



EKO LINE

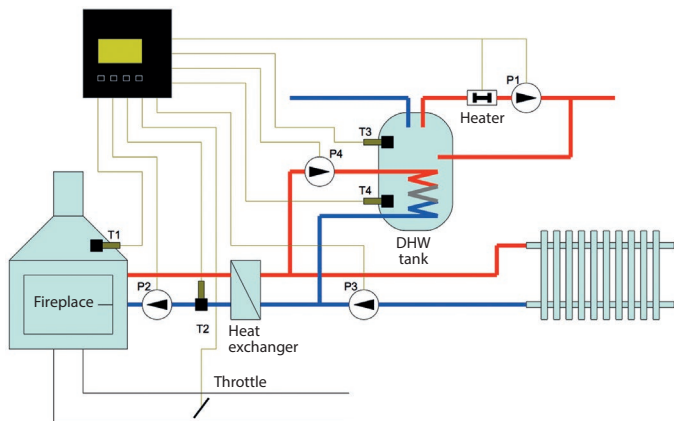
Owner's manual and warranty card

1. Controller installation.

1.1. Diagrams of supported systems.

The controller allows operating a fireplace with a water jacket and hot air distribution. It is possible to set three modes of controller operation, which can ensure the correct operation of many different systems for room heating, as well as for domestic hot water heating. The actual installation diagram at the user's place, where the controller is to be installed, may differ from the diagrams shown in this document, but the controller is very flexible and it is possible to adapt it to various situations by modifying the controller parameters.

1.1. Fireplace with a water jacket, without a buffer tank.



In this mode the controller can control the heating of a DHW tank with the use of a coil and an electric heater, and at the same time assists the central heating system.

When the water temperature in the DHW tank drops below the set value, the electric heater or the P4 and P2 pumps are turned on, depending on whether the temperature of the water jacket reached the set value or not. Simultaneously with the DHW tank heating or after its end it is possible to assist the central heating system by turning on the P3 and P2 pumps.

The T1 sensor measures the temperature of the water jacket, while the controller controls the throttle to keep this temperature at the set level.

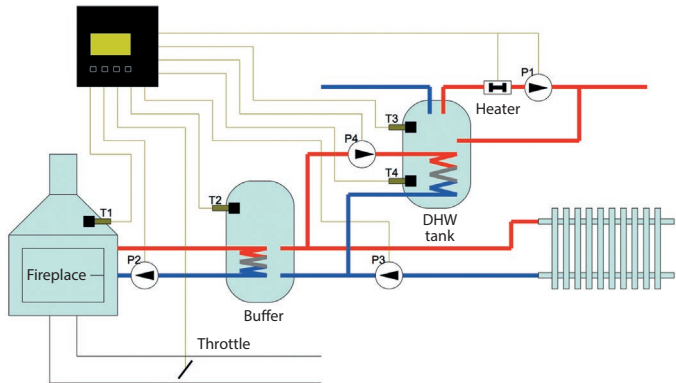
The T2 sensor measures the temperature of the water returning to the water jacket. This temperature is measured for information purposes only and does not affect the operation of the controller. While it can be used for other purposes, it is also possible to not connect this sensor at all.

The T3 and T4 sensors measure the upper and lower temperature of water in the DHW tank. The T3 sensor should be located near the domestic hot water outlet, while the T4 sensor - near the bottom of the tank. Such an arrangement of the sensors allows saving electricity, because water in the tank does not reach a uniform temperature. The electric heater is activated only when the temperature at

the top of the tank drops below the set value, while heating with the use of a coil is turned on until the set temperature at the bottom of the tank is reached. If it is not possible to install two sensors in the tank, only one of them can be installed, however the control of the electric heater will be then less economical.

The electric heater may be installed inside the tank or outside as a flow heater. When installed outside, it should be connected in parallel with the P1 pump that forces the closed water cycle through the heater.

1.1.2. Fireplace with a water jacket and a buffer tank.

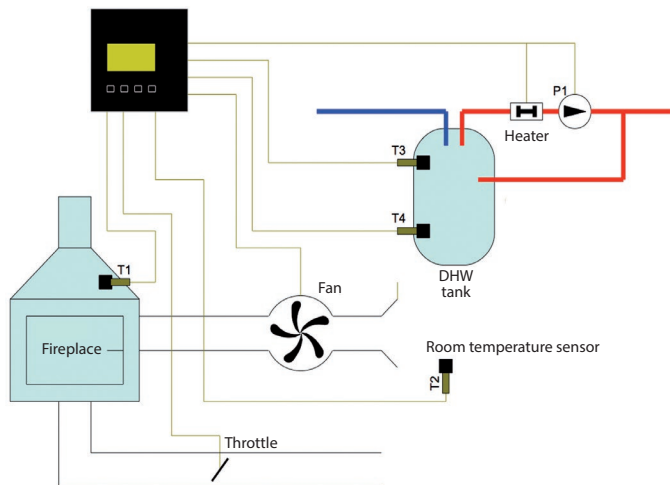


In this mode the buffer tank is used to store the heat from the fireplace. The use of such a tank allows utilizing the stored thermal energy after extinguishing the fire in the fireplace.

When the T1 temperature reaches the set value and at the same time will be higher than T2 by the set value, the P2 pump will be turned on to heat water in the buffer tank.

The heater and other pumps are controlled in a similar manner as in the preceding paragraph, except for the fact that the P3 and P4 pumps are activated when the adequate temperature of the buffer rather than the water jacket is reached.

