ZAB–07, ZAB–07 REVERS, ZAB–07 REVERS RR ZAB–12, ZAB–12RR

Boiler regulator

FOR SOLID FUEL-FIRED BOILERS WITH FEEDING SCREW

Individual Fuzzy Logic

FAN	FEEDER	PUMP	PUMP	WEATHER CONTROL	TERMOSTAT	100% FUEL GAUGE 0%
MIXER 1	PUMP 1	SUMMER WINTER	70°C DISINFECTION	STB INPUT	CIRC. PUMP *	CLOCK
MIXER 2	PUMP 2	TERMOSTAT 2	MIXER 3	PUMP 3	TERMOSTAT 3	CIRC. PUMP **
BOILER SWITCH	ALARM					

* - functions available instead Mixer 1
** - functions available with additional extension module MX.01
*** - room panel ecoSTER200 (not included)

CE   RoHS COMPLIANT

SERVICE AND ASSEMBLY MANUAL

ISSUE: 1.6

GENERAL PRINCIPLES OF A PROPER WORK BOILER WITH INDIVIDUAL FUZZY LOGIC:

- **The controller must be programmed individually for each type of boiler and fuel point. 19.1!**

- **There shall be no change in type of operator, and other type of fan gear changes affecting boiler combustion process. Equipment shall comply with factory-installed parts in the circuit by the boiler manufacturer point. 19!**

- **It is recommended to work with a maximum aperture open fan.**

- **Mode, fuzzy logic is not exempt from the need to adjust parameters SUPERVISION point. 8.9.**

- **Mode fuzzy logic in some cases may require control up by. point. 8.8.**

Table of contents

2 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 domestic hot water system against results of malfunction of the regulator, or of errors in its software, should be applied.

⇒ Choose the 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 the 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.

3   General information

The ecoMAX 800R1 boiler regulator, model R1, version ec, is a modern electronic device the purpose of which is to control operation of a 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 water container,
– it automatically maintains a preset temperature of one heating mixer cycle, and after equipping the regulator with an extension module, it controls (altogether) 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 is in favour of natural preservation, decreases fuel consumption and relieves the user of the necessity of adjusting the burner parameters.

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

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

The device is operated in an easy and intuitive way.

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.

4   Information about documentation

The regulator manual is a supplement for the boiler manual. In particular, except for this manual, the boiler manual 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.

5   Storage of documentation

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

6   Applied symbols

In this manual the following graphic symbols are used:

☞   - useful information and tips,

⚠   - important information, failure to observe these can cause damage of property, threat for human and household animal health and life.

Caution: the 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!

7   Directive WEEE 2002/96/EG

Act on electrical and electronic equipment

⇒ Recycle the product and the 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

8 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 regulator mode FIRING-UP , and then switch the regulator into the mode OPERATION.

8.1 Description of buttons
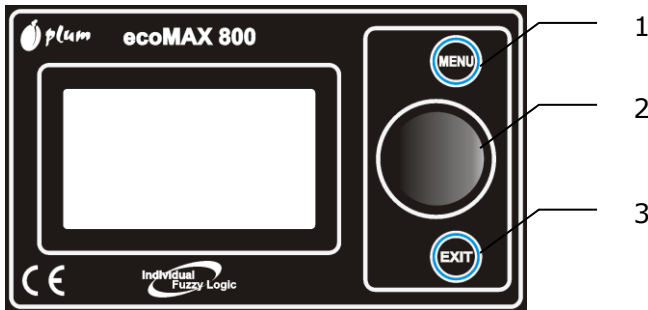
Fig. 1 View of control panel

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

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

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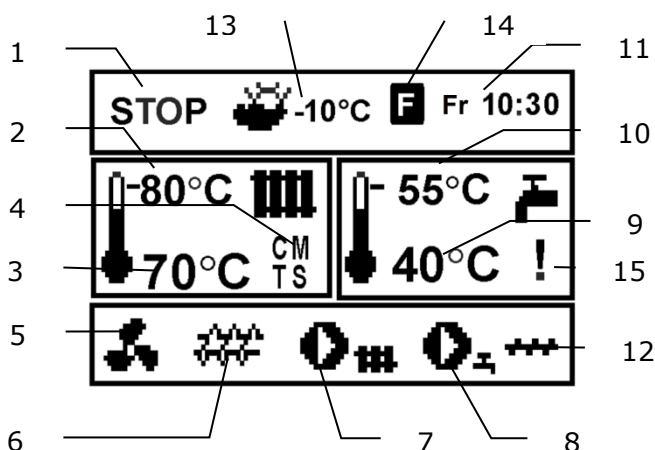
Fig. 2 Display main window

Legenda
1. regulator operation modes: STOP, FIRING-UP , OPERATION, CONTROL,
2. preset boiler temperature,

3. measured boiler temperature,
4. field of values which influence the preset boiler temperature: ,,T" – symbol of decrease in the preset boiler temperature due to disconnection of the room thermostat contacts; „S" symbol of decrease in the preset boiler temperature due to active intervals; „M" – symbol of increase in the preset boiler temperature for the time of filling the domestic hot water (HUW) container; "P" - weather control for the boiler cycle enabled.
5. airflow operation symbol
6. fuel feeder operation symbol,
7. central heating pump operation symbol,
8. domestic hot water pump operation symbol,
9. measured temperature of domestic hot water container,
10. preset temperature of domestic hot water container,
11. clock and day of the week
12. operation symbol ash remover
13. outside (weather) temperature,
14. active fuzzy logic control symbol,
15. warning symbol is activated disinfection of the hot water[1].

The domestic hot water window in the main screen can be changed into a selected mixer cycle using the TOUCH and PLAY knob.
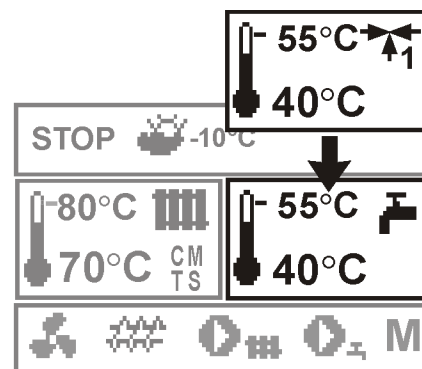
Fig. 3 Auxiliary window, note: the windows for mixers 2 and 3 appear only if the additional mixer module MX.01 is equipped.

---

[1]The symbol is displayed not only in the course of hot water sanitizing function HUW, but also appears when you turn on hot water disinfection function HUW

10

Hot water window on the main screen, you can also change the view of the fuel level by turning the knob TOUCH and PLAY if the parameter of the fuel level is set properly, the details given point. 7.24. Note: The fuel level can be seen in the room panel ecoSTER200.
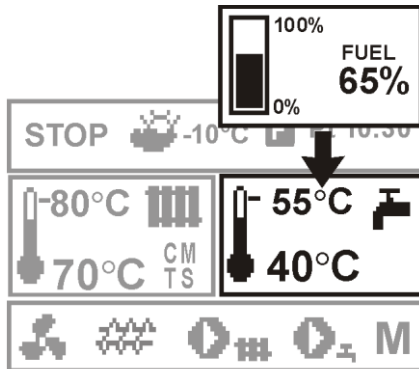
Fig. 4 auxiliary window with a view of the fuel level

8.3 Start-up of the regulator

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

8.4 Presetting boiler temperature

Specify the preset boiler temperature by entering:

MENU -> Preset boiler temperature.

and setting this parameter at the desired value.

The preset boiler temperature can be also set at the main window. Press the "TOUCH and PLAY" knob in the main window and turn it to specify the preset boiler temperature – the temperature "pulsates". Confirm the settings by pressing the "TOUCH and PLAY" knob once more. In order to exit the temperature editing, press the EXIT button.

> Pressing EXIT when the parameter - e.g. the preset boiler temperature - „pulsates" makes the regulator discard the specified value. 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 when the preset boiler temperature is determined in relation to the weather. The preset boiler temperature is temporarily increased in order to fill the domestic hot water container, and the mixer cycles.

8.5 STOP

After its 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 PLAY" knob.
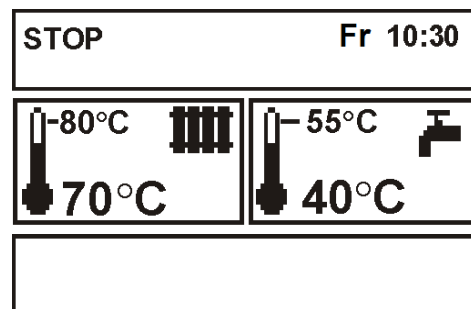
Fig. 4 View of the main window in the STOP mode

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

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

8.6 FIRING-UP

Enter the FIRING-UP mode by selecting the FIRING-UP operation mode and pressing the "TOUCH and PLAY" button.

The FIRING-UP 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 the boiler manufacturer's recommendations.
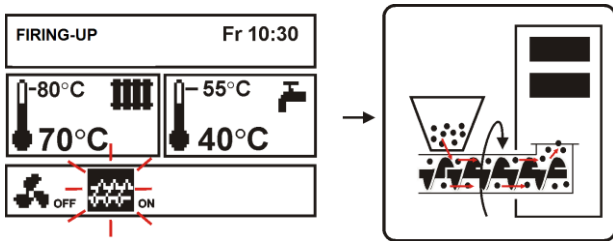
Fig. 5 Manual start-up of the feeder

Pressing the „TOUCH and PLAY" knob on the feeder symbol activates it, which is signalled by an ON sign next to this symbol. Feed the fuel until it appears at the end of the retort.

Press the knob again to turn the feeder off. Next, put some kindling (e.g. for barbecue) under the layer of fuel and FIRING-UP it.
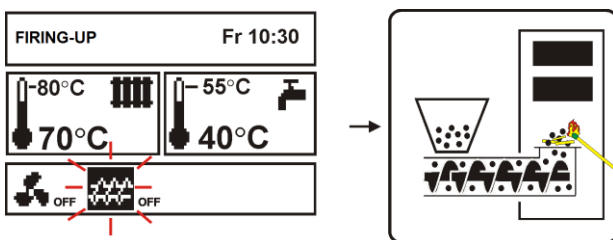
Rys. 6 Disabling the feeder during firing up

Pressing the "TOUCH and PLAY" knob on the airflow symbol activates it, which is signalled by an ON sign next to this symbol. Press the "TOUCH and PLAY" knob again to turn the airflow off. FIRING-UP the fed fuel up and, once in a while, feed another dose of the fue.
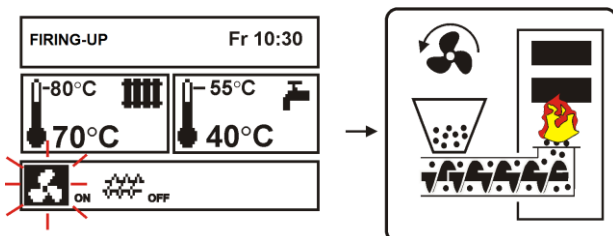
Fig. 7 Manual activation of airflow

☞ The Blow-in can be set by pressing the MENU button and setting the *Blow-in* parameter

After making sure that the fire in the furnace is lit up properly, disable the fan and the feeder, and exit the FIRING-UP mode by pressing the EXIT button. At this moment the regulator will by default switch to the OPERATION mode. The sign OPERATION will appear in the upper left corner. At that time, the regulator works in the 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 CH temperature* + 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 CH temperature* + 5°C, the FIRING-UP mode cannot be enabled. In order to do so, increase the preset CH temperature, or wait until the boiler cools down..

8.7 OPERATION – mode STANDARD

The regulator offers two modes of controlling the boiler furnace: 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 -> Regulation mode, and place the cursor on „Standard".
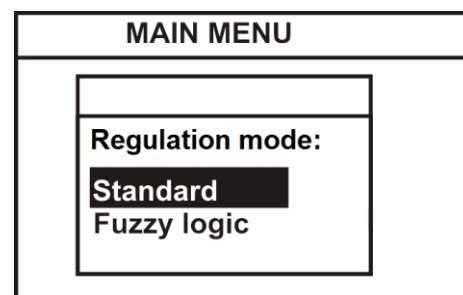
Fig. 8 Selecting the Regulation mode

In the *Standard* regulation mode, the regulator operates in the automatic cycle with <u>user-defined settings</u>. View of the display:

---

[2] Fuzzy Logic available only in special versions of the regulator
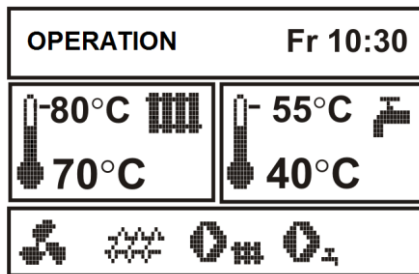
Fig. 9 View of the main window in the OPERATION mode

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

After switching over to the OPERATION mode, the airflow is activated 5s earlier than the feeder, and it works constantly, as presented in Fig.11. The fuel feeder is enabled cyclically. A cycle consists of the feeder operation time (*feed time OPERAT*), and the interval between feeding (*feed interval OPERAT*). 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 *Blow-in*, to match the amount and type of fuel.
Feeder operation time, feeding interval and Blow-in can be set in:

MENU -> FEED TIME OPERAT

MENU -> FEED INTERVAL OPERAT

MENU -> BLOW-IN
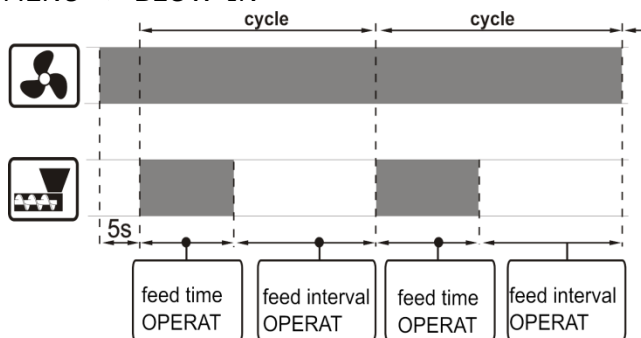
Fig. 10 Airflow and feeder operation cycles in the OPERATION mode.

☞ The order between *the time feed work and the* interval feed work can

be changed, the details in section 11.23

⚠ THE MANUFACTURER'S SETTINGS DO NOT ALWAYS MATCH THE GIVEN BOILER TYPE, THUS THEY MUST BE ADJUSTED TO THE GIVEN TYPE OF BOILER AND FUEL

⚠ Administration time and break WORK administration should be selected so that the furnace is not stepping back to the fuel feed, nor decreased, what can cause burnout screw feeder.

If in the OPERATION mode it is necessary to fill the HUW container, the regulator will increase the preset boiler temperature, fill the HUW container, and return to the original settings.

After reaching the preset CH temperature, the regulator automatically switches into the Supervision mode.

8.8 OPERATION – mode Fuzzy logic

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 time OPERAT, feed interval OPERAT, Blow-in.* The regulator selects the parameters, to optimize the combustion process.

In order to enable the Fuzzy logic regulation mode, enter: MENU -> REGULATION MODE, and place the cursor over „Fuzzy logic".
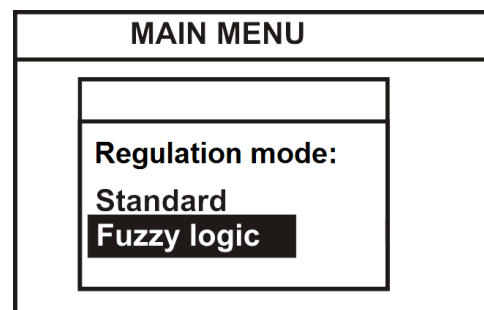
Fig. 11 Selecting the regulation mode

Please note that the fuzzy logic program is selected individually for the given type of the boiler and fuel, and it can work properly only with this boiler and fuel. Therefore, fuzzy logic mode requires activation by the boiler manufacturer in accordance with paragraph. 19.1. If the mode is not activated when you try to change the STANDARD mode fuzzy logic prompted 'function is unavailable.

Fine-tune fuzzy logic

In some cases, depending on fuel quality, it may be necessary to fine-tune the airflow in the *Fuzzy Logic*. Used to this user parameter. MENU → Airflow correction FL. The adjustment range is limited, so that it is possible only to a small extent. It is not recommended to change the parameter settings adjustment if the airfl. correction FL is correct, there is no unburned fuel particles and the furnace does not shrink into the retort. If the fuel is of poor quality and there are unburned particles, then you can increase the amount of air supplied. If the fuel is dried hard, making its burn rate is high and the furnace is fired too hard, then you can decrease the airflow correction FL. Setting range: 85% - 120%. Manufacturer's default setting control 100%.
Note: unburned fuel particles or understated fireplace can also result from incorrect operation of the boiler in SUPERVISION. Therefore it is recommended to adjust SUPERVISION parameters accordingto point. 7.9. ahead of fuzzy logic control up

⚠️ Control mode, fuzzy logic is not exempt from the need to adjust parameters SUPERVISION - the risk of burn-out auger feeder.

