

# Boiler temperature controller

EKOSter 420

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## Service Manual



## Safety instructions and notes on installation

- ❑ The controller is designed to work with central heating boilers for solid fuels.
- ❑ The controller must be installed by an authorized person.
- ❑ The controller must be connected to a socket with a protective contact.
- ❑ It is required that the boiler had its own safeguards against excessive temperature rise of the boiler caused e.g. boiler controller or related equipment malfunction.
- ❑ The controller should be placed in a location that prevents its heating to a temperature higher than 40°C.
- ❑ The controller must not be exposed to water and conditions causing condensation (e.g. sudden changes in ambient temperature).
- ❑ The device should be installed and operated as described in the assembly description and rules for electrical equipment.
- ❑ A blown fuse due to bad wiring or a short circuit in the electrical system does not constitute grounds for a warranty repair.
- ❑ Before starting the controller, you should check the electrical connections.
- ❑ The controller is protected with two 2,5A fuses.
- ❑ Connection of the power cord and fuse replacement should be made with the controller powered off (the controller power plug must be disconnected from the mains). Connection of the receiving devices and replacement of fuses with the mains plug of the controller plugged in creates an electric shock hazard.
- ❑ The connection cables of the controller can be replaced only by the manufacturer or their authorized service establishment.
- ❑ You must not use a damaged controller.
- ❑ Any damage caused by lightning, improper power surges in the power grid or random events are not eligible for warranty repair (please refer to the warranty terms and conditions).



**Notice:** Fuses should be replaced only with the controller powered off and the plug disconnected from the mains.

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## 1. Description of a controller

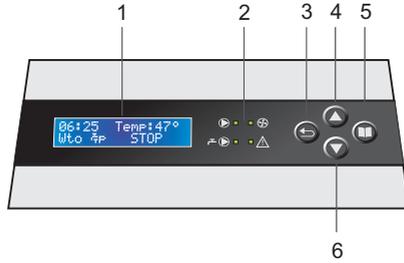
Central heating boiler temperature controller with domestic hot water heater service EKOSter 420 is designed for boiler blow-in control, switching on the circulation pump in heating installations and domestic hot water heater charging pump (DHW).

The controller has the following features:

- maintaining the preset temperature of a boiler by controlling the air blow-in
- modulated and adjustable power of the fan
- function of supporting the combustion process by the so-called blow-bys
- adjustable damping time and automatic control turn off after extinguishing of the boiler
- stopping the fan operation when adding fuel to a boiler / damping
- control of the central heating circulation pump
- option of enabling or disabling the DHW priority
- control of the domestic hot water heater charging pump depending on the required temperature
- protection system - a TERMIK thermal fuse as an additional, mechanical protection of the boiler against uncontrolled temperature increase
- option to work in the SUMMER mode
- COMFORT SYSTEM function, which protects the pump against scaling
- function of protecting the system against freezing and overheating of the boiler
- damage indication of the temperature sensor
- adjustable display brightness - increased during settings modification
- ability to connect the remote control panel CONTROL with audible alarm function
- possibility of connecting a room thermostat
- large, readable, alphanumeric LCD display with 2x16 characters



## 2. Description of the controller components



1. Display
2. Signal LEDs
3. The back button / START / STOP
4. Adjust setting UP button ( ▲ )
5. MENU button
6. Adjust setting DOWN button ( ▼ )

