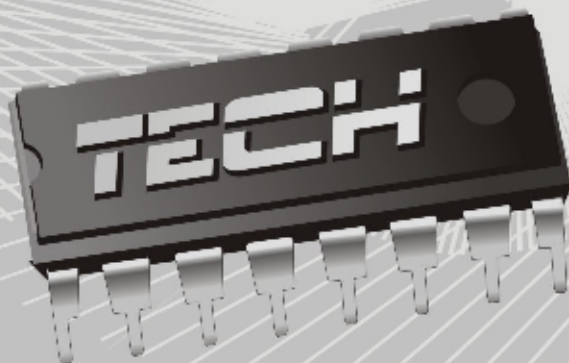


ST-81

USER'S MANUAL



TECH



Declaration of conformity no 23/2007

We, company **TECH**, ul. St. Batorego 14, 34-120 Andrychów declare with full responsibility that ST-81, 230 V, 50 Hz thermo regulator that we manufacture meets the requirements of Ordinance of the Minister of Economy (Dz.U. Nr 155, poz. 108) from 21st August 2007 which implements LVD 2006/95/EC from 16.01.2007 into Polish law. **ST-81 controller has passed EMC compatibility test with optimal loads.**

For assessment of conformity harmonized standards **PN-EN 60730-2-9:2006** have been used.

Co-owners:

Paweł Jura, Janusz Master



CAUTION!

ELECTRICAL EQUIPMENT UNDER VOLTAGE!

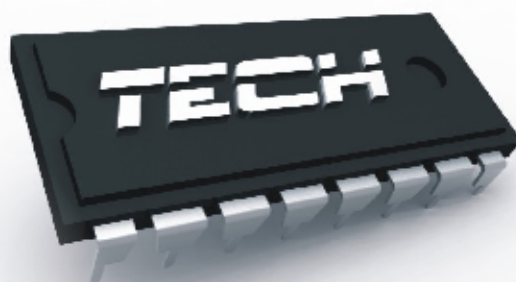
Before starting any actions concerning montage (connection of cables to the pump, installation of the device etc.) it is essential to make sure that the thermo regulator is not powered!

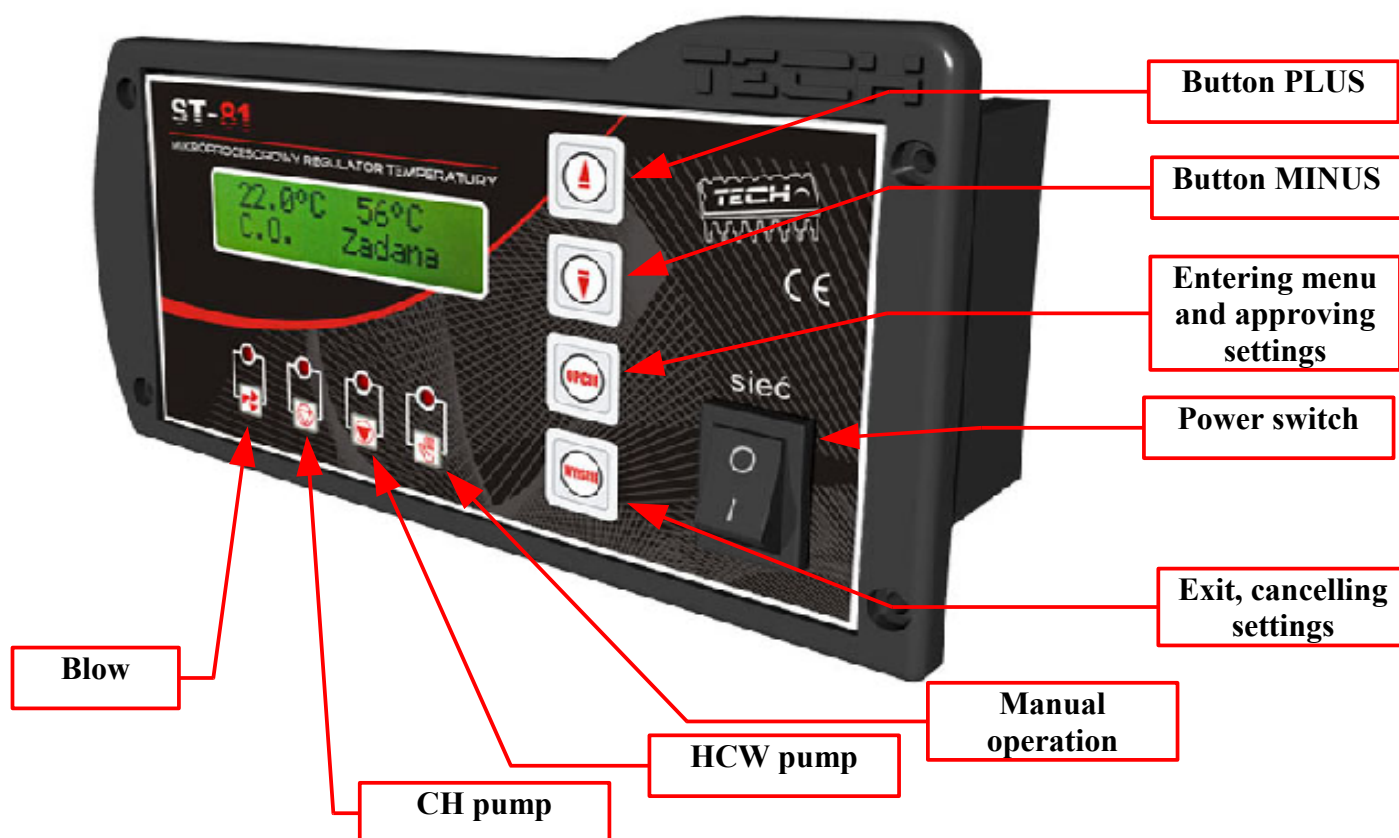
All connection works must only be carried out by qualified electricians.

