



TOPLING
P R N J A V O R

USER GUIDE



**Combined pellet and solid fuel
hot water boiler
3BT 25 kW
3BT 35 kW
3BT 50 kW**

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1 NOTES ON THIS USER GUIDE

1.1 Introduction

EASY AND SAFE USE	This guide contain significant information for appropriate and safe use of hot water boiler type 3BT. If you follow these Instructions, you can avoid risky situations, reduce maintenance costs, avoid failure, provide reliability and prolong boiler life.
READ USER GUIDE TECHNICAL CHANGES	<p>This User guide must be read and applied by anyone using the boiler type 3BT.</p> <p>We keep developing and enhancing our boilers. All information regarding this Guide that are related to the boiler type 3BT are correct at the moment of print out.</p> <p>Before use, all details mentioned herein concerning standards and legislation must be checked and compared to standards and legislation applied in the location where the boiler is to be installed.</p>
RIGHT TO COPY	<p>We reserve the right to make changes to boilers that would differ in technical data and drawings herein.</p> <p>Written approval of Topling d.o.o. to copy, store in electronic form, transfer information in electronic format, photography, translation of this manual in whole or in part is required.</p>

1.2 Structure of User guide

Tabel 1. Structure of User guide

Chapter	You can find the following here in.....
1. Notes on instructions	... how to use the instructions.
2. Safety tips	...all related with safety use, what you should keep in mind when using a boiler.
3. Description and purpose of boiler	... structure and all about characteristics of boiler, technical data, what kind of pellet to be used
4. Assembly of boiler	... how to connect boiler to central heating system.
5. Commissioning	... how it is commissioned and how to set operating parameters.
6. Maintenance	... who is in charge of maintenance, how to clean and how often.
7. Possible problems in operating	...which problems can be experienced in boiler use.
8. First boiler commissioning	...requirements for successful commissioning
9. Disposal of boiler after its life ends	... what should be taken into account when dismantling and preparing of the boiler for disposal.
10. Guarantee	... deadlines and terms of guarantee.

1.2 Glossary

Tabel 2. Explanation of terms

	Explanation
Engine gear	Part of system intended for moving pellet screw conveyor.
Screw conveyor	Serves for pellet transporting from reservoir to firebox.
Automatic cleaning	Part of program intended for cleaning firebox just before damping down a fire.
Display	Display of central unit for furnace operating control
3BT	Boiler with double firebox intended for pellet, solid fuel (e.g. logs, coal) burning.
Central unit	Logical controller for operation management
Pellet	Type of solid fuel made of sawdust previously dried, then pressed and in such manner making a cylindrical form with 6 mm diameter and 20-50mm length.
PP set	System for preventing fire in pellet reservoir. It is activated if temperature in pellet feeder pipe exceeds 95 °C.
Draught controller	Serves for regulating air quantity entering through bottom flap into the furnace.
Solid fuel	Logs, coal, wooden briquette.
Pellet reservoir	Reservoir for storing a pellet that is transported to firebox by screw conveyor.
Probe	Serves for detecting certain parameters (temperature, feeder level, etc.) and forwards them to the central unit for further processing.

2 SAFETY TIPS

2.1 Proper use

MAIN PRINCIPLES

MAIN PRINCIPLES OF SYSTEM CONSTRUCTION

The boiler is made in accordance with the known principles of safe use. Improper use may cause harm, injury or even death to those who do not comply with safety guidelines as well as to third parties, which may result in damage to the boiler, and damage to other resources in the immediate environment

Specialized person who made the boiler installation and commissioning should demonstrate you how to use it.

Use boiler only when it is completely in order. Use it the right way and for the purpose for which it is intended, always taking care of your own safety and the safety of others and the safety of property. Constantly comply with this manual

Any defect which may impair safety must be immediately removed.

RELIABLE AND UNRELIABLE USE

USE OF BOILER

The boiler is designed to burn pellet and solid fuel (e.g. wooden logs, coal). This is possible because the boiler is designed with double firebox (one for pellet, and other for wooden logs, coal)

Use of any other fuel is not allowed. The manufacturer is not liable for any damages resulting from improper use. In case of improper use the responsibility is borne by the one who used boiler improperly.

As a user, you can enter or alter the operating parameters within the limits prescribed by these instructions. Entering any other value of the operating parameters that are not listed in this leaflet, can lead to errors in the functioning of the system

ALLOWED FUEL

Only pellet that is made from sawdust is allowed to burn.

Pellet is cylindrically pressed into cylindrical shapes. It is made from wood residues generated in wood processing. Pellet must have a standard diameter and length. Chips from which the real pellet is made, are pressed under high pressure and must have a low percentage of humidity.

RECOMMENDED

CHARACTERISTICS OF PELET

"Topling" recommends pellet of 6 mm diameter and a 10-30 mm length. Quality and geometric characteristics of pellets are prescribed by the German Standard DIN 51731 or Austrian Standard ONORM 7135



Pay special attention to the quality of pellet, both when ordering and admissioning.
Use pellet that meets the standards of DIN or ONORM.

For additional information regarding the pellet, see Section 3.4. Requirements regarding fuel quality.

2.2 PRESENT RISKS

Despite of all precautions, the below given risks should be always considered:



Attention!

High temperature surfaces.

Contact with such surfaces may cause burns.

Wait for the boiler to cool to touch these uninsulated surfaces.



Warning!

Danger of choking carbon monoxide.

When boiler is used, carbon monoxide can be emitted through openings in the boiler.

Do not leave boiler doors open more than required.

2.3 Used warning and safety signs

The below listed warning and safety signs are used in the Instructions:



Danger!

Danger from electrical current.

Work on devices marked with this symbol is only allowed for the qualified persons.



Warning

Work in areas that are marked with this symbol could result in serious injury or create significant damage.



Attention

Possible hand injury.

Work in areas marked with this symbol can lead to hand injuries.



Attention

High temperature surfaces.

Work in areas marked with this symbol can lead to burns.



Attention

Flammable.

Work in areas marked with this symbol can lead to fire.



Attention

Danger of freezing.

Work in areas marked with this symbol can lead to freezing.



Notes on proper disposal.

Additional information for operator.

2.4 Duty- be informed

READING

USER GUIDE

Anyone who intends to use the boiler is required to read and understand this manual, and special attention must be paid to the Chapter II, Safety instructions. This especially refers to those who only occasionally use the boiler, for example, only when cleaning or other tasks related to the maintenance of the boiler.

This manual must be constantly "at hand" where the boiler is installed.



Particular attention should be paid to the standards applicable to the place where the boiler is installed.

3. DESCRIPTION AND PURPOSE

3.1. Summary

Furnace "3BT" has a modern structure and design, made from quality certified material.

Construction of the boiler is compliant with European Directives:

2006/42/EC, PED 97/23/EC, LVD 2006/95/EC, EMC 2004/108/EC and

European Standards :

EN 303-5:1999; EN 60204-1 : 2006; EN 60335-1:2002; EN 50165:1997 +A1; EN 61000-6-3:2001; EN ISO 12100:2010;EN 287-1: 2004, EN 15014-1; EN10204:2004;EN ISO 7000 :2004

Boiler testing was done according to EN 303-5 and meets all requirements for connection to the central heating system.

Hot water boiler is designed for heating of small residential units, family houses, shops and small manufacturing units.

Automatic operation of the boiler provides the user with an enviable comfort considering that you need to take into account only the charge of pellet reservoir, which makes it suitable for widespread use.

Pellet is an environmentally clean fuel produced from sawdust. Sawdust is initially dried and then pressed under high pressure. The final product is fuel of exceptional calorific power and pure composition with no chemical additives. The percentage of ash in the combustion of pellets is very low and amounts to 1%.

Calorific power of pellet is about 18000 kJ/kg , which means that 2 kgs of pellet corresponds to 1l of heating oil.

Operating the boiler is a very simple and means only turning on over the master switch and setting the desired temperature.

From a functional point of view the pellet boiler is not behind the oil or gas heating systems, while in fuel consumption it is significantly more cost-effective.

Compared to boilers with heating oil the savings with pellet boilers is up to three times. Pellet is renewable, which means that, as such, is environmentally friendly.

Pellet tank is an integral part of the boiler plant and needs to be recharged as needed.

The firebox and convective part of boiler are made of quality sheet metal by welding technology. The boiler is well insulated with hard-pressed mineral wool in a quality tin plating.

Assembly and commissioning of the furnace are simple, and the connectors are standard. Boiler is tested for water resistance. Allowable working pressure is 2.5 bar.