☞ Boiler type and fuel type for which the regulator is set, is given in the fuel typemenu - choice of fuel

☞ With fuzzy logic control fan aperture should be fully open and the boiler should be clean.

If you need to replace the fan or brush away the tray must be the same type.

☞ It is recommended that before switching fuzzy logic to control the fire the boiler using FIRE UP mode and wait to stabilize the combustion process.

8.9   SUPERVISION

The SUPERVISION mode can be active both during manual and automatic (Fuzzy Logic) regulation.
The regulator switches into the SUPERVISION 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 CH temperature by + 5°C. In the Fuzzy logic mode, the regulator tries not to switch into SUPERVISION and to supply as much heat as the CH system requires at the time.

In the SUPERVISION 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 increase in temperature.
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.
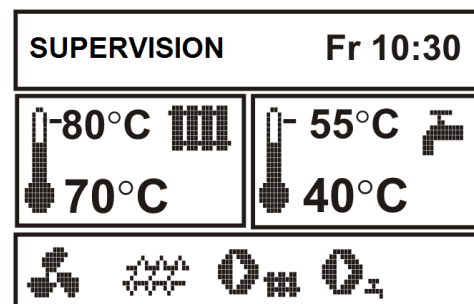
Fig. 12 View of the main window in the SUPERVISION mode
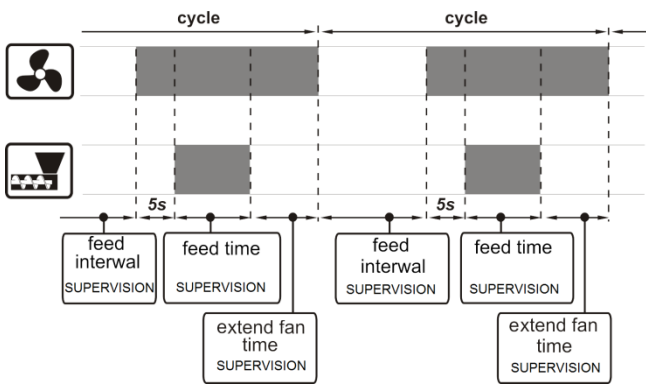
Fig. 13 Fan and feeder operation cycles in the SUPERVISION mode

The interval between operations of airflow and feeder is determined by the parameter *feed interval* SUPERVISION available in:

MENU -> Feed. interv. SUPERV

This time should be set in accordance with the boiler manufacturer's recommendations. The time should be chosen bearing in mind, that too long an interval can make the furnace fall in during the boiler standstills, yet setting an insufficient time will lead to an increase in the boiler temperature. The feeder and airflow operation time in the SUPERVISION mode is set using the parameter *feed time* SUPERVISION, available in:

MENU -> SERVICE SETTINGS -> PASSWORD-> BOILER SETTINGS ->*Feed time superv*

The time of *extend fan time* in order to fire up the fuel after is has been fed is set in:

MENU -> SERVICE SETTINGS -> BOILER SETTINGS -> *Extend Fan Time*

⚠️ Set the parameters *feed interval C* SUPERVISION, *feed time* SUPERVISION and *extend fan time* to allow the boiler temperature gradually drop in this mode. Wrong settings can make the boiler overheat.

In the SUPERVISION mode, the fan works with identical power as in the OPERATION mode, equal to the *Blow-in* parameter.

The regulator automatically returns to the OPERATION mode once the boiler temperature decreases by the value *boiler*

hysteresis in relation to the preset temperature.

Recommended settings SUPERVISION mode:
 -*Feed Interval supervision = 15 minutes*
- *Feed time supervision = 12s,*
- *Airflow oper.extend supervision = 1s.*

8.10 Fuel type

The fuel type menu is intended only for the FUZZY LOGIC regulation mode. Choose the appropriate type of fuel, accordingly to the fuel used in the boiler.
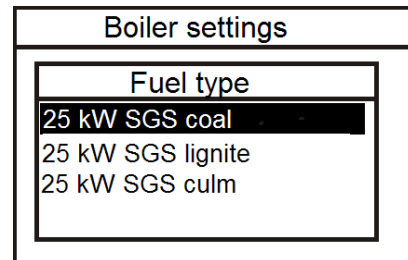
Fig. 14 Fuel type

In the STANDARD regulation mode, the user must choose the values of the burner parameters on their own!

8.11 Settings for domestic hot water HUW

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

- *disable* feeding of the container, parameter *OFF*,
- set HUW priority using the *priority* parameter - in this case, the CH pump is off and the mixer is closed in order to fill the HUW container faster,
- enable simultaneous operation of the CH and HUW pump using the parameter *no priority*

8.12 Presetting domestic hot water temperature

The HUW temperature can be preset by entering:

MENU -> PRESET HUW TEMP.

and set this parameter at the desired value.

15

The preset domestic hot water temperature can be also set at the main window. 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 – you can set it then. Press the „TOUCH and PLAY" knob to preset the domestic hot water temperature. Confirm the settings by pressing the "TOUCH and PLAY" knob once more. In order to exit the temperature editing, press the EXIT button.

8.13   Enabling the SUMMER function

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

MENU -> HUW PUMP MODE-> *Summer*

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

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

The summer can be activated automatically with the parameters: Auto *SUMMER* mode, SUMMER mode act. temp., *SUMMER* mode deact. temp. parameters are available: MENU → SETTINGS HUW

8.14   HUW container disinfection
The regulator has a function of automatic, periodical heating of the HUW water container to 70°C. The purpose of this is to eradicate bacterial flora from the HUW container.

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

Once per week, on Sunday at 02:00 a.m., the regulator increases the HUW container temperature. After 10 minutes of keeping the container 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 support is disabled.

8.15   Mixe settings
Settings of the mixer can be found in:
MENU -> MIXER 1 SETTINGS

Mixer settings without a weather sensor
Set the desired temperature manually heating water, mixing with a Preset mixer temp. parameters, such as the value of 50° C. The value should be such as to ensure obtaining the desired room temperature.

After connecting the room thermostat, set Reduce preset mixer temperature to thermostat for example, at 5 °C. The value should be selected empirically. Room thermostat can be traditional thermostat (NO-NC) or ecoSTER200 room panel. Upon activation of the thermostat preset temperature mixer circuit is reduced, which in properly selecting the lower value will cause stunted growth in a heated room temperature.

Mixer settings with weather sensor (no room panel ecoSTER200)

Set the weather SUPERVISIONs parameter on.

Using the parallel shift of the curve parameter set the desired temperature heating room, guided by the following formula: Room set temperature = 20 °C + curve shift. Example. For the room temperature of 25 °C value of the heating curve shift must be set to 5 °C. For the room temperature of 18 °C parallel displacement parameter of the curve shift to be set to -2 °C.

Select the weather curve by point. 7.16

In this configuration, you can connect a room thermostat, which will be compensated for the inaccurate selection of the heating curve, where the value of the heating curve is chosen too large.

Then, set the value Reduce preset mixer temperature to thermostat parameter, for example. the value of 2 °C. After contact opening set temperature thermostat mixer circuit is reduced, as the proper choice of the reduction, will drag down the temperature in a heated room.

Mixer settings with weather sensor and room panel ecoSTER200)

Set the the weather SUPERVISIONs on.

Select the weather curve by point. 7.16

EcoSTER200 controller automatically shifts the heating curve according to the room temperature. The controller applies the setting to 20 °C, for example, the temperature set point temperature = 22 °C, the controller moves the heating curve at 2 °C, the temperature set point temperature = 18 °C, the heating curve will shift control of - 2 °C. In some of the cases described in paragraphs. 7.16 may need to control up shift the heating curve.

In this configuration, the room thermostat ecoSTER200   can:
- Reduce the constant temperature of the heating circuit when the preset room temperature is reached. Similarly, as described in the previous paragraph (not recommended),   or
- Automatically, continuously adjust the temperature of the heating circuit. It is not recommended to use both options. Automatic adjustment occurs at room temperature according to the formula:

Adjustment = [(preset room-temperature measured room temperature] x Room temp. factor / 10

Example.
Set temperature in a heated room (set in ecoSTER200) = 22 °C. The temperature measured in the room (by ecoSTER200) = 20 °C. Room temp. factor = 15 Preset mixer temperature is increased by [(22 C -20 °C)] x15/10 = 3 °C. Please find the correct Room temp. factor parameter. Range: 0 ... 50 The higher the ratio,

the greater the correction preset boiler temperature. When set to a value, 0 " Preset mixer temperature is not corrected. Note: To set the values too high room temperature factor can cause cyclical fluctuations in room temperature!

8.16   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 given building too, this allows to maintain a constant temperature inside, regardless of the temperature outside. Therefore, it is crucial to select a proper heating curve.

Note: when looking for the impact of the heating curve off the room thermostat to the controller (regardless of whether the room thermostat is connected or not), by setting:
- The mixer circuit: MENU → Settings mixer → Room thermostat→ Reduce preset mixer temperature to thermostat: =0
- For boiler: MENU → Settings → Settings Service → Settings boiler → Room thermostat →Reduce preset mixer temperature to thermostat = 0
And in the case of a connected room panel ecoSTER200 also set the Room temp. factor = 0
Guidelines for setting proper heating curve:
- floor heating   0,2 -0,6
- radiator heating   1,0 - 1,6
- boiler   1,8 - 4
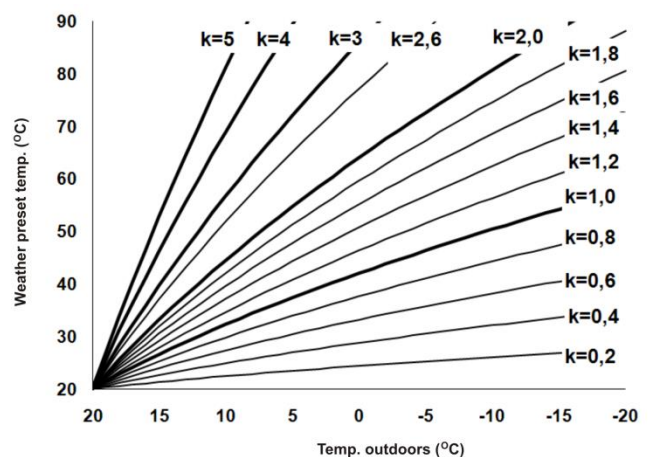
Fig. 15 Heating curves

17

Tips for selecting appropriate heating curve:
 - if the temperature inside rises while the temperature outside drops, the selected heating curve is too high,
 - if the temperature inside drops while the temperature outside drops as well, the selected heating curve is too low.

- if in winter the room temperature is suitable and the appropriate time warmer weather is too low, it is recommended to increase the Curve shift and reduce the heating curve,
- If the cold room temperature is too low, and during the warmer weather is too high, it is advisable to reduce the parallel displacement of the heating curve and raise the heat 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 in the basis of the heating curve if it goes beyond the temperature range for the given cycle.

8.17 Description of setting night-time decreases

In the regulator menu, you can set time periods for: boiler, heating cycles, and domestic hot water container.

The time periods allow to lower the preset temperature in the given 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 increases thermal comfort and decreases fuel consumption.

In order to activate the time periods, set the parameter Night time decrease. to on in:

MENU -> Night time decrease
The night-time decreases can be specified separately for weekdays, Saturday and Sunday.
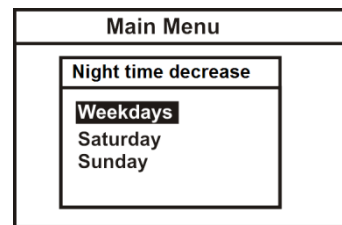
Fig. 16 Time periods selection window

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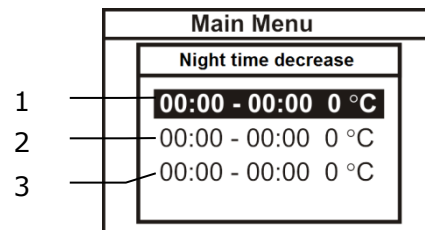
Legenda:
 1. First time period,
 2. Second time period,
 3. Third time period.

Below is an example of how to specify time periods. The following example assumes night-time decrease in the preset CH temperature lasting from 22:00 till 06:00 (sleeping time), as well as another decrease between 09:00 and 15:00 (when the household members leave the heated rooms – in order to go to work and to school).

☞ Start defining the time periods from 00:00 (midnight).
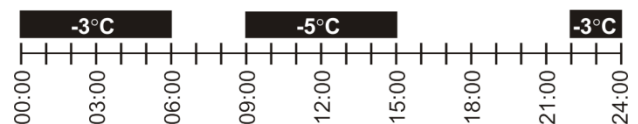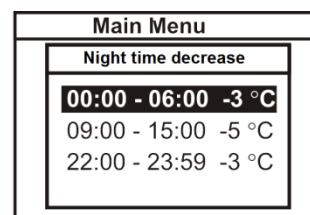
Fig. 17 Example of defining time periods

In the example above, the regulator will decrease the preset CH 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 CH temperature by 5°C. Between 15:00 and 22:00, the regulator will keep the preset CH 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 hours are specified.

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

Fig. 18 Signalling time periods

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

8.18   Control of circulation pump

Note: in the basic controller functionality is available instead of manual mixing. The functionality is also available by connecting additional expansion modules MX.01, it retains the possibility of operating the mixing valve.

Settings are located in:

Menu → Night time decrease→ CIRCULATION. pump

and

Menu → Settings Service → Password→Settings CH and HUW

Settings time control circulation pump are the same as setting depressions night. At defined intervals circulation pump is switched off. The missed periods circulation pump is switched on Circulating pump operation time on time when Circulating pump standstill time. Detailed settings given point. 10.15, 12.8, 12.9.

8.19   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 change the information windows.

After connecting a mixer extension module MX.01, two additional windows with information about the extra mixers are activated.
The sign „CAL" in the mixer information window, next to the valve opening extent symbol, means active calibration. Wait until the mixer valve servo calibration is completed to see the current percentage of its opening.

8.20   Off feeder

Some retort boilers are adapted for burning other types of fuel, e.g. wood rejects, etc. Burning thereof requires the feeder to be off. You can disable the feeder via the regulator; to do so, set the value of the *feeder* parameter to *off.* The parameter can be found in:

MENU -> FEEDER

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

Disable the feeder only if the boiler manufacturer provided for such solution. Observe the boiler manufacturer's recommendations.

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

8.21   Off fan

In case the boiler is adapted for combustion of the additional fuel on the grate is possible to stop the fan. Then the air is supplied through the chimney. To turn off the fan, go to MENU → Fan and set,, Off ". Note: turn off the fan turns off feed at the same time.

8.22   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 you can check whether the given device is operative or properly connected. During the calibration mixer servo input to the actuator manual control menu is locked.

Manual control	
Feeder	OFF
Fan	OFF
CH pump	OFF
DHW pump	OFF
Contact 30-31	OFF
Pump mixer1	OFF
Mixer1 open	OFF
Mixer1 closed	OFF

Fig. 19 View of manual control window where OFF - indicates that the device is turned off, ON - switched on

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

☞ Position Mix 1 close / circulation means closing the mixer servo and if the servo mixer is not used, support service mixer operation = off, or just the pump is circulating pump is connected to the terminals 14-15.

8.23   Restoring user settings

In order to restore default user settings, place the cursor on the „YES" option and press the "TOUCH and PLAY" knob.
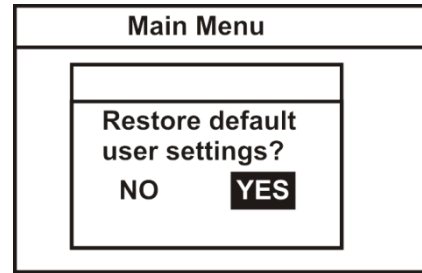
Fig. 20 Default service settings

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

8.24   Setting the fuel level

The inclusion of the fuel level indicator
To enable the fuel level set threshold value of Fuel shortage prompt display to a value greater than zero, such as 10%.
The parameter is in:
MENU → Fuel Level→ Alarm Level
Turning the knob TOUCH and PLAY in the main window causes the window to the level of the fuel.

