Controller for smart electrical water heater NHC-56M

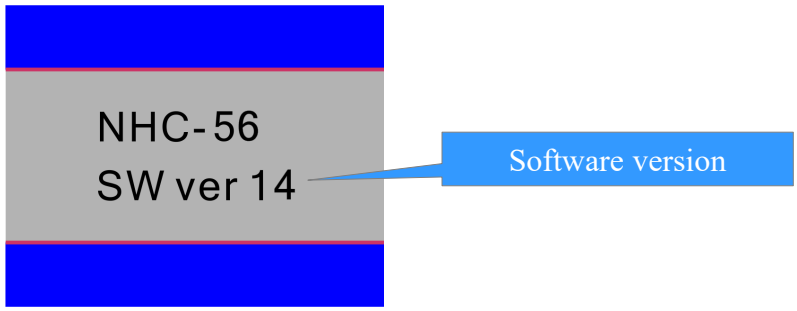
User manual
Software version 35

NHC-56M is an electronic controller with a color TFT display for electrical water heater with Smart control function. The elegant graphic display displays a variety information on water heater's operation and state. The controller has four main working mode: "Standby", " Heating" - the set temperature is maintained, " Smart control"- self- learning mode with automatic selection of the heating temperature in order to maximize saving electricity consumption and " Timers" mode, using the seven weekly timers. "Smart control" mode can work with two priority: use low cost tariff or use a weekly schedule of hot water consumption.

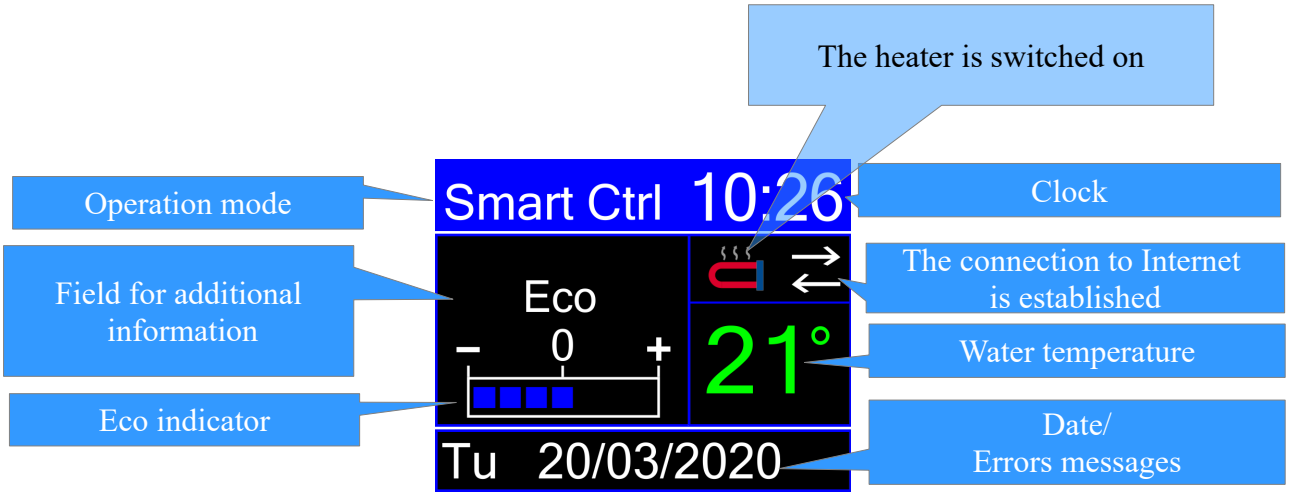
NRM-W3 WiFi module can be install to the controller for connection to Naturela Smart Home (NSH) system for remote monitoring and control via Internet.

Information displayed on the controller

The display has a different views when the state is “ On” or “ Off”. When the boiler power supply is turned on for 2 seconds, information about hardware and software controller version is displayed.



After that the main screen with water temperature, date, time and the other information is displayed, depending of the current working mode.



Main screen of Smart Control mode with “Low cost tariff” priority

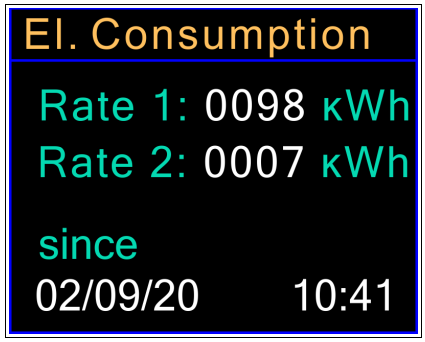
Operation modes messages:

Antifrost	Frost protection mode is activated
Standby	The thermoregulator is switched off
Heating	“Heating” mode supports the set temperature
Program	“Timers” mode with weekly programmer, working with T s change
Timers	“Timers” mode with weekly programmer in two state On/Off
Smart Control	“Smart Ctrl” mode works depending of set priority
Learning	“Self learning” mode supports the max temperature in water heater and saves hot water consumption in one week time

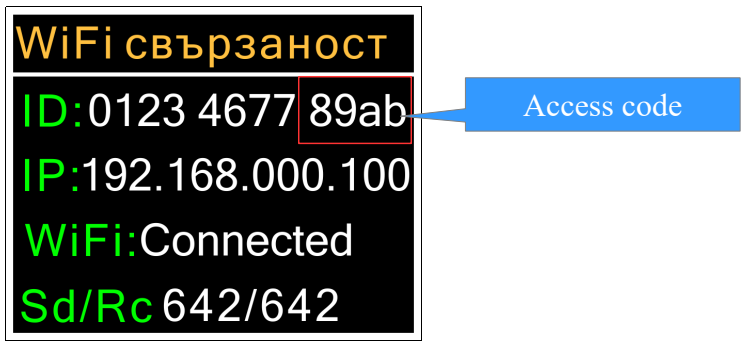
Error messages:

Wrong time!	The thermoregulator clock is not set. The water heater can only be switched on in " Heating" mode. The rest modes are not available.
Disconnected SL	Thermo sensor failure at the bottom part of the water heater. It is switched off or interrupted. The heater will not work and water heater will not switching on without troubleshooting.
Short SL	Thermo sensor at the bottom is in short. The heater will not work and water heater will not switching on without troubleshooting.
WH Frost	May be the water is frozen. The water heater will switch off.
Faulty heater	The heater is failed. The water heater will switch off. The water temperature doesn't rise. The boiler will switch off.
Faulty Flash!	Unable to save settings changes in the non-volatile memory of the controller.

