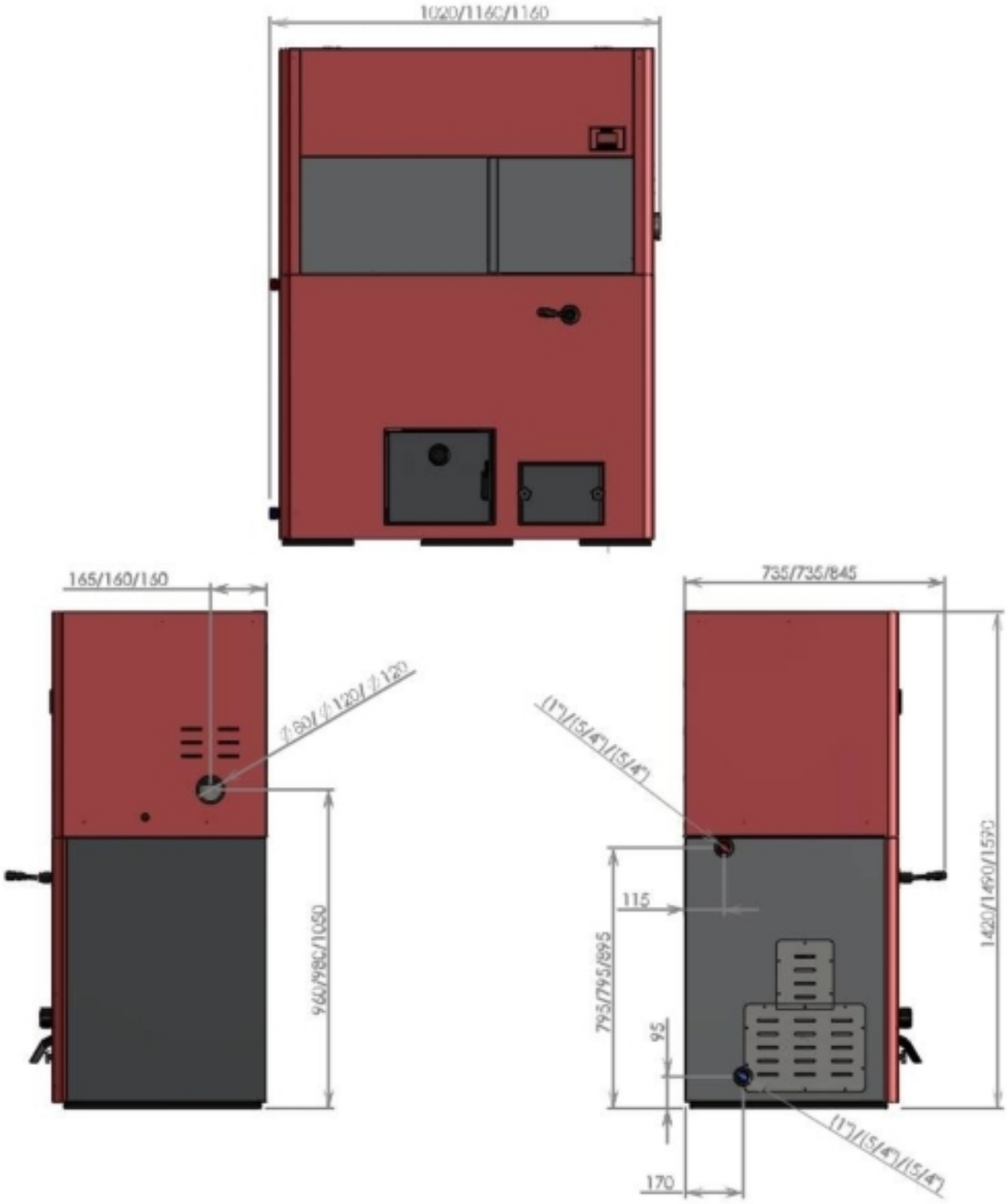
compact-size automatic sub-pressure wood pellet boiler toby 25-35-55

Directions for usage and maintenance

September 3, 2013

Contents

1 Boiler data



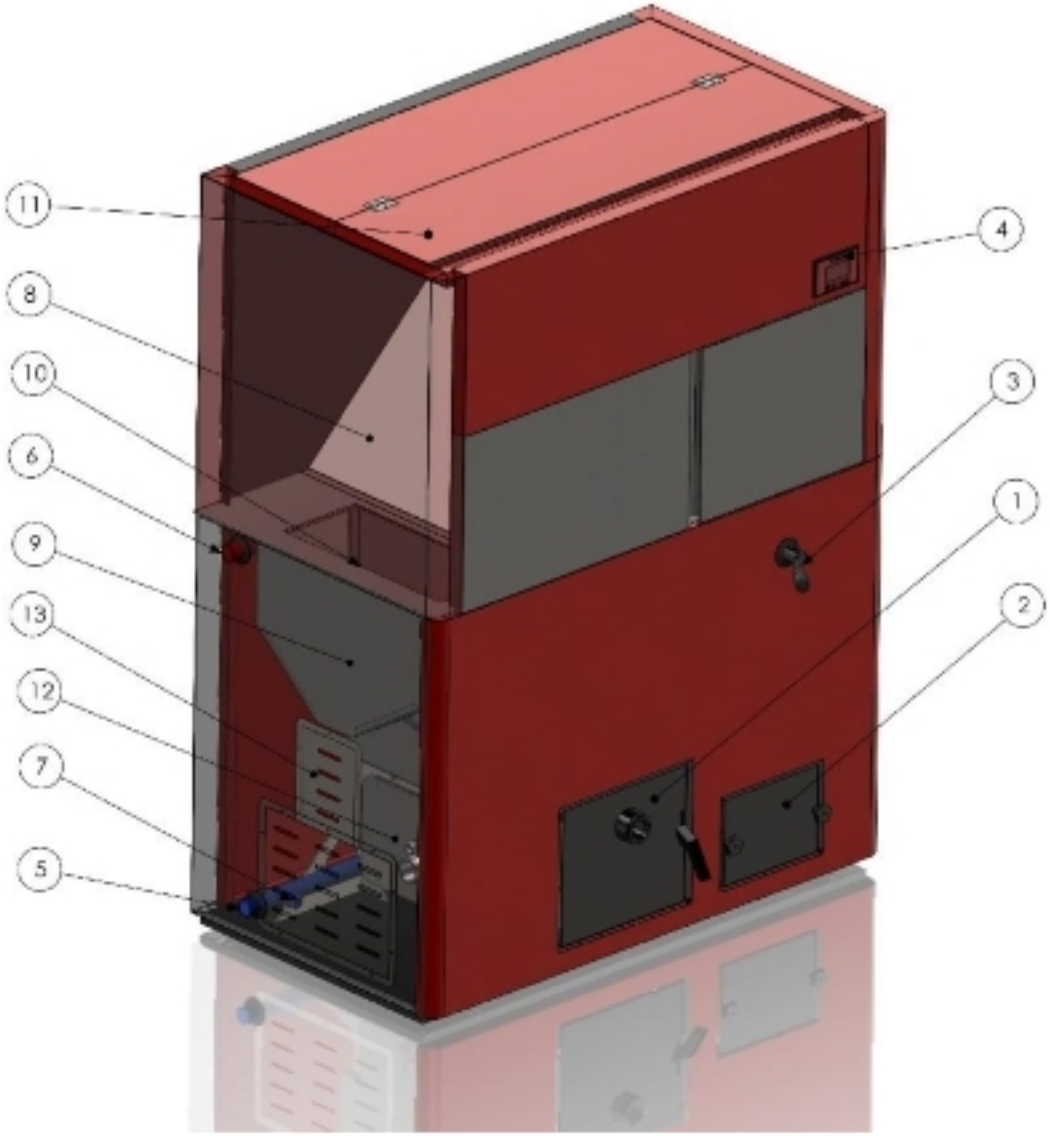
Boiler measures are given in the form X / Y / Z where first value is for the 20 KW model and second value for 30 KW and third value for a 50 KW model where measures di□er. Single measure is shown elsewhere valid for all the models.