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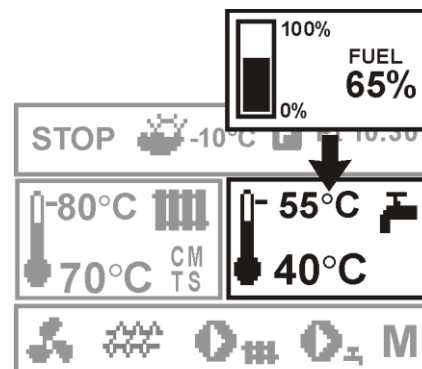
Fig. 22 auxiliary window with a view of the fuel

Support the fuel level indicator
Each time you filled up the fuel container to the desired level, press and hold the knob in the main window, you will be prompted:
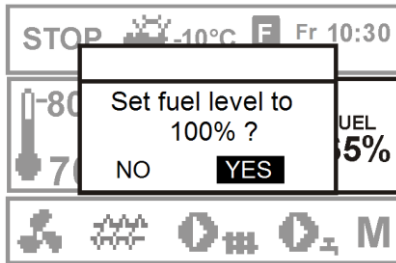
Fig. 23 Using the fuel level

After selecting and confirming,, YES, "the fuel level is set to 100%. Note: Fuel can be sprinkle at any time, you do not need to wait to empty the fuel container. However, the fuel must be sprinkle always to a level corresponding to 100% and approved by pressing and holding the knob.

Description of operation

The controller calculates the fuel level based on the current fuel consumption. The factory settings will not always correspond to the actual consumption by the boiler, so to work properly, this method requires calibration level by the regulator. I do not need any additional fuel level sensors.

Calibration

Cover with fuel container to a level which corresponds to the full loading, then set the value of the parameter calibration level of 100%. The parameter is in: MENU →Fuel Level → Cal. Fuel level. In the main window pointer is set to 100%. An indication of the duration of the calibration process is blinking fuel gauge. The indicator will blink to indicate the time point corresponding to the minimum level of consumption. Please keep decreasing control fuel level in the container. As soon as the level drops to a minimum, you must set the parameter calibration level to 0%.

☞ Calling alarm, "no fuel" according to the point. 15.1 automatically sets the point of 0%. The fuel level gauge is connected to the alarm function, "no fuel" These functions work independently.

ecoMAX 800, model R1

Hydraulic diagrams

8.25   Diagram 1
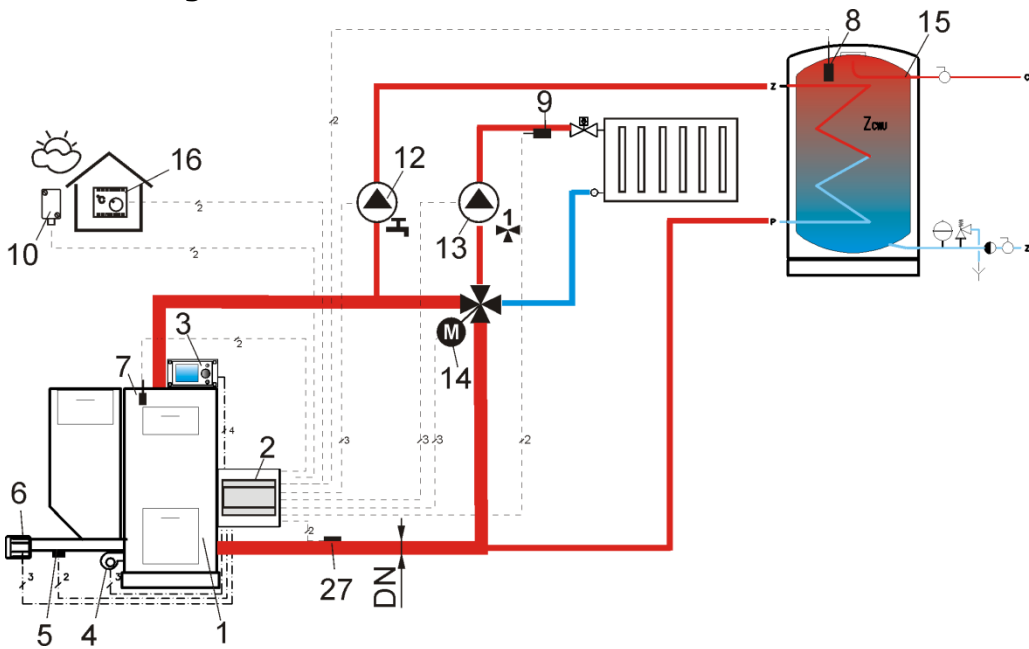
Fig. 21 Diagram with four-way valve controlling the central heating cycle[3],where: 1- boiler with retort feeder, 2 – ecoMAX regulator – executive module, 3 – ecoMAX regulator – control panel, 4 - Fan, 5 – feeder temperature sensor, 6 – gear motor engine , 7 – boiler temperature sensor, 8 - domestic hot water temperature sensor, 9 – mixer temperature sensor, 10 – temperature sensor – weather, 12 – domestic hot water cycle pump, 13 – mixer cycle pump, 14 – mixer servo, 15 – domestic hot water container, 16 – room thermostat, 27 – return temperature sensor. (does not affect the control of the combustion process), 31 - Reed (piston position sensor)

⚠	To improve the circulation of water in the boiler gravity circuit (circuit shown in bold) include: use large sections of pipe DN and four-valve, to avoid more knee and throats section, apply different rules for the construction of the installation of gravity, such as the maintenance of inheritance, etc. If the sensor is mounted adjacent return, then it must be thermally isolated from the environment and to improve the thermal contact with the pipe by applying thermal paste. Preset boiler temperature must be set high enough to provide thermal power for the mixer circuit annealing while the water returning to the boiler.

SUGGESTED SETTINGS:

Parameter	Setting	MENU
Return protection	Valve 4D	service settings -> boiler settings
Min. return temp.	42°C	service settings -> boiler settings
Return temp. hysteresis	2°C	service settings -> boiler settings
Valve closing	0%	service settings -> boiler settings
Increasing pre-set boiler temp.	5-20°C	service settings -> CH and HUW settings
Min. pre-set boiler temperature	65°C	service settings -> boiler settings
Mixer support 1	CH on	service settings -> mixer 1 settings
Max. preset mixer temp.	75°	service settings -> mixer 1 settings
Mixer heating curve	0.8 – 1.4	service settings -> mixer 1 settings
Out. temp. control	on	service settings -> boiler settings

Brief description: The HUW pump (12) can start its operation only after the boiler exceeds the *CH pump start temp.* (by default 40°^{O}C) Mixer pump and servo start operation regardless of the value of the parameter *CH pump start temp.* The mixer servo (14) founds such valve opening

---

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

stage at which the temperature at sensor (9) will be equal to the *preset mixer temperature.* 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 container (15) is filled, i.e. when the temperature on sensor (8) is equal to the *preset HUW temperature.* When the temperature on sensor (27) drops below the value *Min. return temp.*, the servo (14) closes to the value *close valve for return protect.* After the temperature on sensor (27) increased buy the value *Return temp. hyst.*, the servo switches into stabilization of *preset mixer temperature.*

The setting *Mixer operation = CH on* guarantees that even in the case of the boiler (1) overheating, the mixer (14) will open maximally, and the mixer pump (13) will not be disabled at the moment of exceeding the *Max. preset mixer temp.* Return protection is only available to the mixer 1 circuit.

8.26 Diagram 2
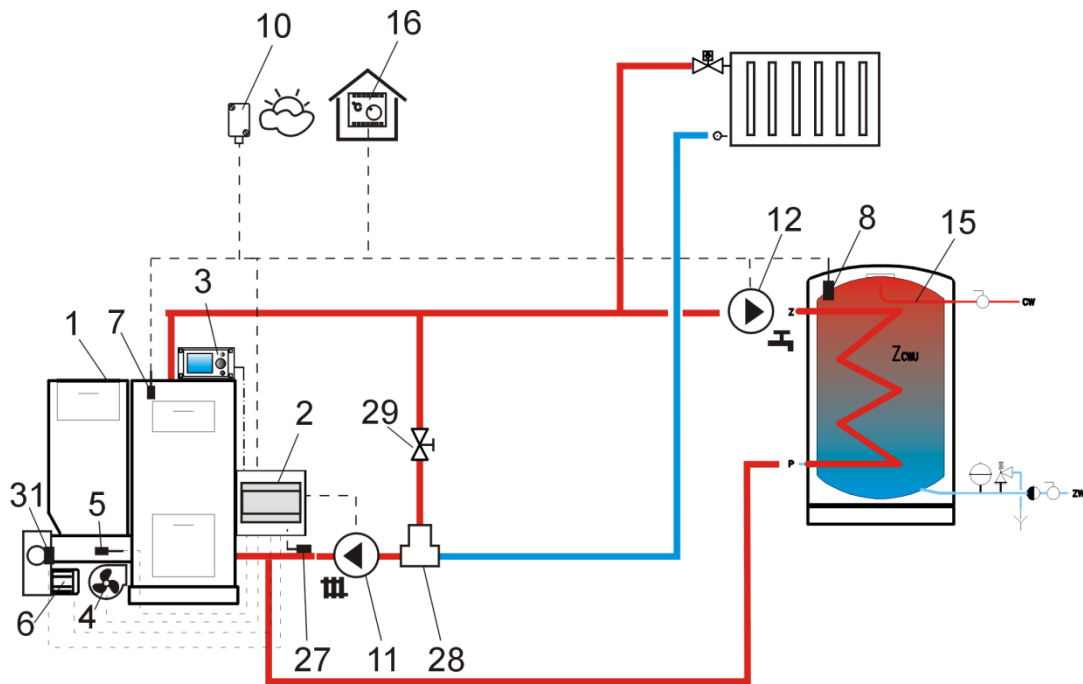
Fig. 22 Diagram with thermostatic three-way valve which protects the temperature of return water[4], where: 1- boiler with retort feeder, 2 – ecoMAX regulator – executive module, 3 – ecoMAX regulator – control panel, 4 - Fan, 5 – feeder temperature sensor, 6 – gear motor engine , 7 – boiler temperature sensor, 8 - domestic hot water temperature sensor, 9 – mixer temperature sensor, 10 – temperature sensor – weather, 11 – central heating cycle pump, 12 – domestic hot water cycle pump, 13 – mixer cycle pump, 14 – mixer servo, 15 – domestic hot water container, 16 – room thermostat, 27 – return temperature sensor, 28 – thermostatic three-way valve 50-55°C, 29 – throttle (poppet) valve. 31 – Reed (piston position sensor)

SUGGESTED SETTINGS:

Parametr	Nastawa	MENU
Return protection	Valve 3D	service settings -> boiler settings
Mixer support 1	off	service settings -> mixer 1 settings

Brief description: The CH pump (11) and the HUW pump (12) can start their operation only after the boiler exceeds the *CH pump start temp.* (by default 40°C). The thermostatic valve (28) closes at the initial stages of heating, when the 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) –

---

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

pump (11). The thermostatic valve (28) opens after the temperature returning to the boiler 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 container (15) is filled, i.e. when the temperature on sensor (8) is equal to the preset HUW temperature.

8.27   Diagram 3
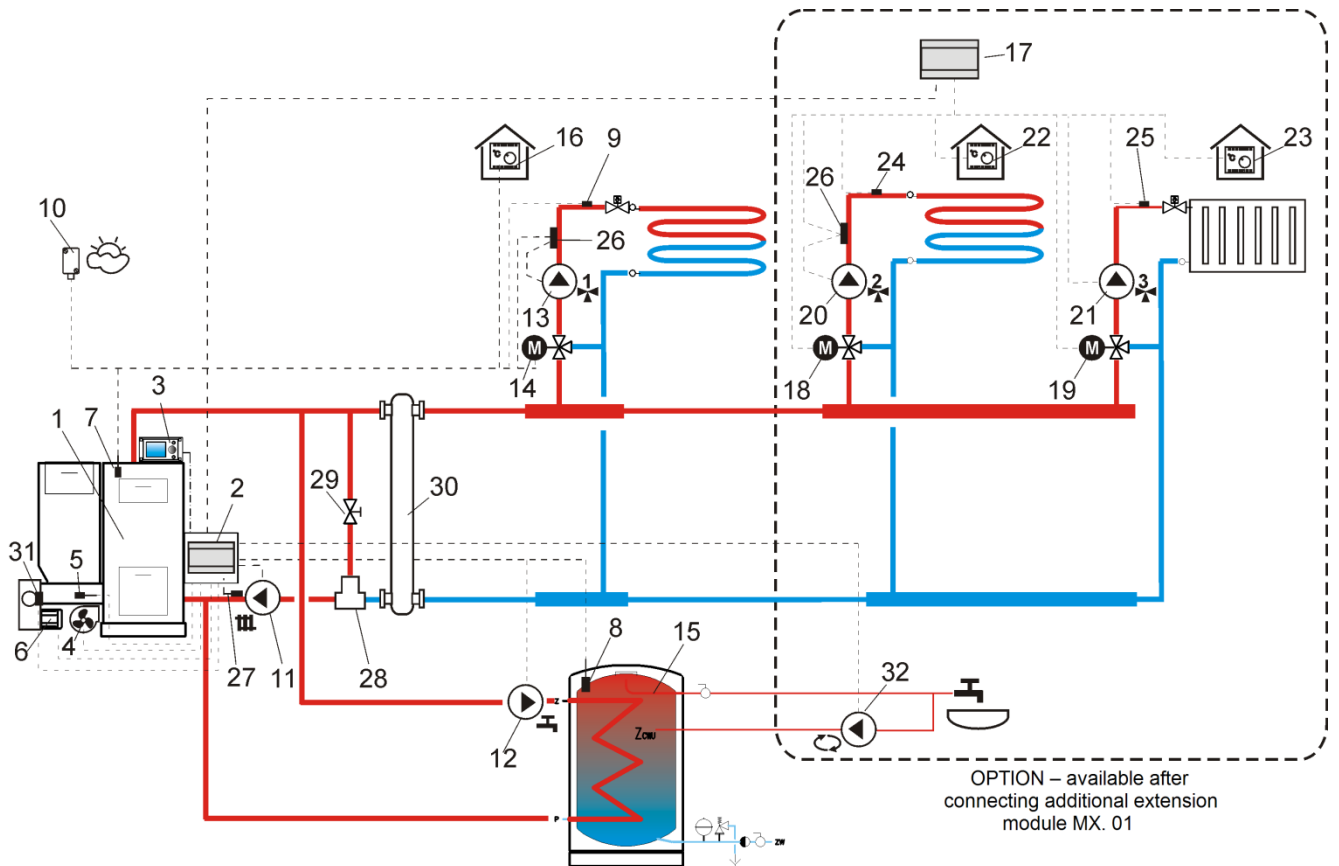
Fig. 23 Diagram with a three-way thermostatic valve which protects the temperature of the return water, and a three-way valve which feeds floor heating, as well as with two additional mixer cycles after attachment of extension module MX.01[5], where 1 – boiler with retort feeder, 2 - ecoMAX regulator - executive module, 3 - ecoMAX regulator – control panel, 4- Fan, 5 – feeder temperature sensor, 6 – gear motor engine, 7 – boiler temperature sensor. 8 – domestic hot water temperature sensor, 9 – mixer temperature sensor, 10 – temperature sensor—weather, 11 – central heating cycle pump, 12 – domestic hot water cycle pump, 13 – mixer cycle pump, 14 – mixer servo, 15 – domestic hot water container, 16 – room thermostat, 17 – ecoMAX 800 regulator – mixer module MX.01. 18 – mixer servo 2, 19 – mixer servo 3, 20 – mixer pump 2, 21 – mixer pump 3, 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°C (cuts off power supply of mixer pump when the maximum temperature is exceeded – the thermostat is not part of the ecoMAX 800 regulator set), 27 – return temperature sensor (does not affect the control of the combustion process), 28 – thermostatic three-way valve 50-55°C (protecting boiler return), 30 – fluid coupling (eliminates necessity of balancing the pumps' flows),31 –Reed (piston position sensor), 32 – pump circulation.