1.1.3. Fireplace with hot air distributionh.



In this mode the fireplace is equipped with an air insert. The controller enables smooth regulation of fan revolutions depending on the temperature of the fireplace insert and the temperature in the rooms being heated. Like in the previous modes, this controller allows controlling the DHW electric heater.

The T1 sensor measures the temperature of the fireplace insert and with the use of the throttle tries to keep the temperature at the set level.

The T3 and T4 sensors measure the temperature of the DHW tank. The temperature read by these sensors is used to control the electric heater that heats the tank.

The T2 sensor measures the temperature in the room being heated. The rotational speed of the fan blowing hot air into rooms is selected on the basis of this temperature and the temperature of the fireplace insert.

If the controller is not used to control the DHW tank heater, the T3 and T4 sensors can be utilized to measure the temperature in other rooms being heated, thanks to which the fan control will be even more precise.

1.2. Mechanical installation.

The controller is sold together with a mounting box that enables installation of the controller in a plasterboard wall. An adequate hole should be cut in the plasterboard. The mounting box should be put into this hole and fasten with screws on all sides, taking care that the box is not deformed. Then all the wires should be inserted to the box and connected to the controller. The printed circuit board with the mounting plate should be fastened to the box, then the ribbon from the front panel must be

connected to the main board and the front plate must be fastened to the controller's plate.

1.3. Connecting the controller.

The controller has numbered connectors. This numbering scheme should be followed when connecting appropriate wires to the controller:

1, 2 – output 0 -10 V to control the rotational speed of the fan with an electronically commutated motor (1 - earth, 2 - output 0 - 10 V).

3,4,5 - output for connection of the throttle (3 - earth - black wire, 4 - control output - yellow wire, 5 - power supply +5 V - red wire).

6,7 - RS 485 bus used to connect other modules (for future use).

8,9 - Input of the signal from a fire alarm control unit. If a fire alarm control unit is installed in the home, the control signal from this unit should be connected to this input. This signal should be provided by the control unit in the form of a normally closed contact. If the control unit is not to be connected, both pins of this connector should be closed with a jumper.

10,11 - Door opening sensor. If the fireplace insert is equipped with a door opening sensor in the form of a limit switch that closes the contacts after opening the door, it must be connected to this connector.

12,13 - Temperature sensor T1.

14,15 - Temperature sensor T2.

16,17 - Temperature sensor T3.

18,19 - Temperature sensor T4.

20,21,22 - Controller power supply ~ 230 V/50 Hz (20 - earth, 21 - neutral, 22 - phase).

23,24,25 - Power supply of the DHW heater and P1 pump (23 - earth, 24 - neutral, 25 - phase).

26,27,28 - Power supply of the P2 pump (26 - earth 27 - neutral, 28 - phase).

29,30,31 - Power supply of the P3 pump (29 - earth, 30 - neutral, 31 - phase).

32,33,34 - Power supply of the P4 pump (32 - earth, 33 - neutral, 34 - phase).

35,36,37 - Power supply of the fan with phase control of the rotational speed (35 - earth, 36 - neutral, 37 - phase).

38,39,40 - Output of the primary heat source control.

This output allows turning off the primary heat source when the fireplace is burning. It is a relay output and appropriate elements must be connected to it depending on the type of the primary heat source (38 - normally closed contact, 39 - central contact, 40 - normally open contact).

Controller connections scheme:

Fireplace with a water jacket, without buffer tank

PE - protective earth (yellow-green)

N - neutral (blue)

L - phase (brown)

Power supply of the controller: 20 PE, 21 N, 22 L

Power supply of the throttle: 3 black, 4 yellow, 5 red

T1 water jacket temperature sensor: 12 brown, 13 blue

T2 return water temperature sensor: 14 brown, 15 blue

T3 sensor of the upper temperature limit of water in the DHW tank: 16 brown, 17 blue

T4 sensor of the lower temperature limit of water in the DHW tank: 18 brown, 19 blue

Pump 1/HEATER connection of the heater and the DHW pump: 20 PE, 21 N, 22 L

Pump 2 – pumps water to the fireplace: 26 PE, 27 N, 28 L

Pump 3 – assists the central heating system: 29 PE, 30 N, 31 L

Pump 4 – pumps water to the DHW tank: 32 PE, 33 N, 34 L

Door opening sensor: 10, 11

Control of the primary heat source: 38 normally closed contact, 39 central contact, 40 normally open contact

Fireplace with a water jacket and a buffer tank

PE - protective earth (yellow-green)

N - neutral (blue)

L - phase (brown)

Power supply of the controller: 20 PE, 21 N, 22 L

Power supply of the throttle: 3 black, 4 yellow, 5 red

T1 water jacket temperature sensor: 12 brown, 13 blue

T2 sensor of the water temperature in the buffer tank: 14 brown, 15 blue

T3 sensor of the upper temperature limit of water in the DHW tank: 16 brown, 17 blue

T4 sensor of the lower temperature limit of water in the DHW tank: 18 brown, 19 blue

Pump 1/HEATER connection of the heater and the DHW pump: 20 PE, 21 N, 22 L

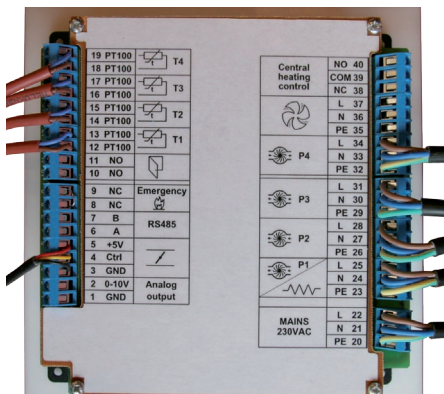
Pump 2 – pumps water from the buffer tank: 26 PE, 27 N, 28 L

Pump 3 – assists the central heating system: 29 PE, 30 N, 31 L

Pump 4 – pumps water to the DHW tank: 32 PE, 33 N, 34 L

Door opening sensor: 10,11

Control of the primary heat source: 38 normally closed contact, 39 central contact, 40 normally open contact.