Boiler connections to the central heating system are on its left hand side. Flow line is painted red.

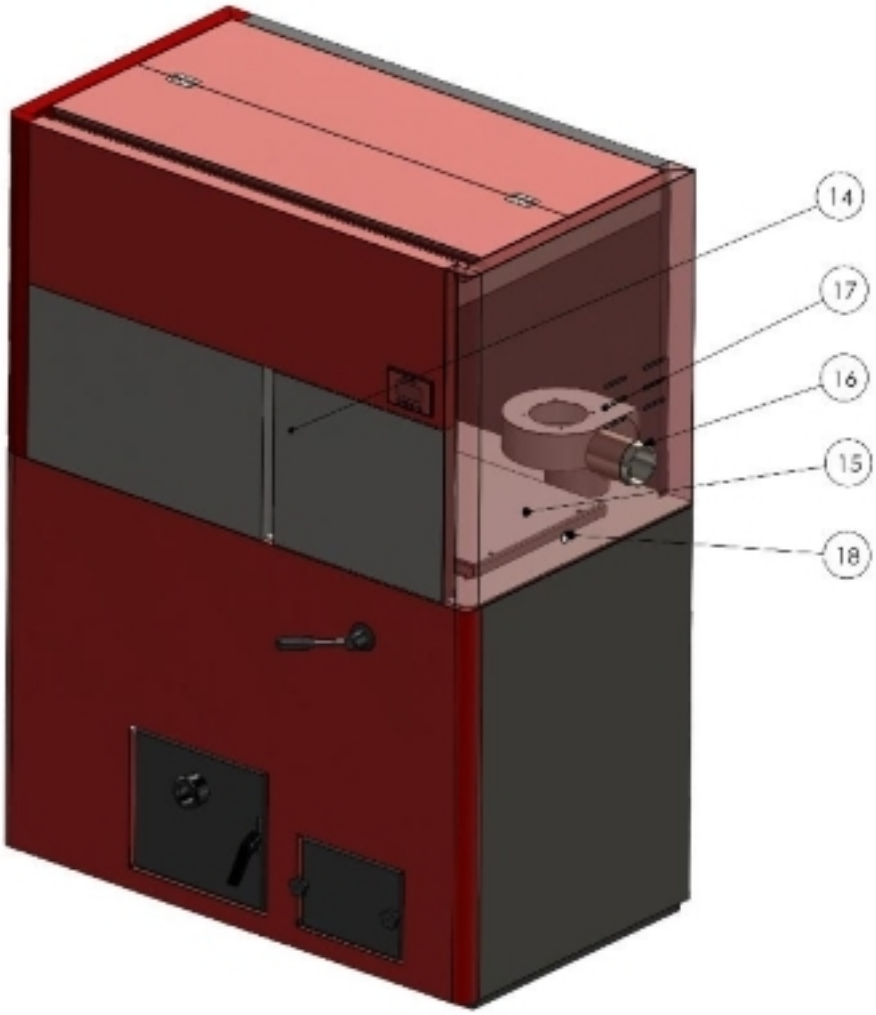
Return line is painted blue. Fill/ Drain tap is located at the return line.

Flue gas exit is located on the right hand side of the boiler.

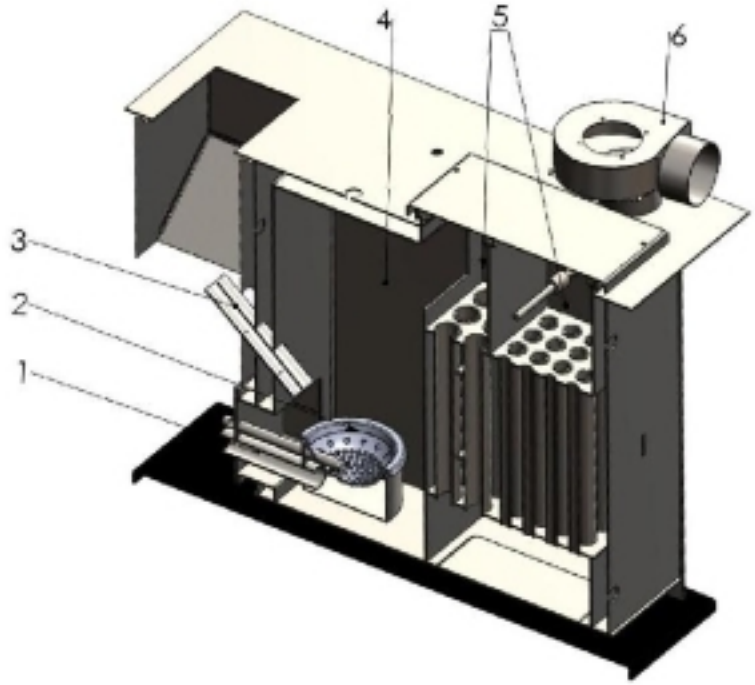
On the front side of the boiler there is a handle to clean the heat exchanger and also the control panel of the boiler.



Boiler parts 1. Bigger front door (allows access to clean the burner) 2. Smaller front door (allows access to clean the part below the heat exchanger, see combustion chamber figure below!) 3. Handle to move the mechanical system to clean the tubes of the heat exchangers (dust will down to the bottom, where it is accessed easily through the smaller front door) 4. Control panel 5. Return line 6. Flow line 7. Fill/ Drain tap (dont forget to close this connection once filling is completed) 8. Pellet storage, bigger unit 9. Pellet storage, smaller unit fed from the bigger unit 10. Bridge from bigger to smaller pellet unit 11. Pellet storage opening for refill (when there is no pellets, refill here!) 12. Screw feeder motor 13. Technical opening to access the motor or the fill/ drain tap



Boiler parts on the right side 14. Door to access the regulation board or the fan (authorized person only) 15. Heat exchanger cover (access allowed only to authorized service persons) - covered by insulation layer 16. Flue gas exit 17. Fan 18. Hole for cables



Combustion chamber parts: 1. Primary air inlet 2. Retort burner 3. Free fall pellets feed line from the screw transporter 4. Heating chamber 5. Heat exchanger (2nd and 3rd pass) 6. Exhaust fan

1.1 Technical data chart according to EN 303-5

nominal power	20	30	50 power
range	5 kw - 25 kw	10 - 35 kw	16 - 55
kwboiler weight	275 kg	315 kg	440 kg
flow/return (inch)	1"	5/4"	5/4"
fill/drain tap (inch)	1/2"	1/2"	1/2"
flue gas output diameter ( )	80 mm	120 mm	120
Output gas temperature at nominal heat output	150 °C	140 °C	160 °C
Output gas temperature at minimum heat output	75 °C	71 °C	79 °C
Setting range for the temperature controller	60 - 90 °C	60 - 90 °C	60 - 90 °C
Minimum return temperature	60 °C	60 °C	60 °Cstorage
capacity	120 kg	150 kg	200 kg
pellet consumption at min power	min 1 kg/h	min 2.18 kg/h	min 3.2 kg/h
pellet consumption at max power	max 4 kg/h	max 7.17 kg/h	max 10 kg/h
necessary draught	10 pa	10 pa	10 pa
water volume	70 lit	100 lit	150 litelectrical
network	220 v 50 hz	220 v 50 hz	220 v 50 hz
energy consumption during start-up	400 w	400 w	400 w
energy consumption in operation	100 w	100 w	100 we ciency
toward boiler water	89 %	90 %	88 %e ciency
toward ue gases	93 %	93.5 %	92 %
boiler class	4	5	4

Additional information for TOBY 30 according to EN 303-5 (obtained during laboratory testing): Exhaust mass flow at nominal power: 15.6g/ s ; at minimal power: 7.7g/ s.