---

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

SUGGESTED SETTINGS:

Parameter	Setting	MENU
Return protection	Valve 3D term.	service settings -> boiler settings
Mixer support 1	on, floor	service settings -> mixer 1 settings
Max. pre-set mixer temp. 1	50°C	service settings -> mixer 1 settings
Mixer weather control 1, 2, 3, 4	off	menu→ mixer settings 1,2,3
Mixer heating curve 1	0.2 – 0.6	service settings -> mixer 1 settings
Mixer support 2	on, floor	service settings -> mixer 2 settings
Max. pre-set mixer temp. 2	50°C	service settings -> mixer 3 settings
Mixer heating curve 2	0.2 – 0.6	service settings -> mixer 2 settings
Mixer support 3	off CH	service settings -> mixer 3 settings
Max. pre-set mixer temp. 3	80°	service settings -> mixer 3 settings
Mixer heating curve 4	0.8 – 1.4	service settings -> mixer 3 settings
Boiler weather control	off	service settings -> boiler settings

SUGGESTED SETTINGS:

Parameter	Setting	MENU
Return protection	Valve 3D term.	service settings -> boiler settings
Mixer support 1	on, floor	service settings -> mixer 1 settings
Max. pre-set mixer temp. 1	50°C	service settings -> mixer 1 settings
Mixer weather control 1, 2, 3, 4	off	menu→ mixer settings 1,2,3

9 Technical data

Voltage	230/400V~;
Current consumed by regulator	I = 0,02 A[6]
Maximum rated current : CH pump HUW pump Fan Engine ash remover Mixer motor Feeder (version control 1) Feeder (version control 2) Note: The total loading (without feeder) up to six (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
ZAB-07 REVERS RR: Maximum rated current: CH pump HUW pump Fan Engine ash remover Mixer motor Feeder (version control 1) Feeder (version control 2) Note: The total loading (without feeder) up to six (6) A. Circulation HUW pump Mixer pump 3 Grate ON Grate OFF Mixer pump 2 Mixer motor 2 ON Mixer motor 2 OFF	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 2(2) A 2(2) A 3(2,6) A 3(2,6) A 3(2,6) A 3(2,6) A } together max. 6(6)A 3(2,6) A
ZAB-12: Maximum rated current: CH pump HUW pump Fan Engine ash remover Mixer motor Feeder Note: The total loading (without feeder) up to six (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 6(6) A
ZAB-12 RR: Maximum rated current CH pump HUW pump Fan Engine ash remover Mixer motor Feeder Note: The total loading (without feeder) up to six (6) A. Circulation HUW pump Mixer pump 3 Grate ON Grate OFF Mixer pump 2 Mixer motor 2 ON	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 6(6) A 2(2) A 2(2) A 3(2,6) A 3(2,6) A 3(2,6) A } together max. 6(6)A 3(2,6) A
Regulator protection rating	IP20
Ambient temperature	0...50 °C
Storage temperature	0...65°C
Relative humidity	5 - 85% without condensation
Measuring range of temperature sensors CT4	0...100 °C
Measuring range of temperature sensors CT4-P	-35...40 °C
Accuracy of temperature measurements with sensors	2°C
Terminals	Screw terminal on the mains voltage side 2,5mm² Screw terminals on the control side 1,5mm²
Display	Graphic 128x64
External dimensions	Control panel: 164x90x40 mm Executive module: 140x90x65 mm
Total weight	0,5 kg
Norms	EN 60730-2-9 EN 60730-1
Software class	A
Protection class	To be built into class I devices

Table 1 Technical data

[6] It is a current consumed by the regulator itself. Total current consumption depends on devices connected to the regulator.

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 pcs.
- panel screws B3x8   2 pcs.
- manual   1 piece
- warranty   1 piece
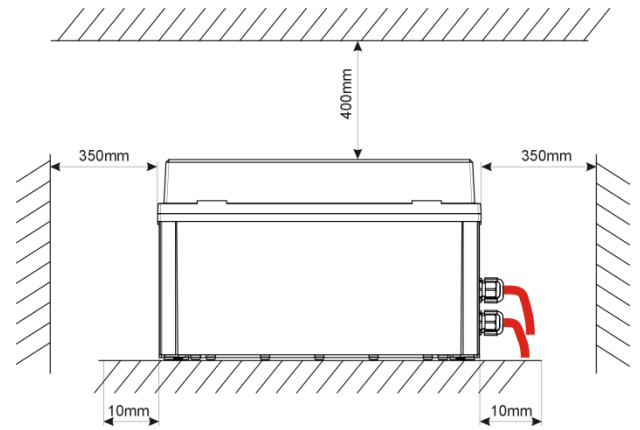
Fig. 27 Installation conditions

9 Conditions of storage and transport

The regulator cannot be exposed to direct effects of weather, i.e. rain and <u>sunlight.</u> Storage and transport temperature cannot exceed the range of -15…65 °C.

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

10 REGULATOR INSTALLATION

This forum is designed for boiler manufacturers and skilled technicians. Boiler manufacturer and servicer should also familiarize themselves with the other departments of instruction.

WARNING! The cover must be secured before opening by the unauthorized persons with a padlock. Closure in the cover to mount a lock.

10.1 Environmental conditions

The regulator has been designed to be used in PN-EN 60730-1. It is prohibited to operate the regulator in explosive gas and flammable dust atmosphere (e.g. coal dust).

10.2 Conditions of building

The controller is designed to be mounted on a rigid and stable surface. When installing the controller must provide the following area:

Output signal cables glands on the right side of the housing, Figure 28 When connected to the pin connector cable that hooks them if loose, prevent them access to items on which there is dangerous voltage.
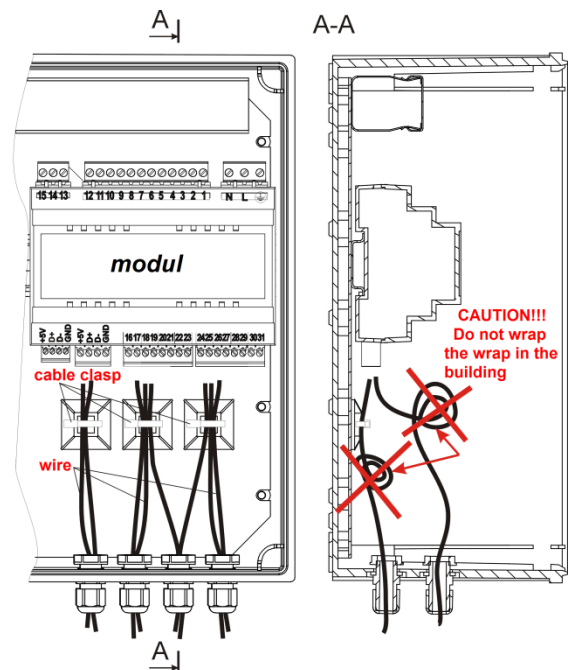
Fig. 28 View to connect wiring to the terminal chamber

Mains voltage cables 230V/400V ~ output by glands on the left side of the housing. Make sure that it is not possible breaking wires after crimping them in glands. Conductors exposed to mechanical loads must be installed in such a manner that did not exist in relation to their external stresses (lead in the trays).

Cable gland PG09-14 piece to cable at diameter 4-8mm
Cable gland PG13,5-2 piece to cable at diameter 8-12mm

Fig. 29 The range of diameters cables installed in cable glands

10.3 Ambient temperature

Operating temperature regulator can not exceed the range of 0-50 ° C. It is recommended to measure the temperature in buildings designed for the controller.

10.4 Protective bonding

Housing boiler peripherals PE pipes and other conductive parts, connected to the terminal marked with the symbol ⏚, inside the building.
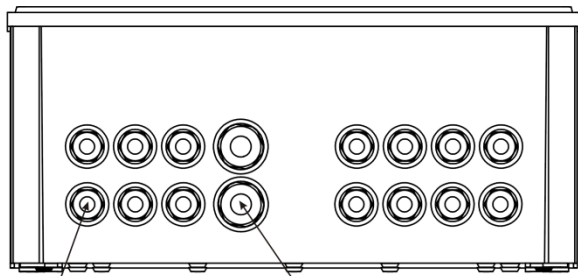
10.5 Removing the control module

In the event it becomes necessary to remove the control unit (3), flat screwdriver (2) to the tabs (1).
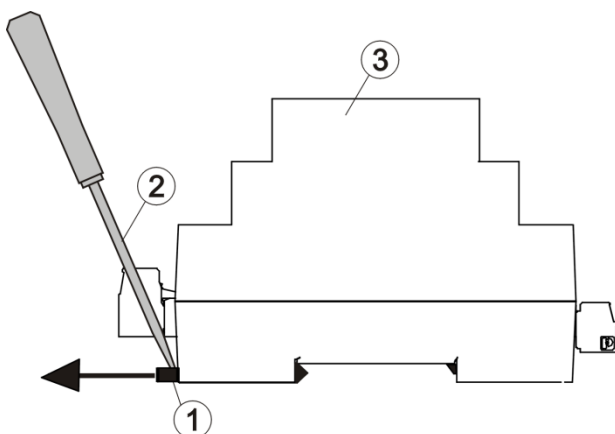
Fig. 30 Installation conditions

10.6 Connecting electrical system

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

- three core (with protective wire),
- in accordance with applicable regulations.

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

Diagram of electrical connections is presented inf Fig.32. The connection wires should not have contact with surfaces of room temperature exceeding the nominal temperature of their operation.

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

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

.

⚠ Connecting mains supply 230V~ to terminals 16-31 and to transmission connectors RS485 will damage the regulator and creates risk of an electric shock.

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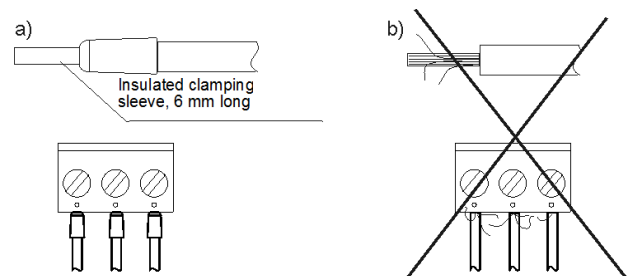
Fig.31 Securing wire tips: a) right, b) wrong

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

Fig. 24 ZAB-07 diagram for electric connections with external devices.

Switch 10A type C

L1 L2 L3 NC A1
T1 T2 T3 NC A2
LC1K0610P7

22 12
21 11
24 14
230V AC
24 12
21 11
22 14
A2 A1
DC 5V
RM84
GZT80
A2 A1

COVER

XB7ES545P

21
22

2 4 6
ŁK16R-2.8211
1 3 5

CONTROL

MODULE

15 14 13   12 11 10 9 8 7 6 5 4 3 2 1   N L

RS485   RS485
+5V D+ D- GND   +5V D+ D- GND

16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

CONTROL PANEL

Sensor BOILER
Sensor FEEDER
Sensor HUW
Sensor MIXER
Sensor WEATHER
Sensor LEVEL

REVERSE

Outputs:

MIXER OFF 50
MIXER ON 51
52
ASH REMOVAL 53
54
DHW PUMP 55
56
CH PUMP 57
58
FAN 59
60
STB 61
62
V2 63
C 64
W2 65
FEEDER U2 66
U1 67
N 68
SUPPLY L 69

MOUNTING PLATE

Fig. 25 ZAB-12 diagram for electric connections with external devices.

MOUNTING PLATE

XB7ES545P

ŁK16R-2.8211

21
22

2 4 6
1 3 5

69
68
67 SUPPLY
66
65
64 FEEDER
63
62 STB
61
60 FAN
59
58 CH PUMP
57
56 DHW PUMP
55
54 ASH REMOVAL
53
52 MIXER ON
51
50 MIXER OFF
Outputs:

12 11 14
GZT80
A1
22 21 24
230V AC
A2
DC 6V

LC1K0610P7
A1
NC A2
L3 T3 NC
L2 T2
L1 T1

LC1K0610P7
A1
NC A2
L3 T3 NC
L2 T2
L1 T1

GZ1-M07
5
3
1
6
4
2
GZ1AN11
31 32

N
L

CONTROL
MODULE

16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

REVERSE
SIGNALIZATION
Sensor LEVEL
Senor WEATHER
Sensor HUM
Sensor FEEDER
Sensor BOILER

RS485 RS485
GND GND
+ +
- -
+5V +5V

CONTROL
PANEL

Fig. 26 ZAB-07 REVERS diagram for electric connections with external devices.

Fig. 27 ZAB-07 REVERS RR diagram for electric connections with external devices.
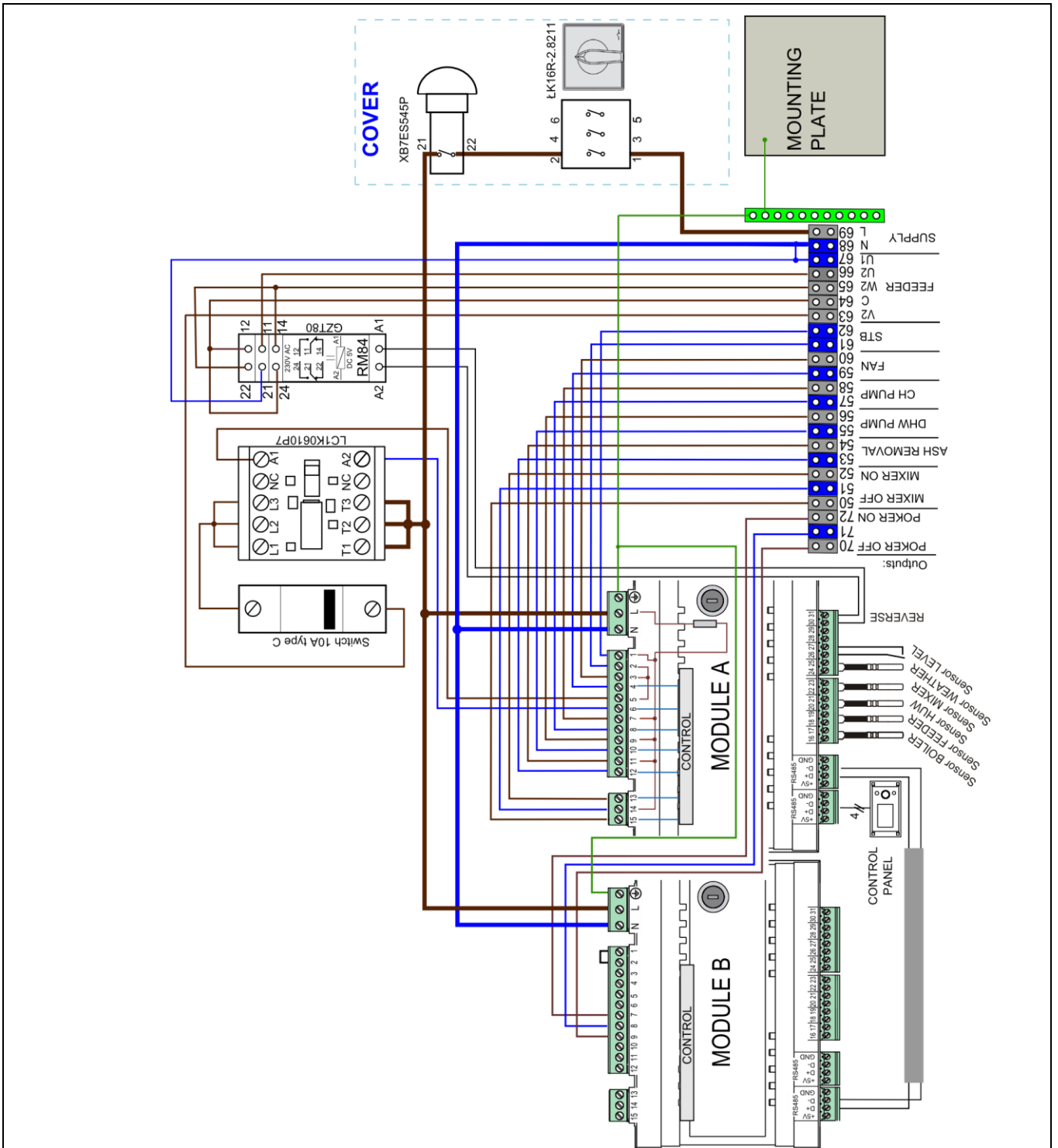
Fig. 28 ZAB-12 RR diagram for electric connections with external devices.

