

TECHNICAL MANUAL



For assembling, use and maintenance of the boiler and additional equipment



USE OF THE BOILER - QUICK OVERVIEW (see details under the point 6.0, 6.4., 10.0.)

- ▶ Open upper boiler door (and close bottom if they open).
 - ▶ Put fine chopped wood to the top chamber, on refractory stone (chamotte) over the burner nozzle so that the nozzle is not obstructed, then put crumpled paper for ignition and fill the top chamber with fuel (split logs).
 - ▶ Close upper boiler door.
 - ▶ Turn the MAIN SWITCH on.
 - ▶ Push the button START (the LED diode flutters).
 - ▶ Open the middle door and ignite paper.
 - ▶ Couple minutes after fine chopped wood starts burning, close the middle door.
 - ▶ Push the button START (the LED diode lights).
 - ▶ (Only for Bio-Tec 25) place the button RP into position "▼"
 - ▶ (Only for Bio-Tec 25) leave the button RP in position "▼" at least 1 hour or longest to the next charge with wood and then restore it in the left position.
- (The above actions are for ignition of the boiler from cold state (without glow). These measures should be implemented always when we don't have, or don't have enough glow, and we will load the wood).
- ▶ After the regulation starts to display the lack of fuel ~~⚡~~, the fuel should be refilled (if it is necessary to continue the heating process)-BEFORE REFILLING, press START button ones, when upper chamber is full with wood and all doors are closed press button START for second time.

It is not recommended to open the boiler's door while the light ~~⚡~~ is NOT on.

When refill the boiler with fuel the main switch must be turned on. When the firing process is over, we can turn off the main switch, but first it is necessary, after the indication "FUEL" ~~⚡~~ is turned on, to wait that the boiler cool down under 65°C and the glow disappear in combustion chamber. After that the main switch on the control boiler unit may be turned off (see point 7.0.).

IMPORTANT !

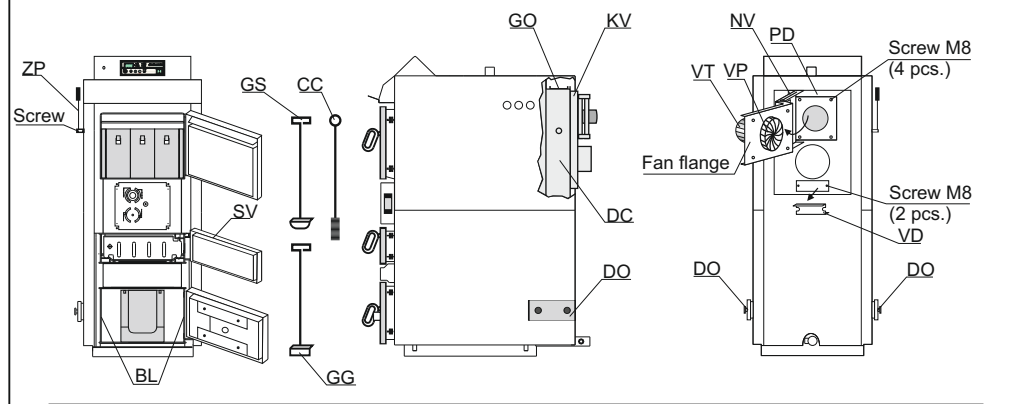
- ▶ The fuel to be used is only wood under 25% humidity content (wood dried min. 1 year).
- ▶ The outlet temperature always has to be over 60°C. This can be reached by obligatory connection of the 3-way thermic valve ESBE VTC 512, VTC 531, LTC 141 or Laddomat 21, which blocks the boiler temperature fall under the 60°C level.
- ▶ The connection of CAS water accumulators is obligatory. It is recommended to connect min. 50 liters water accumulation to each 1 kW of boiler power.
- ▶ To the closed central heating system an expanding vessel has to be connected (the volume of the expanding vessel is about 10% of the installation volume).
- ▶ To the open central heating system an open expanding vessel has to be connected (OPC), which volume has to be about 7% of the installation volume.

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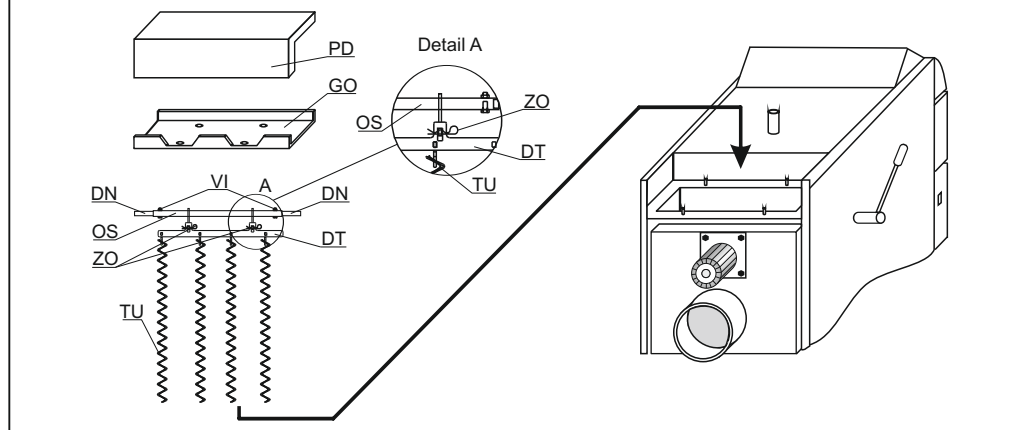
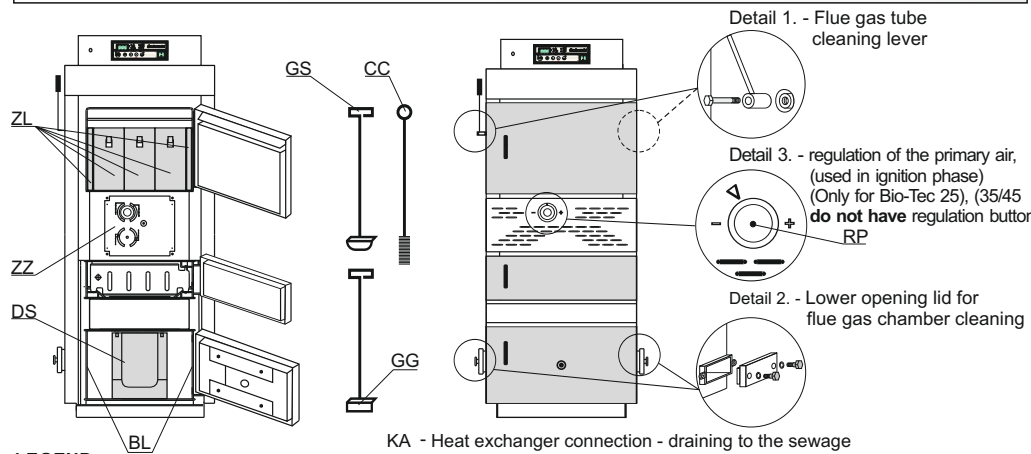
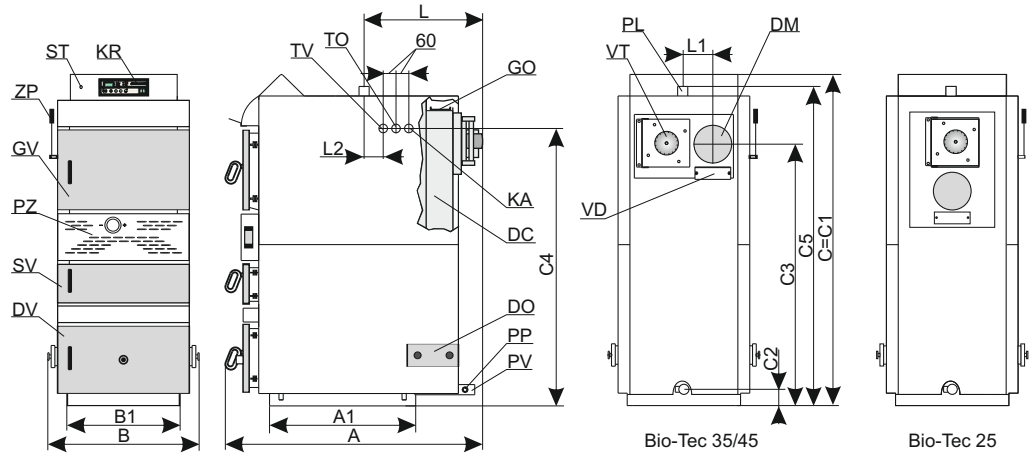
Centrometal d.o.o. Glavna 12, 40306 Macinec, Croatia
maloprodaja tel: +385 40 372 640
centrala tel: +385 40 372 600, fax: +385 40 372 611

www.centrometal.hr
e-mail: servis@centrometal.hr

Image 12. - Cleaning of Bio-Tec 25



DIMENSIONS AND BASIC PARTS OF THE BOILER



- | | | |
|---|---|---|
| ZP - Lever for cleaning of flue gas tubes | VT - Fan | OS - Shaft |
| DO - Bottom openings for cleaning of flue gas chamber | VP - Fan blade | TU - Turbulator (4 pcs. for Bio-Tec 25) |
| SV - Middle boiler door | NV - Fan flange holder | GS - Poker for cleaning of bottom refractory stone (chamotte) |
| BL - Lateral sides of the bottom fire place | PD - Top back casing cover | CC - Brush for cleaning of flue gas tubes |
| GO - Top opening for cleaning of flue gas tubes | VD - Lid of opening for flue gas box cleaning | GG - Poker for cleaning of the top chamber and flue gas passage |
| KV - Fan box | DN - Turbulator holder support | VI - Screw and nut M8 |
| DC - Flue chamber with flue gas tubes and turbulators | DT - Turbulator support | ZO - Wire fuse $\phi 3$ DIN 11024 |
| | OS - Shaft | |