Fireplace with hot air distribution + DHW tank

PE - protective earth (yellow-green)

N - neutral (blue)

L - phase (brown)

Power supply of the controller: 20 PE, 21 N, 22 L

Power supply of the throttle: 3 black, 4 yellow, 5 red

T1 fireplace body temperature sensor: 12 brown, 13 blue

T2 room temperature sensor: 14 brown, 15 blue

T3 sensor of the upper temperature limit of water in the DHW tank

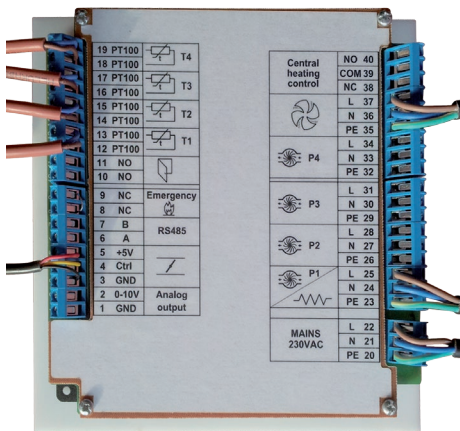
T4 sensor of the lower temperature limit of water in the DHW tank

Pump 1/HEATER connection of the heater and the DHW pump: 20 PE, 21 N, 22 L

Turbine control: 35 PE, 36 N, 37 L

Door opening sensor: 10, 11

Control of the primary heat source: 8 normally closed contact, 39 central contact, 40 normally open contact.



Fireplace with hot air distribution

PE - protective earth (yellow-green)

N - neutral (blue)

L - phase (brown)

Power supply of the controller: 20 PE, 21 N, 22 L

Power supply of the throttle: 3 black, 4 yellow, 5 red

T1 fireplace body temperature sensor: 12 brown, 13 blue

T2 room temperature sensor: 14 brown, 15 blue

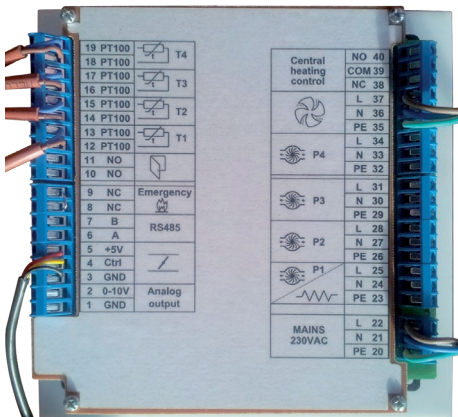
T3 room temperature sensor: 16 brown, 17 blue

T4 room temperature sensor: 18 brown, 19 blue

Turbine control: 35 PE, 36 N, 37 L

Door opening sensor: 10,11

Control of the primary heat source: 38 normally closed contact, 39 central contact, 40 normally open contact



WARNING! All wires including the ribbon connecting the front panel with the main board must be connected when the power supply of the controller is turned off.

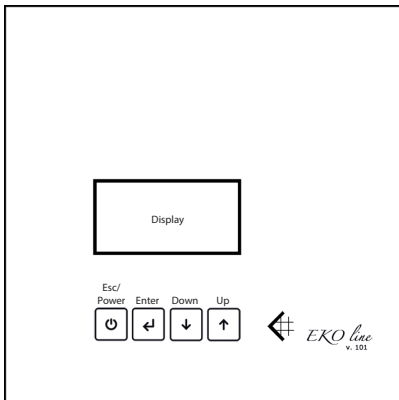
A single-phase heater with a power of 1200 W can be connected directly to the P1 output. Three-phase heaters or the heaters with a higher power should be connected through the contactor.

Temperature sensors can be extended up to 10 m using a 0.5 mm x 2 cable, or up to 25 m using a 1 mm x 2 (or thicker) cable. After extending the cable and connecting the sensor, the latter should be calibrated, i.e. the measurement error must be determined and appropriate correction should be entered in the menu 6.9.15-6.9.18.

2. Operation of controller.

2.1. Displayed screens.











The controller is equipped with an OLED display and four capacitive sensors performing the function of buttons.



The display may show the main screen, a screen saver, a menu, or a fire warning.

The main screen displays a number of values and symbols representing the current state of the fireplace:

Symbol:	Description:
	The current temperature of the fireplace is displayed in a large font.
	In the case of systems with hot air distribution, the fireplace temperature can be expressed by a 3-digit value.
	The current time is displayed in a small font.
	The symbol of wood without flame means that the fire in the fireplace is extinguished.
	The symbol wood with a match and a small flame means that the fire in the fireplace is being lighted.