Before activating the controller, measure the motor resetting efficiency, check the boiler and inspect wire insulation.



**THE DEVICE MAY BE DAMAGED
IF STRUCK BY A LIGHTNING.
MAKE SURE IT IS UNPLUGGED
DURING STORMS**





I. Description

ST-81 thermo regulator is designed for controlling CH boilers. It is regulating the pump responsible for CH water circulation, HCW pump and the blow (fan).

The main advantage of this thermo regulator is the simplicity of its operation. The user is able to change all the parameters by the means of knob of the pulse generator. Another advantage is a large and easily readable graphic display which allows the user to precisely inspect the actual status of the boiler operation.

All remarks on the software should be forwarded to the manufacturer of the boiler.

Each thermo regulator should be set up in accordance with specific needs, basing on the type of fuel used and the type of the boiler. TECH does not take any responsibility for incorrect set up of the thermo regulator

I.a) **Basic Terms**

Fire up – The cycle begins when you activate the *fire up* function in the controller's menu and is active until the central heating boiler temperature reaches 40°C (the default *fire-up threshold*), on condition that the temperature does not drop below this value for 2 minutes (the default *fire-up time*). If these conditions are met, the regulator will switch to the *operation* mode and the *manual operation symbol* on the housing will be deactivated. If the controller fails to reach parameters required for entering into the *operation* mode within 30 minutes from activation of the *fire-up* function, the "*Unable to fire up*" message will appear on the display. In such a case, the fire-up cycle needs to be restarted

Operation– The operation cycle is the basic functionality of the regulator, in which the Power of the blow is regulated by the user. If the temperature rises above the set temperature a so called suspension mode will be activated.

Suspension mode – this mode will be activated automatically if the temperature is equal or higher than the set temperature. In that case, in order to ensure smooth decrease of temperature of circulating water it is necessary to properly set operation times of the fan.

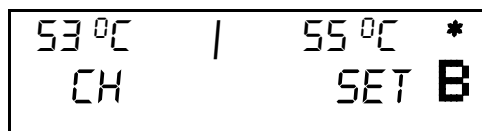
Damping – if boiler temperature drops by 2°C below the *fire-up threshold* and fails to rise above this value for 60 minutes (default *damping time*), the regulator will switch to the *damping mode*. While in this mode, the fan is deactivated and the display shows "*Damping*".

