

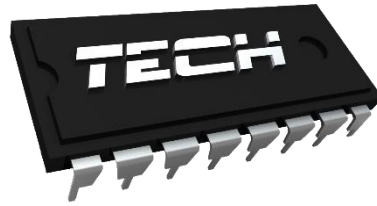
Controllers

User's manual

ST-81

EN





Declaration of Conformity for Controllers

ST-81 No 23/2007

The product was marked with CE for the first time: on July 4, 2007.

The company TECH, based in Wieprz 1047A, 34-122 Wieprz, declares with complete liability that the temperature regulator **ST-81** 230V, 50Hz meets the requirements of the Regulation of the Minister of Economy, Labor and Social Policy (Journal of Laws No 155, item 1,089) dated August 21, 2007, implementing the provisions of the Low Voltage Directive **(LVD) 2006/95/EC**, the Act dated April 13, 2007 on electromagnetic compatibility (Journal of Laws 07.82.556) implementing the provisions of Directive **(EMC) 2004/108/EC**, as well as the Regulation of the Minister of Economy dated May 8, 2013 "on basic requirements on the restriction of the use of certain hazardous substances in electrical and electronic equipment" implementing the provisions of Directive **ROHS 2011/65/EU**.

Harmonized standards were used to assess the conformity **PN-EN 60730-2-9:2011, PN-EN 60730-1:2012**.

 PAWEŁ JURA	 JANUSZ MASTER
<small>WŁAŚCICIELE TECH SP.J.</small>	

Wieprz, 30. 01. 2015

I. Safety

Before using the device for the first time the user should read the following regulations carefully. Not obeying the rules included in this manual may lead to personal injuries and device damage. This manual should be stored carefully.

In order to avoid unnecessary errors and accidents it should be ensured that every person using the device has familiarized themselves with the principle of operation as well as security functions of the device. If the device is to be sold or put in a different place, make sure that the user's manual is there with the device so that any potential user has access to essential information about the device. The manufacturer does not accept responsibility for any injuries or damage resulting from negligence; therefore, users are obliged to take the necessary safety measures listed in this manual to protect their lives and property.



WARNING

- **High voltage!** Make sure the regulator is disconnected from the mains before performing any activities involving the power supply (plugging cables, installing the device etc.)
- The device should be installed by a qualified electrician.
- Before starting the controller, the user should measure the earthing resistance of the electric motors as well as the insulation resistance of the cables.
- The regulator should not be operated by children.



NOTE

- The controller may be damaged by lightning. Make sure the plug is disconnected from the power supply during storms.
- Any use other than that specified by the manufacturer is forbidden.
- Before and during the heating season, the controller should be checked for the condition of its cables. The user should also check if the controller is properly mounted and clean it if dusty or dirty.

Changes in the merchandise described in the manual may have been introduced subsequent to its completion on February 2th 2015. The manufacturer retains the right to introduce changes to the structure. The illustrations may include additional equipment. Print technology may result in differences in colours shown.



Care for the natural environment is our priority. Being aware of the fact that we manufacture electronic devices obligates us dispose of used elements and electronic equipment in a manner which is safe for nature. As a result, the company has received a registry number assigned by the Main Inspector of Environmental Protection. The symbol of a crossed out rubbish bin on a product means that the product must not be thrown out to ordinary waste bins. By segregating waste intended for recycling, we help protect the natural environment. It is the user's responsibility to transfer waste electrical and electronic equipment to the selected collection point for recycling of waste generated from electronic and electrical equipment.

II. Principle of Operation

The ST-81 temperature regulator is intended for central heating boilers. It controls the CH water circulation pump, the hot water (DHW) pump and the airflow (the fan).

If the boiler temperature is lower than the pre-set temperature, the regulator enters its operation cycle in which the airflow operates continuously.

If the boiler temperature is equal to, or higher than the pre-set temperature, the regulator is in the support cycle and the controller operates by activating blow-throughs at a frequency dependent on the user's settings. The blow-through operation and pause time in support should be selected in accordance to the type of fuel combusted in the boiler.

TECH uses one manual for the ST-81 controller in various program versions, depending on the boiler type. The program's version is written individually for each boiler's manufacturer. Any comments regarding the program should be reported to the boiler's manufacturer.

Each controller should be set individually for the user's own needs, depending on the type of fuel used for burning, as well as the boiler type. TECH does not accept responsibility for incorrect use of settings for the controller.

III. Installation

The controller should be installed by a qualified person.