	The symbol of wood with a large flame means that the fire in the fireplace is lighted.
	The symbol of wood with a small flame means that the fire in the fireplace is being extinguished due to a lack of fuel. When this symbol is flashing and short beeps are emitted, touch the „Enter“ sensor button to add fuel to the hearth.
	The temperature in a small font denotes the temperature set by the user. The controller tries to maintain this temperature by selecting an adequate position of the throttle. The arrow pointing up on the left side of the temperature value means that the fireplace temperature has been increased for the time of heating the DHW tank.
	The symbol of open hearth door.
	The symbol of the throttle with a percentage value of opening (0% - closed, 100% fully open).
	The symbol of the P2 pump feeding the buffer or the heat exchanger. The rotating impeller of the pump indicates that the pump has been activated, while the still impeller means that the pump has been turned off.
	The symbol of the P1 pump, the DHW tank heater and the P4 pump. The rotating impeller of the pump indicates that the P4 pump has been activated, while the animated symbol of the heater inside the tank means that the heater and the P1 pump have been activated. Flashing contour of the DHW tank warns about too low tank temperature.
	In the case of a fireplace without water jacket and with active heater operation, only the symbol of the DHW tank (without the pump symbol) is displayed. The meaning of the animated heater and the flashing contour is the same as in the previous section.
	The symbol of the P3 pump that assists the central heating system. The rotating impeller of the pump means that the pump is activated.
	The symbol of the fan for hot air distribution. The value displayed next to the fan and the speed of blades rotation in the fan symbol indicate the capacity currently set.

The screen saver is displayed as flashing stars and the current time moving on the screen. The screen saver is necessary because it prevents uneven wear of the display.

After start-up of the unit, the main screen is displayed. After a certain time of inactivity, i.e. when none of the sensors is touched and fire lighting is not detected, the screen saver will appear on the display. The screen saver can also be activated manually by touching the „Esc/Power“ sensor button for 1 second.

When the screen saver is active, it is possible to go to the main screen after detection of fire lighting or by holding down the „Esc/Power“ sensor button for 1 second.

2.2. Navigating the Menu.

When the main screen is displayed, you can enter the menu by touching the „Enter” sensor button. By using arrow sensors, you can navigate the menu up and down. Some menu items allow editing variables, while other are used to enter a submenu.

The menu items that contain numerical or descriptive values displayed on the right side allow editing such values. When you move the cursor on such an item and touch the „Enter” sensor button, you will activate the mode for editing the value of this variable. This is indicated by the flashing value and by a frame around it. You can change the value of this variable using arrow sensors. You can leave the variable edition mode by touching the „Enter” or „Esc/Power” sensor button, however touching the „Enter” sensor button will change the value of that variable to the set value, while touching the „Esc/Power” sensor button will restore the value of the variable before entering the edition mode.

Menu items, which do not contain values displayed on the right side, allow entering a submenu or activating a function by pressing the „Enter” sensor button. Touch the „Esc/Power” sensor button to go from a submenu to a parent menu. If you are in the main menu, the main screen will be displayed. If you do not touch any sensor for 30 seconds, the menu will be disabled due to a lack of user activity and the main screen will be display.

2.3. Supervising the wood burning process.

Before lighting the fire in the fireplace, the unit should be in the extinguishing mode, which is indicated by a symbol of wood without flame. In the extinguishing mode, the throttle is closed. The lighting mode can be activated by entering the menu and selecting the item „2 lighting„. If you do not select this item and the controller detects an increase in the fireplace temperature, the lighting mode will be automatically activated. This mode is indicated by a symbol of wood with a match and a small flame. In the lighting mode, the throttle is set in the position indicated by the service parameters and the automatic control of throttle position does not work. To leave the lighting mode, touch and hold down the „Esc/Power” sensor button for a second (provided that there is no condition of an increase in the fireplace temperature). If the temperature that enables switching to the full wood burning mode is not reached during the time indicated by the service parameters, the controller closes the throttle and switches to the extinguishing mode.

When the temperature of the fireplace reaches the preset level, the full wood burning mode is activated. This mode is indicated by a symbol of wood with a very large flame. In this mode, the position of the throttle is determined by the controller in such a way so that the temperature set in the item „1 temp.” of the menu is reached as soon as possible and maintained. When almost all wood in the fireplace is burned and the fireplace temperature begins to drop despite the fact that the throttle is fully open, the controller will switch into the fire extinguishing mode. This mode is indicated by a symbol of wood with a small flame. Additionally, if the parameter in the „3 fuel signal” menu is set to „Y”, the symbol flashes and the controller emits short beeps informing the user that more wood must be put to the fireplace. After the lack of fuel has been indicated, the sound signal can be switched off by touching the „Enter” sensor button. If after adding the fuel the fireplace temperature rises, the controller will switch into to the full wood burning mode. If the fuel is not added and the fireplace temperature drops to a level lower than set in the service parameters, the controller will switch into the extinguishing mode.

3. Description of the menu and service parameters.

Symbol:	Description:
1. temp.	Variable: The fireplace temperature that the controller will try to maintain by adjusting the throttle position.
2. lighting	Function: When the fireplace is extinguished, select this item to switch into to the lighting mode.
3. fuel signal	List: When the „Y” value is selected from the list, the controller will inform the user about a lack of fuel in the fireplace by emitting a sound. The „N” value means that the controller will let all the fuel to burn out without signalling.
4. state sensors	Function: When this option is selected, a window, which contains the information about states of all inputs and outputs of the controller, will open.
5. options	Submenu: Selecting this option to go to the submenu that contains basic parameters of the controller operation.
5.1 brightness	Variable: Brightness of the display.
5.2 sound of butt.	Variable: Duration of the sound of buttons.
5.3 main screen	List: From this list you can select some layouts of the main screen.
5.4 screen saver	Variable: Controller idle time, after the lapse of which the screen saver will be displayed.
5.5 language	List: From this list you can select the menu language.
5.6 date / time	Function: Select this option to open a window, in which the current date and time can be set. Use arrow sensors to change the values of each part of the date and time that is currently highlighted. Use the „Enter” sensor button to move to the next value. You can accept the entered values by touching the „Enter” sensor button, when the value of seconds is highlighted. You can leave this window at any time by touching the „Esc/Power” sensor button.
6. service	Submenu: Opens a submenu containing advanced service parameters. Recommended only for service staff and very aware users.
6.1 level of access	Submenu: Opens a submenu that allows blocking the access to some parameters and setting an access password.
6.2 type of install	Submenu: A submenu that allows selecting the type of fireplace system.
6.3 furnace parameters	Submenu: A submenu that contains parameters responsible for controller operation modes and the throttle control.