3.2. How the boiler operates

BOILER TYPE 3BT

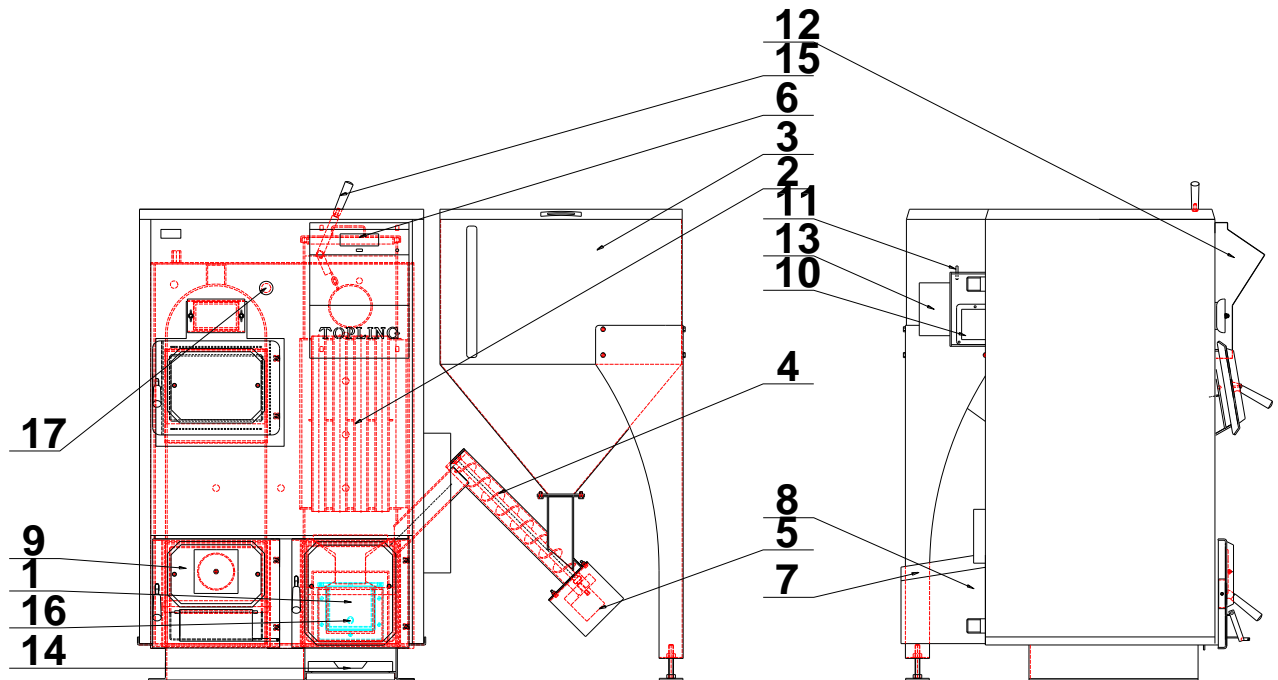


Figure 1. Parts of boiler

LEGEND

- | | |
|----------------------------|--|
| 1. firebox | 9. firebox doors |
| 2. convective beam | 10. chimney |
| 3. pellet reservoir | 11. probe of flue gases |
| 4. screw conveyor | 12. box with operating display |
| 5. motor of screw reductor | 13. flue pipe |
| 6. flap of convective beam | 14. ash collector |
| 7. air feeder | 15. convective beam cleaning mechanism |
| 8. fan | 16. heater to fire pellet |
| | 17. connection for draught control |

Boiler operation when pellet is used as fuel

From pellet reservoir **Fig.1 pos.3** a screw conveyor **Figure 1 position 4** inserts pellet into firebox **Fig.1 pos.1**.

Electric heater, which is located in the firebox **Fig.1 pos.16** is used to fire pellets. This occurs only in the initial stage of commissioning of the boiler in operation and after a long break.

Fan **Fig.1 pos.8** supports pellets burning in a way that it leads required amount of oxygen for combustion into firebox.

Boiler operation when wood or coal is used as fuel

In this case, the furnace firebox for wood or coal is active. The fire is put manually to the lower door (Figure 1 position 9). Firing chopped wood or coal is done through the upper door of the boiler. In this case, automated functions of boiler are off. Feeding the boiler is done manually and fuel should be filled every 2 to 5 hours, depending on the quality of the wood (coal). Draught regulator (not supplied with the boiler) is set to the desired temperature of boiler water which should be within the limits of between 60-90 °C.

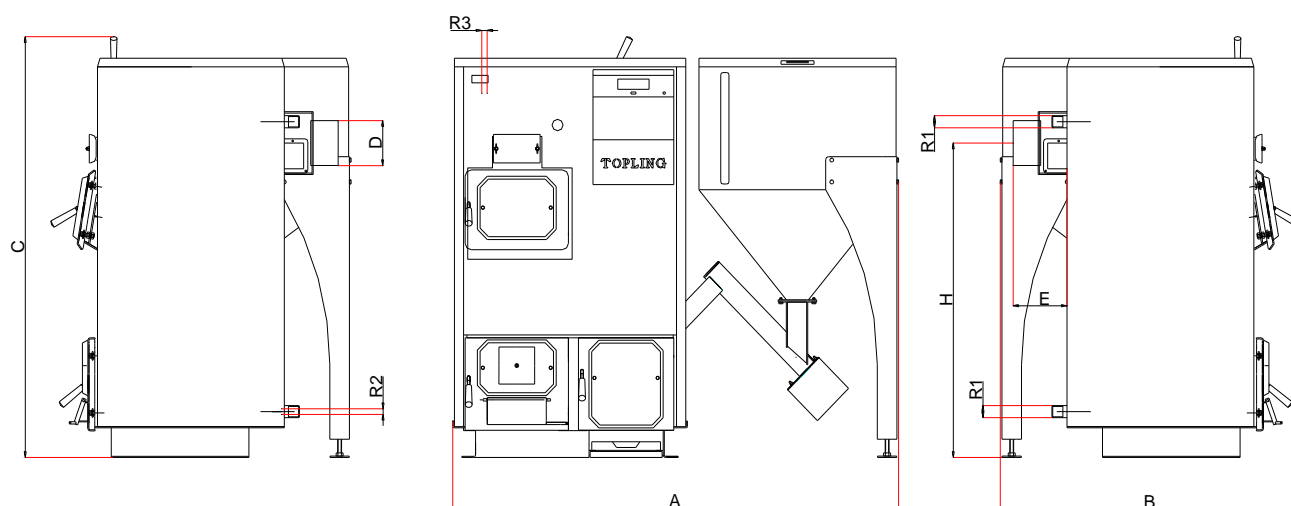


Figure 2. External appearance of furnace

3.3. Technical data

Tabel 3. Technical data

TYPE	Power [kW]	DIMENSIONS [mm]						ACCESSORIES [col]			Required draught [Pa]	Boiler weight + reservoir [kg]	Water content [l]	Capacity of pellet reservoir [kg]
		A	B	C	D	H	E	R1	R2	R3				
3 BT-25	25	1623	1093	1474	160	1101	196	5/4	3/4	1/2	21	634	213	230
3 BT-35	35	1740	1100	1650	180	1286	230	6/4	3/4	1/2	25	890	310	290
3 BT-50	50	2135	1185	1752	200	1326	253	6/4	3/4	1/2	28	1025	410	290

parameter	unit	3BT25	3BT35	3BT50
Max. power	kW	25	35	50
Nominal boiler power	kW	8-25	11-35	16-50
Coefficient of efficiency	%	91	91	91
Working pressure of boiler	bar	2.5	2.5	2.5
Test pressure	bar	5	5	5
Temperature at the boiler entrance	°C	70	70	70
Temperature at the boiler exit	°C	90	90	90
Water content	l	213	310	410
Boiler category according to EN 303-5		3	3	3
Resistance on the water side at nominal load	hPa	7	7	7
- $\Delta t=10$ K				
- $\Delta t=20$ K				
Required operating pressure	Pa	21	25	29
Mass flow of flue gases:	kg/s	0.0176	0.0350	0.510
-nominal load				
-partial load		0.0079	0.0160	0.335
Temperature of flue gases:	°C	135	129	129
-nominal load				
- partial load				
-max. load		170	180	180
Capacity of pellet reservoir [kg]	kg	230	290	290
Starting flow	col	5/4	6/4	6/4
Return flow	col	5/4	6/4	6/4
Opening for filling and emptying	col	3/4	3/4	$\frac{3}{4}$
Electrical power:	W	100	123	123
-under normal regime				
-in incineration phase		300	323	323
Electrical components:	V	230	230	230
-power				
-power supply at normal operation				
- power supply in incineration phase	A	1.0	1.0	1.0
	A	2	2	2

3.4. Requirements for pellet quality

GERMAN STANDARD DIN 51731

Pellet in group of size HP5 is made of pressed wood chips of intact wood including bark, with no additional bonding materials. The energy that is contained in 2 kgs of pellet corresponds roughly to the energy contained in 1 liter of heating oil (10 kWh).

