



Boiler regulator

TIS TRONIC 496P

FOR SOLID FUEL ATOMATIC BOILERS WITH THE IGNITER



TIS TRONIC 297*



TIS TRONIC 281*

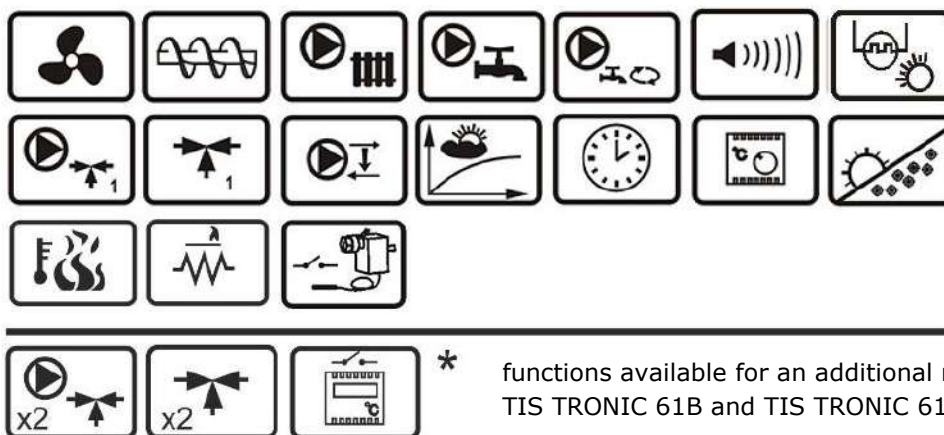


TIS TRONIC 501*



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* functions available for an additional module
TIS TRONIC 61B and TIS TRONIC 61C

* room panel TIS TRONIC 297 and TIS TRONIC 281, and internet module TIS TRONIC 501 are not part of standard equipment regulator.



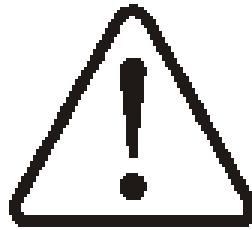
OPERATING AND INSTALLATION MANUAL

ISSUE: **ONLY DRAFT**

APPLIES TO SOFTWARE:

MODULE
v01.XX.XX

PANEL
v01.XX.XX



ELECTRIC DEVICE UNDER VOLTAGE!

Before any action related to the power supply (cables connection, device installation etc.) check if the regulator is not connected to the mains!

Installation should be done by a person with appropriate electrical qualifications. Improper cables connection could result in the regulator damage.

The controller cannot be used in steam condensation conditions and cannot be exposed to water.

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1. Safety requirements



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 still can occur on its terminals. The regulator cannot be misused.
- The regulator is designed to be enclosed.
- 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.
- In the regulator there is applied electronic disconnection of connected devices (2Y type of operation according to PN-EN 60730-1) as well as micro-disconnection (2B type of operation according to PN-EN 60730-1).
- Keep the regulator out of reach of children.

2. General information

Boiler regulator is a modern electronic device intended to control boiler operation with automatic feeding of solid fuel and with the ignition. Flame detection occurs with the optical brightness sensor flame.

The regulator is a multipurpose device:

- it automatically maintains a preset boiler temperature by controlling the fuel combustion process,
- it controls timing fuel feeder and fan (modulating its power),
- it automatically stabilizes a preset temperature of the domestic hot water container,
- it automatically maintains preset temperature of several independent mixer heating cycles.

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

The device includes the control panel with horizontal regulation of its position, the main operating unit and optional modules to control additional heating circuits.

Regulator can cooperate with an additional room panel TIS TRONIC 297 and TIS TRONIC 281 situated in living quarters and module for the web WiFi TIS TRONIC 501.

It can be used in a household and similar facilities, as well as in lightly industrialized facilities.

3. 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.

4. 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.

5. 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.

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!

6. 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.

REGULATOR INSTRUCTION MANUAL

TIS TRONIC 496P

7. STRUCTURE – MAIN MENU

Main menu
Information
Boiler settings
Operating mode
- House heating - HUW priority - HUW no priority
HUW settings*
Summer/Winter
Boiler pump
CH pump activation temp.
Circulation pump*
Mixer 1-5 settings*
General settings
Manual control
Services settings

Boiler settings
Preset boiler temp.
Burner settings
- Fan output - Feeder operation - Feeder interval
Boiler hysteresis
Room thermostat
- Thermostat selection: Off, Universal, TIS TRONIC * - Stand. t. CH from therm. - Oper. t. CH from therm. - Reduction boiler by therm. - Room temp. factor
Weather control *
- Boiler weather control - Heating curve boiler - Curve translation
Manual burning
Fuel level
- Alarm level - Fuel level calibration
Night time decrease
- On - Reduction value - Schedule

Summer/Winter
SUMMER mode
- Off - On - Auto*
Activ. temp. SUMMER
Deactiv. temp. SUMMER

Circulation pump *
Circulation support
Circ. standstill time
Circ. operat. time
Start temperature
Night time decrease
- On - Reduction value - Schedule

HUW settings*
HUW preset temperature
HUW container hysteresis
HUW disinfection
Night time decrease
- On - Reduction value - Schedule

Mixer 1-5 settings*
Preset mixer temperature
Room thermostat
- Thermostat selection: Off, Universal, TIS TRONIC * - Reduction temp. by therm. - Room temperature factor
Weather control*
- Mixer weather control - Heating curve mixer - Curve translation
Night time decrease
- On - Reduction value - Schedule

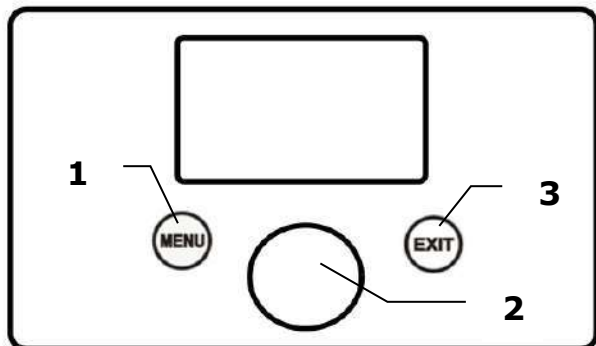
General settings
Clock
Date
Screen brightness
Screen contrast
Sound
Weather correction
Language
Software update
WiFi settings*

* unavailable if no adequate sensor or additional module is connected or the parameter is hidden.

8. Operating the regulator

The regulator turns on by pressing the knob. To start the use of boiler, fire up the boiler using the FIRING UP operation mode, then change the operation mode to OPERATION.

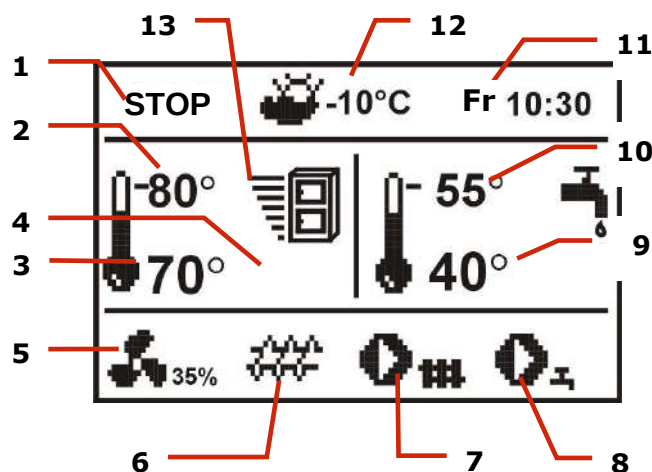
8.1 Buttons description



1. MENU button
2. „TOUCH and PLAY“ knob
3. przycisk EXIT

Turning the “TOUCH and PLAY” knob increases or decreased the edited parameter. Pushing this knob allows to enter the given parameter, or to confirm the selected value.

8.2 Main screen



1. regulator operation modes: FIRIE UP, STABILIZATION, WORK, BURNING OFF, PAUSE, STOP.
2. preset boiler temperature
3. measured boiler temperature,
4. field of factors influencing preset boiler temperature:

☐ - preset boiler temperature decrease due to thermostat disconnection (room temperature is reached),

⬇️Ⓛ - preset boiler temperature decrease due to activated time spans,

⬆️⚡ - boiler preset temperature during loading the domestic hot water tank (HUV),

⬆️⚡ - boiler preset temperature increase from mixer circulation,

⬆️Ⓛ - increasing preset temperature for loading buffer,

⊕ - warning, HUV disinfection mode is active,

⬇️ - 4-way valve partially closed (active return protection),

5. fan operation symbol,

6. fuel feeder operation symbol,

7. boiler pump operation symbol,

8. HUV pump operation symbol,

9. measured temp. of domestic HUV container,

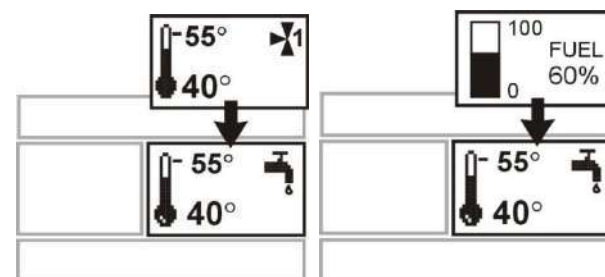
10. preset temp. of domestic HUV container,

11. clock and day of the week,

12. outside (weather) temperature,

13. current boiler output level.

Right window on the main screen is customizable, the user can decide what information is to be presented there. It is possible to choose setup presenting info of HUV by rotating the “TOUCH and PLAY” knob.



Fuel level can be also shown in the room panel TIS TRONIC 297 and TIS TRONIC 281.

8.3 Setting the preset boiler temperature

Set the preset boiler temperature and preset mixer temperature in menu:

Boiler settings → Preset boiler temp.

Mixer 1-5 settings → Preset mixer temp.

Note: Preset boiler temperature will be automatically increased to enable filling HUV container and heating circuits of mixers, if required.

8.4 FIRIE UP

The FIRIE UP mode is used for automatic firing-up of furnace in the boiler. Total duration of the firing-up process depends on regulator settings and on the boiler's status before firing-up. All parameters which influence the firing-up process can be found in menu:

Service menu → Boiler settings → Burner settings → Firie up

If firing up the furnace fails, further attempts are carried out during which the fuel dose is reduced to 10% of the dose in the first attempt.

After three unsuccessful attempts, an alarm *Failed firing up attempt* is reported. In such case, the boiler operation is halted. Boiler operation cannot be continued automatically - service crew must intervene. After removing causes of impossibility to fire-up, the boiler must be restarted.

8.5 STABILIZATION

Additional intermediate mode between the FIRE UP mode and WORK mode. In this mode, the regulator aims to provide flame stabilization and therefore the most efficient fire up the furnace, taking into account parameters grouped in menu:

Service settings → Boiler settings → Burner settings → Stabilization

8.6 WORK

In WORK mode the fan runs continuously with power set in the Fan output. The fuel feeder is enabled cyclically. Cycle consists of feeder operation time and pause time are set in *Feeder operation* and *Feeder interval*.

The parameters affecting the Work mode are located in the menu:

Boiler settings → Burner settings
and

Service settings → Boiler settings → Burner settings → Work

8.7 Output modulation

The regulator is equipped with boiler output modulation mechanism, which allows to change its output gradually, as the boiler temperature approaches the preset value. In this mode the regulator uses an output modulation algorithm.

Each of the levels - referred to as 30%, 50% respectively - can be attributed with different fuel feeding time and airflow power, which translates into actual boiler output level. When the boiler is supposed to operate at specific output level is determined by values called hysteresis, 30% and 50% respectively. Each of these values relates to measured boiler temperature relative to its preset value. The currently selected output level is presented on the display in the form of indicator on the left side of the boiler icon. Parameters for all output levels are available in the menu:

Service settings → Boiler settings → Burner settings → Work

8.8 BURNING OFF

In the BURNING OFF mode remains of the pellet are burnt out for a few minutes and the boiler is prepared for PAUSE mode.

The process of burning off does not occur when the selected fuel is coal!.

The parameters affecting the Burning off mode are located in the menu:

Service settings → Boiler settings → Burner settings → Burning off

8.9 STOP

In the STOP mode, the boiler is put out and awaits signal to resume heating.

A signal to start heating can be:

- decrease in preset boiler temperature below the preset temperature minus the value of boiler hysteresis (*Boiler hysteresis*),
- if the boiler is set to work with a buffer - decrease in upper buffer temperature below the preset value (*Loading start temperature*).

8.10 Settings HUW preset temperature

Preset HUW temperature is defined by parameter:

HUW settings → HUW preset temp,

Hysteresis HUW container

Below temperature *HUW preset temp.* reduced by *HUW container hysteresis*, the HUW pump is activated in order to fill the HUW container.



When value of hysteresis is set too low, the HUW pump will start faster after decrease in HUW temperature.

8.11 Disinfection of the HUW container

The regulator has a function of automatic, periodic heating of HUW container to 70°C to eliminate bacterial flora from the HUW container.

The function is activated in the menu:

HUW settings → HUW disinfection



Keep the tenants informed of activating the disinfection function as there is risk of being burnt with hot usable water.

The regulator increases the HUW container temperature once a week, at 2:00 a.m. Monday. After 10 minutes of maintaining the temperature at 70°C, the HUW pump is switched off and the boiler returns to normal operation. Do not activate the disinfection function when the HUW support is off.

8.12 Manual burning

The regulator has the function of manual burning, where the fuel loading is done manually.

Activating the function in the menu:

Boiler settings → Manual burning

will cause that the fuel feeder is switched off and the work will only fan.

8.13 Operating mode

Using the parameters available in the menu: **Operating mode**, the user can:

- turn off loading the HUW container, parameter: *House heating*,
- set HUW priority, parameter: *Priority HUW* – boiler pump is OFF and mixer closed to faster loading HUW container,
- set simultaneous (parallel) operation of HUW and boiler pumps, parameter *No priority HUW*.

8.14 HUW circulation pump

Settings for the HUW circulation pump are located on the menu: **Circulation pump**.