6.4 electric heater DHW	Submenu: A submenu that contains parameters responsible for the control of the DHW electric heater and the P1 pump.
6.5 heating DHW	Submenu: A submenu that contains parameters responsible for heating the DHW tank, i.e. for the control of the P4 pump. This submenu is available only when you set the following system types: „with exchanger“ or „with buffer“.
6.6 support CH	Submenu: A submenu that contains parameters responsible for assisting the central heating system, i.e. for the control of the P3 pump. This submenu is available only when you set the following system types: „with exchanger“ or „with buffer“.
6.7 heating buffer	Submenu: A submenu that contains parameters responsible for heating the buffer, i.e. for the control of the P2 pump. This submenu is available only when you set the following system type: „with buffer“.
6.8 air heating	Submenu: A submenu that contains parameters responsible for the control of the fan distributing hot air to the rooms. This submenu is available only when you set the following system type: „of blowing“.
6.9 input / output	Submenu: A submenu that contains other parameters responsible for handling the inputs and outputs.
6.10 others	Submenu: A submenu that contains parameters that can not be assigned to any of the above categories.
6.1.1 lack of access	Function: Select this item to block the access to all variables. This item is protected by a password, if it has been set.
6.1.2 basic pos.	Function: Select this item to block the access to all variables in the „6 service“ menu. This item is protected by a password, if it has been set.
6.1.3 middle pos.	Function: Select this option to block the access to the parameters in the „6 service“ menu, a change of which could damage the fireplace system. This item is protected by a password, if it has been set.
6.1.4 advanced pos.	Function: Select this item to unblock the access to all parameters. This item is protected by a password, if it has been set.
6.1.5 change a password	Function: After selecting this option, it is possible to set an access password consisting of 5 digits. This password protects all functions in the „6.1 level of access“ menu. If the password is set to „00000“, the controller will not prompt for a password. The password is set to „00000“ in each controller during the manufacturing proces.
6.2.1 with exchanger	Function: Switches the controller into the operation mode with a fireplace insert, a water jacket, without buffer tank.
6.2.2 with buffer	Function: Switches the controller into the operation mode with a fireplace insert, a water jacket, and a buffer tank.
6.2.3 of blowing	Function: Switches the controller into the operation mode with a fireplace insert, without water jacket, and with hot air distribution.

6.3.1 aladm temp.	Variable: The fireplace temperature, the exceeding of which is signalled by a flashing temperature indication and sound signals. At the same time the throttle is closed, while the fan and the P2, P3 and P4 pumps are activated in order to cool down the fireplace as soon as possible.
6.3.2 baf. extinct.	Variable: Throttle position in the extinguishing mode.
6.3.3 baf. ligh.	Variable: Throttle position in the lighting mode.
6.3.4 incr. ligh. 6.3.5 per. ligh.	Variables: When the controller is in the extinguishing mode, an increase in temperature of the T1 sensor by the temperature set in the „6.3.4 incr. ligh.“ parameter during the time set in „6.3.5 per. ligh.“ will cause that the controller will switch into the lighting mode.
6.3.6 time ligh.	Variable: If from the moment, when the lighting mode has been manually activated or the condition described in the previous cell has been fulfilled, the time set in this parameter elapses and the controller does not switch into the full wood burning mode, the controller switches back to the extinguishing mode.
6.3.7 temp. ligh.	Variable: The fireplace temperature, the exceeding of which causes the controller to switch from the lighting mode into the full wood burning mode.
6.3.8 decr. exting. 6.3.9 time exting.	Variables: When the fireplace temperature in the full wood burning mode drops by the value set in the „6.3.8 decr. exting.“ parameter, the throttle opens to 100% and this condition persists for the time set in the „6.3.9 time exting.“ parameter, the controller will switch into the extinguishing mode and may indicate a lack of fuel.
6.3.10 temp. exting	Variable: When the temperature in the extinguishing mode drops below the value set in this parameter, the controller will switch into the extinguishing mode.
6.3.11 PID Kp	Variable: The gain of the proportional term of the PID controller. Description of tuning is given below the table.
6.3.12 PID Ki	Variable: The gain of the integral term of the PID controller. Description of tuning is given below the table.
6.3.13 PID Kd	Variable: The gain of the derivative term of the PID controller. Description of tuning is given below the table.
6.3.14 PID Min	Variable: The minimum position of the throttle during the operation of the PID controller. This parameter should be selected in such a way so that it is not possible to stifle the fire excessively, e.g. after reducing the set temperature.
6.3.15 contin. control	Variable: If this parameter is set to „Y“, the continuous control will be active. Otherwise, the throttle will be controlled only at a significant change in its position. Active continuous control results in a quick wear of the throttle and it should be used only when tuning the PID controller. Continuous control will be automatically disabled after activation of the extinguishing mode.