AUSTRIAN STANDARD ÖNORM M 7135

Austrian standard contains requirements regarding the quality of pellets, pellet testing procedures, the method of pellet production control and labeling of the same.

DIN PLUS STANDARD

Standard DINplus is a combination of the two previous standards.

Certification procedures is performed by the pellet manufacturer verified by a body that has a DIN Certco. Independent testing should be carried out at regular intervals in order to ensure the required quality of pellet.

PELLET CHARACTERISTICS

Tabel 4. Pellet characteristics

Standard	DIN 51731	ÖNORM M7135	DINplus	AS/NZS 4014.6
Length	max. 50 mm	max. 5 x Ø	max. 5 x Ø	max. 38 mm
Diameter Ø	4 – 10 mm	max. 10 mm	4 – 10 mm	max. 10 mm
Energy value	17.5 - 19.5 MJ/kg	min. 18.0 MJ/kg	min. 18.0 MJ/kg	18.0 - 21.0 MJ/kg
Pellet density	1.0 – 1.4 kg/dm ³	min. 1.12 kg/dm ³	min. 1.12 kg/dm ³	N/A
Bulk density	min. 650 kg/m ³	min. 650 kg/m ³	N/A	min. 640 kg/m ³
Water content	max. 12%	max. 10%	max. 10%	max. 8%
Ash content	max. 1.5%	max. 1.5%	max. 0.5%	max. 0.5%
Abrasion of pellet	N/A	max.2.3%	max.2.3%	N/A
Sulphur content	N/A	max. 0.04%	max. 0.04%	N/A
Nitrogen content	N/A	max. 0.3%	max. 0.3%	N/A
Chlorine content	N/A	max. 0.02%	max. 0.02%	N/A

3.5. Declaration of Conformity

DECLARATION OF CONFORMITY



in compliance with EN45014:1998



We : **TOPLING**
Vijaka bb
78430 Prnjavor
Bosnia and Herzegovina

hereby declare under own responsibility that the product:

label..... : hot water boiler

Type / Model.. : **3BT-25, 3BT-35, 3BT-50**

Date of production : 2012

to which this Declaration applies to, is:
 in accordance with EC Directives:

2006/42/EC - Directive on machinery
 PED 97/23/EC - Pressure Equipment Directive
 LVD 2006/95/EC - Low Voltage Directive
 EMC 2004/108/EC - Electromagnetic Compatibility Directive

Applied harmonised standards, in particular:

EN 303-5:1999; EN 60204-1 : 2006; EN 60335-1:2002;
 EN 50165:1997 +A1; EN 61000-6-3:2001; EN ISO 12100:2010

Other mentioned standards and technical specifications:

EN 287-1: 2004, EN 15014-1; EN 10204:2004; EN ISO 7000 :2004;

Applied procedure for evaluation of conformity: Module B1

The limit value of emissions of combustion products (Category):

Issued certificates: EC control of type-Certificate No.

Accredited laboratory: TÜV Thüringen e. V. Service-Center Südthüringen
 Industriestr. 13 98544 Zella-Mehlis

We hereby declare that the above named product in its concept and workmanship, is in accordance with the security and safety standards that comply with the above directives and standards. Thereby all operating conditions and application requirements are in accordance with the User guide and technical documentation.

Once a single change has been made to the product not in agreement with us, this statement loses its importance.

Place and date

Full name and title of signatory:

Prnjavor

Živanić Radislav, Director

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LS

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4. BOILER ASSEMBLY

4.1. Boiler connection to central heating system



Boiler connectioning should be performed only by skilled and authorised persons.

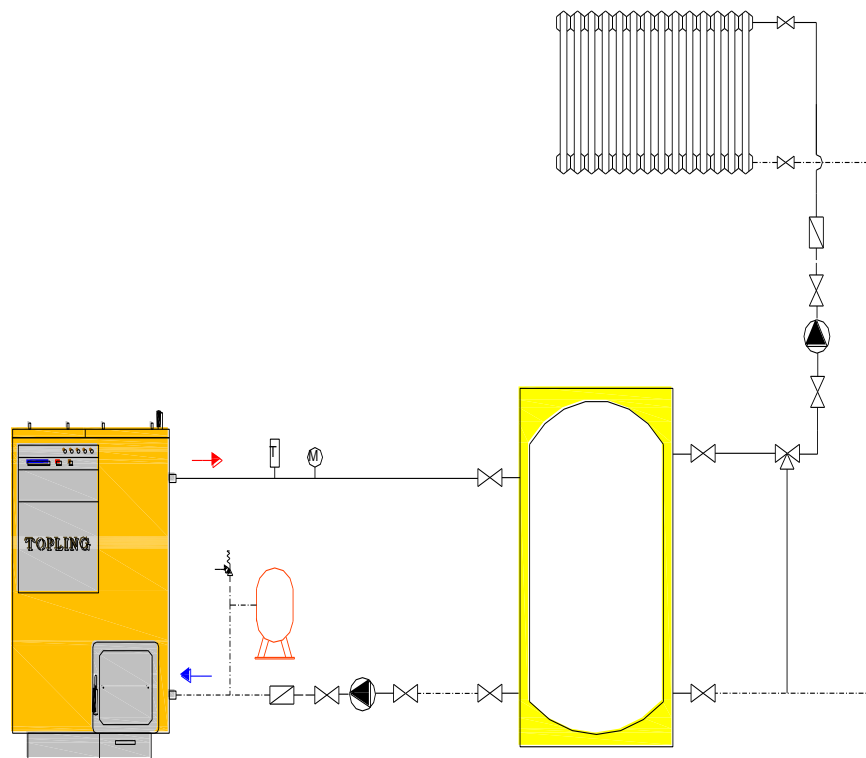


Figure 3. (scheme of connecting boiler to the system)-version 1, with heat battery

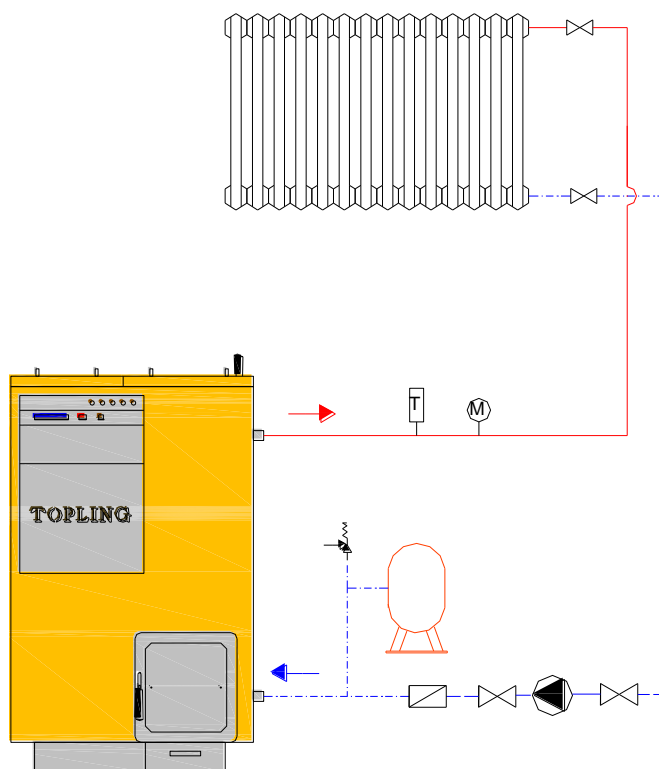
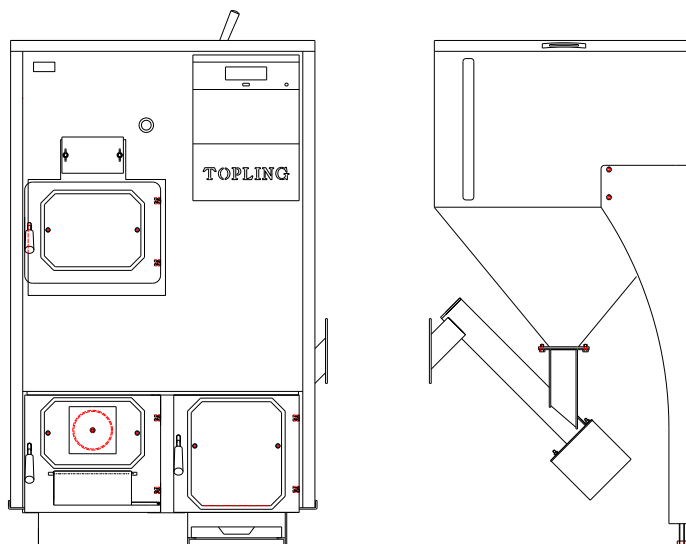


Figure 4. (scheme of connecting boiler to the system)--version 2, no heat battery



Fuel (pellet) reservoir is an integral part of the equipment and is supplied with the boiler and are bonded by flange.

