



NTPM 100

Installation and Operation Manual



NTPM 100

Smart Power Quality Sensor

INSTALLATION AND OPERATION MANUAL



1. SAFETY INSTRUCTIONS

This equipment must be mounted only by professionals. The manufacturer shall not be held responsible for failure to comply with the instructions in this manual.

1.1 RISK OF ELECTROCUTION, BURNS OR EXPLOSION

- 1.1.1 The device must be installed and serviced only by qualified personnel
- 1.1.2 Prior to any work on or in the device, isolate the voltage inputs and power supply inputs and short-circuit the secondary winding of all current transformers
- 1.1.3 Always use an appropriate voltage detection device to confirm the absence of voltage
- 1.1.4 Always supply the device with the correct rated voltage

Failure to take these precautions could cause serious injuries.

1.2 RISK OF DAMAGING THE DEVICE Check the following:

- 1.2.1 The voltage of the power supply
- 1.2.2 The frequency of the distribution system (50 or 60 Hz)
- 1.2.3 The maximum voltage across the voltage-input terminals (V1, V2, V3 and VN) 520V AC phase-to-phase or 300V AC phase-to-neutral
- 1.2.4 A maximum current of 10A on the current-input terminals (I1, I2 and I3)



- Before starting any maintenance, change in connections, repair, etc, it must be disconnected from all power sources.
- When an operating fault or protection fault is suspected, the equipment must be taken out of service.
- Do not open the instrument under any circumstances when it is connected to a power source.
- Only qualified personnel familiar with the instrument and its associated electrical equipment must perform setup procedures.
- The equipment is designed to be quickly replaced in the event of any breakdown.





2 GENERAL

2.1 NTPM SERIES

The NTPM series are Smart Power and Energy Sensors for use in three-phase systems. All models have integrated WEB server as a modern user interface. Also, all the models support Modbus TCP and Modbus RTU communication protocols for integration in a SCADA system.

2.2 TECHNICAL DATA

Electrical characteristics		
Power supply	AC	85-265 V AC/ 90-300 V DC
	DC	18-36 V DC, 24 V DC nominal
Power consumption		max 2,5 W
Type of Measurement		1P+N,3P,3P+N
Accuracy Class		0,5 S
Rated Input Current (IB)		5A (supported external current transformers with ratio of 1-1000)
Permissible Current Overload		6A continuous
		20A 10S
Starting Current		0,001 IB
Line Frequency Range (configurable)		47-53 Hz(50 Hz nominal)
		57-63Hz(60Hz nominal)
ADC Sampling Rate		3,2 ksps
Measured Voltage (Un)		Up to 300V AC (P-N) (supported external transformers with ratio of 1-350)
Permissible Voltage Overload		1,15 Un
Active Power Measurement Precision Class		0,5
Reactive Power Measurement Precision Class		0,5
Power Factor (PF) Precision Class		0,5
Frequency Measurement Precision Class		0,5
Harmonic Component Measurement of Voltage Input (200 series)		2ND-31ST Harmonic
Harmonic Component Measurement of Current Input (200 series)		2ND-31ST Harmonic
Relay outputs (NO)	Rated voltage	250 V AC/30 V DC
	Rated current	3A



NTPM 100

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Communication		
Interfaces	10/100Mbps Ethernet	Modbus TCP, ICMP Server, DHCP Client, Lan Discovery, Web server
	IEEE 802.11b (Wi-Fi)	
	RS 485	Modbus RTU
Protocols		Modbus TCP
		Modbus RTU

Construction and Mechanical properties		
Dimensions	71 x 90 x 58 mm (4 modules)	
Weight	0,3 Kg	
Case	Material	Plastic, PC (UL 94 V-0)
	Mounting	DIN Rail
	Protection	<IP 40

Ambient conditions	
Operating temperature	14 to 122°F (-10 to 50 °C)
Relative humidity (non-condensing)	5 to 95 %
Altitude	2000 m

Safety	
Category III - 300 V AC. / 520 AC. EN-61010-1:2010 Class II double insulation against electric shock	
Standards:	
EN 61000-6-2:2008 EN 55011:2011 + A1:2011 (Group1, Class B) EN 61000-4-2:2009 EN 61000-4-3:2008+2008/A1:2009 EN 61000-4-4:2008+2008/A1:2012+2013 EN 61000-4-5:2008 EN 61000-4-6:2010 EN 61000-4-11:2008	



3 INSTALLATION

This manual contains information and warnings that must be followed by the user to ensure the safe operation of the equipment and to maintain it in a safe condition. The device must not be switched on until it is finally attached to the electrical board. When it is likely that the equipment has lost its protection (with visible damage), it must be disconnected from the auxiliary supply. In this event, contact a qualified technical service representative.

3.1 PRE-INSTALLATION CHECK

Check the following points before switching the equipment on:

- a) Power supply voltage.
- b) Maximum voltage in the measurement circuit.
- c) Maximum admissible current.
- d) Relay output maximum current
- e) Operating conditions.
- f) Safety.

3.2 MOUNTING THE DEVICE

3.2.1 DIN RAILS INSTALLATION, EN 50 022 (TS35)

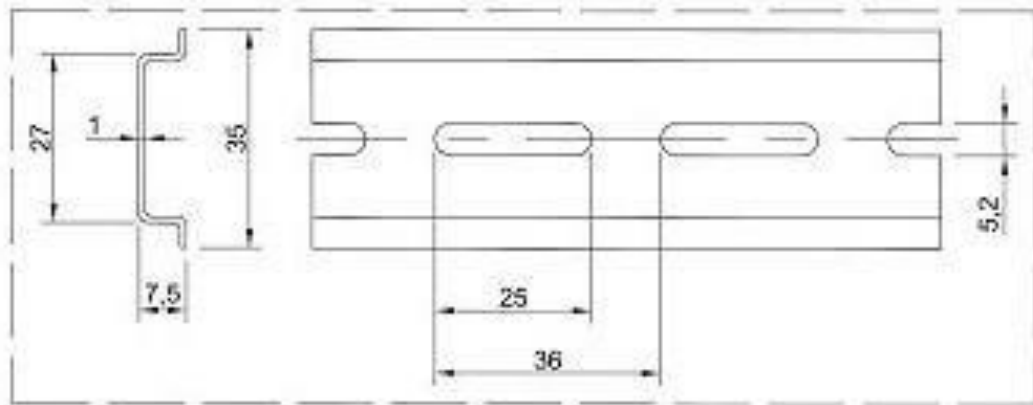
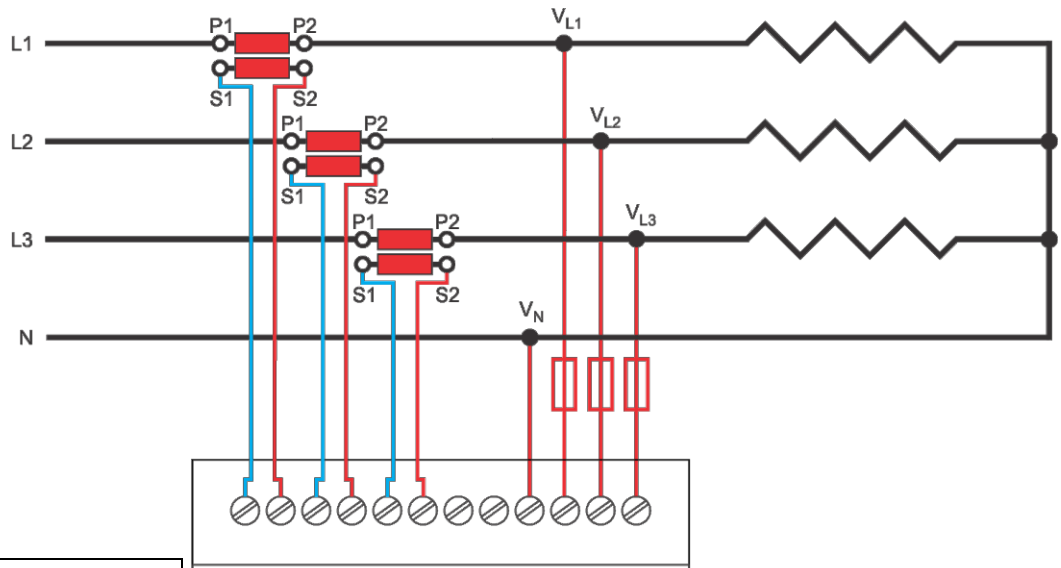


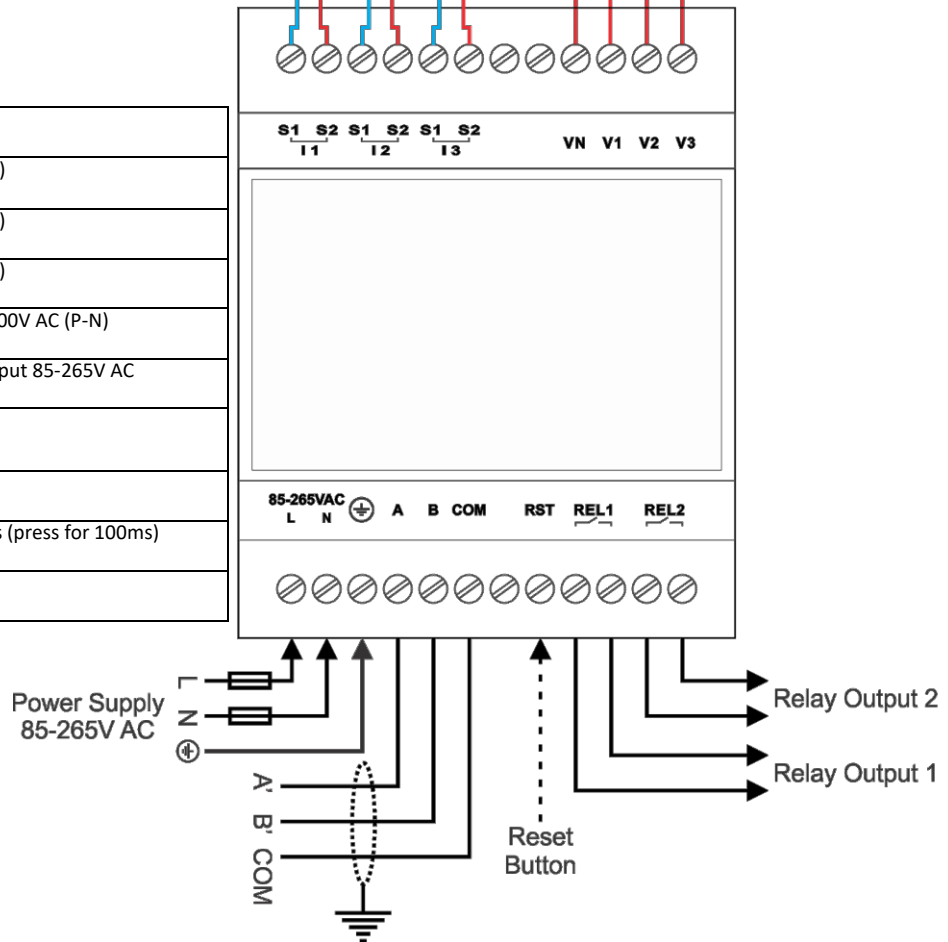
Figure 1: TS35 DIN Rail



3.2.2 WIRING



Label	Terminal Description
S1-S2 (I1)	Current input 5A (Line 1)
S1-S2 (I2)	Current input 5A (Line 2)
S1-S2 (I3)	Current input 5A (Line 3)
V1,V2,V3,VN	Voltage inputs - Up to 300V AC (P-N)
L,N	Power supply voltage input 85-265V AC
⊕	Ground
A,B,COM	RS485
RST	Reset to default settings (press for 100ms)
REL1, REL2	Relay outputs (2)



4 CONFIGURATION

NTPM has an embedded Web server that is used to host configuration pages. These web pages can be accessed from a Web Browser such as Microsoft Internet Explorer or Mozilla Firefox. HTML5 compliant browser must be used in order to get full functionality.

NOTE: Depending on the Ethernet infrastructure, the device TCP/IP settings may need to be reconfigured for the working environment. To obtain required parameters such as IP address, Gateway address etc., please contact local network administrator.

If the device has never been configured, follow the procedure described in [First Time Configuration](#) section. If the device has been previously configured and there already exists IP connectivity to the device, [First Time Configuration](#) step can be skipped and configuration pages can be accessed with current device settings. Details on configuration options can be found in [Configuration Pages](#) section of this document.

4.1 FIRST TIME CONFIGURATION

For the first-time configuration, it is advised for both the device and configuration PC to be in an Ethernet LAN. Reset device settings to default, and set the PC IP configuration to correct LAN settings. To reset device settings to default, hold **Reset** button for 5 seconds and then release it. The device will reboot with default settings. Information about the default IP settings and user authentication data can be found on the device enclosure, as shown on Figure 2.