Setting of circulating pump control is analogical to night decrease setting. Circulating pump switches on in selected time intervals. In disregarded time intervals circulating pump will start and remain in operation for the period of time set in *Circulating pump operation time*, then will stop and remain out of operation for the period of time set in *Circulating pump standstill time*.

The parameter *Start temperature* for circulation set temperature hot water circuit at which a circulation pump is activated to force circulation of the HUW circuit.

8.15 Enabling the SUMMER function

In order to activate the SUMMER function, which enables to load the HUW container in the summer, without the need for activating the CH system and mixer cycles, set the parameter *Summer mode* to *ON*, in the menu:

Summer/Winter.



The Summer function cannot be enabled if the HUW sensor is disconnected.



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



During the Summer function all receivers heat can be turned off, so before turning it back on, make sure that the boiler will not overheat.

The Summer function can be enabled automatically – parameter *Auto*, on the basis of readouts from the weather sensor. This functionality is enabled with the following parameters: *Activ. temp. SUMMER*, *Deactiv. temp. SUMMER*.

8.16 Mixer circuits settings

Settings for the first mixer circuit can be found in the menu: **Mixer 1 settings**.

Settings for other mixers can be accessed in next menu items and they are identical for each circuit.

Settings for mixer without weather sensor.

It is necessary to manually set the required water temperature in the heating mixer circuit using parameter *Preset mixer temp.*, e.g. at a value of 50°C. The value should allow to obtain the required room temperature.

After connecting room thermostat, it is necessary to set a value of decrease in preset mixer temperature by thermostat (parameters *Mixer room therm.*) e.g. at 5°C. This value should be selected by trial and error. The room thermostat can be a traditional thermostat (no/nc), or room panel TIS TRONIC 297 and TIS TRONIC 281. Upon activation of the thermostat, the preset mixer circuit temperature will be decreased, which,

if proper decrease value is selected, will stop growth of temperature in the heated room.

Settings for mixer with weather sensor without room thermostat.

Set parameter *Mixer weather control* to *On*. Select weather curve. Using parameter *Curve translation*, set preset room temperature following the formula:

Preset room temperature = 20°C + heating curve translation.

In this setup, it is possible to connect a room thermostat which will equalize the inaccuracy of selecting heating curve, if the selected heating curve value is too high. In such case, it is necessary to set the value of preset mixer temperature decrease by thermostat, e.g. at 2°C. After opening of the thermostat contacts, the preset mixer circuit temperature will be decreased, which, if proper decrease value is selected, will stop growth of temperature in the heated room.

Settings for mixer with weather sensor and with room thermostat.

Set parameter *Weather control* to *On*. Select weather curve. The TIS TRONIC 297 and TIS TRONIC 281 room panel automatically translates the heating curve, depending on the preset room temperature. The regulator relates the setting to 20°C, e.g. for preset room temperature = 22°C, the regulator will translate the heating curve by 2°C, for preset room temperature = 18°C, the regulator will translate the heating curve by -2°C.

In some cases it may be necessary to fine-tune the heating curve translation.

In this setup, the TIS TRONIC 297, TIS TRONIC 281 room thermostat can:

- decrease the heating cycle temperature by a constant value when the preset room temperature is reached. Analogously, as specified in the previous point (not recommended), or
- automatically, continuously correct the heating cycle temperature.

It is not recommended to use both options at the same time.

Automatic correction of room temperature is carried out in accordance with the following formula:

Correction = (Preset room temperature - measured room temperature) x room temperature coefficient / 10.

Example.

Preset temperature in the heated room (set at TIS TRONIC 297, TIS TRONIC 281) = 22 °C. Temperature measured in the room (by TIS TRONIC 297, TIS TRONIC 281) = 20 °C.

Room temp. factor. = 15.

Preset mixer temperature will be increased by (22 °C - 20 °C) x 15/10 = 3 °C.

It is necessary to find appropriate value of the *Room temp. factor*. Range: 0...50. The higher the coefficient, the greater the correction of preset boiler temperature. If the setting is "0", the preset mixer temperature is not corrected. Note: setting a value of the room temperature coefficient too high may cause cyclical fluctuations of the room temperature!.

8.17 Weather control

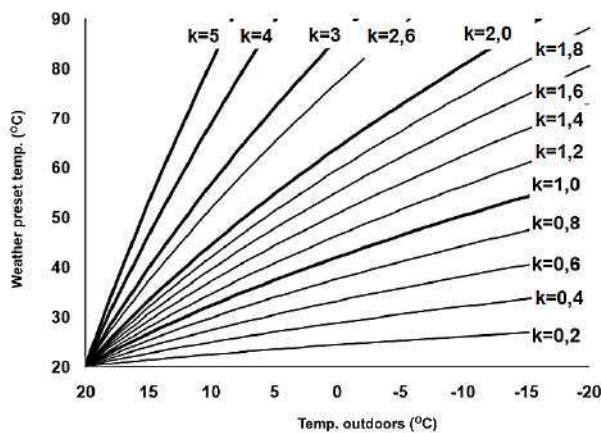
Depending on the temperature measured outside the building, both preset boiler temperature and temperatures of mixer circuits can be controlled automatically. If proper heating curve is selected, the temperature of the circuits is calculated automatically, depending on the outdoor temperature. Thus, if the selected heating curve is appropriate for the given building, the room temperature stays more or less the same, regardless of the temperature outside. Note: during trial and error selection of appropriate heating curve, it is necessary to exclude influence of the room thermostat on regulator operation (regardless of whether the room thermostat is connected or not), by setting the parameter:

Mixer 1 settings → Room therm. = OFF.

If a room panel TIS TRONIC 297 or TIS TRONIC 281 is connected, it is also necessary to set the parameter *Room temp. factor* to "0".

Guidelines for proper setting of the heating curve:

- | | |
|--------------------|-----------|
| - floor heating | 0,2 - 0,6 |
| - radiator heating | 1,0 - 1,6 |
| - boiler | 1,8 - 4 |



Guidelines for selection of appropriate heating curve:

- if the outdoor temperature drops, and the room temperature increases, the selected heating curve value is too high,
- if the outdoor temperature drops, and the room temperature drops as well, the selected heating curve value is too low,
- if during frosty weather the room temperature is proper, but when it gets warmer - it is too low, it is recommended to increase the *Curve translation* and to select a lower heating curve,
- if during frosty weather the room temperature is too low, and when it gets warmer - it is too high, it is recommended to decrease the *Curve translation* and to select a higher heating curve.

Buildings with poor thermal insulation require higher heating curves, whereas for buildings which have good thermal insulation, the heating curve can have lower value.

The regulator can increase or decrease the preset temperature, calculated in accordance with the heating curve, if it exceeds the temperature range for the given circuit.

8.18 Description of night time decrease settings

The regulator offers possibility to select the time intervals for boiler, heating circuits, HUW container and HUW circulating pump, at which lower preset temperature may be set e.g. for a night time or when the user is not at home. This feature enables automatic reduction of preset temperature, which improves heat comfort and reduces fuel consumption. It is

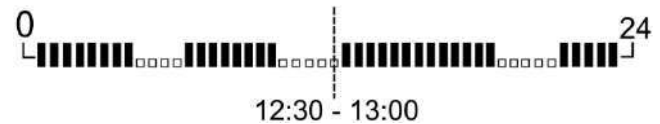
indicated with a sign .

To activate the time intervals set the parameter *ON* for the boiler and the heating

circuit on *YES*. The parameter [Reduction value] is set reduction temperature, one temperature for all time intervals.

Decrease of night time can be defined separately for every day of the week in set *Schedule*.

Select the "TOUCH and PLAY" knob decreasing the preset temperature for a given time interval. The time intervals for 24 hours are fixed at 30 minutes.



Time interval is not disregarded when its decrease is set to "0" even values have been entered.

8.19 Manual control

Regulator offers possibility to manual start of working equipment such as pump, feeder motor or fan. This feature enables checking whether the given equipment is fault-free and properly connected.



Note: Access to manual control menu is possible only in the *STANDBY* mode, i.e. when the boiler is *OFF*.



Note: Long-term operation of the fan, the feeder or other working equipment may lead to occurrence of hazardous conditions.

8.20 Fuel level setup

Activating the fuel level gauge.

In order to enable display of the fuel level, set value of parameter:

Boiler settings → **Fuel level** → **Alarm level** to a value greater than zero, e.g. 10%

Rotate the "TOUCH and PLAY" knob in the main window to open the fuel level window.

Tip: the fuel level can be viewed in the room panel TIS TRONIC 297 and TIS TRONIC 281. The room panel is not standard equipment of the regulator.

Operation of fuel level indicator.

Each time when fuel silo is filled to required level it is necessary to press and keep the knob in main window. Following info will appear:

Set fuel level at 100%?
YES NO

Once **YES** has been selected and confirmed, fuel level is set at 100%. Fuel may be replenished at any time without a need to wait for complete empty fuel tank. Replenish fuel always to the level corresponding to 100% and confirm achieved 100% level by keeping the knob pressed for a while!.

Description of operation.

The regulator calculates the fuel level basing on the current fuel consumption. Default settings do not always correspond to the actual consumption of fuel by the given boiler, therefore, for proper operation this method requires the regulator user to perform level calibration. No additional fuel level sensors are required.

Calibration.

To perform calibration - fill the fuel tank to the level corresponding to its full load and set the parameter:

Boiler settings → Fuel Level → Fuel level calibration → Fuel Level 100%

The indicator in the main window will be set to 100%. On-going calibration process is signalled by flashing fuel level gauge. The gauge will flash until the time of marking the point corresponding to minimal fuel level. One must systematically control the decreasing level of fuel in the bin. When the level reaches the requested minimum, set the value of the parameter:

Boiler settings → Fuel Level → Fuel level calibration → Fuel Level 0%

Calibration process can be skipped if done properly will set the parameters *Feeder efficiency* and *Tank capacity*, which can be found in:

Service Settings → Boiler settings.

8.21 Information

"Information" menu allows to preview temperatures being measured and to recognize which equipment is currently ON.



Upon connection of mixers' extension module, information windows of additional mixers are displayed.

8.22 Cooperation with the room panel

The regulator can work together with TIS TRONIC 297 and TIS TRONIC 281 remote control device, which have a built-in room thermostat. This room panel shows useful information such as: fuel level, alarm indication etc.

8.23 Cooperation with the internet module

The regulator can work with the internet module TIS TRONIC 501 that control regulator on-line via WiFi or LAN, using the Web service **www.econet24.com** and convenient application for mobile devices **ecoNET.apk**. The application ecoNET.apk can be downloaded free of charge from:

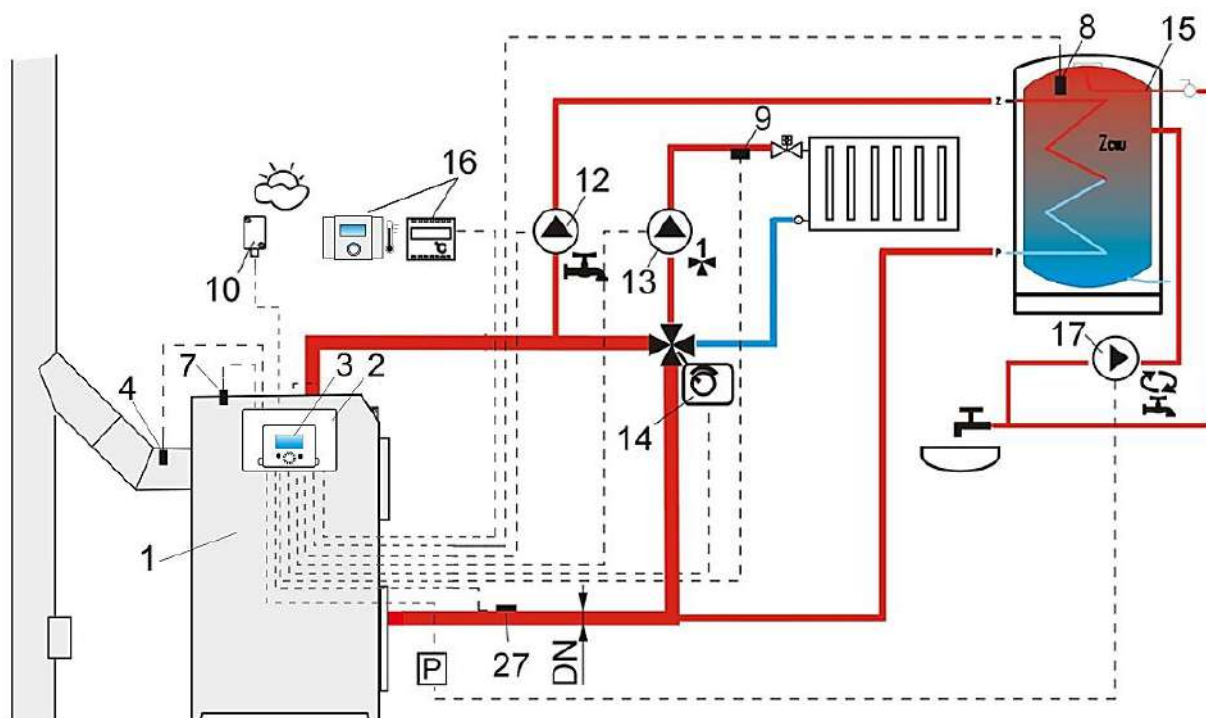


TIS TRONIC 496P

9. Hydraulic schemes



The presented hydraulic schemes does not replace central heating engineering design and may be used for information purposes only!