In case of voltage loss, the regulator ceases to operate. When power is restored, the controller returns to operation with previously set parameters using its built-in memory.

II. Functionality of the regulator

This chapter describes the functionality of the thermo regulator, means of changing the settings and moving around in the menu.

II.a) Main Page



During normal operation of the thermo regulator (in only CH mode) the LCD display shows the main page which presents the following information:

- **Boiler temperature** (on the left side of the display)
- **Set temperature** (on the right side of the boiler)
- Symbol of non-operating fan (*)
- Symbol of current operations mode or symbol of an active room regulator.

This screen allows for quick change of the set temperature, by the means of PLUS and MINUS buttons. Pressing down OPTIONS moves the user to the 1st level menu, the display then shows the first two rows of the menu. In each menu the user can move up and down by the means of PLUS and MINUS buttons. Pressing down OPTIONS moves the user to the consecutive menu or enables a specific function. EXIT moves the user back to the root menu.

II.b) Fire up

This function starts up the fan during fire up sequence. In the case that the boiler reaches the temperature higher than 40 degrees but it will not reach the set temperature this button acts as a START/STOP, the display will show Start/Stop fan instead of fire up. If the fan is not operating, a star symbol will appear in the upper right corner of the

ST-81 – USER'S MANUAL

display. This function allows the user to safely operate the boiler. If the fan is turned on it is forbidden to open the furnace door. This setting allows to temporarily switch off the fan at any time e.g. during feeding fuel.

If, during fire up sequence the boiler will not reach 40 degrees (default damping threshold) during 30 minutes the display will present the following alarm:

33 °C		55 °C
UNABLE TO FIRE UP		

In this case the user should restart the fire up sequence – the thermo regulator will once again start the fire up sequence.

II.c) Manual operation

In order to increase the Comfort of the user the thermo regulator is fitted with manual operation mode. In this mode each executive element can be switched off and on independently from all the other elements.

53 °C		55 °C *
CH		SET B

Pressing down OPTIONS starts the fan, which remains turned on until the next pressing of the OPTIONS button.

BLOW FORCE
BLOW

Pressing down OPTIONS Turns on/ off CH water pump.

BLOW
CH PUMP

Naciśnięcie **OPCJE** załącza / wyłącza pompę C.W.U. (bojlera).

CH PUMP
HCW PUMP

Naciśnięcie **OPCJE** załącza / wyłącza alarm.

HCW PUMP
ALARM

II.d) Pumps (CH and HCW) switch on temperature

42 °C CH	55 °C SET	*
MANUAL OPERATION PUMPS SWITCHON TEMP		35 °C PUMPS SWITCHON TEMP

This option is used in order to set the switch on temperature of the CH and HCW pump (it is measured in the boiler). If the temperature increase above the set level the pumps will switch on. The pumps will switch off after the temperature drops below the set temperature (minus 2 degrees of hysteresis), in this case the pump will switch when the temperature in boiler drops below 33 degrees.

II.e) Hysteresis of the boiler

62 °C CH TEMP.	72 °C SET	PUMP SWITCHON TEMP.
2 °C HYSTERESIS		

This option can be used to set the hysteresis of the set temperature. It is the difference between the temperature of start of the suspension mode and the temperature of restarting the operation mode (e.g. when value of the set temperature is 60°C and hysteresis is 2°C, the start of the suspension mode will take place at 60°C, whereas the restart of the operation mode will take place at 58°C. Hysteresis can be set in the range between 2°C and 6°C.

II.f) HCW hysteresis

62°C CH TEMP	72°C SET	BOILER HYSTERESIS HCW HYSTERESIS
		5°C HYSTERESIS

This option can be used to set the value of the hysteresis of the boiler set temperature. It is the difference between the set temperature (that is the boiler required temperature) and the actual boiler temperature (e.g. if the set temperature has the value of 55°C, and the hysteresis is 5°C. After the set temperature (55°C) is reached the HCW pump will switch off and the CH pump will switch on. The HCW pump will restart if the temperature decreases to 50°C.