WARNING

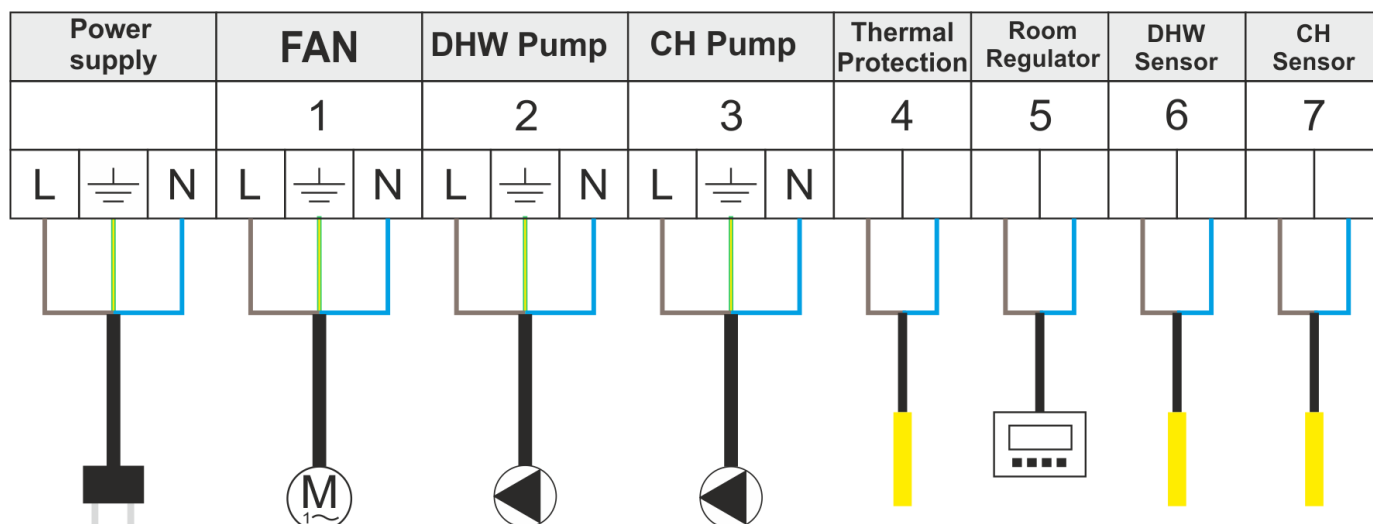
Risk of fatal shock from touching live connections. Before installing the regulator, switch off the power supply and prevent it from being switched on accidentally.

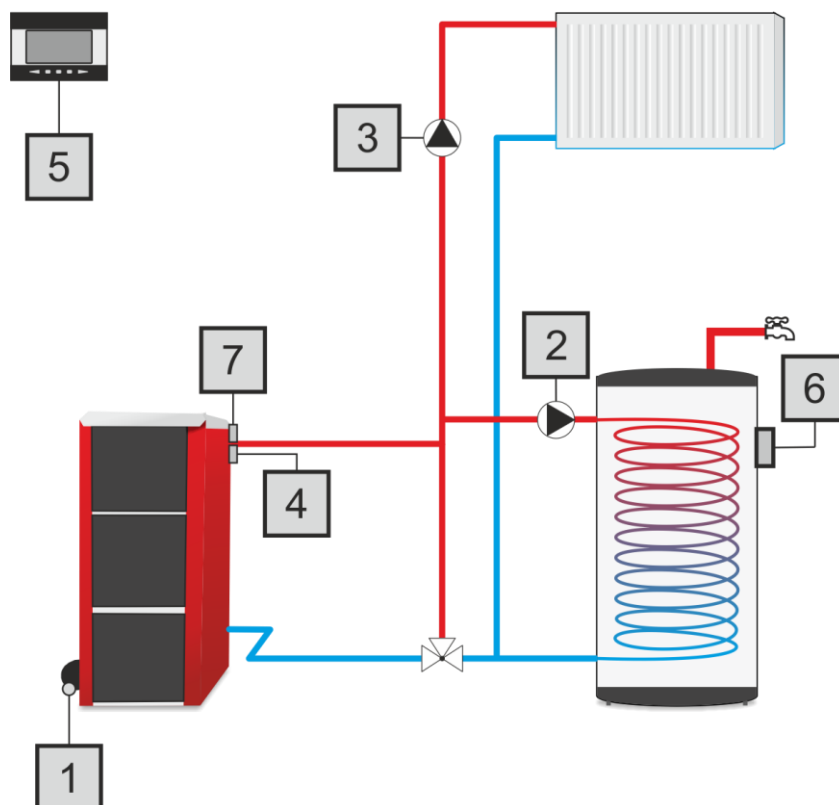


NOTE

- Incorrect connection of cables may damage the regulator!
- The **ST-81** controller needs to be connected to the boiler during installation so that there is no external access to the cable installation strip.