1.2 On Product

- TOBY represents one of the most sophisticated solutions for automatic combustion of wood pellets to be found on the market.
- It is completely adapted to burn wood pellet as a primary fuel, achieving maximum e□ciency level up to 94% and a very low exit temperature for flue gases (below 160 $^{+}$C).
- Emission levels of this boiler fulfill the most rigorous norms of European countries. TOBY 30 is o□cially tested as a Class 5 boiler according to EN 303-5 at KiWa Institute in Treviso Italy and is eligible for subventions and grants available in most EU countries.
- Ignition, start-up and turning-o□ are fully automatized. Combustion control is optimized using algorithms such as 'modulation' which automatically decreases pellet dose as the di□erence between desired and reached temperature is decreasing.
- Working principle of this boiler is based on the "sub-pressure" of the heating chamber. The chamber is completely air-proof so that air flow in the boiler is fully controlled by the exhausting fan mounted on the back. Boiler regulation completely controls the quantity of the air inside the heating chamber: optimum combustion comes as a result.
- Boiler chamber is made by welding 5mm thick steel plates (all surfaces in touch with fire). Other parts are made of 4mm steel.
- The e□ciency of this boiler is much higher than that of the conventional boilers with natural air flow. This boiler does not need a long chimney, just an ordinary flue gas outlet. It can be put in any part of the building, which is easily done thanks to its compact dimensions (pellet storage is above boiler, overall boiler length 70cm only).
- Pellets are fed to boiler via internal transporter screw inside the storage tank. From there pellets are fed over to heating chamber where they fall free to the designated melting area (the 'actual' embedded burner of the boiler). Storage and melting area are physically divided. There is no chance for reverse fire to happen.
- Maintenance and cleaning are reduced to a minimum compared to all solid fuel boilers – only once a week, if not less than that, with a premium quality pellet and proper use. Please note the handle on the front side of the boiler. This is designated for occasional cleaning of the heat exchanger of the boiler (forcing the ash to fall down to te bottom of the boiler).

2 Directions for storage and transport

2.1 Delivery form

Boiler is shipped with plastic protection sleeve on a europallet.

 Boiler must be in its upright position all the time.

 The rotation of the boiler during the shipment or installation represents a serious risk and can lead to damaging the boiler.

 It is forbidden to place one boiler onto another.

 The boiler can be stored only in closed rooms with no atmospheric influence. The humidity in the storing room also must not exceed the critical value of 80%, so as not to create any condensate.

The temperature of the storing room must be in the range from 0 ° C to 40 ° C.

When unpacking the boiler, you must check whether the paint on the boiler coating has been scratched somewhere and whether all parts of the boiler stand in their proper position.

2.2 Delivery range

Together with the boiler, also the following parts are supplied:

- Cleaning kit with an external ash tray
- Warranty paper and this boiler manual
- Boiler regulation (built-in already)
- Tap valve (to be found below the housing on the return line)
- Boiler cables to connect to power supply and circulation pump

Along the boiler following parts are NOT INCLUDED:

- Thermomanometer and the safety group
- Mixing valve
- Boiler valves etc.

3 Introductory remarks

The end user must follow the guidelines from this manual all the time. In contrary case the warranty won't be acknowlidged.

Boiler chamber is tested on test pressure of 6 bar in our own facility.

Pay strict attention that boiler valves are always open while boiler in use.

Don't forget to do a mechanical reset of the circulation pump at start of every heating season.

Clean the boiler on a regular base.

An expert should be entrusted with the mounting of the heating and the initial operation. This must be a person who will take over the responsibility and guarantee the correct operation of the boiler and of the complete central heating system. In the case of an incorrectly planned system with manifesting deficiencies caused by the respective person's incorrect installation of the system, which can again lead to an incorrect operation of the boiler, the complete liability for the material damage and potential new costs arising in relation to it is borne exclusively by the person who was entrusted with

the mounting of the central heating system, and not by the boiler manufacturer, sales representative or seller.

4 Safety remarks

 While in use, some parts of the boiler may be hot. Don't touch the boiler without appropriate hand protection against heat.

 If some parts of the boiler occur to be damaged it is strictly forbidden to continue using the boiler.

 Do not touch electrical wires with wet hands

 Electric connections must be made according to 73/ 23 CEE i 93/ 98 CEE and properly dimensioned.

 Use of the temperature relief valve is OBLIGATORY with this boiler to ensure safety in heating systems using solid fuels.

5 Boiler placement

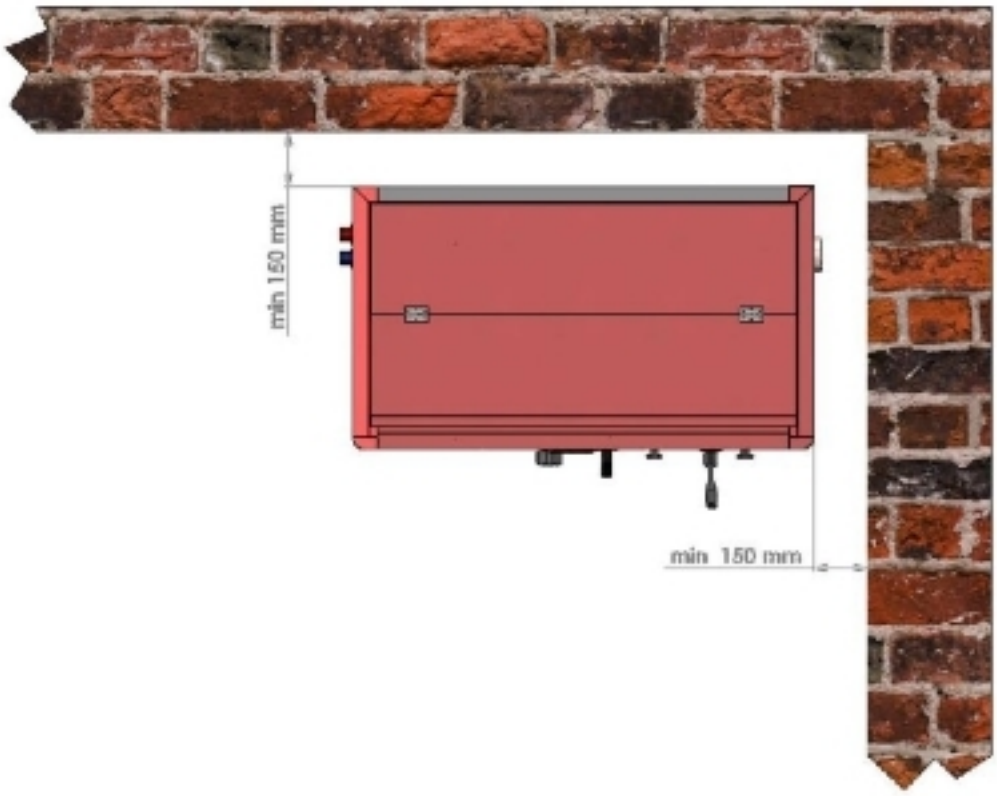
5.1 Boiler room

 Boiler room must posess ventilation windows. The area for necessary ventilation surface is defined like this:

$$A(cm^2) = 6;02 \ \ P(KW)$$

where P is nominal boiler power KW.