II.g) Blow force

62°C CH TEMP	72°C SET	HCW HYSTERESIS BLOW FORCE
		5 GEAR BLOW FORCE

This function allows to choose the operations speed of the fan. Range of regulations is between 1 and 10 (one can assume those are the gears of the fan). The higher the gear the faster the operation of the fan, whereas gear 1 is the minimal speed and gear 10 is the maximal speed. Change of gears is being done by the means of PLUS and MINUS buttons. The fan always starts up with the maximal speed which allows it to start operation even with some amount of dust present in the engine.

II.h) Modes of operation

This function allows the user to choose one of four different modes of operation.

```

42°C | 55°C *
CH   SET   D

```

```

HCW PUMP TEMP
MODES OF OPER.

```

A proper symbol for each operation mode is shown in the lower, right corner of the display. Depending on the mode of operation a specific letter is displayed:

D – house heating,

B – boiler priority,

R – *parallel pumps*,

L – *summer mode*.

II.h.1) House heating

```

HOUSE HEATING *
H.C.W. PRIORITY

```

```

42°C | 55°C *
CH   SET   D

```

If you select this option, the regulator will switch to the house heating mode. The central heating pump starts to run above the pump activation temperature (set to 35°C by default). Below this temperature (minus central heating hysteresis of 2°C), the pump is shut off. While in the *house heating* mode, the letter D is displayed in the bottom right corner of the main screen.

II.h.2) HCW priority

```

HOUSE HEATING
H.C.W. PRIORITY *

```

```

23°C 23°C 50°C *
CH   HCW SET B


```



Activating the hot consumption water priority will cause the regulator to switch into the water heater priority mode. In this mode, the (hot consumption water) heater pump is activated until the set H.C.W. temperature is reached. Then, the H.C.W. pump is shut off and the C.H. pump is activated. The central heating pump will run until the water heater temperature drops below the set point value (and the

H.C.W. hysteresis); then, the C.H. pump is shut off and the H.C.W. pump is activated.

In this mode, the fan is operated as long as the temperature is below 62°C to prevent the boiler from overheating.

The hot consumption water priority function consists in that the consumption water is heated up before heating up water in radiators.

Change of the set HCW temperature can be done by pressing button  (holding down for a few seconds). The display will show the HCW temperatures screen for a few moments.

Set temperature can be changed with buttons  . After a few seconds the display will return to its previous state.

When HCW priority mode is on the main, the letter B is shown in the lower right corner of the display.


ATTENTION: The boiler should have non-return valves mounted on the central heating pump circuit and the hot consumption water pump circuit. A valve mounted on the hot consumption water pump will prevent hot consumption water from being drawn from the water heater.

II.h.3) Parallel Pumps

H.C.W. PRIORITY PARALLEL PUMPS *

42 °C		55 °C	*
CH		SET	R

In this mode, the pumps start to run in parallel above the pump activation temperature (set by default to 35°C). The central heating pump runs continuously, while the hot consumption water pump stops after the set point temperature is reached in the boiler; it then restarts when the temperature drops by 2°C.

Change of the set HCW temperature can be done by pressing button  (holding down for a few seconds). The display will show

the HCW temperatures screen for a few moments.

Set temperature can be changed with buttons



After a few seconds the display will return to its previous state.

ATTENTION: In this mode, a non-return valve should be fitted to maintain different temperatures in the water heater and in the house. After activation of the parallel pumps function, three items appear on the display. Starting from the left, these are: Boiler Temperature (C.H.); Water Heater Temperature (H.C.W.) and Set point Temperature (C.H.).

When parallel pumps mode is on the letter R is shown in the lower right corner of the display.

II.h.4) Summer Mode

PARALLEL PUMPS
SUMMER MODE *

45 °C	43 °C	55 °C *
C.H.	H.C.W.	SET L

When the function is enabled, only the hot consumption water pump is running in order to heat water in the water heater. The pump is switched on above a predefined activation threshold (see the *pump activation temperature* function) and will run until the set point temperature has been reached. The pump will start again when the temperature drops below the set hysteresis. In the Summer Mode, only the set point temperature is set on the boiler that heats up water for the water heater (the temperature set for the boiler is also the temperature set for the water heater). While in the *Summer Mode*, the letter L is displayed in the bottom right corner of the main screen.