### Opis diod sygnalizacyjnych

- CH pump
- DHW pump
- fan
- error

Fig.1 Description of the controller components

## 3. Description of connections Controller

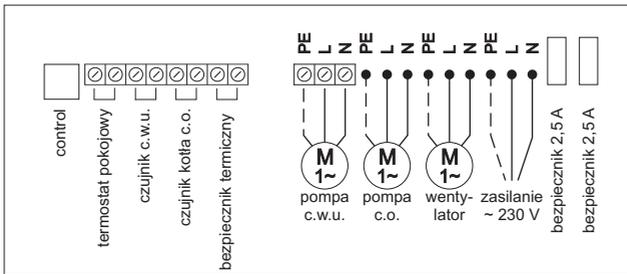


Fig. 2 Description of connections Controller

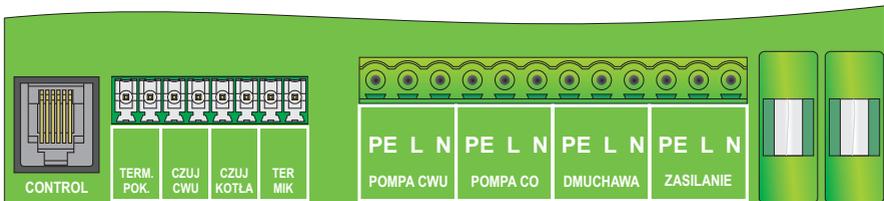


Fig. 3 View connections regulator

## 4. Pump and blower connection diagram

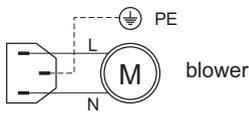


Fig. 4 Connection diagram of the blower cable

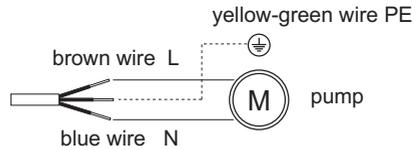


Fig. 5 Connection diagram of the pump cable

## 5. Controller installation

1. The controller is designed to be mounted on the boiler.
2. Using the provided template for positioning of the controller.
3. Install a screw in the boiler housing in the place indicated on the template.
4. Decide on the method of routing the cable from the controller (rear, bottom) and remove the corresponding caps from the housing.
5. Slide the controller onto the fixed screw, use the other two screws to fasten it to the boiler housing.
6. Install the optional cables at the appropriate connectors and put them through the holes in the housing.
7. Protect the installed cables against pulling out, fixing them to the housing in special sockets using the provided brackets and screws.
8. Install the controller door.

### 5.1 Connection of the controller to the electrical system

1. Connect the fan, pump and feeder with the appropriate power cables (see - Figure 3).
2. Install all necessary sensors (and reed relay for the piston feeder) acc. to Fig.4 and Fig.6.
3. Put the plug of the controller power supply cable in a ~ 230 V socket.
4. Switch the controller on, using the power switch.



**Note:** If after the controller is switched on, the display is not lit up, check whether there is voltage in the mains socket, then check the fuses and replace if damaged with new ones 2 x 5 A. If, after the replacement of fuses the display remains dark, please contact the maintenance provider.

Always replace fuses with the unit switched off and the plug removed from the socket.

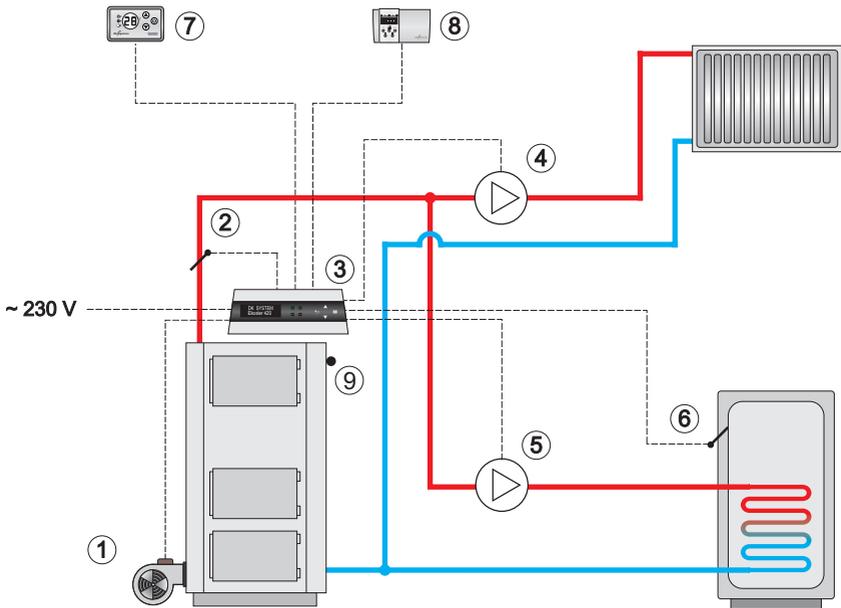
## 5.1 Connection of the controller to the electrical system (cont.)



**Note:** Each time you connect or disconnect the sensor hot water or remote control requires a reset controller EKOSTER 420, by switching on and off switch.

None made the reset will cause the malfunction of the controller.