The rear part of the controller contains couplings to which the sensors as well as devices operated by the controller should be connected:

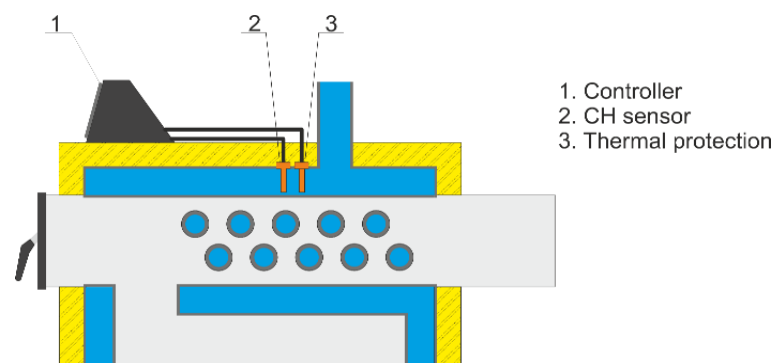




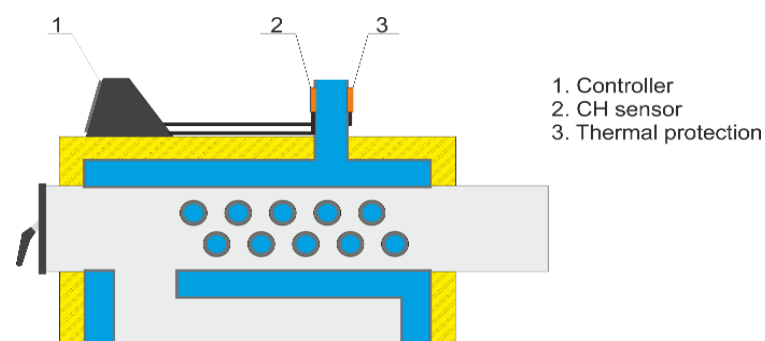
General Diagram - the diagram does not replace the design of a CH system. It is intended for the demonstration of the controller's expansion possibility. The presented diagram of the heating system does not contain elements cutting-off and protecting for the execution of professional installation.

Location of the Thermal Overload Relay and the Boiler's Sensor:

The thermal overload relay is a bimetallic sensor located next to the boiler's temperature sensor in the capillary or on the pipe feeding the CH circulation as close to the boiler as possible.

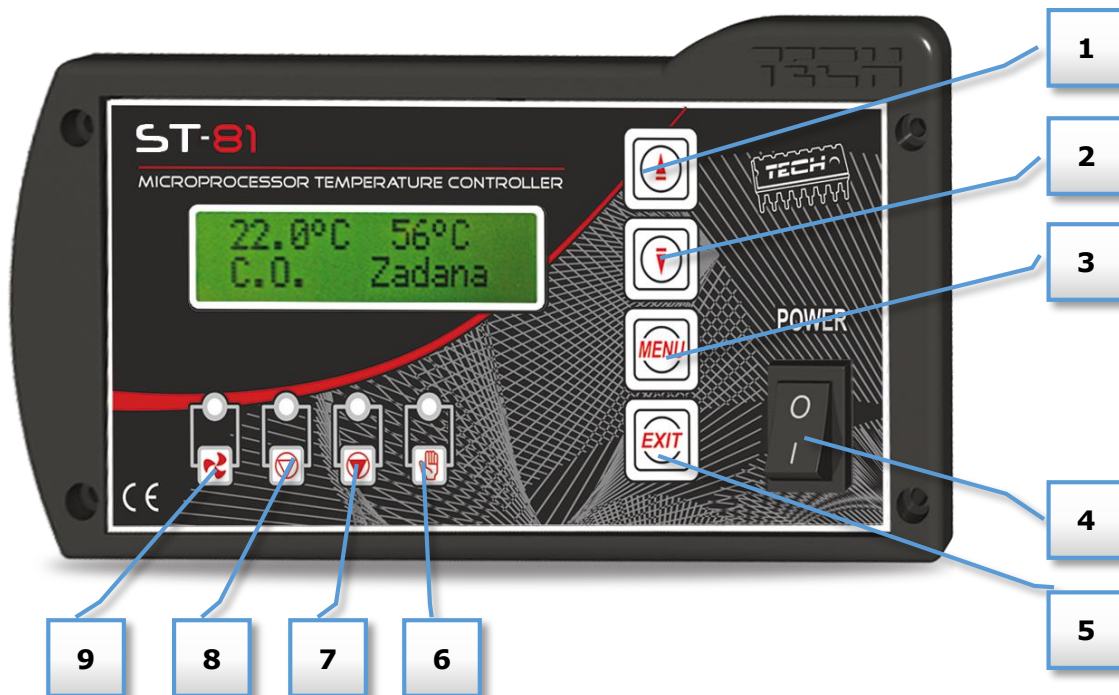


Installation in the boiler's capillary.