When the controller is in main screen and a "↵" button is pressed, four screens with additional information are displayed in series. First of them are the counters for the electricity consumption for the two tariffs separately and the date and time of their last reset. While this screen is displayed, if the "↵" is hold for 2 seconds, then the counters are reset and the resetting date and time are recorded.



When the button "▼" is pressed switches to the screen with WiFi module status information screen, if there is.



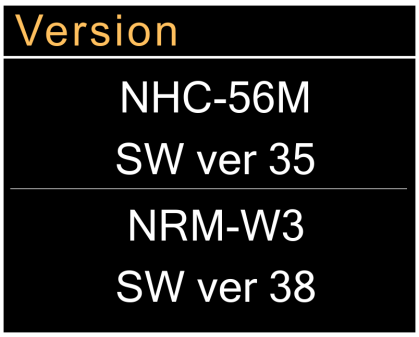
The fields are as follow:

ID – Identification code of each modem.
IP – IP address of the modem
WiFi – The connection status:

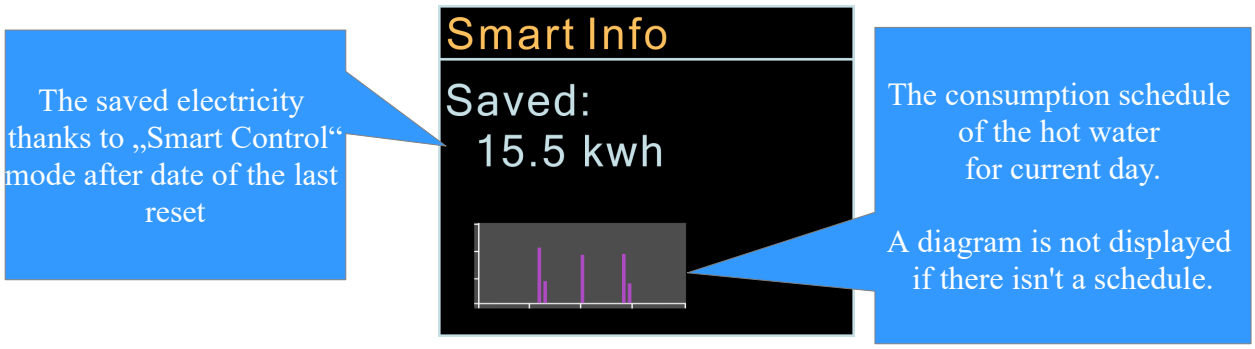
- **Idle** – The modem has not yet connected to a WiFi router with Internet
- **AP mode –** The modem is in Access point mode and provide ability to accept the name and password of the local WiFi network for connection with it.

- **Router** – The modem is connected to router
- **Internet** – The Internet connection is established.
- **Connected** – The modem is connected with server of the information system.
- **Sd/Rc** – Sent / received data packets via Internet

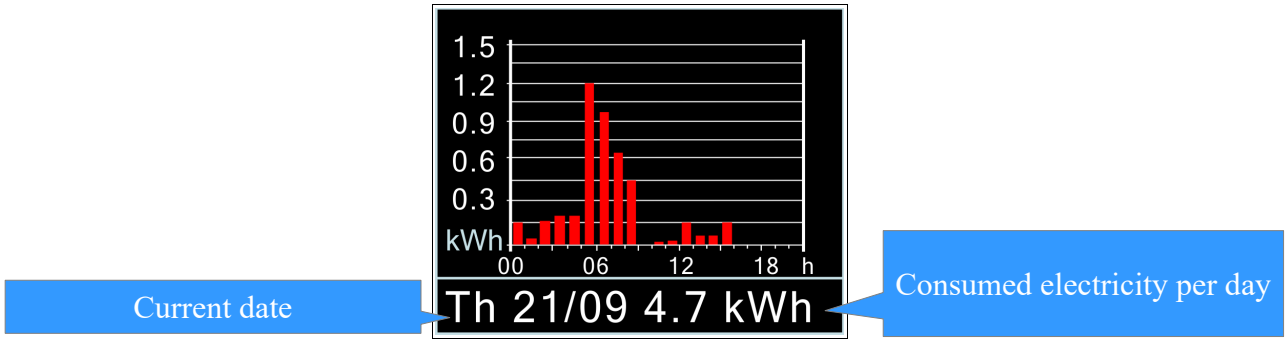
When a "▼" button is pressed switches to the screen with information for thermoregulator's software version and a WiFi's software version if a WiFi module is installed in Control module.



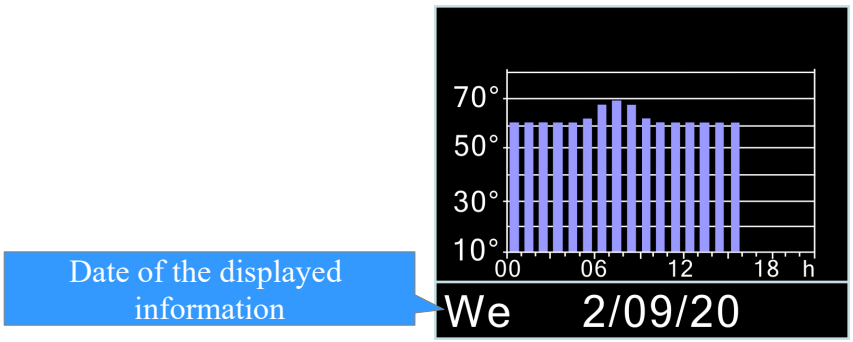
The next press of the "▼" button switches to " Smart info" screen, which displays an additional information for water heater operation in "Smart control" mode:



The next press of the button "↵" switches to the screens with drawing of the consumed energy by hours. The controller saves such as information for the last 8 days. Pressing the "▲" or "▼" buttons will change the drawings for available days. A date and a total consumed energy for relevant day is displayed under each drawing. You have to mind, that the information for the consumed energy is calculated on the base of adjusted heater power.



