Boiler regulator
ZAB – 07

FOR SOLID FUEL-FIRED BOILERS WITH FEEDING SCREW

plum

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Individual Fuzzy Logic

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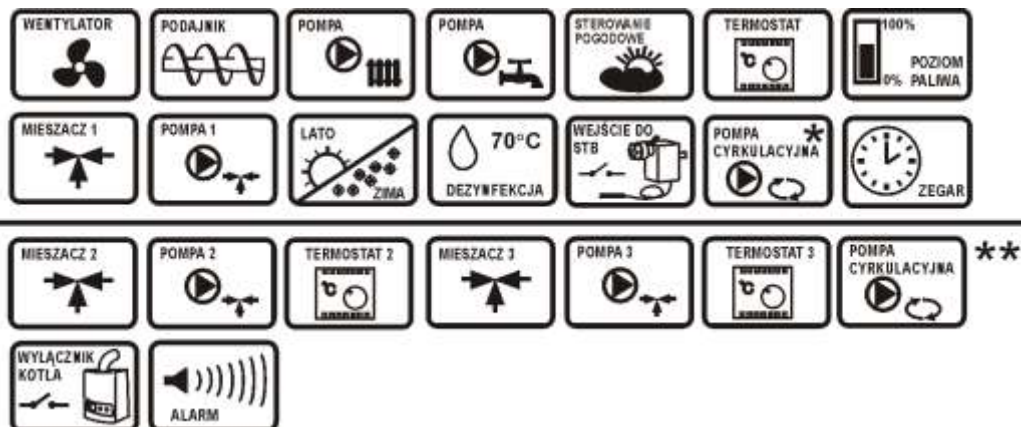
* - function available instead of mixer 1
** - functions available in additional MX.01 extending module
*** - ecoSTER room panel is not a part of standard equipment

CE RoHS COMPLIANT

SERVICE AND ASSEMBLY MANUAL
ISSUE: 1.1

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- **The regulator must be programmed individually to a particular boiler and fuel type, pt. 19.1!**

- **It is forbidden to change gear motor type, fan type and to make any other changes in boiler equipment which has any influence on the combustion process. Equipment should be matched by with components factory-assembled by the boiler manufacturer, pt. 19!**

- **Operation with opened fan screen is recommended.**

- **Activation of fuzzy logic mode does not make regulation of CONTROL parameters unnecessary, pt. 7.9.**

- **In some cases, the fuzzy logic mode may require additional regulation acc. to pt. 7.8.**

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1 RECOMMENDATIONS REGARDING SAFETY

Requirements concerning safety are described in detail in individual chapters of this manual. Apart from them, the following requirements should in particular be observed:

⚠

⇒ Before starting assembly, repairs or maintenance, as well as during any connection works, please make sure that the mains power supply is disconnected and that terminals and electric wires are devoid of voltage.

⇒ After the regulator is turned off using the keyboard, dangerous voltage can occur on the terminals,

⇒ The regulator cannot be used at variance with its purpose,

⇒ Additional automatics which protect the boiler, central heating (CH) system, and hot utility water system against results of malfunction of the regulator, or errors in its software, should be applied,

⇒ Choose a value of the programmed parameters accordingly to the given type of boiler and fuel, taking into consideration all the operational conditions of the system. Incorrect selection of the parameters can cause malfunction of the boiler (e.g. overheating of the boiler, the flame going back to the fuel feeder, etc.),

⇒ The regulator is intended for boiler manufacturers. Before applying the regulator, a boiler manufacturer should check if the regulator's mating with the given boiler type is proper, and whether it can cause danger,

⇒ The regulator is not an intrinsically safe device, which means that in the case of malfunction it can be a source of a spark or high temperature, which in the presence of flammable dusts or liquids can cause fire or explosion. Thus, the regulator should be separated from flammable dusts and gases, e.g. by means of an appropriate body,

⇒ The regulator must be installed by a boiler manufacturer in accordance with the applicable safety standards,

⇒ The programmed parameters should only be altered by a person familiarized with this manual,

⇒ The device should only be used in heating systems in accordance with the applicable regulations,

⇒ The electric system in which the regulator operates must be protected by means of a fuse, selected appropriately to the applied loads,

⇒ The regulator cannot be used if its casing is damaged,

⇒ In no circumstances can the design of the regulator be modified,

⇒ Electronic isolation of the connected devices is applied in this regulator (action type Y2 acc. to PN-EN 60730-1).

⇒ The regulator consists of two subassemblies. In the case of replacing one subassembly, make sure to maintain compatibility with the other one. More information on that issue can be found in the documentation intended for fitters.

⇒ Keep the regulator out of reach of children.

2 General information

The ecoMAX 800R1 boiler regulator, model R1, version M, is a modern electronic device purposed for controlling operation of coal-fired boiler with a feeding screw. The regulator is a multipurpose device:

– it automatically maintains a preset boiler temperature by controlling the fuel combustion process,
– it controls timing of feeding screw and fan,
– it automatically stabilizes a preset temperature of the domestic hot utility water tank,
– it automatically maintains a preset temperature of one heating mixer cycle, and after equipping the regulator with an extension module, it controls (altogether) the operation of three heating mixer cycles,

The preset temperature of heating cycles and boiler can be set on the basis of a weather sensor readouts.

The regulator features an individual fuzzy logic function. It allows to optimize the combustion process which supports natural environment preservation, decreases fuel consumption and relieves the user of the necessity of adjusting burner parameters.

Possibility of cooperation with room thermostats, separate for each heating cycles, facilitates maintaining comfortable temperature in heated rooms. Moreover, if needed, the device enables a spare boiler (gas- or oil-fired).

The device has a modular construction, consisting of control panel, main executive module, and, optionally, a control module for two additional mixer cycles.

The device is operated in an easy and intuitive way.

The regulator can cooperate with an additional control panel situated in living quarters. It can be used in a household and similar facilities, as well as in light industrialized facilities.

3 Information about documentation

The regulator manual is a supplement for the boiler documentation. In particular, apart from this manual, the boiler documentation should also be observed. The regulator manual is divided into two parts: for user and fitter. Yet, both parts contain important information, significant for safety issues, hence the user should read both parts of the manual.

We are not responsible for any damages caused by failure to observe these instructions.

4 Storage of the documentation

This assembly and operation manual, as well as any other applicable documentation, should be stored diligently, so that it is available at any time. In case of removal or sale of the device, the attached documentation should be handed over to the new user/owner.

5 Applied symbols

The following graphic symbols are used in this manual:

- useful information and tips,

- important information; failure to observe these can cause damage of property, threat for health and life of humans and household animals.

Caution: these symbols indicate important information, in order to make the manual more lucid. Yet, this does not exempt the user from the obligation to comply with requirements which are not marked with a graphic symbol!

6 WEEE 2002/96/EG Directive
Act on electrical and electronic equipment

⇒ Recycle the product and packaging at the end of the operational use period in an appropriate manner.
⇒ Do not dispose of the product together with normal waste,
⇒ Do not burn the product.

ecoMAX 800, model R1

7 Operating the regulator

This section briefly describes how the regulator should be operated. In order to start using a boiler with the regulator, you must fire the boiler up using the IGNITION regulator mode, and then switch the regulator into the OPERATION mode.

7.1 Description of buttons

Fig. 1 Control panel view

Legend
1. MENU button
2. "TOUCH and PLAY" knob
3. EXIT button

Turning the "TOUCH and PLAY" knob increases or decreases the edited parameter. This is an element of quick operation of the regulator. Pushing this knob enables to enter the selected parameter, or to confirm the selected value.

7.2 Description of display main window
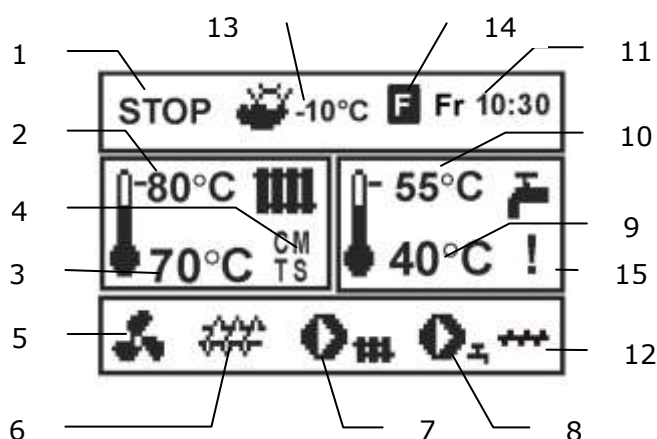
Fig. 2 Display main window

Legend
1. regulator operation modes: STOP, IGNITION, OPERATION, CONTROL,
2. preset boiler temperature,
3. measured boiler temperature,

4. field of values which influence the preset boiler temperature: "**T**" – symbol indicating a decrease of the preset boiler temperature due to disconnection of the room thermostat contacts; "**S**" - symbol indicating a decrease of the preset boiler temperature due to active time intervals; "**W**" – symbol indicating an increase of the preset boiler temperature for the time of filling the hot utility water (HUW) tank; "**M**" - symbol indicating an increase of the preset boiler temperature due to a mixer cycle; "**P**" - weather control for the boiler cycle enabled.
5. airflow operation symbol,
6. fuel feeder operation symbol,
7. central heating pump operation symbol,
8. HUW hot utility water pump operation symbol,
9. measured temperature of HUW hot utility water tank,
10. preset temperature of HUW hot utility water tank,
11. clock and day of the week
12. ash disposal operation symbol,
13. outdoor (weather) temperature,
14. active fuzzy logic control symbol,
15. warning symbol of active hot utility water tank disinfection[1].

The hot utility water window on the main screen can be changed into a selected mixer cycle with the use of TOUCH and PLAY knob.
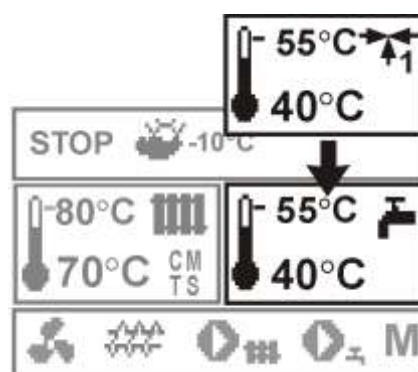
Fig. 3 Auxiliary window, note: the windows for mixers 2 and 3 appear only if the additional mixer module MX.01 is connected.

The hot utility water window on the main screen can be also changed into a fuel level view by turning the THOUCH and PLAY knob,

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[1] Symbol is displayed not only during the operation of HUW disinfection function, but it also appears in the moment of activation of HUW disinfection function.

provided that the fuel level parameter is set properly, details in pt. 7.24. Note: fuel level can be visible in ecoSTER200 room panel.
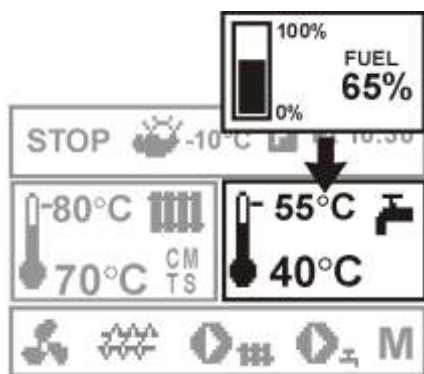
Fig. 4 Auxiliary window with fuel level view

7.3   Start-up of the regulator

The regulator is switched on by pressing the "TOUCH and PLAY" knob. First, the information window including software versions appears, then the regulator switches to the STOP operation mode.

7.4   Presetting boiler temperature

Specify the preset boiler temperature by entering:

MENU -> Preset CH temp. (Temperatura zadana kotła)

and setting this parameter to the desired value.

The preset boiler temperature can be also set from the main window level. Press the "TOUCH and PLAY" knob in the main window and turn it to specify the preset boiler temperature – the temperature "flashes". Confirm settings by pressing the "TOUCH and PLAY" knob again. In order to exit the temperature edition mode, press the EXIT button.

☞ Pressing EXIT when the parameter - e.g. the preset boiler temperature - "flashes", makes the regulator discard the specified value. In order to make the regulator store the preset value, confirm it by pressing the "TOUCH and PLAY" knob.

The regulator skips the preset boiler temperature parameter if the preset boiler

temperature is determined in relation to the weather. The preset boiler temperature is temporarily increased in order to fill the hot utility water tank and mixer heating cycles.

7.5   STOP

After activation, the regulator is in the STOP mode. The STOP mode can be also enabled by selecting the STOP operation mode in the main window and pressing the "TOUCH and PLA" knob.
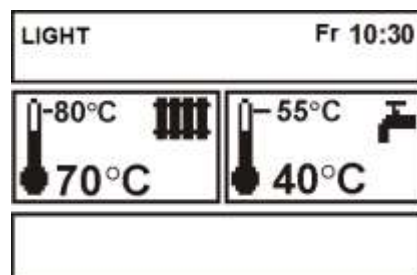
Fig. 5 View of the main window in STOP mode

In this mode, the following executive devices are disabled: blower, feeder, CH and HUW pump. The mixer (pump and servo) remains active.

⚠ In the STOP mode, the CH pump is turned off, what can increase the boiler temperature.

7.6   IGNITION

Enter the IGNITION mode by selecting the IGNITION operation mode and pressing the "TOUCH and PLAY" button.
The IGNITION mode is used to fire up the furnace in the boiler. In this mode, the user can manually control the airflow and the fuel feeder. The boiler should be fired up in strict accordance with boiler manufacturer's recommendations.
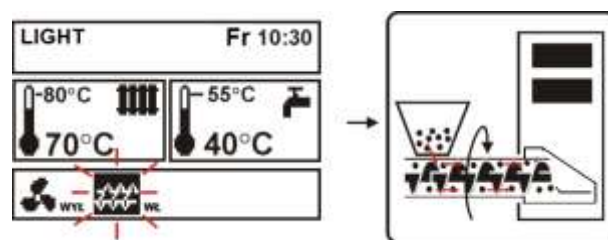
Fig. 6 Manual start-up of the feeder

Pressing the "TOUCH and PLAY" knob on the feeder symbol activates it, what is indicated

by ON (WŁ) sign located next to this symbol. Feed the fuel until it appears at the end of the furnace.

Press the "TOUCH and PLAY" knob again in order to turn the feeder off. Next, put some kindling (e.g. for barbecue) under the layer of fuel and light it up.
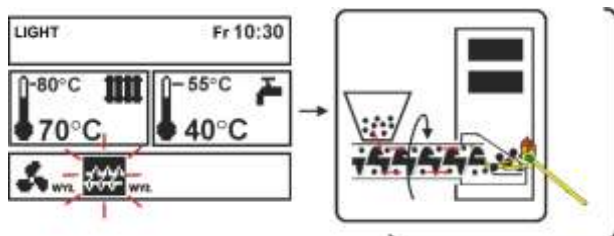
Fig. 7 Disabling the feeder during ignition

Pressing the "TOUCH and PLAY" knob on the airflow symbol activates it, what is indicated by ON (WŁ) sign next to this symbol. Press the "TOUCH and PLAY" knob again to turn the airflow off. Light the fed fuel up and, once in a while, feed another dose of the fuel.
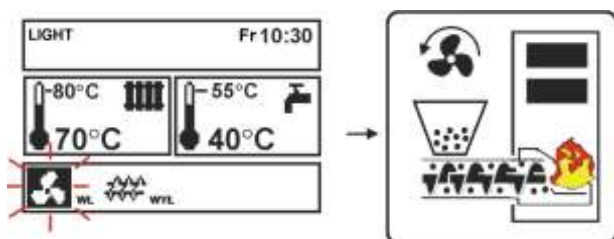
Fig. 8 Manual activation of airflow

the airflow can be set by pressing the MENU button and setting the *airflow power* parameter

After making sure that the fire in the furnace is lit up properly, disable the fan and the feeder, and exit the IGNITION mode by pressing the EXIT button. At this moment the regulator will switch to the OPERATION mode by default. The OPERATION sign will appear in the upper left corner. At that time, the regulator works in automatic cycle.

Shall the user forget to switch the regulator into the OPERATION mode, the regulator will continue to heat the boiler until reaching the preset boiler temperature of + 5°C. Then, it will automatically switch into the OPERATION mode, and, as a result, into the CONTROL mode, on account of the fact that the preset boiler temperature has been reached.

If the boiler temperature is higher than the preset boiler temperature of + 5°C, the IGNITION mode cannot be enabled. In order to enable the function, increase the preset boiler temperature or wait until the boiler cools down.

7.7   OPERATION – STANDARD mode

The regulator provides two modes of boiler furnace control: manual setting – Standard mode, described in this section of the manual, and automatic setting – Fuzzy Logic[2]. In order to enable the Standard regulation mode, enter: MENU -> Adjustment mode (Tryb Regulacji), and place the cursor on Standard (Standardowy).
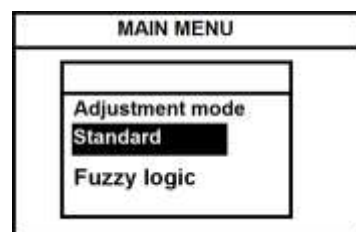
Fig. 9 Selecting the adjustment mode

In *Standard* regulation mode, the regulator operates in automatic cycle with user-defined settings. Display view;
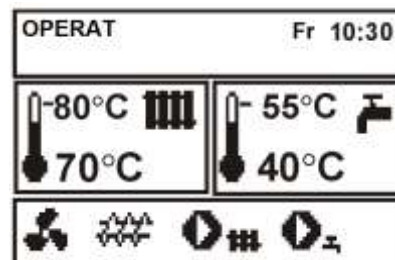
Fig. 10 View of the main window in the OPERATION mode

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[2] The Fuzzy Logic mode requires activation, pt. 19.1

The regulator can be switched into the OPERATION mode while skipping the IGNITION mode. To do so, select the OPERATION mode in the main window and push the "TOUCH and PLAY" knob.