Furnace is preferably placed as close as possible to the chimney.

Do not close free air supply to the boiler.

**WARNING**

- The furnace must be placed on a stable, flat surface. Setup and installation of the furnace must be conducted by **a professional**.
- Water supply connections must be provided in the furnace room, plus a connection for possible drainage and electrical connection with **mandatory grounding**.
- The furnace room should have natural ventilation that provides fresh air.
- The floor and inside the boiler room must be made of fireproof materials.

It is desirable that the room is not damp, in order to avoid the corrosion of metal parts, with the goal of extending life.

Softened water is recommended for filling the boiler from the system.

Circulation pump is put into operation only when the heating system is filled with water. What must be taken into account is that the system is vented.

When connecting the furnace and chimney, the flue pipe should be placed horizontally or vertically. All connections must be well sealed.

Before the first firing, it is necessary to check whether the chamotte is properly placed in the furnace and check that the transportation and installation of the boiler has not caused movement of refractory bricks.



The chimney must be sized according to the diagram in Figure No. 5.

Insufficient airflow, ie. when geometric features of chimney as indicated in Figure 5 herein have not been met, there is a real risk of transmission of the flame from the firebox into the pellet feeder tube, and then in the pellets reservoir which can cause a fire.

Chimney size for furnaces type 3BT

For a good and safe operation of the furnace a chimney should be sized according to the diagram in Figure 5. Figure 6 shows the proper placement of the chimney over the roof.

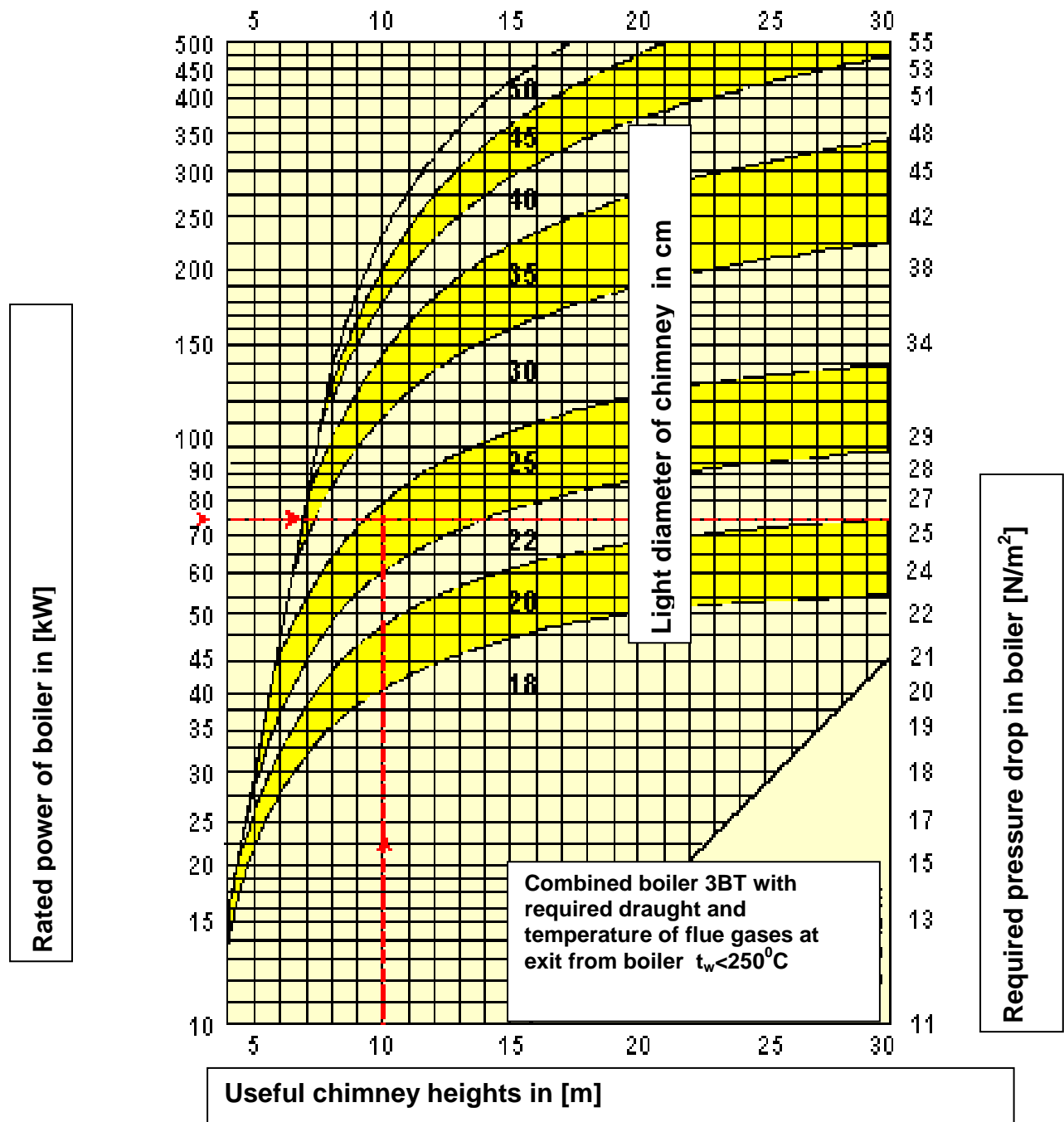


Figure 5. Selection of chimney section for boiler 3BT

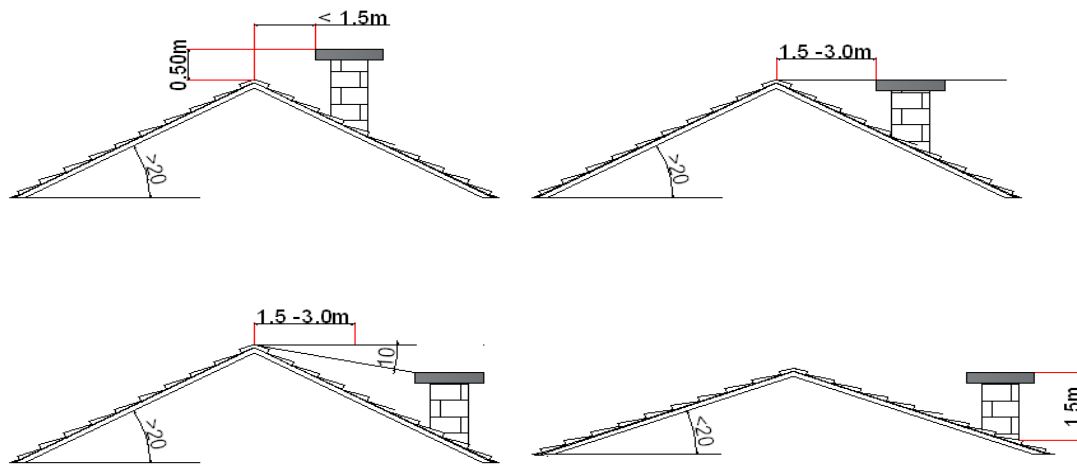


Figure 6. Samples of properly set and dimensioned chimneys



Connecting the control panel of boiler to the network

When installing the boiler, power supply cord must be connected to the boiler. The power supply is single-phase 220 V, 50 Hz. Installation must be performed by an expert because there is a danger of electrical shock.



Connection of room thermostat

The room thermostat can be connected to a furnace panel.

Installation has to be performed by an expert because there is a danger of electrical shock.

Before putting into operation the work You must check:

- the pressure in the boiler and installation,
- whether complete installation is properly vented,
- whether boiler cables do not rely on the warm (hot) portions of the boiler or the cables are not physically damaged,
- whether furnace fireclay is properly positioned (**Figure 7**),
- before feeding pellets into the reservoir, check that there are no mechanical hard objects that could impede the work of the screw conveyor.