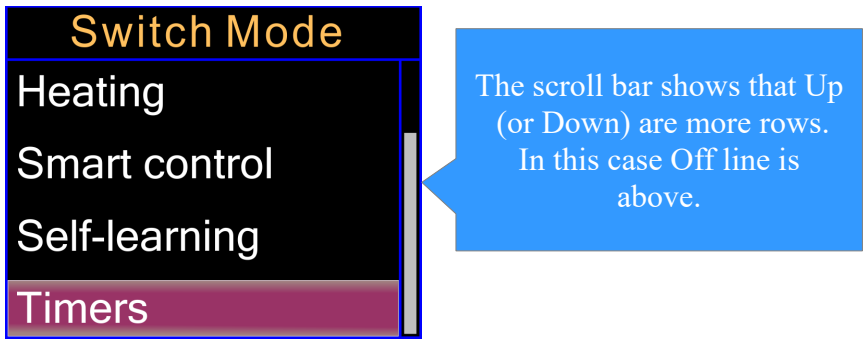
The graphs for electricity consumption is followed of average water temperature graphs by hours. The controllers store such information for the last 8 days. Pressing “▲” or “▼” buttons changes the graphs for days with available information. A relative date is displayed below each graph.



Operation with the regulator

1. Selection of operating mode

Pressing **“On/Off”** button is displayed the next menu:

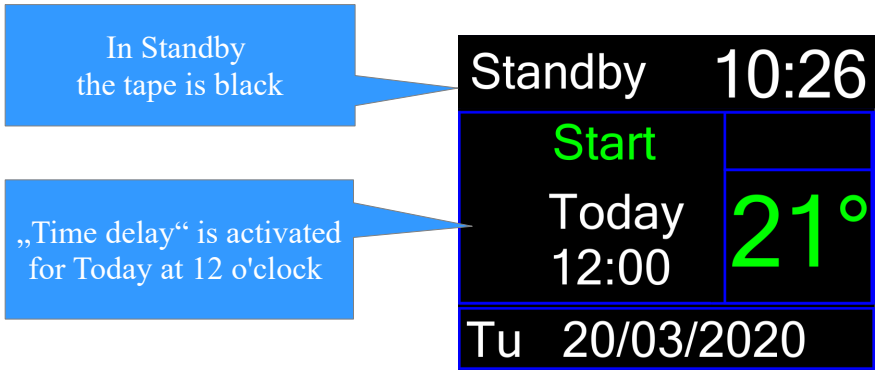


Pressing “▲” или “▼” buttons choose the corresponding mode, "↵" or **“On/Off”** buttons confirm the choice.

Five seconds after the last button pressing, you will exit from the mode selection menu without any change of the mode.
Keep in mind, that “ Timers” mode can't be selected, if at least one timer is not “On” and if the clock is not set. In this case only “ Heating” mode can be activate. The “ Timers”, “ Smart Control” and “ Self learning” mode aren't accessible.

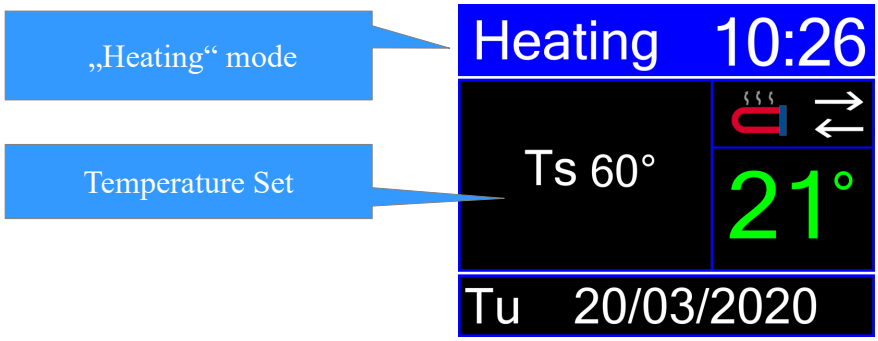
Switch off of the water heater

To turn off all active boiler actions, select the “ Off” mode. In this mode, only the “ Anti-freeze” function and the option “ Delayed start” are retained. When the thermoregulator is off, the upper blue bar becomes black and has a notice “Off”.



„ Heating” mode

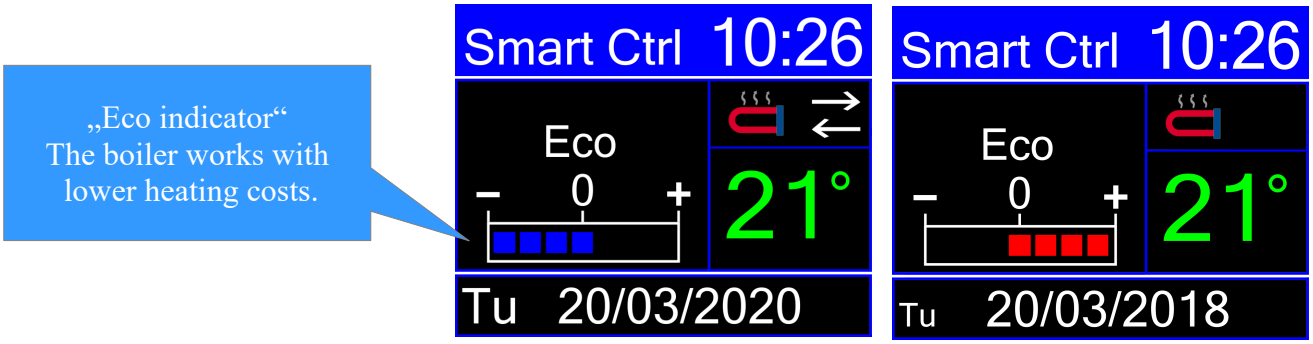
When “Heating” mode is active, the thermoregulator will supports the Tset. The heater will switch on, when the measured temperature by SL thermosensor drops 4 degrees below the T set value and will switch off when the set T value is reached. The display view will be as follows:



“ Smart control” mode

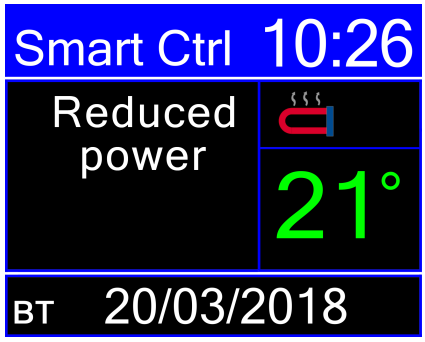
“ Smart control” mode is designed to automatically selection of the most suitable temperature for water heating in order to achieve the lowest electricity cost. This mode has three operation priority and user should choose the best one suits his needs. The “Smart Control” mode is designed to completely take you away from the daily worries of turning on/off the boiler so you could reduce water heating costs. In this way your water heater never leave you without hot water.

The first priority of the “Smart Control” mode has the priority “ Low cost tariff”. Its advantage is significantly lower price of night electricity. The thermoregulator saved customer usage history during the last 7 days selecting the most economical strategy for heating during the current day. The screen when selecting this mode is as follows:

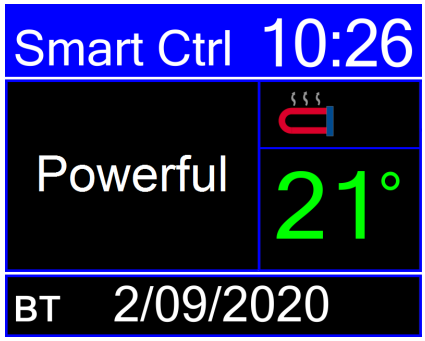


In most cases when the boiler operates in “Smart Control” mode, an Eco indicator is displayed on the left side on the screen. It shows whether a more economical heating algorithm currently is running when the values are to the left of the center or a less economical one when the values are on the right of the center.

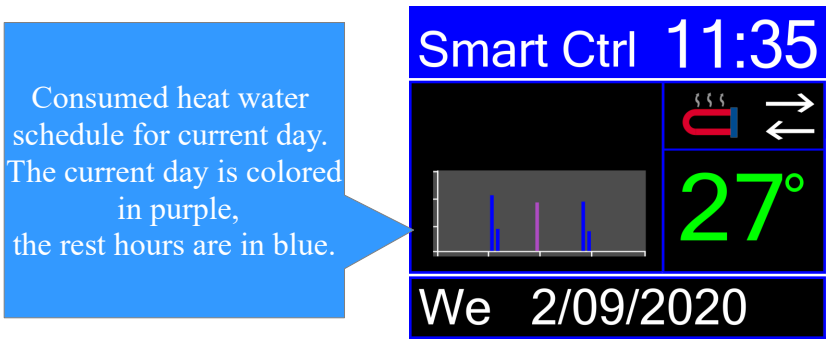
If two or more consecutive days the power consumption is small enough, the boiler switch to the most economical algorithm and the following screen will be displayed:



While the water heater is switched on in “Smart Control” mode there is a possibility for additional water heating up to T max. This is done by pressing and holding “▲” button for more than 2 s. The “Powerful” is displayed on the screen..



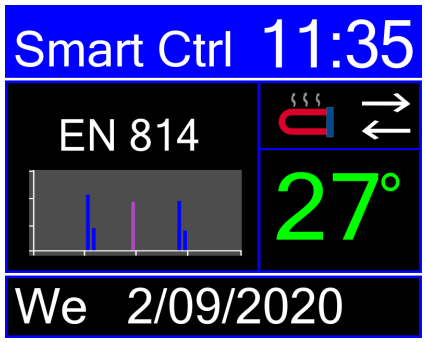
The second priority of “Smart Control” mode is” Schedule of use“. In this mode the thermoregulator complies with the weekly hot water usage schedule previously stored during the “Self-learning “ mode. The screen when selecting this mode is as follows:



The third priority of the Smart Control mode is "EN 814". This mode operates as a "Consumption Schedule" priority mode and also has additional heating at certain time intervals in accordance with Directive 814/ 2013. The screen when select this mode is as follows:

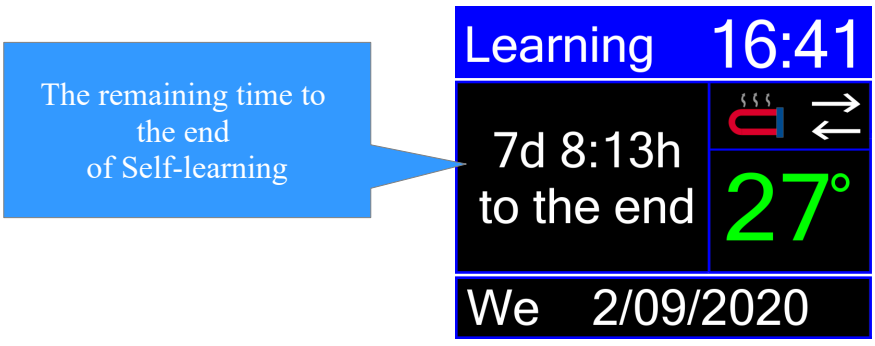
Attention:

- *To turn on Smart Control mode , the system clock must be set!*
- *When " Low cost tariff" is chosen it is important correctly to enter "Start" and "End "of the Low cost tariff!*
- *For "Smart Control"mode operation with "Schedule of use" priority or " EN 814"is necessary to have available a completed consumption schedule full one -week cycle of self-learning!*



„Self- learning" mode

The purpose of this mode is the thermoregulator to record for a week when hot water has been used, so the "Smart Control" mode can achieve maximum energy savings while providing enough hot water when the customer need. After completing the full weekly cycle of self-learning, the thermoregulator automatically switches to "Smart Control" mode with priority " Schedule of use". The Self-Learning screen is as follows:



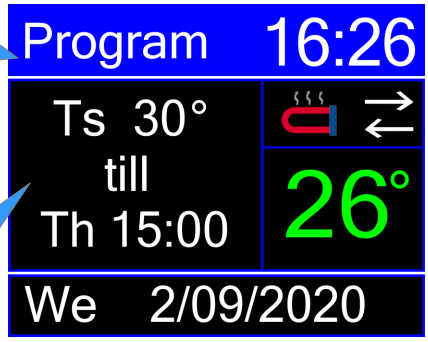
For Self- learning mode to be activated the system clock must be set!