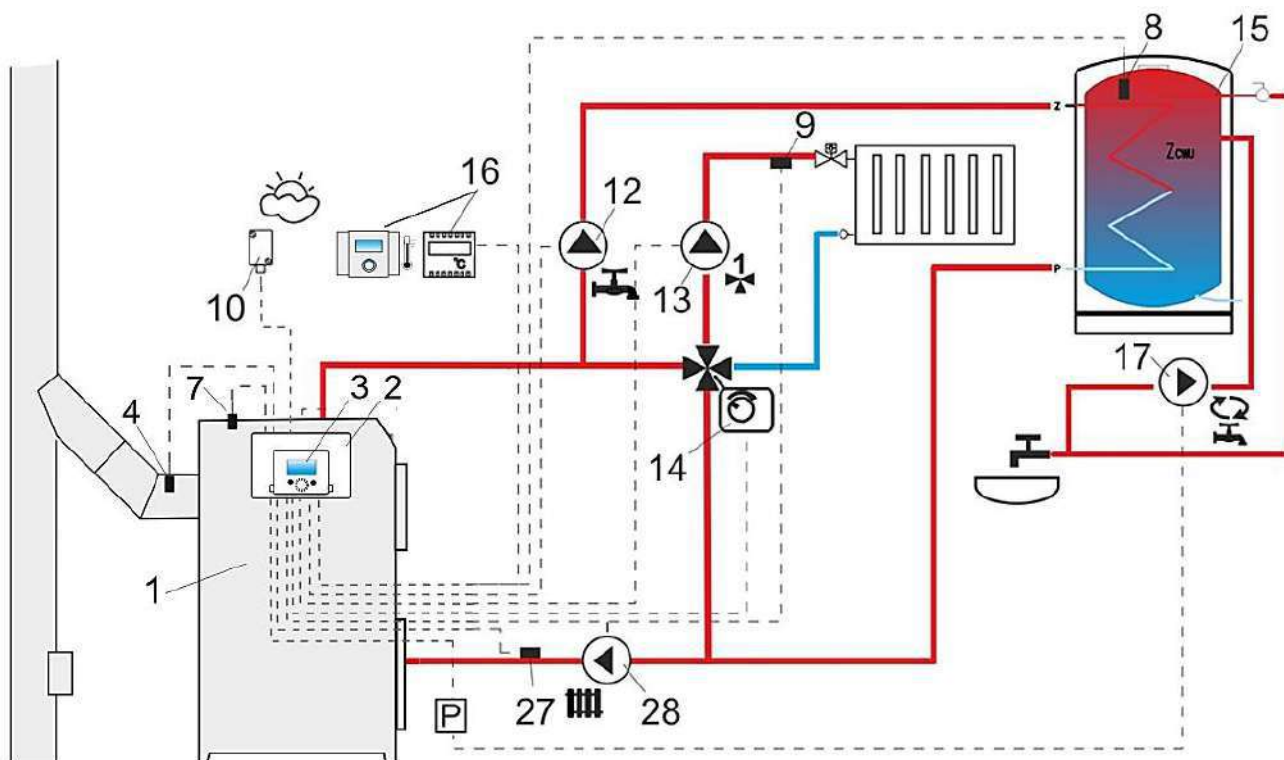
Scheme with 4-way control valve for central heating circuit: 1 – boiler, 2 – regulator – module A, 3 – control panel, 4 – exhaust temp. sensor, 7 – boiler temp. sensor, 8 – HUW temp. sensor, 9 – mixer temp. sensor, 10 – weather temp. sensor, 12 – HUW pump, 13 – mixer pump, 14 – electric servo the valve, 15 – HUW container, 16 – room thermostat or room panel TIS TRONIC 297 and TIS TRONIC 281, 17 – HUW circulation pump, 27 – return temperature sensor (does not affect combustion process control), P – relay.



As there is not mechanically forced water flow in boiler return circuit - this method of protection of boiler return circuit from cold water is not efficient. Use of other methods is recommended. To improve water flow in gravitational circuit of the boiler (the circuit is indicated on the diagram with a bold line) it is necessary to: (i) use pipes and 4-way valve of large DN value, (ii) avoid using excessive number of elbows and cross section reductions, and (iii) apply other rules of gravitational circuit construction - e.g. keeping of gradients, etc. In case the return temperature sensor is of contact type - provide the sensor with heat insulation to isolate it from the environment and improve its thermal contact with the pipe by application of thermal paste. Set the preset boiler temperature at so high value that heat output required to the heating circuit and to heat-up return water to the boiler is guaranteed.

RECOMMENDED SETTINGS:

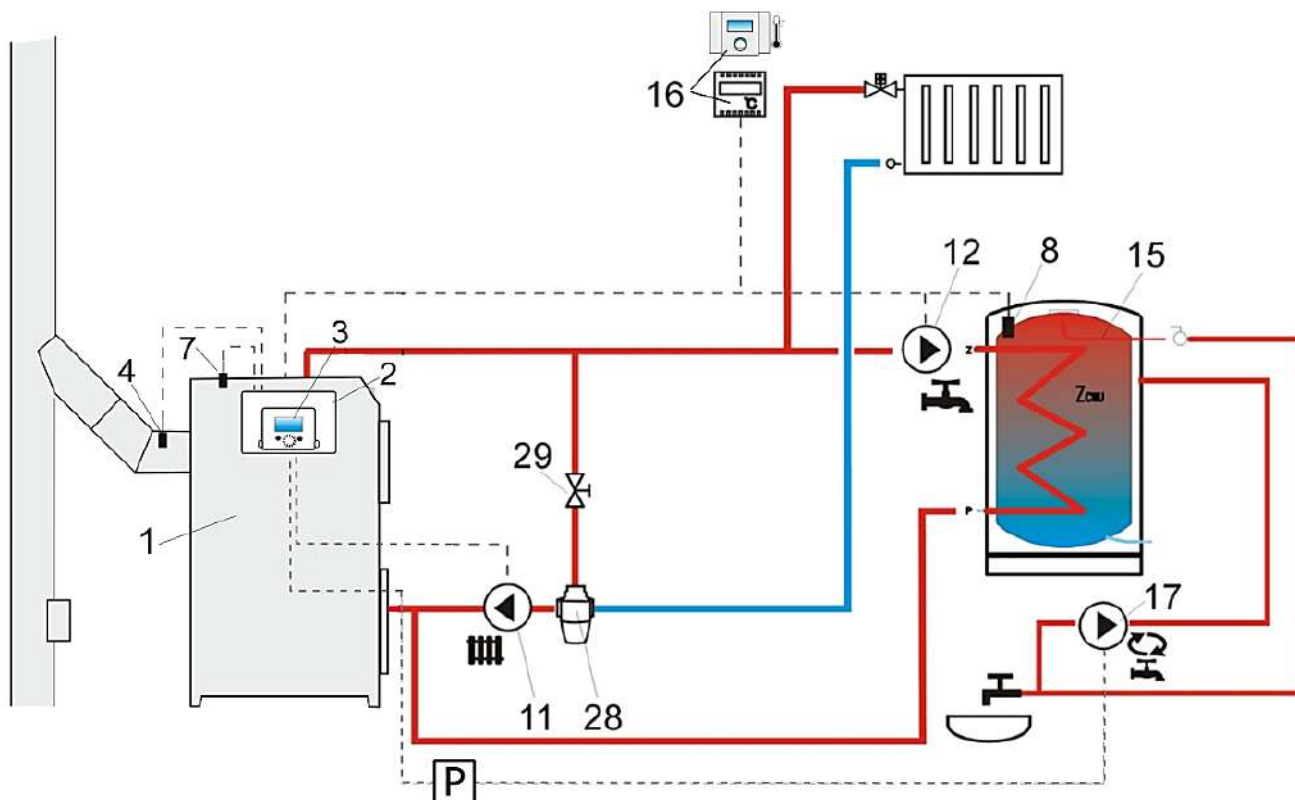
	Parameter	Setting	MENU
	Return Protection	ON	Service settings → Boiler settings → Return protection
	Min. return temp	45°C	
	Return temp. hyst.	2°C	
	Valve closing	0%	
	Min. preset boiler temperature	70°C	Service settings → Boiler settings
	Mixer support 1	CH On	Service settings → Installation → Mixer 1 settings
	Max. preset mixer 1 temperature	75°C	Service settings → Installation → Mixer 1 settings
	Heating curve. mixer 1	0.8 – 1.4	Mixer 1 settings
	Weather control mix.1	ON	Mixer 1 settings → Weather control
	Circulation support	ON	Circulation pump



Scheme with 4-way valve and additional pump in the boiler circuit: 1 – boiler, 2 – regulator – module A, 3 – control panel, 4 – exhaust temp. sensor, 7 – boiler temp. sensor, 8 – HUW temp. sensor, 9 – mixer temp. sensor, 10 – weather temp. sensor, 12 – HUW pump, 13 – mixer pump, 14 – electric servo of the valve, 15 – HUW container, 16 – room thermostat or room panel TIS TRONIC 297 and TIS TRONIC 281, 17 – HUW circulation pump, 27 – return temperature sensor (does not affect combustion process control), 28 – boiler pump, P – electric relay.

RECOMMENDED SETTINGS:

	Parameter	Setting	MENU
	Return Protection	ON	Service settings → Boiler settings → Return protection
	Min. return temperature	45°C	
	Hysteresis of the return temperature	2°C	
	Valve closing	0%	
	Min. preset boiler temperature	70°C	
	Mixer support 1	CH On	Service settings → Installation → Mixer 1 settings
	Max. preset mixer temperature 1	75°C	Service settings → Installation → Mixer 1 settings
	Heating curve. mixer 1	0.8 – 1.4	Mixer 1 settings
	Weather control mix. 1	ON	Mixer 1 settings → Weather control
	Circulation support	ON	Circulation pump

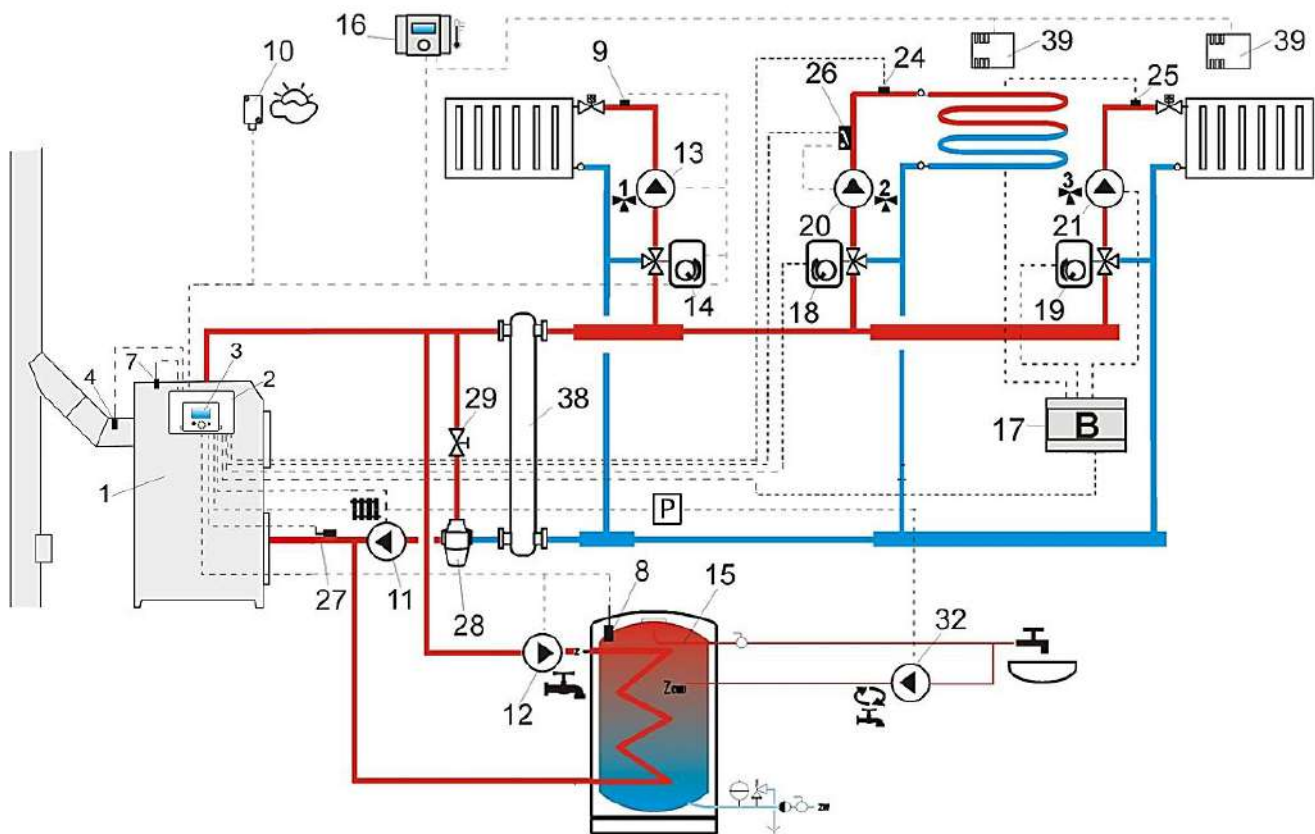


Scheme with 3-way thermostatic valve to secure return water temperature¹: 1 – boiler, 2 – regulator– module A, 3 – control panel, 4 – exhaust temp. sensor, 7 – boiler temp. sensor, 8 – HUW temp. sensor, 11 – boiler pump, 12 – HUW pump, 15 – HUW container, 16 – room thermostat or room panel TIS TRONIC 297 and TIS TRONIC 281, 17 – HUW circulation pump, 28 – thermostatic 3-way valve, 29 – throttle (mushroom) valve, P – electric relay.