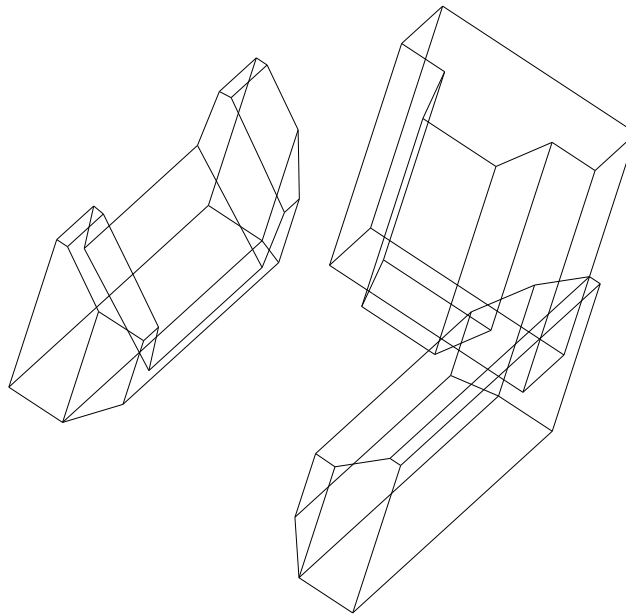


Figure 7. *Distribution of refractory elements in the furnace firebox for combustion of pellets*

In a closed heating system the installation of a certified safety valve opening pressure of 2.5 bars is required, and installation of expansion vessel. Locking element must not be installed between the safety valve, expansion vessel and boiler.

Water temperature in boiler may not fall below 55°C not to cause condensate.

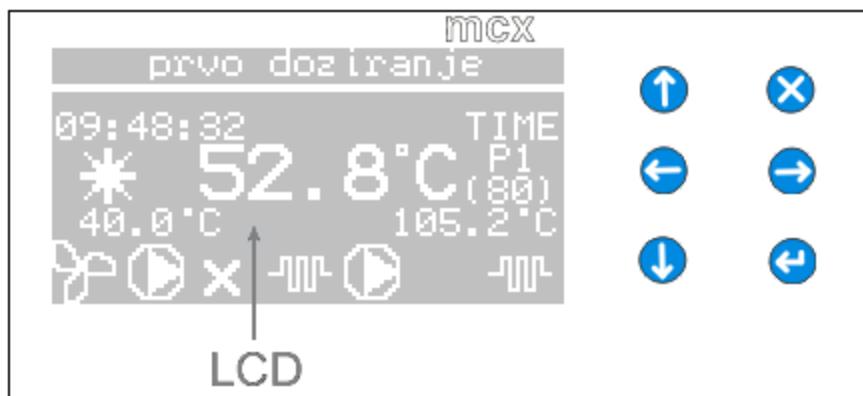


In the event of severe winter weather and low temperature, and when the boiler is not used it is necessary to drain water from the system or fill it with antifreeze liquid.

5. COMMISSIONING

5.1. Main characteristics of controller

The controller is designed for boiler operation which uses pellet and solid fuel, and boiler additionally owns two electric heaters total power of 18 kW. The appearance of the front of the controller is shown in the figure below.



- GORE
 - DOLE
 - LIJEVO
 - DESNO
 - ESC
 - ENTER

Slika 8. Front side of the controller

The controller has LCD 128 x 64 pixels and six buttons on the right. Function of buttons is as follows:

- confirmation of set parameters, menu overview and boiler turn on,
- listing menu and shutting down the boiler,
- setting parameters,
- setting parameters,
- menu overview and access to user's parameters,
- menu overview.

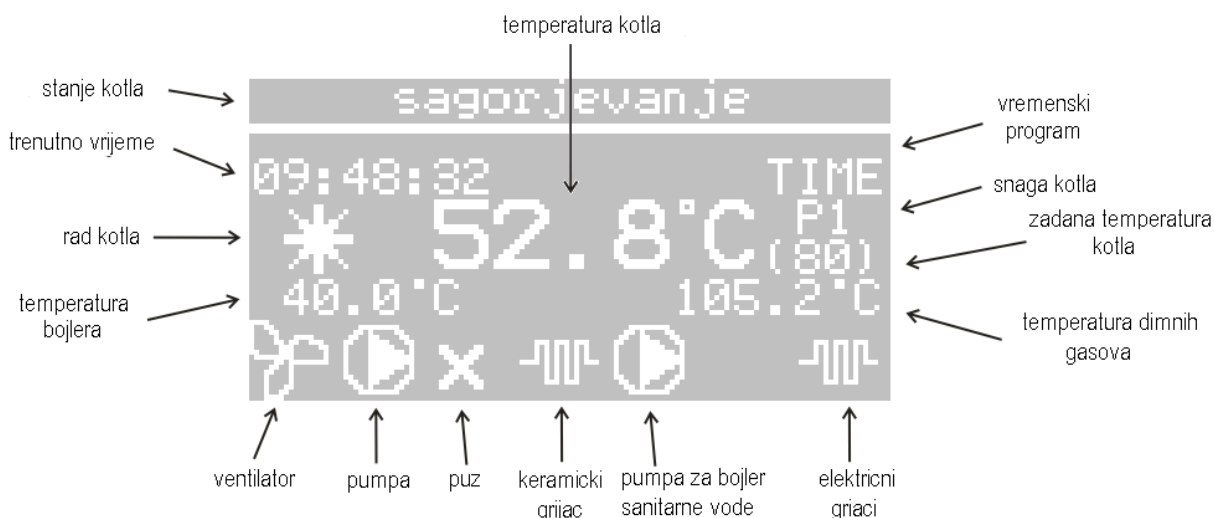
Inputs of controller are as follows:

- boiler water probe (Pt1000),
- flue gas probe on pellet side of the boiler (Pt1000),
- flue gas probe on solid fuel side of the boiler (Pt1000),
- boiler side of hot water (NTC, 10KΩ),
- room thermostat.

Outputs of controller are as follows:

- electrical heater for pellet firing (relay, 16 A, NO),
- screw conveyor (relay, 16 A, NO),
- heating system pump (relay, 8 A, NC),
- pump for hot water boiler (relay, 8 A, NC),
- electrical heaters, 2 x 9 KW (relay, 8 A, NO),
- fan (PWM).

The below given figure describes a meaning of certain symbols, numbers and displayed images on main display of user interface.





In the upper line, „STATE OF BOILER“ the information on the current stage of the boiler (boiler off, the first ignition, combustion, room therm. off, ...) are alternately printed, and on the selected type of fuel that the boiler uses. Symbol „OPERATION“ means that the boiler is on or off. If the boiler is set to run at a set time program the **TIME** is displayed. Symbols in the bottom line of the display show the state of controller output, or whether the executive components (fan, heating system pump, feeder conveyor, heater, boiler hot water pump and electric heaters) are on or off. The existence of a particular symbol means that the element is turned on.


5.2. How the controller operates


There are many different combinations related to the type of fuel that the boiler can use. The following table describes the meaning of each item of the display FUEL TYPE.

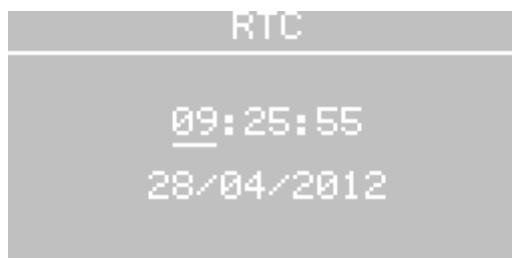
Tabel 5. Possible operations of combined boiler


Type of fuel	Meaning
PELLET	Pellet used as fuel
WOOD	Designed to burn solid fuel
EL. HEATERS	Electrical heaters of 2 x 9 KW are used
WOOD THEN PELLET	In case you want to use the pellet boiler after combustion of solid fuels.
WOOD AND PELLET	For simultaneous firing of solid fuel and combustion of pellets.
WOOD THEN EL. HEATERS	In case you want to use electric heaters after combustion of solid fuels.
WOOD AND EL. HEATERS	For simultaneous electric heaters and solid fuel heating.
PELLET THEN EL. HEATERS	In case you want to use electric heaters when pellet runs out.
PELLET AND EL. HEATERS	For simultaneous use of electric heaters and pellet heating.

After the type of fuel is selected, the boiler should be started. The boiler is turned on by pressing the button  for two seconds, unless **START** appears on display. Previously it is required to turn on the main, red switch on the boiler. The boiler is set to work at the defined time program when you press again the button  for two seconds, unless **VREMENSKI PROGRAM (TIME PROGRAM)** appears on display. The boiler is turned off by pressing the




button  for two seconds, unless **STOP** appears on display. In the event that the fuel type "WOOD THEN PELLET" is selected, after each boiler feeding with solid fuel, it is necessary to choose the TYPE OF FUEL on display, and re-select "WOOD THEN PELLET". The same should be done in the case the fuel type "WOOD THEN EL. HEATERS" is selected. The objective of this action is to reset the timers significant for automatic startup of pellet boilers, or electricity boiler. On the display "EL. HEATERS POWER" the number of electric heaters that will be loaded if "EL. HEATERS" is selected as a fuel (0KW, 9KW, 18 KW). The existence of symbol "electric heaters" means that one or both electric heaters (9 KW and 18 KW) are involved.