„Timers “ mode

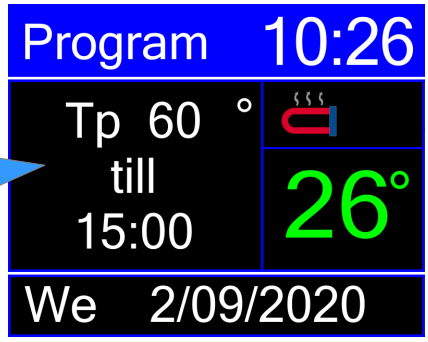
This mode allows the user to control the water heating algorithm himself, using the weekly timers of the thermoregulator. Will be possible to program when the heater switching on or desired temperature for water heating. The timers can work in two ways- with a change of temperature or with permission to turn on. One of two variants of “Timer” mode can activate in “ System settings”, “Timer” row. Each of 7 timers allows you to enter one time interval and week days during which to be active. When the timers work with a temperature change, there is also a temperature to which the water is heated during the time interval of the timer. Outside the timer interval, the temperature for water heating is Set temperature- Ts. When timers work with water temperature change, they called “ Program”. They named “ Timers” when operate in mode which allows only their switching on/off. Then in timer interval is permissible heater switching on. Water will heat until the Tset is reached. To turn on the operating mode with timers, system clock should be adjust and at least one timer should be active. The thermoregulator displays information on T set of water in the left field and time interval for this temperature or when the timer will switch on.

The timers work with option to change temperature. The mode is named „Program“.

„Program“ mode- when the current moment is in range is shown the program set temperature -Ts and when it will change.

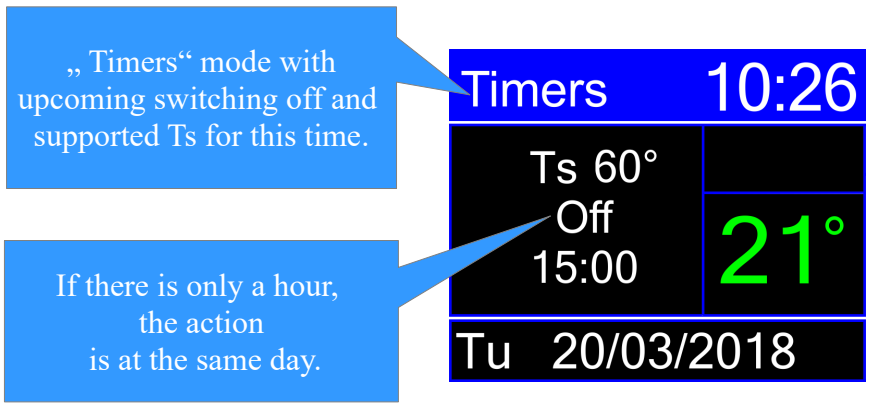


„Program“ mode- when the current moment is out of range is shown Tp and when it will change.



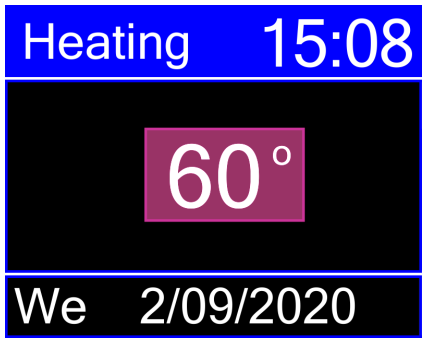
Timers mode-
The timers work with permission for switching on/off.

„ Timers“ mode with upcoming start of heating.



2. Adjust the temperature

The temperature can be set by short press the “▲” button. The T set is displayed in the middle field of the display. The next press of the buttons “▲” and “▼” changes settings in the desired direction. If no new buttons pressed up to 5 sec, the settings is saved and automatically switch to the main screen. If the “▼” buttons hold over 0,7 s the temperature value automatically increases or decreases with 4 units/ sec. The Ts interval is from 20 ° C up to 75 ° C.



3. „Time delay” mode

When the water heater is turned off, by pressing and holding a button “▲” for 3 s is possible to input an hour for automatically switch on of the appliance. The hour is define with step of 10 min. The time delay can be up to 24 hours. When enter in “ Start delay” mode for settings, the default time is the current hour, rounded up to 10 min and by pressing the "▲" or "▼" buttons, the time can be increased or decreased by 10min. If any buttons "▲" or "▼" hold for more than 0.7 sec, the value starts to increase or decrease automatically at 4 units/ sec. When “Delayed Start” mode is activated, the start time is shown in the middle field of the display.

For next correction of already defined Time delay start, have to hold "▲" button. Canceling of the " Time delay start time is possible by pressing "On/Off" button and switching to another mode, for example " Heating". The next pressing of "On/Off" button switch to " Standby" mode of the water heater. The controller will save the time for Start delay, if the power supply is turned off while the " Start Delay" mode is activated. If the set time occurs before the power supply is restored, the controller will remain in state " off", when the power is turn on.

4. Frost protection

When the boiler is in state" Standby" or heating is forbidden from set Timer, if the water temperature drops below 3 degrees, the "Anti frost" mode will activate and displays in the top field and the heater will switch on. When the temperature rises above 3 degrees, the protection mode is switched off.

5. "Anti legionela" function

If "Anti-legionela: function is enabled from the "System settings" menu and the water has not been heated to 70 ° C for more than 7 days, then this function will activate and the water will be heated to 70 ° C. After that the function will turn off automatically. In order to minimize the cost of electricity, the water heating will switch on one hour after the start of the night tariff.