10.7 Connecting temperature sensors

The regulator cooperates only CT4 sensors. It is forbidden to use different sensors.
Sensor leads can be extended with wires with section of at least 0,5mm^2. Total length of the sensor leads cannot exceed 15 m.
The boiler temperature sensor should be fitted in the thermometric pipe, situated in the boiler shell. The feeder temperature sensor must be fitted on the surface of the feeder screw pipe. The domestic hot water temperature sensor - in the thermometric pipe welded into the container. It is best to fit the mixer temperature sensor in a tube (sleeve) placed in the stream of water flowing in the pipe, but it is also possible to clip it onto the pipe, covering the sensor and the pipe with thermal insulation.
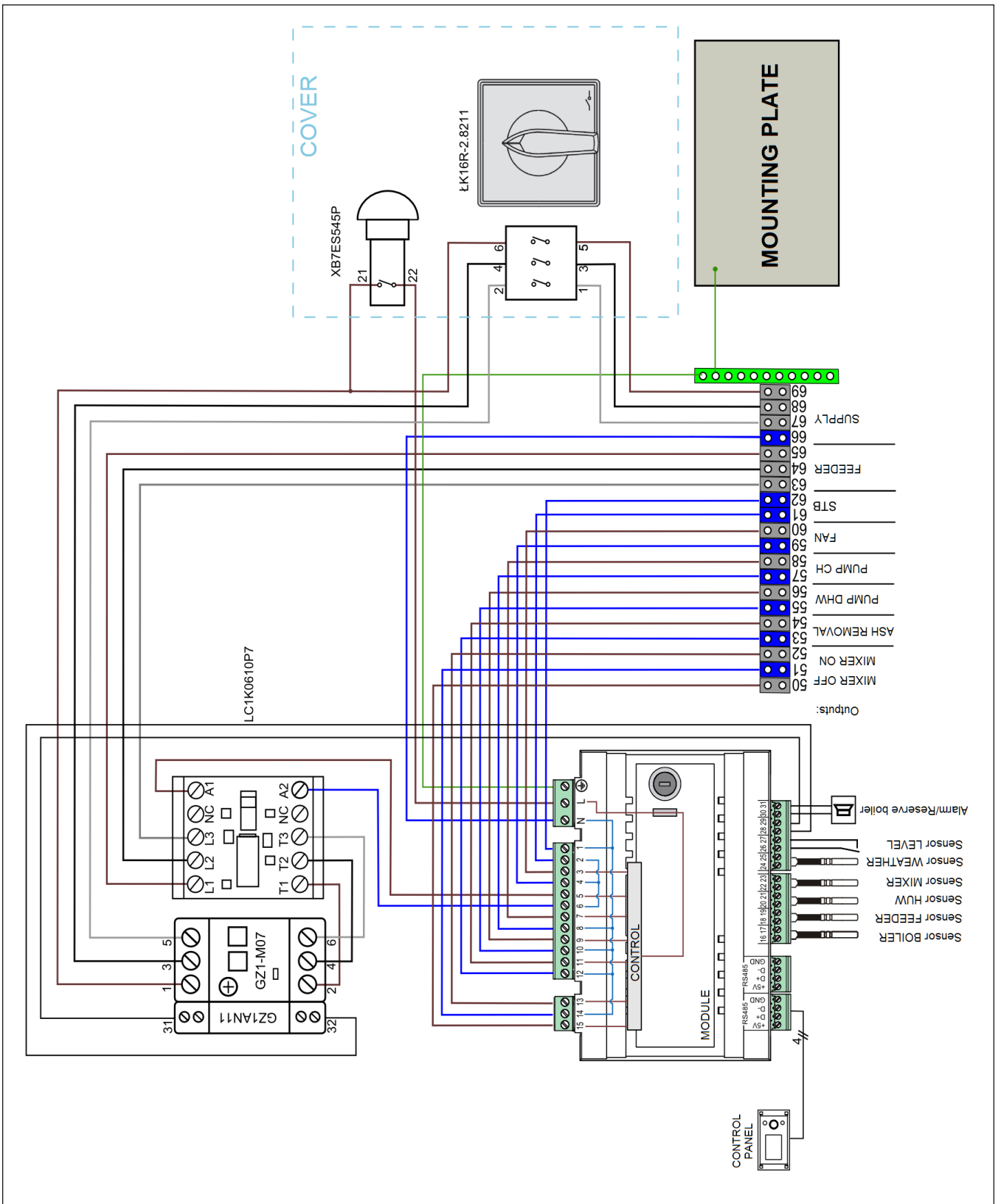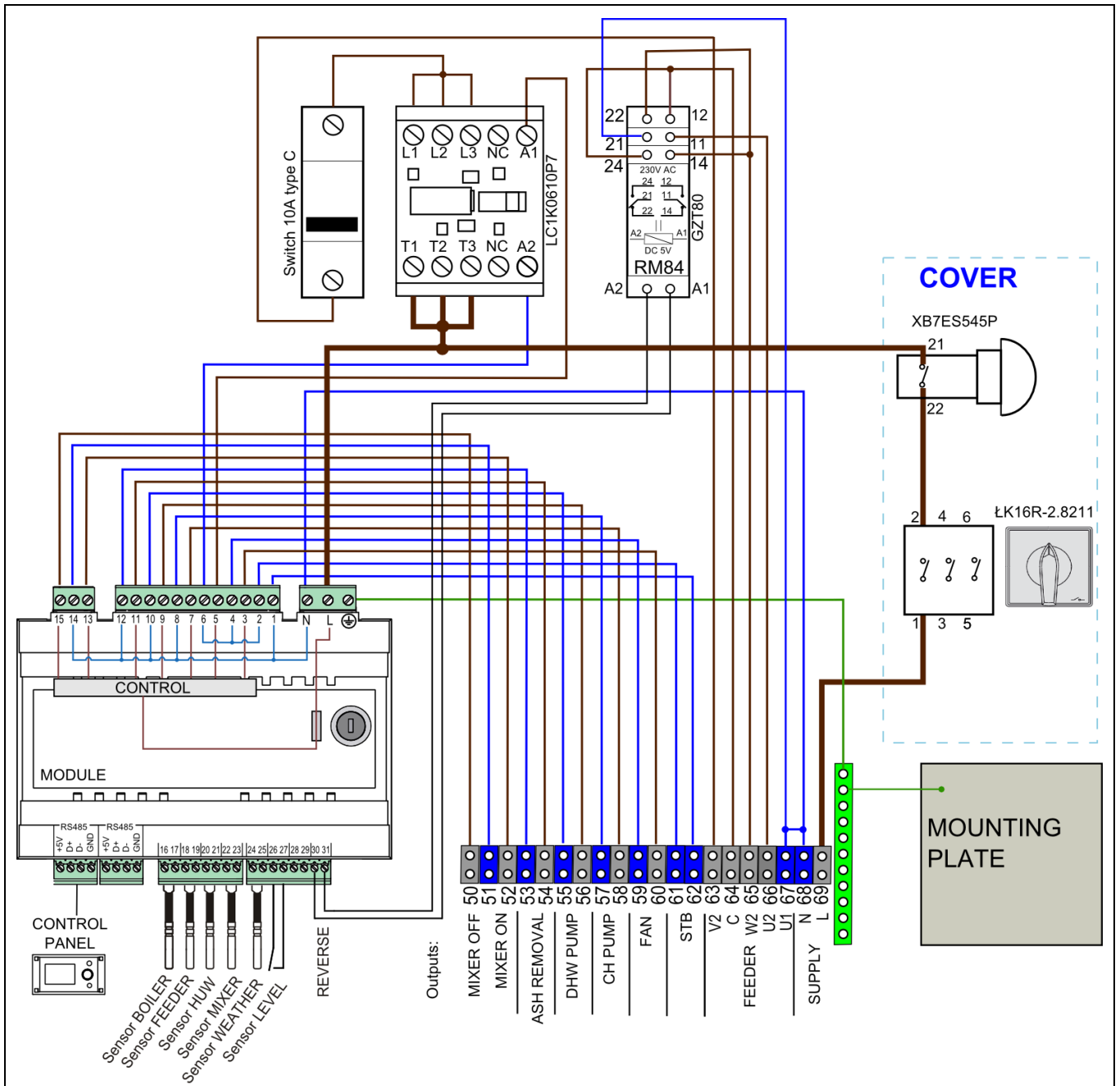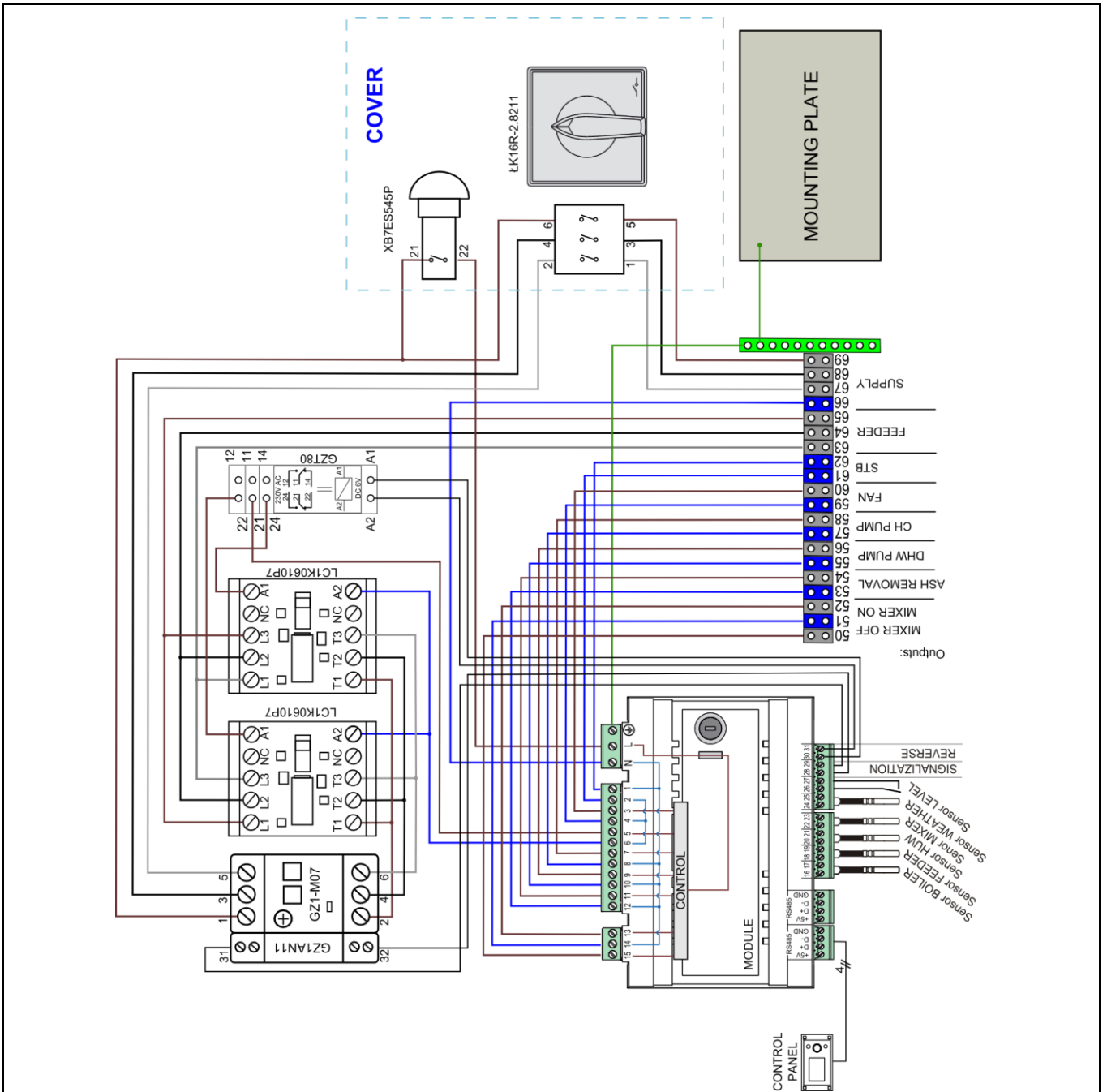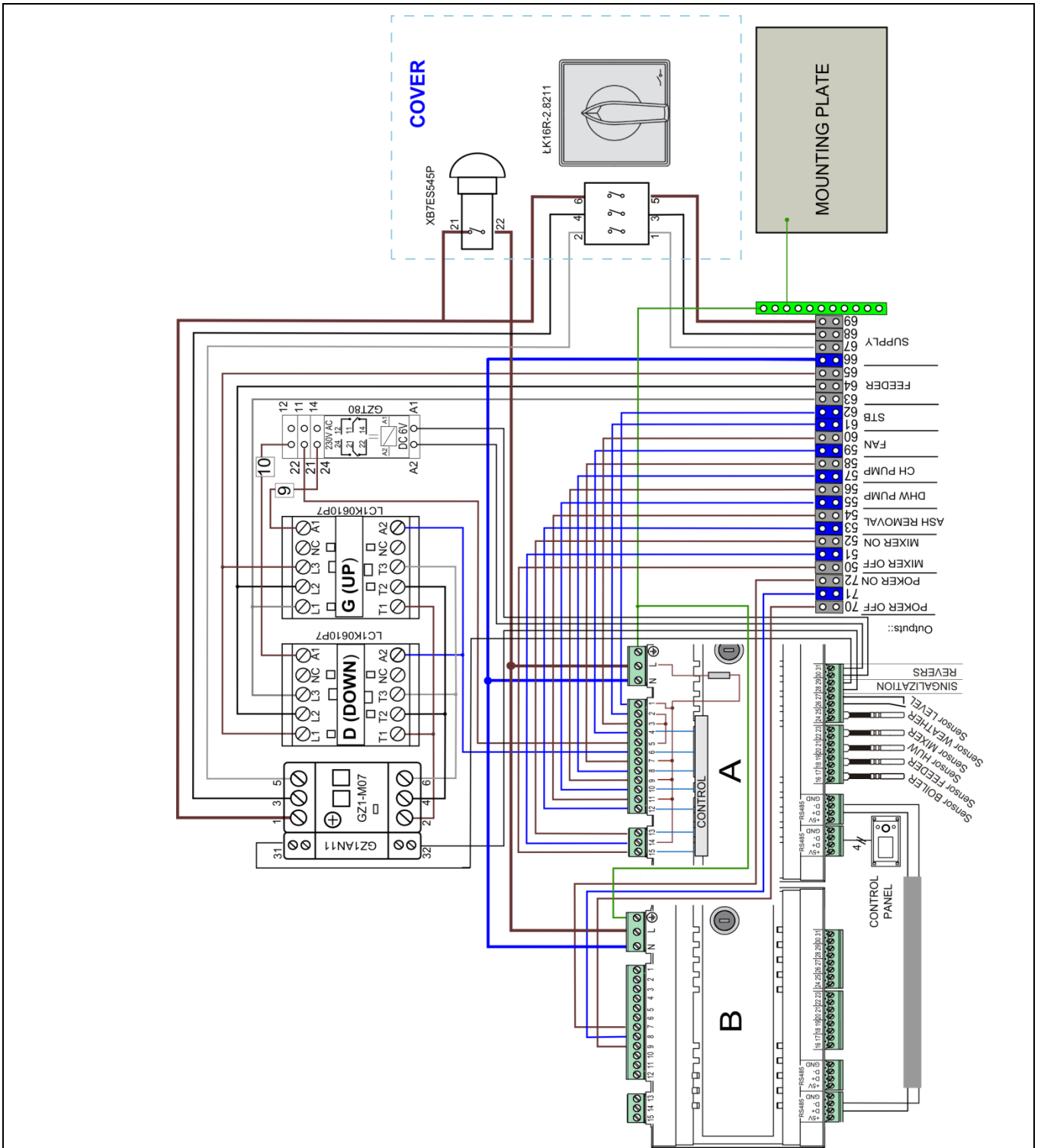
⚠ The sensors must be secured against coming loose from the measured surfaces.

Good thermal contact between the sensors and the measured surface must be ensured. For this purpose, use thermally conductive paste. Do not pour oil or water over the sensors.
The sensor cables should be separated from mains leads. Otherwise, the temperature indications can be incorrect. Minimum distance between these leads should be at least 10 cm.
The sensor leads cannot have contact with hot elements of the boiler and heating system. The temperature sensors' leads are resistant to temperature up to 100°C.

10.8 Connecting weather sensor

The regulator cooperates only with a weather sensor of the CT4-P type. The sensor should be installed on the coldest wall of the building, usually this is the northern wall, under a 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 the temperature measurement (at least 1,5 m).

Connect the sensor using cable of 0,5 mm^2 cross-section, up to 25 m long. Bias of the leads is insignificant. Connect the other end of the cable to the regulator, as shown in Figure 32.
Attach the sensor to the wall using tackbolts. To access the tackbolts holes, unscrew the sensor lid.
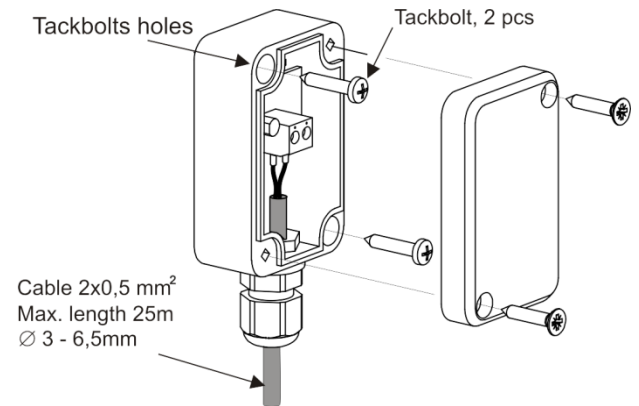
Fig. 29 Connecting weather senor CT4-P, the sensor is an optional equipment.

10.9 Checking temperature sensors

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

CT4			
Ambient temp.°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 Values of resistance of temperature sensors CT4

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 Values of resistance of temperature sensors CT4-P

10.10 Connecting room thermostat

☞ Do not make the controller settings under this section if the whole building heating system is powered by a mixer.

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 contact after a preset temperature has been reached. The thermostat should be connected in accordance with Figure 32.