After switching to the OPERATION mode, the airflow activates 5s before the feeder and it works constantly as presented in Fig. 11. The fuel feeder is enabled cyclically. One cycle consists of the feeder operation time (*czas podawania praca*) and the interval between feeding actions (*przerwa podawania praca*). These times should be set in accordance with the boiler manufacturer's recommendations.

In order to ensure proper operation of the boiler, set these parameters, as well as the *airflow power* according to the type and quality of fuel.
Feeder operation time, feeding interval and *airflow power* can be set in*:*

MENU -> *FEED. OPER. TIME (CZAS PODAW. PRAC)*

MENU -> *FEED. OPER. INTERV. (PRZER. PODAW. PRAC)*

MENU -> *AIRFLOW POWER (MOC NADMUCHU)*
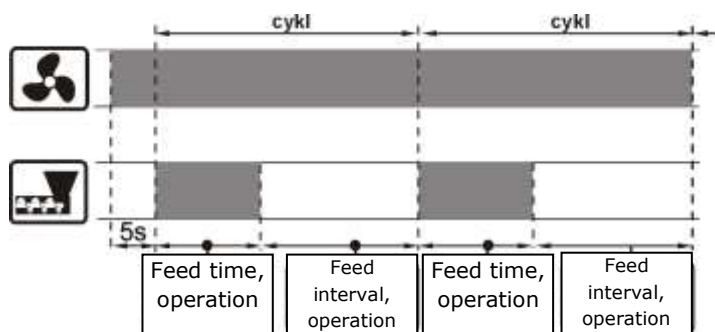
Fig. 11 Airflow and feeder operation cycles in the OPERATION mode

☞ Sequence between *feed operation time* and *feed operation interval* can be changed; details in pt. 11.23.

⚠ DEFAULT SETTINGS DO NOT ALWAYS MATCH THE PARTICULAR BOILER TYPE, THUS THEY MUST BE ADJUSTED TO THE PARTICULAR TYPE OF BOILER AND FUEL

⚠ The *feed OPERATION time* and *feed OPERATION interval* should be selected in such way that the ignited fuel would not recede to the fuel feeder and not lower down what could cause the feeding screw to burn.

If there is a necessity of loading the HUW tank in the OPERATION mode, the regulator will increase the preset boiler temperature, load the HUW tank and switch back to previous settings.

After reaching the preset boiler temperature, the regulator automatically switches into the CONTROL mode.

7.8 OPERATION – Fuzzy logic mode

After switching the boiler regulation mode from Standard to Fuzzy Logic, the regulator works in the OPERATION mode without the need of programming the following parameters: *feed OPERATION time, feed OPERATION interval, airflow power*. The regulator selects the parameters in order to optimize the combustion process.

In order to enable the Fuzzy logic regulation mode, enter: MENU -> REGULATION MODE (TRYB REGULACJI), and place the cursor over "Fuzzy logic".
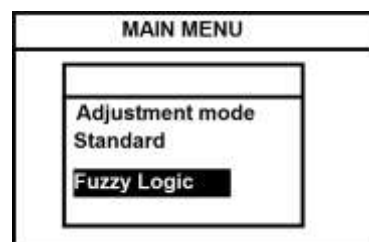
Fig. 12 Selecting the regulation mode

Please note that the fuzzy logic program is selected individually for particular type of the boiler and fuel and it can work properly only with this boiler and fuel. Therefore the fuzzy logic mode requires activation performed by the manufacturer of the boiler according to pt. 19.1. If the mode is not activated, the "function not available" (funkcja niedostępna) message will be displayed during switching from STANDARD to fuzzy logic mode.

Fuzzy logic additional regulation

In some cases, depending on a fuel type, there may be a necessity of performing additional airflow regulation in fuzzy logic mode. MANU -> *FL airflow correction (Korekta nadmuchu FL)*. Range of settings is limited in order to allow it to be performed only to a small extent. **It is not recommended to change the *FL airflow correction* parameter if combustion is correct, which means that there are no uncombusted fuel particles and the furnace is not moving back into the retort.** If the fuel is of poor quality and uncombusted particles occur, the amount of supplied air can be increased. If the fuel is considerably dry and therefore its combustion rate is high, and the furnace is burning too fast, the *FL airflow correction* can be changed. Range of settings: 85% - 120%. Default setting made by the regulator manufacturer: 100%.

Note: uncombusted fuel particles or lowered furnace can be also a result of improper operation of the boiler in CONTROL mode. Therefore it is recommended to adjust the CONTROL parameters according to pt. 7.9 prior to the additional regulation of fuzzy logic.

> Activation of fuzzy logic mode does not make regulation of CONTROL parameters unnecessary – feeding screw burning hazard.

> Type of the boiler and fuel to which the regulator is set is specified in the fuel selection menu: MENU -> fuel selection (wybór paliwa)

> During the fuzzy logic regulation, the fan aperture should be maximally opened and the boiler should be clean. In case of necessity of changing the fan or feeder, replace them with identical types.

> It is recommended to ignite the boiler with the use of IGNITION mode and wait until a combustion process is stable before switching into the fuzzy logic control mode.

7.9 CONTROL

The CONTROL mode can be active during regulation with both manual and automatic (Fuzzy Logic) settings.

The regulator switches into the CONTROL mode automatically, without the user's interference:

- in *Standard* regulation mode – after reaching the preset boiler temperature,

- in *Fuzzy logic* regulation mode – after exceeding the preset boiler temperature of + 5°C. In the Fuzzy logic mode, the regulator tries not to switch into CONTROL and to supply as much heat as the CH system requires at the time.

In the CONTROL mode, the regulator supervises the furnace, so that it would not go out. For this purpose, the airflow and the feeder are activated only once in a while, less frequently than in the OPERATION mode. There is no further temperature increase.

The airflow does not work continuously, it is enabled cyclically together with the fuel feeder which prevents the flame from going out during the boiler standstill.
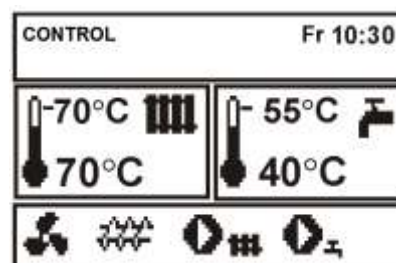
Fig. 13 Main window view in the CONTROL mode
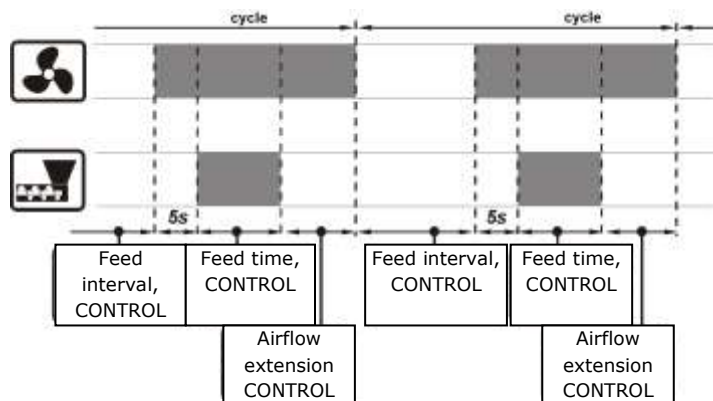
Fig. 14 Fan and feeder operation cycles in the CONTROL mode

The interval between operations of airflow and feeder is determined by *feed interval contr. (przerwa podawania nadzór)* parameter which is available in:

MENU -> FEED INTERVAL CONTR (PRZER.PODAW. NADZÓR)

This time should be set in accordance with the boiler manufacturer's recommendations. The time should be selected in such a way as not to make the furnace fall in during the boiler standstills, yet setting an insufficient time will lead to an increase of the boiler temperature. The feeder and airflow operation time in the CONTROL mode is set using the feed time CONTR parameter which is available in:
MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> PASSWORD (HASŁO) -> BOILER SETTINGS (USTAWIENIA KOTŁA) -> feed time control (czas podawania nadzór)
The *airflow operation extension* time, in order to fire up the fuel after is has been fed is set in:

MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> PASSWORD (HASŁO) -> BOILER SETTINGS (USTAWIENIA KOTŁA) -> Feed extension control (Wydłużenie podawania nadzór)

⚠ Set the *feed interval contr*, *feed time contr* and *feed extension contr* parameters in such a way as to allow the boiler temperature to drop gradually in this mode. Wrong settings can make the boiler overheat.

In the CONTROL mode, the airflow works with identical power as in the OPERATION mode which is equal to the *airflow power* parameter.

The regulator returns into the OPERATION mode automatically after the boiler temperature drops by *boiler hysteresis* value in relation to the preset temperature.
Recommended CONTROL mode settings:
- *feed interval control (przerwa podawania nadzór) = 15min.*
- *feed time control (czas podawania nadzór) = 12s.*
- *feed extension control (wydłużenie nadmuchu nadzór) = 1s.*

7.10 Fuel selection

The fuel selection menu is intended only for the FUZZY LOGIC regulation mode. Choose the appropriate type of fuel, accordingly to the fuel used in the boiler.
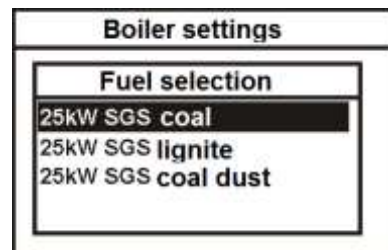
Fig. 15 Fuel selection

In the STANDARD regulation mode, select the values of the burner parameters.

7.11 HUW hot utility water settings

The device regulates the temperature of hot utility water tank, provided that HUW temperature sensor is connected. If the sensor is disconnected, an appropriate notification is displayed in the main window. Using the *HUW pump mode* parameter, the user can:

- disable tank loading, ***OFF (wyłączony)*** parameter,
- set HUW priority with the use of ***priority (priorytet)*** parameter - in this case, the CH pump is off and the mixer is closed in order to fill the HUW tank faster,
- enable simultaneous operation of the CH and HUW pump with the use of ***no priority (bez priorytetu)*** parameter

7.12 Presetting the HUW hot utility water temperature

The HUW temperature can be preset by entering:

MENU -> HUW Preset Temperature (Temperat. Zadana CWU)

and by setting this parameter to a desired value.

The preset hot utility water temperature can be also set from the main window level. Press the "TOUCH and PLAY" knob in the main window. The preset boiler temperature flashes; press the knob again to make the HUW temperature flash and to enable to set it.

Turn the "TOUCH and PLAY" knob in order to preset the hot utility water temperature. Confirm the settings by pressing the "TOUCH and PLAY" knob. In order to exit the temperature edition mode, press the EXIT button.

7.13 Enabling the SUMMER function

In order to enable the SUMMER function which allows to fill the hot utility water tank in the summer without the need of warming the central heating system and mixer cycles, set the *HUW pump mode* parameter to *summer (lato)*.

MENU -> HUW pump operation mode (Tryb pracy pompy CWU) -> *Summer (Lato)*

☞ The SUMMER function cannot be enabled if the hot utility water sensor is disconnected.

⚠ Do not enable the summer function if the HUW pump is disconnected or damaged

The SUMMER function can be enabled automatically with the use of the following parameters: *Auto summer mode (Auto tryb lato)*, *SUMMER activation temperature (temperatura włączenia LATO)* and *SUMMER deactivation temperature (temperatura wyłączania LATO)*
MENU -> HUW SETTINGS (USTAWIENIA CWU)

7.14 HUW tank disinfection

The regulator is equipped with a function of automatic, periodical heating of the HUW water tank to a temperature of 70°C. The purpose of this is to eradicate bacterial flora from the HUW tank.

⚠ The household members must be notified about the fact of enabling the disinfection function, as it carries the risk of scalding with hot utility water.

Once per week, on Sunday at 02:00 a.m., the regulator increases the HUW tank temperature. After 10 minutes of keeping the tank at this temperature, the HUW pump is turned off and the boiler resumes normal operation. The disinfection function should not be activated if the HUW handling is disabled.

7.15 Mixer cycle settings

Mixer settings can be found in:
MENU -> MIXER SETTINGS 1 (USTAWIENIA MIESZACZA 1)

Miser settings without a weather sensor
The desired water temperature in the mixer heating cycle should be set manually with the use of *mixer preset temperature (temperature zadana mieszacza)* parameter, e.g. to 50°C. The value should provide desired room temperature.

After connecting the room thermostat, set the *preset mixer temperature decrease from thermostat (obniżenie temp. zadanej mieszacza od termostatu)* parameter, e.g. to 5°C. Value should be selected empirically. The room thermostat can be in a form of a traditional thermostat (no/nc) or the ecoSTER200 room panel. When the thermostat starts its operation, the mixer cycle preset temperature is decreased, what will restrain temperature increase in heated room, provided that the value is selected properly.

Mixer settings with a weather sensor (without the ecoSTER200 room panel)

Set the *weather control (sterowanie pogodowe)* parameter to *on (włączony)*.

Set the preset room temperature with the use of *heating curve parallel offset (przesunięcie równoległe krzywej grzewczej)* parameter and basing on the following formula:
Preset room temperature = 20°C + heating curve parallel offset. Example.
In order to achieve the room temperature of 25°C, the value of *heating curve parallel offset (przesunięcie równoległe krzywej grzewczej)* parameter must be set to 5°C. In order to achieve the room temperature of 18°C, the value of *heating curve parallel offset (przesunięcie równoległe krzywej grzewczej)* parameter must be set to -2°C.

16

Select the heating curve according to pt. 7.16

In this configuration, the room thermostat can be connected which will decrease inaccuracy of heating curve selection, in case when the value of heating curve is too high. Then, the *preset mixer temperature decrease from thermostat (obniżenie temp. zadanej mieszacza od termostatu)* should be set, e.g. to 2°C. After opening thermostat contacts, the preset mixer cycle temperature is decreased, which causes restriction of temperature increase in the heated room, provided that reduction values are selected properly.

Mixer settings with a weather sensor and the ecoSTER200 room panel

Set the *weather control (sterowanie pogodowe)* parameter to *on (włączony).*

Select the heating curve according to pt. 7.16

The ecoSTER200 regulator automatically shifts the heating curve according to the preset room temperature. The regulator relates the setting to 20°C, e.g. for preset room temperature = 22°C, the regulator will shift the heating curve by 2°C, for preset room temperature = 18°C, the regulator will shift the heating curve by -2°C. In some cases described in pt. 7.16 there may be a necessity for making additional regulation of the heating curve offset.

In this configuration, the ecoSTER200 thermostat can:
- decrease the heating cycle temperature by constant value when the preset room temperature is reached. Similarly as in previous point (not recommended), or
- correct the heating cycle temperature automatically and constantly.
It is not recommended to make use of both possibilities.

Automatic correction of room temperature is made according to the following formula:

Correction = [(Preset room temperature – measured room temperature] x *room temperature index* /10

Example.
Preset temperature in heated room (set in ecoSTER200) = 22°C. Measured room temperature (by ecoSTER200) = 20°C. Room temperature index = 15.
Preset mixer temperature will be increased by [(22°C - 20°C)]x15/10 = 3°C.
Appropriate *room temperature index* parameter should be found. Range: 0...50. The higher the index value, the higher the boiler preset temperature correction. The preset mixer temperature is not corrected when the value is set to "0". Note: setting too high *room temperature index* can cause cyclical room temperature fluctuations!

7.16 Weather control
Weather control can be enabled both for the boiler cycle and for the mixer cycle. After selecting appropriate heating curve, the preset temperature of boiler or mixer is calculated automatically, depending on the outdoor temperature. If the heating curve is appropriate for the particular building, this allows to maintain a constant inside temperature, regardless of the outside temperature. Therefore, it is crucial to select a proper heating curve.

Note: during searching for heating curve, exclude the influence of room thermostat on operation of the regulator (regardless whether the room thermostat is connected or not), by setting the following parameter:
- For mixer cycle: MENU -> Mixer settings (Ustawienia mieszacza) -> Room thermostat (Termostat pokojowy) -> *decrease from room thermostat (obniżenie od termostatu pokojowego)* = 0.
- For boiler cycle: MENU -> Service settings (Ustawienia serwisowe) -> Boiler settings (Ustawienia kotła) -> Room thermostat (Termostat pokojowy) -> decrease from room thermostat *(obniżenie od termostatu pokojowego)* = 0
In case when the ecoSTER200 room panel is connected, the *room temperature index = 0* parameter should be additionally set.

Guidelines for setting proper heating curve:
- floor heating   0,2 – 0,6
- radiator heating   1,0 – 1,6
- boiler   1,8 – 4
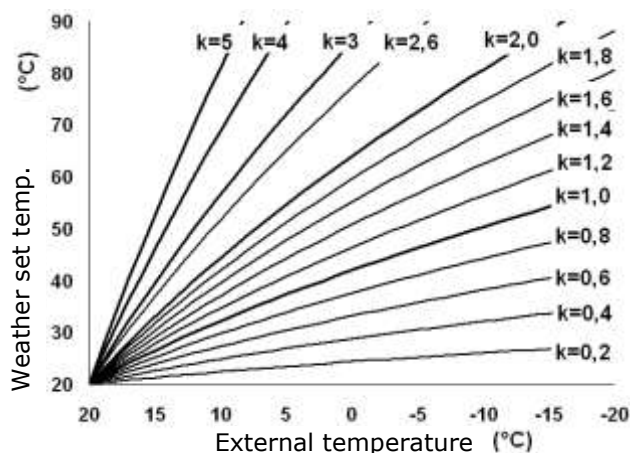
Fig. 16 Heating curves

Tips for selecting appropriate heating curve:
- if the inside temperature rises while the outside temperature drops, the selected heating curve is too high,
- if the inside temperature drops while the outside temperature drops as well, the selected heating curve is too low,
- if the room temperature during frosts is appropriate and too low during warmer weather, it is recommended to increase the *parallel offset of heating curve* and lower the heating curve,
- if the room temperature during frosts is too low and too high during warmer weather, it is recommended to decrease the *parallel offset of heating curve* and raise the heating curve,

Poorly insulated buildings require higher heating curves. Whereas for well-insulated buildings, the heating curve will be lower.