## 6. Diagram for the connection of controller to the hydraulic system

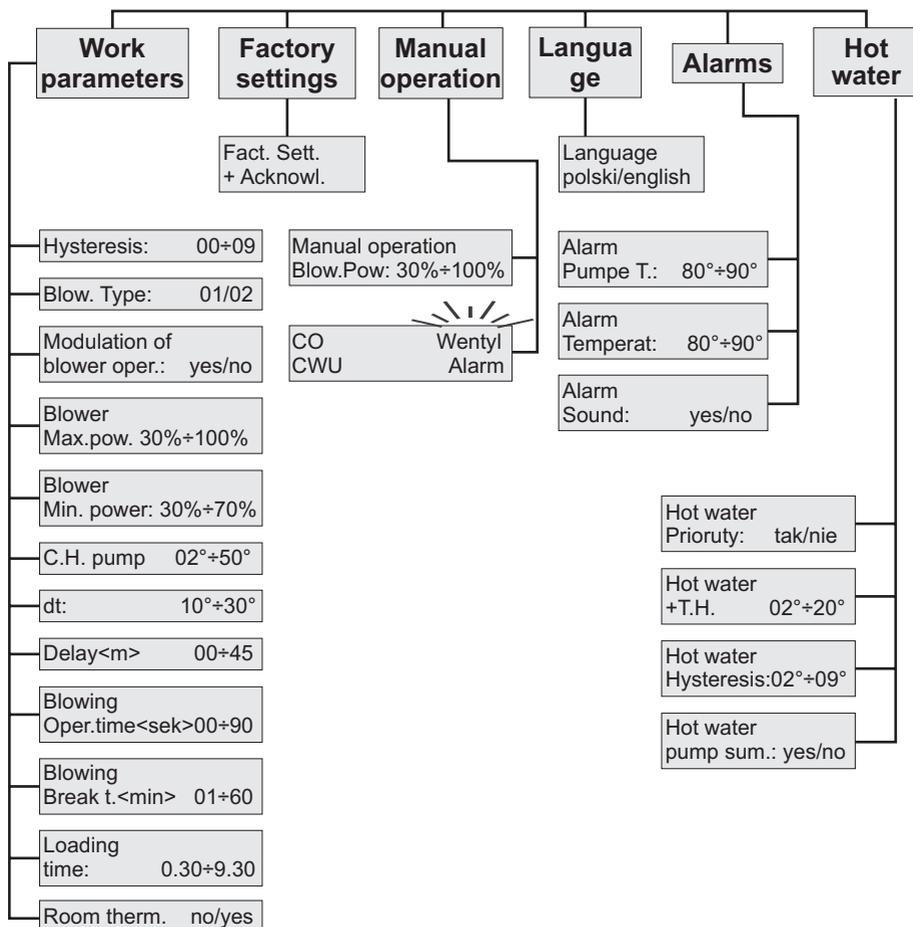


- |  |                        |
|--|------------------------|
| 1. Fan                                       | 6. DHW heater sensor   |
| 2. Central heating boiler temperature sensor | 7. CONTROL panel       |
| 3. EKOSter 420 controller                    | 8. Room thermostat     |
| 4. Central heating pump                      | 9. TERMIK thermal fuse |
| 5. DHW pump                                  |                        |

Fig. 6 Example of the heating installation diagram with a EKOSter 420 controller without the cutting off and protecting devices. It does not replace a professional project at the assembly spot.

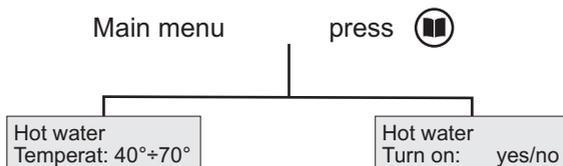
## 7. Maintenance menu - structure

Maintenance menu Press  and hold approx. 5 seconds.



## 8. Hot water - menu

The menu of hot water is only available when you connect the dhw sensor



## 9. Switching the controller on and starting operation

Switch the controller on with the power switch - the display will show the following information: Controller name and program number.

**DK SYSTEM**  
**Ekoster 420**

Then the display will start showing the currently measured temperature of the boiler and the heater (if the heater sensor is installed and support for the DHW pump is enabled); at the same time the current condition of operation of connected equipment will be signalled.

**ver 5.13**

**STOP Temp:42°**

**STOP Temp:42°**  
**∇F :36°**

## 10. Setting the boiler operating parameters and lighting up

In order to light up the furnace, you need to:

1. Fill the boiler cavity with fuel and set fire to it.
2. Close the door of the furnace chamber tight.
3. Start the blower by pressing the button .