Default configuration:

- IP Address:192.168.1.100
- Network mask: 255.255.255.0
- Web access username:admin
- Web access password:admin

To connect to the NTPM via Ethernet port, you will need the following items:

1. A NTPM device with an Ethernet port (any of the NTPM XX0 models);
2. Appropriate power supply for the NTPM device;
3. One Ethernet cable (crossover, Cat 5 or6);
4. A PC computer with working Ethernet interface.

To connect to the NTPM device follow these steps:

1. Connect one end of the Ethernet cable to the Ethernet interface of the NTPM device, and the other end of the cable to the PC Ethernet interface (Figure3).
2. Configure the PC Ethernet interface IP address and networkmask:
 - PC IP address:192.168.1.1
 - PC network mask:255.255.255.0
3. Reset the NTPM device settings to the default.
4. Test IP connectivity from the PC. This can be done by using the PING tool:
 - On Windows OS start CMD.EXE from Start menu, on Linux start terminal software;
 - Type "ping 192.168.1.100" in the terminal.
 - If IP connectivity exists, PING utility will report how much time it takes for a message to go to the NTPM and to return to the PC (Figure4).
 - If there is no connectivity check cables and make sure that correct Ethernet interface is set on the PC, then go back to step 1 to repeat the procedure.

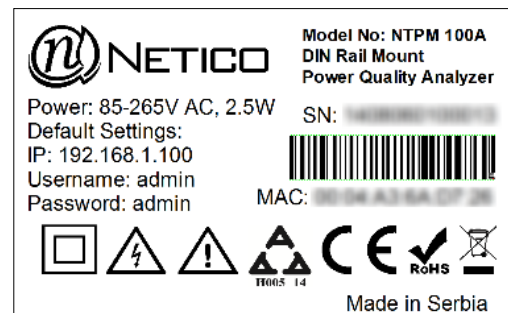


Figure 2: Sticker with default device settings information

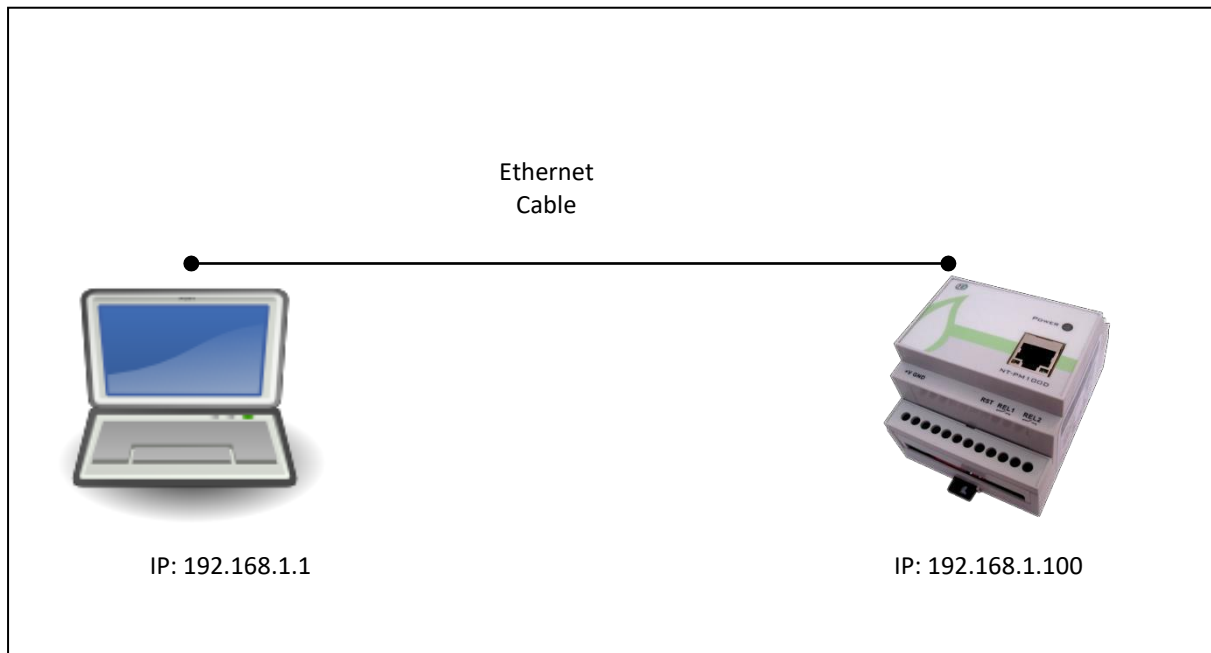


Figure 3: Default Ethernet network configuration

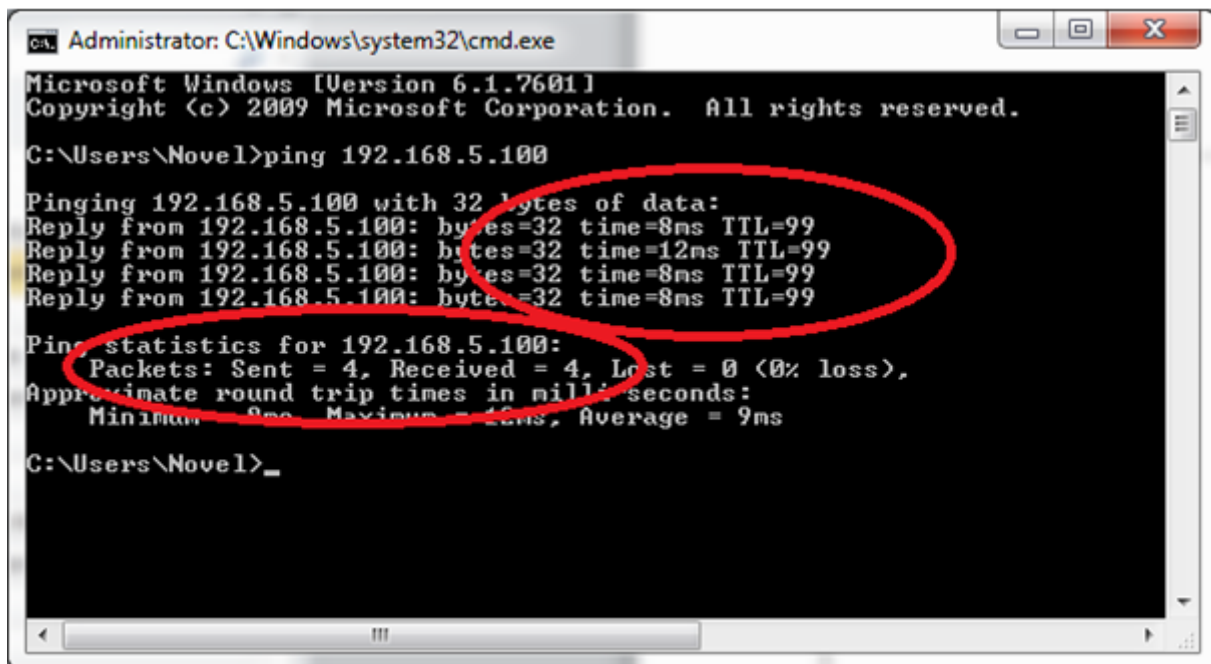


Figure 4: Successful Ping IP connectivity test



4.2 WEB CONFIGURATION

Before accessing the configuration pages, make sure that:

- The device power supply is connected properly.
- The device is physically connected to Ethernet network.
- IP connectivity exists between the device and PC that is running the web browser.

NOTE: IP connectivity can be tested with “ping” tool from the host PC.

To access web configuration pages, start a Web browser on the host PC and type the IP address of the device in the URL box of the Web browser. The pages require user authentication (username and password) to be entered before they can be accessed (Figure 5). When a dialogue box appears, enter the current username and password.

Once the correct username and password are entered, the homepage will be displayed with a dashboard (Figure 6).

From here on, various device settings can be changed, and measured electrical parameters can be monitored from the web pages. For details on Web Interface see [Configuration Pages](#) chapter of this document.