The regulator can increase or decrease the preset temperature calculated if it goes beyond the temperature range for particular cycle.

7.17 Description of settings of night-time decreases

Time periods can be set in the regulator for: boiler, heating cycles and hot utility water tank.

Time periods enable to lower the temperature preset in particular time period, e.g. at night or when users leave the heated rooms, e.g. when they go to work. This allows to decrease the temperature automatically, which improves thermal comfort and lowers fuel consumption.

In order to activate time periods, set the *Night decrease (Obniżenie nocne)* parameter to on in:

MENU -> Night decrease (Obniżenia nocne)
The night-time decreases can be specified for weekdays, Saturday and Sunday.
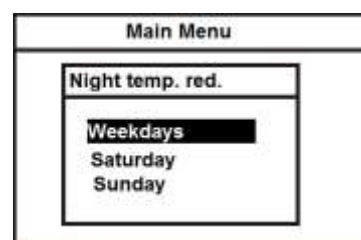
Fig. 17 Time periods selection window

Choose the beginning and the end of the particular time period, as well as the decrease of the preset temperature for the particular period. Three periods are available during 24 hours.
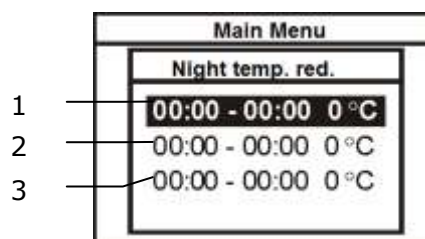
Legend:
1. First time period,
2. Second time period,
3. Third time period,

Below, there is an example of how to specify time periods. The following example assumes night-time decrease in the preset boiler temperature lasting from 22:00 till 06:00 (sleeping time), as well as another decrease between 09:00 and 15:00 (when household

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members leave the heated rooms – in order to go to work and to school).

☞ Start defining the time periods from 00:00 (midnight).

Main Menu

Night temp. red.

00:00 - 06:00	-3 °C
09:00 - 15:00	-5 °C
22:00 - 23:59	-3 °C
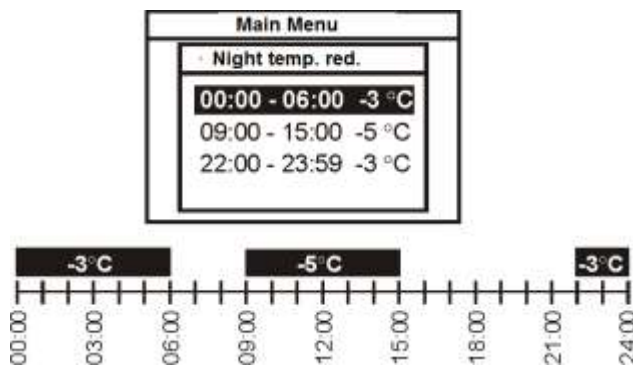
Fir. 18 Example of defining time periods

In the example above, the regulator will decrease the preset boiler temperature by 3°C between 00:00 and 06:00. Between 06:00 and 09:00, the regulator will keep the preset boiler temperature unchanged. Between 09:00 and 15:00, the regulator will lower the preset boiler temperature by 5°C. Between 15:00 and 22:00, the regulator will keep the preset boiler temperature unchanged. Between 22:00 and 23:59, the regulator will lower the preset boiler temperature by 3°C.

☞ The time period is skipped if its decrease value is "0", even if hour range are specified.

☞ Decrease of the preset boiler temperature on account of time period is signaled by letter „S" displayed in the main window.

60°C
58°C S ————— "S"

Fig. 19 Signaling time periods

☞ Decrease of the preset boiler temperature on account of time period is inactive during filling of the HUW tank (when the HUW pump is active).

7.18 Circulation pump control

Note: in standard regulator, the functionality is available instead of mixer handling. Functionality is also available after connecting additional MX.01 extending module; possibility of handling the mixing valve is maintained.

Settings are localized in:

Menu → Night decrease (Obniżenie nocne) → Circulation pump (Pompa cyrkul.)

and

Menu → Service settings (Ustawienia serwisowe) → Password (Hasło) → CH and HUW settings (Ustawiania CO i CWU)

Circulation pump time control settings are similar to night decrease settings. In defined time periods, the circulation pump is disabled. In skipped periods, the circulation pump is enabled on *circulation pump operation time (czas pracy pompy cyrkulacji)* by *circulation pump standstill time (czas postoju pompy cyrkulacji).* Detailed settings are included in pt. 10.16, 12.8, 12.9.

7.19 Information

The information menu allows to view temperatures and to check which devices are active at the time. Turn the TOUCH and PLAY knob to switch between information windows.

☞ After connecting the mixer extension module MX.01, two additional windows with information about the extra mixers activate.
The **"CAL" (KAL)** message in the mixer information window, next to the valve opening extent symbol, indicates active calibration. Wait until the mixer valve servo calibration is completed to see the current percentage of its opening.

7.20 Disabling feeder

Some retort boilers are adapted for combusting other types of fuel, e.g. wood rejects, etc. Burning thereof requires the feeder to be disabled. The user can disable the feeder via the regulator; in order to do so, set the value of the feeder parameter to

off (wyłączony). The parameter can be found in:

MENU -> FEEDER (PODAJNIK)

After disabling the feeder, the regulator will only control fan and pumps.

⚠️ Disabling the feeder is permitted only if the boiler manufacturer assumed such a solution. Observe the boiler manufacturer's recommendations.

⚠️ This option is not intended for boilers with additional grate, where the air is regulated with a draught regulator or manually by the user. Operation with active fan with additional grate can cause the boiler to overheat.

7.21 Disabling the fan

In case when the boiler is adopted for burning fuel on additional grate, there is an option of disabling the fan. Then the air is supplied via chimney draught. In order to disable the fan, enter MENU -> Fan (Wentylator), and set to "ON" (Wyłączony). Note: disabling the fan results in disabling the feeder.

7.22 Manual control

The regulator provides a possibility of manual activation of an executive device, e.g. a pump, feeder motor or blower. Thanks to this functionality the user can check whether the given device is operative or properly connected. During calibration of mixer servo, the access to the manual control menu is disabled.

MANUAL	
FEEDER	OFF
FAN	OFF
CH pump	OFF
DHW pump	OFF
Contact 30-31	OFF
Ash remover	OFF
Mixer1 open	OFF
Mixer1 closed/Circ	OFF

Fig. 20 Manual control window view, where OFF - device disabled, ON - device enabled,

⚠️ Caution: Enabling a fan, feeder or another device for a long period of time can cause danger.

☞ **Mix1 Close/Circ (Miesz1 Zam/Cyrkul)** position indicates closing mixer servo and in case when the mixer servo is not used (*Mixer handling = disabled* or *only pump*), it indicates that the circulation pump connected to terminals 14-15 is connected.

7.23 Restoring default settings

In order to restore default settings, place the cursor on "YES" option and press the "TOUCH and PLAY" knob.

Main Menu
Restore default user settings?
NO   YES
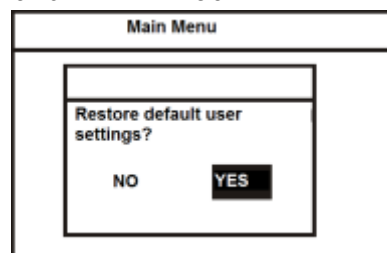
Fig. 21 Default service settings

☞ Only the parameters available in the main menu will be restored to their default settings; the service parameters will remain unaltered.

7.24 Fuel level configuration

Enabling fuel level indicator

In order to enable fuel level displaying function, set the *fuel shortage message display threshold (próg wyświetlania monitu braku paliwa)* parameter to a value higher than zero, e.g. 10%. The parameter can be set in:

MENU → Fuel level (Poziom paliwa) → Alarm level (Poziom alarmowy)

Access the fuel level window by turning the TOUCH and PLAY knob in the main window.

Note: fuel level can be visible in the ecoSTER200 room panel. Room panel is not a part of standard equipment.
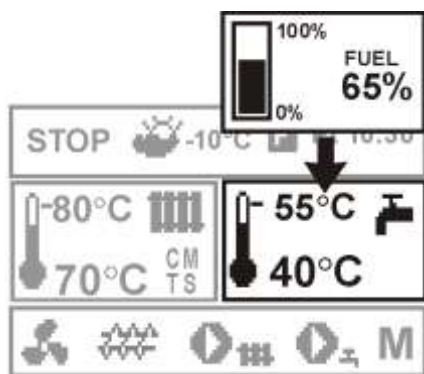
Fig. 22 auxiliary window with a fuel level view

Handling the fuel level indicator

Each time after the fuel tank is filled up to a desired level, press and hold the knob in the main window; a message will appear:
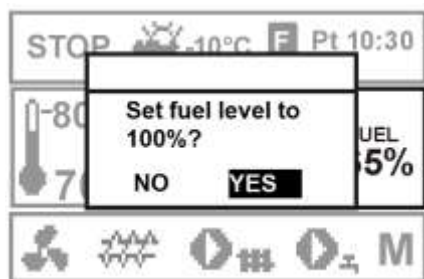
Fig. 23 Fuel level handling

After selecting and confirming "YES", the fuel level will be set to 100%.

Note: Fuel can be added at any moment, which means that there is no need to wait for complete emptying of the fuel tank. Whereas the fuel should be always added to a 100% level and it should be confirmed by holding the knob.

Description of operation

The regulator calculates fuel level according to the current fuel consumption. Default settings not always correspond to the actual fuel consumption of the particular boiler and therefore, this method works properly if the user of the boiler has performed level calibration. No additional fuel level sensors are required.

Calibration

Fill the fuel tank to a level corresponding to a full loading and set the *Level calibration (Kalibracja poziomu)* parameter to 100%. The parameter can be set in:

MENU → Fuel level (Poziom paliwa) → Fuel level calibration (Kalibr. Poziomu paliwa.)

In the main window, the indicator will be set to 100%. When the fuel level indicator flashes, it means that the calibration process is active. This indicator will flash until the minimum fuel level point is selected. Decreasing fuel level in the tank should be controlled up-to-date. When the level decreases to a minimum, set the *Level calibration (Kalibracja poziomu)* parameter to 0%.

> ☞ Calling the "Fuel shortage" alarm according to pt. 15.1, automatically sets 0% point. The fuel level indicator function is not connected with the "Fuel shortage" alarm function. These functions operate independently.

ecoMAX 800, model R1

7.25 Diagram 1
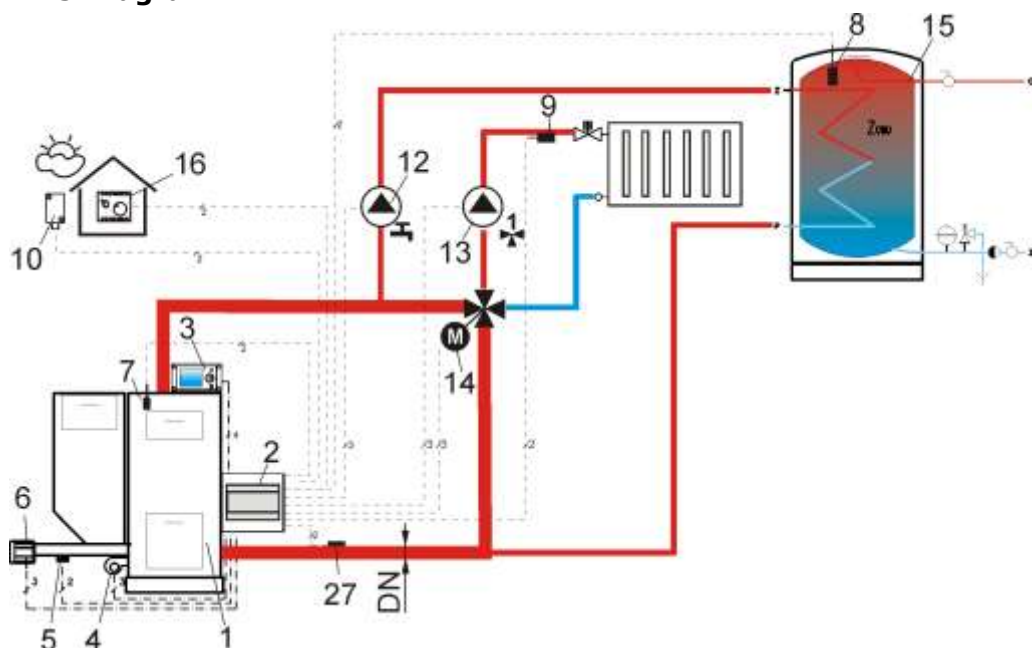
Fig. **24 Diagram with four-way valve controlling the central heating cycle[3]**, where: 1- boiler with feeder, 2 – ecoMAX regulator – executive module, 3 – ecoMAX regulator – control panel, 4 – Fan, 5 – feeder temperature sensor, 6 – gear motor engine, 7 – boiler temperature sensor, 8 – hot utility water temperature sensor, 9 – mixer temperature sensor, 10 – temperature sensor – weather, 12 – hot utility water cycle pump, 13 – mixer cycle pump, 14 – mixer servo, 15 – hot utility water tank, 16 – room thermostat, 27 – return temperature sensor (no influence on combustion process control), 31 – reed relay (piston position sensor).

⚠	**In order to improve water circulation in boiler gravitational cycle (bold cycle on the drawing): use big nominal cross sections of pipe and four-way valve; do not use many elbows and cross-section narrowings; apply other methods concerning development of gravitational installations, such as maintaining inclinations.**
	If the return sensor is pad-monitored, it should be thermally isolated from the surroundings and thermal contact with the pipe should be improved with the use of thermally conductive paste.
	Preset boiler temperature should be set to a level providing heating power for the mixer cycle with subsequent heating of water which returns to the boiler.

SUGGESTED SETTINGS:

Parameter	Setting	MENU
Return protection	4D valve	service settings -> boiler settings
min. return temperature	42°C	service settings -> boiler settings
Return temp. hysteresis	2°C	service settings -> boiler settings
Valve close level	0%	service settings -> boiler settings
Boiler preset temperature increase	5-20°C	service settings -> CH and HUW settings
Min. boiler preset temperature	65°C	service settings -> boiler settings
Handling mixer 1	CH enabled	service settings -> mixer 1 settings
Max. mixer 1 preset temperature	75°	service settings -> mixer 1 settings
Mixer 1 heating curve	0.8 – 1.4	service settings -> mixer 1 settings
Mixer 1 weather control	enabled	menu -> mixer 1 settings

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[3] The presented hydraulic diagram does not replace the central heating system design and is provided solely for demonstration purposes!

Brief description of operation: The HUW pump (12) can start its operation only after the boiler exceeds the *CH pump start temp.* (40°C by default). Mixer pump and servo start operation regardless of the value of *CH pump start temp.* parameter. The mixer servo (14) sets such valve opening at which the temperature at sensor (9) will be equal to the *preset mixer 1 temperature*. When the temperature on sensor (27) drops below the value *Min. return temp.*, the servo (14) closes to the *valve close level* value. When the temperature on sensor (27) increases by *return temp. hysteresis*, the servo switches into stabilization of the *preset mixer 1 temperature*. *Mixer cycle 1 = CH on* setting guarantees that even in the case of the boiler (1) overheating, the mixer (14) will open to its maximum, and the mixer pump (13) will not be disabled at the moment of exceeding the *Max. preset mixer temp.*.Return protection is available only for mixer 1.

7.26 Diagram 2
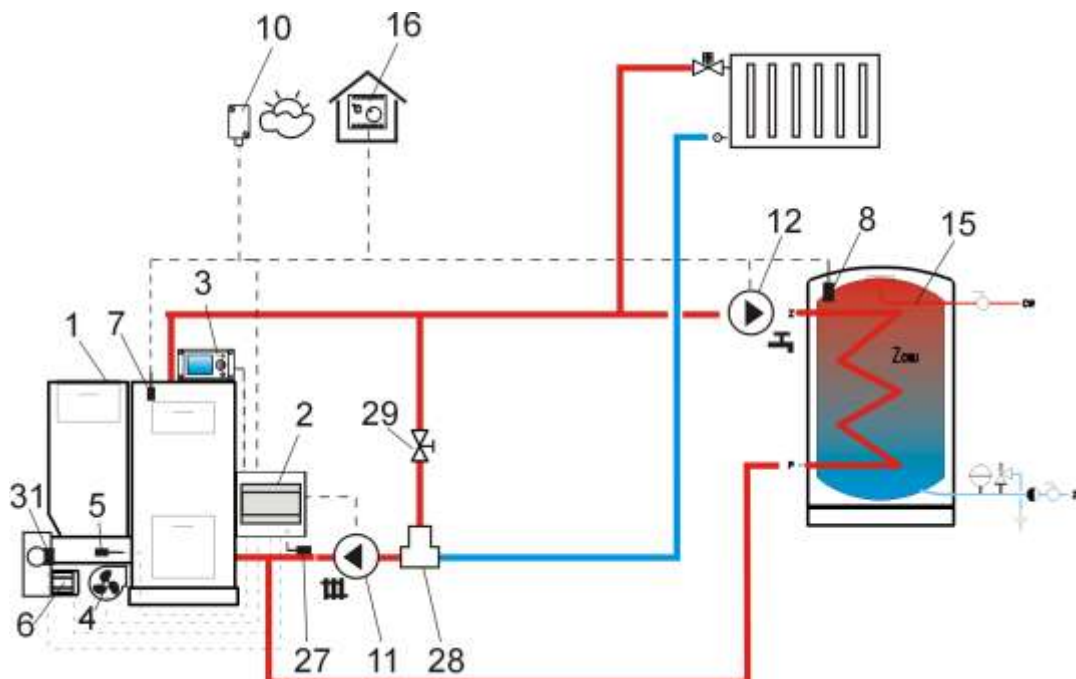
Fig. 25 Diagram with thermostatic three-way valve protecting return water temperature [4], where: 1 – boiler with retort feeder, 2 – ecoMAX regulator – executive module, 3 – ecoMAX regulator – control panel, 4 – Fan, 5 – feeder temperature sensor, 6 – gear motor engine, 7 – boiler temperature sensor, 8 - hot utility water temperature sensor, 9 – mixer temperature sensor, 10 – temperature sensor – weather, 11 – central heating cycle pump, 12 – hot utility water cycle pump, 13 – mixer cycle pump, 15 – hot utility water tank, 16 – room thermostat, 27 – return temperature sensor (no influence on combustion process), 28 – thermostatic three-way valve, 29 – throttle (poppet) valve, 31 – reed relay, feeder piston position sensor.