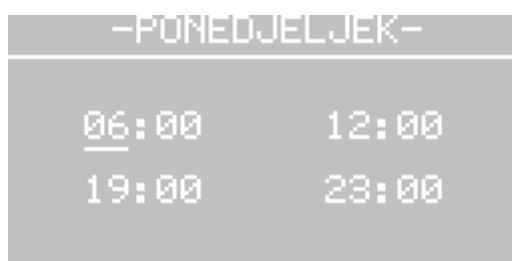
By pressing the button  for two seconds you enter into display where time and date are set.






By pressing the button  for two seconds you enter into display where boiler operation time program is set.






By pressing the buttons ,  date of certain time program is set, and by pressing the button  settings for selected date are done.















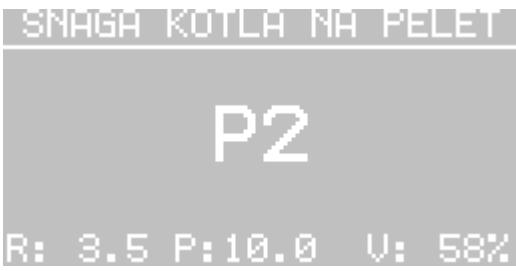




























The values shown on the display represent the time within which the boiler will be in use. Values are set by pressing the buttons  and , and are confirmed by pressing the button , and an underscore () is shown under currently active variable. Settings can be made independently for each day, and there are two time intervals for the boiler use for every single day. After you finish entering the last value in the time program the form that asks if you want to copy the same time pattern for the next day of the week is shown on display.



By pressing the button  the same time pattern for the following days is confirmed, and by pressing the button  it is cancelled and you are directed to settings for the time pattern for the following day.

There are two groups of parameters relevant to the operation of the boiler, quality of pellet combustion, emission of fumes, etc. One group represents service parameters that are set by an authorized person at start-up of the boiler. The other group are user's parameters that the end user sets, and can be set by pressing the button . The list of user's parameters is shown in table below.

	 ,  - sets desired value.  - confirms set value and starts setting the next parameter.  ,  - lists the menu.  - returns to the main menu.
	 ,  - fuel type selection.  - confirmation of selected fuel and setting the next parameter.  ,  - lists the menu.  - returns to the main menu.
	 ,  - selection of pellet boiler power.  - confirmation of selected power and setting the next parameter.  ,  - lists the menu.  - returns to the main menu.

	 ,  - izbor snage elektro grijača.  - confirms selected power and setting the next parameter.  ,  - lists the menu.  - returns to the main menu.
	 ,  - sets desired value.  - confirmation of set value and setting the next parameter.  ,  - lists the menu.  - returns to the main menu.
	 ,  - sets desired value.  - confirmation of set value and setting the next parameter.  ,  - lists the menu.  - returns to the main menu.

The course of the boiler executive elements action is divided into several stages in order to ensure reliable operation of the boiler, the optimal combustion, satisfactory flue gas emissions to the higher utilization factor. The boiler's operation is divided into three main phases including: *ignition*, *stabilization* and *combustion*. In order to facilitate understanding of the process of the boiler's operation when reading the text, the figure 9 should be observed at the same time.

When starting the boiler, if the actual flue gas temperature is above the fixed limits for incineration, it is considered that the furnace has enough ember to continue burning pellets and no electric heater is started, but continuous pellet dosing keeps going. If the temperature of the flue gases is below the fixed limits for firing, then the firing process begins. In the firing process initially only the fan is involved to clean the firebox partially, primarily to clean the front of the heater. Afterward, the feeder conveyor that feeds in initial quantity of pellets for firing is involved (K2). During the initial pellet dosing an electric heater is involved that continues to work after feeder conveyor is stopped, and fires the pellet in the furnace over the next several minutes. Shortly after firing pellet the flue gas temperature begins to grow. This increase in the temperature of flue gases transfers the operation process in *stabilization* phase, when the electric heater gets off. At this stage the pellet dosage is done by a reduced mode, while the fan is running with slightly more power than at the *combustion* stage (to be configured in the service parameters).

The purpose of the stabilization phase is that the pellet burning is spread throughout the combustion chamber. Duration of the stabilization phase is scheduled, after which it goes into operating mode, in the phase of *combustion*. If there is no required increase in the flue gas in specified time in the phase of incineration, the pellet is considered not fired and boiler stops working. In this case, at the line "state of boiler" the **FAILURE** is displayed.

At the stage of combustion, the pellet and air dosing is done as set in the user settings (K5, K6 and K7). By approaching the current boiler temperature to the parameter "maximum boiler temperature" the boiler starts to decrease power continuously in order to minimize offs and ons. The boiler goes into a resting phase when the temperature of the boiler water reaches the value set in parameter "**maximum boiler temperature**". Then in the line "state of boiler" the **SLEEPING MODE** is displayed. From resting stage the boiler restarts when the boiler water temperature drops below the parameter "maximum boiler temperature" for a certain difference set in service parameters. Whether the operation of the boiler shall continue after the stabilization phase, or the firing process shall begin, depends on the current temperature of flue gases.

If you are using a room thermostat, it can be set that boiler stops working when the room thermostat gets disconnected, or that the boiler keeps operating for a defined period of time. If the boiler keeps operating for some time, the temperature will reach the set temperature of the boiler very soon and the boiler will stop working.

Heating system pump is activated when the boiler temperature is higher than the set pump temperature (S21 parameter) and if the room thermostat is fitted. If the room thermostat switches off, the pump may still be active for a while (5 minutes) and then turns off until restart of the room thermostat is activated.

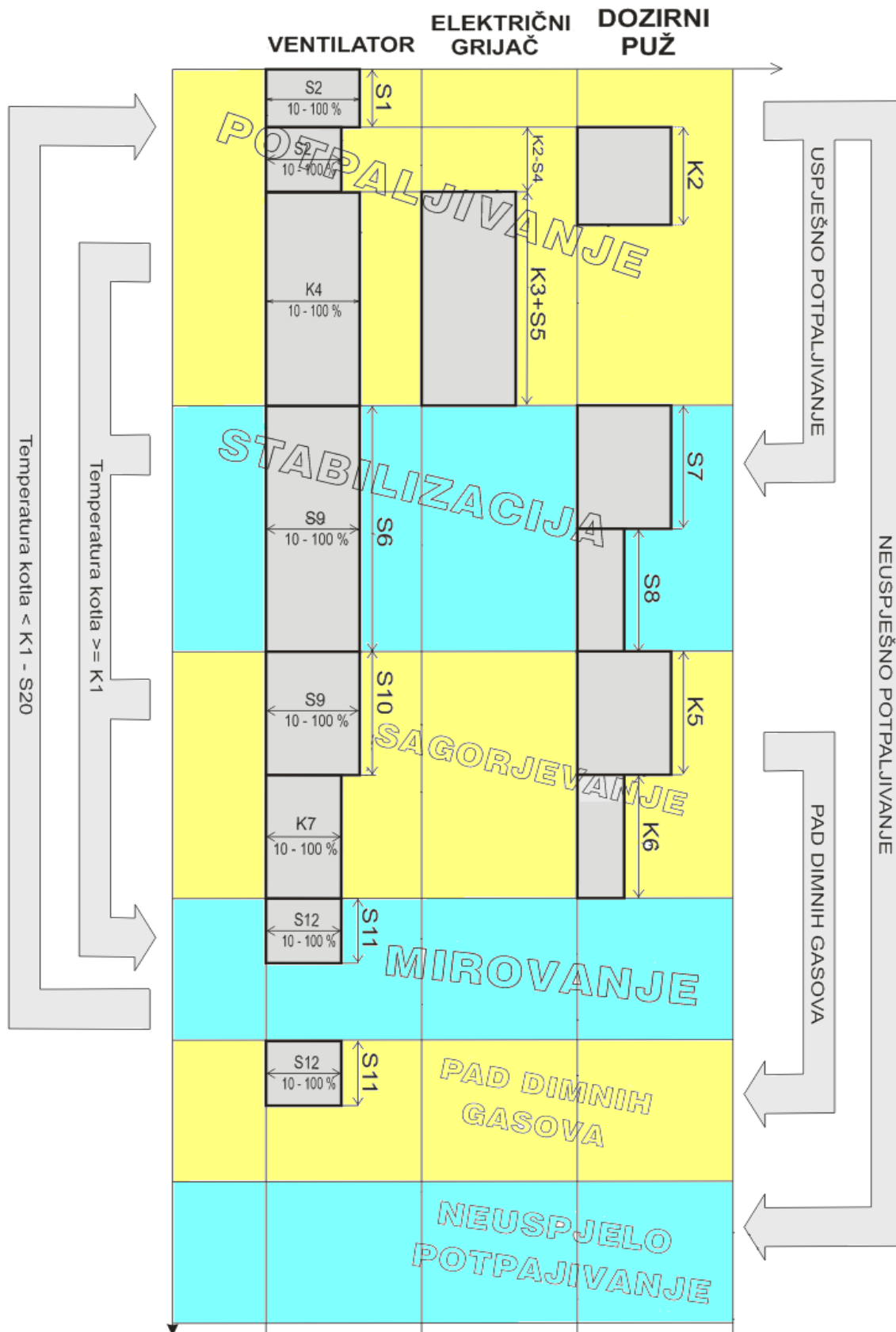


Figure 9. Principal diagram of boiler operation

K1 – maximum boiler temperature, K2 – initial pellet feeding time, K3 – duration of first incineration, K4 – fan power at incineration, K5 – operation time of feeder conveyor, K6 – break of feeder conveyor, K7 – fan power at burning, S1 – time of initial blow out, S2 – fan power at