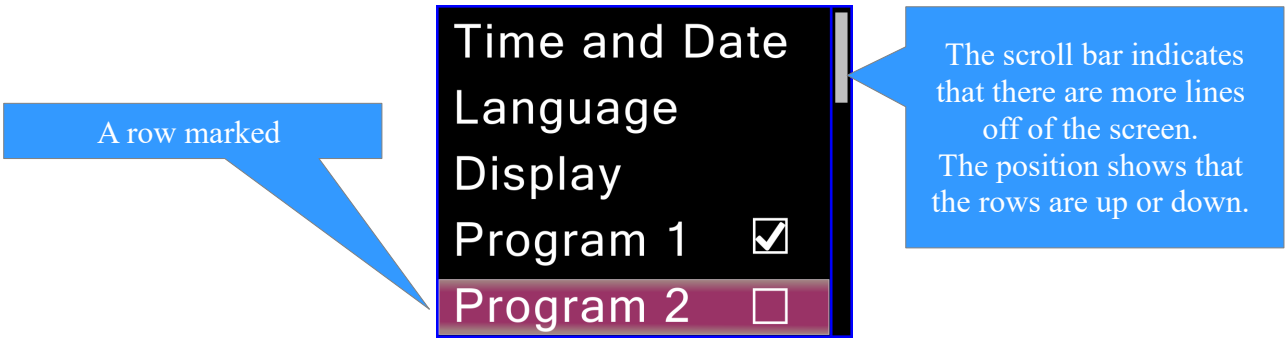
If the boiler is turned off from the mains power supply, the set temperature and operating mode will be saved. For example, if it was in "Heating" mode when the unit was switched off, it will be in this mode again with the same set temperature after switching on.

In the event of short power failure, the thermoregulator supports its system clock, as well as counts the " Delayed Start" time.

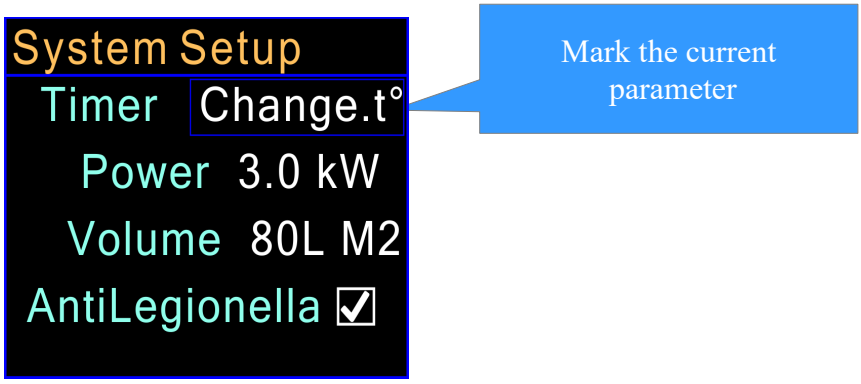
If the thermoregulator has been powered for less than 4 minutes before the power is turned off, it will stop working when 40 s the power supply is missing. If the thermoregulator has been powered for more than 4 minutes, then it can operate without power for up to 25 hours.

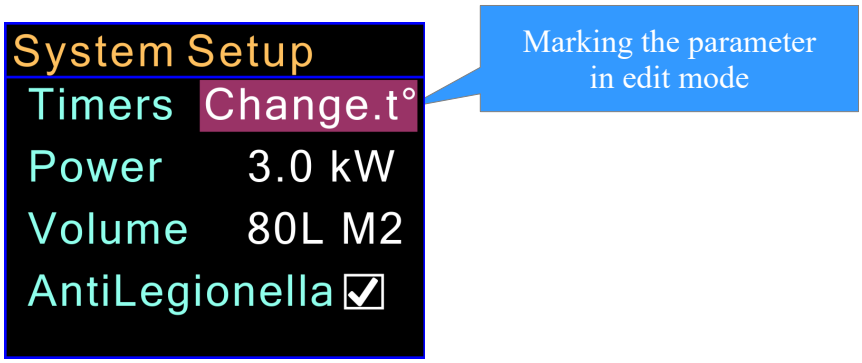
Settings

Access to “ Settings” mode is possible pressing down navigation button. You will receive next screen:

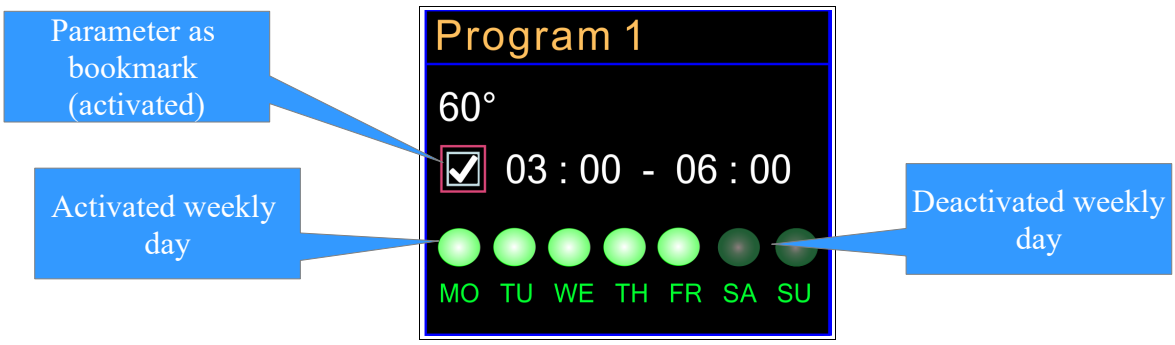


Pressing buttons “▲” and “▼”, you will select down or upper field. For entering of the selected row, you should press "↵". button. This will display the screen with the relevant settings. For correction, please follow the next way: The relevant parameter is displayed in blue rectangle. By “▲” and “▼” buttons the parameters are listed. Pressing "↵" entering in the correction mode of the current parameter. Its value is displayed in red rectangle. After that through “▲” and “▼” you may change the parameter value. Confirm of the changes through "↵" button and going out from correction parameter mode.





Exception to this rule are parameters with bookmarks (enabled / disabled). In this way, pressing "↵" button changes enabled to disabled state.