SUGGESTED SETTINGS:

Parameter	Setting	MENU
Return protection	3D therm. valve	service settings -> boiler settings
Handling mixer 1	disabled	service settings -> mixer 1 settings

Brief description of operation: The CH pump (11) and the HUW pump (12) can start their operation only after the boiler exceeds the *CH pump start temp.* (40°C by default). The thermostatic valve (28) closes when water getting into the boiler is cold. This causes the boiler water to flow in a short cycle: boiler (1) – throttle valve (29) - thermostatic valve (28) – pump (11). The thermostatic valve (28) opens after the temperature of the water returning to the boiler

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[4] The presented hydraulic diagram does not replace the central heating system design and is provided solely for demonstration purposes!

increases, directing the boiler water to the central heating system. When the temperature measured by sensor (8) drops below the preset HUW temperature, the HUW pump (12) is enabled. The HUW pump (12) will be disabled after the HUW tank (15) is filled, i.e. when the temperature on sensor (8) is equal to the preset HUW temperature.

7.27 Diagram 3
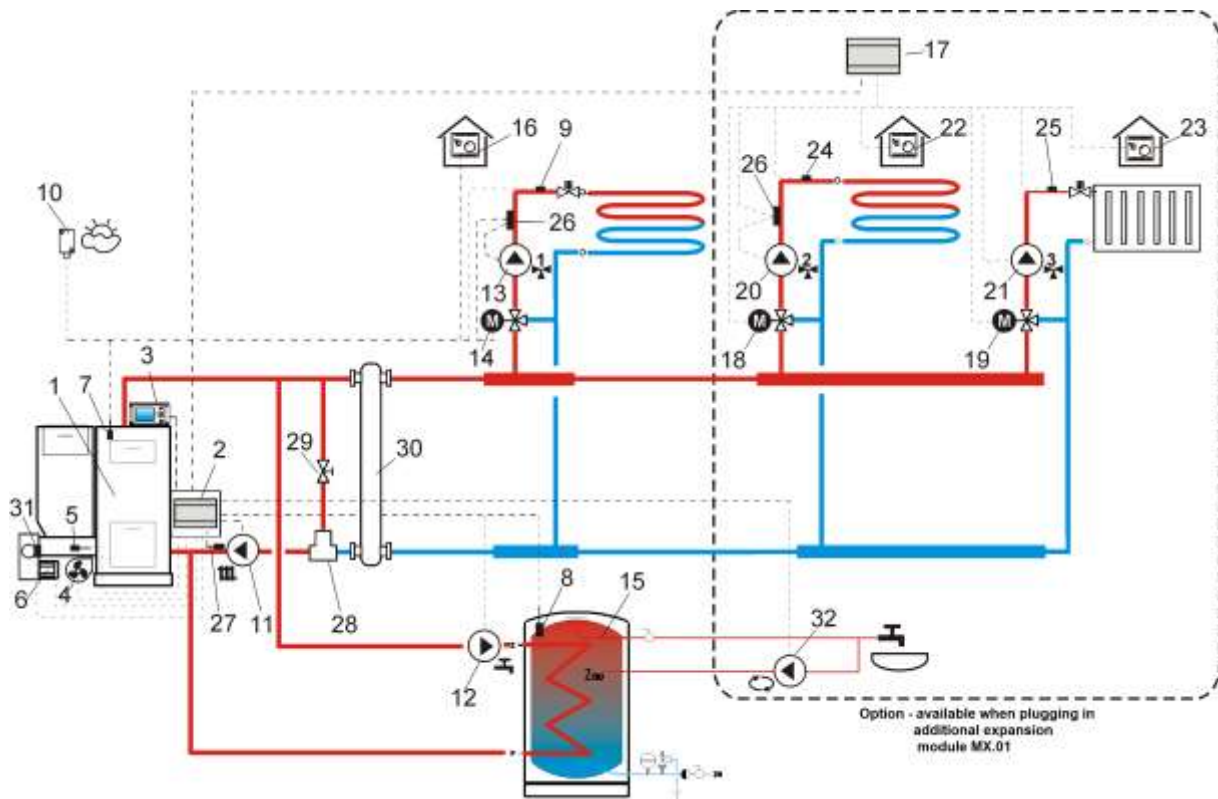
Fig. 26 Diagram with a three-way thermostatic valve protecting temperature of the return water, and a three-way valve feeding floor heating, as well as with two additional mixer cycles after connecting the additional module [5], where 1 – boiler with retort feeder, 2 – ecoMAX regulator – executive module, 3 – ecoMAX regulator – control panel, 4 – Fan, 5 – feeder temperature sensor, 6 – gear motor engine, 7 – boiler temperature sensor, 8 – hot utility water temperature sensor, 9 – mixer temperature sensor, 10 – temperature sensor – weather, 11 – central heating cycle pump, 12 – hot utility water cycle pump, 13 – mixer cycle pump, 14 – mixer servo, 15 – hot utility water tank, 16 – room thermostat, 17 – MX.01 extension module, 18 – mixer 2 servo, 19 – mixer 3 servo, 20 – mixer 2 pump, 21 – mixer 3 pump, 22 - room thermostat of mixer 2, 23 – room thermostat of mixer 3, 24 – temperature sensor – mixer 2, 35 – temperature sensor – mixer 3, 26 – external thermostat protecting floor heating 55 deg. C (cuts off power supply of mixer pump when the maximum temperature is exceeded – the thermostat is not a part of the ecoMAX 800 regulator set), 27 – return temperature sensor (no influence on combustion process), 28 – thermostatic three-way valve (protecting boiler return), 30 – fluid coupling (eliminates necessity of balancing flows of pumps), 31 - reed relay, feeder piston position sensor, 32 – circulation pump.

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[5] The presented hydraulic diagram does not replace the central heating system design and is provided solely for demonstration purposes!

SUGGESTED SETTINGS:

Parameter	Setting	MENU
Return protection	3D therm. valve	service settings -> boiler settings
Handling mixer 1	floor enabled	service settings -> mixer 1 settings
Max. mixer 1 preset temperature	50°C	service settings -> mixer 1 settings
Weather control of mixer 1, 2, 3	enabled	menu - > mixer 1, 2, 3 settings
Mixer 1 heating curve	0.2 – 0.6	service settings -> mixer 1 settings
Handling of mixer 2	floor enabled	service settings -> mixer 2 settings
Max. preset temperature of mixer 2	50°C	service settings -> mixer 2 settings
Heating curve of mixer 2	0.2 – 0.6	service settings -> mixer 2 settings
Handling of mixer 3	CH disabled	service settings -> mixer 3 settings
Max. preset temperature of mixer 3	80°	service settings -> mixer 3 settings
Heating curve of mixer 3	0.8 – 1.4	service settings -> mixer 3 settings
Weather control of the boiler	disabled	service settings -> boiler settings

8 Technical data

Supply	230/400V~; 50Hz;
Current consumed by regulator	I = 0.02 A[6]
Maximum rated current: CH pump HUW pump Fan Ash removal motor Mixer servo Feeder (regulator version 1) Feeder (regulator version 2) Note: Total load (without feeder), maximum 6(6)A.	3(2.6) A 3(2.6) A 3(2.6) A 3(2.6) A 3(2.6) A } together max. 6(6)A 2,5(2.5) A 4(4) A
Regulator protection level	IP20
Ambient temperature	0...50 °C
Storage temperature	0...65°C
Relative humidity	5 - 85% without condensation
Measuring range of CT4 temperature sensors	0...100 °C
Measuring range of CT4-P temperature sensors	-35...40 °C
Accuracy of temperature measurements with CT4 and CT4-P sensors	2°C
Terminals	Screw terminal on the mains voltage side 2.5 mm^2 Screw terminals on the control side 1.5 mm^2
Display	Graphic 128x64
External dimensions	Control panel: 164x90x40 mm Executive module: 140x90x65 mm
Total weight	0.5 kg
Standards	PN-EN 60730-2-9 PN-EN 60730-1
Software class	A
Protection class	To be built into class I devices

Table 1 **Technical data**

The set includes:
- boiler temperature sensor   1 piece
- feeder temperature sensor   1 piece

- HUW temperature sensor   1 piece
- executive module   1 piece
- control panel   1 piece
- connecting cable
- panel lid   1 piece
- panel hole plugs   4 pieces
- B3x8 panel tackbolts   2 pieces
- manual   1 piece
- warranty   1 piece

9 Storage and transportation conditions

The regulator cannot be exposed to direct effects of weather, i.e. rain and sunlight. Storage and transportation temperature cannot exceed the range of –15…65 °C.

During transportation, the device cannot be exposed to vibrations greater than those typical of normal road transport.

10 REGULATOR INSTALLATION

This section is intended for boiler manufacturers and qualified servicemen. Boiler manufacturer and serviceman should also read the other sections of the manual.

> ⚠ ***NOTE!!! Casing must be protected against opening the lid by unauthorized person, with, e.g. padlock. Casing fastener enables to install the padlock.***

10.1 Environmental conditions

The regulator was designed to be used in 2nd degree of contamination according to PN-EN 60730-1.

It is forbidden to use the regulator in explosive gas and dust (e.g. coal dust) atmospheres.

10.2 Installation requirements

The regulator should be installed by the boiler manufacturer, in accordance with the applicable norms and regulations. The regulator is purposed for mounting on a stiff and stable surface. Turn off the regulator supply before starting the installation.

10.3 Casing Conditions

The following space should be provided during installation of the regulator:

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[6] This is the current which is consumed by the regulator itself. The total current consumption depends on devices connected to the regulator.
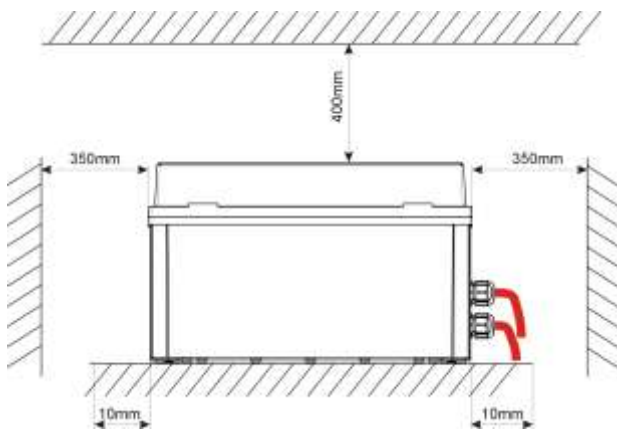
Fig. 27 Casing conditions

Signal cables should be fastened with cable clips after connecting to terminals, in order to separate them from high-voltage elements in case of loosening.
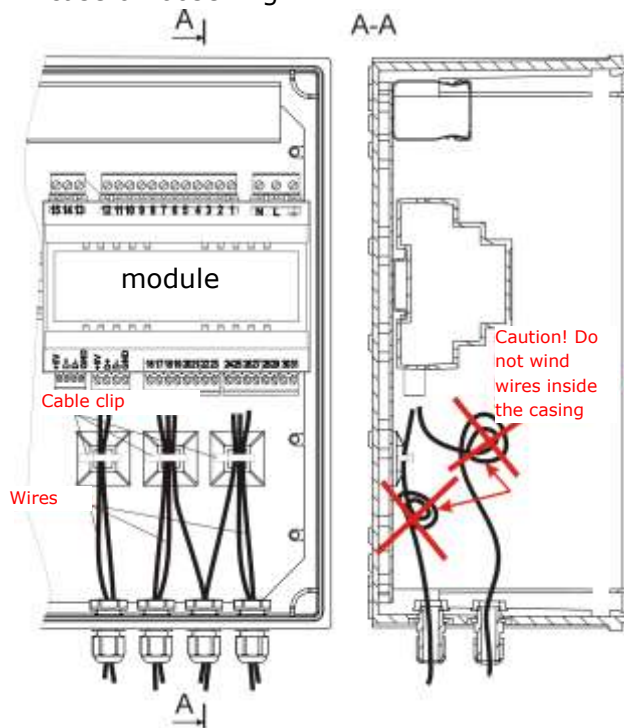
Fig. 28 Connection of signal cables in terminal chamber
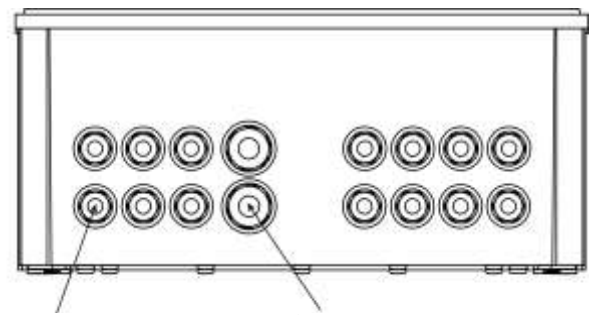
PG09 cable gland - 14 pieces for 4-8 mm diameter cables

PG13,5 cable gland - 2 pieces for 8-12 mm diameter cables

Fig. 29 Allowable range of diameters of cables mounted in cable glands

10.4 Ambient temperature

Ambient temperature during operation of the regulator cannot exceed the range of 0–50°C. It is recommended to perform temperature measurement in a place intended for building the regulator over.

10.5 Protective connections

Connect boiler casing, cables of peripheral devices and other available conductive parts to a zero strip marked with ⊕ symbol, inside the casing.

10.6 Control module disassembly

In case of a necessity of disassembling the control module (3), shift clamps (1) with flat screwdriver (2)
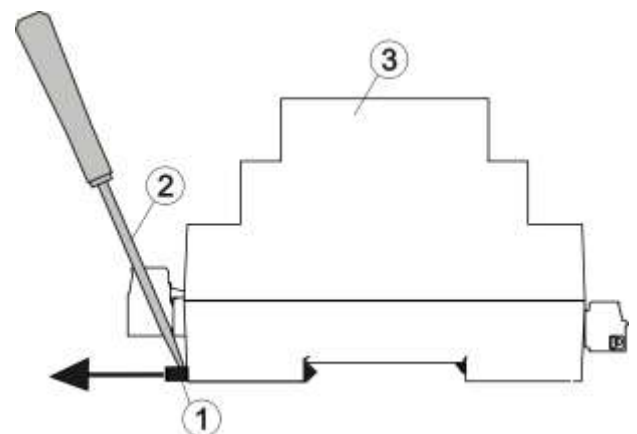
Fig. 30 Casing conditions

10.7 Connecting electrical system

Regulator is designed to be fed with 230V~, 50Hz voltage. The electrical system should be:

- five core (with protective wire),

29

- in accordance with applicable regulations.

⚠️ Caution: After the regulator is turned off using the keyboard, dangerous voltage can occur on terminals. Before starting any assembly works, the operator must disconnect the mains supply and make sure that there is no dangerous voltage on terminals and cables.

Diagram of electrical connections is presented in Fig. 32. Connection wires should not be in contact with surfaces of temperature exceeding the nominal temperature of their operation.

Terminals 1-15 are intended only for connecting devices of 230V~ mains supply.

Terminals 16-31 are intended for cooperation with low voltage devices (below 12 V).

⚠️ Connecting mains supply 230V~ to terminals 16-31 and to RS485

transmission terminals will damage the regulator and creates electric shock hazard.

Tips of the connected wires, especially power cords, must be secured against splitting by means of insulated clamp sleeves, in accordance with the drawing below:
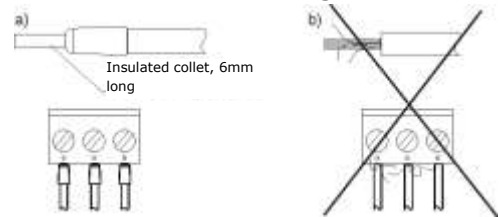
Fig. 31 Securing wire tips: a) correct, b) incorrect

Power cable should be connected to the terminals marked with an arrow.