- LEGEND:**
- | | |
|---|---|
| KR - Digital boiler regulation | TO - Thermal safety valve sensor connection |
| GV - Upper boiler door | TV - Heat exchanger connection - thermal safety valve connection point |
| SV - Middle boiler door | DO - Cover of the lower openings the flue gas chamber |
| ZP - Flue gas tube cleaning lever (can be installed on the left or right boiler side) | GO - Upper opening for flue gas tube cleaning |
| PZ - Primary and secondary air opening lid | DS - Lower refractory stone (chamotte) (2 parts) |
| DV - Lower boiler door | ZZ - Regulation of primary and secondary air |
| PL - Inlet | DC - Flue gas chamber with tubes and turbulators |
| DM - Flue gas tube connection | GS - Poker for cleaning of the lower refractory stone (chamotte) |
| VT - Fan | GG - Poker for upper refractory stone (chamotte) and flue gas channels cleaning |
| PV - Outlet | CC - Flue gas tubes cleaning brush |
| PP - Filling / draining | ST - Safety thermostat |
| ZL - Sheet metal protecting cover | BL - Lateral sides of bottom chamber |
| | RP - (Only for Bio-Tec 25) regulation of primary air (used in ignition phase) |
| | VD - Opening for cleaning the flue gas chamber |

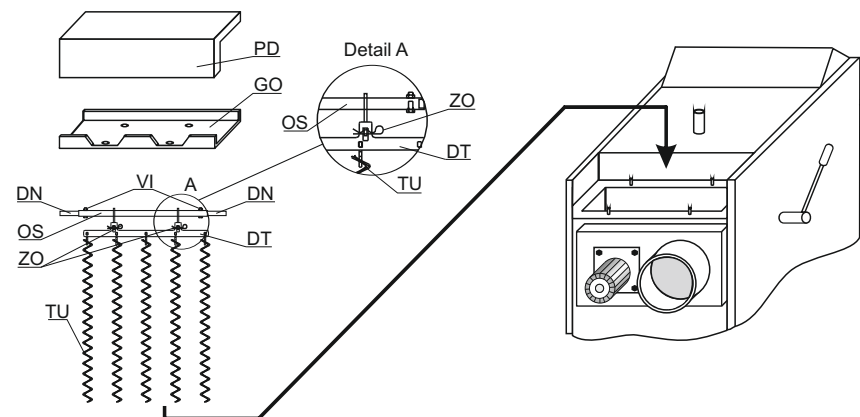
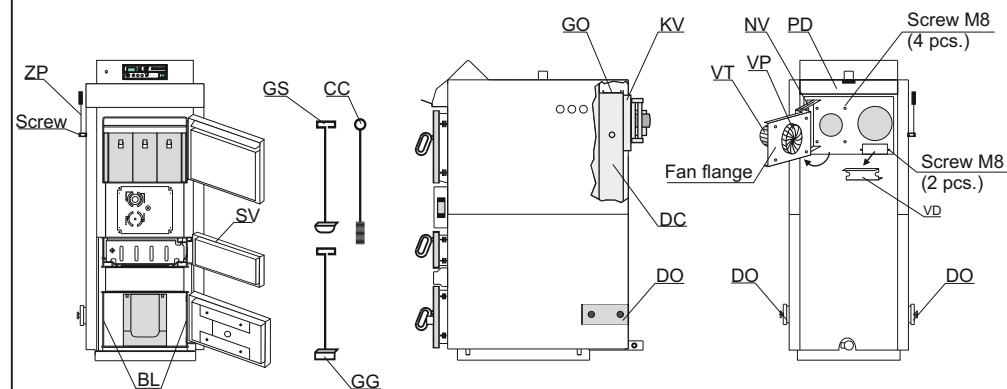
1.0. IN GENERAL

Steel boilers **Bio-Tec**, with an rated thermal output 25, 35 and 45 kW are constructed for **wood** firing and aimed for heating of small and middle sized premises. Due to the applied wood gasification principle, wood is totally burned. Widely sized combustion chamber enables the firing with wood pieces of 500 mm. One filling period lasts min. 4 hours, with the possibility of prolonging it to the whole day, if the heating requirement is decreased. Boiler has the option of maintaining the glow up to 12 hours, making unnecessary to perform firing process in case you want to continue firing. The functioning of the boiler is steered by the built-in digital regulation system. The boiler must be connected to the central heating system through an appropriate number of the CAS water accumulators.

1.1. CHARACTERISTICS OF THE Bio-Tec BOILER

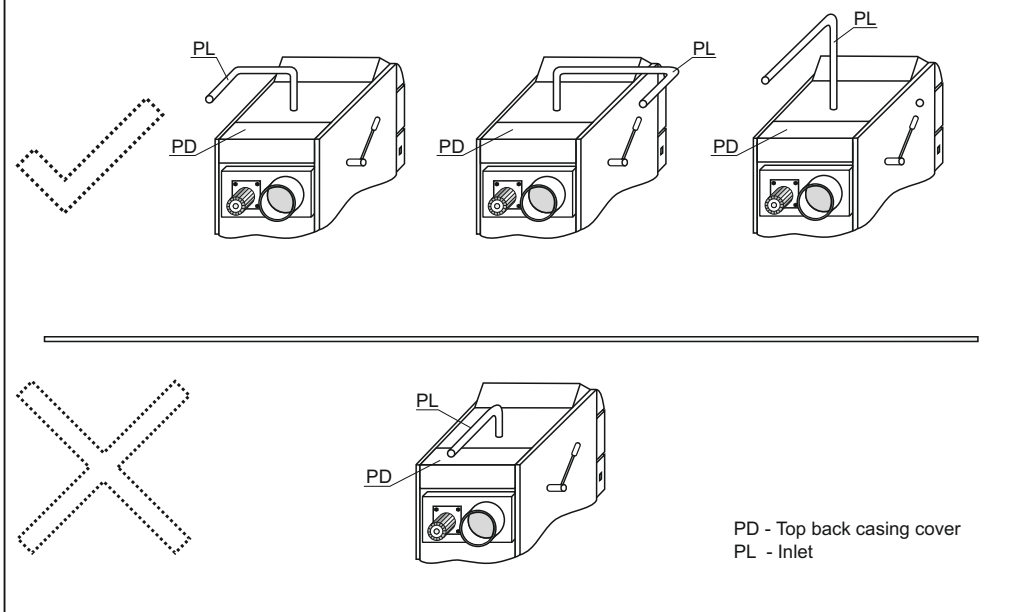
The Bio-Tec boiler is produced in compliance with the EN 303-5 norm, which enables the required level of functioning and minimal environmental pollution, through the firing with wood. The boiler is aimed for firing with wood. The system of flue gases conduction and their additional burning out, enables its high efficiency, which makes this product extremely economical. Widely sized combustion chamber door enables firing with large pieces of wood and a very simple and easy cleaning and maintenance. One filling period lasts minimum 4 hours, depending on the nominal thermal output. There is also a possibility of prolonging the firing process to the entire day, if the heating requirement is decreased. The boiler can keep the glow up to 12 hours, during which period it is not necessary to repeat the firing process. The flue gases leading system is good optimized. The boiler must be connected to the central heating system through the CAS water accumulators. An integrated digital regulation system steers the functioning of the boiler, steers the circulation pump integrated inside the primary heating circuit (boiler-water accumulator), steers the circulation pump in the heating circuit (water accumulator-radiators) and steers the sanitary water pump. The steering system leads the information related to the necessity of the additional fuel filling towards the regulation and the room thermostat. The Bio-Tec boiler is very simple to handle, while the built-in regulation enables its reliable functioning. Through the compulsory connection of the CAS water accumulator to the heating system, the optimal functioning of the boiler is achieved and the produced heat is saved, which enables consumption exactly according to the need. The firing process can be implemented in suitable period of the day. If the outdoor temperature is not very low, the room heating and the sanitary hot water production can be extended to the period of few days. The boiler is delivered together with thermal insulation, covered by a metal casing and it is pre-wired.

Image 11. - Cleaning of Bio-Tec 35/45



- | | | |
|---|---|---|
| ZP - Lever for cleaning of flue gas tubes | VT - Fan | OS - Shaft |
| DO - Bottom openings for cleaning of flue gas chamber | VP - Fan blade | TU - Turbulator |
| SV - Middle boiler door | NV - Fan flange holder | 5 pcs. for Bio-Tec 35,
5 pcs. for Bio-Tec 45) |
| BL - Lateral sides of the bottom fire place | PD - Top back casing cover | GS - Poker for cleaning of bottom refractory stone (chamotte) |
| GO - Top opening for cleaning of flue gas tubes | VD - Lid of opening for flue gas box cleaning | CC - Brush for cleaning of flue gas tubes |
| KV - Fan box | DN - Turbulator holder support | GG - Poker for cleaning of the top chamber and flue gas passage |
| DC - Flue chamber with flue gas tubes and turbulators | VI - Screw and nut M8 | ZO - Wire fuse ϕ 3 DIN 11024 |
| | DT - Turbulator support | |
| | OS - Shaft | |

Image 10. Examples of inlet construction



Concerning the specific need of sanitary hot water, the Bio-Tec boiler can be connected to one of water heaters produced by our company. We suggest the combination with wall hanged SKB Digi or LKB Digi water heaters, as well as with standing TB water heaters and STEB solar water heaters, if the future connection to the solar system has been planned as also CAS-B or CAS-BS, combination of accumulation tank and stainless steel DHW tank.