Installation on the feed of CH circulation.

IV. Operating the Controller



1. PLUS Button - changing the pre-set temperature from the main screen view, after entering the controller's menu the button is used to increase the work settings.
2. MINUS Button - changing the pre-set temperature from the main screen view, after entering the controller's menu the button is used to decrease the work settings.
3. Entering the controller's menu, approving settings.
4. Mains switch.
5. Exiting the controller's menu, cancelling settings.
6. Diode signaling manual operation.
7. Diode signaling operation of DHW pump
8. Diode signaling operation of CH pump
9. Diode signaling fan operation.

Changing the Settings of Pre-Set CH and DHW Temperatures

During regular operation of the regulator, the LCD displays the main page with the following information: current temperature of the boiler as well as the pre-set temperature.

This screen enables the user to quickly change the pre-set CH temperature with the use of PLUS and MINUS buttons.

In order to change the setting of the pre-set DHW temperature, the user should press and hold the button EXIT and then mark the option DHW screen. The display will show the DHW screen which enables the user to change the setting of pre-set DHW temperature with the use of PLUS or MINUS buttons.

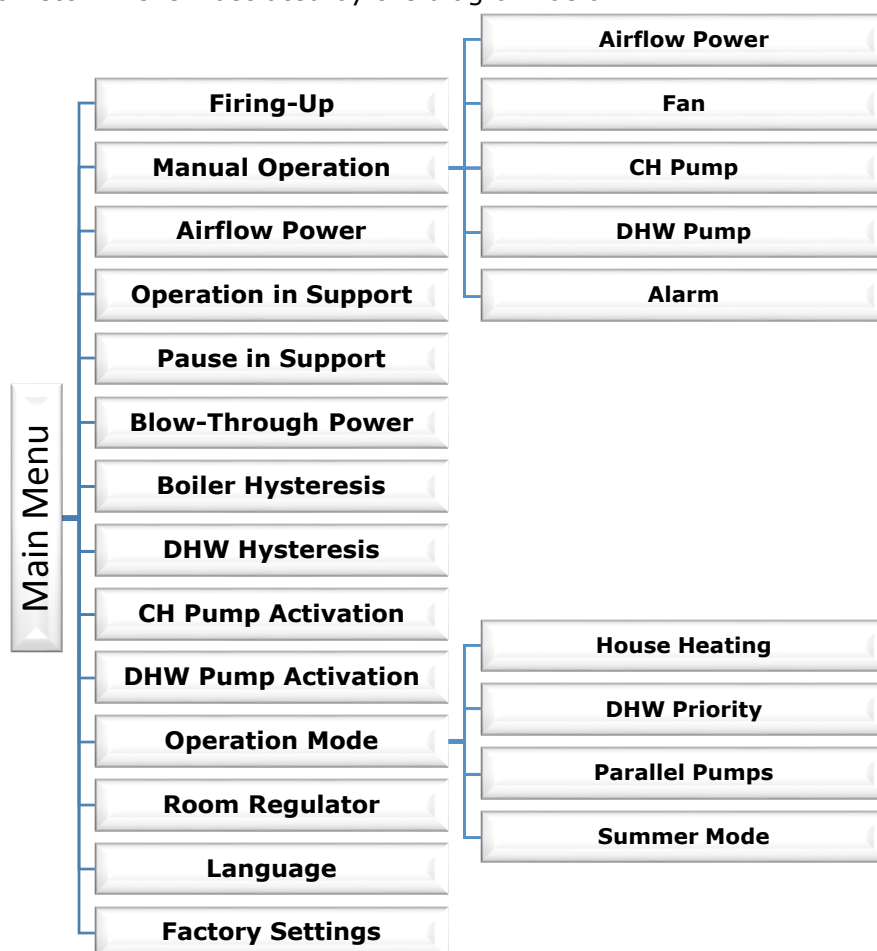
Pressing the OPTIONS button moves the user to the menu. Use PLUS and MINUS buttons to move around the menu. After marking the appropriate function, the user should confirm it by using the OPTIONS button (this button is also used to approve changed parameters). Pressing the EXIT button enables the user to leave the selected function (to the main screen view) or cancel the setting.