30
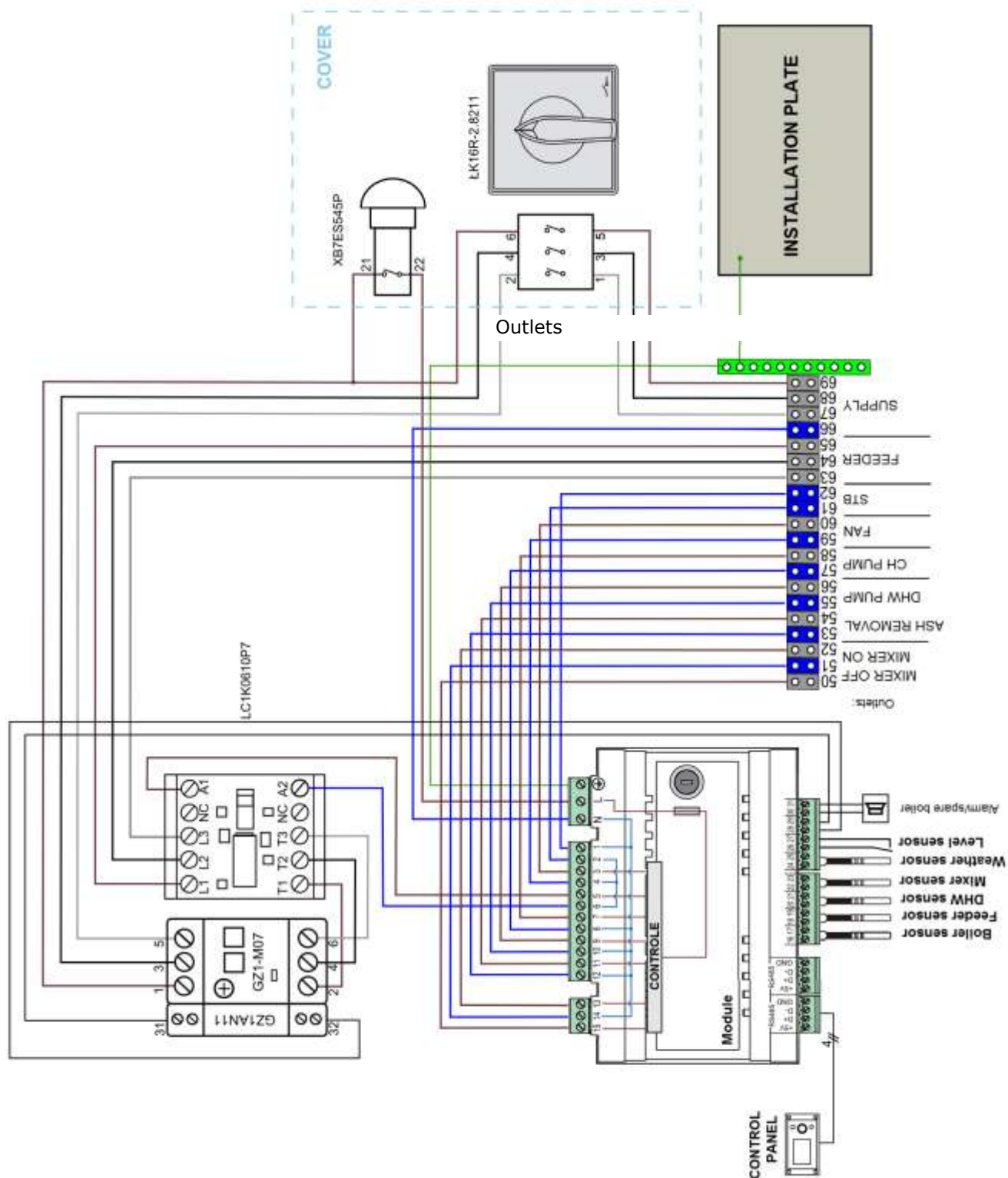
Fig. 32 Diagram of electric connections with external devices

Pokrywa	Lid		Czujnik kotła	Boiler sensor
Wyjścia	Outlets		Czujnik podajnika	Feeder sensor
Zasilanie	Supply		Czujnik CWU	HUW sensor
Odpopielanie	Ash removal		Czujnik mieszacza	Mixer sensor
Pompa CWU	HUW pump		Czujnik pogodowy	Weather sensor
Pompa CO	CH pump		Czujnik poziomu	Level sensor
Wentylator	Fan		Alarm/kocioł rez.	Alarm/spare boiler
STB	STB		Panel sterujący	Control panel
Podajnik	Feeder		Płyta montażowa	Installation plate
Zasilanie	Supply			

10.8 Connecting temperature sensors

The regulator cooperates only with CT4 sensors. It is forbidden to use different sensors.

Sensor wires can be extended with wires with minimum cross section of $0.5mm^2$. Total length of the sensor wires cannot exceed 15 m.

The boiler temperature sensor should be fitted in thermometric pipe located in the boiler jacket. The feeder temperature sensor must be fitted on the surface of the feeder screw pipe. The hot utility water temperature sensor – in the thermometric pipe welded into the tank. It is best to fit the mixer temperature sensor in a tube (sleeve) placed in the stream of water flowing through the pipe, but it is also possible to clip it onto the pipe, covering the sensor and the pipe with thermal insulation.

⚠ Sensors must be secured against coming loose from measured surfaces.

Good thermal contact between the sensors and measured surface must be ensured. For this purpose, use thermally conductive paste. Do not pour oil or water over the sensors.

Sensor cables should be separated from mains cables. Otherwise, temperature indications can be incorrect. Minimum distance between these cables should be at least 10 cm.

Sensor cables cannot be in contact with hot elements of the boiler and heating system. Cables of temperature sensors are resistant to temperature not exceeding 100°C.

10.9 Connecting weather sensor

The regulator cooperates only with CT4-P type weather sensor. The sensor should be installed on the coldest wall of the building, usually this is a northern wall, under the roof. The sensor should not be exposed to direct sunlight and rain. The sensor should be fitted at least 2m above the ground, far from windows, chimneys and other heat sources which could disturb temperature measurement (at least 1.5 m).

Connect the sensor with the use of cable of $0.5\ mm^2$ cross-section and up to 25 m long. Polarity of cables is not significant. Connect the other end of the cable to the regulator, as shown in Fig. 32.
Attach the sensor to the wall using tackbolts. To access the holes for tackbolts, unscrew the sensor lid.

Tackbolts sockets   Tackbolts 2 pcs.

2 x 0.5mm2 cable,
Max. length 25m,
diameter 3-2.5 mm
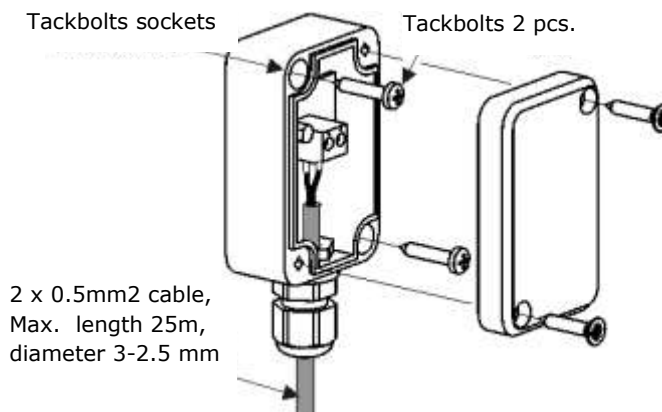
Fig. 33. Connecting CT4-P weather sensor; it is not a standard regulator equipment.

10.10 Checking temperature sensors

The CT4 temperature sensor can be controlled by measuring its resistance in particular temperature. In case of finding significant differences between the value of measured resistance and values presented in the table below, the sensor must be changed.

CT4			
Ambient temperature °C	Min. Ω	Nom. Ω	Max. Ω
0	802	**815**	828
10	874	**886**	898
20	950	**961**	972
25	990	**1000**	1010
30	1029	**1040**	1051
40	1108	**1122**	1136
50	1192	**1209**	1225
60	1278	**1299**	1319
70	1369	**1392**	1416
80	1462	**1490**	1518
90	1559	**1591**	1623
100	1659	**1696**	1733

Table with values of resistance of CT4 temperature sensors

CT4-P (weather)			
Temp. °C	Min. Ω	Nom. Ω	Max. Ω
-30	609	**624**	638
-20	669	**684**	698
-10	733	**747**	761
0	802	**815**	828
10	874	**886**	898
20	950	**961**	972

Table with values of resistance of CT4-P temperature sensors

10.11 Connecting room thermostat of the boiler

👉 Do not make regulator settings according to this point in case when the whole heating system of the building is supplied by the mixer.

In order to make the boiler more economical and the temperature in the heated rooms more stable, install a room thermostat.

The regulator is compatible with a mechanical or electronic room thermostat, which disconnects its contacts after a preset temperature has been reached. The thermostat should be connected in accordance with Fig. 32.

After installing the room thermostat, enable it in:
MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> BOILER SETTINGS (USTAWIENIA KOTŁA) -> *Room thermostat (Termostat pokojowy)*

Boiler Settings

Lower preset CH temp. to thermostat 5°C
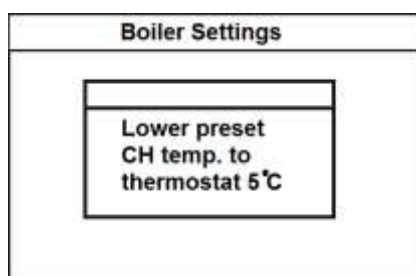
Fig. 34 Setting up the regulator for cooperation with a room thermostat

👉 After reaching the preset room temperature, the room thermostat disconnects its contacts, and letter "T" appears on the display

60°C

58°C T ———— "T"

Fig. 35 View of the main window after thermostat activation

Setting the value other than "0" will activate the thermostat.

When the temperature in the room where the room thermostat is installed reaches the preset value, the regulator will decrease the preset boiler temperature by the *preset boiler temperature decrease from thermostat* value. This will cause longer boiler standstills (staying in the CONTROL mode), thus decreasing the temperature in heated rooms. Additionally, for the purpose of precise adjustment of temperature in heated rooms, it is possible to enable a CH pump lock by disconnecting room thermostat contacts. In order to enable the CH pump lock, enter:

MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> (CH and CWU SETTINGS (USTATWIENIA CO i CWU) -> *CH pump standstill (Postój pompy CO)*

CH/DHW settings

CH pump start temp. with thermost. on 5min.
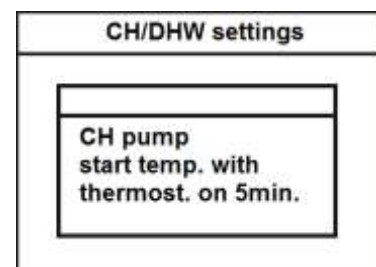
and set the value of this parameter to greater than zero. For instance, setting "5" will cause the pump to be disabled by the room thermostat for 5 minutes. After this time, the regulator will enable the CH pump for a constant, programmed time of 30 s. With this parameter set to "0", the CH pump will not be locked by the room thermostat. This solution prevents from extensive cooling of the system due to CH pump lock.

⚠ Central heating pump lock by thermostat opening can be enabled only after making sure that the boiler will not overheat.

If the boiler overheats after activation of thermostat, decrease the value of this parameter or set it to "0".

10.12 Connecting room thermostat of mixers

The room thermostat connected to the executive module according to Fig. 32, influences the mixer 1 cycle and/or boiler cycle. When the whole heating system in the building is supplied with a mixer, then all room thermostat settings for the boiler should be disabled.

The room thermostat decreases the preset mixer cycle temperature by *Preset mixer temperature decrease from thermostat* value after disconnecting its contacts. This parameter can be set in:

MENU -> (1,2,3 MIXER SETTINGS) USTAWIENIA MIESZACZA 1,2,3

Mixer pump is not disabled after disconnecting room thermostat contacts.

Value of the parameter should be set in a way to decrease the temperature after activation of the room thermostat (disconnection of contacts).

Other settings according to pt. 7.15

10.13 Connecting spare boiler

The regulator can control a spare boiler (gas- or oil-fired), eliminating the necessity of enabling or disabling this boiler manually. The spare boiler will be enabled if the temperature of the retort boiler drops, and disabled when the retort boiler reaches an appropriate temperature. Connection to a spare boiler, e.g. oil-fired one, should only be made by a qualified fitter, in accordance with the technical documentation of this boiler.

The spare boiler should be connected to terminals 30-31 of the regulator via relay, according to Fig. 32 and Fig. 36.
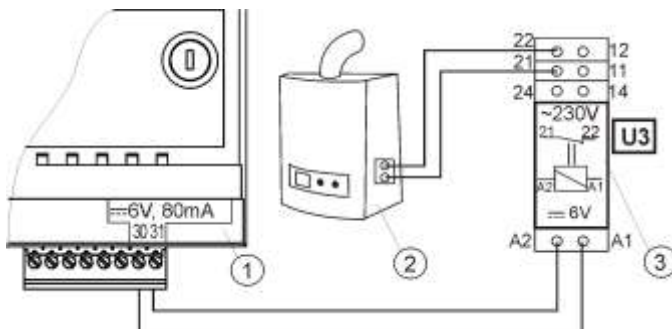
Fig. 36 Model diagram of layout for connecting a spare boiler to the ecoMAX 800 regulator, where: 1 – ecoMAX 700 regulator, 2 – spare boiler (gas- or oil-fired), 3 – U3

module, consisting of RM 84-2012-35-1006 relay and GZT80 RELPOL base,

In a standard version, the regulator is not equipped with the U3 module. Components necessary for assembly of the U3 module can be purchased from the manufacturer of the ecoMAX regulator.

⚠️ Perform assembly and installation of the module on your own and in conformity with applicable standards.

In order to enable control of a spare boiler, set the temperature of the CH system at which the spare boiler is to be disabled:
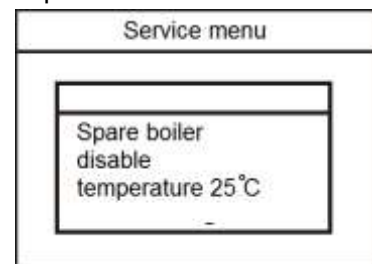
Fig. 37 Enabling spare boiler control

MENU -> SERVICE PARAMETERS (USTAWIENIA SERWISOWE) -> BOILER SETTINGS (USTAWIENIA KOTŁA) -> Spare boiler (Kocioł rezerwowy) -> *Spare boiler disable temperature* (*Temperatura wyłączenia kotła rezerwowego*)

Control over a spare boiler is disabled if the aforementioned parameter is set to "0".

When the retort boiler is fired up and its temperature exceeds a preset value, e.g. 25°C, the ecoMAX 800regulator will disable the spare boiler. It will supply a constant voltage 6V to terminals 30-31. This will cause release of U3 module relay coil and its contacts will be disconnected. If the boiler temperature drops below the *Spare boiler disable temperature* parameter, the regulator ceases to supply voltage to the terminals 30-31 and the spare boiler is activated.

☞ Disabling control over the spare boiler causes switching of 30-31 contact into alarms.

☞ Switching the ecoMAX800 regulator into the STOP or STANDBY mode causes activation of the spare

boiler.

Mixer operates when the spare boiler is enabled. Thanks to this, if the retort boiler runs out of fuel, the mixer cycle is still fed. It is recommended to switch the ecoMAX regulator into the STOP mode if the retort boiler becomes damaged and it becomes necessary to operate on the spare boiler. In the STOP mode the mixer is operative.
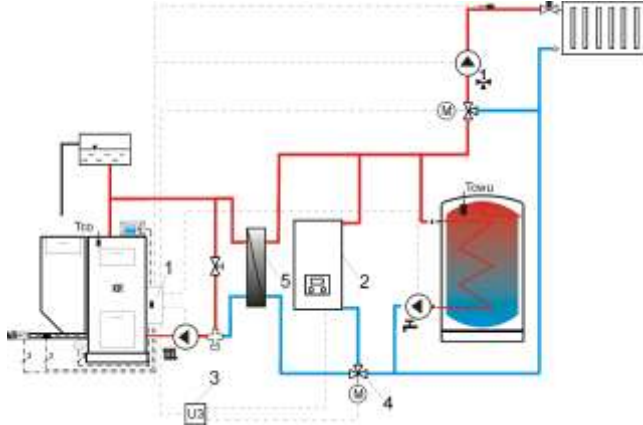
Fig. 38[8] Hydraulic diagram with the spare boiler, connection of an open cycle with a closed cycle, where: 1 – ecoMAX regulator, 2 – spare boiler, 3 - U3 module x 2, 4 – switching valve (with limit switches), 5 – heat exchanger, recommended setting *HUW priority = off, CH pump=boiler pump - YES.*
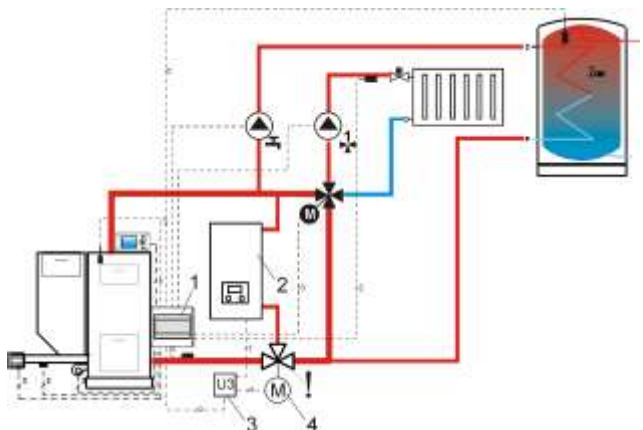
Fig. 39[7] Hydraulic diagram with spare boiler and four-way valve in a closed cycle, where: 1 – ecoMAX regulator, 2 – spare boiler, 3 – U3 module x 2, 4 – servo of switching valve (with limit switches), ! - in order to provide free gravitational flow of water in the boiler cycle, the effective diameter of the switching valve (4) must be greater or equal to the diameter of the boiler

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[7] Presented hydraulic diagrams do not replace the central heating system design and are provided solely for demonstration purposes!

cycle pipes. Use gravitational boiler cycle pipes with large diameters.
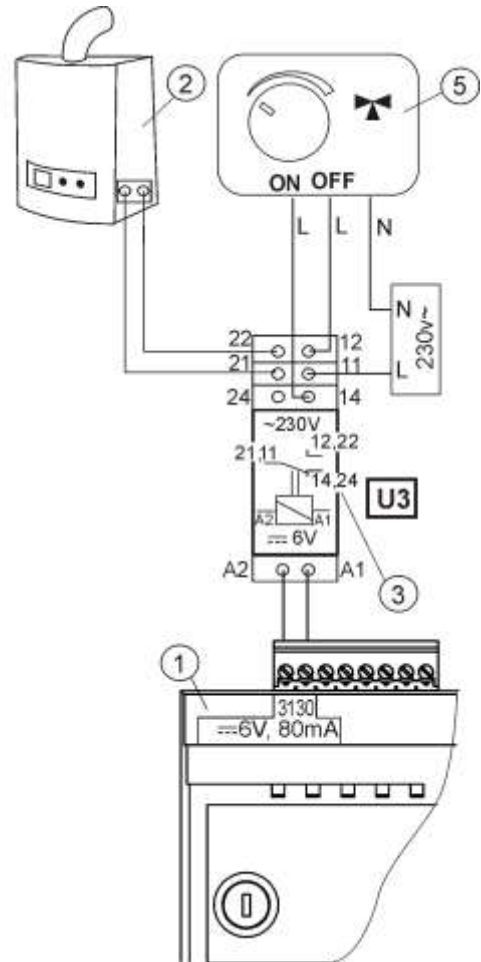
Fig. 40. Electric diagram of switching valve control, where: 1 – ecoMAX regulator, 2 – spare boiler, 3 – relay, e.g. RM 84-2012-35-1006 RELPOL (U3 module), 5 – servo of switching valve (with limit switches), note: contacts 22, 21, 24 must be galvanically separated from contacts 12, 11, 14.