1.2. THE WOOD GASIFICATION COMBUSTION PROCESS

The process is carried out in double combustion chamber in several phases. After fuel supply and fuel drying follows the outgasing at the temperature 100 to 300°C. The burning gases and different C_xH_y joints are drawn out of the wood. The gases created in such a process are mixed with the air and burn out creating high temperature.

Fuel: wood having moisture content to 20% (max. 25%), minimum size bigger than a nozzle in refractory stone (chamotte) of the top chamber. This demand for moisture content is fulfilled with wood dried on air at least 12 months.

1.3. DELIVERY PACKAGE

Bio-Tec boiler (covered with casing with thermal insulation, built in boiler control unit and room thermostat (delivered in the boiler)), cleaning brush and poker for lower refractory stone, as well as for the flue gas channels and upper combustion chamber cleaning, two lids of bottom openings of the flue gas chamber and the flue gas tube cleaning lever.

1.4. ADDITIONAL EQUIPMENT

3-way thermic valve **ESBE VTC 512** (maintains minimum temperature of return water into the boiler above 60°C), **VTC 531** (maintains minimum temperature of return water into the boiler above 60°C), **LTC 141** (maintains minimum temperature of return water into the boiler above 60°C) or **Laddomat 21** (maintains minimum temperature of return water into the boiler above 63°C) and the water accumulator **CAS / CAS-S / CAS-B / CAS-BS** are **obligatory**.

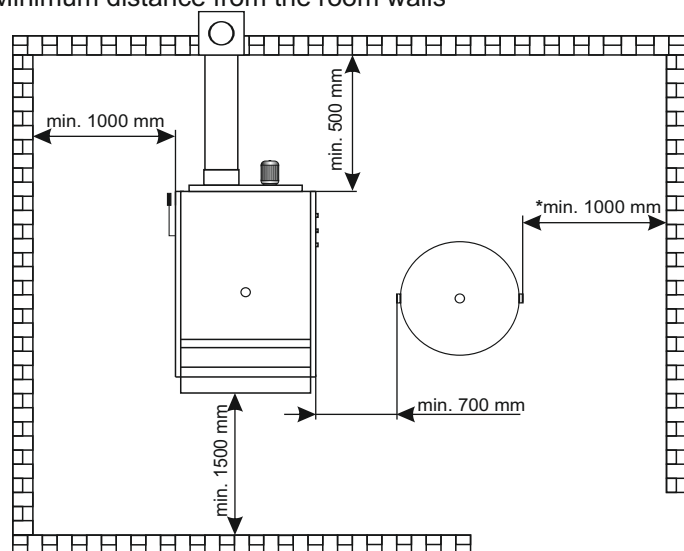
2.0. BOILER / ADDITIONAL EQUIPMENT POSITIONING AND ASSEMBLY

The allocating of the boiler has to be carried out by the authorized person. We suggest the allocation on the solid concrete basis, which height is between 50-100 mm. The boiler room has to be absolutely protected from freezing and properly ventilated. The boiler has to be set up in order to enable its connecting to the chimney (see point 3.) as well as its servicing during the functioning process, cleaning and maintenance (Image 1). The connection boiler to the central heating system is obligatory through the one or more **CAS water accumulators**, depending of the boiler's power. It is recommended to connect **50 liters water accumulation to each 1 kW boiler power** (i.e. for the 45 kW boiler minimal water accumulation should be 2250 liters). The boiler should not be used without being connected to the water accumulation tank. It must be connected to the CAS water accumulator exclusively through an 3-way thermic valve ESBE VTC 512 (maintains minimum temperature of return water into the boiler above 60°C), VTC 531 (maintains minimum temperature of return water into the boiler above 60°C), LTC141 (keep minimal temperature of return water into the boiler above 60°C) or Laddomat 21 (maintains minimum temperature of return water into the boiler above 63°C).

WARNING!

Flammable items must not be placed on the boiler and within the minimum distances shown in Figure 1.

Image 1. Minimum distance from the room walls



*valid for closest tank to the wall

Cleaning of the flue gas chamber with flue gas tubes (Image 11.-DC):

- remove top back cover of the boiler casing (Image 11.-PD).
- unscrew four M8 nuts and remove the lid of top opening for flue gas tube cleaning (Image 11.-GO).
- take out the wire fuse (Image 11.-ZO).
- unhook turbulator holder (Image 11.-DT) together with turbulators (Image 11.-TU) from the shaft (Image 11.-DN).
- take out the turbulator holder (Image 11.-DT) together with turbulators (Image 11.-TU) from the flue gas chamber.
- clean flue gas tubes using a brush (Image 11.-CC) supplied with the boiler.
- remove turbulators (Image 11.-TU) from the turbulator holder (Image 11.-DT).
- clean spiral turbulators (Image 11.-TU) and place them back together with the turbulator holder (Image 11.-DT) into flue gas tubes.
- hook the turbulator holder (Image 11.-DT) onto the shaft (Image 11.-DN).
- place back the wire fuse (Image 11.-ZO).
- place back the lids of bottom openings for the flue chamber cleaning (Image 11.-GO) to their original place and tighten them using screws (as before removal) to get good air tightness during boiler operation.
- put the top back cover of the boiler casing (Image 11.-PD).
- take out the lids of lower openings for cleaning the flue gas chamber (Image 11.-DO).
- clean flue gas chamber through the lower openings for cleaning (Image 11.-DO).
- place back the lids of lower openings for cleaning (Image 11.-DO) to its original place and tighten them using screws to get good air tightness during boiler operation.

In order to clean the boiler, there is no need to remove the refractory stone (chamotte).

11.0. CLEANING AND MAINTENANCE OF THE BOILER

Protective gloves must be used (see Image 9). Ash remaining in boiler after solid fuel firing should be disposed into metal containers with a cover. As through the **wood gasification** principle the fuel burns out totally, the cleaning of the boiler is limited to the upper and lower combusting chamber once in a week and the cleaning of flue gas tubes (DC - page 3) on the back side of the boiler is necessary only after the heating season, i.e. min. once in one heating season. Cleaning the fan blade VP and fan box has to be performed when necessary.

Before each starting of the boiler (press button "START") it is recommended to shake the flue gas tube cleaning lever few times (Image 11 - ZP).

Cleaning of lower and upper part of the combustion chamber:

- to be performed by a poker delivered with the boiler.
- it is necessary to take care, at cleaning the lower combustion chamber, to clean lateral sides of the lower combustion chamber well, in order to provide as better heat exchange and maximum boiler efficiency, as possible (Image 11, -BL).

Cleaning of fan blades (Image 8. -VP):

- unscrew four M8 nuts by which the fan flange is fixed to the boiler (Image 11).
- pull out the fan (Image 11. -VT) with the flange along the flange holder (Image 11. -NV) and turn it to the left to access the fan blade (Image 11. -VP).
- then, remove all deposits of ash and impurities from the blade.
- put the fan together with the flange back on four M8 screws and tighten them with four M8 nuts to get good air tightness during operation.

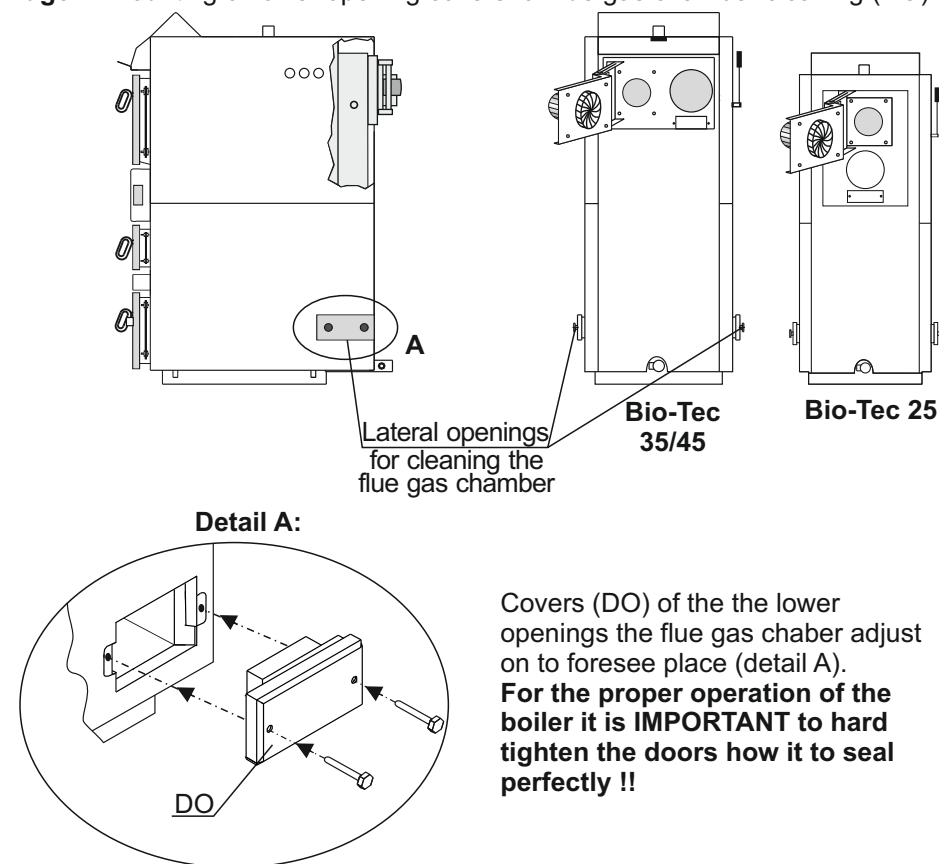
Cleaning of the fan box (Image 11. -KV):

- unscrew two M8 nuts and remove the fan box lid with gasket (Image 11. -VD).
- remove ash and impurities from the fan box.
- place back the fan box lid (Image 11. -VD) with gasket on two M8 screws and tighten them with two M8 nuts to get good air tightness during operation.