The display will show  indicating that the lighting up process is in progress. During operation, the controller displays the current measured temperature of the boiler.

 **Temp:42°**

 **Temp:56°**

 **Nast:50°**

After pressing the button  or  once the screen of the required boiler temperature will be displayed. Set the required value, using the same buttons:  to increase the setting or  to reduce the setting.

Change range from 40 °C to 90°C  
Factory setting (typical): 50 °C

## 10. Setting the boiler operating parameters and lighting up



**Note:** The symbol that the display shows:  or  indicates the current temperature change trend in the boiler:  indicates the trend to reach the set temperature;  indicates reduction of the temperature in the boiler to the value specified by the "HI" parameter.

## 11. Feeding fuel to the boiler

When you feed fuel to the boiler, stop the blower. Do this by pressing the button  the display will show the  symbol with a countdown to restarting. The time required for fuel feeding is set in the WORK PARAMETERS maintenance menu - see the Blower pause - fuel feeding. .

Pressing the button  during the countdown will exit the fuel feeding mode and return of the controller to automatic mode.

 1:30 Temp:56°

## 12. Setting the operating parameters of the domestic hot water heater

During operation of the controller press the button  the display will show the screen for setting the required temperature of the heater. Set the required temperature using the buttons:  to increase the set point value, or  to reduce it.

Heat Water  
Temperat: 50°C

Change range: 40 °C ÷ 70°C  
Factory setting (typical): 50 °C

If you press the button again  will take you to a screen where it is possible to enable or disable the domestic hot water pump functionality. The setting is made using the buttons:  or .

Heat Water  
Turn on:no

Change range: yes / no  
Factory setting: no



**Note:** The prerequisite for entry into the set operating parameters of the hot water heater is to connect the sensor hot water heater.

### 13. Summer work mode

The controller can operate in the SUMMER mode, which means that outside of the heating season the heating pump is not used and all the heat generated by the boiler is used for the domestic hot water. In order to enable this mode change the temperature setting by pressing the button ▼ until the display shows the “SUMMER” symbol.



### 14. Maintenance menu - Work Parameters

The maintenance menu is used to set the specific equipment parameters, such as those regarding the central heating pump and the blower. To enter the maintenance menu, press and hold for a few seconds the button ■■ .

The display will show the WORK.PARAM. symbol. Each pressing of the button ■■ will enter the parameter's setup screen; changing the parameter is performed by using the ▲ or ▼ .



#### 14.1 Work Parameters - Hysteresis of blower operation

A parameter that specifies the number of degrees Celsius by which the boiler temperature must fall below the set point for the blower to switch on



Change range: 0 °C ÷ 9°C  
Factory setting: 2 °C

## 14.2 Work Parameters - Blower type

The parameter for setting of one of two characteristics of adjustable blower power, depending on the type mounted on the boiler.

**Blow.Type : 01**

Change range: 01 / 02  
Factory setting: 1



**Note:** Blower type 1 - applies to RV05, RV14.  
Blower type 2 - applies to RV12 and others with power of 80 W, based on EBM/EMC. If the type of installed blower is not known, it is recommended to choose setting 1.

## 14.3 Work Parameters - Modulation of blower operation

This parameter causes the modulation of the blower motor operation to go on or off. When modulation is enabled ("yes" symbol), the fan will reduce its speed when the boiler is about to reach the set temperature and will increase its speed when the temperature of the boiler drops, disabled modulation is indicated by the "no" symbol.

**Blower  
Modulation : yes**

Change range: yes/no  
Factory setting: no



**Note:** Modulation of the blower is performed only in the hysteresis range i.e. in a temperature range between the boiler setting and that resulting from the hysteresis parameter - below the hysteresis, the blower operates at maximum power.

## 14.4 Work Parameters - Adjusting the maximum power of the blower

This parameter allows you to set the maximum operating power of the blower

**Blower  
Max.Power: 100%**

Change range: 30% ÷ 100%  
Factory setting: 100%

### 14.5 Work Parameters - Adjusting the minimum power of the blower

This parameter allows you to set the minimum operating power of the blower.

**Blower  
Min.Power: 30%**

Change range: 30% ÷ 70%  
Factory setting: 30%



**Note:** Some types of blowers cannot be switched on at the lowest power setting parameter. In such a situation, it is recommended to increase the minimum power.