10.14 Connection of alarm signaling

The regulator can signal emergencies by activating an external device, e.g. a bell or a GSM device which sends short messages (SMS). Alarm signaling and control over the spare boiler are made using the same contacts, thus enabling alarm signaling precludes control over a spare boiler.

The alarm-signaling device should be connected in accordance with Fig. 41 via U3 module.
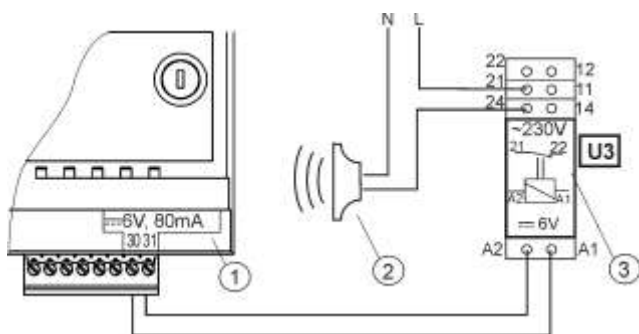
Fig. 41Connection of an external alarming device, where: 1 – ecoMAX800 regulator, 2 – external alarming device, 3 – U3 Module, consisting of RM 84-2012-35-1006 RELPOL relay and GZT80 RELPOL base.

To make the regulator control an external alarming device, set the *Spare boiler disable temperature* parameter to "0"

☞ MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> BOILER SETTINGS (USTAWIENIA KOTŁA) -> Spare boiler disable temperature (*Temperatura wyłączenia kotła rezerwowego*)

In order to provide proper operation, set an appropriate value of the *Active alarms signaling code* parameter in:

MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> Alarms (Alarmy) -> *Active alarms signaling code* (*Kod sygnalizacji aktywnych alarmów*)

Choosing 31 causes voltage to be fed to contact 30-31 in situation when any of the alarms occur. After setting this parameter to "0", the regulator will not supply voltage in case of any alarm.

The 30-31 contact can be configured so that voltage will be supplied only if one or more alarms occur. The value to which this parameter should be set for individual alarms is presented in the following table:

Fuel shortage	Boiler overheated	Flame reverse	CH boiler temperature sensor damage	Feeder temperature sensor damage
AL 1	AL 2	AL 3	AL 4	AL 5
1	**2**	**4**	**8**	**16**

Example: the value of the parameter is set to "8", voltage will be supplied to the contact only if AL4 alarm occurs. Setting "1" will cause the contact to signalize only alarm "1". Should the contact signalize several alarms, e.g. AL2 and AL4, sum up the values corresponding to individual alarms, i.e. set 2 + 8 = 10. If AL1, AL2 and AL3 alarms are to be signaled, set the parameter to "7", as 1 + 2 + 4 = 7.

10.15 Connecting mixer

The regulator cooperates only with servos of mixing valves equipped with limit switches. It is prohibited to use different servos. Permitted servos are those which make a full revolution in 30 – 255s.
Description of connecting the mixer:
- disable power supply to the regulator,
- determine the direction in which the servo opens/closes and make the electric connection between the mixer and the regulator, in accordance with Fig. 32 and with the documentation provided by the valve servo manufacturer (do not confuse the valve direction of opening with the direction of closing).
- connect mixer temperature sensor and mixer pump.
- turn the regulator on and set an appropriate *valve full opening time* in the mixer service settings, in accordance with the servo manual.
- disable and enable power supply to the regulator, wait until the servo is calibrated. During the calibration, the servo is closed by the *valve full opening time*. Calibration is signaled in the MENU Information and mixer-info tab by "CAL" (KAL).
- make sure that the servo opens in the correct direction. To do so, open MENU

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Information and go to info-mixer tab, or enter the regulator manual control. If the mixer does not open in a correct direction, change the electric connection.
- disable and enable power supply to the regulator, wait until the servo is calibrated.
- set the mixer parameters in accordance with pt. 12.8

10.16 Connecting circulation pump

Circulation pump can be connected to the ecoMAX800R1 boiler regulator instead of a mixer piston servo or to additionally purchased MX.01-type ecoMAX800S regulator.

Connection to ecoMAX800R1 (instead of a valve servo):
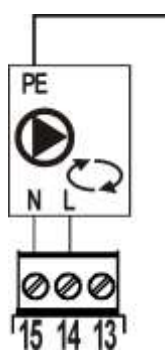
In order to switch a terminal with connectors 14-15 to a circulation pump, set the parameter value in ecoMAX800 regulator MENU: MENU -> SERVICE MENU (MENU SERWISOWE) → PASSWORD (HASŁO) (0000) → MIXER 1 SETTINGS (USTAWIENIA MIESZACZA 1) → MIXER HANDLING (OBSŁUGA MIESZACZA) on "ENABLED" (WŁĄCZONY) or "DISABLED" (WYŁĄCZONY).
Then, the circulation pump is operated by the ecoMAX800R1 boiler regulator.

Connection to ecoMAX800S:
Follow the ecoMAX800S regulator manual.

The circulation pump is enabled on *circulation pump operation time* by *circulation pump standstill time*. Both parameters are available in: MENU → SERVICE MENU (MENU SERWISOWE) → PASSWORD (HASŁO) (0000) → CH and HUW (USTAWIENIA CO i CWU). Circulation pump time intervals is set in: MENU → NIGHT DECREASES (OBNIŻENIA NOCNE) → CIRCULATION PUMP (POMPA CYRKULACYJNA) → ENABLED (WŁĄCZONE) → …. In order to disable the circulation pump permanently, set the *circulation pump operation time* parameter to "0". In order to enable the circulation pump permanently, set

the *circulation pump time interval* parameter to "0". Then, the circulation pump operates without breaks, unless intervals of night decreases had been set on which the pump does not operate.
It is recommended to connect the circulation pump to the additionally purchased MX.01 ecoMAX800S regulator; it maintains the possibility of controlling a mixer piston servo by the ecoMAX800R regulator.

10.17 Connecting temperature limiter

In order to prevent the boiler from overheating due to the regulator malfunction, an STB safety temperature limiter, or any other appropriate for the particular boiler and heating system, should be fitted.

The STB limiter can be connected to terminals 61-62, as specified in Fig. 32. When the limiter is activated, the airflow and fuel feeder motor are disconnected.

⚠️ The temperature limiter must have a nominal operating voltage of at least ~230V and it should have the applicable permissions.

If the limiter is not connected to terminals 1-2, a bridge should be made. Bridge should be made of wire of at least 0.75 mm^2 cross-section, with insulation thick enough to comply with the boiler safety requirements.

⚠️ Current regulations require using a safety temperature limiter.

10.18 Connecting room panel
It is possible to connect the ecoSTER200 room panel. Main functions of the panel:
- room thermostat function (3 thermostats),
- boiler control panel function,
- alarm signaling function,
- fuel level indicator function,

Four-wire connection:
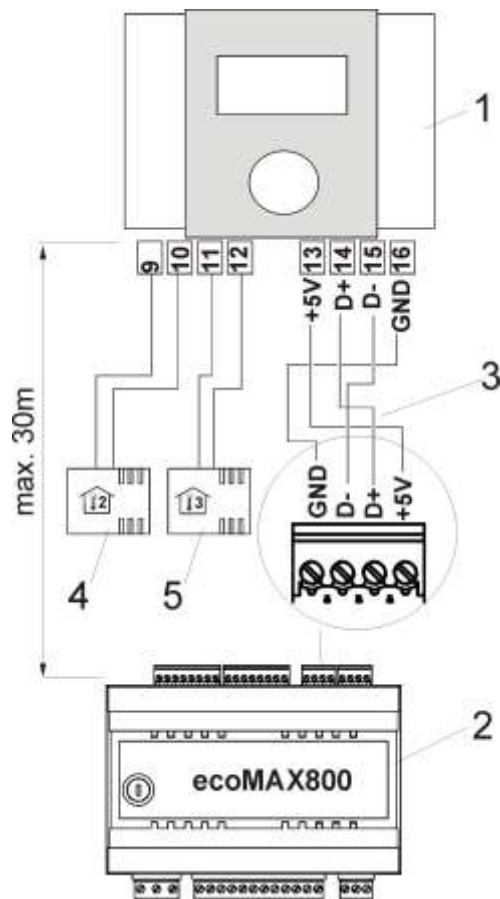
Fig. 42 Electrical connection diagram (four-wire), where: 1 - ecoSTER200 room panel, 2 - ecoMAX800T1 regulator, 3 - connecting cable, 4 - room sensor of CT7-type thermostat 2, 5 - room sensor of CT7-type thermostat 3.

Two-wire connection:

Two-wire connection requires 5V DC adapter of min. 200 mA rated current. Switch the GND and +5V wires from module (2) to an external adapter located next to the ecoSTER200 (1). The adapter is not a part of regulator equipment.

Maximum length of additional panel wires should not exceed 30m, whereas the cross-section should not be less than 0.5 mm^2.

11 BOILER SERVICE SETTINGS

11.1 Return protection

Note: return protection function protects the boiler against operating in cold return water. This function will not operate properly in hydraulic system is damaged. Installation should be designed in such way that the boiler return temperature increases over a preset threshold in a situation of half-closing (closing) the mixing valve.

Note: return protection function is not available if the boiler is equipped with ceramic head with fuel level sensor.

If the boiler cooperates with a four-way valve and valve servo and return temperature sensor is connected, then it is possible to activate protective function against cold water returning to the boiler. To do so, select the option "4D Valve". Otherwise, or if the boiler return is protected by a thermostatic valve, choose the "3D valve thermostat" option Then, the regulator does not influence protection of the boiler return.

Caution: the return protection function is active only for mixer 1 cycle.
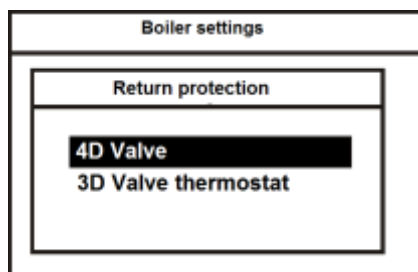
Fig. 43 Return protection

Description of the regulator's operation at return protection can be found in pt. 0.

☞ If the T6 return temperature sensor is disconnected or damaged, the regulator will automatically switch into the *3D thermostat piston* option. The return sensor which is pad-fixed to a pipe, should be thermally isolated from its surroundings.

11.2 Room thermostat of the boiler

This parameter allows to set a decrease in the preset boiler temperature due to disconnection of room thermostat contacts. Detailed information can be found in pt. 10.11

11.3 Thermostat selection

This option enables to change the room thermostat for the boiler cycle in case when the ecoSTER200 room panel is connected. Available options:
- ecoSTER1 – thermostat 1 in ecoSTER 200,
- ecoSTER2 – thermostat 2 in ecoSTER 200,
- ecoSTER3 – thermostat 3 in ecoSTER 200.
For the boiler cycle, the regulator cooperates only with the ecoSTER200 room panel. There is no possibility of connecting standard room thermostat with contact output.

11.4 Boiler weather control

This parameter allows to enable weather control of the boiler which calculates the preset boiler temperature on the basis of a weather sensor's indications. Detailed information can be found in pt. 7.16 and 10.9.

☞ Enabling the weather control is unnecessary in central heating systems where the mixing valve with a servo supplies the whole CH system. In such situation, enabling weather control for mixer cycle results in automatic determination of the preset boiler temperature.

11.5 Heating curve
This parameter enables to select an appropriate heating curve. Detailed information can be found in pt. 7.16.

Fig. 44 Boiler heating curve selection, where: 1.4 – selected heating curve, 59 – temperature calculated from the heating curve for the current outdoor temperature measured by the CT4-P sensor.

11.6 Curve parallel offset

Enables to shift the heating curve within the range of ±20 C. Detailed information are included in pt. 7.15 and 7.16.

11.7 Room temperature index

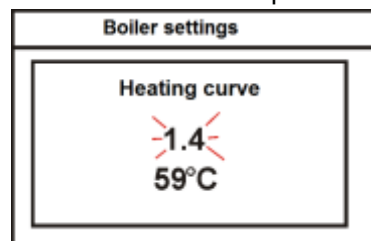Option available only after connecting the ecoSTER200 room panel. It enables applying the boiler preset temperature correction on the basis of temperature indication in heated room.

Range: 0…50. The higher index value, the higher boiler preset temperature correction. Preset boiler temperature is not corrected if the value is set to "0".

Example.

Preset temperature in a heated room (set in ecoSTER200) = 22°C. Measured room temperature (by ecoSTER200) = 20°C. Room temperature index = 15.

Preset boiler temperature will be increased by [(22°C -20°C)]x15/10 = 3°C.

11.8 Boiler hysteresis

This parameter determines the temperature at which the boiler returns from the CONTROL mode to the OPERATION mode. The regulator returns to the OPERATION mode at the *preset boiler temperature – boiler hysteresis*.

11.9 Minimum preset boiler temperature

This parameter can be used to prevent the user from setting too low preset boiler temperature. If the boiler operates at too low temperature, it can cause its rapid damage, corrosion, contamination, etc. Additionally, the regulator will accept this temperature instead of the preset boiler temperature which results from a decrease on account of time periods or room thermostat.

☞ Set the value in accordance with the boiler manufacturer's recommendations

11.10 Maximum preset boiler temperature

This parameter can be used to prevent the user from setting preset boiler temperature too high.

If the heating curve temperature or the preset HUW temperature is higher than the *maximum preset boiler temperature*, the regulator will adopt the *maximum preset boiler temperature.* as the preset temperature.

☞ Set the value in accordance with the boiler manufacturer's recommendations

11.11 Minimum fan power

When the regulator is turned on for the first time, it is necessary to set the user-defined *Minimum airflow power* parameter .

MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> BOILER SETTINGS (USTAWIENIA KOTŁA) -> Min. airflow power (Min. moc nadmuchu) -> *Minimum airflow power* (*Minimalna moc nadmuchu*)

This parameter prevents the fan against being damaged due to too low rotary speed. The *minimum airflow power* should be determined after observing the fan behavior. After setting a value of e.g. 20%, the user will be able to set fan power of at least 20%.

In the STANDARD regulation mode, before reaching the preset boiler temperature (at Tzk temperature of – 1°C), the regulator starts to reduce fan revolutions from the value of *airflow power* parameter to revolutions set in the *Min. airflow power* parameter.

☞ If the boiler cannot reach the preset temperature due to reduction of the fan revolutions, the value of the *Min. airflow power* parameter should be increased.

11.12 Fuel shortage detection time

This is the time after which the regulator starts the fuel shortage detection procedure. This procedure is described in pt. 15.1.

☞ If the regulator produces the "Fuel shortage" alarm too early, increase the value of this parameter.
When the parameter is set to "0", fuel shortage is not detected. It is not recommended because of a

probability of loading the combustion chamber with fuel in a situation "when a furnace goes out for reasons other than fuel shortage, e.g. it is not fired up properly".

11.13 Feed time CONTROL

This is the time for which the fuel is fed and the airflow is active in the CONTROL mode(Fig. 14).

⚠ Value of this parameter cannot be too high, as it can make the boiler overheat in the CONTROL mode. In the CONTROL mode, the boiler temperature must decrease slowly.

11.14 Extending airflow operation

In the CONTROL mode, after feeding a dose of fuel and disabling the feeder, the fan continues to work for *extending airflow operation* time in order to burn the supplied fuel (according to Fig. 14).

⚠ Value of this parameter cannot be too high, as it can make the boiler overheat in the CONTROL mode. In the CONTROL mode, the boiler temperature must decrease slowly.

11.15 Maximum feeder temperature

This is the temperature at which the function which prevents the flame from returning to the fuel feeder is activated. This function is described in pt. 15.3.

☞ Setting the *max. feeder temp.* to "0" allows to disconnect the feeder sensor and lets the regulator operate without this sensor. Nonetheless, such settings are not recommended, as they will disable the function preventing from flame recession.