II.i) Room regulator

62°C CH TEMP	72°C SET	OPERATION MODE ROOM REGULATOR
ON OFF		

ST-81 thermo regulator allows a room regulator to be connected in the system. In this mode the thermo regulator is being controlled by the room regulator and does not take into account the temperature set on thermo regulator main unit. Blow is operating until the temperature set on the room regulator is reached. However the operation of the boiler is limited by the temperature set on the thermo regulator mounted on the boiler.

CONNECTION OF THE ROOM REGULATOR: there is a 2-lead cable coming out of the room regulator which should be connected to the montage slit of the thermo regulator in the position described as “**room regulator**”.

ATTENTION: no external voltage can be connected to the room regulator

II.j) Suspension operation

This option allows the user to set the time of operations of the fan (blow) in the suspension mode (above the set temperature).

II.k) Suspension pause

This option allows the user to set the time of the pause in the fan operation during the suspension in order to prevent the boiler burn out, in case when the temperature will hold over the set point value.

ATTENTION: Improper setting of this option may cause a constant rise of the temperature! Suspension pause shouldn't be too short.

II.l) Language

23°C 23°C 50°C CH HCW SET	SUSPENSION PAUSE LANGUAGE CHOICE	POLSKI * ENGLISH
------------------------------	-------------------------------------	---------------------

This function allows the user to change the language version of the thermo regulator

II.m) Factory settings

23°C 23°C 50°C CH HCW SET	CONST. CH PUMP FACTORY SETTINGS	YES NO
------------------------------	------------------------------------	-----------

The thermo regulator is preset for operation. However it is necessary to adjust it to one's specific needs. There is always the possibility of returning it to factory (default) settings. Switching on this function will cause the user to lose all personal device settings which will be replaced by the settings saved by the manufacturer (this does not apply to settings of the service menu). At this point it is possible to re-set personal settings of the controller.

III. Safeguards

In order to ensure a safe and faultless operation, the regulator has been provided with numerous protections. In the case of an alarm, an acoustic warning is sounded and the display shows a corresponding message.

Press **OPTIONS** to restore the controller to operation. In the case of the **C.H. Temperature Too High** alarm, wait until the temperature drops below the alarm value.

III.a) Thermal protection

The boiler is protected with an additional bimetal sensor (located at the boiler temperature sensor) that disables the fan when the temperature exceeds the critical value: 85°C. This is to prevent water from boiling in the system when the boiler has been overheated or the controller is damaged. When the protective function is enabled and the temperature drops to a safe value, the sensor will automatically restart the device and

the alarm will be deactivated. If the sensor is damaged or overheated, the fan is disabled.

III.b) Automatic sensor check

In case when the CH temperature sensor is missing or damaged an alarm is activated, which additionally reports the fault on the display e.g.:

<p>ALARM</p> <p>CH SENSOR DAMAGE</p>
--

The blow is being turned off, whereas CH and HCW pumps are operating independently from the current temperature, each in accordance with its specific settings. In case of CH sensor damage, the alarm will remain active until the sensor is replaced. If the HCW sensor is damaged, the user should press **OPTIONS** which will turn off the alarm and the thermo regulator will return to one pump operation (house heating). In order for the boiler to operate in all modes the sensor needs to be replaced.

III.c) Temperature protection

The regulator features an additional protection in case the bimetal sensor is damaged. After the temperature exceeds 85°C, the alarm is sounded with the display showing the following message:

<p>ALARM</p> <p>TEMP. TOO HIGH</p>
--

The current temperature is read from an electronic sensor and processed by the thermo regulator. When the alarm temperature is exceeded, the fan is shut off and both pumps begin to run in order to distribute hot consumption water throughout the system.