### 14.6 Work Parameters - Adjustment of the CH pump operating threshold

The parameter that specifies the operating range of the heating circuit pump - the pump will operate at temperatures higher than the temperature set on the boiler minus the CH PUMP parameter.

**C.H. Pump :20°**

Change range: 2 °C ÷ 50°C  
Factory setting: 20 °C



**Note:** As a result of user settings, there may be a situation where the central heating pump should theoretically turn on, for example, at the temperature of 24 °C (boiler's temperature setting 60 °C CH PUMP 36°C). However the pump will not turn on, because the controller allows it to start only at the temperature of > 35 °C

### 14.7 Work Parameters - Blower START / STOP

A parameter that specifies how many degrees Celsius below the temperature set on the boiler the blower starts up in automatic mode (during lighting up) or will enters burning the residual fuel (burning out).

**dt :15°**

Change range: 10 °C ÷ 30°C  
Factory setting: 15 °C

### 14.7 Work Parameters - Blower START / STOP (cont.)

#### Example:

- the temperatur. set on the boiler: 50 °C  
 - "dt": 10 °C

1. When lighting up the boiler, the blower switches to automatic mode when the temperature reaches 40 °C (50 °C - 10 °C), then furnace will continue to light up, and after reaching a temperature of 50 °C, the fan turns off.

2. During burning out of the boiler, when the temperature drops to the level of 40 °C (50°C - 10°C), the controller will start counting the time set (allowing the remaining fuel to burn out) - see item Burn out time adjustment - after which the blower will finally turn off.

### 14.8 Work Parameters - Burn out time adjustment

This parameter allows you to set the blower operating time during burning out, i.e. temperature drop at the boiler by the "dt" parameter.

**Delay <m>:30**

Change range: 0 min ÷ 45 min  
 Factory setting: 30 min

### 14.9 Work Parameters - Blowing - operating time

BLOWING or the function of regular supply of air to the furnace has the purpose of:

- maintaining the burning in a situation when the temperature set point on the boiler has been reached
- burning out gases in the combustion chamber and expelling them through the stack to the outside.

This parameter defines the duration of blower operation (in seconds) when the BLOWING functionality is active.

**Pulses  
 Runn<sec>:15**

Change range: 0 s ÷ 90 s  
 Factory setting: 15 s

### 14.10 Work Parameters - Blowing - break time

This parameter specifies the break time in blower operation (in minutes) between each blowing sequence.

**Pulses  
Pause<min>:15**

Change range: 1 min ÷ 60 min  
Factory setting: 15 min

**Note:** The blowing functionality is activated when the boiler reaches the temperature set point.

Blowing will not operate, when

1. boiler temperature is higher than 85 °C
2. boiler temperature is lower than specified by the "HI" parameter.

Setting the operation time to "0" will disable the BLOWING functionality



### 14.11 Work Parameters - Blower pause - fuel feeding

A parameter that specifies the duration of the blower pause needed to feed fuel to the boiler.

**Loading  
Time: 3:00**

Change range: 0:30 min ÷ 9:30 min  
Factory setting: 3:00 min

### 14.12 Work Parameters - Room thermostat

You can connect a room thermostat that controls the activation of the central heating pump, depending on the room temperature. In order to operate the pump the boiler must also reach its corresponding minimum temperature.

**Room regu.  
:no**

Change range: yes / no  
Factory setting: no

## 15. Maintenance menu - HOT WATER

The maintenance menu is used to set the specific equipment parameters, such as those regarding the domestic hot water pump.

Entry into the HOT WATER maintenance menu is done by pressing and holding the button ; The display will show the WORK. PARAM. and then you must press the  button.



### 15.1 Hot water - ON / OFF domestic hot water priority

The controller can operate in the domestic hot-water priority mode or without it. Priority means that when the water temperature in the heater drops below the set point, then the boiler stops working for the central heating system and begins to heat up warm water. If the "boiler + heater" system is matched correctly, a break in heating does not cause deterioration of thermal comfort.

The "yes" setting enables the hot water priority function, and "no" disables it.



Change range: yes / no  
Factory setting: no

### 15.2 Hot water - The temperature difference between the boiler and heater

The parameter that specifies the minimum measured temperature difference between the boiler and the domestic hot water heater that must occur for the heating of domestic hot water to be cost effective and the domestic hot water pump to be turned on. If this difference is less than the set point, the DHW pump will not switch on (regardless of whether priority of hot water is turned on or not).