RECOMMENDED SETTINGS:

	Parameter	Setting	MENU
	Return Protection	OFF	Service settings → Boiler settings → Return protection (if mixer sensor in not provided - this option is not available)
	Circulation support	ON	Circulation pump

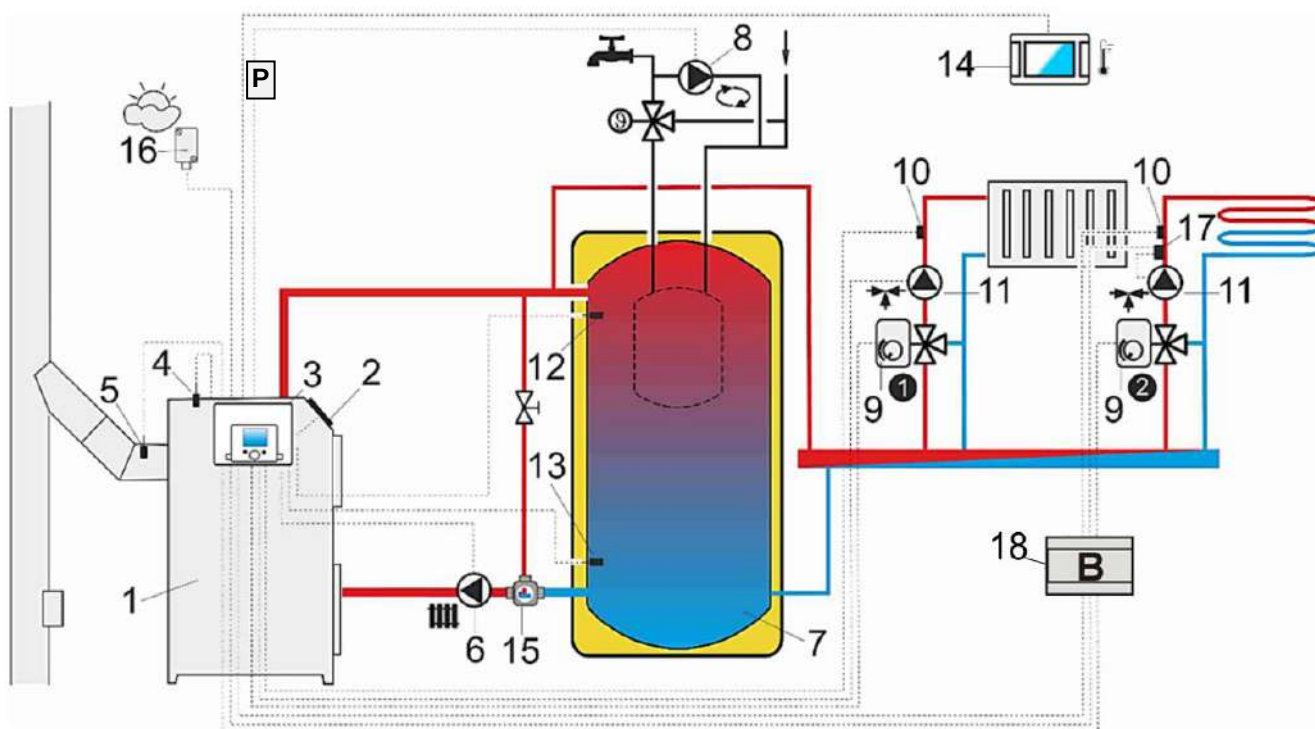
¹ The presented hydraulic diagram does not replace central heating engineering design and may be used for information purposes only.



Scheme with two additional mixer circuits upon connection of additional module B: 1 – boiler, 2 – regulator-module A, 3 – control panel, 4 – exhaust temp. sensor, 7 – boiler temp. sensor, 8 – HUW temp. sensor, 9 – mixer 1 temp. sensor, 10 – weather temp. sensor, 11 – boiler pump, 12 – HUW pump, 13 – mixer 1 pump, 14 – mixer 1 servo, 15 – HUW container, 16 – – room thermostat or room panel TIS TRONIC 297/TIS TRONIC 281, 17 – extension module TIS TRONIC 61B, 18 – mixer 2 servo, 19 – mixer 3 servo, 20 – mixer 2 pump, 21 – mixer 3 pump, 24 – mixer 2 temp. sensor, 25 – mixer 3 temp. sensor, 26 – autonomous thermostat to protect underfloor heating - max. temp. 55°C (it cuts off power supply to the mixer pump once the maximum temperature has been exceeded; thermostat is not included in the regulator supply), 27 – return temperature sensor (recommended mounting location: bottom section of boiler water jacket), 28 – thermostatic 3-way valve (to protect boiler return), 29- throttle mushroom valve, 32 – HUW circulation pump, P – electric relay, 38 – hydraulic coupling, 39 – room temperature sensor CT7.

RECOMMENDED SETTINGS:

	Parameter	Setting	MENU
 1,3	Mixer support	CH On	Service settings → Installation → Mixer settings
	Max. preset mixer temperature	75°C	Service settings → Installation → Mixer settings
	Heating curve. mixer	0.8 – 1.4	Mixer settings
	Weather control mix.	ON	Mixer settings
 2	Mixer support	Floor On	Service settings → Installation → Mixer settings
	Max. preset mixer temperature	50°C	Service settings → Installation → Mixer settings
	Heating curve. mixer	0.2 – 0.6	Mixer settings
	Weather control mix.	ON	Mixer settings
	Circulation support	ON	Circulation pump
	Return Protection	OFF	Service settings → Boiler settings → Return protection



Scheme with heat buffer: 1 – burner, 2 – boiler, 3 – regulator, 4 –boiler temp. sensor, 5 – exhaust temp. sensor, 6 – boiler pump, 7 – heat buffer, 8 – HUW pump, 9 – mixer servo, 10 – mixer temp. sensor, 11 – mixer pump, 12 – upper buffer temp. sensor, 13 – lower buffer temp. sensor, 14 – room control panel with room thermostat function, 15 – thermostatic 3-way valve (to protect boiler return), 16 – weather temp. sensor type CT6-P, 17 – autonomous thermostat to protect underfloor heating, 18 – extension module TIS TRONIC 61B, P – electric relay.
The regulator supports one mixer. The supply by the regulator mixer 2 or next mixer requires the use of additional module TIS TRONIC 61.

RECOMMENDED SETTINGS:

Parameter	Setting	MENU
Preset boiler temp.	80°C	Boiler settings
Min. boiler temp.	75°C	Service settings → Boiler settings
CH activation temp.	55°C	Boiler pump
Buffer support	ON	Service settings → Installation → Buffer
Loading start temp.	50°C	Service settings → Installation → Buffer
Loading end temp.	75°C	Service settings → Installation → Buffer
Mixer 1 support	CH On	Service settings → Installation → Mixer 1 settings
Max. preset mixer 1 temp.	70°C	Service settings → Installation → Mixer 1 settings
Heating curve. mixer 1	0.8 – 1.4	Mixer 1 settings
Weather mixer 1 control	ON	Mixer 1 settings
Thermostat mixer 1 selection *	TIS TRONIC 297 or TIS TRONIC 281	Service settings → Mixer 1 settings
Mixer 2 support	Floor On	Service settings → Installation → Mixer 2 settings
Max. preset mixer 2 temp.	45°C	Service settings → Installation → Mixer 2 settings
Heating curve. mixer 2	0.3 – 0.8	Mixer 2 settings
Weather mixer 2 control	ON	Mixer 2 settings
Thermostat mixer 2 selection *	TIS TRONIC 297 or TIS TRONIC 281	Service settings → Installation → Mixer 2 settings

* when instead of room panel TIS TRONIC TRONIC TIS 297 or 281 (14) connected is a standard room thermostat (ON/OFF), must to select: *Universal*, or when the setting is hidden, it does not have to choose any option for the thermostat.

10. Technical data

Power supply	230V~, 60Hz
Current consumption by the regulator	0,2 A
Max. rated current	6 (6) A
IP rating of the regulator	IP20
Ambient temperature	T50
Ambient temperature	0...50 °C
Storage temperature	0...65°C
Relative humidity	5 - 85% without steam condensation
Temperature measurement range of sensors CT4	0...100 °C
Temperature measurement range of sensors CT6-P	-35...40 °C
Accuracy of temperature measurement using	2°C
Connectors	Screw terminals at supply voltage side - 2.5mm ² Screw terminals at control voltage side - 1.5mm ²
Graphical display	Graphical 128x64
Overall dimensions	340x225x60mm
Total weight	1,6 kg
Standards	PN-EN 60730-2-9 PN-EN 60730-1
Software class	A
Pollution degree	2nd pollution degree

11. Storage and transport conditions

The controller cannot be exposed to immediate effects of atmospheric conditions i.e. rain or sunrays. Temperature of storage and transport should be within scope -15...+65°C.

During transport the controller cannot be exposed to vibrations bigger than typical for transport of boilers as well as direct pressure upon the clamp cover in order to protect the STB capillary, which is situated inside the clamp box for the controller version equipped with STB device.

12. REGULATOR INSTALLATION

12.1 Environmental conditions

Due to fire risk it is forbidden to use the controller in proximity of explosive gases or dust. Moreover the controller cannot be used

in conditions of water steam condensation or be exposed to effects of water.

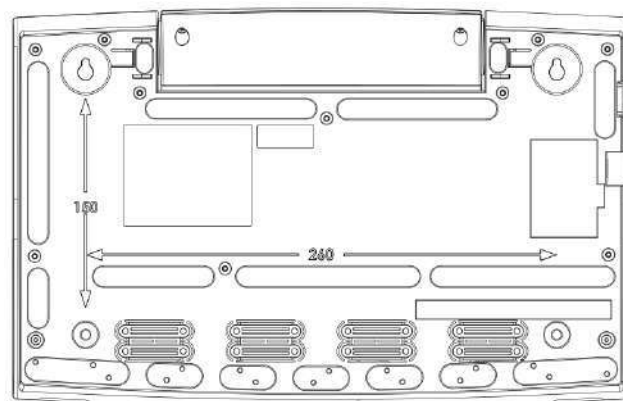
12.2 Mounting requirements

Regulator should be installed by qualified and authorized technician with observance of applicable standards and regulations. The manufacturer disclaims any liability for damage caused by non-observance of instructions specified in this manual. The regulator is intended to build into other equipment, and may not be used as a stand-alone device.

Ambient temperature and temperature of mounting base should be within the range of 0...50°C. The regulator is composed of two modules: a control panel and an operating unit, connected with electric wire.

12.3 Module installation

The regulator casing does not provide dust and water immunity. In order to provide the protection from these factors the regulator should be enclosed with a proper casing. The regulator is to be enclosed – which means the regulator should be screwed on to the flat horizontal or vertical surface (e.g. boiler housing, room wall). To screw on the regulator use mounting holes and proper screws. Location and spacing of mounting holes are shown in the picture below. The regulator must not be used as a free-standing device.



After installation make sure that the device is properly mounted and it is impossible to detach it from the mounting surface.

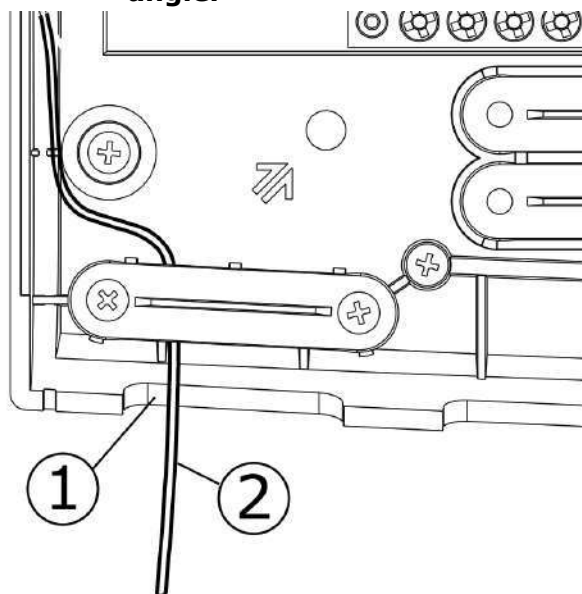


Opening of the boiler door or flue leakiness cannot expose the regulator directly to hot gases and fire from the fireplace.



In case of using the version with STB device before making the montage and wiring it is strongly recommended to take out the STB capillary from inside the clamp box using cable opening as described on the picture below.

Attention! This capillary cannot be smashed or bend with acute angle.



1- Cable opening 2 - The STB capillary cable, which was being correctly taken out from the clamp box.

12.4 IP protection rate

The regulator casing provides the IP20 protection rating. The casing on the connectors cover side provides IP00 rating, and because of that connectors must be unconditionally covered with the cover.

If there is a need to gain an access to the terminals side, it is a must to disconnect the mains voltage and make sure there is no dangerous voltage on regulator terminals.

12.5 Electric connection

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

- three core (with protective wire PE),
- 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

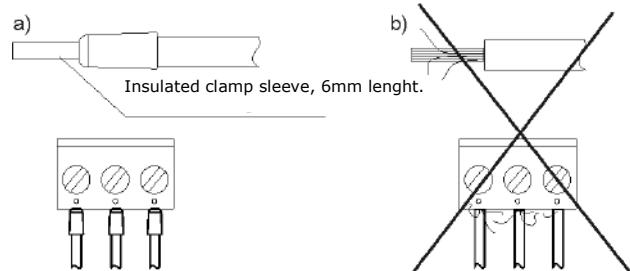
assembly works, you must disconnect the mains supply and make sure that there is no dangerous voltage on the terminals and the leads.

Connection cables should not have contact with surfaces which temperature exceeds cables nominal operating temperature. Terminals 1-22 are designed to connect devices supplied by the mains 230V~ voltage. Terminals 25-48 are designed to work with low-voltage devices (<12V).



Connection of the 230V~ mains voltage to terminals 25-48 or to transmission terminals G2, G3, B and USB results in the regulator damage and poses a threat of electrocution.

Tips of connection cables, especially mains voltage cables should be secured from splitting by e. g. insulated clamp sleeves in accordance with the picture below: a - properly secured, b - improperly secured.



Unconditionally check if any lead of the insulated cable, or the cable itself DO NOT have electrical connection with the metal grounding strip (which is placed near to high voltage terminals of the regulator).

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



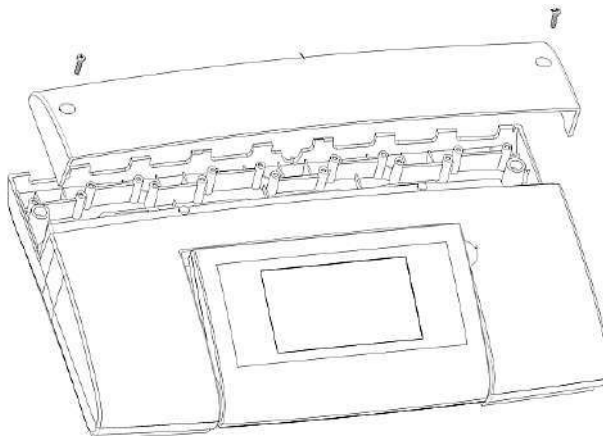
All peripherals (such like: pumps, RE-marked relays and connected recipients) may be connected only by qualified person in accordance with applicable regulations. Safety precautions to prevent electrocution shall be observed.