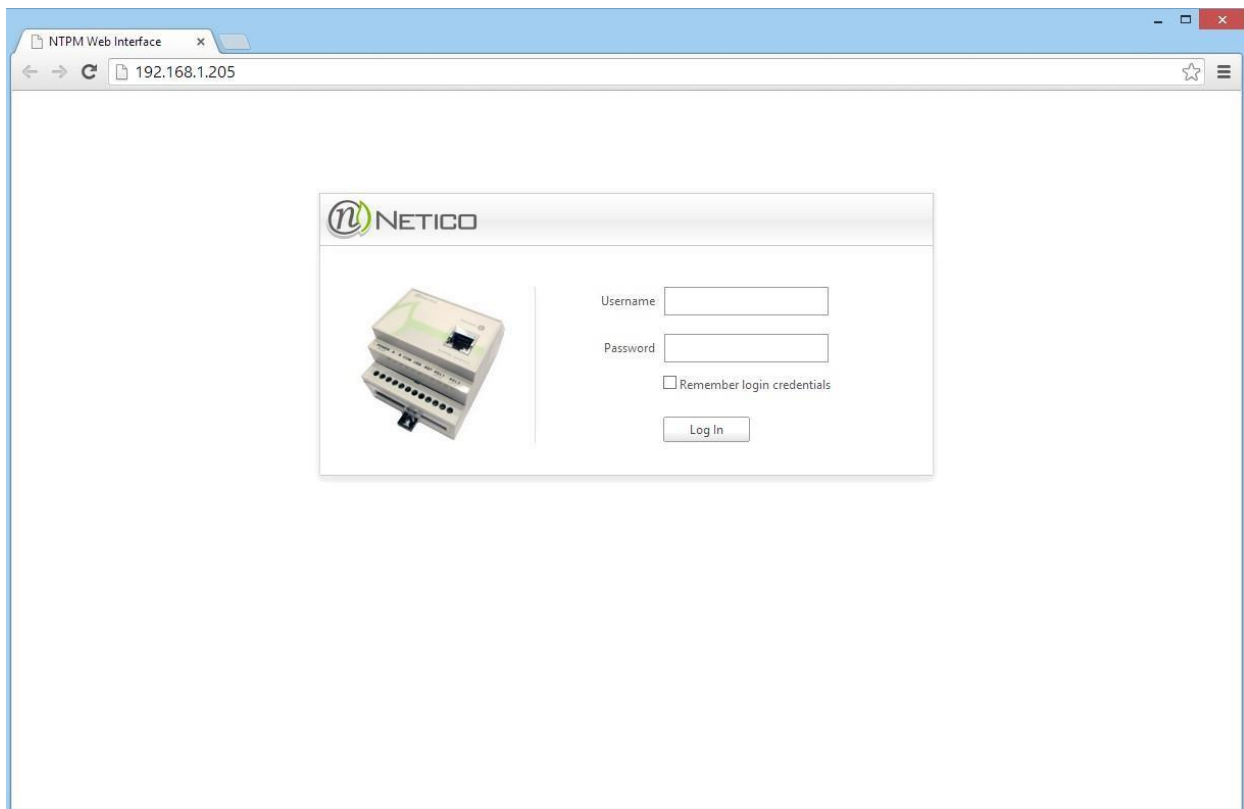


Figure 5: Login page

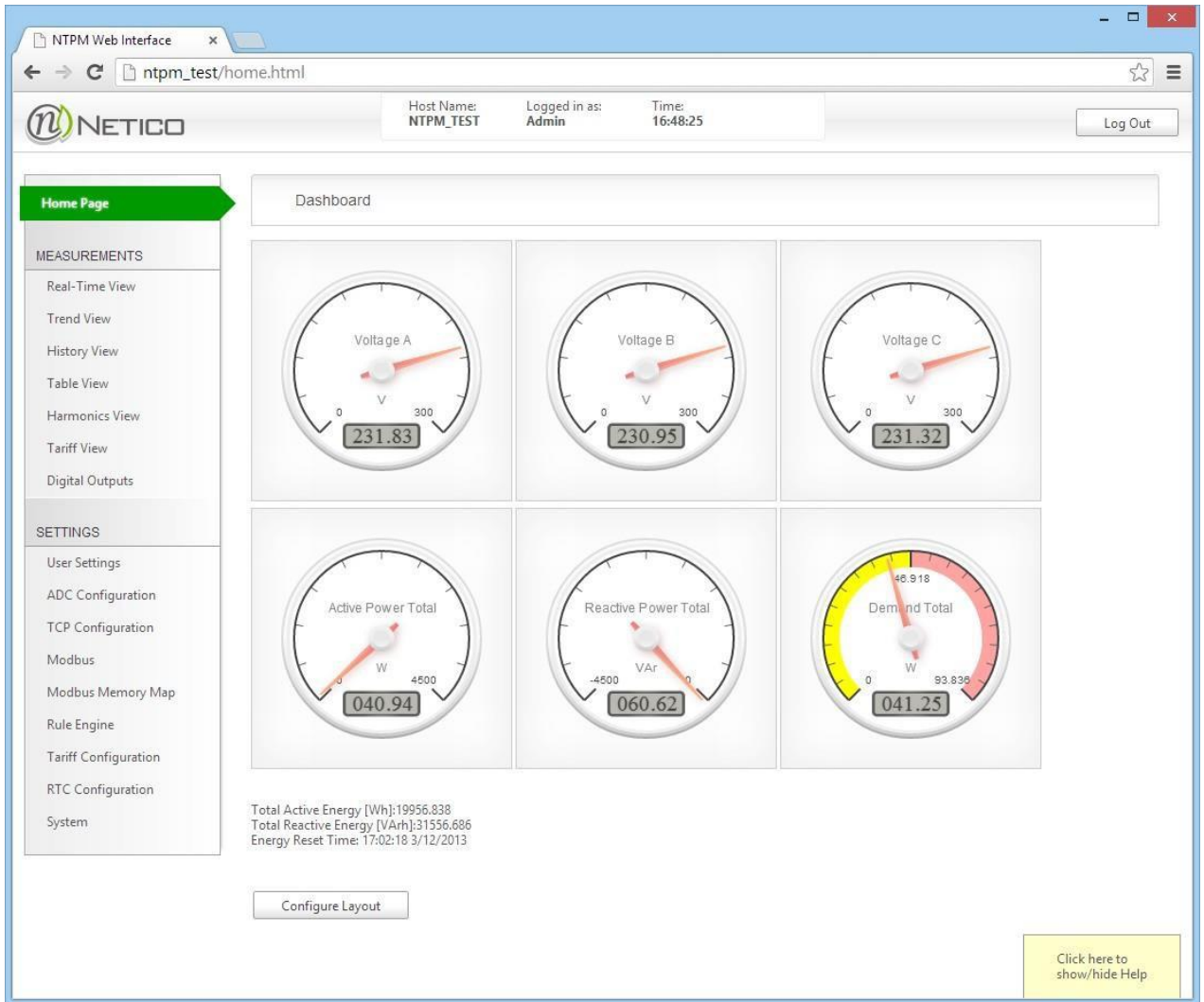


Figure 6: Home Page





5. NTPM DATA

5.1 DATA PRESENTATION

The data are presented in three different categories:

- REAL-TIME DATA

The Real-Time data can be accessed both in tabular and graphical presentations.

- TREND DATA

The device records these parameters with one second resolution. The data recorded in this way is available for maximum of 31 days in the past. These parameters are stored in the internal memory and can be accessed by Web interface or by Web service.

- HISTORY DATA

The device also records historical data of the measured parameters. This historical data is stored on the device in the internal memory with a capacity to record 5 years history. The data can be retrieved by Web interface or Web service. History Data consists of minimum, maximum and average values recorded at: 5 minute, 15 minute, 1 hour, 1 day and 1 month periods.

5.2 DATA ACCESS

Current measured data parameters can be accessed in one of three ways:

- by Web interface (section [WebInterface](#));
- by Web service (section [Web service](#)),
- or by Modbus communication protocol (section [Modbus ProtocolSupport](#)).



6 WEB INTERFACE

The web interface is used for: device configuration and measurement analysis. In order to use full potential of the device web client application, you need to have a HTML5 compliant browser (IE9 and above supported) installed on your PC/Tablet and enable JavaScript functionality. Some specific features like Hostname will only work under specific operating systems that support NetBIOS name resolution method. If you experience problems when using Internet Explorer, try disabling Compatibility mode.

Depending on user level access (regular or admin) main menu will have different options available. Also some of the same items from the menu will have different features displayed.

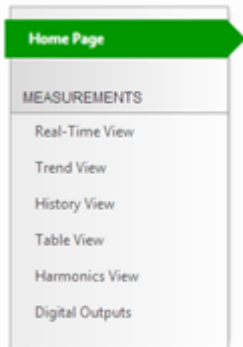


Figure 7 : Regular user menu



Figure 8: Admin user menu



6.1 HOME PAGE

This page displays real-time measurements using gauges and numeric fields.

By clicking on “Configure Layout” button you are presented with screen where you can configure which measurements will be displayed. These settings are saved into browser’s local storage.

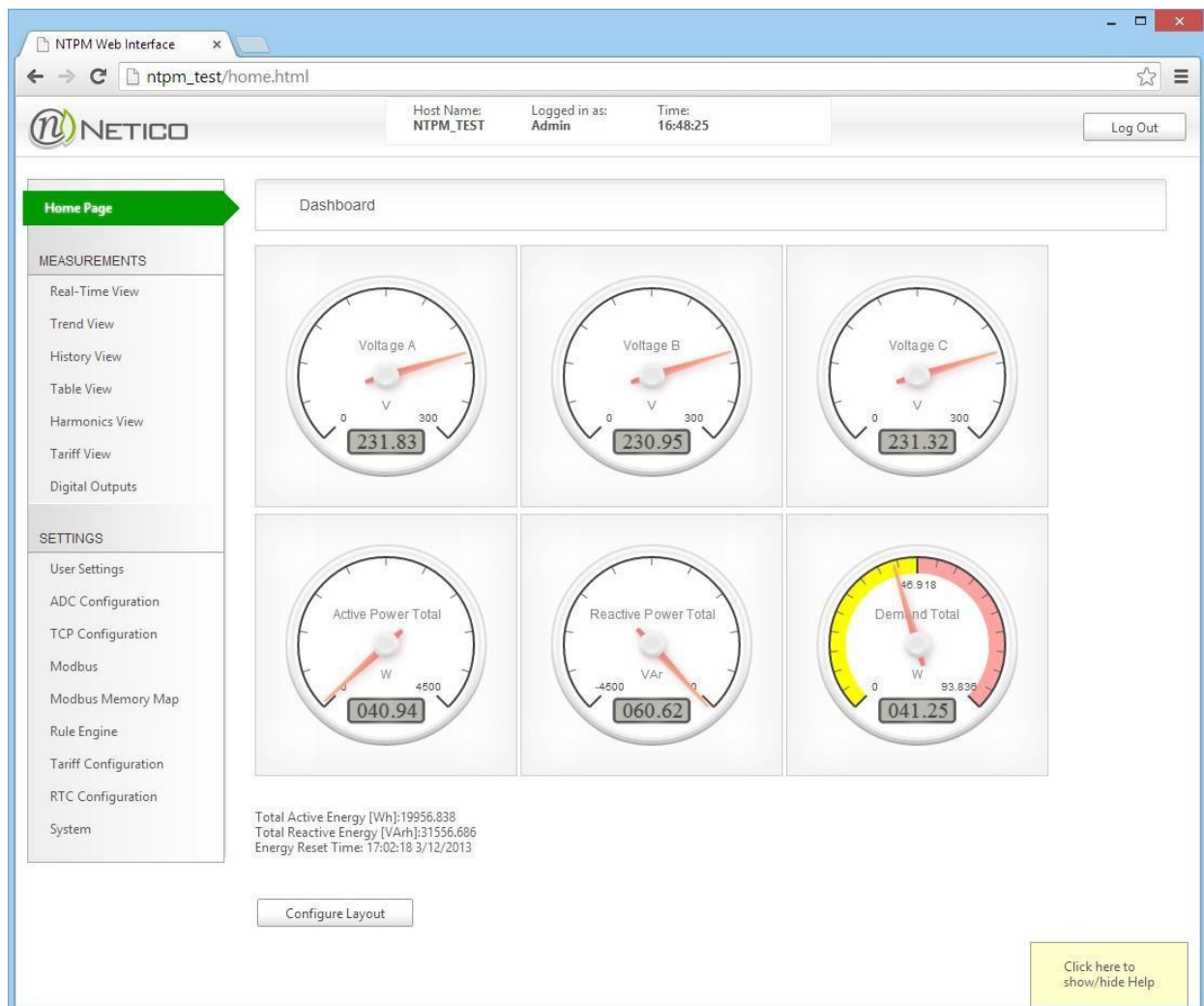


Figure 9: Home page

NOTE: IN ORDER TO USE HOME PAGE CONFIGURATION FUNCTIONALITY, YOU NEED TO ADDRESS THE DEVICE FROM A BROWSER EITHER BY USING NETBIOS HOSTNAME (SUITABLE IF DEVICE USES DYNAMIC IP ADDRESS) OR SET A FIXED IP ADDRESS TO THE DEVICE. LOCAL CONFIGURATION IS TIED TO THE NETBIOS HOSTNAME OR THE IP ADDRESS OF THE DEVICE, AND WILL BE LOST IF THESE CHANGE (FOR EXAMPLE IF THE DEVICE USES DYNAMIC IP ADDRESS).

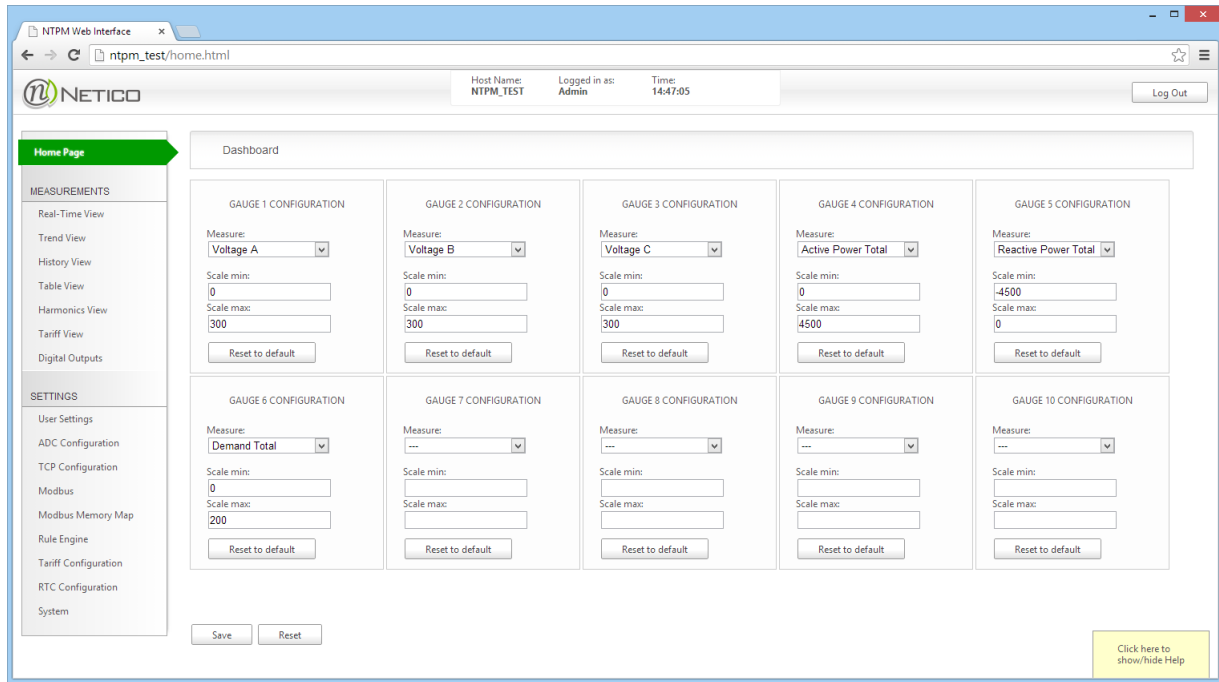


Figure 10: Configuration of the home page

For each gauge, you can configure:

- displayed measurement
- scale minimum value
- scale maximum value

“Reset to default” button resets scale ranges to recommended ones, using set values for voltage transformer and current transformer ratios (ADC Configuration page). If you leave blank dropdown for measure (---) that gauge will not be displayed. “Reset” button on the bottom will reset gauge configuration to recommended default layout. “Save” button saves configuration into browsers local storage and returns to gauge display.



6.2 MEASUREMENTS PAGES

6.2.1 REAL-TIME VIEW

Measurements refreshed in one second interval can be monitored on this page. The page shows selected measured (or calculated) values in real-time, as soon as the device records them.