11.16 Min. return temperature

This parameter specifies the temperature of water which returns to the boiler, below which the servo of the four-way valve will be closed. After the temperature goes back above this parameter + *return temp. hysteresis*, the servo resumes normal operation.

11.17 Return temperature hysteresis

This parameter specifies the return temperature hysteresis.

11.18 Half closing the valve

This parameter defines percentage of closing the four-way valve after temperature decrease of the water returning to the boiler, below a preset value. Set such level at which the temperature increases at return to the boiler. Recommended value - 0%.

11.19 Spare boiler

Use this parameter to specify the temperature of the retort boiler at which the spare boiler (e.g. a gas-fired) is disabled. Detailed information can be found in pt. 10.13.

11.20 Alarms – signaling setup
Detailed information can be found in pt. 10.14

11.21 Boiler cooling temperature
Temperature at which the boiler is preventatively cooled down. Detailed description can be found in pt. 16.3.

☞ It is recommended to set the *boiler cooling temp.* below the value of activating the safety temperature limiter which will prevent interruptions in the boiler operation due to overheating.

11.22 A and B Fuzzy Logic parameter
A and B Fuzzy Logic parameters have an influence on how fast the boiler temperature reaches a preset value and on stability of maintaining a preset boiler temperature in Fuzzy Logic mode. These parameters don't have any influence on combustion quality in Fuzzy Logic mode.

It is not recommended to change these parameters if the boiler power changing rate is on a desired level.

Parameter **A**	Increasing the value increases the boiler power growth rate. The higher the value, the faster the boiler reaches a preset value. Too high a value can result in unstable maintaining the boiler preset temperature. Range of settings 6...8; recommended value is 6.
Parameter **B**	Increasing the value decreases the boiler power growth rate. The lower the value, the slower the boiler reaches a preset value, but setting the higher value guarantees that the boiler preset temperature will not vary. Too low a value can result in unstable maintaining of the boiler preset temperature. Range of settings 20...30; recommended value is 30.

11.23 Ash removal operation and interval

In OPERATION mode, the regulator enables an ash removal mechanism cyclically. It is enabled for the time defined in *Ash removal operation* parameter and its operation is suspended for the time defined in *Ash removal interval* parameter.

11.24 Sequence of cycles operation

Set the parameter to "feeding - break" in order to enable the OPERATION mode in the moment of supplying a fuel dose, pt. 7.7.
Set the parameter to "break - feeding" in order to enable the OPERATION mode in the moment of supply break, pt. 7.7.

When the boiler switches from the CONTROL mode to the OPERATION mode too frequently, this could cause fuel overloading because the OPERATION mode starts from supplying a fuel dose. After changing sequence, the OPERATION mode can begin from a break in supply, which can eliminate fuel pouring.

Default setting = "feeding - break".

Note: check whether the burner furnace sags when "break - feeding" is set. There is a risk of

burning the feeding screw.

12 CH and HUW SERVICE SETTINGS

12.1 CH start temperature

This parameter specifies the temperature at which the central heating pump is activated. After reaching the temperature equal to the *CH pump start temp.* parameter, the central heating pump is activated. This protects the boiler against retting caused by its being cooled down by hot water returning from the system.

Disabling the CH pump does not guarantee protection of the boiler against retting and, as a result, against corrosion of the boiler. It is recommended to use additional automatics, e.g. a four-way valve.

12.2 CH pump down-time

This parameter determines the central heating pump down-time after it is blocked by disconnected room thermostat, at the moment of reaching a preset room temperature (pt. 10.11). As a result of blocking the central heating pump, the temperature in the heated rooms will drop and the boiler will reach the preset temperature faster and switch to the CONTROL mode. Yet, locking the central heating pump for too long will cause the system to cool down, which is disadvantageous for maintaining the room temperature at a constant level. The heating medium accumulated in the system has high thermal inertia and heating it after the thermostat contacts are shorted can take too long. Thus, it is not recommended to set excessively long central heating pump down-times. After the *CH pump down-time*, the regulator will enable it for a constant, pre-programmed time of 30 s. Note: Locking the CH pump can cause boiler overheating!

12.3 CH pump standstill at HUW priority

Prolonged loading of the HUW tank when HUW priority is enabled can cause extensive cooling of the CH system, because with these settings, the CH pump is disabled.

The *CH pump down-time during HUW loading* prevents this by enabling periodical activation of the CH pump while the HUW tank is loaded. After this time, the CH pump will be activated for a constant, programmed time of 30s.

12.4 Maximum HUW temperature

This parameter specifies to what maximum temperature will the HUW tank be heated in the case of dropping excessive heat from the boiler during an emergency. This parameter is very important, as setting it at too high a value can cause burns suffered by the users. Too low a value of this parameter will make it impossible to discharge excessive heat to the HUW tank if the boiler gets overheated.

When designing the hot utility water system, the possibility of regulator malfunction should be taken into consideration. As a result of malfunction of the regulator, the water in HUW tank can become dangerously hot, exposing users to burns.

THEREFORE, ADDITIONAL SAFEGUARDS IN THE FORM OF THERMOSTATIC VALVES SHOULD BE USED.

12.5 HUW tank hysteresis

Below the preset *HUW temp. – HUW cont. hysteresis,* the HUW pump is activated in order to fill the HUW tank.

After setting a low value, the HUW pump will be activated faster after the HUW temperature drops.

12.6 Increase of the boiler temperature from HUW and mixer

This parameter specifies by how many degrees will the preset boiler temperature be increased in order to fill the HUW tank and the mixer cycle. Yet, it will be performed only when such need arises. When the preset boiler temperature is high enough, the regulator will not change it for the purpose of filling the domestic hot water tank or the mixer cycle.

Increasing the preset boiler temperature for the time of filling the hot utility water tank is signaled by "C" in the display main window

12.7 Extending HUW pump operation

After loading the HUW tank and disabling the HUW pump, there is often a problem of the boiler overheating. It occurs if the preset hot utility water temperature is higher than the preset boiler temperature. In particular, this problem occurs in the HUW pump mode: SUMMER, where the CH pump is disabled. In order to cool the boiler down, operation of the HUW pump can be extended by the time of *Extending HUW pump operation.*

It is not recommended to set the time of *Extending HUW pump operation* to a value other than zero if the preset HUW temperature is higher than the preset boiler temperature.

12.8 Circulation down-time

Circulation pump after finishing its operation, does not operate for the *circulation down-time*. It applies both to active night decreases and situation when the circulation pump is enabled permanently. It enables to save electric and heat energy. Recommended setting: 15 - 40 min.

12.9 Circulation operation time

Circulation pump after the *circulation down-time*, operates for the *circulation operation time*. It applies both to active night decreases and situation when the circulation pump is enabled permanently. It enables to save electric and heat energy. Recommended setting: 60 - 120 s.

12.10 Boiler pump

If the *CH pump = Boiler pump* is set to *"YES"*, the CH pump is not stopped at HUW priority and at HUW SUMMER mode. The parameter is intended only for hydraulic systems with a heat exchanger, where the HUW tank is installed on a closed system side and the heat exchanger separates the opened boiler system from the CH installation closed system.

13 MIXER SERVICE SETTINGS

13.1 MIXER OPERATION
The following options are available:

off - mixer servo and mixer pump are inoperative,

CH enabled - select this option if the mixer cycle feeds the central heating radiation system. The maximum temperature of mixer cycle is unlimited, the mixer is fully opened during alarms, e.g. boiler overheat. Note: Do not enable this option if the system is made of pipes vulnerable to high temperature; in such case, we recommend setting the mixer to *FLOOR enabled*.

FLOOR enabled - select this option if the mixer cycle feeds a floor system. The maximum temperature of the mixer cycle is limited to the max. mixer preset temp parameter.
Note: after selecting the *FLOOR enabled* option, set the *max. mixer preset temp.* parameter to such value that the floor would not be damaged and the floor heating users would not be burned.

pump only – in the moment of exceeding *mixer preset temperature*, supply of the mixer pump is disabled and after the temperature drops by 2 °C – it is enabled again. This option is usually used to control the floor heating pump in situation when it cooperates with thermostatic valve without a servo. Whereas it is not recommended. It is recommended, in case of floor heating, to use a standard heating cycle consisting of a valve, servo and mixer pump. Mixer pump can also be used in order to protect the boiler return temperature with the use of a pump connecting supply with the boiler return. In such case, there is no possibility of operating the mixer.

13.2 Thermostat selection

This option enables to change the room thermostat for the mixer cycle in a case when the ecoSTER200 room panel is connected. The following options are available:
- universal - standard no/nc thermostat connected to terminals 28-29 of the MX.01 module (available only for mixer 2 and 3),
- ecoSTER1 – thermostat 1 in ecoSTER 200,
- ecoSTER2 – thermostat 2 in ecoSTER 200,
- ecoSTER3 – thermostat 3 in ecoSTER 200.
If the ecoSTER200 is not connected, the regulator cooperates with a standard room thermostat.

13.3 Max. preset mixer temperature
This parameter serves two purposes:
- This parameter can be used to prevent the user from setting too high preset mixer temperature. Additionally, the regulator will adopt this temperature instead of the preset temperature resulting from weather control, if it is higher than *max. mixer preset temp.*
- if the *mixer operation = enabled FLOOR* parameter is enabled, it is also a limit temperature of the mixer, at which the mixer pump is disabled.

⚠ For floor heating, set the value within the range of 45°C - 50°C, or other, unless the manufacturer of the floor materials or a designer of the CH system specified otherwise.

13.4 Min. preset mixer temperature
This parameter can be used in order to prevent the user from setting too low preset mixer temperature.
If the mixer preset temperature (e.g. as a result of night decreases) is lower than the *Min. preset mixer temp.* value*, the regulator will assume the *Min. preset mixer temp*. as a preset temperature.

13.5 Range of proportionality
Note: it is recommended not to modify this parameter.

This is a mixer step value. Increasing its value will speed up reaching the preset mixer temperature, yet too high value of this parameter will cause over-regulation of temperature and unnecessary movement of the servo, thus shortening its life-span.

It is recommended to set this parameter within the range of 2 – 6 [by default: 3].

13.6 Integration time constant
Note: it is recommended not to modify this parameter.

This parameter influences the mixer down-time if the temperature measured by the mixer sensor is close to a preset mixer temperature. Greater value will cause longer down-times of the servo. Too high a value extends the time by which the servo searches for a preset temperature. Setting too low values can cause over-regulation of temperature and faster wear of the servo.

It is recommended to set this parameter within the range of 80 – 140 [by default: 110].

13.7 Valve opening time
Enter the time of full valve opening which can be found on the valve servo rating plate, e.g. 140 s.

13.8 Mixer insensitivity
Parameter setting which defines a value of temperature insensitivity (dead zone) for the mixer control system.

The regulator controls the mixer in such a way as to make temperature measured by the mixer circuit sensor equal with a preset value. However, in order to prevent too frequent servo movements which can shorten its life-span, the regulation is carried out only when a mixer circuit measured temperature is higher or lower than a preset temperature by a value greater than *Mixer insensitivity.*

13.9 Disconnecting pump from thermostat
Set this parameter to "YES" in order to close the mixer servo and disable the mixer pump after disconnection of room thermostat contacts (room heated up). However, it is not recommended because heated room will be cooled too much.

13.10 Boiler temperature increase from the MIXER
If the preset boiler temperature is lower than the preset mixer temperature, the regulator shall automatically assume the preset boiler temperature equal to the preset mixer temperature increased by a value of the *boiler temp. increase from HUW and MIXER* parameter

Parameter can be set in: MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> CH and HUW SETTINGS (USTAWIENIA CO oraz CWU)

14 RESTORING DEFAULT SETTINGS
In order to restore default service settings, place the cursor on "YES" option and press the "TOUCH and PLAY" knob.

Fig. 45 Default service settings

☞ Restoration of default settings will also restore user settings.

15 DESCRIPTION OF ALARMS

15.1 Fuel shortage

If the boiler temperature in the OPERATION mode drops by 10°C below the preset boiler temperature, the regulator will start counting the *fuel shortage detection* time.

MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> BOILER SETTINGS (USTAWIENIA KOTŁA) -> *fuel shortage detection time (czas detekcji braku paliwa)*

If during that countdown the boiler temperature is not increased by 1°C, the regulator will disable the CH and HUW pump and will start counting the *fuel shortage detection time* again. This protects the boiler against excessive cooling down. If after this time the temperature does not increase by 4 °C, the regulator will enter the STOP mode and show the "Fuel shortage" (Brak opału) alarm on the display. If the boiler temperature approximates the preset boiler temperature (difference t≤ 10°C), pumps will be activated and countdown of the *fuel shortage detection time* will be stopped. Cancel by restarting the regulator.
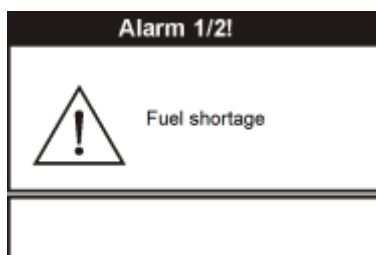

Fig. 46 "Fuel shortage" alarm view

If the regulator identifies fuel shortage incorrectly, increase the *fuel shortage detection time* parameter (pt. 11.12) or decrease the difference between measured boiler temperature and *preset boiler temperature*.

In the upper section of the screen, a number of alarms occurring at the same time is displayed. 1/2 means that two alarms occurred and the first of them is displayed, etc. Move to the next alarm by turning the "TOUCH and PLAY" knob.

15.2 Exceeding max. boiler temperature

Protection against boiler overheating consists of two stages. First, after exceeding the *boiler cooling preventive temperature* (90°C by default), the regulator tries to decrease the boiler temperature by dropping the excessive heat to the HUW tank and by opening the mixer servo (only if mixer cycle = CH enabled). If the boiler temperature drops, the regulator will return to normal operation. Whereas if the temperature continues to rise (reaches 95°C), fuel feeder and fan are disabled and a permanent boiler overheating alarm with sound signaling is activated. If during boiler overheating alarm, the temperature measured by the HUW sensor (8) exceeds the *Max. HUW temp*. value, the HUW pump is disabled. This protects HUW users against burning. Whereas the mixer pump is not disabled in the moment of exceeding the *Max. preset mixer temperature*, if *mixer cycle = enabled CH* was set. The mixer pump is disabled in the moment of exceeding the *Max. preset mixer temperature*, if *mixer cycle = enabled FLOOR* was set.
Cancel the alarm by restarting the regulator.

Note: placing the temperature sensor beyond the boiler water jacket, e.g. on the outlet pipe, is not recommended, as it can delay detection of the boiler overheating.
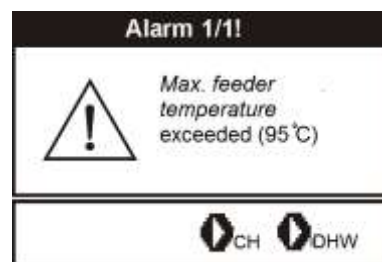

Fig. 47 „Max. boiler temperature overheating" alarm view

15.3 Exceeding max. feeder temperature

This alarm will occur after feeder temperature exceeds the *Max. feeder temperature* service parameter

MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> BOILER SETTINGS (USTAWIENIA KOTŁA) -> *Meximum feeder temperature (Maksymalna temperatura podajnika)*

If the feeder temperature exceeds this value, the regulator will enable the feeder for a constant, programmed time of 8 minutes. After this time, the airflow is disabled and pumps are enabled. After "pushing the fuel out", the regulator disables the feeder and does not activate it again, even if the feeder temperature is still high.

Canceling the alarm is possible only after the feeder temperature drops and the regulator is turned off.

⚠ The function of protection against flame recession is inoperative if the feeder sensor is disconnected or damaged.

⚠ The function of protection against flame recession is inoperative if the regulator is not powered.

⚠ The ecoMAX 700R regulator cannot be used as the only protection against flame recession in a boiler. Use additional protective automatics.

☞ The function of protection against flame recession can be disabled, see pt. 11.15

15.4 Boiler temp. sensor damage

This alarm will occur in case of damage of the boiler sensor and after exceeding its measuring range. The alarm activates CH and HUW pump, as well as the mixer pump, in order to cool the boiler down.
Cancel the alarm by pressing the TOUCH and PLAY button or by restarting the regulator. Check the sensor and replace it, if needed.

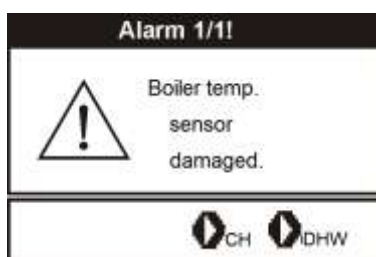☞ Method of checking the temperature sensor is described in pt. 10.10

Fig. 48 "Boiler temp. sensor damage" alarm view

15.5 Feeder temperature sensor damage

This alarm will occur in case of damage of the feeder sensor and after exceeding its measuring range. The alarm causes activation of CH and HUW pump in order to cool the boiler down.
Cancel the alarm by pressing the TOUCH and PLAY button or by restarting the regulator. Check the sensor and replace it, if needed.

☞ Method of checking the temperature sensor is described in pt. 10.10

☞ The regulator can operate if the feeder temp. sensor is disconnected and after setting the *max. feeder temperature = 0* parameter . Nonetheless, it is not recommended, as it disables the function of protection against the flame recession into the fuel tank.
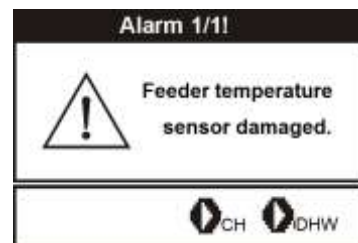

Fig. 49 "Feeder sensor damage" alarm view

15.6 Feeder lock

This alarm will occur if a thermal protection of feeder motor is activated. Fan and feeder operation is suspended. After eliminating the cause of the feeder motor overload and disabling thermal protection manually, the regulator returns to normal operation automatically.