at blow out, S3 – fan power at initial feeding, S4 – early involvement of the heater, S5 – duration of second incineration, S6 – duration of stabilisation phase, S7 – operation time of feeder conveyor at stabilisation, S8 – break time of feeder conveyor at stabilisation, S9 – fan power at stabilisation, S10 – period of stabilisation prolongation, S11 – time for firebox cleaning, S12 – fan power at firebox cleaning, S13 – delay of boiler switching off after the room thermostat is disconnected, S14 – fixed limits for firing, S15 – required increase in temperature of flue gases, S16 – minimum temperature of flue gases, S17 – allowed flue gas temperatures drop, S18 – the beginning of a reduced dosing regimen, S19 – exceeding factor, S20 – difference for the boiler operation, S21 – temperature for the pump startup, S22 – difference for pump operation, S23 – maximum temperature of the boiler, S24 – difference between the boiler and the furnace.

**NOTE**

These instructions must be followed to ensure safe and proper installation, operation and maintenance of the boiler. Anyone who install, operate and maintain the boiler must carefully read this manual before using the boiler and properly treat it. Ignoring this instruction may lead to invalidating the warranty.

**FIRE RISK**

No flammable materials or liquids should be kept in the immediate vicinity of the boiler.

**RISK TO LIFE**

Insufficient air supply to the plant can result in exposure to hazardous flue gases in a room where the boiler is placed. It is necessary to make sure that openings for fresh air and exhaust waste are not reduced or closed. If this problem is not resolved immediately, the boiler must not be in use.

6. BOILER MAINTENANCE

6.1. The frequency of Cleaning and Maintenance

In order to enable long life expectancy of the boiler without any operation interruptions, it is necessary to regularly clean and maintain the boiler. In this way you will avoid costly repairs. Keeping your firebox clean is the basic condition for the good boiler operation. A layer of soot and tar accumulates on the firebox walls and it is necessary to mechanically clean the furnace.

The frequency of the maintenance depends on the quality of pellet and the power of the boiler. Generally, it is necessary to observe the frequency of maintenance described in the table.



Turn off the automation of the boiler and the boiler main switch before the operations described in the table below.

Table 6. The frequency of Cleaning and Maintenance

Interval	Component	How it is performed
Every three days	Clean the convective beam	Move the handle for cleaning on the mechanism for cleaning the convective beam (Fig. 1, position 15) forward - backward. It is necessary to move the handle forward-backward for five to six times.
Every seven days (for firebox used for combustion of wood or coal)	Clean the internal exchange surface of the layers of soot	Use the cleaning kit shown in Fig.14 to scrape soot layers from the walls of the firebox
Monthly	Clean the pellet storage	Regardless of the pellet quality, a certain amount of pellet dust remains on the walls and bottom of the storage. During the cleaning it is necessary to use or remove all pellet from the storage, and then suck up the dust with a vacuum cleaner.
Every six months	Clean the automation display	Cleaning should be done with well wrung-out damp cloth
	Check whether the chimney, flue pipe elbow, chimney pipe are clean and if necessary clean them.	Wait for the boiler to cool down, dismantle the flue pipe, flue gas channel and smoke outlet elbow and perform the cleaning with the same kit which is delivered with the boiler
	Check the water probe of the boiler and the probe of flue gas and if necessary clean them	Carefully take out the probes out of their location and if necessary clean them of soot layers (for flue gas probe) and of possible lime scale (water probe of boiler)
Annually	Thorough annual cleaning at the end of the heating season.	Clean all the components described in the upper part of the table

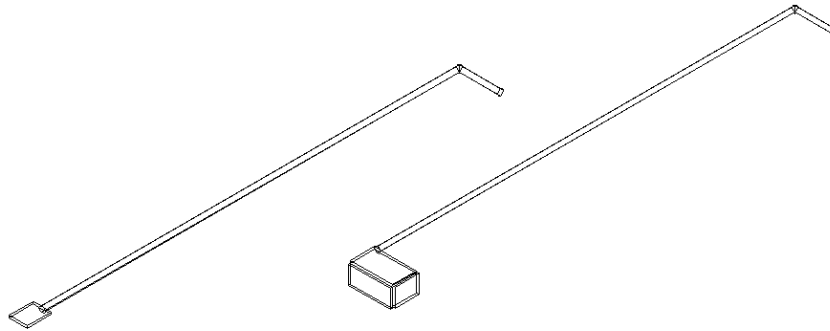


Figure 10. Boiler Cleaning Kit



When cleaning the furnace of ashes and soot deposits by vacuum cleaning, the ash has to be cooled, i.e. to have the room temperature, in order to avoid the risk of the combustion of the vacuum cleaner with which we suck up the ashes.

When removing the front part of the fire clay in order to clean the furnace there is the risk of burns. Fire clay is hot and it is necessary to leave enough time for cooling down.



The amount of the ashes in the furnace depends in many aspects on the pellet quality. If the pellet is of the better quality, the need for cleaning will be less frequent. The pellet of the better quality leaves less dust.



When cleaning chimney, flue pipe and the elbow there is a risk of burns because these surfaces may have the temperature up to 150 °C during the operating regime. It is necessary to leave enough time for cooling down.



When performing the cleaning works, there is a risk of carbon monoxide poisoning, if the combustion process is not over and the clearing process is performed carelessly. In this case, carbon monoxide is emitted through openings on the boiler (i.e. open doors, removed flue pipe, or the elbow). Never leave the boiler door open longer than it is necessary.

NOTE

In order to extend the life expectancy of the heater, which ignites the pellet, it is necessary during the cleaning to pay attention to the output of the heater in the furnace. The opening for hot air must be free of the ashes (mustn't be congested).

NOTE

After the heating season, you must thoroughly clean the boiler, thus the boiler exploitation is increased.

6. Possible problems in functioning

Table 7. Possible problems during the operation – spreadsheet.

Problem	Cause	Elimination
The boiler operates, but it cannot achieve the set temperature	1. The boiler is dirty	1.Clean the boiler
	2.There is no enough fuel in the boiler	2.Increase the dosing of feeder
	3.Fire clay elements are not well placed into the furnace	3.Properly place the fire clay elements into the furnace
Boiler is getting wet	Flue gas condensation	1. It is installed the excessive force of radiators. The boiler does not have enough power. Replace the boiler with a boiler of a higher power or adjust the number of radiators with the boiler power.
	The boiler is damaged	It is necessary to weld the boiler. Only the authorized service technician or the producer can perform that.
The smoke returns from the boiler	The chimney, chimney pipe or convective beam are dirty	Clean
	Too small opening of the chimney	Adjust cross section of the chimney with the boiler power
Boiler does not operate	There is no voltage	1.Check the plug 2.Check the fuse of the home installation
Boiler achieves the set temperature, but the radiators do not heat	The pump does not operate, but there is a voltage on it (the pump is not delivered with the boiler)	The pump is bunt up,. It is necessary to unscrew the cap of the pump and to try to start it with the screwdriver
	The pump has no voltage	Check the fuse of the pump
The fan does not work	1.Fuse blown 2.Foreign body in the fan	1. Replace the fuse 2.Check whether fan functions without any obstacles
The pellet cannot be ignited	1. No voltage on the heater 2. Faulty heater 3. The furnace is dirty 4. There is no pellet in the storage 5. Time for ignition not correctly selected 6. Faulty fan 7. Faulty pellet dosing system 8. Faulty flue gas probe	1.Check the fuse 2. Change the heater 3. Clean the furnace 4. Refuel the tank with the pellet 5. Set the correct time for Fire 6. Solve a problem on the fan 7.Repair the defect at snail pellets or gear reducer 8. Replace the probes
There is no dosing of pellets into the firebox	1. No power on gear reducer 2. Foreign body in the dosing tube 3. Too moist pellet 4. Faulty engine	1. Check the fuse 2. Clean the tank and dosing pipe 3. Use the pellet of a good quality 4. Replace the engine

7.1 When can we expect the occurrence of fire in pellet storage



In the case if the boiler is connected to an inadequate chimney (insufficient height, insufficient cross-section of the chimney, reduced cross-section due to dirt, very dirty boiler) there is a risk that fire returns from the firebox into a dosing pipe and pellet storage.