 TOBY was designed to occupy minimum space. Connections for flue and water lines are on lateral sides of the boiler allowing the boiler to be leaned on wall almost completely.



Front side and lateral side(s) should have free access. In case that flue gas exit can be put directly through the wall on the right-hand side, you can lean the boiler completely to the back and/or to the right. Otherwise, follow the measures depicted in the drawing, since additional space is required to place the tube for flue gases behind the boiler.

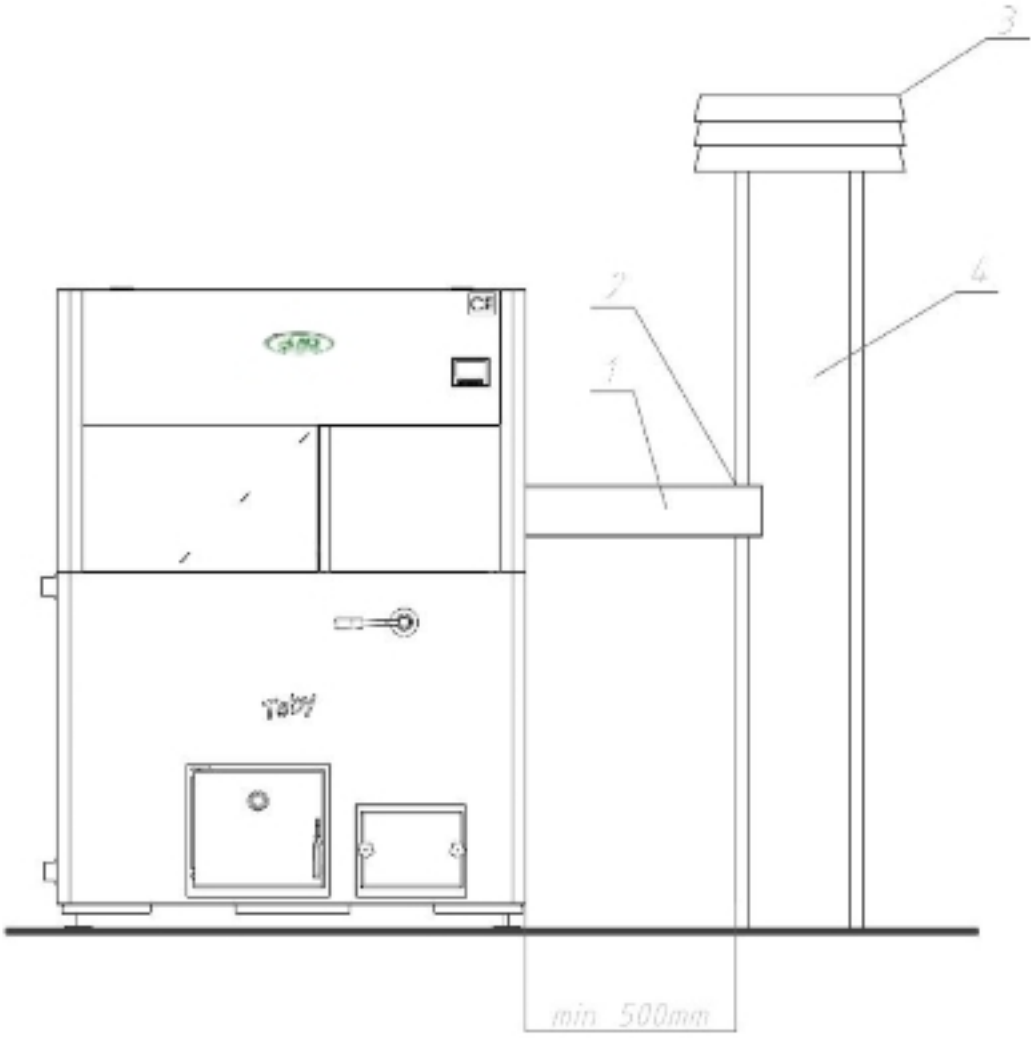
Boiler base must be stable and made of fireproof material.

5.2 Chimney

Sub-pressure pellet boilers require pressure di□erence of at least 10 (# 3) Pa in order to ensure safe and stable combustion process.

This boiler requires a vertical connection for the flue gases in accordance with European norms.

It is essential to regularly clean the chimney, at least few times a year.



Legend: 1) Chimney 2) Gasket 3) Fireproof protection cap 4) Chimney diameter not greater than 200x200mm and not higher than 5-6m

5.3 Filling the system with water

Filling the system with water is to be done using the tap valve connection of the boiler.

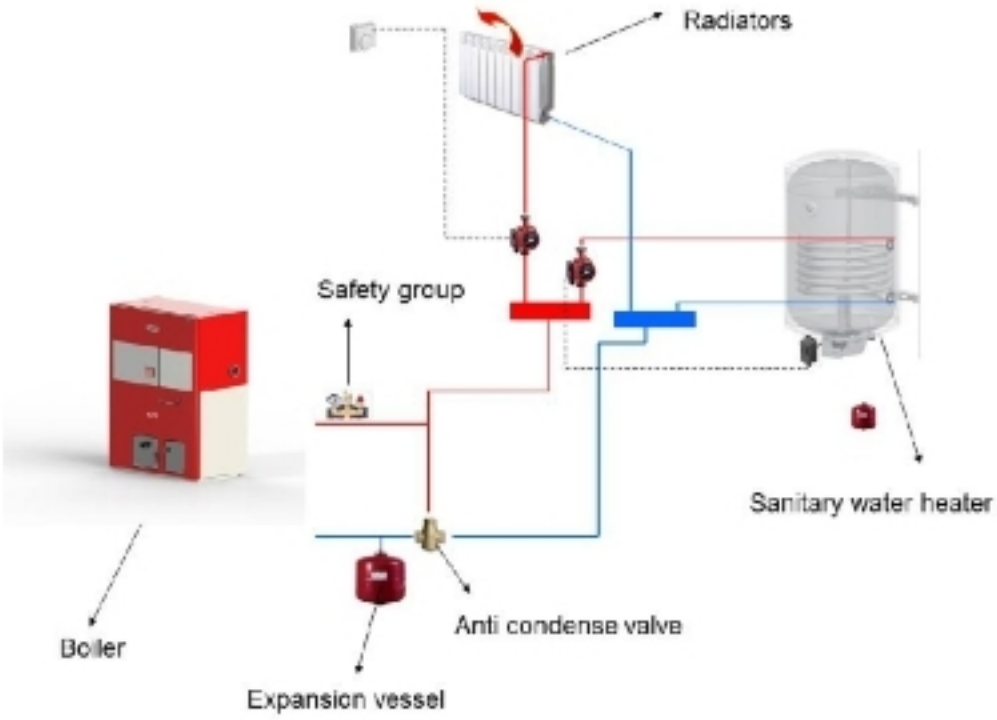
When filling the system with water take care that no air remains in the boiler.