2.1. INSTALLATION OF MOVING PARTS

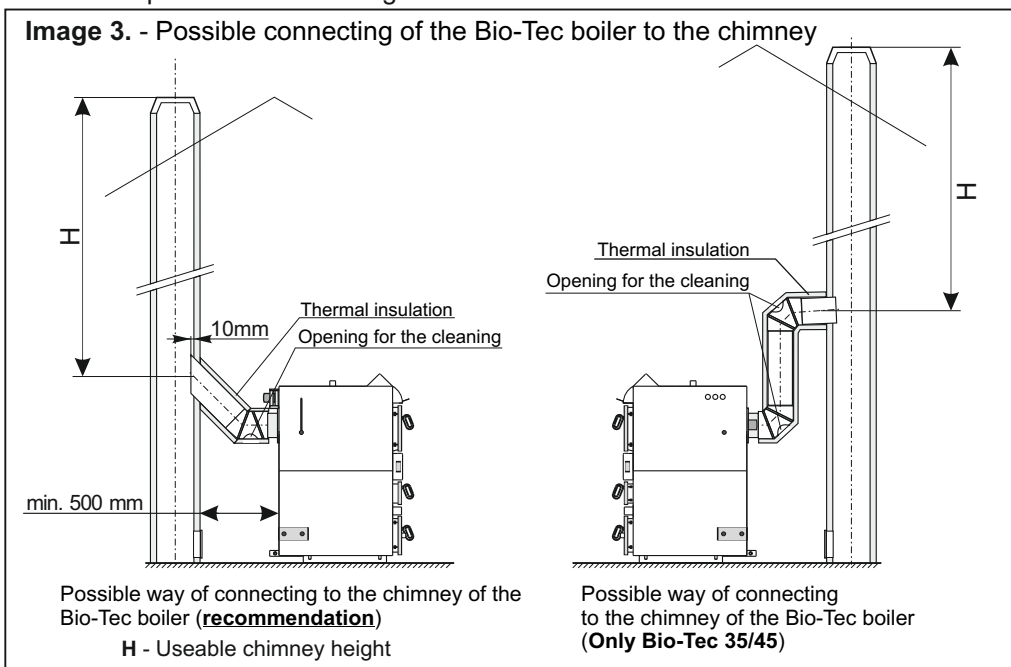
Bio-Tec movable parts are delivered packed as a set within the top boiler chamber. After the boiler is placed in the boiler room, installation of movable parts is carried out (page 3, DO- two lids of bottom openings of the flue gas chamber and ZP-lever for cleaning of flue gas tubes). The lid of bottom openings of the flue gas chamber has to be fixed by two screws to the boiler body to achieve good tightness to prevent air penetration during boiler operation (see Image 2). The flue gas tube cleaning lever can be installed either on the left or on the right boiler side with screws M8 onto the prepared holder (page 3).

Image 2. Mounting of lower opening covers for flue gas chamber cleaning (DO)



3.0. CONNECTION TO THE CHIMNEY

Properly calibrated and built chimney is the precondition for a safe operation of the boiler and economic heating. The chimney has to be good insulated, gas-proof and smooth. On the lower part of the chimney, a cleaning door has to be built in. Brick layed chimney has to have 3 layers with an stone wool thermal insulation in the middle. The thickness of the insulation should be 30 mm, if the chimney is situated inside the building, i.e. 50 mm if the chimney is situated outside the building. **Inside chimney diameter dimensions depend on its height and on the boiler capacity (Image 5).** The temperature of the flue gases on their exit point should be minimum 30°C higher then the temperature of their condensating point. The choice and the construction of the chimney should be performed by an authorized person. Minimal distance between boiler and the chimney is 500 mm. The flue gas tube has to have an inclination of 30-45° (Image 4.). In order to unale entering of the condensate from the chimney into the boiler, 10 mm of the flue gas tube length has to be inserted deaper inside the chimney. **It is recommended to insulate the chimney connection tube with a mineral wool** of 30-50 mm thickness. All installation works must be made in accordance with valid national and European standards. At connecting a boiler to the chimney, flue gas tubes and elbows must not pass behind the fan since in that case the cleaning and maintenance will not be possible. An example of incorrect position of flue gas tubes and elbows in relation to the fan is presented at the Image 3.



- Close upper boiler doors. (see image 7)
 - Turn the MAIN SWITCH on. (see Point 7.0)
 - Push the button START (the LED diode flutters). (see Point 7.0)
 - Open the middle door and ignite paper (see Image 7)
 - Couple minutes after fine chopped wood starts burning, close the middle door. (see Image 7)
 - Push the button START (the LED diode lights) (see Point 7.0)
 - (Only for Bio-Tec 25) place the button RP (see page 3) into position "▼"
 - (Only for Bio-Tec 25) leave the button RP (see page 3) in position "▼" at least 1 hour or longest to the next charge with wood and then restore it in the left position.
- The above actions are for ignition of the boiler from cold state (without glow). These measures should be implemented always when we don't have, or don't have enough glow, and when we will load the wood.
- After the regulation starts to display the lack of fuel ~~🔥~~, the fuel should be refilled (if it is necessary to continue the heating process)-BEFORE REFILLING, press START button ones.

FUEL REFILLING PHASE:

- open the upper boiler door (see Image 7)
- align glow with poker
- insert fuel (recommended to fill the full firebox) (see Image 8)
- close the upper boiler door (see Image 7)
- press button START for second time. (see Point 7.0)

NOTE:

- During the process of refilling the fuel the main switch of the boiler has to be turned on. When the firing proces is over we can turn off the main switch, but first it is necessary, after the indication "FUEL" ~~🔥~~ is turned on, to wait that the boiler cool down under 65°C and the glow disappear in combustion chamber (see point 7.0.).

10.0. BOILER USE

Boiler must not be used in flammable and explosive environment. It must not be used by children or disabled persons (either physically or mentally), as well as by person without knowledge or experience, unless they are under control or trained by a person responsible for their safety. Children must be supervised in the vicinity of the product. Protective gloves must be used (Image 9).

Fuel with max. 25% moisture content may be used.

Before starting up it is necessary to check following:

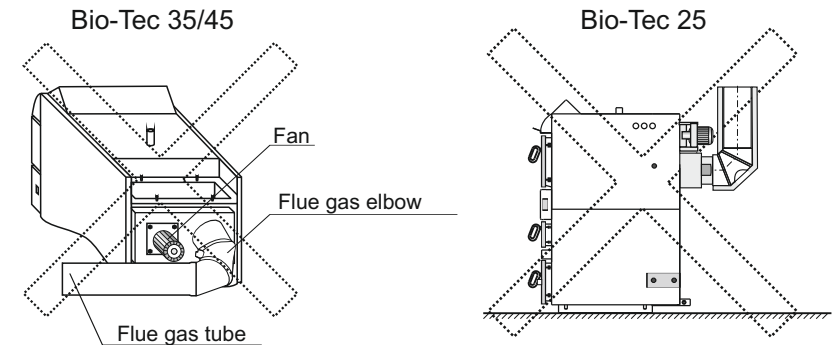
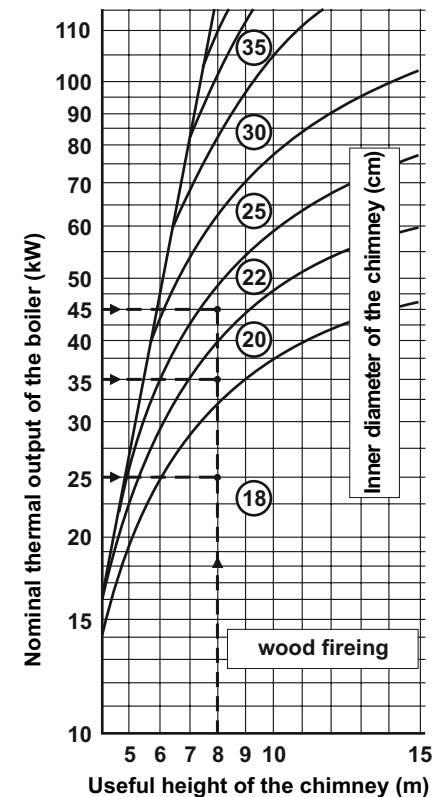
- if the fresh air access to the boiler room is available (Point 4.0).
- if the boiler and the whole system are properly filled with water and airvented.
- **if the safety elements are properly connected and are functioning perfectly:**
- closed central heating systems should have safety valve of max. 2,5 bar, thermal safety valve and expansion vessel of min. volume which is not less than 10% of the total water quantity in the system.
- open central heating systems should have an open expansion vessel of min. volume which is not less than 7% of the total water quantity in the system situated enough over the level of the highest radiator in the system and insulated, if it is mounted outside of heated space.
- **if the mobile elements of the boiler are properly positioned:**
- sheet metal protecting cover (ZL-page 3) have to be fixed to the carriers in the upper combustion chamber.
- pieces of the lower refractory stone have to be situated into the deposits on the lower wall of the combustion chamber (DS-page 3).
- turbulators (TU-page 28) have to be fixed inside the flue exhaust tubes (DC-page 3).
- air damper (PZ-page 3) for secondary and primary air.
- if movable elements-two lids of bottom openings of the flue gas chamber and flue gas tube cleaning lever.