Regulator shall be equipped with a set of pins connected to 230V AC mains.

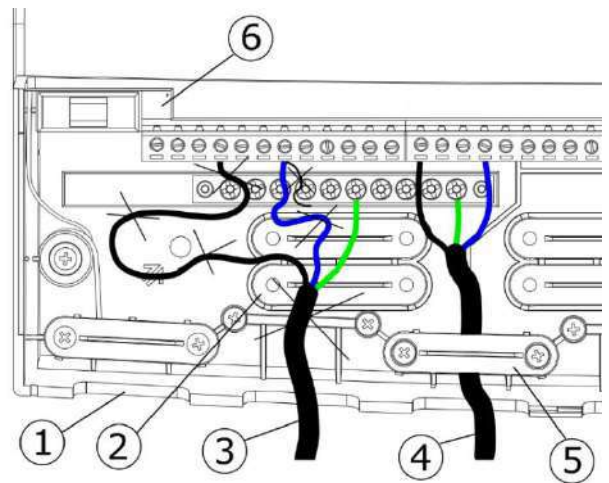
Protection lead of the power supply cable and protection leads of connected devices

should be connected to the grounding strip placed inside the casing of the regulator marked with .

Before making any connections remove the cover from the casing of the regulator as shown below.



- cables secured from splitting should be connected to screw terminals of the (6) connector.
- cables should be put through cable outlets in the casing (1) and secured from ripping or loosening by a holdfast (5 – break it out from the casing).
- cables insulation should be stripped by the minimum possible, max. 60mm. If there is a necessity to strip cable insulation more than 60mm, cable leads should be fasten together or with other leads near the connector – in order to prevent contact with unsafe parts in the case of falling out the lead from the connector.
- it is not allowed to coil excess of the cable and to leave not connected leads inside the casing of the regulator.



1 – cable outlets, 2 – holdfasts placing (should be broken out for the casing), 3 – improper cable connection (it is not allowed to coil excess of the cable inside the device and to leave cables with stripped insulation), 4 – proper cable connection, 5 – holdfast of the cable, 6 – connector.

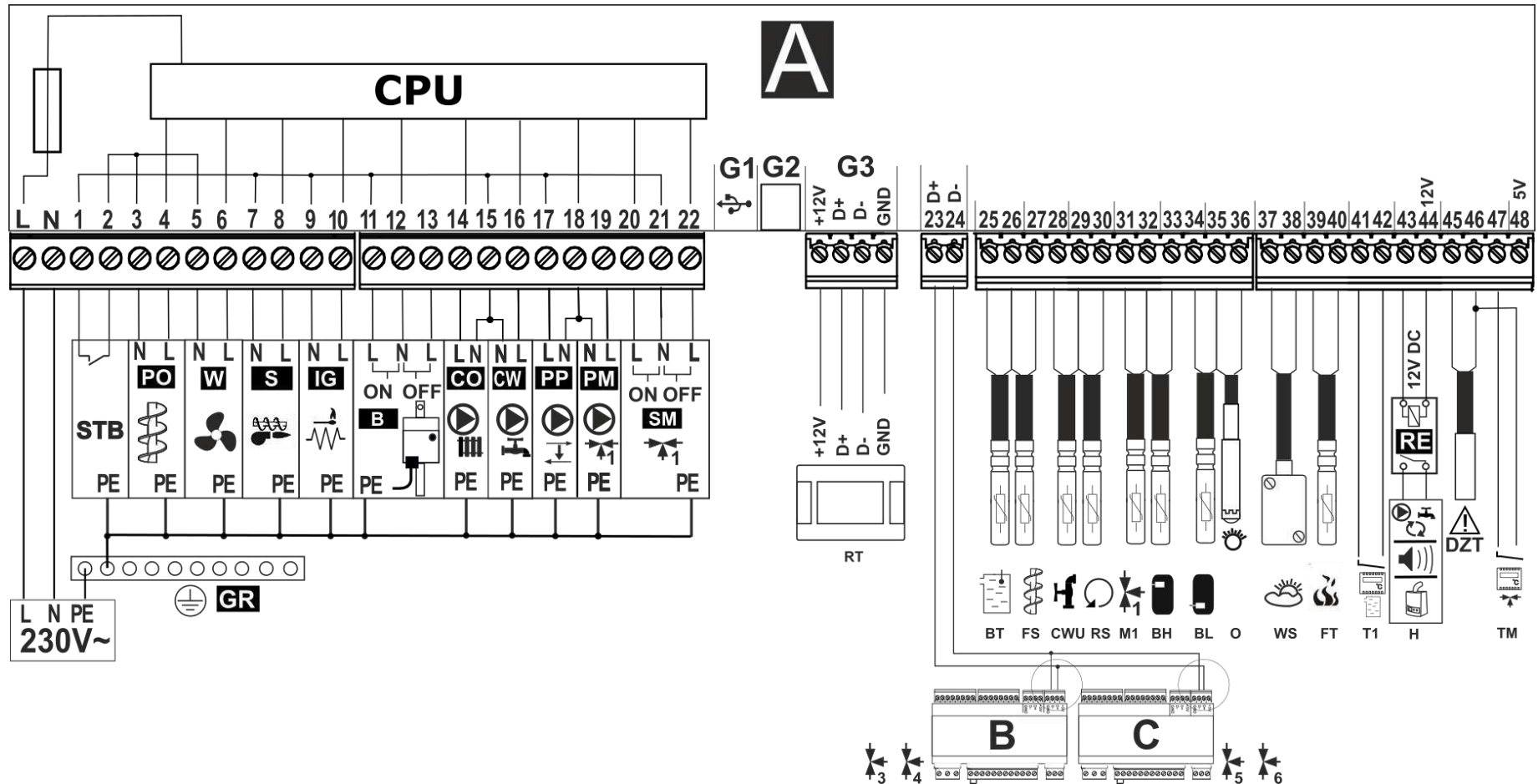


Electrical cables should be isolated from hot parts of the boiler, especially from flues.

- When the cables connection is done the cover of the connectors has to be put in place.

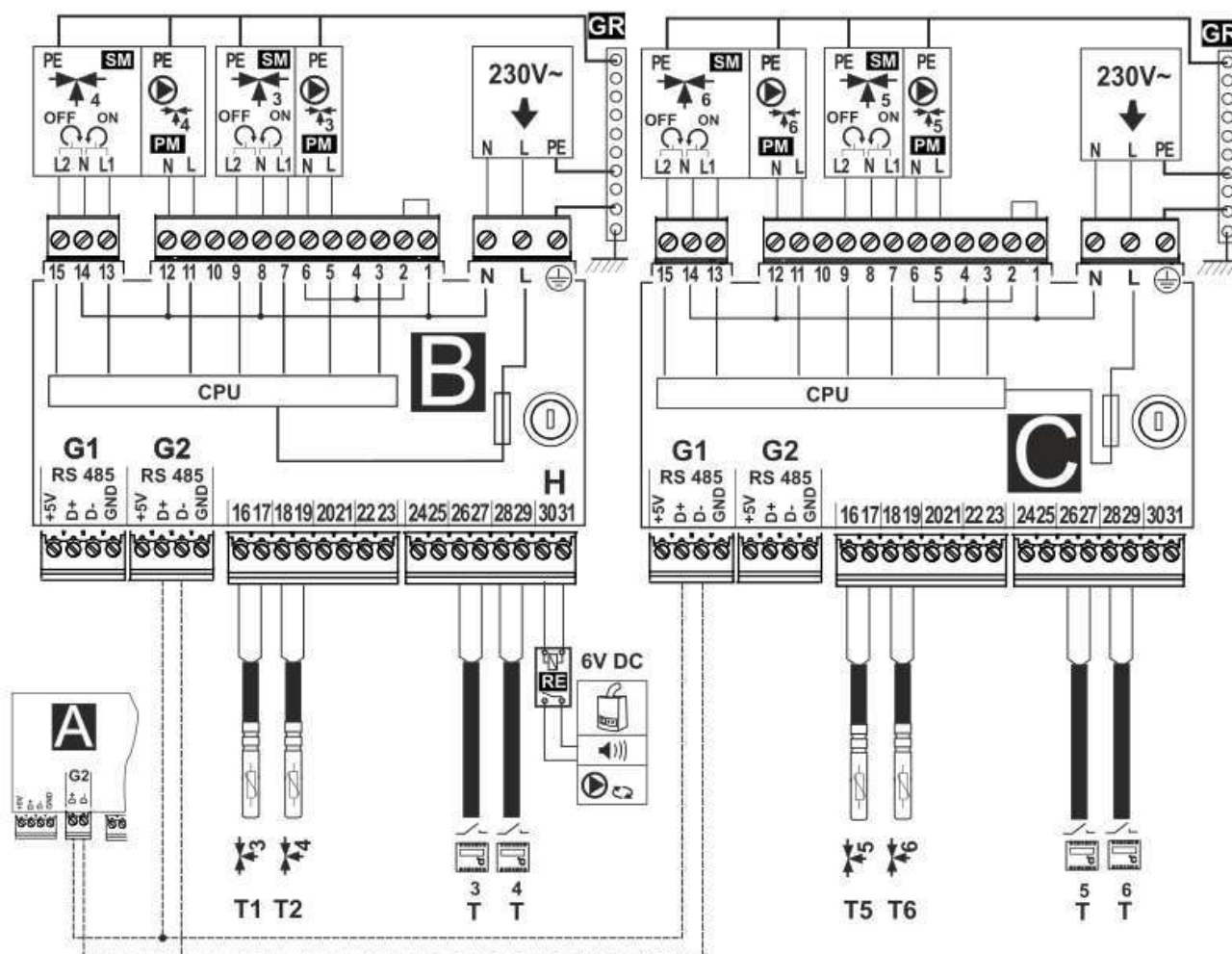


The connectors cover should be always screwed on to the casing of the regulator. Apart from providing safety for the user, the connectors cover also protects the interior of the regulator from hazardous environmental conditions providing a proper level of the IP protection.



Schematic electrical connection to the regulator TIS TRONIC 496P: RT – control panel and additional room panel TIS TRONIC 297 or TIS TRONIC 281, **B, C** - modules to support additional heating circuits TIS TRONIC 61B and TIS TRONIC 61C, **BT** – boiler temp. sensor type CT4, **FS** – fuel feeder temperature sensor type CT4, **CWU** – HUW temp. sensor type CT4, **RS** – boiler return water temperature sensor type CT4, **M1** – mixer 1 temp. sensor type CT4, **BH** – upper buffer temp. sensor type CT4, **BL** – lower buffer temp. sensor type CT4, **O** – optical brightness sensor flame, **WS** – weather temp. sensor type CT6-P, **FT** – exhaust temp. sensor type CTS2 (only to read), **T1** – universal boiler thermostat (ON-NC), **H** – output to control the circulation pump or signaling alarms, or reserve boiler, **RE** – relay 12V, max. 80mA, **DZT** – additional thermal protection, **TM** – universal mixer 1 thermostat (ON-NC).

L N PE - power supply cable 230V~, **GR** – ground strip, **UZ** – grounding of metal regulator housing, **STB** – safety temperature limiter, **PO** – main fuel feeder, **W** - fan, **S** – burner feeder, **IG** – igniter, **B** – Belimo actuator, **CO** – boiler pump or loading buffer pump, **CW** – HUW pump, **PP** – boiler protection pump, **PM** – mixer pump, **SM** – mixer servo, **CPU** – controlling.



Electric scheme – additional modules TIS TRONIC 61B and TIS TRONIC 61C: **T1, T2** – mixer 3,4 temp. sensor type CT4, **T5, T6** – mixer 5,6 temp. sensor type CT4, **T** – room thermostat (ON-NC).

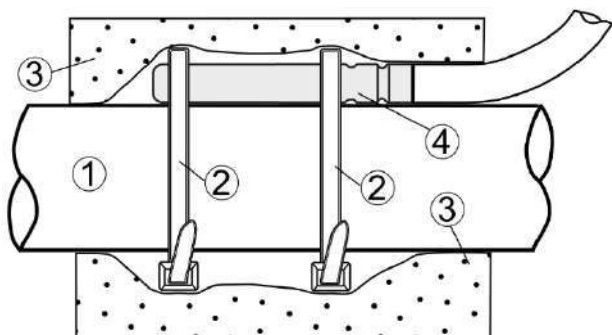
L N PE– supply power 230V~, **GR** – ground strip, **PM** – mixer pump, **SM** – mixer servo, **CPU** – controlling, **G1, G2** – slot transmission, **A** – main module regulator.

12.7 Temperature sensors connection

The regulator is compatible only with CT4, CT6-P and CT2S sensors. The use of other sensors is prohibited!.

Wires of sensors can be extended by wires with diameter no smaller than 0,5mm². Total length of wires in each sensor should not exceed 15m.

The boiler temperature sensor should be installed in a thermostatic pipe installed in the boiler. Temperature sensor of hot water silo should be installed in a thermostatic pipe welded into the silo. The mixer temperature sensor should be installed in a sleeve located in stream of running water in pipe, but also it can be installed on the pipe, on condition that it is thermally isolated from the pipe.



Mounting temperature sensor: 1 - pipe, 2 - clamps, 3 - thermal insulation, 4 - temperature sensor.



Sensor must be protected from getting loose from the surfaces to which they are connected.

Good thermal contact should be maintained between sensors and the measured surface. To this purpose thermal grease should be used. It is not acceptable to lubricate sensors with water or oil. Wires of sensors should be separated from network electrical wires. In such a case wrong readings of temperature may be shown. Minimum length between those wires should be 10 cm. It is not acceptable to allow for contact between wires of sensors and hot parts of the boiler and the heating installation. Wires of sensors are resistant to temperature not exceeding 100°C.