Change range: 2 °C ÷ 20 °C  
Factory setting: 10 °C

### 15.3 Hot water - Hysteresis of the DHW pump

A parameter that specifies the number of degrees Celsius by which the temperature must fall on the domestic hot water heater below the set point for the domestic hot water pump to turn on.

**Heat Water  
Hysteresis:05°**

Change range: 2 °C ÷ 9 °C  
Factory setting: 5 °C

### 15.4 Hot water - Constant operation of the DHW pump in the summer mode

The effect of this parameter is that when the controller is in SUMMER mode, the domestic hot water heater pump is working despite reaching the desired temperature for domestic hot water. It is done to protect the boiler from rapid temperature increases

**Heat Water  
pump(summ):yes**

Change range: yes / no  
Factory setting: yes



**Note:** The prerequisite for the pump to start is maintaining minimum temperature difference between the temperature measured on the reservoir and that measured on the boiler.

## 16. Maintenance menu - Alarm

The menu has settings for triggering the alarm for excessive temperature on the boiler. In an alarm situation the red ERROR LED will blink and an audible signal is generated.

To access the alarm menu, press and hold the button  ; the screen will show WORK. PARAM. Then use the  or  button to select ALARM and confirm .

**< Alarm >**

**16.1 Alarm - pump temperature**

This parameter allows you to set the temperature above which both pumps will start in emergency mode (hot water pump starts, provided that the controller will operate in the domestic hot water mode).

**Alarm  
Pump Temp: 90°**

Change range: 80 °C ÷ 99°C  
Factory setting: 90 °C

**16.2 Alarm - boiler temperature**

This parameter allows you to set the temperature above which an alarm is triggered.

**Alarm  
Temperat: 93°**

Change range: 80 °C ÷ 99°C  
Factory setting: 93 °C

**16.3 Alarm - sound**

This parameter allows you to enable or disable the alarm sounds

**Alarm  
Sound :yes**

Change range: yes / no  
Factory setting: yes

**17. Maintenance menu - Language**

The maintenance menu is used to set the language for displaying of messages. To enter the LANGUAGE maintenance menu, press and hold for a few seconds the button **■**; The display will show the WORK PARAM. then use the **▲** or **▼** button to select the option Language and confirm **■**.

**< Language >**

**Language  
polski**

Change range: polski / english  
Factory setting: polski

## 18. Maintenance menu - Manual operation

This function is used testing the correctness of the connected equipment. Enter the menu MANUAL OPER. after pressing and holding the button . The display will show the WORK. PARAM. then use the  or  button to select the option MANUAL OPER. and confirm .

### 18.1 Manual operation - blowing power

This parameter allows you to set the power at which the blower is to operate in manual mode (testing). Change range: from minimum to maximum blower power (parameters set in the maintenance menu - see item Minimum blower power adjustment and Maximum blower power adjustment). Pressing again  takes you to the next setting.

### 18.2 Manual operation - testing outputs

A window allowing testing the correctness of operation of individual outputs (blower, CH pump, DHW pump) and of the alarm.

Select the tested output with the button , and enable/disable it by pressing the  or  button. The currently tested output is indicated by a blinking symbol on the screen, and enabling it, by the corresponding LED.

## 19. Maintenance menu - Factory settings

This function is used to remove the parameters set by the user and return to the factory settings. To access the FACTORY SETTINGS maintenance menu press and hold the button ; The display will show the WORK PARAM. then use the  or  button select the option FACTORY SETTINGS and confirm .

Confirmation of parameters change to factory settings is done with the  button.




## 20. The COMFORT SYSTEM function

The COMFORT SYSTEM built-in in the controller prevents pump blockage by deposition of scale between the rotor and stator of the pump. The controller automatically switches the pump on for 30 seconds every 24 hours from its last run. Pump operation in this mode is indicated by the blinking LED CH PUMP The function takes effect after 24 hours from turning the controller on.



**Note:** For the COMFORT SYSTEM function to be active after the end of the heating season, leave the controller plugged in.

## 21. The protection against freezing function

The controller protects the heating system from freezing, both pumps running all the time when the temperature of water falls to 4 °C or lower (DHW pump will start, provided that the controller runs in the DHW mode).