25°C	59°C
CH	Pre-set

■	CH screen
□	DHW screen

V. Regulator Functions – Main Menu

Due to the multifunctional nature of the controller, the menu is divided into the Main Menu and the Servicing Menu. The user sets basic working parameters in the Main Menu: pre-set temperatures, modes of operation etc. This is illustrated by the diagram below:



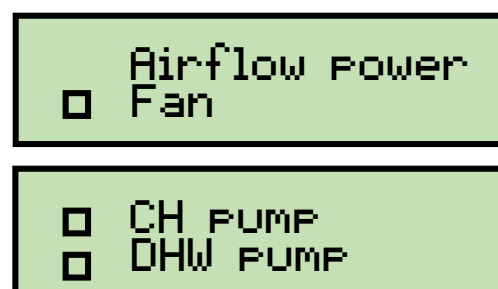
V.a) Firing-Up

After the initial lighting up of the fire source in the boiler, the user should activate the firing-up function. The fan will begin to operate in this mode in order to facilitate the firing-up (on a boiler which is not yet heated). When the CH temperature increases to 30°C (the so-called fan threshold), the display will show 'Switch Fan On/Off' instead of 'Firing-Up', the diode manual operation will go out and the boiler will proceed to its operation mode. Using the 'Switch Fan On/Off' function, the user may switch the airflow on or off (e.g. when adding fuel). Switching the fan off is signalled with the sign of a star on the main screen in the display's bottom right-hand corner. This function enables the user to safely operate the boiler. Opening the doors of the furnace with the fan switched on is forbidden.

If the boiler reaches a temperature of 35°C, the pump activates (or both pumps, depending on the operation mode).

V.b) Manual Operation

For the user's convenience, the regulator is equipped with the ability to be set to Manual Operation where each executive element is switched on and off independently of the others. Pressing the OPTIONS button activates the engine of a selected device (or alarm) which remains activated until the OPTIONS button is pressed again.



The Airflow Power, where the user has the option to define any rotational speed of the fan in manual operation, is additionally available.

□ Alarm

V.c) Airflow Power

This function controls the speed of fan operation. The regulation range varies depending on the program (from 1 to 6 or from 1% to 100%), and it may be assumed that these are the fan's gears - the higher the gear, the faster the fan is operating.

80 %
Airflow Power

Any changes in the fan's gears are made with the use of the PLUS and MINUS buttons. Depending on the program's version, the fan is initially activated with full speed and slows down to the pre-set gear or starts from a low gear and then proceeds to the pre-set gear.

V.d) Operation in Support

This option is used to set the time of airflow operation during support, namely after the boiler reaches the pre-set temperature (or is above the pre-set temperature).

20 seconds
Operat In support

V.e) Pause in Support

This option is used to set the time of pause in airflow operation during support (after the boiler reaches the pre-set CH temperature).

30 minutes
Pause in support

V.f) Blow-Through Power

This option enables the user to set the fan's airflow power in support.

80 %
Blow-through Pow

NOTE

The functions included in these three points of the menu are used to regulate the boiler's operation when in the support cycle. It prevents the boiler from going out as well as hampers the further growth in temperature when the boiler temperature remains above the pre-set temperature.

NOTE

Incorrect setting of the options contained here may result in a constant temperature increase! In particular, pause in support should not be too short, and operation in support should not be too long.

NOTE

The star (*) on the main screen means that the fan is switched on. In this case, the function operation and pause in support is inactive. In order for all functions to be active, the user should switch the fan on using the 'Fan Switch On/Switch Off' function (see: point V.a).

V.g) CH Hysteresis (of the boiler)

This option is used to define the hysteresis of pre-set temperature. It is the difference between the temperature of entering into the support cycle, and the temperature when returning to the operation cycle (e.g. if the pre-set temperature is 60°C and the hysteresis is 2°C, the support cycle is activated when the temperature of 60°C is reached, and the operation cycle is activated again when the temperature drops to 58°C). Hysteresis may be defined depending on the program in the maximum range from 1°C to 20°C.

2°C
Boiler hysteresis

V.h) DHW Hysteresis

This option is used to define the hysteresis of the pre-set temperature of the boiler. It is the difference between the pre-set temperature (namely temperature desired on the boiler when the DHW pump stops operating) and the temperature of activating the DHW pump again (e.g. if the pre-set DHW temperature is 55°C and the hysteresis is 5°C, the DHW pump is deactivated after reaching the pre-set temperature, namely 55°C. The DHW pump is activated again when the boiler's temperature drops to 50°C).

5°C
DHW hysteresis

V.i) CH Pump Activation

This option is used to set the threshold temperature of CH pump activation (it is the temperature measured on the boiler display). Below this value the pump is inactive, whereas above this value the pump is active.