The filling process is done when no air is coming out through automatic air vent and pressure gauge is showing the value between 1,5 and 2,5 bar (closed systems). Air vent is to be set at the highest point of the (closed) central heating system. If the pressure is below 1,5 bar the filling process must be repeated.

For open systems, working pressure depends on the overall height of the system and the open expansion vessel (1 bar for each 10 m is an estimate).

After the filling process is done, it is obligatory to close the drain tap valve, close the water supply to the water-filling pipe and detach the water-filling pipe.

5.4 Connecting the boiler with a closed central heating system



The use of a safety valve is obligatory (with a 2-3 bar threshold, depending on the power of the boiler) and it must be mounted near the boiler.

It is essential to have a thermometer and a manometer installed to the system.

It is recommended to install an anticondensation valve on the return line. (3-way mixing valve).

It is also recommended to mount a filth catcher on the return line.

Depending on the position of the boiler in relation to the pipe-work and the radiators – the installation can be carried out using one of two methods.

5.4.1 Installation method 1

If the boiler is positioned on the same level or higher than the pipe-work and radiators.

Each of the following items of equipment shall be fitted along the flow line:

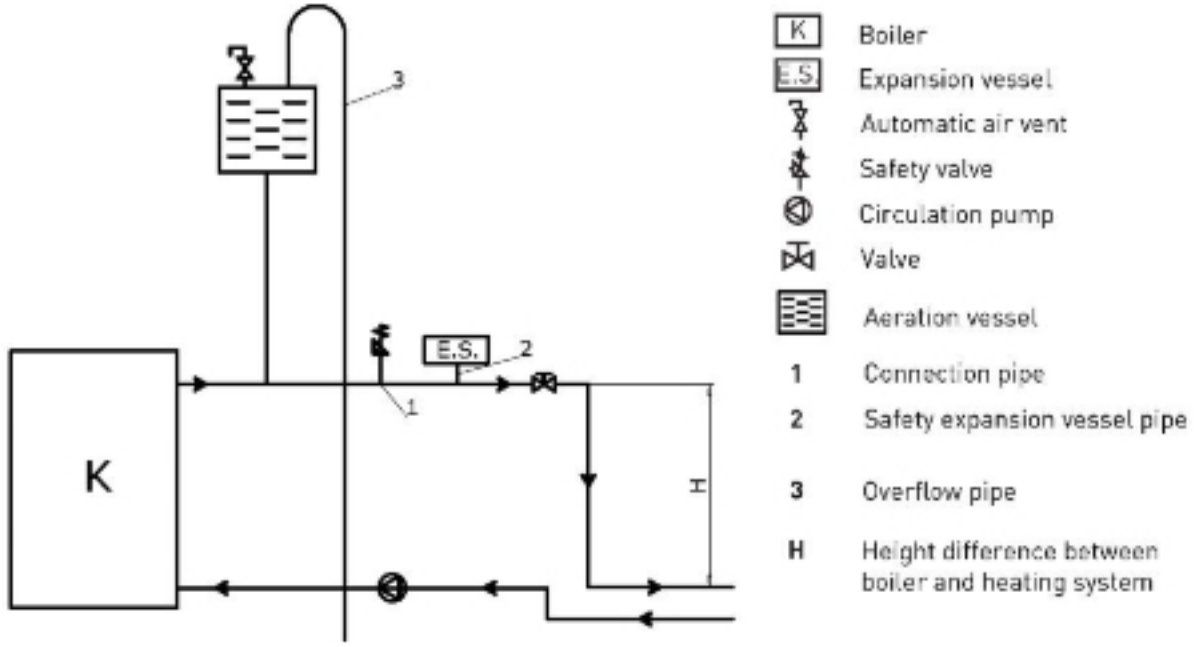
1. Automatic air vent.
2. Safety valve (spring valve is recommended).
3. Expansion vessel.
4. Boiler valve.

The safety pressure valve must always be positioned and mounted close to the boiler. It must be easily identifiable and allow for easy access. The safety pressure valve must be set to a nominal

pressure of 2.5 bar. The valve must open and operate smoothly at 2.5 bar. Diameter for the aperture at the seat of the valve must be at least 15mm. Connecting pipework to the boiler must be as short as possible. Welds, joints or any possible blockage to this pipe-work must be prevented. Bends in the pipe-work should be avoided if possible. Unavoidable bends should be of a diameter r> 3D (D = radius of curvature) and less than (> 90 ° C .

The closed expansion vessel shall be fitted close to the boiler. Connecting pipework should be as short as possible. Fit the expansion vessel in horizontal alignment to the pipe to ensure equal distribution of pressure. The volume of the expansion vessel is determined by the output/ capacity of the boiler. A ratio of 1 kW:1 litre should be used. The safety pressure valve and the expansion vessel should be fitted in close proximity to each other, in the following order: expansion vessel closest to the boiler, followed by the safety pressure valve.

In the event of power failure and the boiler fails to operate correctly – any sudden increase of pressure will be controlled first by the expansion vessel, on any further increase in pressure the safety pressure valve will open.



5.4.2 Installation method 2

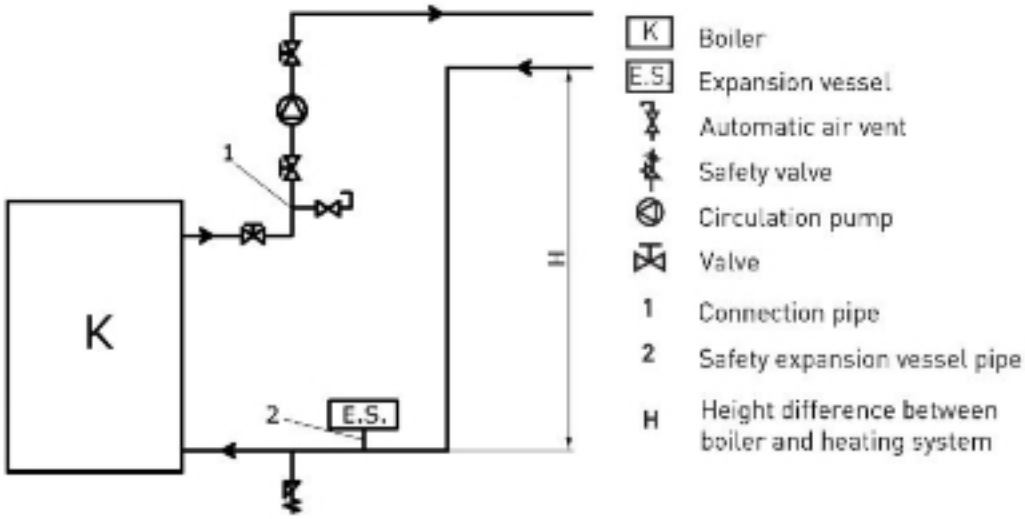
To be used in the case of the boiler being positioned and installed at a lower level than the installed pipework and radiators.

As shown on Figure, following elements are connected along the FLOW:

1. Automatic air vent
2. Safety valve
3. Circulation pump (separated with ball valves on each side so that it can be easily replaced if necessary).

Expansion vessel is on the RETURN line in this case.

Expansion vessel and safety valve are connected following the rules described in the previous chapters. For safe operation info on additional equipment such as expansion vessel and safety valve please refer to manuals delivered with those products.