After installing a room thermostat, you must enable its support in:

MENU-> SERVICE SETTINGS -> BOILER SETTINGS -> ROOM THERMOSTAT

Fig. 30 Setting up the regulator for cooperation with a room thermostat

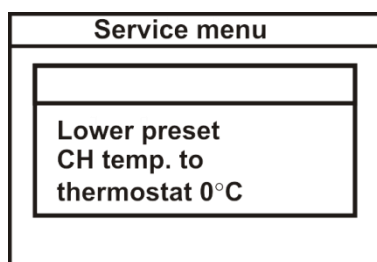☞ After reaching the preset temperature in the room, the room thermostat disconnects its contacts, and a letter "T" appears on the display
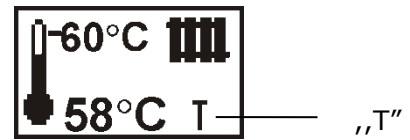
Fig. 31 View of the main window after activation of thermostat

Setting any value other than „0" will cause activation of the room 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 value *Lower preset CH temp. to thermostat.* This will cause longer boiler standstills (staying in the CONTROL mode), thus decreasing the temperature in the heated rooms.

Additionally, in for the purposes of precise adjustment of temperature in the heated rooms, it is possible to enable blockade of the CH pump by disconnection of contactors of the room thermostat. In order to enable the CH pump blockade, enter:

MENU -> SERVICE SETTINGS -> CH/HUW SETTINGS -> *Ch Standstill*
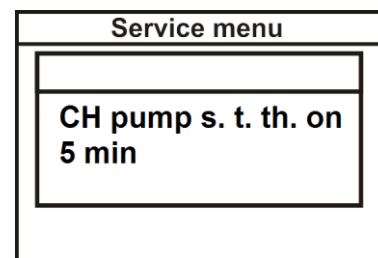
and set the value of this parameter as greater than zero. For instance, setting a value of 5 will cause the pump to be disabled by the room thermostat for 5 minutes. After this time, the regulator will enable the CH pump for a constant, programmed time of 30 s. With this parameter set at „0", the CH pump will not be blocked by the room thermostat. This solution prevents too extensive cooling of the system due to CH pump blockade.

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

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

10.11 Connecting room thermostat of mmixer

Room thermostats connected to executive module influences mixer 1 and boiler. If the entire building heating system is fed by the mixer circuit, all room thermostat settings for boiler should be disabled.

After opening of the contacts, the room thermostat decreases the preset mixer circuit temperature by the value of preset mixer temperature decrease from thermostat. This parameter can be found in:
MENU → MIXER 1, 2, 3 SETTINGS
Mixer pump isn't switched off when the room thermostat contact openingThe value of this parameter should be chosen in such a way, that after activation of room thermostat (opening of contacts), the temperature in the room decreased.
Other settings as per 8.15.

10.12 Connecting reserve boiler

The regulator can control a reserve boiler (gas- or oil-fired), eliminating the necessity of enabling or disabling this boiler manually. The reserve 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 reserve boiler, e.g. oil-fired one, should only be made by a qualified fitter, in accordance with the technical documentation of this boiler.

The reserve boiler should be connected to terminals 30-31 of the regulator via relays, as demonstrated in Figure 32 and Figure 36.
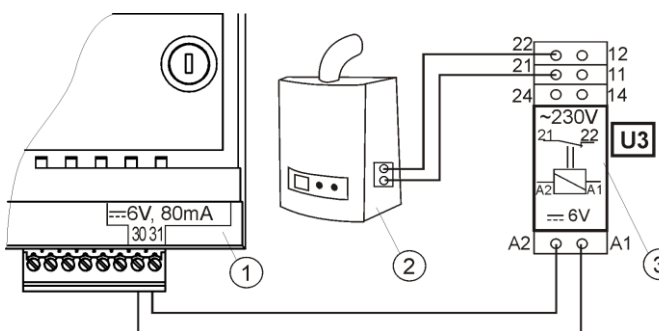
Fig. 32 Model diagram of layout for connecting a reserve boiler to the ecoMAX 800 regulator, where: 1 – ecoMAX 700 regulator, 2 – reserve boiler (gas- or oil-fired), 3 – Module U3, consisting of relay RM 84-2012-35-1006 and base GZT80 RELPOL.

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.

⚠ You have to perform assembly and installation of the module by yourself, in conformity with the applicable standards.

To enable control of a reserve boiler, set the temperature of the CH system at which the reserve boiler is to be disabled:
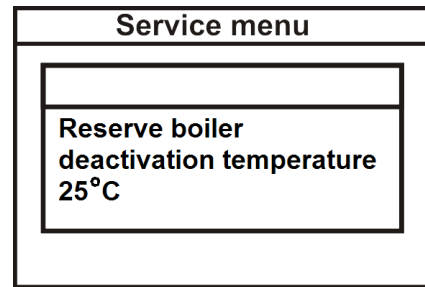
Fig. 33 Enabling control of a reserve boiler

MENU -> SERVICE SETTINGS -> BOILER SETTINGS -> AUXILIARY BOILER -> *Reserve boiler deactivation temperature*

Control over a reserve 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 reserve boiler. It will supply a constant voltage 6V to terminals 31-31. This will cause release of the U3 module relay coil, and its contacts will be disconnected. After the boiler temperature drops below the parameter *auxiliary boiler off temperature*, the regulator ceases to supply voltage to the terminals 30-31, which will activate the reserve boiler. .

☞ Disabling control over reserve boiler causes switching of the contact 30-31 to alarms.

☞ Switching the ecoMAX800 regulator into the STOP or STANDBY modes causes activation of reserve boiler

Mixer is operative when a reserve 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 malfunctions and it is necessary to operate on the reserve boiler. In the STOP mode the mixer is operative.
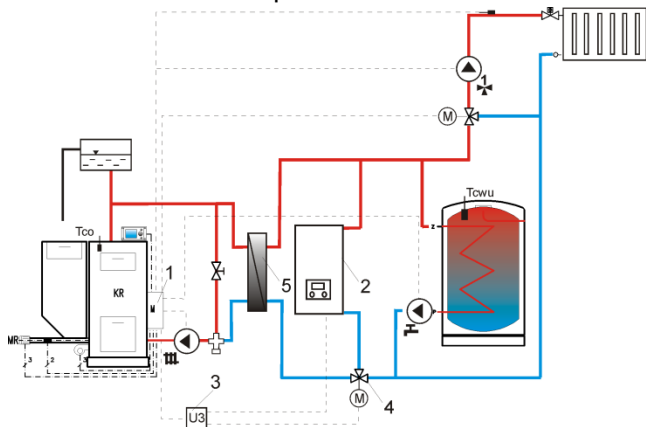
Fig. 34 Hydraulic diagram with a reserve boiler, connection of an open cycle with a closed cycle, where: 1 – ecoMAX regulator, 2 – reserve boiler, 3 - U2 module x 2, 4 – switching valve (with limit switches), 5 – heat exchanger, recommended setting *HUW priority = off, pump CH=YES*
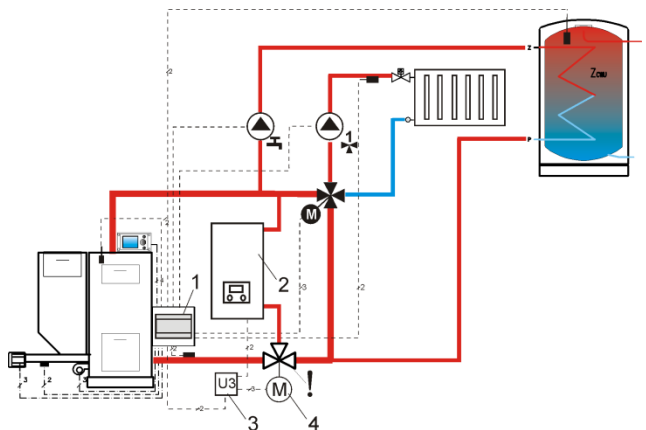
Fig. 35[7]. Hydraulic diagram with reserve boiler and four-way valve in a closed cycle, where: 1 – ecoMAX regulator, 2 – reserve boiler, 3 - U2 module x 2, 4 — servo of switching valve (with limit switches), ! - in order to provide free gravitational flow of water in the boiler cycle, the effective diameter of the switching valve (4) must be greater or equal to the diameter of the boiler cycle pipe.

---

[7] The presented hydraulic diagrams do not replace the central heating system design and are provided solely for the purposes of demonstration!
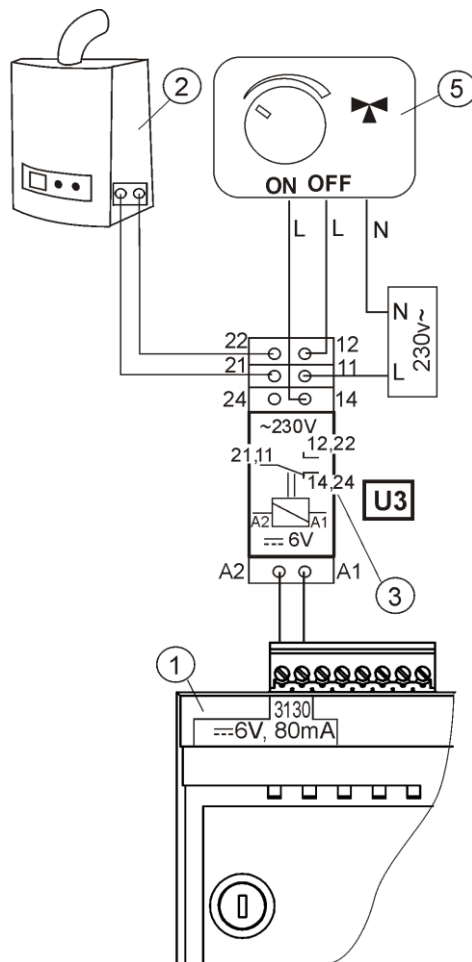
Fig. 36 Electric diagram of switching valve control, where: 1 – ecoMAX regulator, 2 – reserve boiler, 3 – relay, e.g. RM 84-2012-35-1006 RELPOL (U3 module), 5 – servo of switching valve (with limit switches), note: contacts 22, 21, 24 must have galvanic separation from contacts 12, 11, 14.

10.13 Connection of alarm signalling

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

An alarm-signalling device should be connected in accordance with Figure 41 via a U3 module.
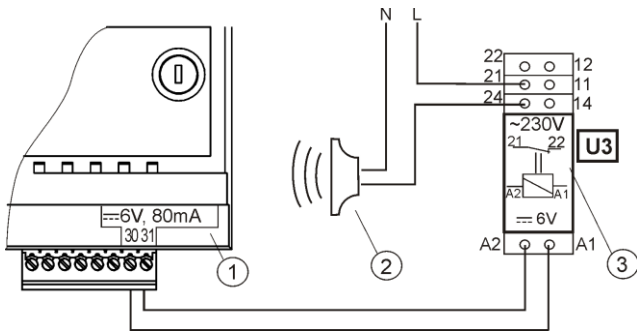
Fig. 37 Connecting an external alarming device, where: 1 – ecoMAX800 regulator, 2 – external alarming device, 3 – U3 Module, consisting of relay RM 84-2012-35-1006 RELPOL and base GZT80 RELPOL.

👉 If the regulator is to control an external alarming device, you must set the parameter *auxiliary boiler off temperature* to "0"

MENU -> SERVICE SETTINGS -> BOILER SETTINGS -> *Reserve boiler deactivation temperature*

To guarantee proper operation, set an appropriate value of the parameter *Active alarms signalling code* in:

MENU -> SERVICE SETTINGS -> ALARMS -> *Active alarms signal code*

Choosing a value of 31 causes voltage to be fed to contact 30-31 if any alarm occurs. After setting this parameter to „0", the regulator will not supply voltage in the case of any alarm.
The 30-31 contact can be configured so that voltage was supplied there 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:

No fuel	Boiler overheated	Flame reversed	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: if you set the value of the parameter to „8", the voltage will be supplied to the contact only if alarm AL4 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. you should set 2 + 8 = 10. If alarms AL1, AL2 and AL3 are to be signalled, set the parameter to "7", as 1 + 2 + 4 = 7.

10.14 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 - 255 s.
Description of connecting a mixer:
- disable power supply to the regulator,
- determine the direction in which the servo opens/closes and make an electric connection between the mixer and the regulator, in accordance with Figure 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

40

signalled in the MENU Information – mixer info by sign "CAL".

- make sure that the servo opens in the correct direction. To do so, open MENU Information and go to tab info-mixer, or enter the regulator manual control. If the mixer does not open in the 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 point 12.8.

10.15 Connecting the circulation pump

The circulation pump can be connected to the boiler control valve actuator instead ecoMAX800R1 mixer or controller also purchased ecoMAX800S type. MX.01.

Connecting to ecoMAX800R1 (instead of valve actuator):
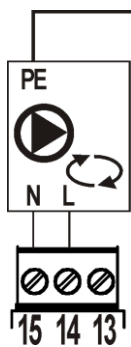
To switch connector terminals 14-15 of the circulation pump, set the parameter to control ecoMAX800 MENU: MENU → SERVICE MENU→ PASSWORD (0000) → SET MIXER 1→MIXER OPERATION 1 on,, OFF "or" PUMP ONLY ".Then the circulation pump is supported by the controller ecoMAX800R1 boiler.

Connecting to ecoMAX800S:
Refer to the manual control ecoMAX800S.

The circulation pump is switched on Circulating pump operation time every time Circulating pump standstill time. Both parameters are available: MENU → SERVICE MENU→ PASSWORD (0000) →CH AND HUW SETTINGS. Intervals circulation pump sets in: MENU →NIGHT TIME DECREASE → PUMP CIRCULAR →ON. To permanently disable the parameter Circulating pump operation time should be set to,, 0 ". To permanently turn on the circulation pump downtime parameter circulation pump should be set to a value, 0 "Then the circulation pump runs continuously, unless set in depressions night

spaces in which the pump is not running. It is recommended to connect a circulator to purchase an additional controller ecoMAX800S MX.01 type, it retains the ability to control the mixing valve actuator for control ecoMAX800R.

10.16 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 given boiler and heating system, should be fitted.

The STB limiter can be connected to terminals 1-2, as specified in Figure 32. When the limiter is activated, the airflow and fuel feeder motor are disconnected.

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

If the limiter is not connected to terminals 1-2, a bridge should be made. The bridge should be made of wire the section of which is at least 0,75 mm^2, with insulation thick enough to comply with the boiler safety requirements.

The current regulations demand that a safety temperature limiter is used.

10.17 Connecting room panel

The regulator can be equipped with room panel ecoSTER200, which can serve as:
- function room thermostat (supporting up to 3 thermostats),
- function boiler control panel,
- function alarm signalling device,
- function fuel level indicator.

41

Four-conductor connection:
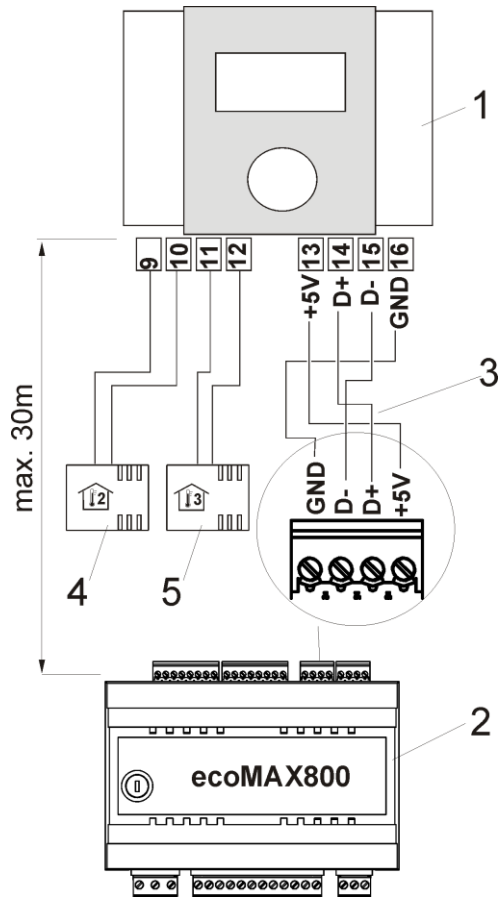
Fig. 38 Electric connections diagram (four-conductor), ecoSTER200 room panel, 2 - ecoMAX800T1 regulator, 3 - connection cable, 4 room sensor thermostat 2 type CT7, 5 - room sensor thermostat 3 type CT7.

Two-conductor connection:

The two-conductor connection requires a 5V DC power supply with rated current of at least 200 mA. Wires GND and +5 V switch module (2) to an external power supply located at the ecoSTER200 (1).

The power supply is not included with the regulator.

Maximum length of leads to the additional panel should not exceed 30 m, whereas their gauge should be at least 0,5 mm^2.