Firing has to be performed according to the instructions described in this manual (See points 6.0 to 6.4) and Technical manual "Digital boiler regulation Bio-Tec".

If you are sure that energy from boiler will be consumed, made firing up for one filling of the upper combustion chamber.

IGNITION PHASE AND FIRST FUEL CHARGING:

- Open upper boiler doors (and close bottom if they open) (see Image 7)
- Put fine chopped wood to the upper chamber, on refractory stone (chamotte) over the burner nozzle so that the nozzle is not obstructed, then put crumpled paper for ignition and fill the top chamber with fuel (split logs). (see Image 7, Image 8).

Image 4. Incorrect connecting the boiler to the chimney**Image 5.** - Calibrating of the chimney for Bio-Tec boilers**An example of the chimney selection:**

- boiler output: 25 kW
- Fuel: wood
- required useable chimney height: H=8 m
- required inner chimney diameter: 18 cm
- boiler output: 35 kW
- Fuel: wood
- required useable chimney height: H=8 m
- required inner chimney diameter: 20 cm
- boiler output: 45 kW
- Fuel: wood
- required useable chimney height: H=8 m
- required inner chimney diameter: 22 cm

Useable chimney height - from flue gas tube connection to the top of chimney
Inner chimney diameter - interior chimney diameter.

4.0. FRESH AIR OPENING

Each boiler room **must be equipped with an opening** for supply of make up air which is dimensioned in accordance with boiler output (minimum opening area according to the below shown equation). Such opening must be protected with a net or grate. All installation works have to be performed in accordance with valid national and European standards. Boiler must not operate in flammable and explosive environment.

$$A = 6,02 \cdot Q$$

A - opening area in cm²
 Q - boiler output in kW

5.0. CONNECTION TO THE CENTRAL HEATING SYSTEM

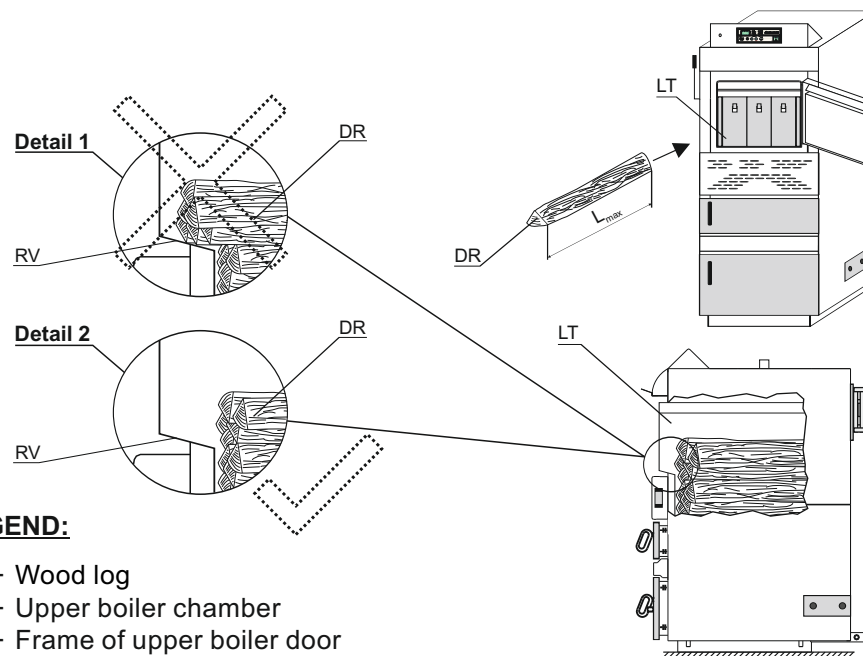
All installation works must be made in accordance with valid national and European standards. Boiler Bio-Tec can be built to closed and open central heating systems. In both cases boiler must be fired with wooden logs. Installation has to be made, in accordance to technical standards, by a professional who will be responsible for proper boiler operation. The inlet pipe from the boiler to the central heating system must not pass above the top back casing cover PD (Image 10), otherwise the removal of the turbulators and cleaning of flue gas tubes is impossible. Before connecting boiler to central heating system, the system has to be flushed to remove impurities remaining after system installation. It prevents boiler overheating, noise within the system, disturbances at a pump and mixing valve. Boiler should always be connected to central heating system by connectors, never by welding. Image 1. shows minimum distances required for boiler cleaning and maintenance.

5.1. CONNECTION TO THE OPEN CENTRAL HEATING SYSTEM

If the boiler is aimed to be integrated into an open central heating system, one of possible way how to connect the boiler to the system is shown on Scheme 1. In case of Bio-Tec boilers, the boiler pump obligatory **has to be** connected to the boiler control unit, in order to make turning on and off of the pump dependant on the temperature of the water in the boiler. The functioning of boiler regulation is shown in Technical manual "Digital boiler regulation Bio-Tec".

Connection to an open central heating system requires the implementation of an open expanding vessel (OPC) above the level of the highest radiator. If the expansion vessel is situated inside the non heated room, it has to be insulated. The volume of the open expansion vessel is about 7% of the volume of entire installation. The boiler **has** to be connected through one or more CAS water accumulators, depending on its power. It is recommended to connect 50 liters water accumulation to each 1 kW boiler power (i.e. for the 45 kW boiler minimal water accumulation should be 2250 liters). The boiler should not be used without being connected to the water accumulation device. It must be connected to the CAS water accumulator exclusively through an 3-way thermic valve ESBE VTC 512 (maintains minimum temperature of return water into the boiler above 60°C), VTC 531 (maintains minimum temperature of return water into the boiler above 60°C), LTC 141 (maintains minimum temperature of return water into the boiler above 60°C) or Laddomat 21 (maintains minimum temperature of return water into the boiler above 63°C)

Image 8. Fuel supply method



LEGEND:

- DR - Wood log
- LT - Upper boiler chamber
- RV - Frame of upper boiler door

NOTE:


At filling the chamber with fuel (split logs) pay attention not to put fuel (split logs) on the frame of top boiler door (detail 1). Fuel (split logs) has to be put so that it can be gradually and freely move downward during burning, as shown in detail 2.

Image 9. Protective gloves

Protective gloves are obligatory!



Boiler start up

- After the regulation starts to display the lack of fuel , the fuel should be refilled (if it is necessary to continue the heating process)-BEFORE REFILLING, press START button ones.

FUEL REFILLING PHASE:

- open the upper boiler door (see Image 7)
- align glow with poker
- insert fuel (recommended to fill the full upper combustion chamber) (see Image 8)
- close the upper boiler door (see Image 7)
- press button START for second time. (see Point 7.0)

NOTE:


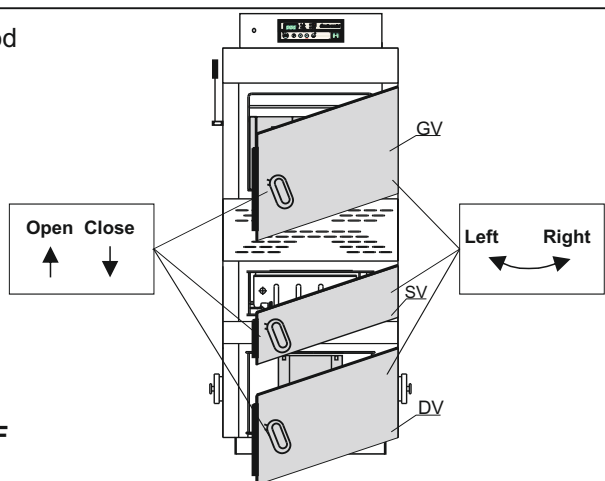
- During the process of refilling the fuel the main switch of the boiler has to be turned on. When the firing proces is over we can turn off the main switch, but first it is necessary, after the indication "FUEL"  is turned on, to wait that the boiler cool down under 65°C and the glow disappear in combustion chamber (see point 7.0.).