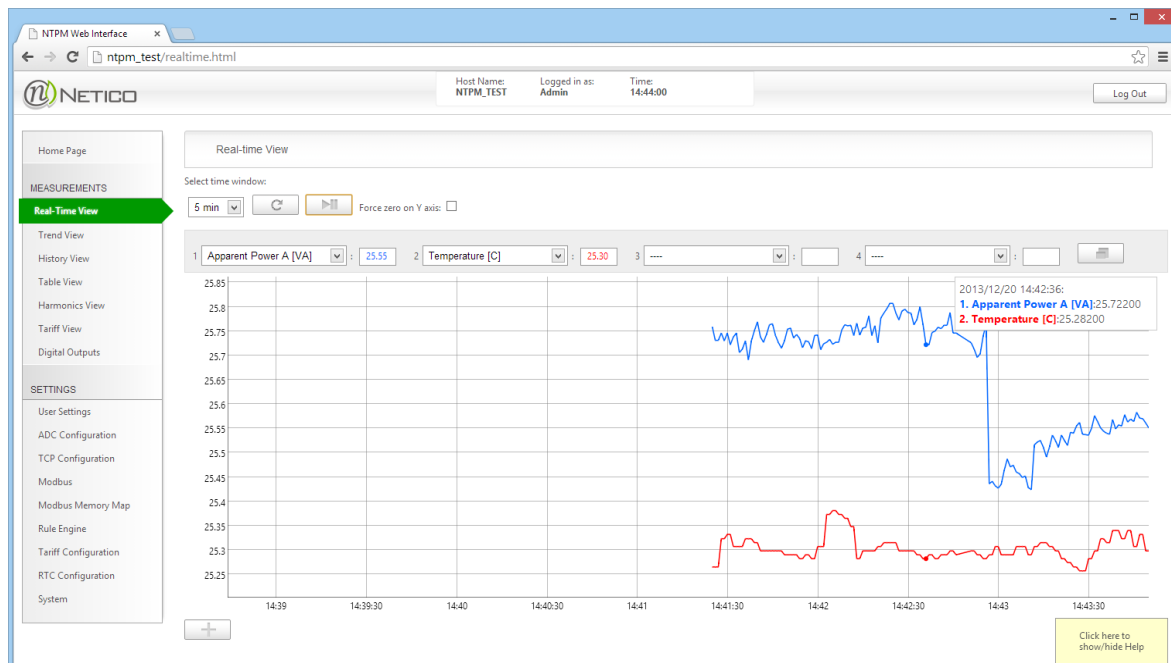





Figure 11: Real-Time View

There is only one graph displayed by default, more (up to three total) are added by clicking on the plus . Up to 4 measurements can be displayed on one graph. Each graph can be stretched over the entire screen for better viewing experience by clicking on double window . You can select between: 1, 5, 15 or 60 minutes time window. By clicking on “Refresh” button  you are applying new settings (graph is then being reset – starts to draw new values from scratch). Graph can be zoomed by dragging mouse while holding left mouse button pressed. By double clicking on a graph you can reset the graph zoom to the initial setting.



6.2.2 TREND VIEW

This page displays any 5-minute interval from last 31 days of recorded measurements, with one second resolution. Interface options are similar to Real-Time View with addition of date and time picker.

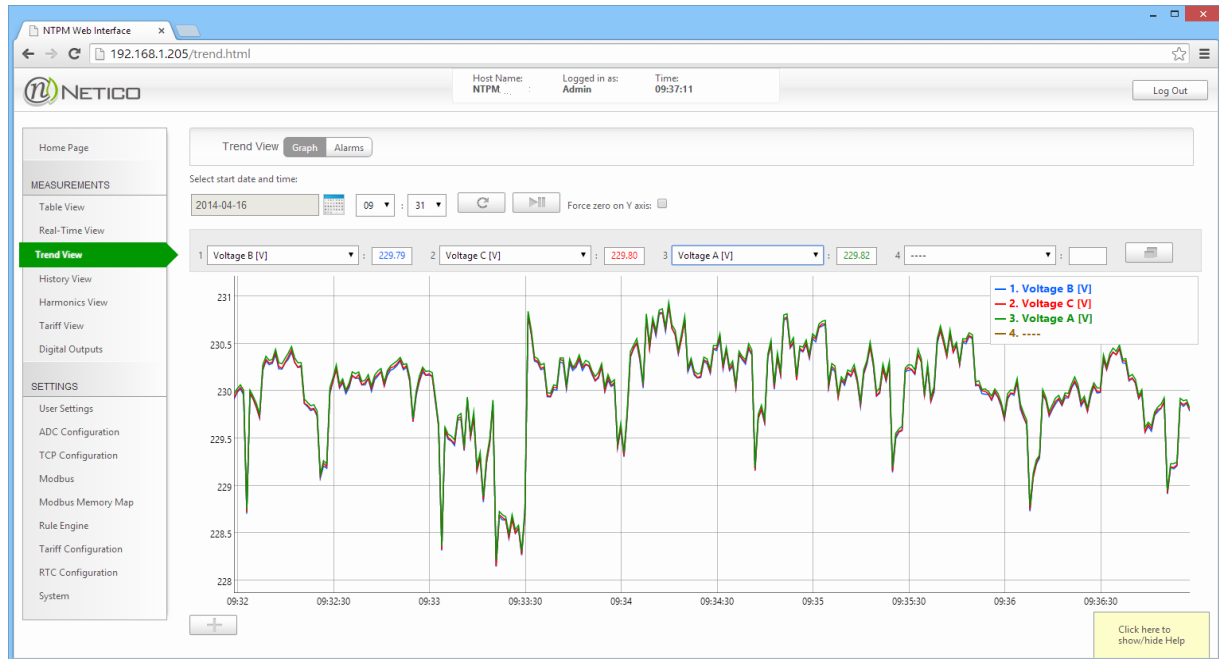


Figure 12: Trend View



6.2.3 EVENTS

Events can also be viewed on the Trend View page. You select a date from which you would like to load events. Events are loaded and displayed from newest to the oldest. You can also click on any listed event, and you will be taken to the trend graph, which will automatically load data from the time when the clicked event was triggered. Events are stored with 1ms resolution.

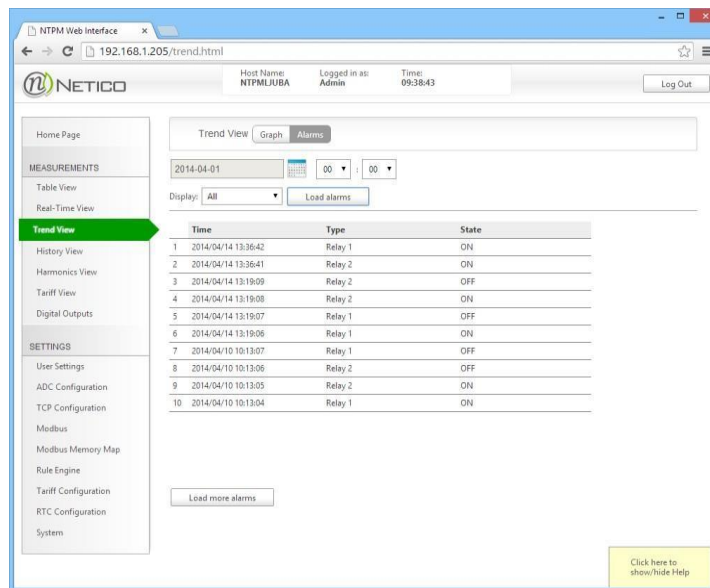


Figure 13: Display of events



6.2.4 HISTORY VIEW

History data can be viewed from this page. There are two preview options available: “single” and “compare” mode. In the “single” mode, you can only view one, selected, time period, while in the “compare” mode you can preload two periods and display them both on one graph, thus allowing comparison of measured values from these two periods.

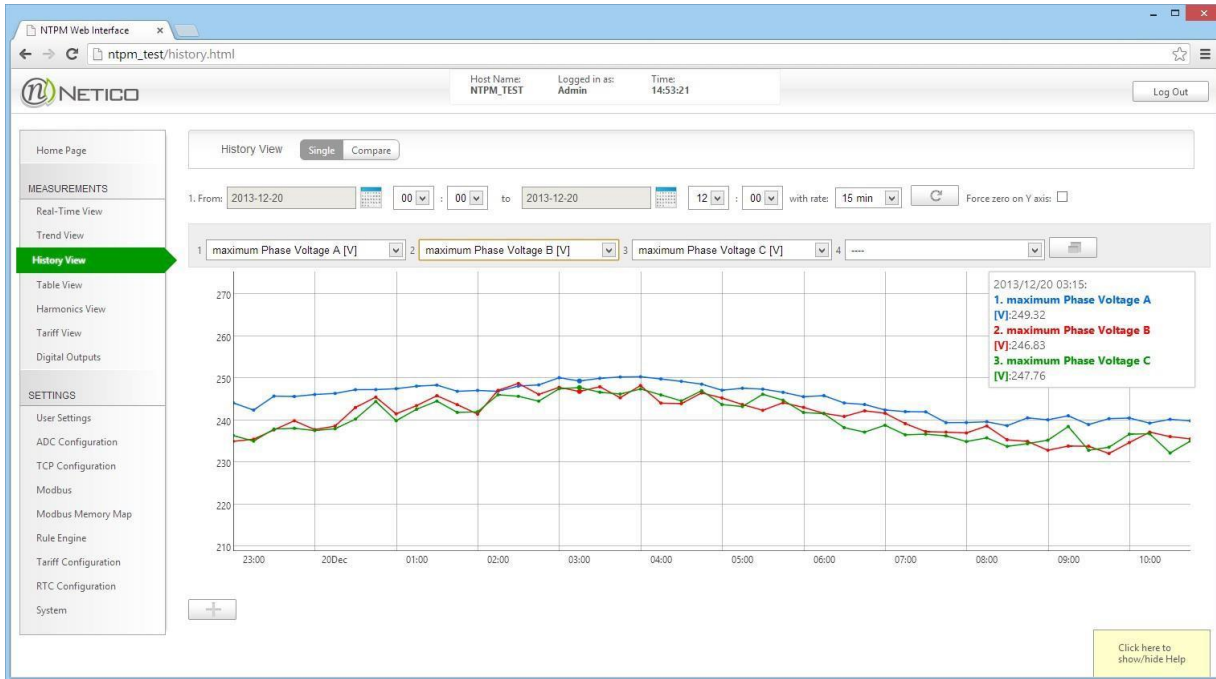


Figure 14: History View – single mode

History measurements are recorded at 5 minute, 15 minute, 1 hour, 1 day and 1 month resolutions. You can choose to display average, minimum or maximum values of measured parameters for the selected resolution. By clicking on any point displayed on the graph, you can jump to a finer resolution around that point timeframe (from 1 hour to 15 minute, from 15 minute to 5 minute... etc.). When you click on the 5-minute points, you will be transferred to the Trend view if the clicked point is within the last 31 days of the trend history. In this way, you are able to analyze instantaneous measurement values (with one second resolution) around the clicked 5-minute point

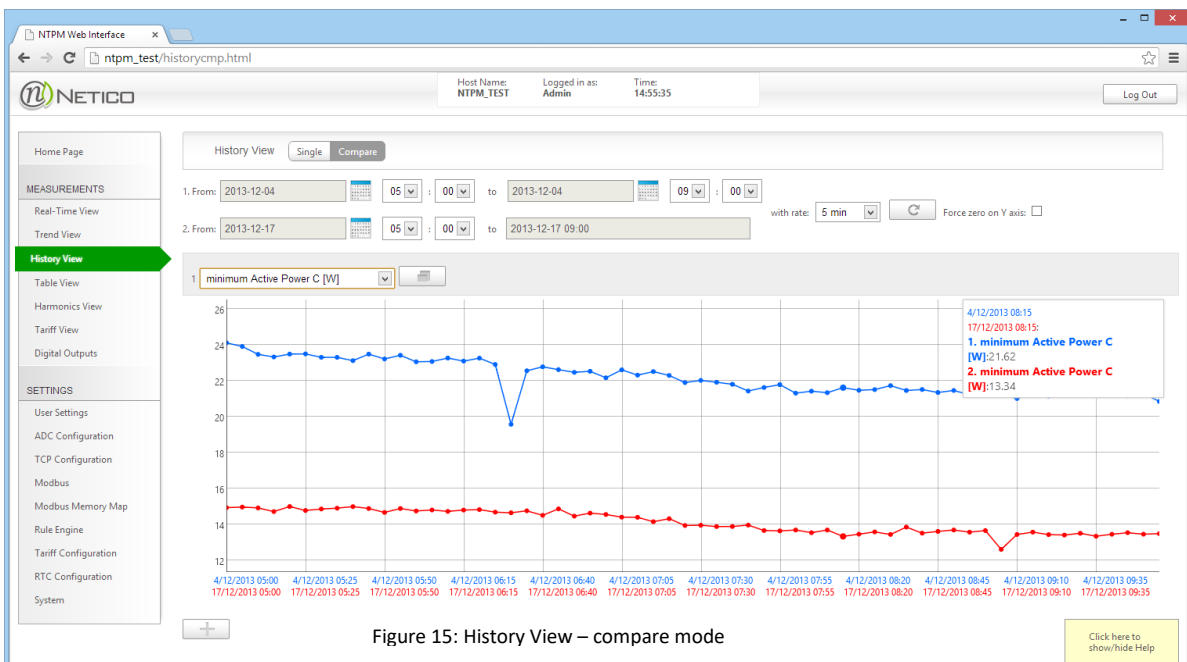


Figure 15: History View – compare mode

6.2.5 HARMONICS VIEW

NTPM measures up to 31-st Voltage and Current harmonic. Both numerical and graphic representations are available on this page. Values here are displayed in real-time, along with the calculated total harmonic distortion (THD) for voltages and currents.