6.3.16 baf. time	Variable: The throttle control time when the continuous control is disabled.
6.3.17 chan. baf.	Variable: The minimum change in the throttle position, upon which the throttle will be controlled when the continuous control is disabled.
6.3.18 min. space	Variable: The minimum time between successive throttle control cycles when the continuous control is disabled.
6.3.19 max. space	Variable: The maximum time between successive throttle control cycles when the continuous control is disabled.
6.3.20 closed baf.	Variable: The level of the control signal, which is responsible for full closure of the throttle. It should be set to such a value, so that the throttle is tightly closed when the controller sets it in the position of 0%.
6.3.21 open baf.	Variable: The level of the control signal, which is responsible for full opening of the throttle. It should be set to such a value, so that the throttle is open to the maximum when the controller sets it in the position of 100%.
6.4.1 add. el.	List: When the "Y" value is selected from the list, additional electric heating is turned on, while the "N" value turns it off.
6.4.2 Temp. DHW	Variable: The temperature of the tank, which the controller will try to maintain using the electric heater.
6.4.3 hysteresis	Variable: The hysteresis of the electric heater.
6.4.4 meas. temp.	List: Used to select the source of information about the current temperature of water in the tank for the adjustment needs: "T3" - T3 sensor, "T4" - T4 sensor, "ave" - the mean value of temperatures from the T3 and T4 sensors, "min" - the minimum value of temperatures from the T3 and T4 sensors, "max" - the maximum value of temperatures from the T3 and T4 sensors.
6.4.5 sw. off heat	List: Used to select when the additional electric heating should be turned off: "not" - never turned off, "light" - turned off after the lighting has been started, "pomp" - turned off when the controllers switches into the full wood burning mode.
6.4.6 only tar. eco	List: When the "Y" value is selected from the list, the additional electric heating will be active only in the economical electricity tariff, while for the "N" value it will be always active.
6.4.7 red. temp.	Variable: If the additional electric heating is active outside the economical electricity tariff, this parameter is used to set the value, by which the temperature of the DHW tank is to be reduced.
6.4.8 Start Eko 1	Variable: Start of the first economical tariff.
6.4.9 Sop Eko 1	Variable: Stop of the first economical tariff.

6.4.10 Start Eko 2	Variable: Start of the second economical tariff.
6.4.11 Stop Eko 2	Variable: Stop of the second economical tariff.
6.4.12 eco wint. time	List: When the „Y” value is selected from the list, the tariff start and stop hours will be determined based on the winter time, while for the „N” value - according to the current time.
6.4.13 sign. temp.	List: If you select the „Y” value from the list, the tank contour on the display will flash, when the temperature of the DHW tank is too low.
6.4.14 meas. sign.	List: Used to select the source of information about the current temperature of water in the tank for the alarm signalling needs: „T3” - T3 sensor, „T4” - T4 sensor, „ave” - the mean value of temperatures from the T3 and T4 sensors, „min” - the minimum value of temperatures from the T3 and T4 sensors, „max” - the maximum value of temperatures from the T3 and T4 sensors.
6.4.15 temp. sign.	Variable: The tank temperature, below which the alarm will be activated.
6.5.1 heating DHW	List: When the „Y” value is selected from the list, heating of the DHW tank with the use of the fireplace is turned on, while the „N” value turns it off.
6.5.2 incr. temp.	Variable: The value, by which the fireplace temperature is to be increased, when the DHW tank is heated.
6.5.3 temp. char.	Variable: The minimum temperature of the source (fireplace or buffer, depending on the type of system), above which the additional heating of the DHW tank is turned on.
6.5.4. diff. temp.	Variable: The minimum difference of the temperatures between the source and the DHW tank, above which the additional heating of the DHW tank is turned on.
6.5.5 Temp. DHW	Variable: The temperature of the DHW tank, which the controller tries to maintain by controlling the P4 pump.
6.5.6 hysteresis	Variable: The hysteresis of the DHW tank temperature.
6.5.7 meas. temp.	List: Used to select the source of information about the current temperature of water in the tank for the adjustment needs: „T3” - T3 sensor, „T4” - T4 sensor, „ave” - the mean value of temperatures from the T3 and T4 sensors, „min” - the minimum value of temperatures from the T3 and T4 sensors, „max” - the maximum value of temperatures from the T3 and T4 sensors.
6.5.8 prior. DHW	List: When the „Y” value is selected from the list, the assistance of the central heating system will be turned off for the time when the DHW tank is being additionally heated.
6.6.1 Wsupport CH	List: When the „Y” value is selected from the list, the assistance of the central heating system with the use of the fireplace is turned on, while the „N” value turns it off.

6.6.2 Ttemp. sour.	Variable: The minimum temperature of the source (fireplace or buffer, depending on the type of system), above which the assistance of the central heating system with the use of the fireplace is turned on.
6.6.3 Hysteresis	Variable: The source temperature hysteresis.
6.6.4 pump	Variable: The time of operation of the P3 pump after a drop of the source temperature below the minimum value.
6.7.1 heating buffer	List: When the „Y” value is selected from the list, heating of the buffer tank with the use of the fireplace is turned on, while the „N” value turns it off.
6.7.2 temp of sour.	Variable: The minimum temperature of the fireplace, above which heating of the buffer is turned on.
6.7.3 dif. temp.	Variable: The minimum difference between the temperatures of the fireplace and the buffer tank, above which the heating of the buffer is turned on.
6.7.4 Hysteresis	Variable: The fireplace temperature hysteresis.
6.7.5 ret. pump	Variable: The time of operation of the P3 pump after a drop of the fireplace temperature below the minimum value.
6.8.1 air heat.	List: When the „Y” value is selected from the list, the hot air distribution is turned on, while the „N” turns it off.
6.8.2 temp. swich	Variable: The temperature of the fireplace, above which the hot air distribution is turned on.
6.8.3 Hysteresis	Variable: The fireplace temperature hysteresis.
6.8.4 min. perf.	Variable: The minimum capacity of the fan.
6.8.5 perf. patt.	Variable: The capacity of the fan at the reference temperature of the fireplace.
6.8.6 temp. patt.	Variable: The reference temperature of the fireplace.
6.8.7 var. in pr.	Variable: The value by which the capacity of the fan changes per each 1°C of the difference between the current temperature and the reference temperature of the fireplace.
6.8.8 contr. room	List: Used to select the sensors to control the temperature in rooms: „not” - no room temperature control, „T2” - T2 sensor, „T2-3” - T2 and T3 sensors, „T2-4” - T2, T3 and T4 sensors.
6.8.9 meas. temp.	List: When more than one sensor is used to control the temperature in rooms, it allows selecting the value to control the fan capacity: „min” - the minimum value of the temperature, „ave” - the mean value of the temperature, „max” - the maximum value of the temperature.