11 BOILER SERVICE SETTINGS

11.1   Return protection

Caution: the return protection function protects the boiler against operation with cold return water. This function will not work properly if the hydraulic system is faulty. The system should be designed in such a way, that at the time of closing the mixing valve, the boiler return temperature can exceed the pre-set threshold.

Caution: The return protection function is not available when the boiler is equipped with a ceramic head with the fuel level sensor.

If the boiler cooperates with a four-way valve and valve servo, and a return temperature sensor is connected, you can activate a function of safeguard against cold water returning to the boiler. To do so, select the option „Valve 4D". Otherwise, or if the boiler return is safeguarded by a thermostatic valve, choose the option "Valve 3D therm. "Then, the regulator does not influence the safeguards of the boiler return.
Caution: the return protection function is active only for mixer 1 cycle.
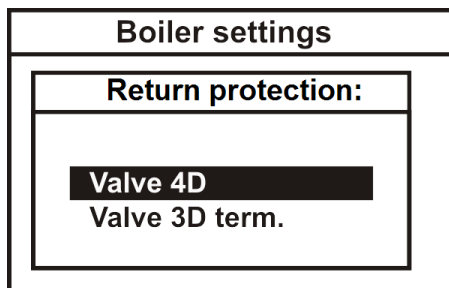
Fig. 39 Return protection

If the return temperature sensor T6 is disconnected or damaged, the regulator will automatically switch into the option *Valve 3D therm.* the clip-on return sensor must be thermally insulated from the surroundings.

11.2   Room thermostat of the boiler

This parameter allows to determine decrease in the preset boiler temperature due to disconnection of room thermostat contacts. Detailed information can be found in point 10.10.

11.3   Thermostat selection

This option allows to change room thermostat for the mixer cycle, provided that room panel ecoSTER200 is connected. The following options are available:
- ecoSTER1 – thermostat 1 in ecoSTER 200,
- ecoSTER2 – thermostat 2 in ecoSTER 200,
- ecoSTER3 – thermostat 3 in ecoSTER 200.
The boiler control panel works only with room panel ecoSTER200. It is not possible to connect a standard room thermostat with contact output.

11.4   Boiler weather control

This parameter allows to disable weather control of the boiler which calculated the preset boiler temperature on the basis of a weather sensor's indications. Detailed information can be found in point 8.16. and 10.8.

Enabling weather control is not required for the boiler in central heating systems, where mixing valve, servo with full central heating system power CH. In this case, simply include weather control for mixer and the Preset boiler temp. will be calculated automatically.

11.5   Heating curve

This parameters allows selection of appropriate heating curve. Detailed information can be found in point 8.16

43

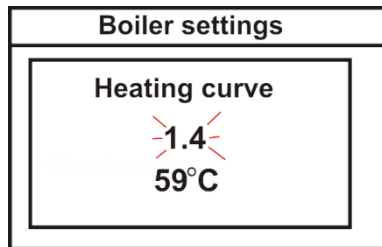Fig. 40 Selection of the boiler's heating curve, where: 1.4 – selected heating curve, 59 – temperature calculated from the heating curve for the current outdoor temperature measured by the CT4-P sensor.

11.6 Curve shift.

You can offset heating curve in the range of ± 20 ° C. For detailed information, points 7.15 and 7.16.

11.7 Room temp. Factor

This option is available only when the room panel ecoSTER200. Allows you to enter correct Preset boiler temp. based on the temperature in the room heated. Range: 0 ... 50 The higher the ratio, the greater the correction preset boiler temperature. When set to a value, 0 " Preset boiler temp. is not corrected.

Example.
Preset boiler temp. in a heated room (set in ecoSTER200) = 22 ° C. The temperature measured in the room (by ecoSTER200) = 20 ° C. Room temp. factor = 15 Preset boiler temp. is 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 temperature *preset CH 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, soiling, etc.

Additionally, the regulator will accept this temperature instead of the preset boiler temperature which results from decreases 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 too high preset boiler temperature.
If the heating curve temperature or the preset HUW temperature are higher than the *Max. preset CH temp.*, the regulator will adopt the *Max. preset CH temp.* as the preset temperature.

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

11.11 Minimum airflow output

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

MENU -> SERVICE SETTINGS -> BOILER SETTINGS -> Min. airflow output->Minimum airflow output
This parameter prevents the fan against being damaged due to too low rotary speed. The minimum airflow output should be determined after observing the fan behaviour.
After setting a value of e.g. 20%, the user will be able to set Minimum airflow output of at least 20%.

In the STANDARD regulation mode, before reaching the CH boiler temperature (at temperature Tzk - 1°C), the regulator starts reducing the fan revolutions, from the value of the parameter *Blow-in* to revolutions set by the parameter Minimum airflow output.

If the boiler cannot reach the preset temperature due to reducing the fan revolutions, the value of the parameter Minimum airflow output should be increased.

11.12 No fuel detection time

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

If the regulator produces the "No fuel" alarm too fast, increase the value of this parameter.
When set to the value of'' 0 "fuel shortage is not detected. However, such action is not recommended due to the likelihood of refill the fuel combustion chamber in a situation where the hearth expire for reasons other than lack of fuel, for example, is not well-heated.

11.13 Feed time Supervision

This is the time for which the fuel is fed and the airflow is active in the Supervision mode.

The value of this parameter cannot be too high, as it can make the boiler overheat in the Supervision mode. In the Supervision mode, the boiler temperature must slowly decrease.

11.14 Airflow oper.extend.

In the SUPERVISION mode, after feeding a dose of fuel and disabling the feeder, the fan continues to work for the time of *Airflow oper.extend* in order to light up the supplied fuel.

The value of this parameter cannot be too high, as it can make the boiler overheat in the SUPERVISION mode. In the SUPERVISION mode, the boiler temperature must slowly decrease.

11.15 Maximum feeder temperature

This is the temperature at which the function which prevents the flame from going back to the fuel feeder is activated. This function is described in point 15.3.

Setting the *max. feeder temp.* to „0" allows to disconnect the feeder sensor and lets the regulator operate without this fuel. Nonetheless, such settings are not recommended, as they will disable the function of preventing 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 Valve closing

This parameter specifies the percentage of closing the four-way valve after the temperature of the water returning to the boiler drops below the specified value. Set such degree of closing at which the boiler return temperature increases the fastest. Recommended value: 0%.

11.19 Reserve boiler

Use this parameter to specify the temperature of the retort boiler at which a reserve boiler (e.g. a gas-fired one) is turned off. Detailed information can be found in point 10.11.

11.20 Alarms – signalling settings

Detailed information can be found in point 10.13.

11.21 Boiler cooling temperature

The temperature at which the boiler is preventatively cooled down. Detailed description can be found in point 16.3.

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

11.22 Parameter A and B fuzzy logic

Parameter A and B fuzzy logic have an impact on the speed of the investigation, the preset boiler temperature and maintain the stability of the preset boiler temperature under Fuzzy logic. These parameters do not affect the quality of the combustion mode Fuzzy Logic.

It is not recommended to change these parameters if the rate of boiler power change is at the required level.

Parameter A	Increasing its value speeds up increment in the boiler output. The higher the value, the faster the boiler reaches the pre-set temperature. Value too high can destabilize maintenance of the pre-set boiler temperature. Settings range 6…8, recommended value: 6.
Parameter B	Increasing its value slows down increment in the boiler output. The higher the value, the slower the boiler reaches the pre-set temperature. Setting higher value guarantees that the pre-set boiler temperature will not fluctuate. Value too low can destabilize maintenance of the pre-set boiler temperature. Settings range 20…30, recommended value: 30.

11.23 Ash remover work and break

WORK mode controller periodically activates the mechanism ash remover. Is switched on for the time defined in parameter ash remover work, and then work it is suspended for the time defined in parameter interval ash removal.

11.24 Cycles order work

Setting the parameter to value" feed – interv. "mode will start from the fuel injection point. 7.7.
Setting the parameter to value" interv. - feed "will start operating mode of feed break point. 7.7.
In case of frequent boiler mode transition SUPERVISION into WORK mode can be up to pouring fuel cycle because WORK starts with fuel injection.
After changing the order cycle WORK can start with feed interv.which can eliminate the fuel pouring.

Factory setting =,, feed-interv. "

⚠	Note: You must check whether the furnace in the burner does not collapse when set,, interv - feed ". There is a risk of burn-out auger feeder.

11.25 Revers time

Applies only to ZAB-07 REVERS and ZAB-12. Specifies the reversing time of feeder after a dose of fuel.
Caution: Revers time cannot be longer than feed time – it threatens return of flame to the fuel feeder!

11.26 Revers multiplicity

Applies only to ZAB-07 REVERS and ZAB-12. Specifies at which successive fuel feeder activation the revers will be not activated. For example, setting value „2" revers will be activated after first fuel injection.

12 CH and HUW SERVICE SETTINGS

12.1 CH activation temp.

This parameter specifies the temperature at which the central heating pump is activated. After reaching the temperature equal to the *CH activation 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 on its own does not guarantee protecting the boiler against retting, and the resulting corrosion of the boiler. Use additional automatics, e.g. a four-way valve.

12.2 CH pump standstill time

This parameter determines the central heating pump down-time after it is blocked by disconnected room thermostat, at the moment of reaching preset room temperature (point 10.10). 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 then switch to the CONTROL mode. Yet, too long a blockade of the central heating pump will cause the system to cool down, which is disadvantageous for maintaining the room temperature at 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 standstill time*, the regulator will enable it for a constant, pre-programmed time of 30 s. Caution: Blocking the CH pump can make the boiler overheat.

12.3 CH pump standstill with HUW priority

Prolonged filling of the HUW container when HUW priority is enabled can cause extensive cooldown of the CH system, as, with these settings, the CH pump is disabled.
The parameter *CH stand. load HUW* prevents this by enabling periodical activation of the CH pump while the HUW container is being filled. 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 container 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 scald the users. Too low a value of this parameter will make

it impossible to channel excessive heat to the HUW container if the boiler overheats.

When designing the domestic hot water system, the possibility of regulator malfunction should be taken into consideration. As a result of malfunction of the regulator, the water in the HUW container can become dangerously hot, threatening the users with scalding.

THEREFORE, ADDITIONAL SAFEGUARDS - THERMOSTATIC VALVES - SHOULD BE USED.

12.5 HUW container hysteresis

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

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

12.6 Increase in boiler temperature an account of HUW and Mixer

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

Increasing the preset boiler temperature for the time of filling the domestic hot water container is signalled by letter „C" in the main display window

12.7 Extending HUW pump

After filling the HUW container and disabling the HUW pump, there is often a problem of the boiler overheating. It occurs if the preset domestic hot water temperature is higher than the preset boiler temperature. In particular, this problem occurs in the HUW pump mode: SUMMER, when the CH pump is disabled. In order to cool the boiler down,

operation of the HUW pump can be extended by the time of *Extend HUW time*.

☞ It is not recommended to set the time of *Extend HUW time* to a value different than zero if the preset HUW temperature is higher than the preset boiler temperature.

12.8   Circul.standstill time

The circulation pump during operation does not work by circul.standstill time. This applies to both active and depressions night when the circulation pump is switched on permanently. This saves electricity. The recommended setting: 15 - 40 min.

12.9   Circul.operat. time

The circulation pump after the circul.standstill time work by the Circul.operat. time. This applies to both active and depressions night when the circulation pump is switched on permanently. This saves electricity and heat. The recommended setting: 60 - 120s. Insensitivity

12.10   Boiler pump

If the *CH pump = boiler pump* parameter is set to "*YES*", the CH pump is not stopped with HUW priority and in the HUW SUMMER mode. This parameter is intended only for hydraulic systems with a heat exchanger, where the HUW container is installed on the closed system side, and the heat exchanger separates the boiler open system from the CH closed system. Thanks to continuous operation of the pump, the heat can be exchanged from the boiler through the heat exchanger to the HUW container.

13   MIXER SERVICE SETTINGS

13.1   Mixer support

The following options are available:

OFF – mixer servo and mixer pump are inoperative

CH ON - choose this option if the mixer cycle feeds radiator system of central heating. The maximum temperature of mixer cycle is unlimited, the mixer is fully opened during alarms, e.g. boiler overheat. Caution: 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 h.ON.*

FLOOR h.ON - choose this option if the mixer cycle feeds a floor system. The maximum temperature of the mixer cycle is limited to the parameter *max. mixer temp.*
Caution: after choosing the option *on FLOOR*, set the parameter *max. mixer temp.* to such value that the floor would not be damaged, and the floor heating users would not be burned.

Pump only – exceeding the *pre-set mixer temperature*, supply of the mixer pump is disabled. When the temperature drops by 2 ^{o}C, it is enabled again. Usually, this option is used to control the floor heating pump if it cooperates with a thermostatic valves without a servo. Nonetheless, such action is not recommended. It is recommended to provide floor heating with a standard heating cycle, consisting of a valve, a servo, and a mixer pump. Another application can be to use the mixer pump to protect the return temperature, using a pump connecting the feeding with the boiler return. In such case, it is impossible to use the mixer control.

13.2   Thermostat selection

This option allows to change room thermostat for the mixer cycle, provided that room panel ecoSTER200 is connected. The following options are available:
- - *universal* - standard no/nc thermostat, connected to terminals 28-29 module MX.01 (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 temp.*
- if the parameter *mixer operation = FLOOR h.ON* is enabled, it is additionally the 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, unless the manufacturer of the floor materials or the designer of the CH system specified otherwise.

13.4   MIN. preset mixer temperature

This parameter can be used to prevent the user from setting too low preset mixer temperature.

If the mixer preset temperature (e.g. as a result of night-time decreases) is lower than the value *Min. preset mixer temp.*, the regulator will assume the *Min. preset mixer temp.* as the preset temperature.

13.5   Proportional range

Caution: it is recommended not to modify this parameter.

This is the mixer step value. Increasing its value will speed up reaching of the preset mixer temperature, yet too high a 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

Caution: it is recommended not to modify this parameter.

This parameter influences the mixer standstill time if the temperature measured by the mixer sensor is close to the preset mixer temperature. Greater value will cause longer standstills of the servo. Too high a value extends the time by which the servo can find the 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 in the valve servo documentation.

13.8   Mixer input dead zone

Determining the value of the parameter setting temperature band (dead zone) for the control mixer.

The controller controls the mixing so that the temperature measured by the sensor is equal to the preset value. However, in order to avoid too frequent servo movements, which may shorten the battery life unnecessarily, adjustment shall be made only when the mixer circuit measured temperature is higher or lower than the preset value by more than Mixer input dead zone.

13.9   Pump off by thermostat

Setting this value to "YES" will cause closing of the mixer motor and deactivation of the mixer pump when contacts of the room thermostat open (the room is heated). Nonetheless, this is not recommended, as the heated room will be excessively cooled.

13.10   Increase in boiler temperature on account of 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 plus value of the parameter *increase preset CH temp. to HUW.*

This parameter can be found in MENU -> SERVICE SETTINGS -> CH/HUW SETTINGS

14 RESTORING SERVICE SETTINGS

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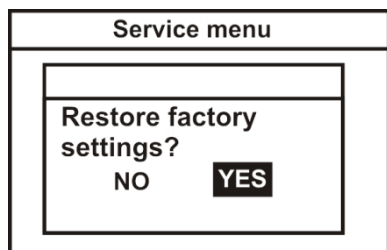

Fig. 41 Default service settings

☞ Restoration of the factory settings will also restore user settings

15 DESCRIPTION OF ALARMS

15.1 No fuel

If the boiler temperature in the OPERATION mode drops by 10°C below the preset boiler temperature, the regulator will start counting the *no fuel detection time.*

MENU -> SERVICE SETTINGS -> BOILER SETTINGS -> *no fuel detection time*

If during that countdown there is no increase in the boiler temperature by 1 °C, the regulator will disable the CH and HUW pump and will start counting the *no fuel detection time*. This protects the boiler against excessive cool down. If after that time the temperature does not increase by 4°C, the regulator will enter the STOP mode and show the "No fuel" alarm on the display. If the boiler temperature approximates the preset boiler temperature (difference t≤ 10°C), the pumps are activated and countdown of the *no fuel detection time* is stopped. Cancel by restarting the regulator.
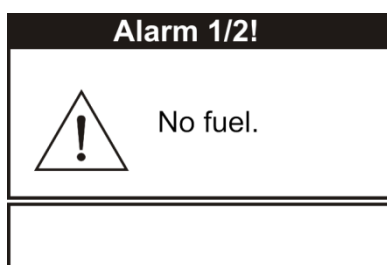

Fig. 42 View of the „No fuel" alarm

☞ If the regulator identifies fuel shortage incorrectly, increase the parameter *no fuel detection time* point 11.12, or decrease the difference between the measured boiler temperature and *preset CH temp.*

☞ In the upper section of the screen, you can see the number of alarms occurring at the same time. Sign 1/2 means that there were two alarms, and the first of them is visible, etc. Move to the next alarm by turning the "TOUCH and PLAY" knob.