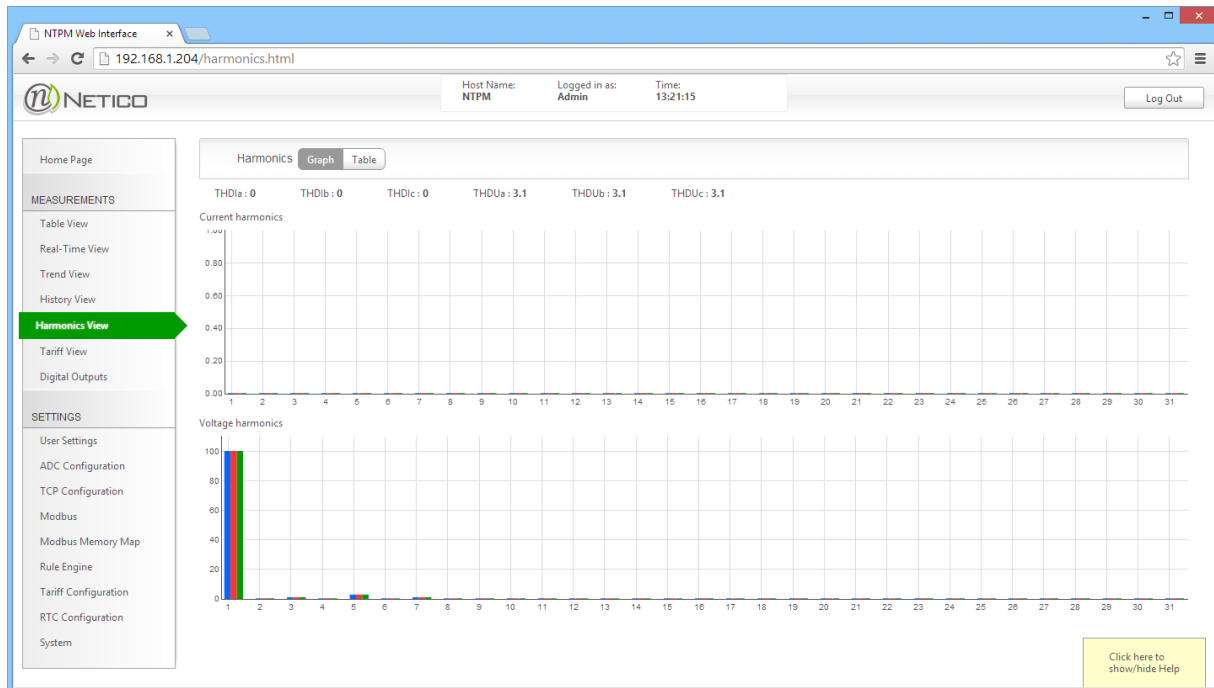
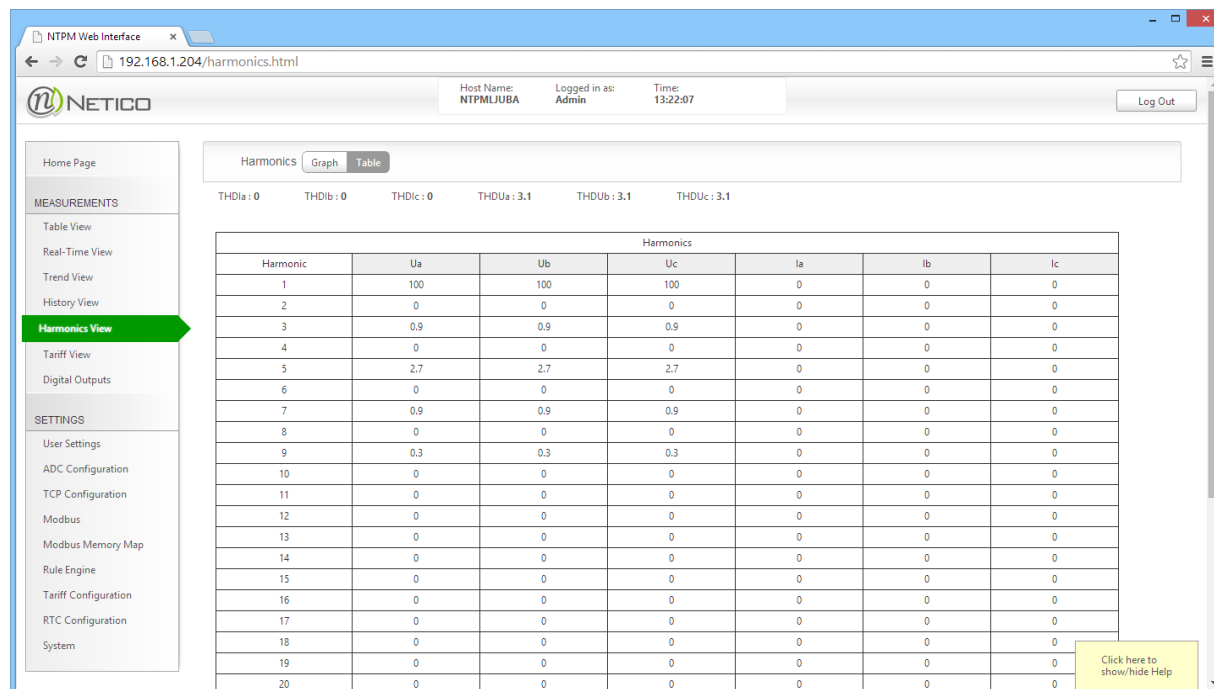


Figure 17: Harmonics View - graph



The screenshot shows the NTPM Web Interface with the following data:

- Host Name: NTPMLJUBA
- Logged in as: Admin
- Time: 13:22:07
- THD_{la}: 0
- THD_{lb}: 0
- THD_{lc}: 0
- THD_{Ua}: 3.1
- THD_{Ub}: 3.1
- THD_{Uc}: 3.1

Harmonic	Ua	Ub	Uc	Ia	Ib	Ic
1	100	100	100	0	0	0
2	0	0	0	0	0	0
3	0.9	0.9	0.9	0	0	0
4	0	0	0	0	0	0
5	2.7	2.7	2.7	0	0	0
6	0	0	0	0	0	0
7	0.9	0.9	0.9	0	0	0
8	0	0	0	0	0	0
9	0.3	0.3	0.3	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0

Figure 18: Harmonics View – table

6.2.6 TARIFF VIEW

On this page you can view tariffs (active energies, reactive energies and demand) for the chosen month. NTPM can be configured to record energy consumption for four separate tariffs, which are configured based on different times of day (see tariff configuration below).

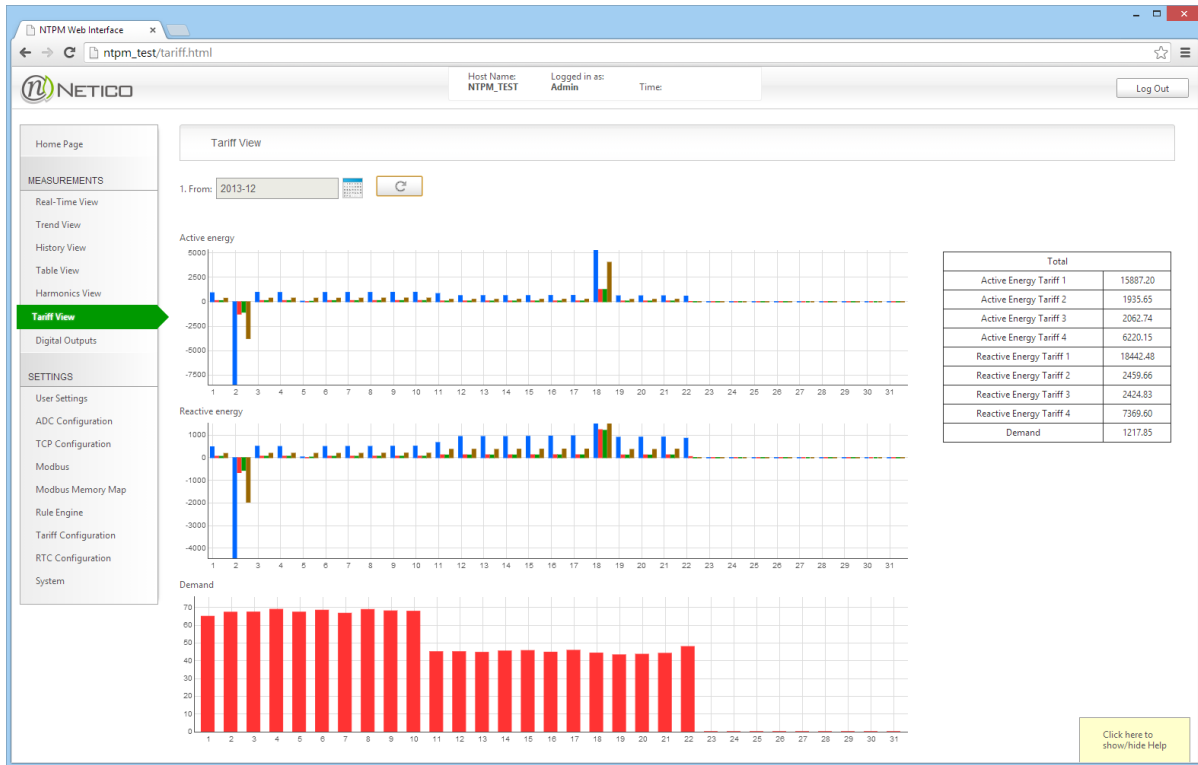


Figure 19: Tariff View



6.3 DIGITAL OUTPUTS

Relay outputs of the device can be manually controlled through this page. Status of the outputs is shown, and can be changed by clicking on appropriate buttons corresponding to each output (only admin can change states). Soft alarms current status is also displayed below.

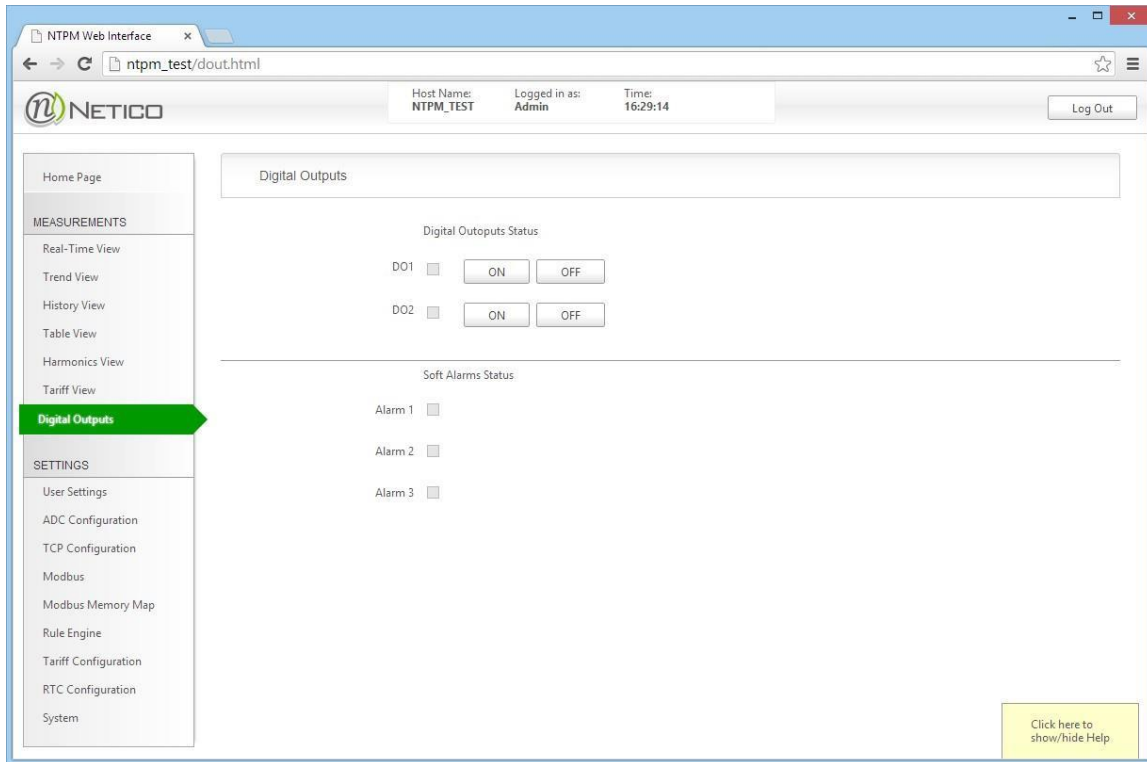


Figure 20: Digital Outputs



6.4 CONFIGURATION PAGES

6.4.1 USER SETTINGS

The username and password for access to the Web Pages can be changed within the User Settings page. The default values are:

For administrator:

Username: **admin**

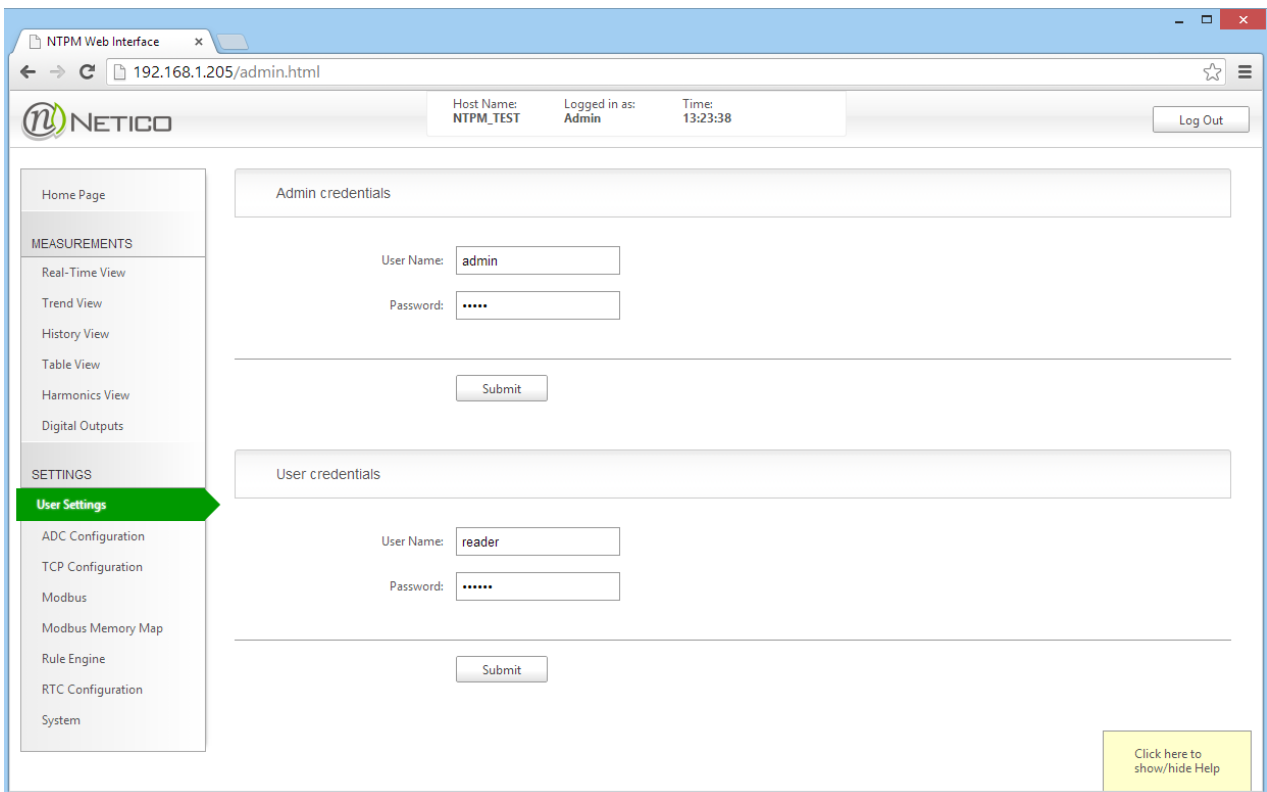
Password: **admin**

For regular user:

Username: **reader**

Password: **reader**

Changes to the user settings can be saved by clicking on the appropriate "Submit" button. New configuration will be stored in the device and the device will reboot after few seconds.



The screenshot shows the NETICO NTPM Web Interface. The browser address bar displays '192.168.1.205/admin.html'. The page header includes the NETICO logo, 'Host Name: NTPM_TEST', 'Logged in as: Admin', and 'Time: 13:23:38'. A 'Log Out' button is located in the top right corner. The left sidebar contains a menu with 'User Settings' highlighted in green. The main content area is divided into two sections: 'Admin credentials' and 'User credentials'. Each section has a 'User Name' field and a 'Password' field, both with 'Submit' buttons below them. The 'Admin credentials' section shows 'User Name: admin' and 'Password: ****'. The 'User credentials' section shows 'User Name: reader' and 'Password: ****'. A 'Click here to show/hide Help' button is located in the bottom right corner.

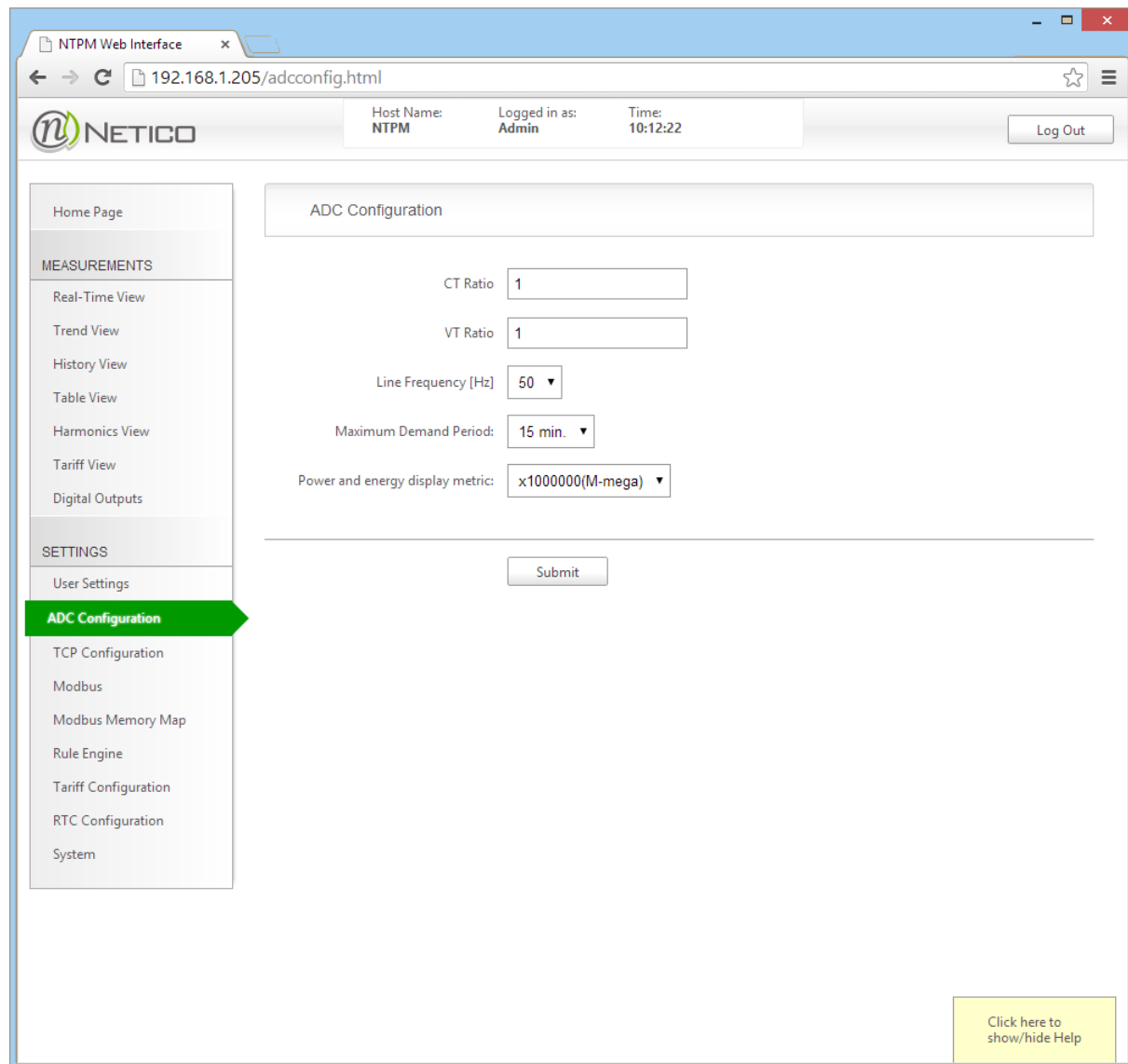
Figure 21: User Settings



6.4.2 ADC CONFIGURATION

This page allows setting transformer ratios for the external voltage and current transformers. When the voltage or current levels of the monitored system exceed the device nominal values, external transformers can be used to lower the values to acceptable ranges. The device needs to be configured with the correct transformer ratios to show correct values for the measured electrical parameters. Nominal frequency of the electrical line and Maximum Demand period are also set on this page.

Power and energy display metric option allows to change display format of all measurements (Power, Apparent Power, Reactive Power, Energy). It is possible to select if the device will display measured parameters in native units or in kilo or mega amounts.



The screenshot shows the NTPM Web Interface for ADC Configuration. The browser address bar shows the URL 192.168.1.205/adconfig.html. The page header includes the NETICO logo, Host Name: NTPM, Logged in as: Admin, Time: 10:12:22, and a Log Out button. The left navigation menu has sections for MEASUREMENTS and SETTINGS, with 'ADC Configuration' highlighted in green. The main content area is titled 'ADC Configuration' and contains the following settings:

- CT Ratio: 1
- VT Ratio: 1
- Line Frequency [Hz]: 50
- Maximum Demand Period: 15 min.
- Power and energy display metric: x1000000(M-mega)

A 'Submit' button is located at the bottom of the configuration area. A 'Click here to show/hide Help' link is located in the bottom right corner.

Figure 22: ADC Configuration

Changes to the ADC configuration settings can be saved by clicking on the "Save" button on the bottom of the page. New configuration will be stored in the device and the device will reboot after few seconds.



6.4.3 TCP CONFIGURATION

TCP Configuration depends on the Ethernet network settings to which the device will be connected. For help on configuring TCP settings contact local network administrator. Figure 2 shows the TCP configuration page. Parameters that are supplied in the TCP configuration page are standard parameters necessary for configuring TCP end points.

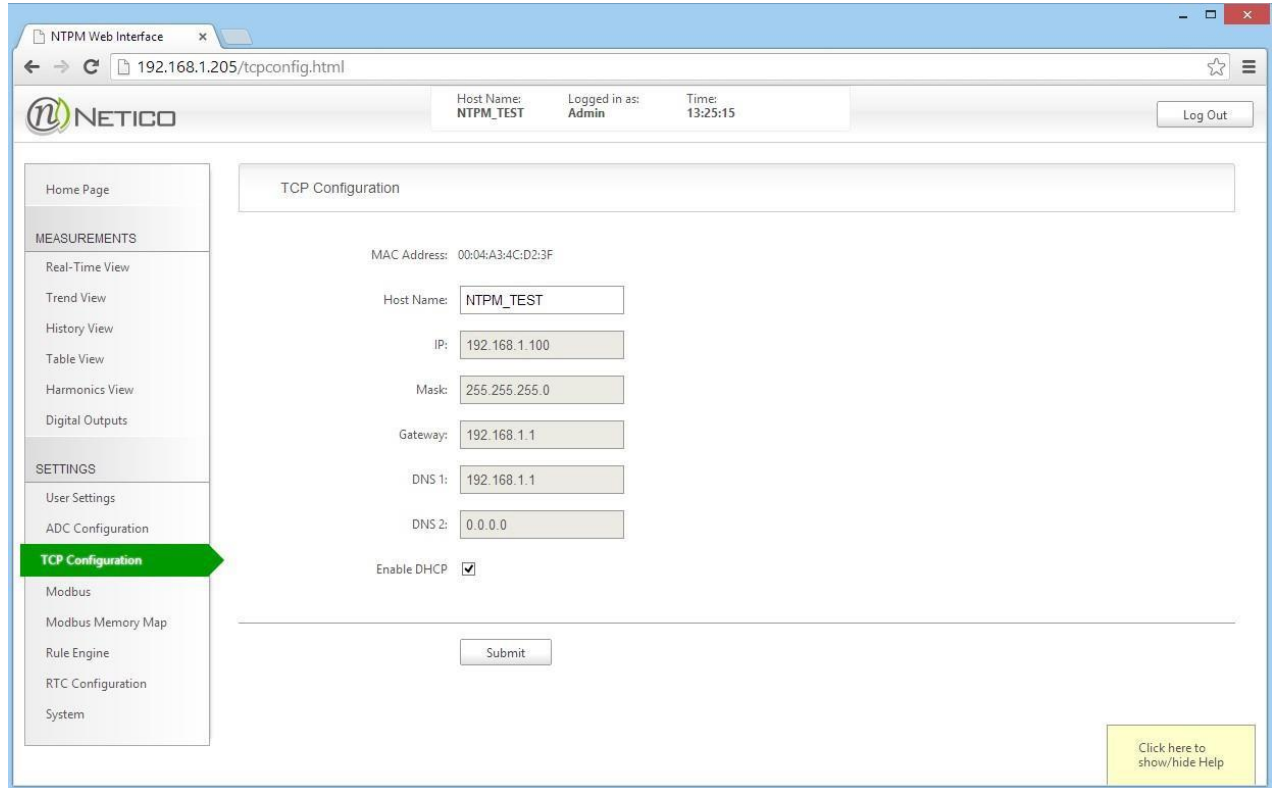


Figure 23: TCP Configuration Page

Option	Default value	Description
MAC Address	Varies	Read-only, set during device assembly.
Host Name	NTPowermeter	Host name for the device.
IP	192.168.1.100	The device IP address.
Mask	255.255.255.0	IP subnet mask.
Gateway	192.168.164.1	Gateway address.
DNS 1	192.168.164.1	DNS Server address
DNS 2	192.168.164.1	DNS Server address
Enable DHCP	Not checked	Check to enable DHCP client on the device.