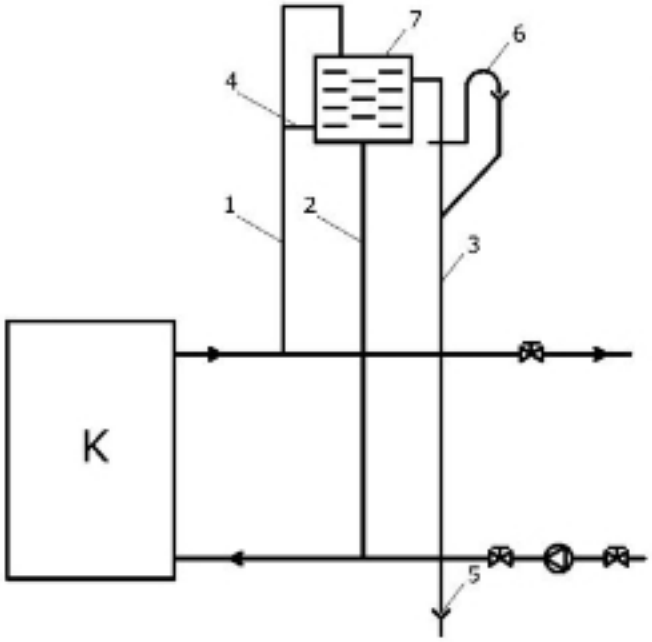


5.5 Use of temperature relief valve with obligatory filling

The temperature relief valve (shown below) must be present in the system. The valve must be installed by a qualified technician in accordance with the instructions given in the manual from the producer of the valve.

5.6 Fitting the boiler to an open central heating system.

The connecting scheme of an open central heating system is depicted on the figure.



K Boiler
Valve
Circulation pump
1 Open system flow line (SR)
2 Open system return line (SP)
3 Overflow
4 Circular pipe
5 Overflow water drain
6 Air outlet
7 Open system vessel

When using open system on the FLOW line following elements are to be installed: safety pipework for the open expansion vessel, boiler valve. On the RETURN line come safety return line of the open expansion vessel, boiler valve and circulation pump valves.

Open expansion vessel is connected to the hot-water distribution pipes (FLOW and RETURN) as shown on Figure – with an additional OVERFLOW pipe output plus CIRCULATION pipe (to prevent freeze during winter months).

Please note that no additional items shall be connected to the open expansion vessel – especially not valves.

The size of expansion vessel is deducted from the following equation:

$$V = 0;07V_{water}(l)$$

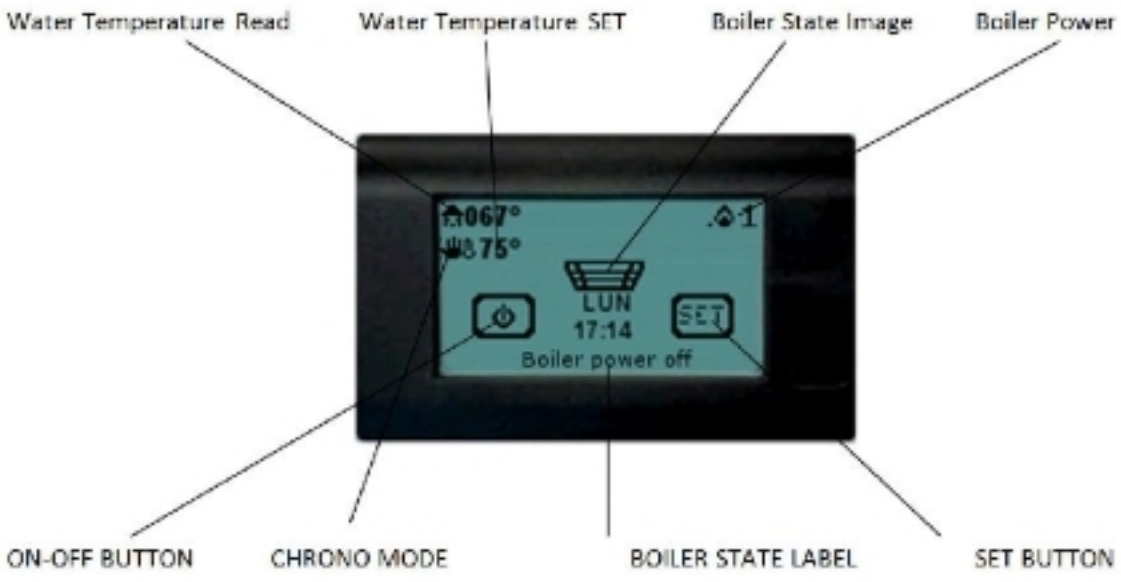
$V_{water}(l)$ is the water volume in the entire installation. Diameter for the pipework of the expansion vessle line should be round 25 mm.

Open expansion vessel is to be positioned vertically above the highest heating element.

6 Control panel

There is a user-friendly touch screen controller on the front side of the boiler.

6.1 Main menu



From main screen is possible reached all menu and pages. It is also possible turn on and turn o boiler.

6.1.1 Button description

- Press and hold for two seconds on ON-OFF BUTTON boiler turn On or turn OFF.
- Press and hold for two seconds on SET BUTTON enter on USER MENU.
- Press and released on SET BUTTON enter on SET MENU

6.1.2 Icons

- Water Temperature Read: show real water temperature inside boiler
- Water Temperature SET: show set temperature by user
- Boiler State Image: show boiler state using images
- Boiler Power: show boiler power
- Chrono Mode: Hand Symbol means boiler is in manual mode. Fixed Clock Symbol means Chrono Mode enabled. Flashing Clock Symbol means Chrono Mode enabled and time slot started.

6.1.3 Boiler state - Normal environment

Poruke se ispisuju na srpskom jeziku ukoliko je srpski jezik odabran.

- Boiler power o: Boiler in o state.
- Cleaning: Boiler is in cleaning fase.
- Test Flame Detection: Boiler is testing flame presence.
- Ignition Resistance: Boiler turn on resistence.
- Loading Pellets: Boiler start feeding.
- Flame Stabilization: Boiler is waiting flame stabilized.

- Boiler power on: Boiler is On. Regulated by power mode.
- Boiler powering o□: Boiler is turning o□
- Waiting: Boiler is in wait state. It wait that water temperature go under SET temperature or Thermostat request (if enabled)
- Test Hardware: StoveCheckProgram access
- Max performance boiler power on: Boiler reached maximum combustion temperature
- Boiler power in modulation: Water reached SET temperature
- SERVICE: Request Service
- Manual loading combustible: Boiler is feeding
- Boiler Fan Calibration: Boiler is in calibration mode for combustion fan (Hall e□ect enabled).
- No-Freeze Cycle: Kotao se gasi jer temperature vode je ispod antifriz temperature.

6.1.4 Alarms

- Alarm BlackOut: Power Line O□ during Boiler not in OFF State
- Lighting failed: Boiler doesn't turn on in time.
- Alarm Smoke sensor broken: smoke temperature probe open or short circuit
- Alarm Low pressure: (if enabled) pressure sensor give alarm
- Alarm Pellet Thermostat: (if enabled) pellet thermostat sensor give alarm
- Alarm No Fuel: Smoke Temperature go under OFF Temperature. System think no feed
- Alarm Water sensor broken: water temperature probe open or short circuit
- Alarm High water temperature: water temperature go over maximum temperature

6.2 Set menu

In this screen user can SET water temperature, power, power mode, feed correction (if enabled), combustion fan correction (if enabled).