Image 7. - Door opening method

LEGEND:

GV - Upper boiler door
SV - Middle boiler door
DV - Lower boiler door

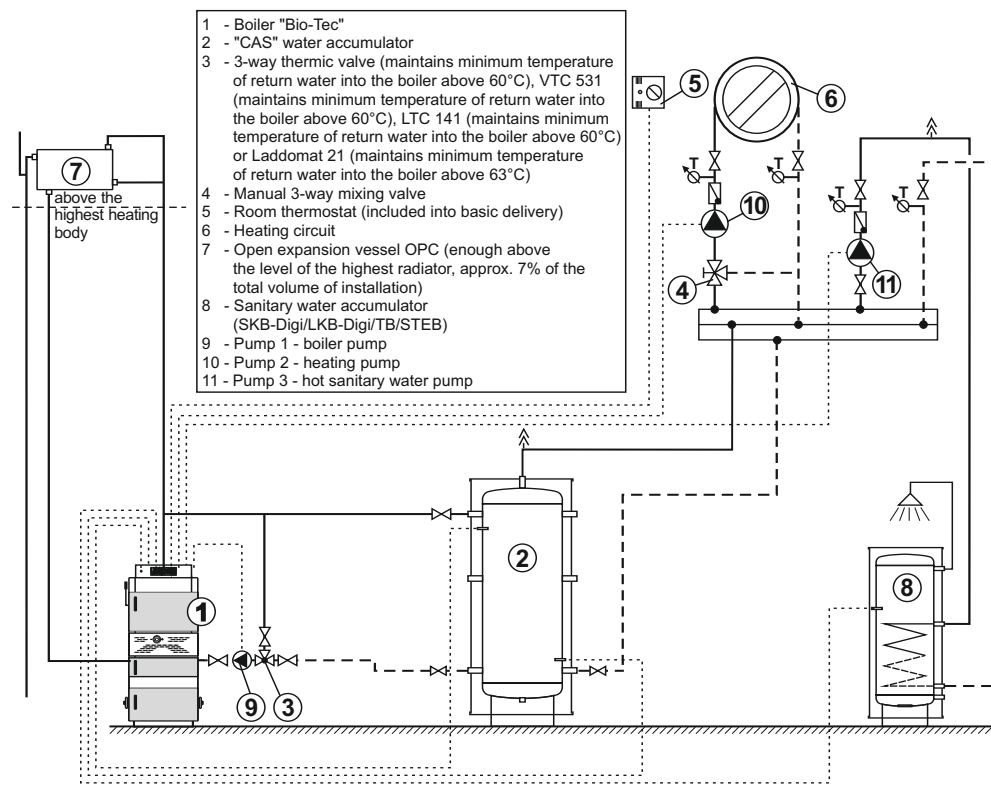


PROCESS THE OPENING OF BOILER DOOR:

- **Upper boiler door** - allowed to open only in ignition phase, fuel charging phase and the phase of cleaning of boiler and boiler parts.
Of durig the opening door is necessary ajar, that leave them for few second so that the fan intake smoke trough bypass, and then fully open.
- **Middle boiler door** - allowed to open only in ignition phase and the phase of cleaning of boiler and boiler parts.
- **Lower boiler door** - allowed to open only in the phase of cleaning of boiler and boiler parts.

Connection to the open central heating system Connection to the closed central heating system

Scheme 1. - Open central heating system with 1 water accumulator



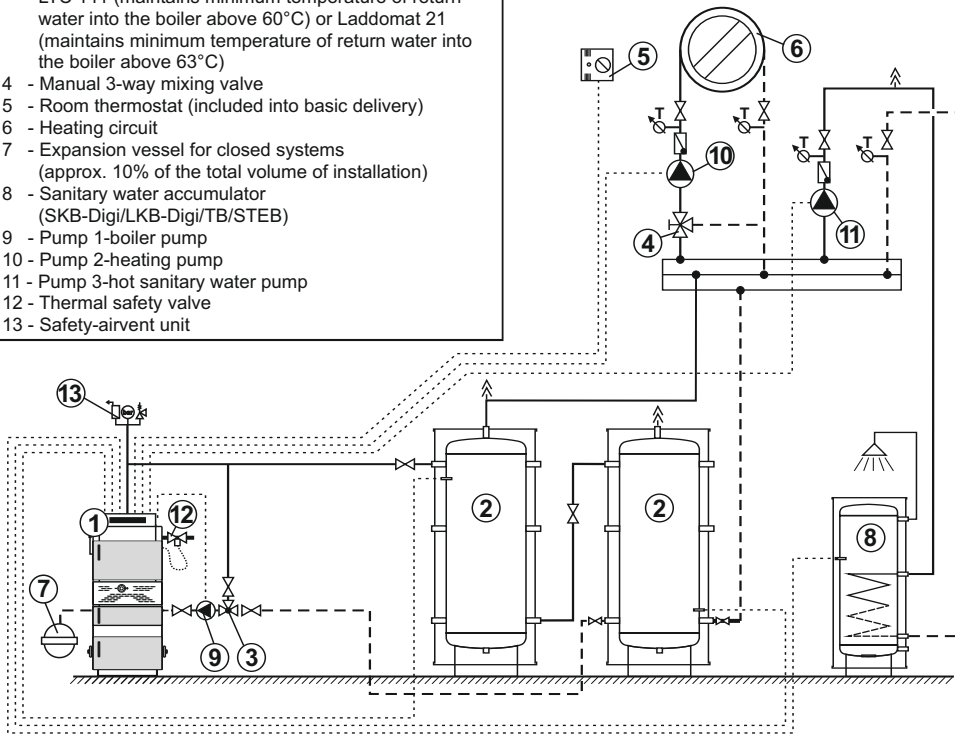
5.2. CONNECTION TO THE CLOSED CENTRAL HEATING SYSTEM

In closed heating system (as in example shown in Scheme 2) it is **obligatory** to build in certified safety valve with opening pressure of 2,5 bar, minimum seat diameter of 15 mm, minimum inlet connection of 1/2", minimum exit connection of 3/4" and a membrane expansion vessel. Safety valve and expansion vessel must be built in accordance with professional rules and any valve must not be located between safety valve and expansion vessel and boiler. The closed heating system must have the installed expansion vessel of larger volume (vessel volume must be approx. 10% of the installation volume). In all boiler types the heating pump **must be** connected to boiler regulation so that the heating pump switching on and off would depend on water temperature in the boiler. The functioning of boiler regulation is shown in Technical manual "Digital boiler regulation Bio-Tec".

The boiler has to be connected to the one or more CAS water accumulators, depending of its power. It is recommended to connect 50 liters water accumulation to each 1 kW boiler power (i.e. for the 45 kW boiler minimal water accumulation should be 2250 liters). The boiler should not be used without being connected to the water accumulator. It can be connected to the CAS water accumulator exclusively through an 3-way thermic valve ESBE VTC 512 (maintains minimum temperature of return water into the boiler above 60°C), VTC 531 (maintains minimum temperature of return water into the boiler above 60°C), LTC 100 (maintains minimum temperature of return water into the boiler above 60°C) or Laddomat 21 (maintains minimum temperature of return water into the boiler above 63°C).

Scheme 2. - Closed central heating system with 2 water accumulators

- 1 - Boiler "Bio-Tec"
- 2 - "CAS" water accumulator
- 3 - 3-way thermic valve ESBE VTC 512 (maintains minimum temperature of return water into the boiler above 60°C), VTC 531 (maintains minimum temperature of return water into the boiler above 60°C), LTC 141 (maintains minimum temperature of return water into the boiler above 60°C) or Laddomat 21 (maintains minimum temperature of return water into the boiler above 63°C)
- 4 - Manual 3-way mixing valve
- 5 - Room thermostat (included into basic delivery)
- 6 - Heating circuit
- 7 - Expansion vessel for closed systems (approx. 10% of the total volume of installation)
- 8 - Sanitary water accumulator (SKB-Digi/LKB-Digi/TB/STEB)
- 9 - Pump 1-boiler pump
- 10 - Pump 2-heating pump
- 11 - Pump 3-hot sanitary water pump
- 12 - Thermal safety valve
- 13 - Safety-airvent unit



- pieces of the lower refractory stone have to be situated into the deposits on the lower wall of the combustion chamber (**DS-page 3**).
- turbulators (**TU-page 29**) have to be fixed inside the flue exhaust tubes (**DC-page 3**).
- air damper (**PZ-page 3**) for secondary and primary air.
- flue gas tube is good fixed, tight and thermically insulated.
- if the boiler is connected to the electric power net.
- if movable elements-two lids of bottom openings of the flue gas chamber DO and flue gas tube cleaning lever.

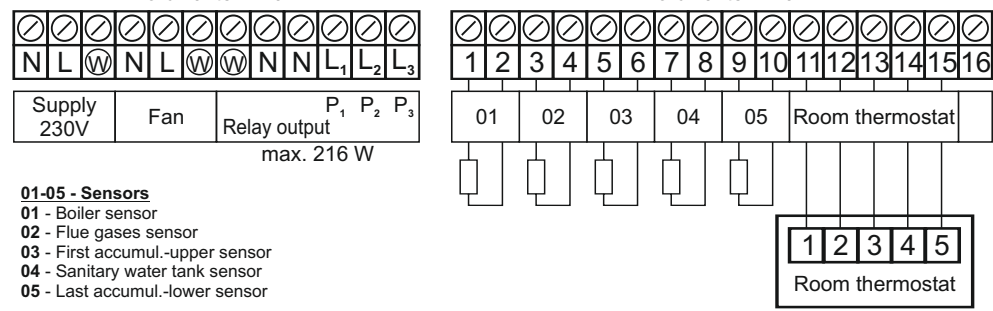
Remove all objects like documents/manuals eventually laying inside the boiler. Firing has to be performed according to the instructions described in this manual (See points 6.0 to 6.4) and Technical manual "Digital boiler regulation Bio-Tec". If you are sure that energy from boiler will be consumed, made firing up for one filling of the firebox.