Changes to the TCP settings can be saved by clicking on the “Save” button on the bottom of the page. New configuration will be stored in the device and the device will reboot after few seconds.

NOTE: Depending on the new TCP settings, web interface may no longer be accessible from the same LAN.



6.4.4 MODBUS CONFIGURATION

Modbus communication settings (both TCP and RS485) can be configured from this page.

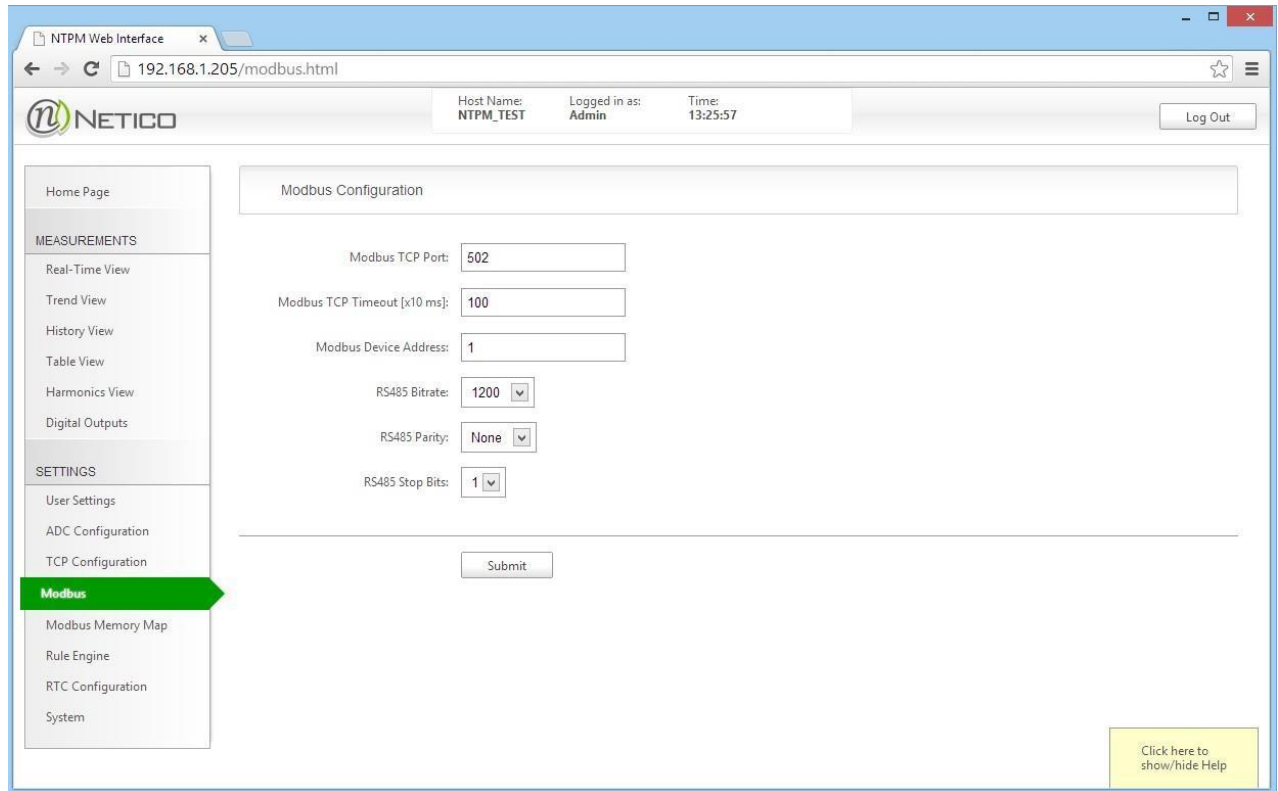


Figure 24: Modbus



6.4.5 MODBUS MEMORY MAP

The device supports Modbus communication protocol, and functions as a Modbus Slave device. To be able to use this feature, one must know the Modbus memory map of the Modbus slave device. The page shows layout of the device Modbus memory map.

Memory map consists of separate tables depending on the object type (**Input Registers**, **Holding Registers** and **Coils**). More details on the Modbus protocol are available on <http://www.modbus.org>.

See Appendix I for NTPM modbus support details.

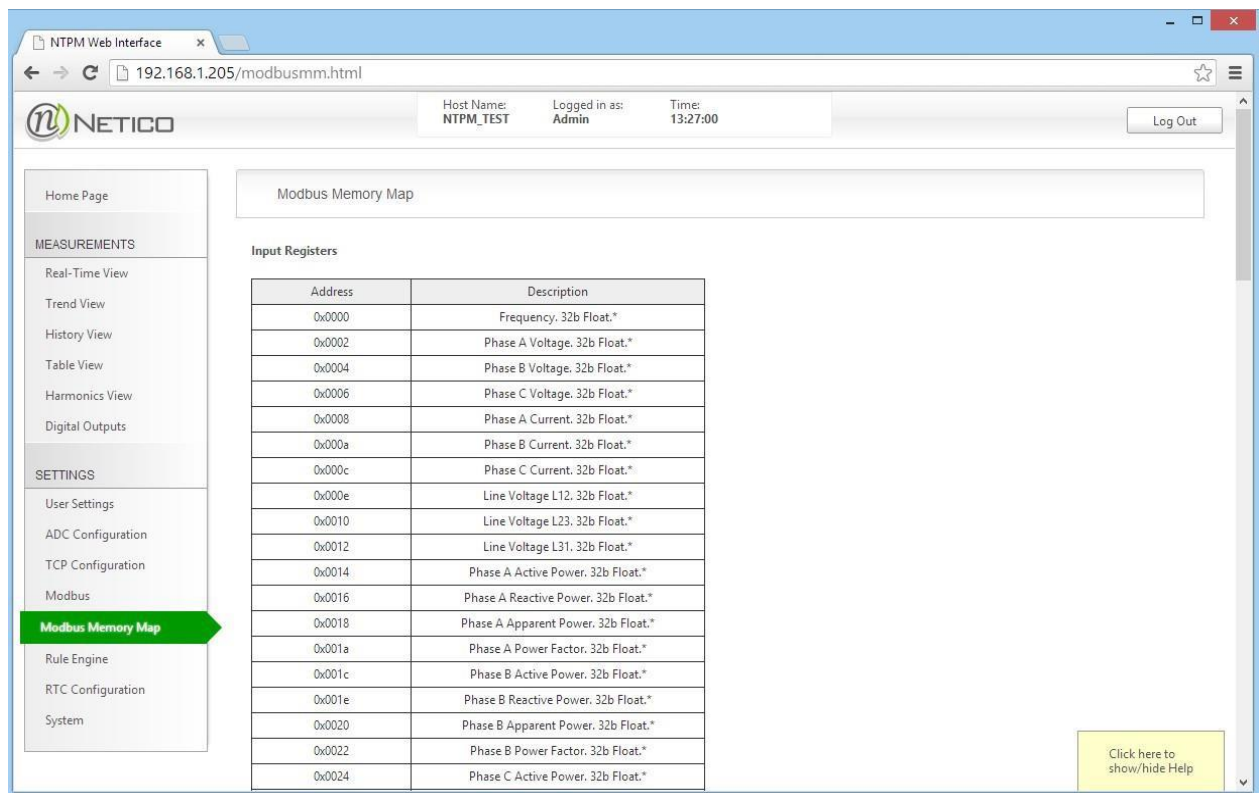


Figure 25: Modbus Memory Map



6.4.6 RULE ENGINE

NTPM built in “Rule Engine” functionality allows for setting actions, which are triggered when set condition is met. Every rule can be enabled or disabled. Two actions can be set for every rule, based on weather condition of the rule is true or false.

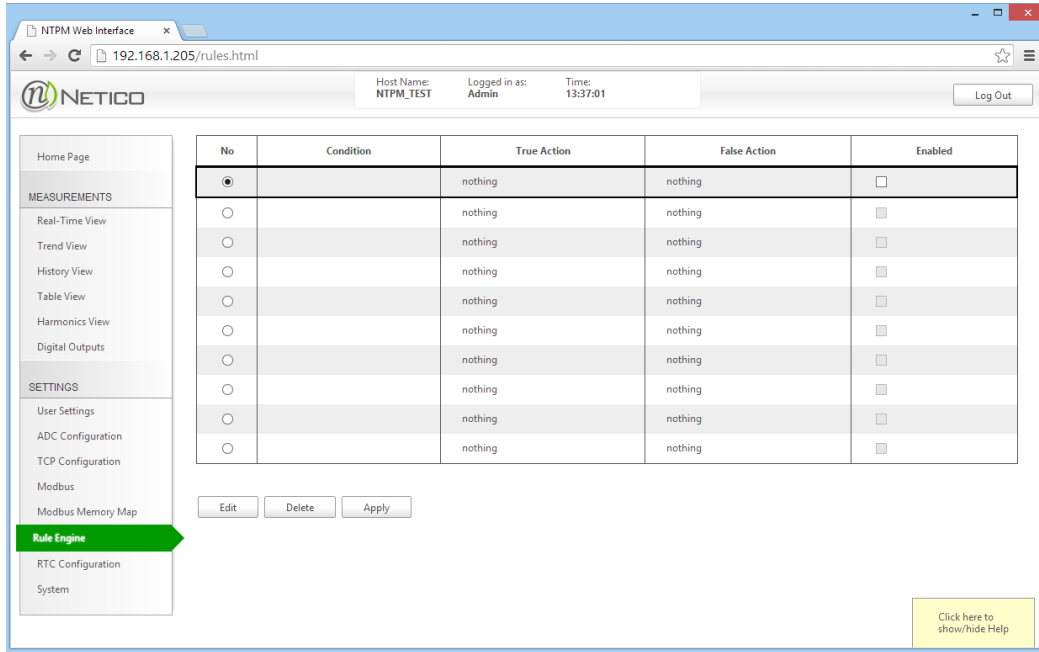


Figure 26: Rule engine - rules list

“Edit” button takes you to Condition editor, where you can set rule condition and action. Once you set expression in the editor, you can check validity by clicking on “Check” button.

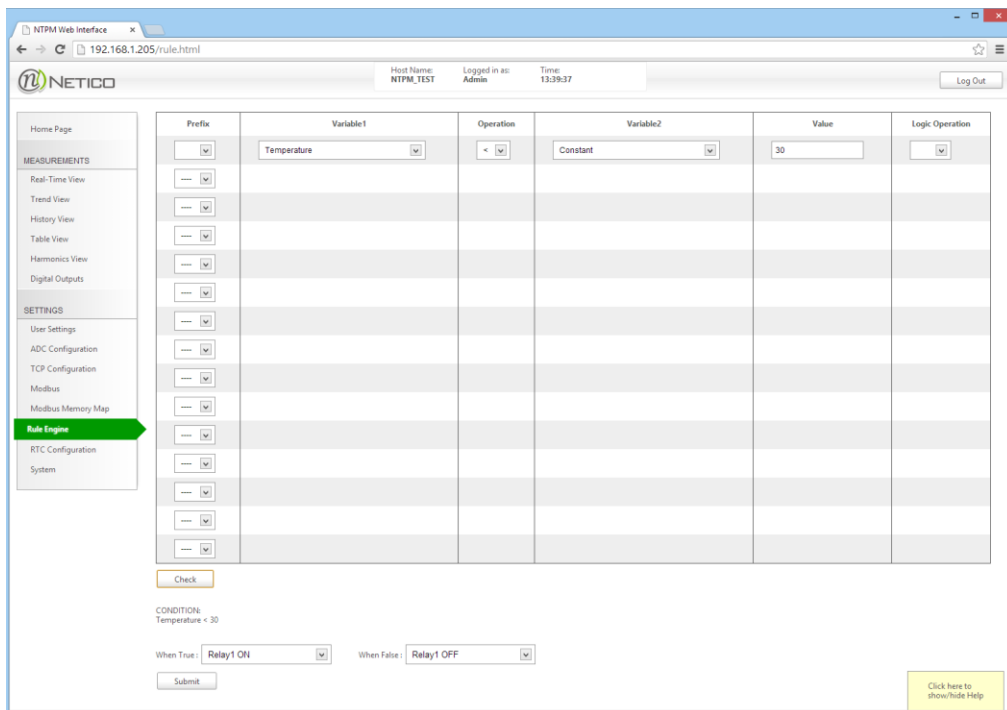


Figure 27: rule engine - condition editor

6.4.7 TARIFF CONFIGURATION

Tariffs can be set on this page. Up to four different tariffs can be configured.