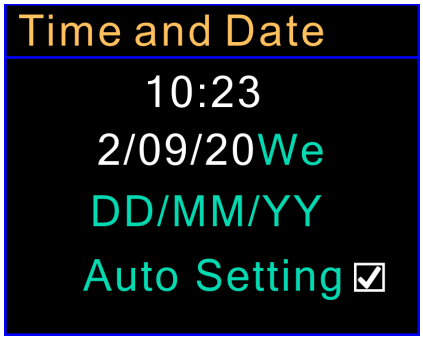


Once all parameters have been set, the changes done are confirm by pressing the “On/off” button, whereby the controller returns to the main screen.

The main menu consists the next settings:

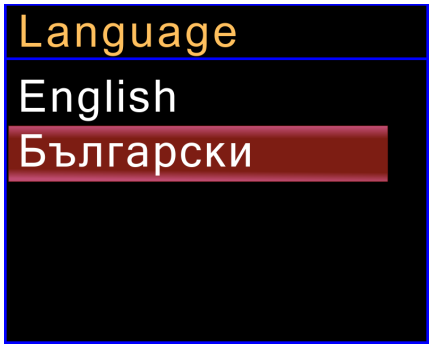
Hour and date

This screen adjusts the date and time of the controller. In addition, the automatic verification function is controlled, when a WiFi module is available.



Language

The language for displayed messages of the controller screens is adjusted.



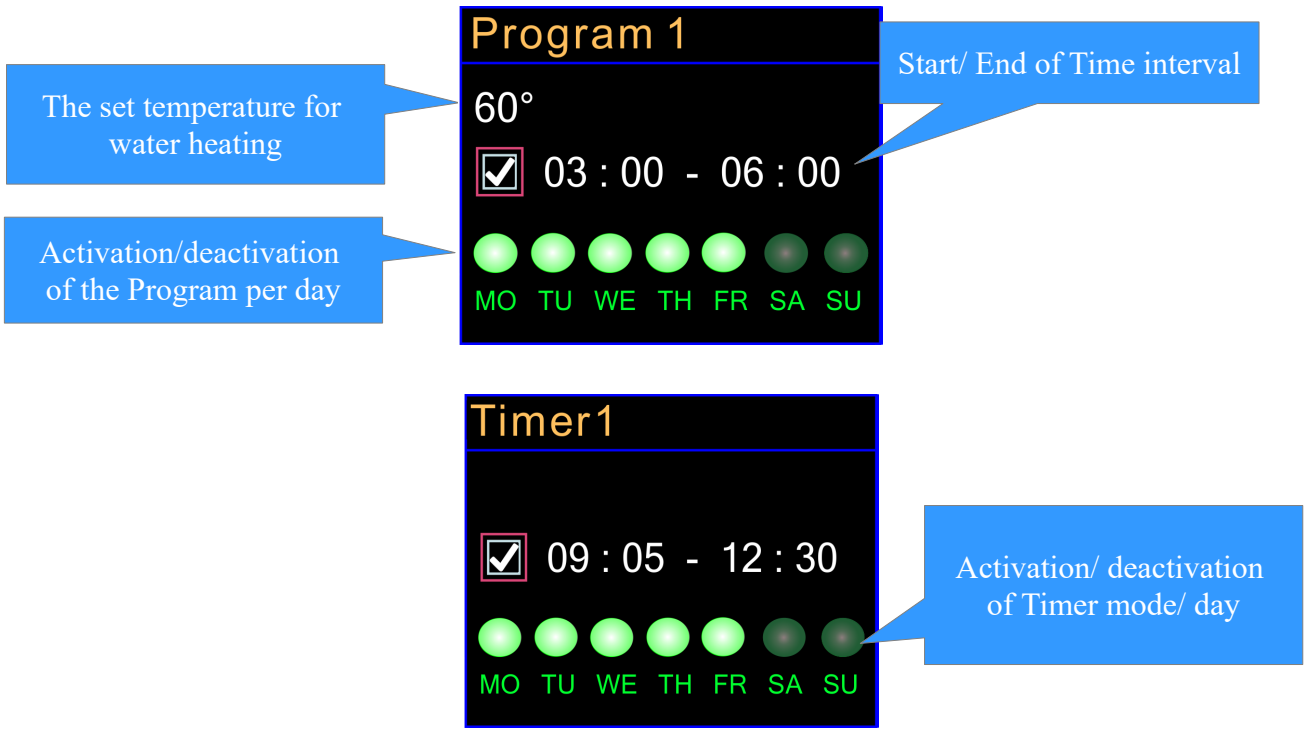
Display

This setting can change the brightness of the display and whether to dim, 30s after the last key press.

Program 1.7/ Timer 1.7

The operation of the weekly programmer is set from next screens. When the weekly programmer is in "On" mode, then the settings are " Timers" and consist only start and end of the interval, weekly days to which is related. When the weekly programmer is "Temperature change" mode, then the timers named "Program" and consist not only start/end of the time, weekly related days, but and temperature for relevant time interval. Each program/ timer can be activated/ deactivated.

Have in mind that the time in column " Begin" can't be later from the time in column" End"!



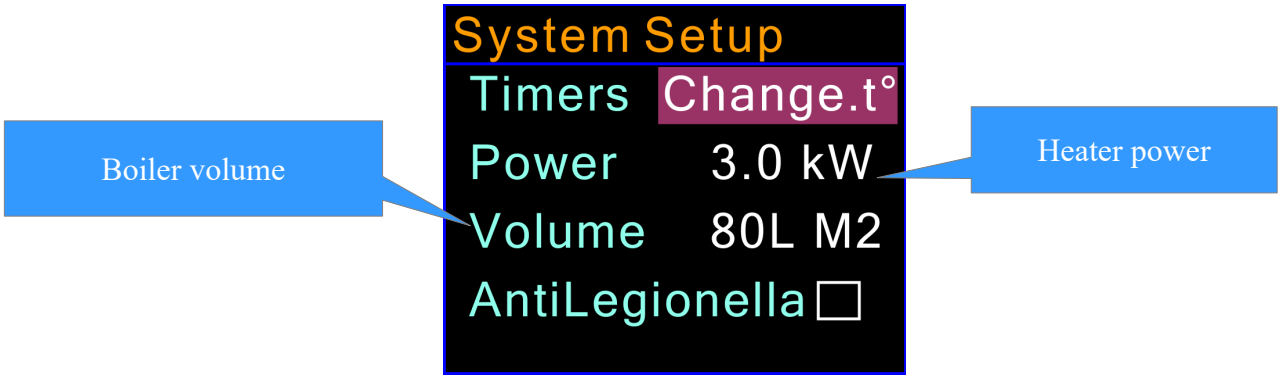
Low Cost Tariff

The start/end time of the night electricity tariff is set. The daily rate covers the rest of the day. This information is used to maintain electricity meters, as well as for " Smart Control" mode with " Night tariff" priority.