III. d) Anti-boil protection

This protective function is used only with the **water heater priority** mode. For example, when the water heater setpoint temperature is 55°C and the boiler temperature rises to 65°C (so-called *priority temperature*), the controller shuts off the fan. If the boiler temperature reaches 80°C, the C.H. pump will be activated. If the temperature continues to rise, the alarm will be activated at 85°C. Such condition may appear when the water heater or the pump is damaged or when the sensor has been improperly installed. However, if the temperature drops, the controller will activate the fan at 63°C and it will remain in the duty mode maintaining the priority temperature of 65°C.

III.e) Fuse

The regulator has a network protection WT 3.15 A tube fuse.

ATTENTION: Higher current ratings may cause damage to the controller.

IV. Maintenance

Before and during the heating season, the **ST-81** controller should be checked for condition of its cables. You should also check if the controller is properly mounted and clean it if dusty or dirty. It is advisable to measure grounding parameters for the motors (central heating pump, hot consumption water pump and fan).

Technical Specifications

No.	Specification	Unit	
1	Supply voltage	V	230V/50Hz +/-10%
2	Power consumption	W	5
3	Ambient temperature	°C	10÷50
4	Circulation pump outlet load	A	0,5
5	Fan outlet load	A	0,6
6	Temperature measurement range	°C	0÷85
7	Measurement accuracy	°C	1
8	Temperature adjustment range	°C	45÷85
9	Sensor thermal resistance	°C	-25÷90
10	Fuse insert	A	3,15

V. Assembly

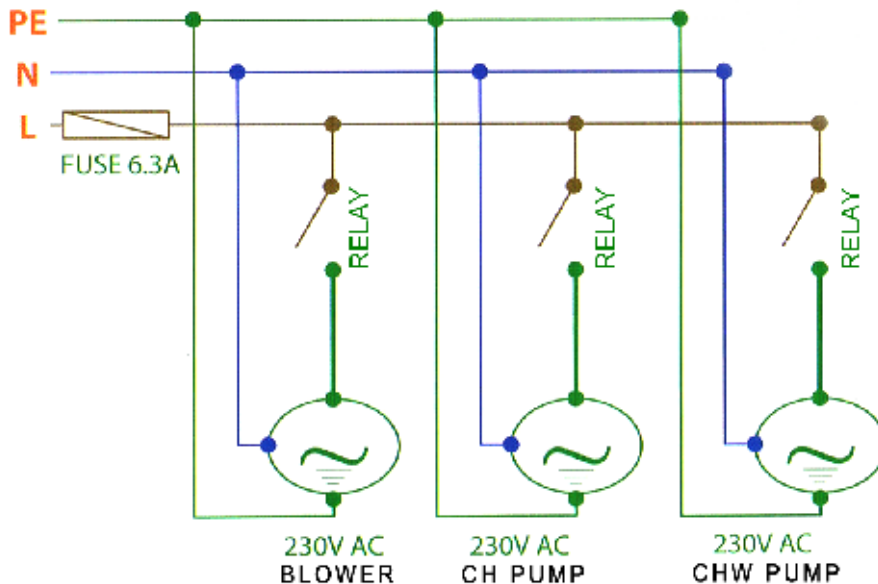
ATTENTION: all assembly works must only be carried out by qualified persons. During assembly, the device **must be** disconnected (make sure the power cord is unplugged)!

ATTENTION: improper cable connections may damage the regulator!

The regulator may not be operated in a closed-circuit central heating system. It is necessary to provide for safety valves, pressure valves and a surge tank in order to prevent water from boiling in the central heating system.

V.a) Cable Connection Diagram for Controller

Pay special attention to cable connections during assembly. Especially, the ground wire should be connected properly.



PE - GROUNDING (YELLOW-GREEN)
N - NEUTRAL (BLUE)
L - PHASE (BROWN)



We are committed to protecting the environment. Manufacturing electronic devices imposes an obligation of providing for environmentally safe disposal of used electronic components and devices. Hence, we have been entered into a register kept by the Inspection For Environmental Protection. The crossed-out bin symbol on a product means that the product may not be disposed of to household waste containers. Recycling of wastes helps to protect the environment. The user is obliged to transfer their used equipment to a collection point where all electric and electronic components will be recycled.

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