6.2.1 Button description

- Press and Hold for 10 seconds on Water temperature SET to start Manual Loading pellet (only if boiler is in OFF state)
- Press and Released on Water temperature SET to select it. It enlarged the value
- Press and Released on Max Power SET to select it. It enlarged the value
- Press and Released on Power Mode to select it. It enlarged the value
- Press and Released on Feed Correction to select it. It enlarged the value
- Press and Released on Combustion Fan Corr. to select it. It enlarged the value
- Press and Released on SUB BUTTON to decrease selected value
- Press and Released on ADD BUTTON to increase selected value
- Press and Released on EXIT BUTTON to return MAIN SCREEN

Water temperature SET is water temperature that boiler has to reached and maintain.

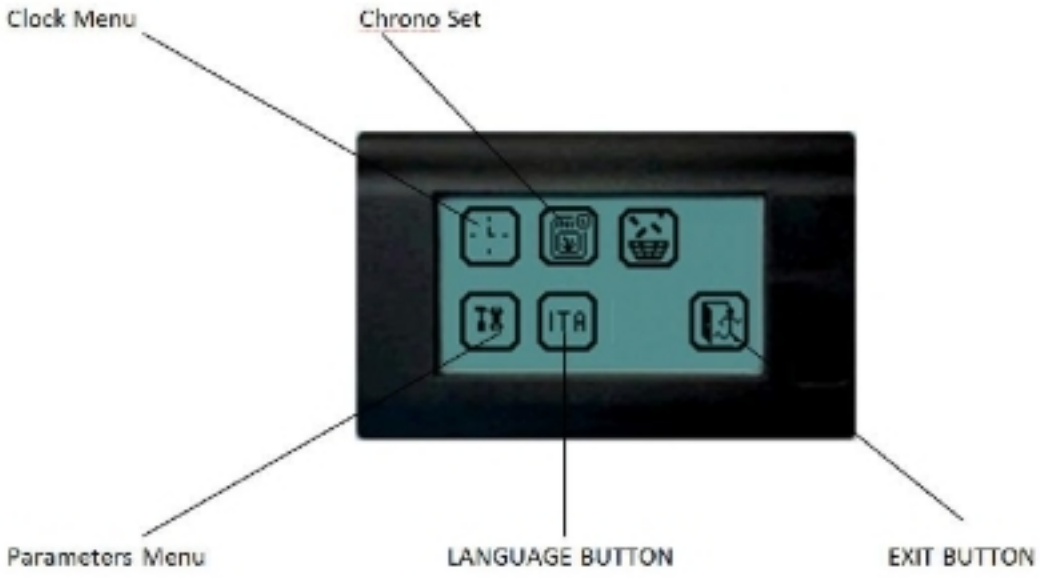
Max Power SET is power SET by user:
On Manual Power Mode boiler uses Power 1 and Power Selected here;
On Auto Power Mode boiler change automatically power depending of di□erences between water temperature and SET and Power Selected here is the maximum Power that boiler can use.

Power Mode select Auto Power Mode (PC icon-AUTO) or Manual Power Mode (Hand icon-MAN).

Feed Correction (if enabled) Select one of 9 positions to correct feed (every position is chosen by manufacturer). 0 Position don't apply any correction

Combustion Fan Correction : (if enabled) Select one of 9 positions to correct combustion fan speed (every position is chosen by manufacturer). 0 Position don't apply any correction

6.3 End User Menu



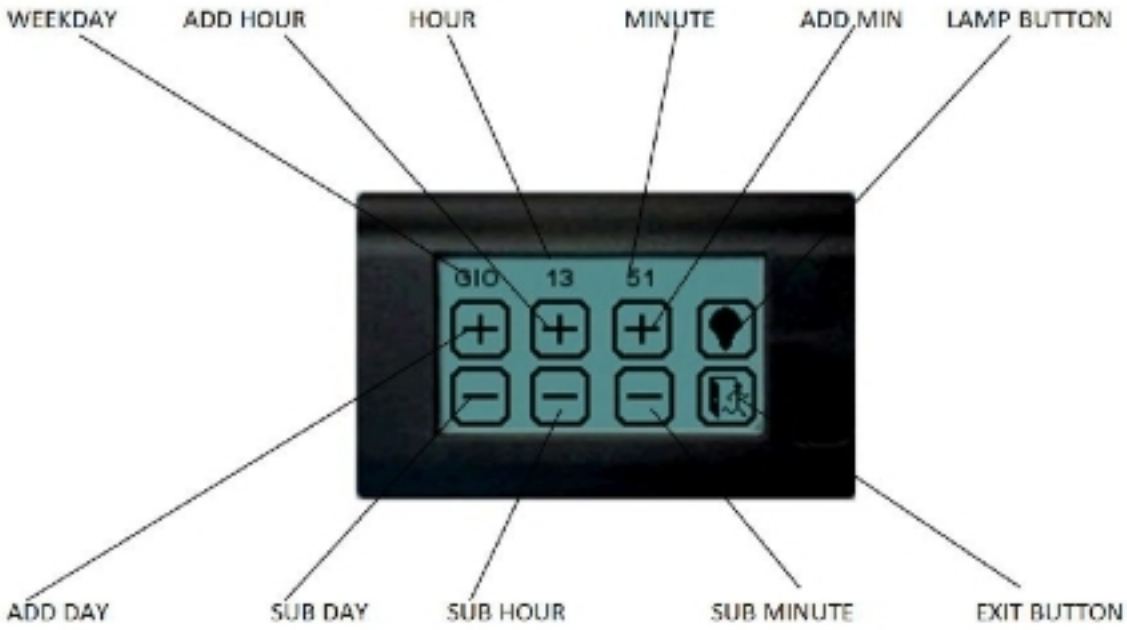
In this menu user can SET Clock Time, Chrono Slot Time and change Language. Technician can read and write boiler parameters protected by password.

Button description:

- Press and Hold for 4 seconds on Parameters Menu to enter in Parameters Screen
- Press and Released on Clock Menu to enter in Clock Setting Screen
- Press and Released on Chrono Set to enter in Chrono Slot Time Set
- Press and Released on LANGUAGE BUTTON to change language.
- Press and Released on EXIT BUTTON to return to main screen.

6.4 Clock setting

In this screen user can Set Clock Time , Weekday and Touch Screen Lamp.



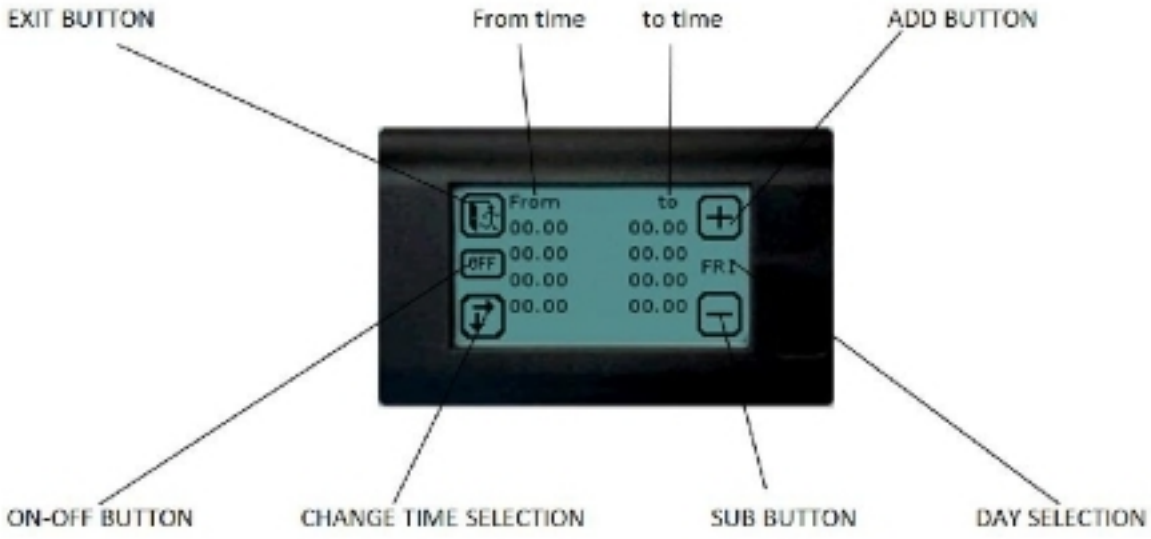
Button description:

, Press and Released on ADD BUTTON to increase values

, Press and Released on SUB BUTTON to decrease values.