System Setup

The mode for weekly programmer, the heater power, the boiler volume are set, " Anti legionela" function can be permit.
For Timers are 2 options: " Change t" or " On/Off". In the first variant the boiler will work entire time, while the Timer mode is active, but weekly programmer will change the set temperature in the specified time interval.
In the second variant, the timers define the time diapasons, which permit water heating.

When the " Anti Legionella" field is marked, the function is permitted.

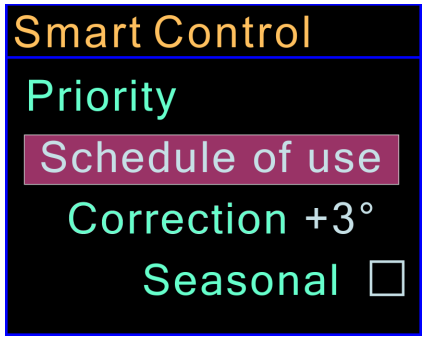


It is important to set the heater power correctly for the metering of the consumed electricity!

For properly operation of "Smart Control" mode it is important to set the heater power and boiler volume correctly.

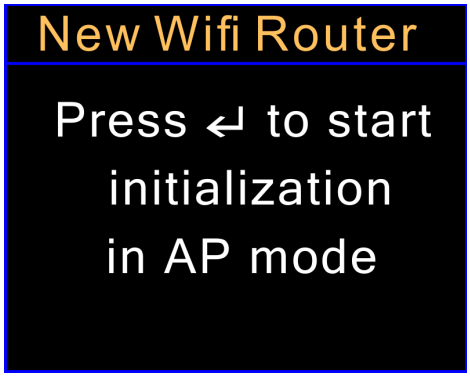
Smart Control

Additional settings of control algorithm for Smart Control mode can be made. With “Priority” you will select how Smart Control mode will work (see “ Smart Control” mode on p.7). The “ Correction ” field can be used to adjust the operation of the controller in “Smart Control” mode with “ Low Cost Tariff” priority, when the standard setting (+0°),, which is the most economical, doesn't provide a sufficient amount of hot water. The “Seasonal comp” option is valid for all variants of the “ Smart Control” mode and allows additional heating of the water during the colder months of the year. This feature compensates the need for more hot water in the winter because of lower temperature of the water and more heat losses in the bathroom and water pipes during the cold months.

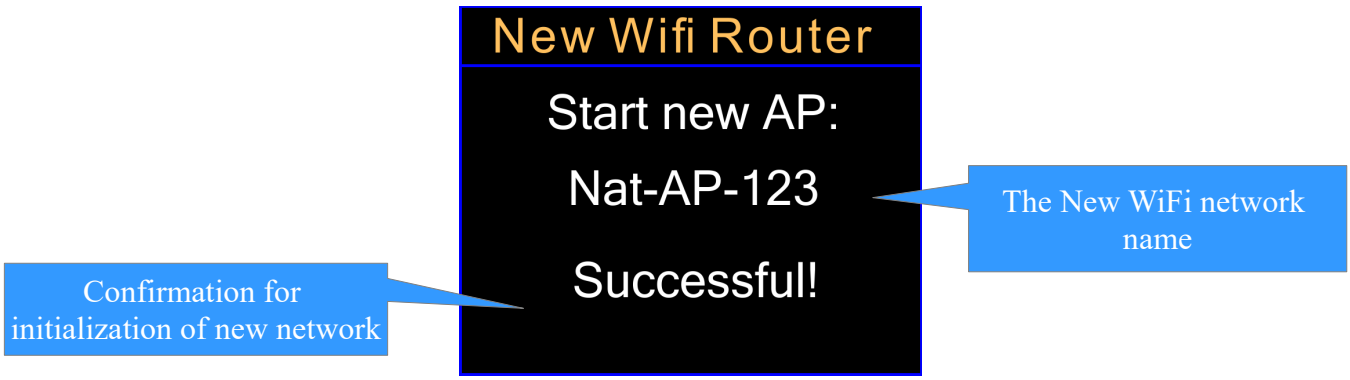


New WiFi network

The initialization of the WiFi module, if the controller is equipped with, is make. You should start Access Point mode(AP) and connect the thermoregulator to Local WiFi network through Smart phone, tablet or PC. The next screen is displayed when select the function.



If "↵" press, the modem will switch to AP mode. The new “ WiFi network” will establish and controller will display its name. The confirmation for “Successful” initialization you will receive.



The next step is to connect your phone or PC to Nat-AP-xx and to configure the modem, entering the local network name and access password. For more information about WiFi modem configuration, can see:

http://www.naturela-bg.com/files/Nat_Smarthome_EN.pdf

Technical data of **NHC-56M**

1	Power supply	230VAC/50Hz +5/-10%
2	Maximum available current through the relay contacts	16A AC
3	Power consumption with switched off heater: - without WiFi module - with WiFi module	 <1.1W <1.5W
4	Measured temperature range	-25°C – 120°C
5	Set temperature range	20 °C – 75°C
6	Error of the thermosensor, while the temperature is measured	<1% +/- 0.5°C
7	Temperature for “Frost protection” mode activation	<=3°C
8	Permissible ambient temperature when relay is on	-10 - +50ºC

NHC-56M connection diagram