IGNITION PHASE AND FIRST FUEL CHARGING:

- Open upper boiler door (and close bottom if they open) (see Image 7)
- Put fine chopped wood to the upper chamber, on refractory stone (chamotte) over the burner nozzle so that the nozzle is not obstructed, then put crumpled paper for ignition and fill the top chamber with fuel (split logs). (see Image 7, Image 8)
- Close upper boiler door. (see image 7)
- Turn the MAIN SWITCH on. (see Point 7.0)
- Push the button START (the LED diode flutters). (see Point 7.0)
- Open the middle door and ignite paper. (see Image 7)
- Couple minutes after fine chopped wood starts burning, close the middle door. (see Image 7)
- Push the button START (the LED diode lights). (see Point 7.0)
- (Only for Bio-Tec 25) place the button RP (see page 3) into position "▼"
- (Only for Bio-Tec 25) leave the button RP (see page 3) in position "▼" at least 1 hour or longest to the next charge with wood and then restore it in the left position.

The above actions are for ignition of the boiler from cold state (without glow). These measures should be implemented always when we don't have, or don't have enough glow, and when we will load the wood.

Scheme 4. - Electrical connection of a ordinal terminal on the boiler



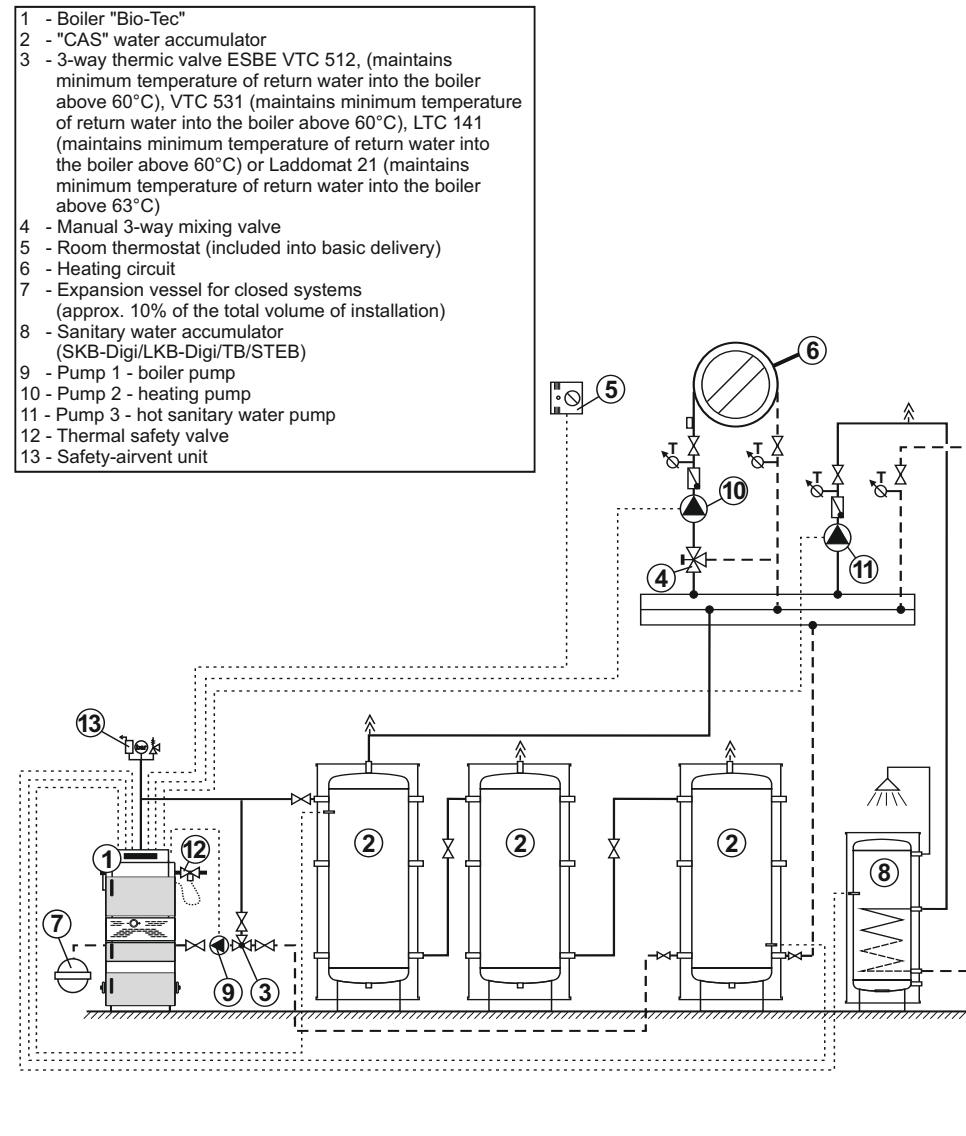
9.0. BOILER START UP

Boiler must not be used in flammable and explosive environment. It must not be used by children or disabled persons (either physically or mentally), as well as by person without knowledge or experience, unless they are under control or trained by s person responsible for their safety. Children must be supervised in the vicinity of the product. Protective gloves must be used (Image 9). Fuel with max. 25% moisture content may be used.

Before starting up it is necessary to check following:

- if the boiler is connected to the central heating system throught one or more water accumulator/s, through the appropriate pump/s and 3-way thermic valve like ESBE VTC 512 (maintains minimum temperature of return water into the boiler above 60°C), VTC 531 (maintains minimum temperature of return water into the boiler above 60°C), LTC 141 (keep minimal temerature of return water into the boiler above 60°C) or Laddomat 21 (maintains minimum temperature of return water into the boiler above 63°C) according to this manual.
- if the fresh air access to the boiler room is available (Point 4.0).
- if the boiler and the whole system are properly filled with water and airvented.
- **if the safety elements are properly connected and are functioning perfectly:**
- closed central heating systems should have safety valve of max. 2,5 bar, thermal safety valve and expansion vessel of min. volume which is not less then 10% of the total water quantity in the system.
- open central heating systems should have an open expansion vessel of min. volume which is not less then 7% of the total water quantity in the system situated enough over the level of the highest radiator in the system and insulated, if it is mounted outside of heated space.
- **if the mobile elements of the boiler are properly positioned:**
- sheet metal protecting cover (ZL-page 3) have to be fixed to the carriers in the upper combustion chamber.

Scheme 2.1. - Closed central heating system with 3 or more water accumulators



5.2.1. BOILER THERMAL PROTECTION

According to European EN standards, boiler thermal protection **must be** installed in closed heating system. Boiler is factory prepared for installation of thermal protection. Heat exchanger is built into boiler at factory, and thermal safety valve ⑦ should be installed according to scheme 3. In case of any damage of boiler installed in the closed heating system due to its overheating, and boiler or system are not equipped with any thermal protection at all, or do not have properly installed thermal protection, guarantee will not be applied.

IMPORTANT:

Thermal protection must be connected to the water supply installation of the premises supplied from the water supply line and not from hydrophor. Namely, in case of failure of power supply, boiler could be overheated, and then hydrophor is not able to ensure required water supply.

THERMAL FUSE:

Thermal protection for boiler Bio-Tec consists of a **heat exchanger** which is factory built in boiler, and **thermal valve** ⑦ (such as CALEFFI 543 513) (see Scheme 3.). Part ⑦ is installed into prepared connector (male thread 3/4") in the upper part of left lateral side of the boiler casing.

INSTALLATION (under Scheme 3.)

- screw the thermal safety valve sensor ⑥ (outer thread 1/2") into the sleeve joint ② (inner thread 1/2").
- fix the connection ④ (inner thread 3/4") of the thermal safety valve to the sanitary cold water inlet and the connection ⑤ (inner thread 3/4") through the reduction to the connection point of the heat exchanger ① (outer thread 1/2") - the arrow shows the direction.
- fix the tube connected to the sewage outlet at the connecting point ③ (outer thread 1/2").

By pressing two buttons simultaneously you can see different values:

Button "**P**" and buttons "+" or "-": *display of measured values:*

- 01 - Measured boiler temperature.
- 02 - Measured sanitary water temperature.
- 03 - Measured room temperature.
- 04 - Setup room temperature (reading from the room thermostat).
- 05 - Measured upper temp. in the first accumulator tank (outlet).
- 06 - Measured lower temp. in the last accumulator tank.
- 07 - Measured flue gases temp. (display scale 5°C).

Button "**P**" and button "**GLOW**": *setup parameter values:*

- 1 - Setup temperature sanitary water. Adjusting range 20-70°C.
- 2 - Sanitary water pump steering mode. 0=parallel functioning, 1=priority sanitary water.
- 3 - Parameter which determines if sanitary hot water heater and sensor are in configuration. 0=no hot water heater, 1= sanitary hot water heater connected.

Other parameters are factory set and can not be changed.