## 22. Protection of the boiler against overheating

The controller reduces the risk of overheating the boiler through the continuous operation of the pumps in the event of the boiler temperature sensor failure or if the alarm temperature for both pumps is exceeded - see Alarm - pump temperature

## 23. Remote control - optional

The controller is designed for remote control, which enables control of the current temperature of the boiler, changing the set temperature of the boiler and a number of other features which improve user comfort. Built-in beeper emits a sound when the temperature rises to a dangerous level specified by the user. The controller is designed for remote control, which enables control of the current temperature of the boiler, changing the set temperature of the boiler and a number of other features which improve user comfort. Built-in beeper emits a sound when the temperature rises to a dangerous level specified by the user.

## 24. Alarms - description

### 24.1 Alarms - Over temperature on the boiler or drop below 0°

When the temperature in the boiler exceeds the value set in point Alarm - boiler temperature, the red ERROR LED starts blinking, the display shows **!T!** and an intermittent beep will be generated (as long as it is turned on - see Alarm - sound)..



**!T! Temp: 91°**



**Note:** Pressing the ▲ or ▼ button when the alarm sounds will mute it.

### 24.2 Alarms - Damaged boiler temperature sensor

When the boiler temperature sensor is damaged, the display shows **STOP** (the blower stops working), instead of the temperature - is shown and the red LED ERROR will remain lit with a continuous sound (as long as it is turned on - see Alarm - sound).



**STOP Temp:--°**



**Note:** The CH pump and DHW pump will run in emergency mode (the DHW pump will run provided that the controller is in the DHW mode).



**Note:** Pressing the ▲ or ▼ button when the alarm sounds will mute it.

### 24.3 Alarms - Damaged DHW temperature sensor

When the DHW temperature sensor is damaged or the temperature measured is out of range, then instead of the temperature - will be shown and the red LED ERROR will be lit continuously with continuous sound (as long as it is turned on - see Alarm - sound).



**Note:** Pressing the ▲ or ▼ button when the alarm sounds will mute it.

### 24.4 Alarms - Thermal fuse

In the event of an overrun on the boiler temperature above 90 ° C, there blower will be disabled in emergency mode. At the same time the display will show THERMAL FUSE, the red ERROR LED will flash and an intermittent beep will be generated (as long as it is turned on - see Alarm - sound)



When the temperature drops below 70 °C, the thermal protection system is "off" and the controller returns to normal operation.

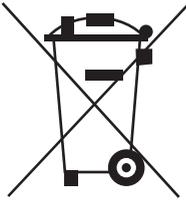


**Note:** Pressing the ▲ or ▼ button when the alarm sounds will mute it.

## 25. Technical data

Measured temperature range	from - 9 °C to + 120 °C
Boiler temperature setting range	from + 45 °C to + 80 °C
Hot water heater temperature range	from + 40 °C to + 70 °C
Temperature setting range for the CH pump	from + 30 °C to + 70 °C
Smooth start of the fan	yes
Adjustable maximum fan power	40 - 100 %
Fan hysteresis (difference between ON - OFF)	from 0 °C to 9 °C
DHW pump hysteresis (difference between ON - OFF)	from 2 °C to 9 °C
Blowing control (option to completely disable blowing)	operation: 0 - 90 seconds break: 1 - 60 minutes
Adjustable boiler damping time	0 - 45 minutes
Allowable load on outputs	fan: 100 W / 230 V CH pump: 100 W / 230 V DHW pump: 100 W / 230 V
Rated supply voltage	~ 230 V, 50 Hz
Electrical protection	2 x 5 A
Air relative humidity	< 95 %
Enclosure protection grade	IP 20
Ambient temperature	from 0 °C to + 40 °C

## 26. Information on waste electrical and electronic equipment



Disposal of Waste Electrical and Electronic Equipment (Applicable in the European Union and other European countries with separate collection systems).

This symbol on the product or its packaging (pursuant to the Act of July 29, 2005 on Waste Electrical and Electronic Equipment) states that this product may not be treated as household waste. It should be handed over to a facility for collection of waste electrical and electronic equipment. By ensuring proper storage of this product, you will help prevent negative consequences for the environment and human health. Recycling helps conserve natural resources. For more detailed information about recycling of this product, information about the set up system to receive and collect waste electrical and electronic equipment and a list of treatment facilities, please contact our office or our distributors.

## 27. Notes

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