------	------------	-----------------------------

Account FTP details:

```
username logreader
password logreader
```

A button labeled 'Browse on FTP server' is present below the details.

At the bottom of the page, there is a footer with contact information: Elettronica Santerno SpA - Gruppo Enertronica via della Concia 7 - 40023 Castel Guelfo di Bologna (BO) - PI 03686440284 - Tel. +39 0542 489711 - www.santerno.com

Figure 13 Download page

4.6 Statistic

In this sub-menu there is the statistical summary of all the Bridge read and write communications.

5. REMOTE MONITORING

5.1. Santerno.io

santerno.io is an IoT platform that allows to monitor in real time all the data in the plant. The monitoring is continuous and granular, with a system of personalized alarms and dedicated dashboard. The portal makes use of the concepts of Industry 4.0, for instance smart production and smart services, and thus creating system more performing. Santerno,.io is designed to monitoring and control all types of plants: industrial, photovoltaic, HVAC, water management and electric recharger. A system diagram constantly photographs the situation of the components, each variation corresponds to a color and a code that describes the situation in real time.

Log in <https://santerno.io/> and enter with your own and secure username and password.

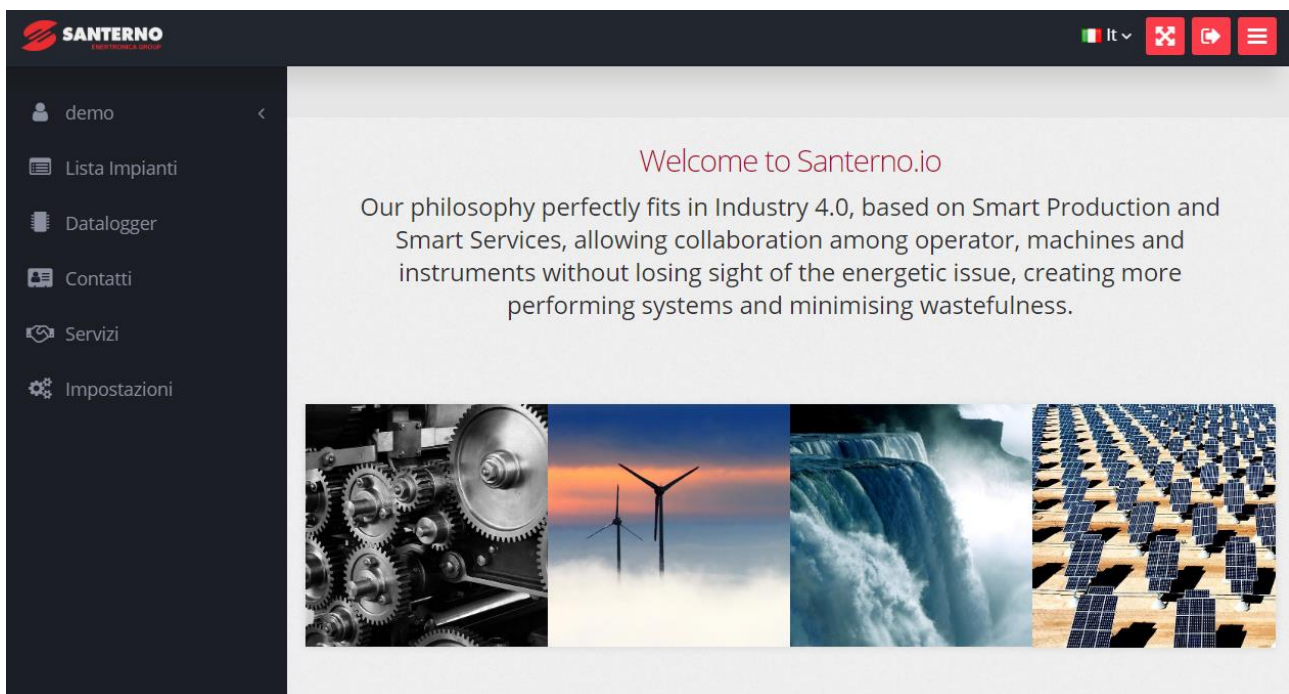


Figure 14 Home page sito Santerno.io

6. SERVICES

6.1 Prerequisites for Remote Communications

In order to guarantee a correct connectivity to the Santerno Cloud, following rules are to be used:

- minimum bandwidth must be 64 kbit/s, that is the GPRS bandwidth. However, if possible, Santerno suggests adopting a > 200 kbit/s bandwidth to ensure a smooth data sending and remote assistance. Any internet connection can be used: GPRS, 3G-4G, ADSL, Fiber Optic, SAT, Wimax.
- Bridge Mini makes use of outgoing TCP/UDP connections only, towards public networks 217.19.155.64/28 and 185.96.206.128/27, so in case firewall rules must be updated accordingly
- DNS and NTP protocols must not be filtered (since public servers may be used)
- In case a private DNS is configured, names resolving in private network must be allowed (ie networks 192.168.0.0/16, 172.16.0.0/12 and 10.0.0.0/8)
- Proxy connections are not supported

Using private network 10.0.0.0/8, even if used with smaller net masks, is forbidden in order to avoid conflicts with the remote networks used by Santerno remote monitoring services.

Failure to do so will affect the full functionality of the device. Please contact Enertronica Santerno S.p.A. if using private network 10.0.0.0/8 is required.

6.2 Remote Connection Security

The datalogger is a client, so no input port is required on the plant, thus ensuring maximum safety.

The physical login is protected by the SSH protocol. The access privileges are granted to Santerno Engineering staff only.

Every communication instance begins an SSL session with bidirectional certificate authentication and renegotiates a 128-bit BF-CBC key every hour; SHA1 is the hash used for every HMAC authentication.

Forwarding between Ethernet interfaces is disabled to ensure that Santerno personnel is forbidden to access the customer's LAN.

The maximum safety level, especially for corporate LANs, is obtained if the datalogger is part of a DMZ.

6.3 Data Refresh Rate and External Queries

Santerno recommends that the following setup should be used to integrate external SCADAs (or any other master):

- Limit to up to 3 (three) concurrent connections, each of which with max 1s timeout.
- Wait several seconds before sending a new request for the same datum: the Sunway Bridge keeps in its cache every datum it reads (typically for approx. 60 seconds); therefore, each request sent in that range will return the same value.
- Preferably send requests with few Modbus registers (up to four), even for contiguous addresses. This is particularly effective for devices connected to the Sunway Bridge through serial wires, where a single error invalidates the entire frame (the shorter, the better).
- Avoid having Remote Sunway clients always connected with auto-refreshing measures, since they are always served before any other request.

Any modifications to the settings above can be evaluated depending on the application. In any case, Santerno will make the final decision and will not guarantee the overall functionalities if the recommended setup is not respected.

7. ANNEX

7.1. Purchase codes

<i>Purchase code</i>	<i>Component</i>
ZZR1007A0	Bridge Mini Embedded
ZZ4600600	Bridge Mini Standalone