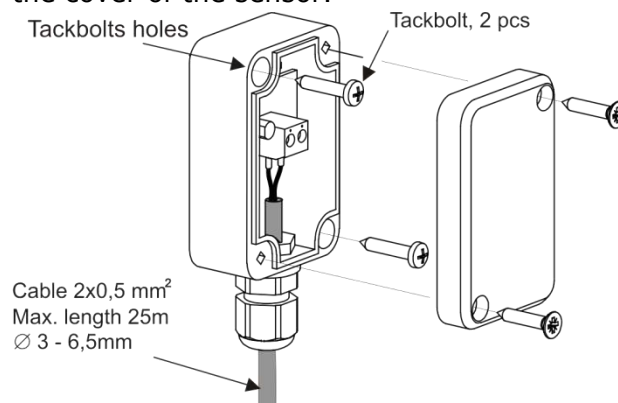
12.8 Weather sensors connection

The controller cooperates solely with the weather sensor type CT6-P. The sensor should be installed on the coolest wall of the building. Usually it is the northern wall, under the roof.

The sensor should not be exposed to direct sunrays and rain. The sensor should be installed at least 2 m above the ground, far away from windows, chimneys and other sources of heat.

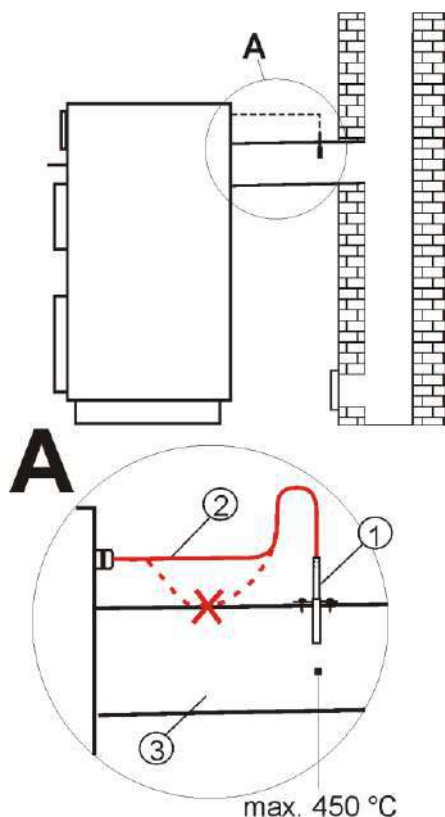
To make the connection use wire with diameter at least 0,5mm² up to 25m long. Polarization of wires is not essential. Second end should be connected to terminals of the controller or properly to the used kind of controller.

The sensor should be screw to the wall. Access to assembly holes is possible after unscrewing the cover of the sensor.



12.9 Connecting exhaust sensor

The exhaust sensor should be fitted in the boiler flue. The gap between the sensor and the flue should be sealed. The sensor should be installed by a qualified fitter, while observing regulations applicable for chimney systems. The emission sensor should be connected to the sensor terminals acc. to The emission sensor lead cannot touch hot elements of the boiler and the flue, the temperature of which exceeds 350°C. The emission sensor should be installed in such distance from the boiler at which it is not directly exposed to flames, and where the emission temperature does not exceed 450°C.



Connecting emission sensor: 1 – exhaust temp. sensor type CT2S, 2 – sensor lead, 3 – flue.



Caution: Opening the boiler door can cause the emission temperature to exceed the sensor's thermal resistance, which can burn the sensor out.

12.10 Checking temperature sensors

Temperature sensors CT4/CT6-P/CT2S can be checked by measuring their resistance at the 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 (KTY81)			
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

CT6-P (PT1000) – weather			
Temp. °C	Min. Ω	Nom. Ω	Max. Ω
-25	901,6	901,9	1000,2
-20	921,3	921,6	921,9
-10	960,6	960,9	961,2
0	999,7	1000,0	1000,3
25	1096,9	1097,3	1097,7
50	1193,4	1194,0	1194,6
100	1384,2	1385,0	1385,8
125	1478,5	1479,4	1480,3
150	1572,0	1573,1	1574,2

CT2S (PT1000) – exhaust			
Temp. °C	Min. Ω	Nom. Ω	Max. Ω
0	999,7	1000,0	1000,3
25	1096,9	1097,3	1097,7
50	1193,4	1194,0	1194,6
100	1384,2	1385,0	1385,8
125	1478,5	1479,4	1480,3
150	1572,0	1573,1	1574,2

12.11 Connection of boiler room thermostat



Note: the boiler room thermostat should be switched off if the whole central heating system of the building is supplied through a mixing valve equipped with electric servo.

The regulator may work with mechanical or electronic room thermostat, which opens the contacts once the preset temperature has been achieved.

Set-up the operation of room thermostat in:

Boiler settings → Room thermostat → Thermostat selection → Universal



Once the preset room temperature has been reached, thermostat opens its contacts and the display shows:



Once the temperature in the room, in which the room thermostat is installed, has reached the preset value, regulator reduces the preset boiler temperature by the value set in *Inc. p. b. temp. thermostat* and the display shows This will cause longer breaks in boiler operation (the boiler will remain in SUPERVISION mode) and the same, temperature in heated rooms will drop.

Moreover, the boiler pump (CH pump) may be interlocked for a certain time by opening the

contacts of the room thermostat in heated rooms. To activate this function - enter:

Boiler settings → Room thermostat → CH pump standstill

and set the value of this parameter >0. Setting the value of e.g. „5” causes the pump will be stopped by the room thermostat for 5 min. When „0” is set, the CH pump will not be stopped by the room thermostat. Once this time has elapsed, the regulator switches on CH pump for a time set in *CH pump op t. th. on* e.g. 30s. This feature prevents from excessive cooling of the system caused by a pump stop.



The pump interlock by opening the contacts of the room thermostat may be activated only upon making sure the boiler will not be overheated.

12.12 Connection of mixer's room thermostat

Room thermostat connected to the operational unit affects mixer 1 circuit and/or boiler circuit. If the whole heating circuit of the building is supplied by a mixer with electric servo, room thermostat for boiler should be turned off.

Room thermostat, after disconnection of its connectors reduces preset temperature of the mixer circuit by a value set up in: *Reduce preset mixer temperature to thermostat*. This parameter is available in:

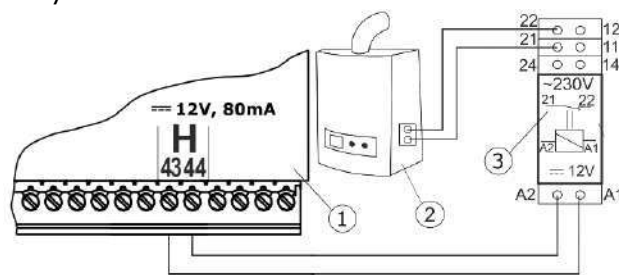
Mixer 1-5 settings → Room thermostat

The mixer pump does not stop upon opening contacts of the room thermostat unless other settings have been made in the Service Menu. Select the value of this parameter so that once the room thermostat has responded (its contacts have opened), the temperature in the room drops.

12.13 Connection of 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 pellet boiler drops, and disabled when the pellet 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 via relay to terminals 43-44.



Model diagram of layout for connecting a reserve boiler to the regulator, where: 1- regulator, 2 - reserve boiler (gas- or oil-fired), 3 - module U3, consisting of relay RM 84-2012-35-1012 and base GZT80 RELPOL.

In a standard version, the regulator is not equipped with the U3 module.



It should to perform assembly and installation of the module by yourself, in conformity with the applicable standards.

Set the temperatures of reserve boiler switch on/off:

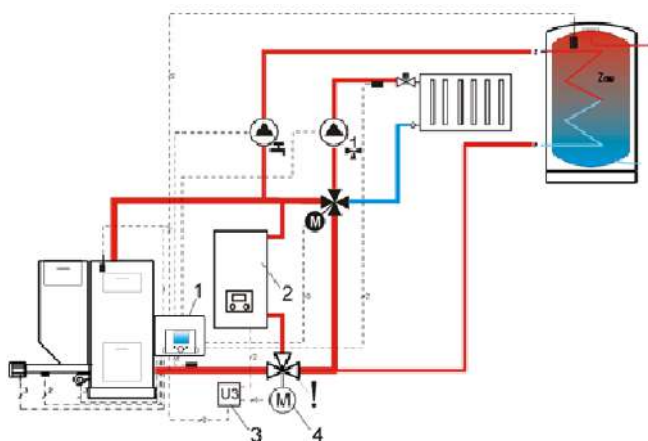
Service settings → Installation → Output H → Reserve boiler → Reserve boiler deactivation temp.

Control of reserve boiler is off upon setting this parameter at „0”.

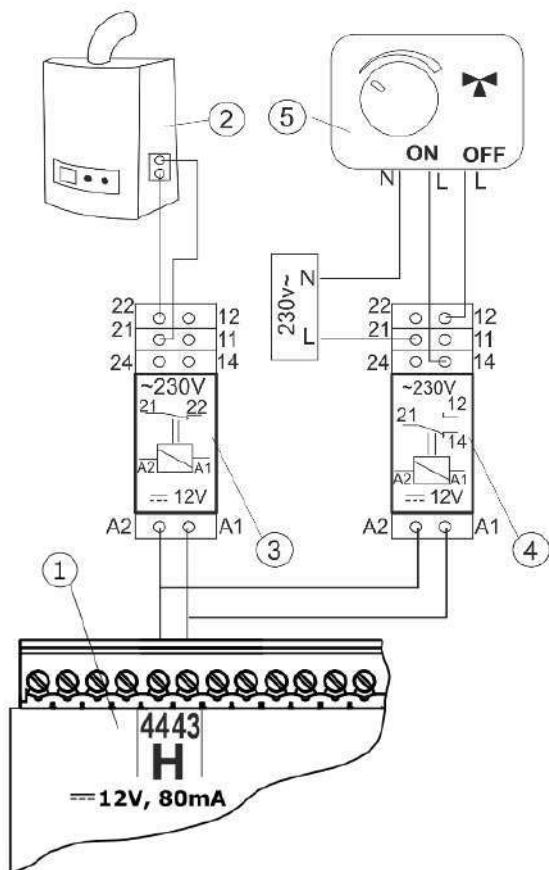
Once the retort boiler has been fired up, and its temperature has exceeded the preset value (e.g. 25°C), regulator switches off the reserve boiler and applies voltage 12V DC at Output H, which causes release of coil of U3 module relay and opening its contacts. Once the boiler temperature has dropped below the value set in the parameter of *Reserve boiler deactivation temperature*, the regulator stops to supply voltage to the Output H, and the reserve boiler switches on.



Entry of the regulator to STAND-BY conditions causes the reserve boiler switches on.



Hydraulic diagram with the reserve boiler and the 4-way valve in close circuit 1 – regulator, 2 – reserve boiler, 3 – U3 module, 2 pcs., 4 – switching valve servo (with limit switches) - to ensure free gravitational flow of water in the boiler circuit, active cross-section of switching valve (4) has to be larger than or equal to cross-section of boiler circuit pipes. Use pipes of large cross section for gravitational boiler circuit.

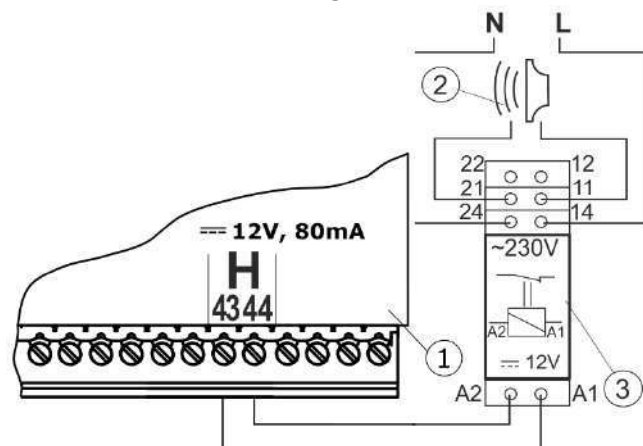


Electric diagram for switching valve of the reserve boiler, where: 1 – regulator, 2 – reserve boiler, 3, 4 – relay RM 84-2012-35-1012 RELPOL and base GZT80 RELPOL, 5 – servo of switching valve.

12.14 Connection of alarm signaling

The regulator may announce an alarm condition by activating external device (e.g. bell or GSM device to send SMS). Alarm signaling and reserve boiler control use the

same terminals, therefore, setting of the H output for alarm signaling deactivates the function of reserve boiler control. Connect alarm annunciator through U3 module.



Connection of an external alarm annunciator 1 - regulator - module A, 2 - external alarm annunciator, 3 - relay RM 84-2012-35-1012 RELPOL and base GZT80 RELPOL.

12.15 Connection of mixer servo



When connecting electric servo of the mixer take care to prevent boiler overheating, which may occur when the flow of boiler water is limited. You are advised to get familiar with the position of the valve corresponding to its maximum opening before commencement of the work so that you may ensure heat collection from the boiler at any time it is required.

The regulator works only with mixing valve servos equipped with limit switches. Use of other servos is not allowed. The servos of full turn time from 80 to 255 s may be used.

Description of mixer servo connection:

- connect mixer temperature sensor,
- switch on the regulator and select proper *Mixer support* in service menu:

Service settings → Installation → Mixer settings → Mixer support, e.g. *CH ON*.

- enter proper *Valve opening time* in Service settings (this time should be indicated on servo rating plate e.g. 120s),
- disconnect power supply of the regulator,
- determine direction of servo closing/opening. For this purpose, set the selector located on the housing of electric servo at manual control and find the positions of the valve in which the temperature in mixer circuit

is maximum and minimum (it corresponds to the setting of the regulator of "100% ON" and "0% OFF", respectively). Write down these positions.