The boiler is equipped with a double protection from the fire in the pellet storage, as follows:

- One part of the air for combustion is discharged into the pellet dosing pipe and prevents the penetration of the flame in the storage. This air is constantly present during the boiler functioning.
- In the case of the chimney of a really bad quality mentioned air may be insufficient to prevent entrance of the air into the storage. Thermo valve activates then (see Figure 11) which opens on a temperature of 95°C and enables the supply of water which through the system on thermo valve partly enters the screw conveyor and the dosing pipe, and partly in the pellet screw conveyor and thus performs fire fighting. Thermo valve together with its probe (see Figure 11) is factory installed into the boiler. The obligation of the customer is to provide a water supply for fire fighting on the thermo valve connection (connection is 1/2") (see Figure 11).

THE CUSTOMER'S OBLIGATION IS TO COMPLY WITH THE INSTRUCTIONS OF THE MANUFACTURER ABOUT THE QUALITY AND CHIMNEY DIMENSIONS (SEE FIGURE 5 AND 6). YOU MUST ALSO FOLLOW THE GUIDELINES FOR BOILER MAINTAINING (SEE CHAPTER 6) IN CASE OF FIRE WHOSE CAUSE IS INADEQUATE OR DIRTY CHIMNEY FURNACE, THE MANUFACTURER IS NOT RESPONSIBLE FOR THE DAMAGE.

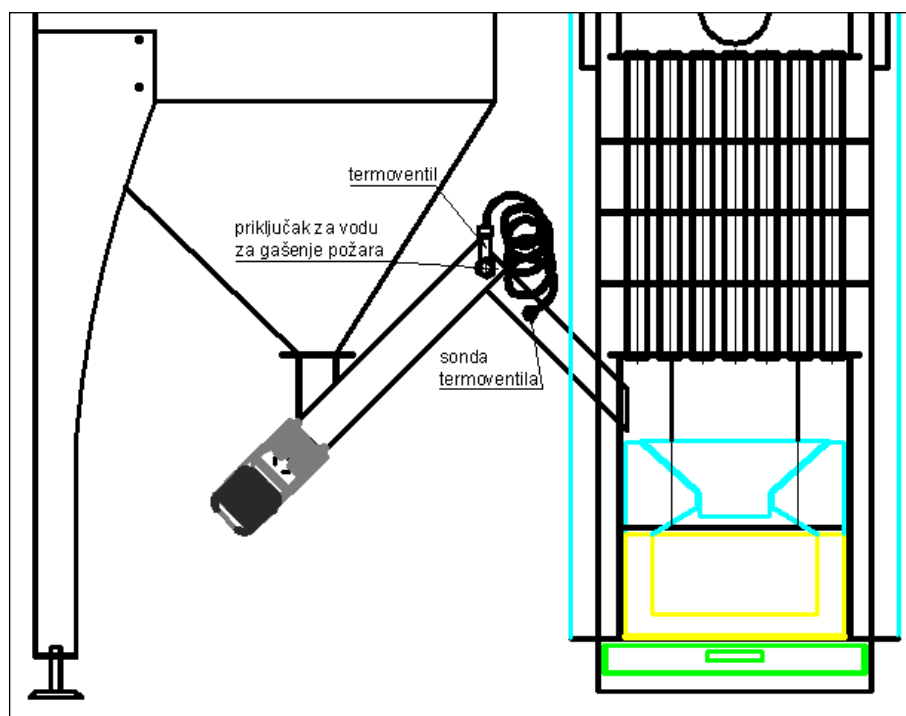


Figure 11. Connection site of thermo valve with the pellet dosing system (PP set)

7.2 Which steps are to be taken when thermal valve gets activated and lets the water into the pellet dosing system

- It is necessary to disconnect the boiler from the electric power supply
- Take out the screw feeder from the tube
- Remove the wet pellet from the storage and dosing system
- Put the screw feeder and gear reducer back in their place
- Make sure that the remaining water does not cause the short circuits. Therefore, it is necessary to remove the remaining water and dry the wet parts of the boiler
- Provide electricity supply to the boiler

If the wet pellet remains in the dosing system, the conveyor may be blocked and winding of the motor redactor may be blown. The producer of the boiler is not responsible for the damage.

7. THE FIRST COMMISSIONING

The first putting into operation of the 3BT boiler should be done by a specialized person of Topling Company or an authorized service technician.

Besides putting the boiler into operation, an authorized person should inform a customer about operation of boiler, its use and about maintenance and cleaning of the boiler.



The boiler should be put into operation by a qualified person. If unqualified person performs the putting into operation, there is the possibility of damage and complete destruction of the boiler. Improper handling can cause injuries.

8.1. Requirements for successful commissioning

The following conditions must be met before starting safe putting into operation of the boiler:

TURN OFF THE ELECTRICAL SUPPLY TO THE BOILER

- Is the main switch for power supply to boiler turned off?

CHECK MECHANICAL COMPONENTS OF THE BOILER

- Are all mechanical components properly implemented into the boiler?
- Are all mechanical components properly and firmly fixed to each other?
- Is the boiler furnace for pellet combustion properly implemented in the boiler?
- Is the fan properly implemented?
- Are the chamotte blocks properly implemented in the boiler furnace?

CHECKING OF PIPING AND INSTALLED COMPONENTS

- Is the circulation pump properly implemented?
- Is the safety valve properly implemented?

CHECK ALL ELECTRICAL CONNECTIONS



Danger!

Risk of electric shock.

- Are all electric components (motor reductor, fan, controller) properly implemented?
- Is the main power cord connected properly?
- Is the cable which connects display with control unit connected properly?
- Are the unused connectors for connecting input and output devices properly protected?
- Are the earth grounds connected to the boiler body?

8. DISPOSAL AFTER END OF LIFE

9.1. Dismantling boiler



Danger!

The boiler must be disassembled by a professional.

Material damage and injury can occur if an unprofessional person disassembles the boiler.

Dismantling of the boiler from central heating installations should be performed at following stages:

1. Switch off the boiler, i.e. stop the boiler operation
2. Leave enough time for boiler and the boiler mechanism to burn the remains of pellets
3. Separate the boiler from the power supply
4. Isolate boiler heating system by closing the valve, and then drain the water from the boiler
5. Demount pellet storage
6. Demount boiler panelling
7. Separate mineral wool from the boiler

9.2. Disposal of boiler

The following components of the boiler are made of steel and must be handed to the centre for collection of secondary raw materials.

- The body of the boiler,
- Plating boiler
- pellet storage
- Screw conveyor
- Motor reductor
- Boiler furnace.

Electrical components are necessary to be collected and handed to the centre for collection of secondary raw materials.

Glass Braid (located on the door of the boiler), mineral wool and plastic parts, must be separated and handed to the centre for collection of secondary raw materials.



Do not throw the boiler components in the dumpster.

9. GUARANTEE

10.1. Period of guarantee

The warranty period for boiler is two years.

10.2. Terms of guarantee

- The boiler must be put into the operation by the TOPLING company or our authorized service technician.
- The boiler must be used in the accordance with recommendations written in this user guide.
- The quality of pellet must be in the compliance with recommendations written in this user guide.

10.3. When the guarantee is not recognized

- The warranty is not valid if the damage is the result of the improper use
- If the installation and putting into operation is performed by an unauthorized persons
- If the service is performed by an unauthorized persons
- If the boiler is not maintained in the compliance with the recommendations written in this guide
- If the damage is caused by natural disasters (earthquakes, floods, fires, lightning, etc.)
- If the damage is caused because of inadequate power supply (too high or too low voltage).
- If the unoriginal spare parts are installed
- If the failure occur because of the improper installations (circulation pump, expansion, etc.), i.e. of the parts which are not the constituent part of the boiler, but are the condition for the functioning of the boiler.
- Because of improperly or incompletely filled Warranty sheet.