30°C
Switch CH PUMP on

V.j) DHW Pump Activation


This option is used to define the threshold temperature of DHW Pumps activation (it is the temperature measured on the boiler display). Below this value the pump is inactive, whereas above this value the pump is active, but operates depending on the operation mode (house heating, boiler priority, parallel pumps, summer mode).

38°C
Switch DHWPUMP on

V.k) Modes of Operation

In this function, the user selects one of four options of the boiler's operation. The star next to one of the operation modes (*) means that the boiler is in this mode.

V.k.1) House Heating

By selecting this option, the regulator switches to house heating only. The CH pump starts to operate above the pump activation threshold (pre-set at 35°C). Below this temperature, the pump stops operating (minus hysteresis). In this mode, the main screen, next to the temperatures on the right-hand side of the display, shows the following symbol .

● House heating
○ DHW Priority


V.k.2) DHW Priority

Activating this function makes the regulator switch into boiler priority mode. In this mode, the boiler pump is switched on (DHW) until the pre-set DHW temperature is reached. After reaching the boiler pre-set temperature, the DHW pump switches off and the CH pump starts operating. The CH pump operates constantly until the temperature on the boiler drops below the pre-set temperature (and DHW hysteresis). Then, the CH pump is switched on and the DHW pump is activated.

User's manual

In this mode, when the boiler is still insufficiently heated, the fan's operation is limited to a temperature of 62°C on the boiler because this prevents the boiler from overheating.

The DHW priority function consists in heating first the hot utility water and then heating up the water in the radiators.

In this mode, the main screen, next to the temperatures on the right-hand side of the display, shows the symbol .

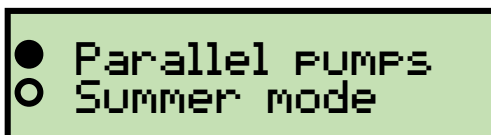



NOTE

The boiler should be equipped with return valves on the circulations of CH and DHW pumps. The valve fitted on the DHW pumps prevents hot water from being sucked out of the boiler. The valve fitted to the circulation of the CH pump never lets through hot water which heats the boiler to the house.

V.k.3) Parallel Pumps

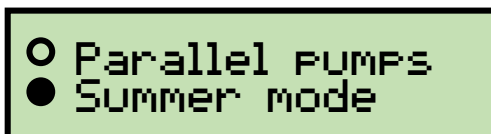
In this mode, the pumps' operation starts simultaneously below the pre-set temperature (see, Function Pump Activation Temperature). The CH Pump operates continuously, and the DHW Pump is switched off after reaching the pre-set temperature on the boiler. In this mode, on the main screen



next to the temperatures on the right-hand side of the display, shows the symbol .

V.k.4) Summer Mode

After activating this function, the CH pump is switched off and the DHW pump is switched on above the pump activation threshold. After exceeding the threshold temperature, the DHW pump operates continuously until the boiler temperature drops below the pump activation threshold (by the DHW hysteresis value). In the summer mode, only the pre-set temperature of the boiler is defined, additionally operates as the boiler's pre-set value. After activating the summer mode, the main screen will show the symbol *.



V.l) Room Regulator

The room regulator is connected to the controller with the use of a two-core cable via the connection socket marked as ROOM REGULATOR. After the correct connection with the boiler controller, the user should activate its activity in the controller's menu.



The principle of the room regulator's operation is based on disconnecting the contacts of cables leading to it when the pre-set temperature in the room is reached. If the boiler's controller receives a signal about room heat-up, it automatically proceeds to the support mode, regardless of the boiler's pre-set temperature.

Note. If the pre-set temperature on the controller fitted on the boiler is too low, the room regulator may not reach the pre-set temperature in the apartment.

After activating the option Room Regulator with the boiler's controller, the main screen in the upper part of the display will show the letter <p>. If the letter is pulsating, this proves that the room is heated insufficiently (the room's regulator pre-set temperature is not reached). When <p> is displayed continuously, the pre-set room temperature has been reached (heated room).

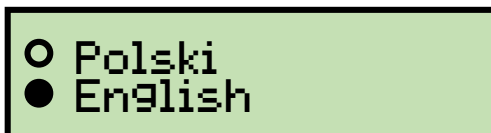


NOTE

No external power supply may be connected to the room regulator's input.

V.m) Language *

In this function, the user may change the language version of the controller's software.



* Function active in certain software versions.