- connect mixer pump,
- wire mixer servo with the regulator,
- connect power supply to the regulator,
- check whether wires to mixer closing and opening are not interchanged. To do this, enter menu: **Manual Control** and open the mixer by selection of *Mix1 open = ON*. When opening, temperature on mixer sensor should increase. In other case, disconnect power supply to the regulator and interchange the wires (Note: other reason of this fault may be incorrect mechanical connection of the valve! - refer to the documentation of valve manufacturer and check whether the valve is properly connected),
- calibrate % factor of mixer valve opening. To do this, disconnect power supply of the regulator and set the selector on housing of electric servo at manual control. Turn the valve head to fully closed position, and set the selector on the housing of electric servo at AUTO again. Connect power supply to the regulator. Now, % factor of mixer valve opening has been calibrated. Note: Calibration in mixers no. 2,3,4,5 starts automatically upon connection of power supply. In case of these mixers - wait until a % factor of the mixer valve opening has been calibrated. During the calibration, servo is closed for the time set in *Valve opening time*. Running calibration is indicated by "CAL" in the menu: **Information**, tab "Mixer-Info",
- set other parameters of the mixer.

12.16 STB temperature limiter

When temperature of water in the boiler exceeds 95°C, power supply of the electric feeder and the fan is cut off by the safety temperature limiter. To reset the limiter it is needed to press the button placed in the side of the casing, near the power switch. Pressing of that button is only possible when temperature of water in the boiler drops.



Safety temperature limiter should have nominal operation voltage of ~230V and should follow current regulations.



Warning: 1-2 terminals are under dangerous voltage.

12.17 Connecting additional thermal protection

The regulator can be equipped with additional thermal protection, type DZT-1. This is an optional equipment, available to special order. It cuts off the fan power supply. Sensor of the additional thermal protection, which operates on low safe voltage, should be placed in the thermometric pipe of the water jacket. You should provide good thermal contact of the DZT-1 sensor, and secure it against coming loose from the measured surface. If the boiler temperature exceeds the DZT-1 sensor activation temperature (85°C or 90°C ±5 depending on the DZT-1 type), the fan power supply is cut off. The fan power supply will be automatically restored after the boiler temperature drops by 10-20°C. If a DZT-1 sensor is not connected, an electric bridge should be made at terminals 45-46 (otherwise the fan will not work).



The additional thermal protection cannot be used instead of the mandatory safety temperature limiter!

12.18 Connecting the circulation pump

Pump hot water circulation may be connected to the regulator to the H Output (terminals 43-44) executive module or H Output (mod) (terminals 30,31) for the additional module TIS TRONIC 61B but always through a electric relay.

Should set the H outputs or H outputs (mod) to support the circulation pump, in the menu: **Service settings → Installation → H Output**

Support for the circulation pump to turn on the user parameter *Circulation support* in the menu:

Service settings → Installation → Pumps

12.19 Connectino of pump protection boiler

Enable support to the pump protection boiler occurs by setting the parameter *Support* to *ON*, in the menu:

Service settings → Installation → Pump protection boiler

The pump protection boiler operate basing upon the read-out of the return temperature

sensor. The pump starts when temperature at the boiler return sensor (in respect of the boiler temperature) has dropped below the value set in the parameter *Start temp.* (it is recommended to set this value at min. 50°C) and stops when the temperature of the return to the boiler temperature rises above parameter *Stop temp.*

For a proper operation of the hydraulic system with the pump protection boiler, a control valve to limit the flow has to be installed and adjusted.



It is recommended to connect the regulator and the pump protection boiler to one common source of power supply. This solution will enable disconnecting power supply to both equipment at the same time.

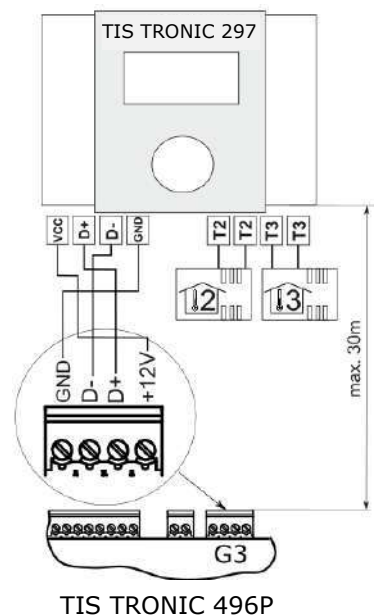
12.20 Connection of room control panel

The TIS TRONIC 297 and TIS TRONIC 281 room control panel may be installed. Main functions of the panel are following:

- room thermostat (3 thermostat units),
- boiler control,
- alarm annunciator,
- fuel level indication.

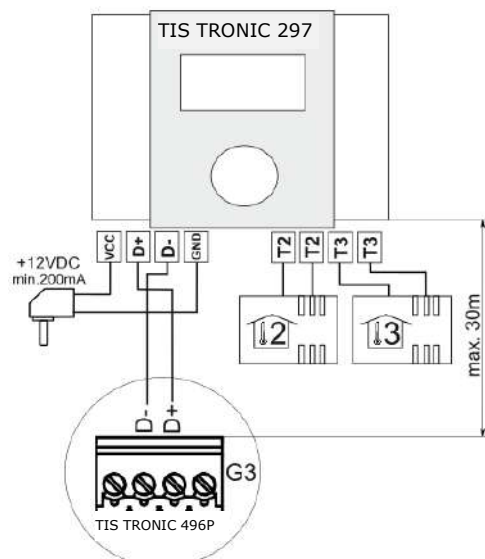
4-wire connection:

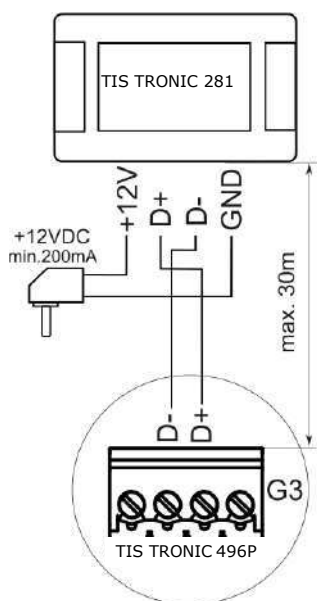
- The room panel TIS TRONIC 281 should be connected to the G3 connector of the regulator, according to the electric scheme.
- The version 2 of the room panel TIS TRONIC 297 should be connected as shown in the picture below, together with room sensors CT7 of a thermostat 2,3.



2-wire connection:

For two-wire connection, power supply of 12V DC and rated current of min. 200mA is required. Disconnect GND and +12V wires from the module (2) and re-connect them to external power supply unit arranged near TIS TRONIC 297 or TIS TRONIC 281. The power supply unit is not included in the regulator supply. The max. length of wires to the TIS TRONIC 297 or TIS TRONIC 281 control panel depends on cross-section area of a wire, and e.g. for a wire of cross-section of 0.5 mm² it should not exceed 30m. The cross-section area of the wire should not be less than 0.5 mm².





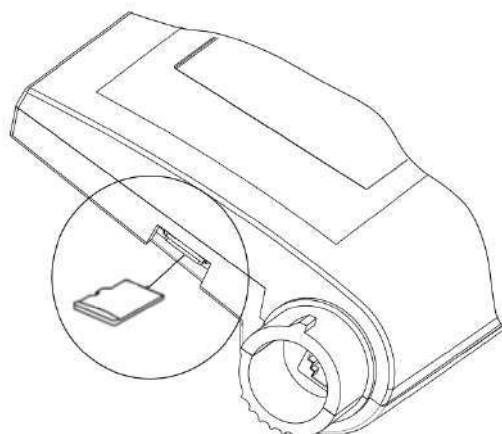
General settings → **Software update** and perform the update firstly in the A module, then in the panel, and in the end in other devices.

12.21 Software update

Simultaneous update of the regulator and panel software can be done using memory card only type microSDHC.



Software update can be performed only by a qualified person. Precautions to prevent electrocution should be observed!.



To update the software:

- disconnect power supply of the regulator.
- insert **microSDHC** memory card (other types of memory cards are not supported) to a socket in the movable casing of the panel shown above. On the memory card there should be written new software in the ***.pfc** format as a 2 files: a file with the panel software and a file with the module A software.
- Software files should be placed directly on the memory card, do not place them in any subdirectory,
- then connect power supply of the regulator and go to:

13.SERVICE MENU

Service settings
Boiler settings
Installation
Service counters
Restore defaults set.

Boiler settings
Burner settings
• WORK • FIRE TEST • FIRE UP • STABILIZATION • BURNING OFF • FAN • STOKER • BELIMO
Min. boiler temp.
Max. boiler temp.
Boiler hysteresis
Room thermostat
• Pump off • Burning off
No fuel detection time
Max. feeder temp.
Boiler cooling temp.
Return protection 4D
• Operation mode • Min. return temp. • Return temp. hysteresis • Valve closing
Feeder efficiency *
Energy density *
Tank capacity *

WORK settings
• Hysteresis 30% • Fan output 30% • Feeding pause 30% • Hysteresis 50% • Fan output 50% • Feeding pause 50% • Hysteresis burning off
FIRE TEST settings
• Test duration • Fan output • Threshold detection
FIRE UP settings
• Blow-in time • Blow-in output • Min. fan output • Max. fan output • Feeding time • Start time • Heater operation time • Heater interval • Threshold detection • Heater extension
STABILIZATION settings
• Stabilization mode • Stabilization time 30% • Stabilization time 50% • Stabilization time 100%

BURNING OFF settings
• Max. time • Extending • Fan • Threshold detection
FAN settings
• Min. output • Max. output
STOKER settings
• Extending time • Push time
BELIMO settings
• Forward time • Return time • Pause time • Support mode: Cleansing in work, Fuel drop

Installation
Pumps
• CH stand. load. HUW • Min. HUW temp. • Max. HUW temp. • Boiler inc. by HUW and M. • HUW oper. extension • Circulation support*
Buffer*
• Buffer support • Loading start temp. • Loading end temp. • Min. buffer temp.
H Output
• Off • Circulation pump • Alarms • Reserve boiler Deactv. temp.
H Output (mod)*
Pump protection boiler*
• Support • Start temp. • Stop temp.
Mixer 1-5 settings*
• Mixer support: Off, CH on, Floor on, Pump only • Thermostat selection • Min. mixer temp. • Max. mixer temp. • Valve opening time • Pump off by therm. • Operat. in SUMMER • Mixer input dead zone • Valve opening - alarm* • Proportional range* • Integr. time const.* • Minimum closing* • Temperature jump • Time temp. control

* unavailable if no adequate sensor or additional module is connected or the parameter is hidden.

14.SERVICE SETTINGS

14.1 BOILER

Burner settings	
WORK	
Hysteresis 30%, 50%	Hysteresis preset boiler temperature, at 30%, 50% of the power boiler, during WORK mode. The parameter is affected by the modulation of the power boiler.
Fan output 30%, 50%	Fan output during WORK mode for 30%, 50% of the power boiler. The parameter is affected by the modulation of the power boiler.
Feeding pause 30%, 50%	Pausing of the fuel supply by the feeder during WORK mode for 30%, 50% of the power boiler. The parameter is affected by the modulation of the power boiler.
Hysteresis burning off	Hysteresis for the boiler preset temperature. Above the value of the hysteresis, boiler will enter the BURNING OFF mode.
FIRE TEST	
Test duration	The duration of the test flame.
Fan output	The fan output during the test fire.
Threshold detection	The detection threshold brightness of the flame during the test fire. Above this threshold test of fire will be stopped.
FIRE UP	
Blow-in time	Time working exhaust fan during firing up. It should not be too long in order not to hinder fire up the furnace.
Blow-in output	Power exhaust fan during firing up. It should not be too large so as not to hinder fire up the furnace.
Min. fan output	Minimum fan output that can be set in the parameters associated with the power of the fan in the user menu.
Max. fan output	Maximum fan output that can be set in the parameters associated with the power of the fan in the user menu.
Feeding time	Feeding time fuel delivery during fire up.
Start time	Time operation airflow fan with the power, set in the <i>Min. fan output</i> . After this time, the fan increases the power value set in the <i>Max. fan output</i> .
Heater operation time	The maximum operating time of the heater during firing up furnace. It should not be too long so as not to damage the heater.
Heater interval	Pause work time heater during firing up.
Threshold detection	The threshold of detection ignite the burner. After crossing this threshold, the regulator recognizes that the burner is aflame and goes to WORK mode.
Heater extension	Extending the operation of the heater during firing up. It should not be too long so as not to damage the heater.
STABILIZATION	
Stabilization mode	Enable or disable the STABILIZATION mode for boiler operation.
Stabilization time 30%, 50%, 100%	This parameter specifies the time to achieve flame stability at a given power level during firing up the boiler.
BURNING OFF	Burnig off mode is inaccessible when the fuel is coal!
Max. time	The maximum time duration of burning off mode. After this time the regulator recognizes that the furnace has not been extinguished and triggers alarm: <i>Failed burned off of the boiler</i> .
Extending	Extending working of the airflow fan during burning off the boiler.
Fan	The power of the airflow fan during burning off the boiler.
Threshold detection	The threshold of detection burning off of the boiler. After crossing this threshold, the regulator recognizes that the furnace was extinguished and goes to the PAUSE modes.
FAN	