, Press and Released on LAMP BUTTON to enable lamp always on (LAMP ON) or safety energy lamp (LAMP OFF) to turn on Lamp only when user touch on screen and automatically turn o after some time.

6.5 Timer (Chrono Mode) Setting



In this menu user can set 4 slot time for start and stop boiler for every weekday.
Opis tastera:

, Press and Released on ADD BUTTON to increase values

, Press and Released on SUB BUTTON to decrease values.

, Press and Released on EXIT BUTTON to return to USER MENU.

, Press and Released on ON OFF BUTTON to enable or disable Chrono Mode. On O option is unique for all weekday.

, Press and Released on DAY SELECTION to change week day.

, Press and Released on CHANGE TIME SELECTION to scroll through times.

Boiler start when , in the correct day, Clock Hour is greater than "From" and Boiler stop when clock hour is greater than "To".

6.6 Boiler cleaning and maintenance

Pellet combustion means total combustion in this case. Little ash remains in the boiler. It is necessary to clean the boiler only once, maybe twice a week. Detailed cleaning once in a month and when the heating period is over. Regular maintenance of the boiler means:

With every cleaning, pull the handle up and down on the front side of the boiler. This is to force the ash to fall dawn from the vertical tube heat exchanger into lower part of the boiler.

1. Emptying the ash from the bottom of the boiler (using the ash tray delivered with boiler)
2. Removing ash layers in the heating chamber if such
3. Cleaning the retort burner (round plate where pellets are falling in)
4. Cleaning the plate which is carrying the retort burner

The cleaning procedure is exactly described in the following images.

Before cleaning, make sure that boiler is turned o, and that all its parts are cool. Hand gloves are to be used to access boiler parts.

Open the left door and take the pot out from the boiler. The pot is to be cleaned from ash completely.

Also remove the ash from the pot basement inside the boiler heating chamber.

Remove the ash from the bottom of the boiler using the cleaning tools delivered with the boiler.

When putting back the pot please make sure that opening for the resistance heater is on its left side and place th epot in its correct position.

Now dismount the smaller boiler door on the right side.

Remove the ash from the bottom.

Place the small door back and make sure that they are fixed and no air is entering through them into the boiler chamber.

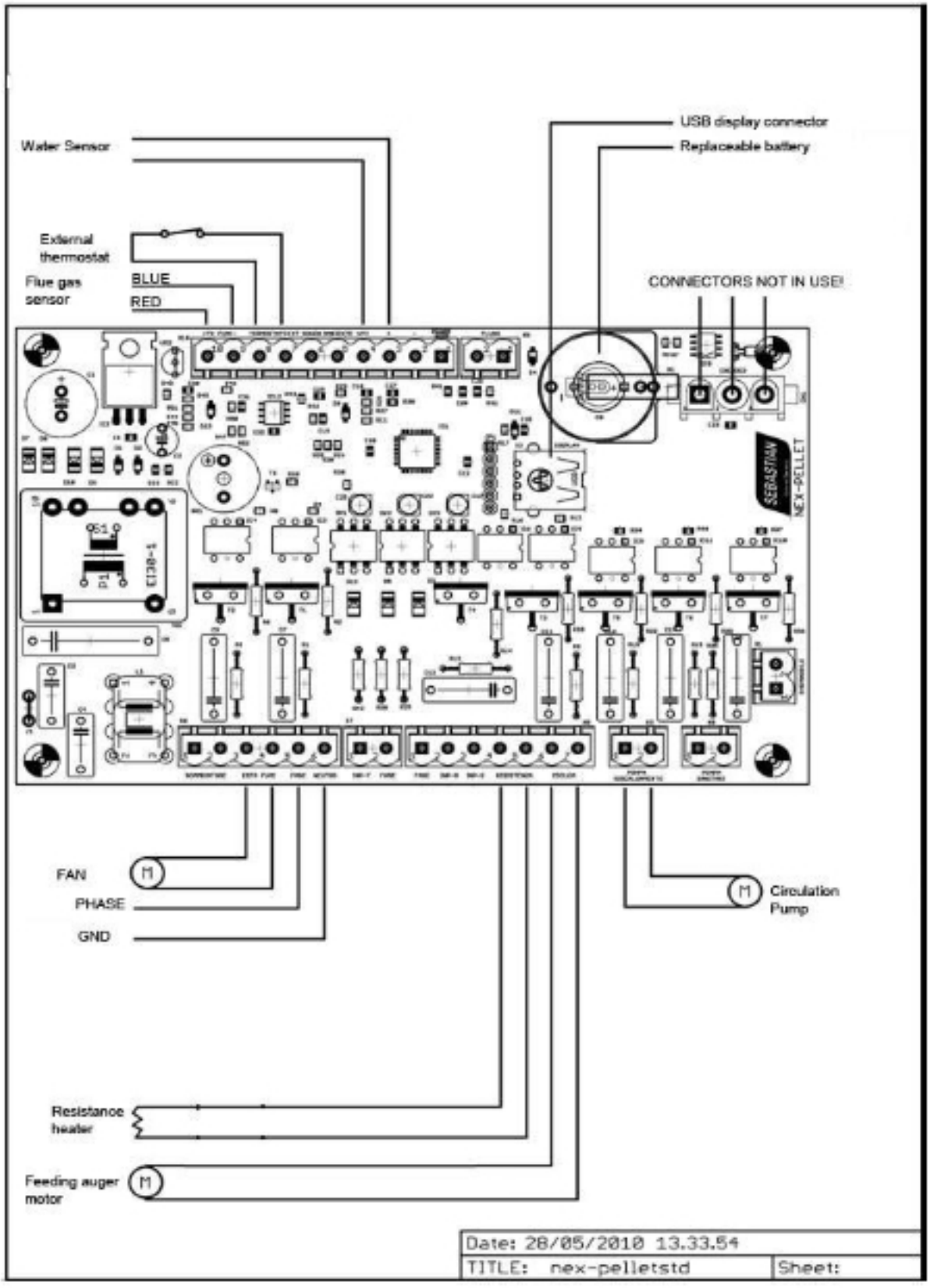
 Regular maintenenace will make your boiler last longer.

 If bad quality pellet is used, with addititions such as earth, dust, sand, silicate layer will show up in the boiler preventing the normal function of the boiler.

 If dirty parts are not removed, boiler will start to decay very fast.

 This boiler is aimed only for 100% wood pellets.

A Electric connection scheme



A Emissions Test Report

Following test report confirms low emissions values of TOBY boiler (within prescribed range of a class 5 boiler according to EN 303/ 5:2012)