6.8.10 temp. opt.	Variable: The optimal temperature of rooms, which does not change the rotational speed of the fan.
6.8.11 var. in pr.	Variable: The value by which the capacity of the fan changes per each 1°C of the difference between the current temperature and the optimal room temperature.
6.9.1 P1 run	Variable: The time of the operation of the P1 pump, which prevents its stagnation when not used.
6.9.2 P1 space	Variable: The time that must elapse after the last activation of the P1 pump to start it for preventive purpose.
6.9.3 freeze P1	List: Allows selecting the temperature sensor to be used for turning on the P1 pump in order to prevent water freezing.
6.9.4 P2 run	Variable: The time of the operation of the P2 pump, which prevents its stagnation when not used.
6.9.5 P2 space	Variable: The time that must elapse after the last activation of the P2 pump to start it for preventive purposes.
6.9.6 reeze P2	List: Allows selecting the temperature sensor to be used for turning on the P2 pump in order to prevent water freezing.
6.9.7 P3 run	Variable: The time of the operation of the P3 pump, which prevents its stagnation when not used.
6.9.8 P3 space	Variable: The time that must elapse after the last activation of the P3 pump to start it for preventive purposes.
6.9.9 reeze P3	List: Allows selecting the temperature sensor to be used for turning on the P3 pump in order to prevent water freezing.
6.9.10 P4 run	Variable: The time of the operation of the P4 pump, which prevents its stagnation when not used.
6.9.11 P4 space	Variable: The time that must elapse after the last activation of the P4 pump to start it for preventive purposes.
6.9.12 freeze P4	List: Allows selecting the temperature sensor to be used for turning on the P4 pump in order to prevent water freezing.
6.9.13 time of run	Variable: The time, at which the pumps will be turned on to prevent their stagnation.
6.9.14 run aft. anoth.	List: When the „Y” value is selected, the pumps will be activated one after another, while for the „N” value the pumps will start at the same time.
6.9.15 T1 offset	Variable: The value correcting the temperature measured by the T1 sensor. It should be selected experimentally, for example when you extend the sensor cables or use a sensor other than that supplied with the controller.
6.9.16 T2 offset	List: The value correcting the temperature measured by the T2 sensor.
6.9.17 T3 offset	Variable: The value correcting the temperature measured by the T3 sensor.
6.9.18 T4 offset	Variable: The value correcting the temperature measured by the T4 sensor.

6.9.19 door delay	Variable: The door opening time (when the controller is in the full wood burning mode), after the lapse of which the necessity to close the door will be signalled.
6.9.20 closed baf.	List: When the „Y” value is selected, the throttle will be closed for the time when the door is open, while for the „N” value its position will remain unchanged.
6.9.21 stove mode	List: Used to select when the controller will turn off the main heat source: „not” - the main heat source will not be turned off, „light” - the main heat source will be turned off after the lighting of fire in the fireplace has been started, „pomp” - the main heat source will be turned off after the activation of the P3 pump that assists the central heating system.
6.10.1 RTC cal.	Variable: The value calibrating the clock of the controller. When the clock is fast by 25 seconds per month, this value should be decreased by 25.
6.10.2 summ. time	List: Used to select how the summer time is enabled and disabled: „Sw Off” - The summer time support is disabled, „Auto” - The summer time is enabled and disabled automatically by the controller, „Manual” - The summer time is manually enabled and disabled in the Menu „5.6 date / time”.
6.10.3 Key sensitiv.	Variable: Sensitivity of the capacitive keypad (increase this value results to increase the sensitivity). This value must be changed very carefully in order to not lose the control over sensors.

3.1. Description of the PID algorithm tuning.

In the full wood burning mode and in the extinguishing mode, the position of the throttle is determined by the PID controller using the „anti-windup” function. The values of the Kp, Ki and Kd parameters should be selected experimentally for each fireplace system. The parameters should be selected in such a way, so that the fireplace temperature after lighting the fire reaches the set temperature within a reasonable time and is maintained at this level with possibly small changes in the throttle position. It is much more important to ensure small changes in the throttle position after this temperature has been stabilized than to reach the set temperature quickly, because the uniform course of the burning process guarantees a more efficient use of the thermal energy obtained in this process. The throttle position is determined by the following formula:

$P[\%] = 50 + K_p * E + K_i * I + K_d * D$; P - the throttle position in %,

Kp - the gain of the proportional term in %,

Ki - the gain of the integral term in %,

Kd - the gain of the derivative term in %,

$E = (T_z - T_a) / 10$ - temperature deviation, i.e. the difference between the set temperature and the temperature read from the fireplace, divided by 10.