• Min. output	Minimum fan power that can be set by the user in the user menu and the minimum that can automatically adjust the regulator.
• Max. output	Maximum fan power that can be set by the user in the user menu and the maximum that can automatically adjust the regulator.
Stoker	The parameters influencing the work of stoker. <i>Extending time</i> stoker work and <i>Push time</i> fuel from the stoker.
Belimo	The team parameters for operation of the actuator Belimo. The duty cycle of the actuator define parameters: <i>Forward time</i> , <i>Return time</i> and <i>Pause time</i> . The parameter <i>Support mode</i> to select the operating mode of the actuator Belimo. <i>Cleansing in work</i> (only cleaning burner during operation boiler) or <i>Fuel drop</i> (only the discharge of fuel during operation boiler).
Min. boiler temp.	This parameter prevents the user to set too low value of boiler preset temperature. Boiler operation at too low temperature may cause its quick damage, corrosion, dirt, etc.
Max. boiler temp.	This parameter prevents the user to set too high value of boiler preset temperature.
Boiler hysteresis	If the boiler temperature drops below the preset boiler temperature by the <i>Boiler hysteresis</i> value, it will boiler automatically firing up.
Room thermostat	• Pump off - disables the influence of the room thermostat (NO-NC) on the operation of the boiler. Activation of the thermostat switches off the boiler pump. • Burning off - activation of the room thermostat (NO-NC) causes burning off the boiler by means of Burning off mode.
No fuel detection time	The time is counted after the exhaust temperature drops below the <i>Threshold detection</i> for the Fire up mode. After deducting this time, the regulator attempts to fire up the burner and after 3 unsuccessful attempts to issue the alarm <i>Failed firing up the boiler</i> .
Max. feeder temp.	Specifies the maximum temperature for which the alarm is displayed on exceeding the maximum temperature of the feeder. After crossing that temperature followed activating the feeder for a limited time and then feeder wait for a few minutes. If the feeder temperature drops, the regulator returns to normal work, if the temperature not drop it will extended work feeder in order to push the ember from the supply pipe burner.
Boiler cooling temp.	The temperature of boiler preventive cooldown. Above this temperature the controller is switching on the HUW pump and opens mixer circuits in order to cool down the boiler. The controller will switch off the HUW pump, when this temperature will exceed the maximum value.
Return Protection4D	A list of settings for boiler return protection function performed using 4-way valve with <u>electric servo</u> . This function is not active if return sensor is disconnected or Mix1 support is OFF. Activation of this function causes all mixers close.
• OPERATION mode	This parameter switches ON and OFF the boiler return protection function performed using mixing valve with electric servo. Note: do not switch on this function if the valve is not provided with electric servo!
• Min. return temp	Boiler return temperature below the value at which electric servo closes mixing valve.
• Return temp. hyst	Electric servo returns to normal operation at the return temperature $\geq \text{min.return temperature} + \text{Return temp. hyst}$.
• Valve closing	It is % opening of mixing valve during active return protection function. Note: the valve closes with accuracy of +/-1%.
Feeder efficiency	Parameter used to rough calculation of boiler output (displayed in INFO window) and of fuel level and it has no effect on control of combustion process [kg/h].
Energy density	Parameter used to rough calculation of boiler output; it has no effect on control of combustion process. Its value for hard coal amounts to approx. 6.5 [kWh/kg]
Tank capacity	Parameter used to calculate fuel level [kg]. Note: Change and confirmation of the value using the knob replaces previously completed fuel level calibration with calculation of fuel level using <i>Tank Capacity and Feeder Efficiency</i> parameters.

14.2 INSTALLATION

Pumps	
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CH stand. load. HUW	It requires a HUW sensor to be plugged in. A prolonged HUW tank loading can, with HUW priority activated, lead to excessive cooling down of CH installation, because with these kind of settings the CH pump is switched off. The parameter of pause time of CH pump preventing this by periodic operation of CH pump while HUW tank loading. The CH pump will after this time activate for fixed set time of 30s.
Min. HUW temp.	This parameter is available upon connection of HUW sensor and prevents the user to set too low preset HUW temperature.
Max. HUW temp.	This parameter is available upon connection of HUW sensor. It defines max. temperature to which HUW container will be heated-up during discharge of excess heat from the boiler in emergency conditions. This parameter is important, because setting too high value may cause the risk of burning the user with hot utility water. On the other hand, too low value of this parameter will cause that in case of boiler overheating excessive heat cannot be removed to HUW container. When designing HUW system, possibility of regulator failure should be considered. In case of regulator failure, water in HUW container may be heated-up to hazardous temperature, which may create the risk of burning the user. Therefore, some other protection (e.g. thermostatic valves) should be used.
Incr. boil. temp. for HUW and mixer	This parameter determines by how many degrees the preset boiler temperature will be increased to fill HUW container, buffer and mixer circuit. Temperature is increased only if required. Once the preset boiler temperature has reached sufficient value to fill HUW container, buffer and mixer circuit, the regulator stops its further increase.
HUW operation ext.	This parameter is available upon connection of HUW sensor. Once HUW container has been filled and HUW pump has been stopped, a boiler overheating risk may occur. It occurs in case the preset HUW temperature is higher than the preset boiler temperature. This issue refers particularly to the operation of HUW pump in SUMMER mode, when CH pump is OFF. To cool down the boiler, duration of HUW pump operation may be extended by the time set in <i>HUW pump operation extension time</i> .
Circulation support	Switches on the user the possibility of operating the circulating pump from the menu. The pause time between periods of operation of the pump circulation is defined by the value of the parameter <i>Circ. standstill time</i> (the recommended setting is 15-40 min.). The circulation pump operates in cycles by <i>Circ. operat. time</i> (the recommended setting is 60 -120 sec.).
Buffer	
Buffer support	Switches ON/OFF buffer support.
Buffer loading start temp.	Temperature measured by upper buffer sensor at which buffer loading starts.
Buffer loading end temp	Temperature measured by lower buffer sensor at which buffer loading ends.
Min. buffer temp.	Temperature measured by upper buffer sensor at which the pumps are switched off and the mixer servos are closed.
H Output H Output (mod)	Operation Output H and H Output (mod) for the circulation pump, alarms and reserve boiler.
Pump protection boiler	Switches on the support pump boiler protection. Boiler temperature at which the boiler pump protection is turned on set in the <i>Start temp</i> . In the <i>Stop temp</i> . is set temperature turned off for the boiler pump protection.
Mixer 1-5 settings	
Mixer support	- Off - Mixer servo and mixer pump are Off. - On CH - It is used when the mixer circuit supplies CH radiator system. Max. temperature of mixer circuit is not limited, mixer is fully opened during alarms e.g. boiler overheating. Note: do not activate this option if the pipes used are not high-temperature resistant. In such conditions it is recommended to set <i>Mixer support</i> at <i>Floor</i>. - Floor on - It is used when the mixer circuit supplies underfloor heating system. Max. temperature of mixer circuit is limited to the value of the parameter of <i>Max. preset mixer temp</i>. Note: upon selection of the option of <i>Floor on</i> set the max. preset mixer temperature at such value, which prevents the floor destruction and occurrence of burn risk. - Only pump - Once the mixer temperature has exceeded a <i>Mixer preset value</i>, power supply to mixer pump stops. Once the mixer temperature has dropped by 2 °C, the pump switches on again. This

	option is mainly used to control the underfloor heating pump in case it works with thermostatic valve without servo.
Thermostat select	Options to choose from: - Off - it switches off the influence of room thermostat (NO-NC) upon the mixer operation, - Universal – it turns on the room thermostat (NO-NC), - TIS TRONIC - this option is available after remote control device TIS TRONIC 297 and TIS TRONIC 281 is being connected, thermostat signal is being send from room panel.
Min. mixer temperature	This parameter is used to prevent the user to set too low preset value of mixer circuit temperature.
Max. mixer temperature	This parameter has two functions: - it enables preventing the user to set too high value of preset mixer temperature, - when the parameter "Mixer support" is set at "FLOOR ON", it determines the limit value of mixer temperature at which the mixer pump will stop. For underfloor heating set this parameter at the value not exceeding 45°C - 50°C unless the manufacturer of materials used to complete the floor or CH system designer has recommended other values.
Valve opening time	Enter the time of full valve opening taken from the rating plate of valve servo (e.g. 140s).
Pump OFF by thermostat	Once this parameter has been set at "YES", mixer servo closes and mixer pump stops upon opening thermostat contacts (the room has been heated). Performance of this operation is not recommended because the heated room may be cooled down too much.
Operat. in SUMMER	Upon setting of <i>Operat. in SUMMER = ON</i> , mixer is not closed in SUMMER mode.
Mixer input dead zone	Parameter setting, which determines the value of temperature dead zone of mixer control system. The regulator controls the mixer in the manner assuring that actual temperature value measured by the mixer sensor is equal to the preset value. Nevertheless, in order to avoid too frequent servo motions, which may unnecessarily reduce its lifetime, regulation starts once the measured temperature of the mixer circuit has been higher or lower than the preset value by the value set in <i>Mixer input dead zone</i> .
Emergency valve opening	It is a % valve opening during active boiler overheating alarm. This parameter is used for cast-iron boilers, and is available in some regulators only.
Proportional range	This parameter influences the range of mixer servo motion. Increase of its value causes actual mixer temperature reaches faster the preset value, but too high value set causes temperature overshoot and unnecessary servo motions. Correct value should be determined experimentally. Recommended settings of this parameter should be within the range of 2 – 6 [3].
Integr. time const.	The higher the value of this parameter is the slower the response of servo on temperature off-set is. Setting too low value may cause unnecessarily servo motions, while too high setting will increase time of finding preset temperature value. Correct value should be determined experimentally. Recommended settings of this parameter should be within the range of 100 – 180 [160].
Minimum closing	This parameter allows to set the minimum closing the mixer valve so that the valve was not completely closed during eg. switching on mixer by thermostat. This allows to keep the heating circuit and thus prevents overheating of the boiler.
Temperature jump	The temperature jump value that will be used during the operation of PID control algorithm for the mixer.
Time temp. control	Time, which can afford to increase the preset temperature of the mixer during operation PID control algorithm for the mixer.

14.3 RESTORE DEFAULT SETTINGS

Restore default settings	Restoring the service settings will automatically lead to restoring the settings from main menu (user settings).
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15.ALARM DESCRIPTION

15.1 Max. boiler temp. excess

Protection against boiler overheating comprises two stages. In first instance i.e. once the *Boiler cooling temp.* has been exceeded, the regulator attempts to reduce the boiler temperature by activation of the boiler pump, HUW pump and opening the mixer servo (only in case mixer circuit = CH ON). Has the temperature dropped - the regulator returns to normal operation. Is the temperature still increasing (and has reached 95°C), power supply to the fuel feeder and the fan is off and permanent boiler overheating alarm with sound signal is produced. If, during boiler overheating time, temperature measured by HUW sensor is higher than *Max. HUW temperature*, HUW pump goes off. In this manner, users of hot utility water are protected from burning. The alarm is reset by switching the regulator off and on. The alarm can be reset by pressing the encoder "TOUCH and PLAY" knob or restarting the power supply.



Note: arrangement of temperature sensor outside the boiler water jacket (e.g. at the outlet pipe) is not recommended because boiler overheating may be detected with delay.

15.2 Exceeding max. feeder temperature

This alarm will occur after the feeder temperature exceeds the parameter *Max. feeder temp.* If the feeder temperature exceeds this value, the regulator will enable the feeder for a constant, programmed time and will activate the poker. 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. This alarm can be cancelled only after the feeder temperature decreases, by pressing the encoder "TOUCH and PLAY" knob or by restarting the regulator.



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.



Regulator cannot be used as the only protection against flame recession in a boiler. Use additional protective automatics.

15.3 Feeder control system failure

The alarm occurs when an electronic control circuit of the feeder is damaged. In that case the feeder become controlled by an electromechanical relay and because of that feature boiler operation will not stop – which is especially important during heating season. The regulator then works in the safe mode, which is indicated by a prompt „Feeder control system failure“ on the screen.

In the event of an alarm, **stop the operation of the boiler and repair immediately regulator.**



Warning: due to reduced safety, long-term use of the regulator in the safe mode is forbidden. It is recommended to immediately submit the regulator to the service repair!.

15.4 Boiler temp. sensor damaged

This alarm occurs in case of boiler temperature sensor damage and excess of its measurement range. Upon occurrence of this alarm, boiler, HUW and mixer pumps start to possibly cool down the boiler. To reset the alarm - switch OFF and ON the regulator. Check the sensor and replace it, if necessary.

15.5 Feeder temp sensor damaged

This alarm occurs in case of damage of fuel feeder temperature sensor and excess of its measurement range. To reset the alarm - switch OFF and ON the regulator. Check the sensor and replace, if necessary.

15.6 Unsuccessful firing up attempt

An alarm occurs after the third unsuccessful automatic furnace firing attempt. The reason behind this alarm occurrence can be among other things: malfunctioning igniter or ventilator, malfunction of fuel feeder system, incorrect parameter setting, insufficient fuel quality or lack of fuel in the container.



Attention! Before work continuation it is required to

check, if in the combustion chamber there was a large accumulation of unburned fuel. If it is the case, then it is required to remove this excessive fuel. Firing the boiler with an fuel overdose can lead to an explosion of combustible gases!.

15.7 Boiler overheating STB, open contact

An alarm occurs after activation of independent safety thermostat that secures the boiler against overheating. The burner will then be deactivated. After the boiler temperature will drop down it is required to unscrew an oval STB lid and then press the Reset button.

15.8 Flame failure during operation

Alarm occurs for the flame failure during boiler operation. The causes of this alarm can be, among other things: fan damage, fuel feeding system damage, inappropriate selection of parameters, lack of fuel in the tank.

15.9 Failed burning off of the boiler

Alarm occurs when the regulator completes burning off of the boiler and fuel will continue to burn.

15.10 No communication

The control panel is being linked with the rest of the electronics with RS485 digital communication link. In case a cable of this link will be damaged, an alarm will occur on the screen with the information "*Attention! No communication*".

The controller doesn't stop to operate and works normally with before preset parameters. It is required to check the connection cable between control panel and the module and replaced it with a new one or repair it.

15.11 Power supply decay

The alarm occurs after power to the regulator, in the case of early no power supply. The regulator returns to the mode of operation where worked before the power failure.

16. ADDITIONAL 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°C, the CH 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.



The described function can not be the only frost protection system!. Other methods must be used. Manufacturer shall not be liable for any damages associated with this.

16.3 Protection of pumps against locking

Regulator performs the function of boiler, HUW and mixer pumps and servo protection from locking caused by scale deposit. To do this, these components are periodically (every 167h) switched on for few seconds. In this way the pumps are protected from immobilization caused by scale deposits. Therefore, during boiler shut-down, power supply to the regulator should be on, and the regulator should be in STOP mode.

17. REPLACEMENT OF PARTS AND COMPONENTS

17.1 Replacement of mains fuse

Mains fuse is located in the Operating Unit. It protects the regulator and other equipment. In case of replacement, use 6.3A.

In order to take out the fuse, raise the fuse holder using flat-blade screwdriver and take out the fuse.

17.2 Replacement of control panel

It is not recommended to replace only the control panel as the software in the panel must be compatible with the software in the rest of the regulator.

Registry changes:



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