V.n) Factory Settings

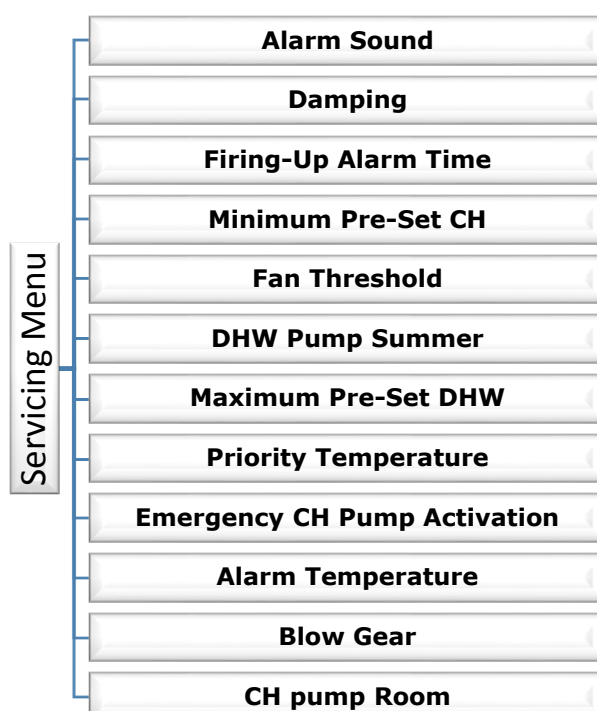
The regulator is pre-configured for operation. However, the user should adjust it to their specific needs. It is possible to return to the factory settings at any time. When the option 'Factory Settings' is activated, all user settings for the boiler are lost and replaced by the manufacturer's factory settings.

From this moment, the user's controller parameters may be defined once again.

Yes No
Fact. settings

VI. Servicing Functions for Temperature Regulator ST-81

In order to enter the controller's servicing functions, the user should switch the controller off using the mains switch, then press the EXIT button and switch the controller on holding the button. The user should keep the button pressed until the following message is shown on the LCD: MENU SERVIS. In order to exit the servicing functions, the user should switch the controller off and switch it on again after a while.



VI.a) Alarm Sound

This option enables the user to switch on or off the acoustic sound signal when the alarm is activated.

□ Alarm sound
Damping

VI.b) Damping

This function is used to set the time after which the fan is switched off if the boiler's temperature drops below the damping threshold plus hysteresis 2°C. It means that if the damping threshold is defined at 40°C, this time is measured not from the temperature of 40°C but 38°C.

10 minutes
Damping

VI.c) Firing-Up Alarm Time

This option is used to define the maximum boiler firing-up time. If the temperature in the boiler does not increase above the damping threshold temperature within this time, the firing-up alarm will be displayed. In this case, the user should start the firing-up from the beginning.

30 minutes
Firing-up alarm

VI.d) Minimum Pre-Set CH

This function enables the user to change the minimum pre-set temperature of the boiler's operation.

60°C
Min Pre-set CH

VI.e) Maximum Pre-Set CH

This function enables the user to change the maximum pre-set temperature of the boiler's operation.

85°C
Max Pre-set CH

VI.f) Fan Threshold

This is the threshold temperature of the CH circulation when the fan starts to operate (factory value - 30°C). The fan switches off after the temperature drops by 2°C below this threshold. Range of settings: 28-55°C.

40°C
Fan threshold

VI.g) DHW Pump Summer

This parameter applies only to the summer mode. If this function is activated, the DHW pump operates continuously (above this pump's activation threshold) and does not switch off after reaching the pre-set temperature. When the DHW pump summer mode is switched off, the pump will operate from the activation threshold to the pre-set temperature.

☐ DHW PUMP SUMM
Max Pre-set DHW

VI.h) Maximum Pre-Set DHW

This function is used to define the maximum temperature which may be defined as the pre-set DHW value on the controller.

60°C
Max Pre-set DHW

VI.i) Priority Temperature

This parameter is active only in the boiler priority mode and defines the priority temperature value. If the boiler is insufficiently heated, this temperature serves as the boiler's temporary pre-set temperature until the preset DHW is reached. Due to the priority temperature, the boiler will heat the boiler as fast as possible. When the actual temperature in the boiler during additional heating reaches the priority temperature, the airflow is deactivated and the controller operates as in support. Range of settings: 50-70°C (factory value - 62°C).

62°C
Priority temperatur

VI.j) Emergency CH Pump Activation

This option is active only in the boilers priority and summer modes. This setting enables the user to define the emergency temperature when the CH pump is activated in order to distribute hot water in the system. Range of settings: 65-80°C (factory value - 80°C).

78°C
Emerg CH PUMP act.

VI.k) Alarm Temperature

It is the temperature which, when exceeded, activates the sound alarm, displaying the message "TEMP ZA DUŽA" on the LCD. If the emergency temperature is exceeded, the fan is switched off permanently (both pumps operate). Range of settings: 70-95°C (factory value - 85°C).

90°C
Alarm temperaturat.