I - integral of the E variable with the integral action time of 1 minute.

D - derivative of the E variable with the derivative action time of 0.1 s.

Tuning of the controller should be started with safe values, for example: $K_p = 25\%$, $K = 5\%$, $K_d = 0\%$.

When the temperature increase or decrease time after a change of the set temperature is too long, the K_p value should be increased. When the temperature of the fireplace deviates from the set temperature too long and approaches it too slowly, the K_i parameter should be increased. When the controller is not able to maintain the set temperature and causes continuous variations in the fireplace temperature resulting from large changes in the throttle position, the value of the K_p or K_i parameter should be decreased (check experimentally, the reduction of which parameter improves the stability of temperature).

It is recommended to set the value of the K_d parameter to 0% and do not change it. It can be useful only in a situation where maintaining the set temperature at an exact level is more important than the effective use of thermal energy. Tuning the controller using the K_d parameter is very difficult and should be done only by a person with theoretical basis and experience in PID controller tuning.

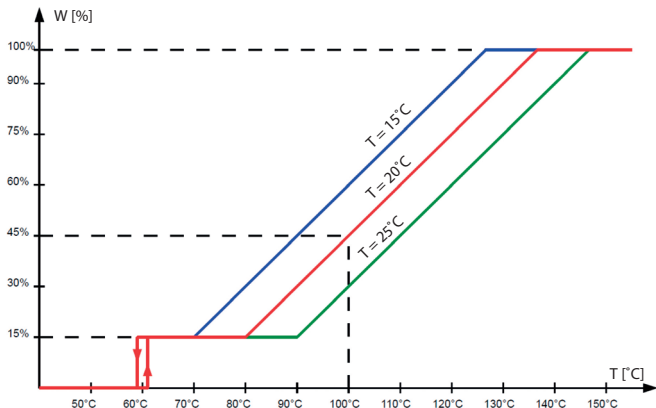
3.2. Description of the hot air distribution configuration.

The following example shows how the controller configures the hot air distribution.

For the needs of the example let's assume the following configuration:

Parameter	Value
6.8.1 air heat.	T
6.8.2 temp. swich	60°C
6.8.3 Hysteresis	2°C
6.8.4 min. perf.	15%
6.8.5 perf. patt.	45%
6.8.6 temp. patt.	100%
6.8.7 var. in pr.	1,5%
6.8.8 contr. room	T2-3
6.8.9 meas. temp.	śr.
6.8.10 temp. opt.	20°C
6.8.11 Zvar. in pr.	3,0%

The turbine capacity is dependent both on the fireplace temperature and the mean value of temperatures in the rooms, in which the T2 and T3 sensors are located. A diagram showing the turbine capacity depending on the fireplace temperature for three different values of the temperature in rooms is given below.



When the fireplace temperature reaches the value of 61°C (the activation temperature from the Menu 6.8.2 + half of the hysteresis value from the Menu 6.8.3), the turbine will be turned on with the minimum capacity, i.e. 15% (Menu 6.8.4). When the fireplace temperature drops to 59°C (the activation temperature from Menu 6.8.2 - half of the hysteresis value from the Menu 6.8.3), the turbine will be turned off. At the fireplace temperature of 100°C, the turbine capacity is 45% (Menu 6.8.5, 6.8.6), while at the temperature of e.g. 120°C, the turbine capacity is 75%. This value is calculated based on the reference temperature (Menu 6.8.6), the reference capacity (Menu 6.8.5) and the change in the capacity (Menu 6.8.7) in the following way: $45\% + 20^{\circ}\text{C} * 1.5\% = 75\%$. The turbine capacity must not be lower than the minimum capacity (Menu 6.8.4) and cannot be greater than 100%.

If the control of the temperature in rooms is enabled, the turbine capacity additionally depends on the temperature in the rooms.

When the temperature in rooms is equal to the optimal temperature set in Menu 6.8.10, the fan capacity is not changed, but when the temperature in the rooms is e.g. 25°C, the fan capacity will be decreased by 15% ($5^{\circ}\text{C} * 3\%$). When the room temperature is lower than the optimal temperature and is e.g. 15°C, the fan capacity is increased by 15% ($5^{\circ}\text{C} * 3\%$).

3.3. Description of service jumpers.

A 16-pin connector, on which 8 jumpers can be placed, is located on the main board of the unit. The pins, on which jumpers can be placed, are numbered from 1 to 8. The jumpers can be placed or removed only when the power supply of the controller is switched off. Individual jumpers are described in the following table.

Jumper	Description
1	When this jumper is placed, the controller will switch into the service mode, in which all outputs are sequentially enabled and disabled. This mode can be used during installation of the controller to check whether all devices are properly connected and working.
2	When this jumper is placed, the default keypad sensitivity, the default access password and the default access level for service variables will be set. It can be used when you forget the access password or set the keypad sensitivity to a value that makes the use of the unit impossible.
3	When this jumper is placed and the controller is turned on, all service parameters will be set to default values. Remember to remove this jumper after clearing the memory.
4	Unused.
5	Unused.
6	Unused.
7	Unused.
8	Unused.

4. Warranty

The manufacturer gives a 2-year warranty for correct functioning of the controller from the date of its purchase.

The buyer shall read the owner's manual and these warranty terms and conditions.

Where making a warranty claim, the user is required to submit a description of the failure and a proof of purchase.

The unit shall be repaired within 14 days.

Any alterations, modifications and structural changes cause immediate loss of the manufacturer warranty.

This warranty does not cover mechanical damage, incorrect connection of the controller, software updates, maintenance and replacement of fuses.



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