Button "**P**" and **main switch (0/1)**: *back to the preset regulator mode.*

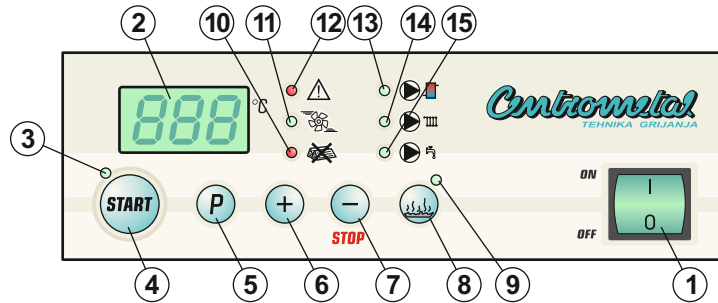
Button "**GLOW**" and **main switch (0/1)**: *test relay regulator mode.*

Detailed description of the digital regulation with single buttons or indications (LED diods) is displayed in the Technical manual "Digital boiler regulation Bio-Tec".

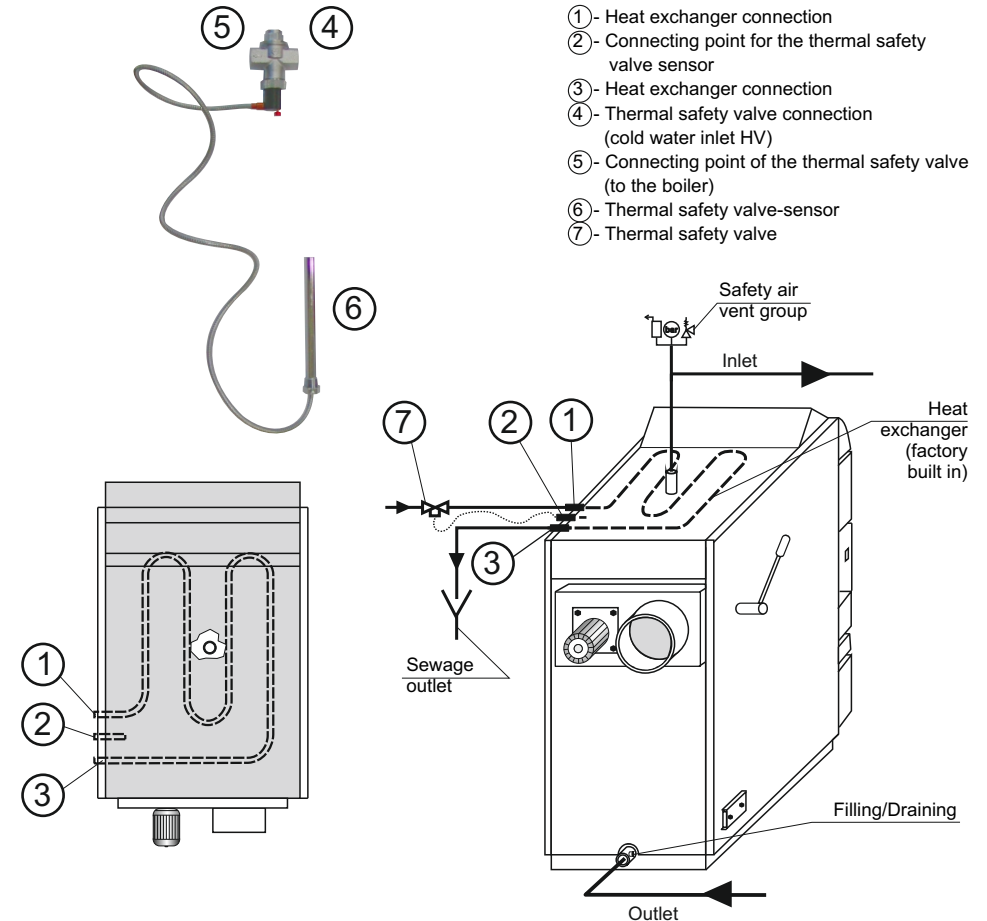
8.0. ELECTRIC CONNECTION

All electrical works must be performed by a certified professional in accordance with valid national and European standards.

A device for switching of all power supply poles must be installed in electrical installation in accordance with the national regulations on electrical installations. Detailed description of connecting the sensors and operation of digital regulation is displayed in the Technical manual "Digital boiler regulation Bio-Tec".

7.0. BOILER REGULATION

- ① - Main switch (power supply switch) has the function to turn on / off the regulator.
- ② - LED display shows the measured temperatures, their ordinary number, number or parameter value as well as the regulator functioning mode signal.
- ③ - Indication "START" (LED diode) shows the regulator functioning mode (ignition/operation).
- ④ - "START"-button.
- ⑤ - "P"-button.
- ⑥ - "+"-button.
- ⑦ - "-/STOP"-button.
- ⑧ - "GLOW"-button.
- ⑨ - Indication "GLOW" (LED diode). Indicates the active functioning of the burning process with glow keeping. This burning process mode can be turned on/off by pushing the button 8.
- ⑩ - Indication "FUEL" (LED diode) indicates that after the period of the boiler warming up has run out, the flue gases temperature is under the setup level for burning with or without glow keeping. It is not recommended to open the boiler's door while the indication "FUEL" is NOT on.
- ⑪ - Indication "FAN" (LED diode) indicates that the fan is turned on/off.
- ⑫ - Indication "ERROR" (LED diode) indicates that the error appeared during the boiler functioning.
- ⑬ - Indication "PUMP 1" (LED diode) indicates that the relay for the P1 supply is turned on/off.
- ⑭ - Indication "PUMP 2" (LED diode) indicates that the relay for the P2 supply is turned on/off.
- ⑮ - Indication "PUMP 3" (LED diode) indicates that the sanitary water pump is turned on/off.

Scheme 3. - Thermal protection in an closed heating system**6.0. STEERING OF THE BOILER**

The boiler is steered by means of the electronic regulator (digital boiler regulation), which is built into the boiler on its upper side and has an steering and protecting function. The functions of the boiler regulations are described in the Point 7.0 and in Tecnical manual "Digital boiler regulation Bio-Tec".

6.1. IGNITION PHASE

After first boiler charging with fuel (see - Ignition phase and first fuel charging - page 21), it is necessary to push "START" button which runs fan and indication (LED) ③ is flashing. (see Point 7.0)


6.2. BOILER OPERATION PHASE

After ignition and closing of middle door by (second) pressing "START" button, the process of boiler heating up and combustion will start (indicator (LED) 3 is switched on continuously). In this mode the control of the flue gas temperature is fulfilled. After the period of the heating up (120 minutes), the temperature of flue gases has to be higher than 85°C during the normal functioning or 115°C in the mode "GLOW". The period of heating up starts from 0 minutes with each deactivation of the fan. The protection system deactivates the fan when the maximal temperature of one of elements in the system has been reached.

Parallel with the flue gases temperature, increases the boiler temperature. When the boiler temperature reaches 65°C+2°C the pump P1 is activated (see Points 5.1. and 5.2.). The fan keeps running until the boiler's temperature comes to the 90°C. It will be newly activated when conditions are fulfilled.


When the flue gases temperature starts to fall, because of the lack of fuel despite the functioning of the fan, the flue gases temperature falls to 85°C, the firing process is completed without keeping the glow, or until 115°C with keeping the glow. The fan stops and the pump P1 keeps functioning for the next 5 minutes. The firing process shall also be deactivated if any error appears for longer than 5 seconds.

The digital boiler regulation steers the heating pump P2 (see points 5.1. and 5.2.) when the condition is fulfilled, i.e. the temperature inside the first water accumulator is minimum 5°C higher than actual room temperature. Steering of the pump P2 does not depend of the firing process status inside the boiler. Description of the fan functioning and the pumps is shown in the Technical manual "Digital boiler regulation Bio-Tec".

After the boiler regulation starts to display the lack of fuel , it is possible to restart the procedure of the filling the combustion chamber.

First is need to push "START" button, indication (LED) 3 is flashing (see Point 7.0), open the upper boiler door and fill upper combustion chamber with wood logs. After that is necessary to close upper boiler door, push "START" button, indication (LED) 3 is flashing. (see Point 7.0). If there is no glow any more, and we still wish to continue with firing process, we repeat the procedure from point 6.1. and 6.2. above.

6.3. TURNING OFF DIGITAL REGULATION

If it is necessary to turn off the digital regulation (control of heating pumps, sanitary water and the pump between the boiler and water accumulation tanks), after the control indicator-no fuel switches on , wait until the boiler is cooled down below 65°C and until there is no wood logs in the upper chamber. Only then the main switch on the boiler digital regulation may be turned off (see point 7.0).

6.4. THERMAL PROTECTION OF THE BOILER (CLOSED SYSTEM)

If by chance the boiler temperature reaches the temperature of 95°C, even though the boiler regulation elements, the thermal safety valve shall allow that the water from the aqueduct comes through the thermal valve into the boiler heat exchanger and to cool the boiler down (see point 5.2.1.).

If the boiler is installed in the closed central heating system, a thermal valve must be built to the designed location on the boiler. Thermal valve must be connected to the aqueduct and, if this is not possible, the boiler has to be built in the open heating system.

6.5. SAFETY PROTECTION IN CASE OF EXCEED TEMPERATURE

If the boiler regulation does not deactivate the fan at 90°C of the boiler water temperature and the level of 101 °C - 110 °C can be reached, safety thermostat will deactivate the fan. For newly start up of the boiler following process has to be performed:

- wait until the boiler temperature falls under 70°C:
- remove the safety thermostat lid at the control unit and push the button on the safety thermostat (Image 6.).
- continue with boiler functioning according the "Boiler Steering Procedure" or let the boiler be disconnected.

If the safety thermostat breaks off repeatedly, the authorized person should check the system.

Image 6. - Safety thermostat