VI.l) Blow Gear

This option is used to define the initial fan speed during its start-up, namely the gear from which it will start. Range of settings: 1-100%.

100%
Blow gear

VI.m) CH Pump Room

This function is active only in cooperation with the room regulator. If the function is activated, the CH pump operates continuously above its activation temperature. If the function is deactivated, then the pump is switched off after the room heats up (signal from the room regulator). The CH will be switched on again when the room regulator reports insufficient heating.

Blow gear
CH PUMP roomreg

VII. Protections

To ensure the maximum safe and unfailing operation, the regulator is equipped with a number of protections. In the case of alarm, a sound signal is activated and a relevant message is shown on the display with the information about the type of error.

In order for the controller to return to operation, the user should press the OPTIONS button.

In the case of alarm CH pump temperature too high, the user should wait a while for this temperature to decrease below the alarm threshold.

VII.a) Thermal Protection

It is an additional bimetallic sensor (thermal overload relay) located near the boiler's sensor (in the capillary or on the pipe feeding the CH circulation) which mechanically disconnects the fan's power supply after reaching the temperature of approx. 85°C (the CH pump operates continuously). This prevents the water in the system from boiling if the boiler is overheated or if the regulator is damaged. After this protection is activated, when the temperature drops to a safe value, the sensor automatically unlocks and the alarm is deactivated. In the case of damage to the thermal overload relay, the fan does not work both in manual operation and in automatic operation.

VII.b) Automatic Sensor Control

If the CH and DHW sensor is damaged, an alarm is activated, additionally signalling the defect on the display, e.g:

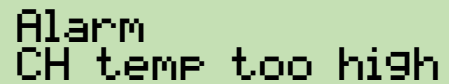
Alarm
CHsensor damaged

The airflow is switched off and both pumps start operating simultaneously regardless of the temperature.

If the CH sensor is damaged, the alarm will be active until the sensor is replaced with a new one. If the DHW sensor is damaged, the user should press the MENU button, which deactivates the alarm and the controller returns to one pump operation mode (house heating). In order for the boiler to operate in all modes, the sensor needs to be replaced with a new one.

VII.c) Temperature Protection

The regulator is equipped with additional protection in the event of damage to the bimetallic sensor after exceeding the temperature of 85°C, the alarm is activated showing the following on the display:



Alarm
CH temp too high

The current temperature is read from the electronic sensor and processed by the temperature regulator. If the emergency temperature is exceeded, the fan is disconnected and both pumps start operating simultaneously in order to distribute hot water throughout the system in the house.

VII.d) Protection against Water Boiling in the Boiler

This protection applies only to the operation mode 'Boiler Priority' if the tank is insufficiently heated. When the boiler temperature is pre-set, e.g. at 55°C, and the actual temperature in the boiler increases to 62°C (this is the so-called priority temperature), then the controller will switch the fan off. If the temperature on the boiler increases to 80°C, the CH pump switches on, in order to distribute hot water in the system. When the temperature still increases, the alarm activates at the temperature of 85°C. Such condition may appear when the boiler is damaged, the sensor is improperly fastened or the pump is damaged. However, if the temperature drops, the controller will switch the airflow on at the temperature of 60°C and will run in the operation mode oscillating around the priority temperature (factory value - 62°C). The priority temperature in this mode is the boiler's temporary pre-set temperature until the boiler's tank is additionally heated.

VII.e) Fuse

The regulator is equipped with two tube fuse links WT 3.15 A protecting the controller.



NOTE

Higher amperage fuse should not be used as it may damage the controller.

VIII. Maintenance

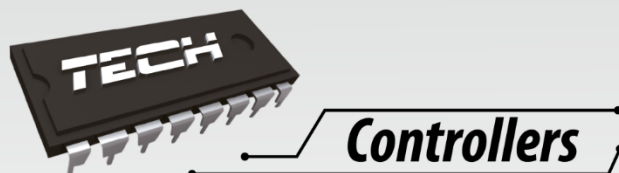
Before and during the heating season, the ST-81 controller should be checked for the condition of its cables. The user should also check if the controller is properly mounted and clean it if dusty or dirty. The user should also measure the earthing effectiveness of the engines (CH pump, DHW pump and the fan).

TECHNICAL PARAMETERS

Item	Specification	Unit	
1	Power supply	V	230V/50Hz +/-10%
2	Power consumption	W	5
3	Ambient temperature	°C	5÷50
4	Load of circulating pump outputs	A	0,5
5	Fan output load	A	0,6
6	Range of temperature measurement	°C	0÷90
7	Measurement accuracy	°C	1
8	Range of temperature settings	°C	45÷80
9	Temperature endurance of the sensor	°C	-25÷90
10	Fuse link	A	2x3,15

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