15.2 Maximum boiler temperature exceeded.

Zabezpiecz Protection against boiler overheating is twofold. First, after exceeding the *boiler cooling preventive temp.* (by default 90°C), the regulator tries to decrease the boiler temperature by dropping the excessive heat to the HUW container and by opening the mixer servo (only if mixer cycle = on CH). If the boiler temperature drops, the regulator will resume normal operation. Whereas is the temperature continues to rise (reaches 95°C), fuel feeder and fan are disabled and a permanent boiler overheating alarm – with sound signalling – is activated. If during the boiler overheating alarm the temperature measured by the HUW sensor (8) exceeds the value *Max. HUW temp.,* the HUW pump is disabled. This protects the HUW users against scalding. Whereas the mixer pump is not disabled at the moment of exceeding the *Max. preset mixer temperature*, if *mixer operation = CO ON* was set. The mixer pump is disabled at the moment of exceeding the *Max. preset mixer temperature*, if *mixer operation = FLOOR h.ON* was set.
Cancel the alarm by restarting the regulator.

⚠ Caution: 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.
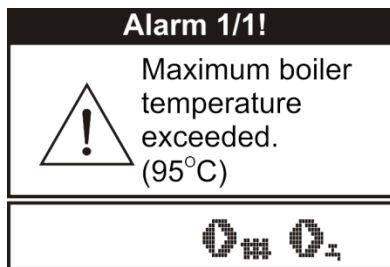
Fig. 43 View of alarm „ Maximum boiler temperature exceeded."

15.3   Maximum feeder temperature exceeded.

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

MENU -> SERVICE SETTINGS -> BOILER SETTINGS -> *Max. feeder temp.*

If the feeder temperature exceeds this value, the regulator will enable the feeder for a constant, programmed time of 10 minutes. After this time, the airflow is disabled and the 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.

You can cancel the alarm 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 point 11.15

15.4   Damage to boiler temp. sensor

This alarm will be produced in the case of damage to the boiler sensor, and after exceeding its measuring range. The alarm activates the CH and HUW pumps, 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 possibly replace it.

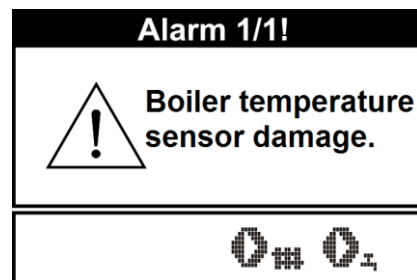The method of checking the temperature sensor is described in point 10.09

Fig. 44 View of alarm "Boiler temperature sensor damage."

15.5   Feeder temperature sensor damage

This alarm will be produced in the case of damage to the feeder sensor, and after exceeding its measuring range. The alarm causes activation of the CH and HUW pumps 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 possibly replace it.

The method of checking the temperature sensor is described in point 10.09
The regulator can operate if the feeder temp. sensor is disconnected, after setting the parameter *max. feeder temp. =0*. Nonetheless, it is not recommended, as in this case the function of protection against the flame recession into the fuel hopper is disabled.
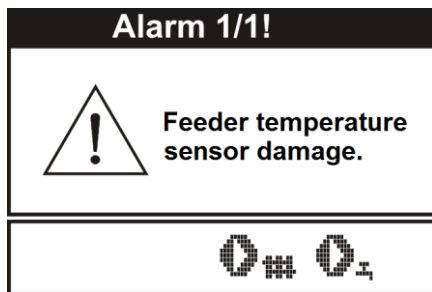
51

Fig. 45 View of alarm „feeder sensor failure

15.6 Feeder blocade

Alarm occurs when the motor of the feeder thermal protection work. And fan and feeder is suspended. Once the cause of the overload off the feeder and manual thermal protection, the controller will automatically return to normal operation.

15.7 Filled pommel

This alarm can only occur if the boiler is equipped with a ceramic head. In the case of the maximum level of fuel in the ceramic head(pommel), the join of limit switches. The controller stops the supply of fuel. Other devices are still there. Fuel burn and the fuel level drops. Limit switches are disconnected, the administration attached again. If after 30 min. limit switch will not activate the alarm is issued again with a message filled with HEAD. The controller goes to STOP mode.

15.8 No communication

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

Fig. 46 View of alarm „no communication"

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

16 EXTRA FUNCTIONS

Except for the functions described above, the regulator offers 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 was before the failure.

16.2 Protection against freezing

If the boiler temperature drops below $5^{\circ}C$, the CO pump will be enabled, thus forcing circulation of the boiler water. This will delay the process of water freezing, yet in the 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 an be found in point 15.2.

☞ In the HUW = SUMMER mode, only the 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 in the boiler is not in use. This function can be enabled also when the regulator is turned off, via keyboard (regulator in STAND-BY) and in the STOP mode.

17 REPLACEMENT OF PARTS AND SUBASSEMBLIES

When ordering parts and subassemblies, please specify necessary information read off the rating plate. It is best to give the regulator serial number. If the 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 of the control panel is the serial number.

17.1   Replacing mains fuse

Bezpi The mains fuse is situated in the executive module. It protects the regulator and the devices fed by it.

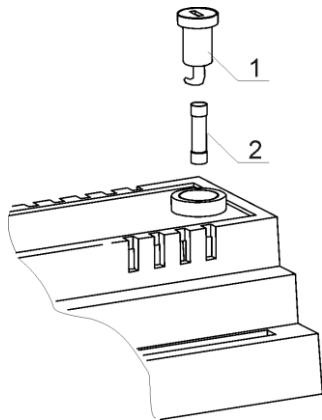Please use time-delay fuses, porcelain, 5x20mm, of nominal burnout current 6,3A.

Fig. 47 Fuse replacement, where: 1 – fuse, 2 – fuse socket

In order to remove the fuse, push in its 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 the subassemblies, or in the display window, right after turning the regulator on.
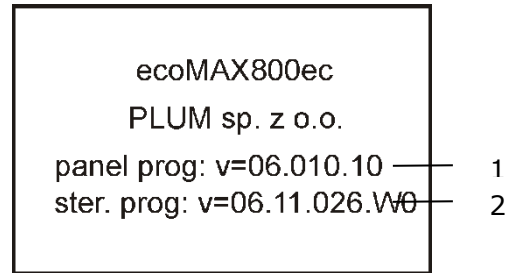

Fig. 48 View of display after turning the regulator on, where: 1 – control panel software number, 2 – executive module software number

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

17.3   Executive module replacement

The requirements are the same as those for replacement of the control panel, point 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 lead connecting the panel with the module is properly plugged in, and if it's not damaged
2. Preset CH temperature on the display is different than the programmed one	Check: ▪ whether the domestic hot water container is filled at the time and the preset domestic hot water temperature is higher than the preset CH temperature; if so, the difference of readouts will disappear after the domestic hot water is filled, or after decreasing the preset domestic hot water temperature. ▪ whether the room thermostat is on – set the service parameter *Lower preset CH temp. to thermostat* to "0" ▪ if the time periods are on – enable time periods
3. CH pump is inoperative	Check: ▪ whether the boiler exceeded the parameter *CH pump start temp.* – wait or decrease the *CH pump start temp.* ▪ if the room thermostat is not blocking the CH pump - set the parameter *CH pump start temp. with thermostat on* 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 detection of fuel shortage
5. The fan is inoperative	▪ increase the Blow-in (parameter *Blow-in*), ▪ 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 it with a temperature limiter STB 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 parameter *Feeder and Blow-in* and set it to *ON,* ▪ check the fan and replace it if necessary
6. Fuel feeder inoperative/does not feed	▪ Check if the feeder leads are properly connected to terminals ▪ If temperature limiter STB is connected to terminals 1-2, check if the circuit is not cut off due to boiler overheating, ▪ Check if the feeder motor is in working order, ▪ Check setting of the parameter *Fuel feeder and Blow-in* and set it to *ON*, ▪ 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	▪ Increase airflow adjustment Fuzzy logic point. 7.8, ▪ Check that the unburned fuel comes from working in supervision - adjust mode SUPERVISION, by. point. 7.9, ▪ Check that the unburned fuel transition is caused by frequent SUPERVISION → OPERATION, by. point. 11.23, Make sure that you select the correct type of fuel points. 7.10 (if the controller are other types of fuels) - fuzzy logic mode does not allow for the combustion of a mixture of fine and coal, ▪ Make sure that you select the right type of boiler section. 19.1 ▪ Open the fan aperture and/or 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 working order, ▪ Unseal the boiler room window, thus providing sufficient amounts of fresh air.
8. When the Fuzzy Logic mode is on, the fuel burns, shrink into the retort .	▪ Decrease Fuzzy Logic airflow correction, point 8.8, ▪ Check that too strong burning fuel derived from work in supervision- adjust mode SUPERVISION, by. point. 7.9 Check that the fuel burn too strong is due to the order parameter setting cycles at WORK,, interv.-feed, "according to. point. 11.23, ▪ Make sure that you select the correct type of fuel points. 7.10 (if the controller are other types of fuels) ▪ Make sure if correct type of boiler is selected, point 19.1.
9. The temperature is measured incorrectly	▪ Check if there is good thermal contact between the temperature sensor and the measured surface, ▪ whether the sensor lead is not placed too close to the mains cable, ▪ If the sensor is connected to the terminal, ▪ Whether the sensor is not damaged – check it in accordance with point 10.9
10. in the HUW=SUMMER mode, the heaters are hot and the boiler overheats	▪ Increase the parameter *Extend HUW pump time* in order to cool down the boiler
11. the HUW pump is active even if the HUW container has been filled	▪ Set the parameter *Extend HUW pump time = 0*
12. The boiler overheats despite enabled airflow	▪ This could be caused by structural defect of the boiler, or the chimney system, consisting in lack of safeguard against too high a chimney draught

13. In a hydraulic system with a mixing valve and servo - the mixer fails to open.	▪ The reason may be activity of the return protection function, point 11.1. If the return protection function is active, check if the sensor for water returning to the boiler is thermally insulated from its surroundings, and improve contact with the pipe by applying thermally conductive paste. Increase the pre-set boiler temperature in order to provide power reserve needed to heat the return water. Check if the hydraulic system is properly made, i.e. after closing the valve, the return temperature must be able to exceed the parameter *Min. return temp.* value. ▪ The reason can be that the HUW container is being filled with *HUW priority* enabled. Wait until the HUW is filled, or disable the *HUW priority*. ▪ The reason can be active SUMMER function. ▪ The reason can be an on-going calibration of the mixer valve, wait until the calibration is complete. Active calibration is signalled with a "CAL" message in the menu INFORMATION – MIXER INFO.

19 Regulator settings by boiler manufacturer

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

19.1 Activating fuzzy logic

In order to activate the Individual Fuzzy Logic mode, enter hidden MENU:

MENU -> SERVICE SETTINGS -> enter special password

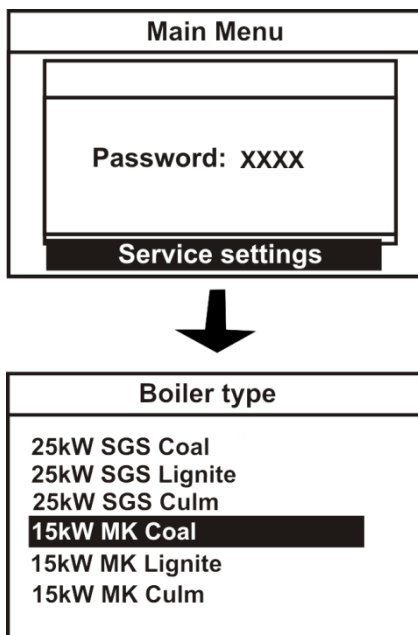The special password is made available only to boiler manufacturers i and authorized fitters.

Fig. 49 Selection of boiler and default fuel type for boiler manufacturers[8]

From among the boilers listed in the menu, select the type of boiler in which the regulator is installed. If you do not have the correct boiler should be approved option, Fuzzy logic = OFF ". Then you can use the controller only in standard mode, fuzzy logic function will be disabled.

Caution: selecting an incorrect boiler type, which was not examined in the PLUM laboratories, can damage the boiler during its operation.

The selected fuel will simultaneously become the 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 the default fuel. Whereas in the menu available to users and fitters, options for a 15kW MK boiler will appear:
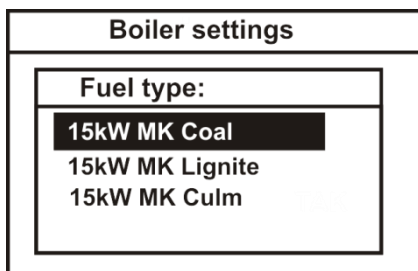

Fig. 50 Selection of fuel for the boiler user

---

[8] Includes only boilers and fuels which were tested in Plum Ltd laboratory.

Settings for individual boilers require arrangements between the boiler manufacturer and the PLUM sp. z o.o. company.

In order to apply the changes, disable and enable mains supply to the regulator.

19.2   Registration 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.
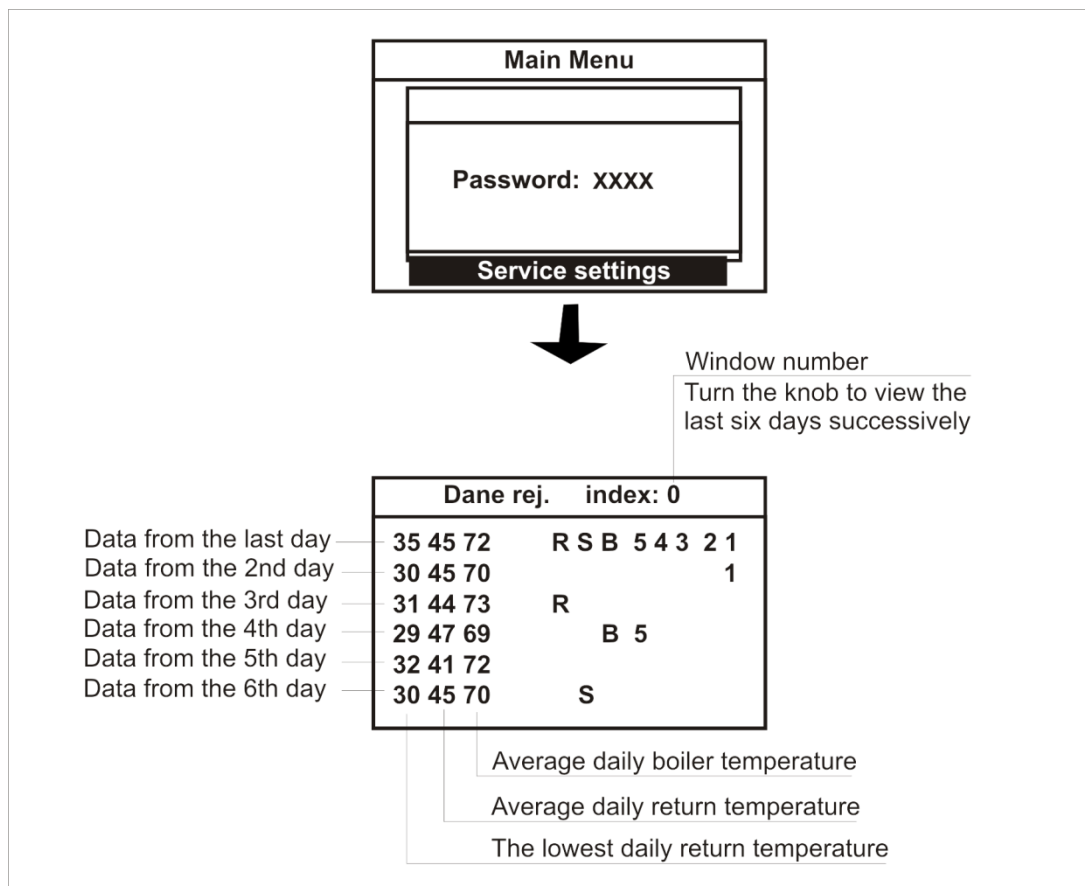

Fig. 51 Readout of stored parameters

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 they 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

No	alarm name
1	No fuel
2	Boiler overheated
3	Flame recessed to retort
4	Boiler temperature sensor damage
5	Feeder temperature sensor damage

Caution: A temperature record of about 108°C is an evidence that the sensor was disconnected. Values recorded for a given day are stored in the memory at 00.00.

20 Changes in documentation records

1.6 – Added technical data and electrical schemes of ZAB–07 REVERS, ZAB–07 REVERS RR ZAB–12, ZAB–12RR. Added point 11.25 and 11.26.