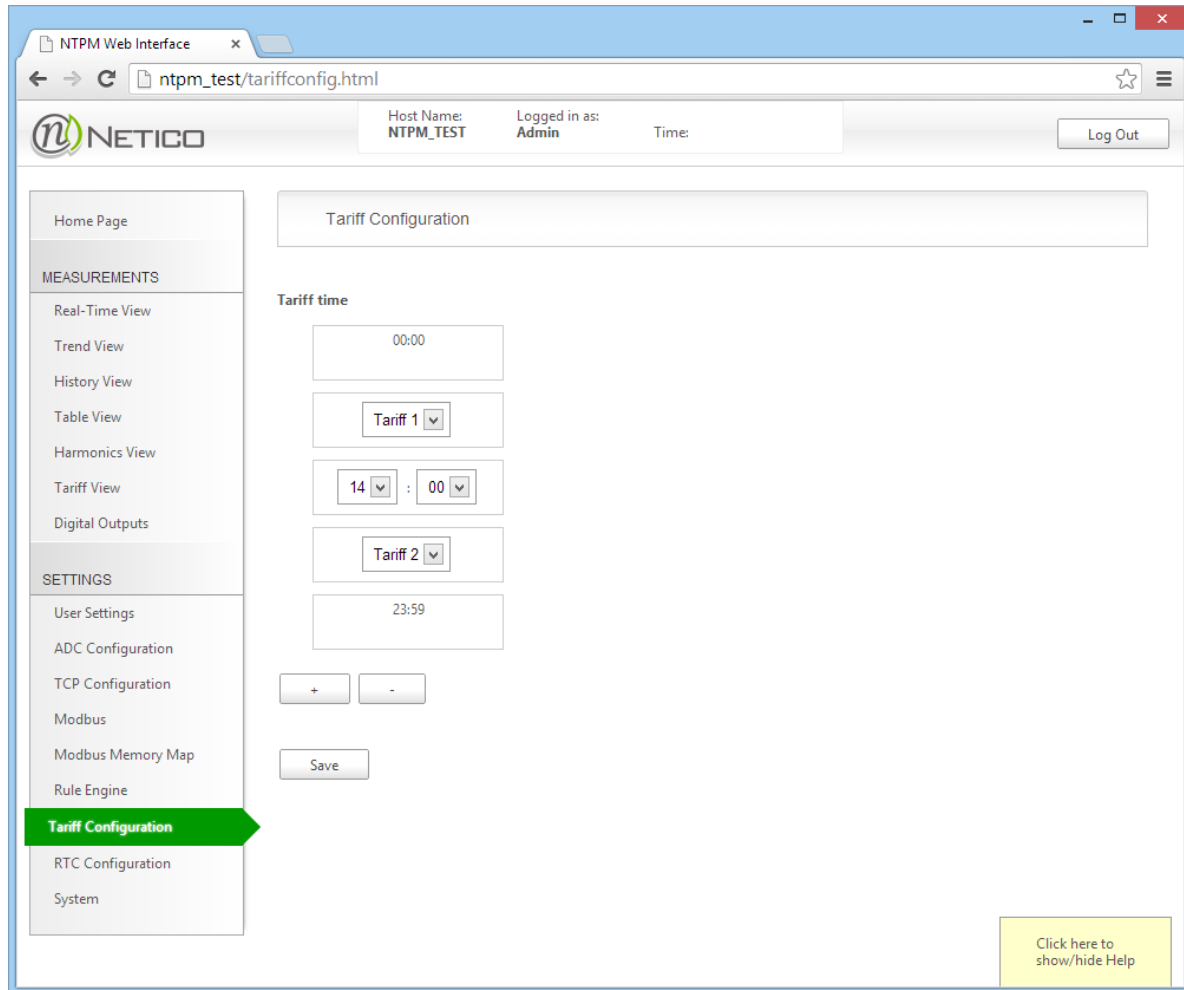


Figure 28: Tariff Configuration



6.4.8 RTC CONFIGURATION

Real Time Clock settings can be configured on this page. “Set” button sets devices clock based on the manual setting of date and time in the calendar and time controls. “Sync” button synchronizes your devices date and time to your client machines date and time (PC/Tablet). Time zone settings are also supported with option to use DST (Daylight Saving Time). NTPM also supports time synchronization over SNTPserver.

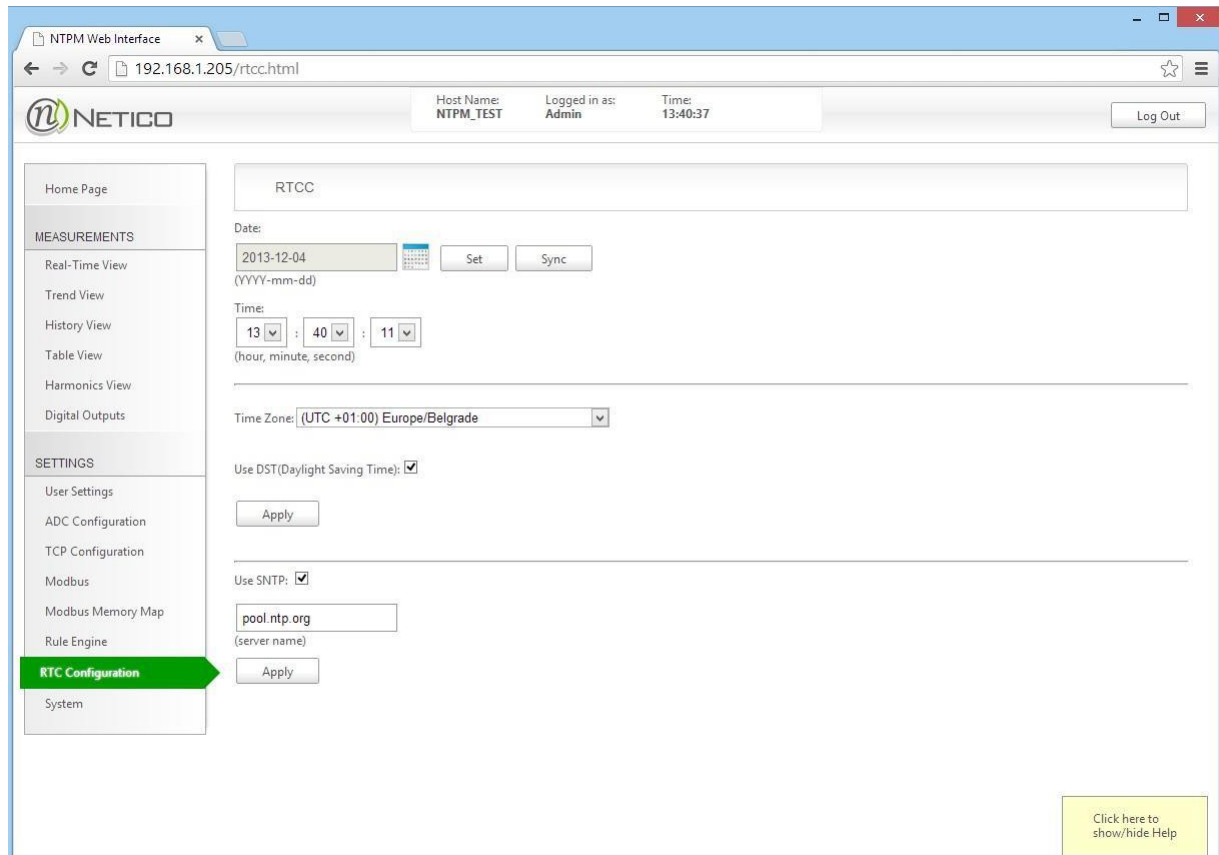


Figure 28: RTC configuration



6.5 SYSTEM PAGE

The page displays device information like Hardware and Firmware version. The device can also be rebooted from this page by clicking on the “Reboot” or “Save and Reboot” button.

Measurement data recorded on device’s SD card can be erased by clicking on “Erase” button found under “Manage Recorded Data” section on the page. Erasing process takes a while and status is indicated with progress bar at bottom of the screen.

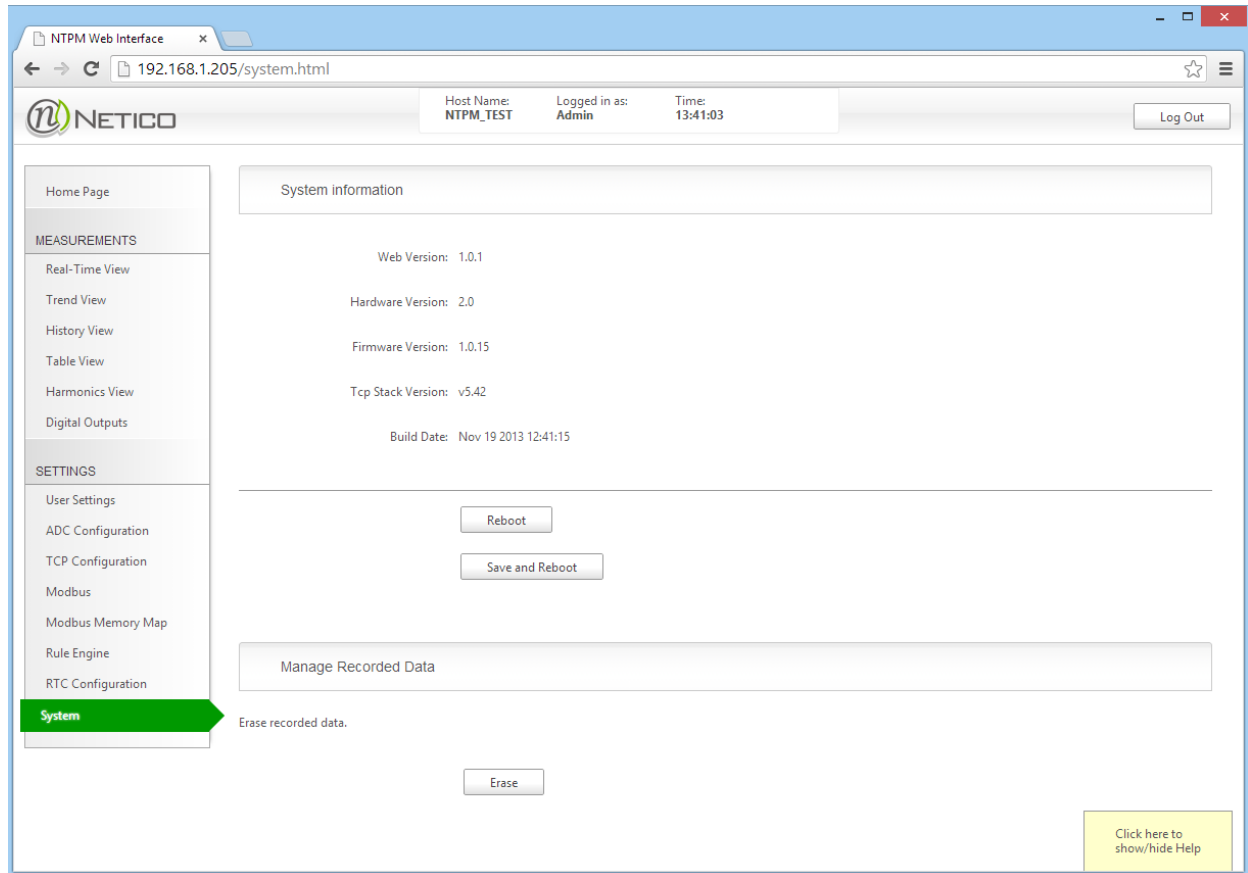


Figure 29: System Page



7 WEB SERVICE

NTPM100 offers a robust web service interface for access to measurement data stored in the device. Data can be obtained by sending HTTP POST request to the devices web server.

Host: <device IP address> Path:
custom.xml Parameters used in
request:

type :
[current|by_second|by_5min|by_15min|by_hour|by_day|by_month]

- **current** – currently measured data
- **by_second** – data measured and saved everysecond
- **by_5min** – history data calculated every 5 minutes
- **by_15min** – history data calculated every 15 minutes
- **by_hour** – history data calculated everyhour
- **by_day** – history data calculated everyday
- **by_month** – history data calculated everymonth

start : [DD-MM-YYYY-hh-mm-ss] - beginning time

stop : [DD-MM-YYYY-hh-mm-ss] - ending time

When using this format for start and stop parameters [DD-MM-YYYY-hh-mm-ss] do not omit leading zeroes. Format fields are:

- DD : day (01-31)
- MM : month (01-12)
- YYYY : year (2000-2100)
- hh : hour (00-23)
- mm : minutes (00-59)
- ss : seconds (00-59).

user : username for authentication

pass : password for authentication

tags : [tag1-tag2-tag3-....] measurement tags separated by dash

See Appendix II for WEB Service tags.

8 SUPPORT AND SERVICES

In the event of any equipment failure or any operational queries please contact the technical service of your local Netico Group sales representative for assistance,

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Suite 134
Orange, CA 92868
☎949.836.5012
✉NTPM@rhytonglobal.com