15.7 Head overloaded

This alarm can occur only in a case when the boiler is equipped with ceramic head. In case of exceeding a maximum fuel level in a ceramic head, limiting switch is enabled. The regulator suspends supplying fuel. Other devices' work is unchanged. Fuel burns out and fuel level drops. The limiting switch is disconnected and feeding is enabled again. If after 30 min, the limiting switch is not enabled again, the HEAD OVERLOADED (GŁOWICA PRZEPEŁNIONA) alarm occurs. The regulator switches into STOP mode.

15.8 No communication

Control panel is connected with executive module via RS485 digital communication link. If any wire of this link is damaged, the following window will be displayed:

Fig. 50 "No communication" alarm view

The regulator does not disable regulation and operates as usual with pre-programmed parameters. If an alarm occurs, it will take action in accordance with the particular alarm.
Check the wire connecting a control panel and executive module and replace or repair it.

16 ADDITIONAL FUNCTIONS

Except for the functions described above, the regulator provides an number of other functions.

16.1 Power supply decay

In the cases of power supply failure, the regulator will resume the operation mode in which it operated before the failure.

16.2 Protection against freezing

If the boiler temperature drops below 5°C, the CH pump will be enabled, thus forcing circulation of the boiler water. This will delay the process of water freezing, yet in case of great frost or shortage of power, it will not protect the system against freezing.

16.3 Preventive cooling

This function consists in attempts to cool the boiler before the regulator switches into permanent boiler overheating alarm. Description can be found in pt. 15.2.

☞ In HUW = SUMMER mode, only HUW pump is enabled preventively.

16.4 Function of protecting pumps against stagnation

The regulator protects the CH, HUW, MIXER and mixer servo pumps against stagnation. It does so by activating them periodically (every 167h for several seconds). This protects the pumps against immobilization due to sedimentation of boiler scale. For this reason, the regulator power supply should be connected also when the boiler is not in use. This function can be enabled also when the regulator is disabled with the use of a keyboard (regulator in STAND-BY mode) and in the STOP mode.

17 REPLACEMENT OF PARTS AND SUBASSEMBLIES

When ordering parts and subassemblies, please specify necessary information from the rating plate. It is best to give the regulator serial number. If serial number is not known, please specify the model and type of the regulation, as well as the year of its production.

☞ The regulator serial number can be found on a rating plate of the executive module. The number on a control panel is not the serial number.

17.1 Replacing mains fuse

The mains fuse is situated inside an executive module. It protects the regulator and devices which are fed by it.

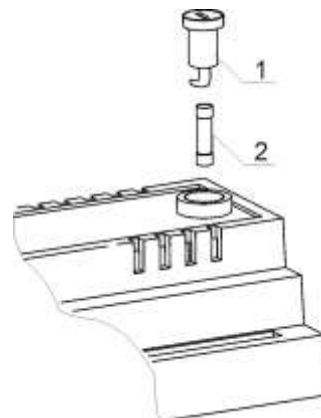Use time-delay fuses, porcelain, 5x20mm, of nominal burnout current of 6.3A.

Fig. 51 Fuse replacement, where: 1 – fuse, 2 – fuse socket

In order to remove the fuse, push in the socket with a flat screwdriver and turn it counter clockwise.

17.2 Control panel replacement

Shall it be necessary to replace the whole control panel, check compatibility of the new panel software with the executive panel software. Compatibility is maintained if the first number of software in the control panel and in the executive module is identical. In the example below, the software versions are compatible, as the first number "06" is the same for both subassemblies:

Examples of software numbers

Control panel   Executive module
06.10.010.   **06**.11.026.W0
↑   ↑

The software numbers can be read on the rating plates of subassemblies or on a display window, right after turning the regulator on.

ecoMAX800ec

PLUM sp. z o.o.

panel prog: v=06.010.10 ——— 1
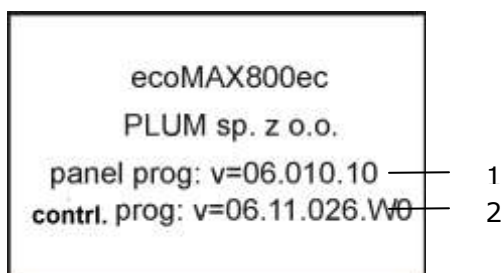**contrl.** prog: v=06.11.026.W0 —— 2

Fig. 52 View of display after turning the regulator on, where: 1 – control panel software number, 2 – executive module software number

The regulator can operate improperly if the control panel is incompatible with the executive module.

17.3 Executive module replacement

Requirements are the same as those for the control panel replacement, pt. 17.1

18 Description of possible faults

Signs of a fault	Hints
1. The display is blank despite connection to power supply.	Check: ▪ if the main fuse is burnt-out, replace if so, ▪ if the wire connecting the panel with the module is properly plugged in, and if it's not damaged
2. Preset boiler temperature on a display is different than the programmed one	Check: ▪ whether the hot utility water tank is filled at the time and the preset hot utility water temperature is higher than the preset boiler temperature; if so, the difference of readouts will disappear after the hot utility water tank is hot or after decreasing the preset hot utility water temperature. ▪ whether the room thermostat is on – set the *preset temp. decrease from thermostat* service parameter to "0" ▪ if the periods are enabled – disable time periods
3. CH pump is inoperative	Check: ▪ whether the boiler exceeded the *CH pump start temp.* parameter – wait or decrease the *CH pump start temp*. ▪ if the room thermostat is not blocking the CH pump - set the *CH pump down-time* to "0", ▪ if the HUW priority which blocks the central heating pump, is enabled – disable the priority by setting the HUW mode to *No priority,* ▪ whether the central heating pump is not damaged or clogged.
4. CH pump switches off temporarily	▪ If this happens when the boiler temperature is 10°C lower than the preset boiler temperature, it is a normal symptom connected with fuel shortage detection.
5. The fan is inoperative	▪ increase the airflow power (*fan power* parameter), ▪ check if the safety temperature limiter STB jumper is on terminals 1-2 (the jumper should be placed only if no temperature limiter is connected). ▪ if the boiler manufacturer equipped the boiler with STB temperature limiter with manual return to the initial position, unlock it by removing the lid and pushing the button in accordance with the documentation provided by the boiler manufacturer. ▪ Check setting of the *fuel feeder and airflow* parameter and set it to *enabled*, ▪ check the fan and replace it if necessary
6. Fuel feeder is inoperative / does not feed	▪ Check if the feeder wires are properly connected to terminals, ▪ If STB temperature limiter is connected to terminals 1-2, check if the circuit is not cut off due to boiler overheating, ▪ Check if the feeder motor is not damaged, ▪ Check setting of the *fuel feeder and airflow* parameter and set it to *enabled*, ▪ If you can hear the motor working but the fuel is not fed, replace the cotter pin in the fuel feeder coupling, in accordance with the boiler manual
7. When the Fuzzy Logic mode is on, the fuel is not burnt out completely and there are fuel remnants in the ashes	▪ Check the correction of Fuzzy logic airflow, pt. 7.8, ▪ Check if the unburned fuel is from the CONTROL mode – if so, adjust the CONTROL mode according to pt. 7.9, ▪ Check if the unburned fuel is caused by frequent switching between CONTROL -> OPERATION, according to pt. 11.23, ▪ Make sure that the proper fuel type is selected, pt. 7.10 (if other fuel types can be selected in the regulator) – in the fuzzy logic mode, combustion of mixed fines and eco-peal coal is not allowed. ▪ Check if the appropriate boiler type is selected, pt. 19.1

	▪ Open the fan aperture and/or the fan return flap to the maximum, ▪ Clean ducts which supply air to the furnace, ▪ Check if the seal between the fan and the boiler casing is in a proper working order, ▪ Unseal the boiler room window, thus providing sufficient amounts of fresh air.
8. When the Fuzzy Logic mode is on, the fuel is overburned and the furnace falls down inside a retort.	▪ Decrease the Fuzzy logic airflow correction, pt. 7.8, ▪ Check if the overburned fuel comes from the CONTROL mode - if so, adjust the CONTROL mode according to pt. 7.9, ▪ Check if overburning of the fuel is caused by setting of OPERATION cycles sequence to "break - feeding", according to pt. 11.23, ▪ Make sure that the proper fuel type is selected, pt.7.10 (if other fuel types can be selected in the regulator) ▪ Check if the proper boiler type is selected, pt. 19.1.
9. Temperature is measured incorrectly	Check: ▪ if there is a good thermal contact between the temperature sensor and measured surface, ▪ whether the sensor wire is not placed too close to the mains cable, ▪ whether the sensor is connected to the terminal, ▪ whether the sensor is not damaged – check it in accordance with pt. 10.10
10. In the HUW=SUMMER mode, heaters are hot and the boiler overheats	▪ Increase the *Extending HUW pump operation time* parameter *in order to cool down the boiler*
11. The HUW pump is active even if the HUW tank has been already loaded	▪ Set the *Extending HUW pump operation time* parameter to "0"
12. The boiler overheats despite disabled airflow	▪ This could be caused by structural defect of the boiler or the chimney system, consisting in a lack of safeguard against too high a chimney draught
13. The mixer does not open in a hydraulic system with mixing valve and servo.	▪ It can be a result of activation of the return protection function, pt. 11.1. If the return protection function is enabled (*return protection* = 4D valve), check whether the water return sensor is thermally separated from the surroundings and whether a thermal contact with the pipe should be corrected with the use of thermally conductive paste. Increase the boiler preset temperature in order to ensure power reserve for heating return water. Check whether the hydraulic system is made properly, i.e. after closing the valve, return temperature should exceed the *Min. return temperature.* ▪ It can be a result of loading the HUW tank when HUW priority is enabled. Wait until the HUW is loaded or disable *HUW priority.* ▪ It can be a result of active SUMMER function. ▪ It can be a reason of currently performed mixer valve calibration; wait until calibration is finished. Active calibration is marked with "CAL" (KAL) in INFORMATION (INFORMACJE) -> MIXER INFO (MIESZACZ INFO) menu.

19 Regulator configuration by boiler manufacturer.

NOTE: THE FUZZY LOGIC PROGRAM IS SELECTED INDIVIDUALLY TO THE PARTICULAR BOILER STRUCTURE. MAKE SURE THAT FITTINGS FOR BOILERS TESTED IN THE PLUM LABORATORIES ARE COMPATIBLE WITH FITTINGS FOR SOLD BOILERS! IT IS FORBIDDEN TO REPLACE THE TYPE OF TRANSMISSION, SCREW COILS, FAN TYPE AND TO MAKE OTHER CONSTRUCTIONAL MODIFICATIONS WHICH CHANGE THE CONDITIONS OF COMBUSTION.

19.1 Fuzzy logic activation

In order to activate fuzzy logic mode, enter the hidden MENU:

MENU -> SERVICE SETTINGS (USTAWIENIA SERWISOWE) -> enter special password (wprowadzić hasło specjalne).

The special password is made available only to boiler manufacturers and authorized fitters.
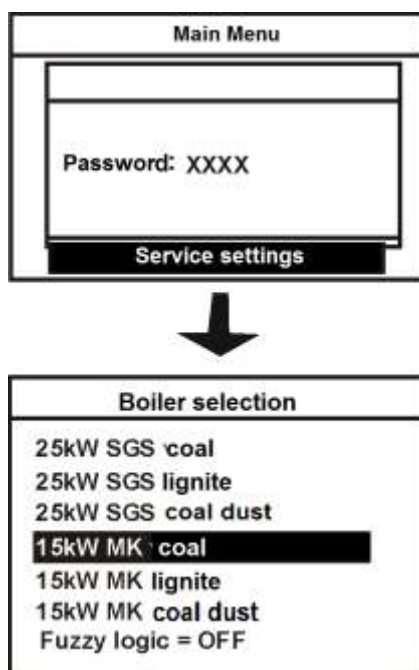

Fig. 53 Selection of boiler and default fuel type for boiler manufacturers[8]

From among the boilers listed in the boiler menu, select and confirm a type of boiler in which the regulator is installed. If there is no appropriate boiler on the list, confirm the ,,Fuzzy logic = OFF" option. Then, the regulator will be operative only in STANDARD mode; the fuzzy logic function will be disabled.

Note: selecting inappropriate boiler which was not tested in PLUM Sp. z o. o. laboratory, can lead to damaging the boiler during its operation, e.g. burning the feeding screw.

Selected fuel will be a default fuel. In the example above, selecting a 15kW MK, coal-fired boiler will make the regulator load stored settings for a 15kW boiler with three types of fuel and hard coal will be a default fuel. Whereas in Menu -> *fuel selection* available for users and fitters, options for a 15kW MK boiler will appear:

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[8] Only boilers and fuels researched in PLUM sp. z o.o. laboratory are available in the regulator.
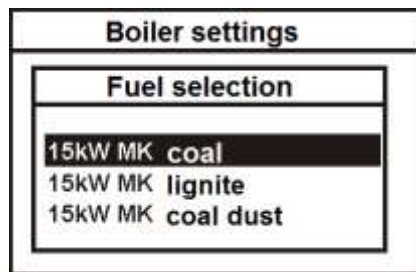
Fig. 54 Selection of fuel for the boiler user

Settings for particular boilers require agreement between the boiler manufacturer and PLUM sp. z o. o.

In order to confirm changes, resetting the regulator network supply is necessary.

19.2 Recording temperatures and alarms

The regulator has another hidden menu for boiler manufacturers which allows to read recorded parameters of boiler operation. This allows to check whether the boiler has been operated in conditions required by the manufacturer, as specified in the boiler documentation. In such cases, any disputes arising from complaints can be settled faster, e.g. if they result from lack of securing the boiler return temperature. It is possible to record data from 1024 days back, that is from about 3 years. You can clear the data from the regulator memory only after connecting the regulator to a computer. In order to enter the recording menu, it is necessary to enter the special password when opening the service settings.
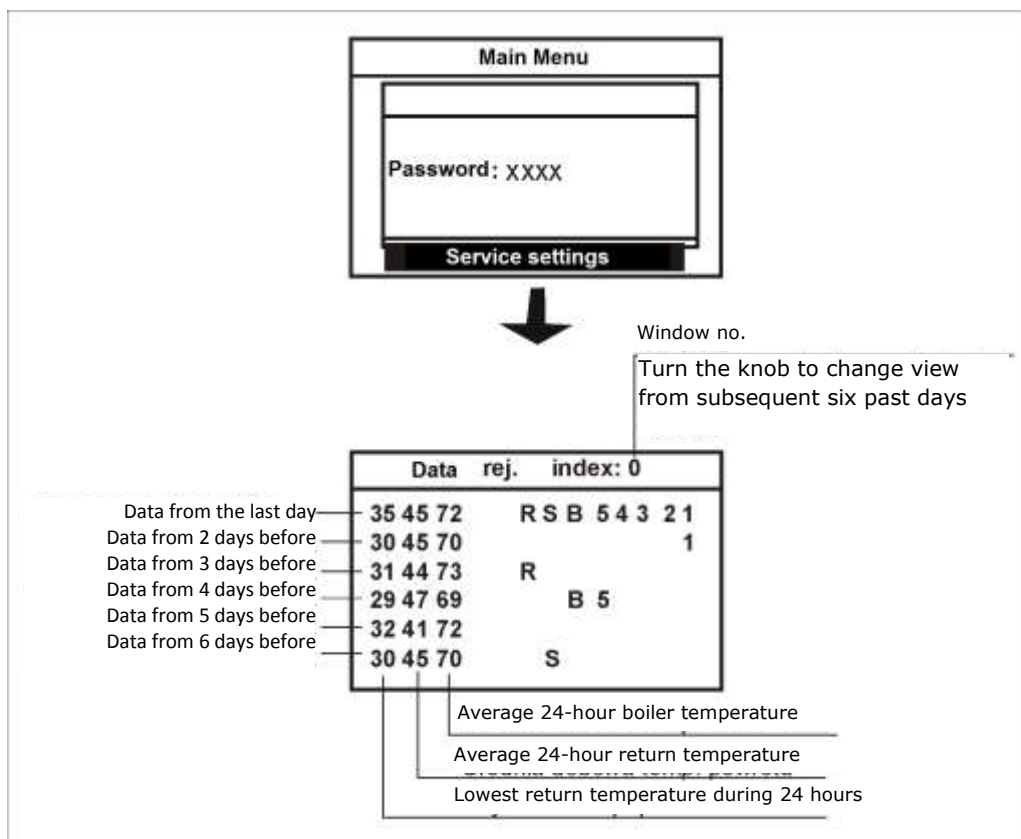

Fig. 55 Readout of stored parameters

Legend:

R – there has been a "reset" during the previous day (24 hours), i.e. a momentary or prolonged interruption in the boiler power supply,

S – within the last day (24 hours), the user enabled the STOP mode of the regulator, or turned it off for a moment or for a longer period,

B – "no sensor", within the last day (24 hours), the return sensor was disconnected or damaged, for a moment of for a longer period,

1 – within the last day (24 hours), alarm 1 occurred, analogically for alarm 2...5, etc.

no.	alarm name
1	Fuel shortage
2	Boiler overheated
3	Flame return to retort
4	Boiler temperature sensor damage
5	Feeder temperature sensor damage

Note: A temperature record of about 108°C indicates that the sensor was disconnected. Values recorded for a particular day are stored in the memory at 00.00.

20 Changes in documentation
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