thermostahl
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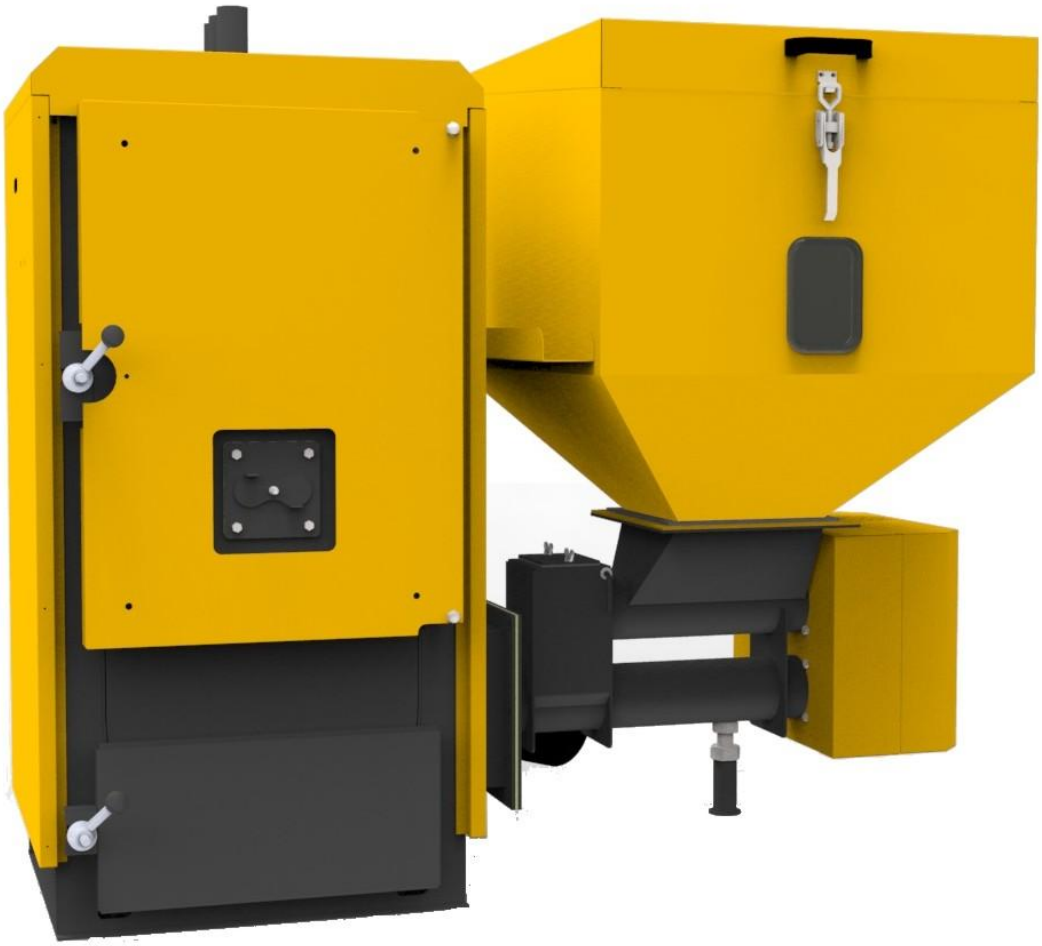
BIOMASS-SOLID FUEL RETORT BOILER

BIOPLEX MCL-BIO

INSTALLATION AND SERVICE MANUAL



VERSION: 2.1
UPDATE: 10.10.2013

Contents

1. GENERAL INFORMATION

1.1. Proper use of the appliance

Before you make use of this appliance make sure you have read and fully understood the instructions included in this manual.

The installation and use of the appliance must be performed according to the instructions indicated in this manual in combination with the current national safety regulations.

The appliance is designed for use in pumped hot water central heating systems. Any other use is considered improper and is prohibited. THERMOSTAHL declines any responsibility for damages or injuries caused by improper use; in this case the risk is completely at the user's responsibility.

To ensure an efficient and flawless function of the appliance, it is strongly recommended that you have performed an annual service by a qualified technician.

1.2. Safety warnings

All installation and maintenance procedures must be carried out by professional and authorized personnel, in compliance with the indications in the present manual and national regulations. Any failure to correctly install this appliance could cause damage or injuries!

Do not make modifications to parts of the appliance, unless you have contacted the company and an authorized service contractor.

Only original accessories and spare parts must be used to ensure correct and safe function.

Make sure you respect the cleaning and maintenance procedures on the corresponding intervals. Failure to do so can cause malfunction to the appliance and possible damages.

The boiler is design to function on the fuels indicated in the corresponding paragraph. Any other fuel is prohibited. Do not use explosive or flammable substances! Do not store such substances inside the boiler room.

The working pressure varies according to the model. Make sure you use the appropriate water pressure. **Working in a pressure higher than the one indicated in this manual is strictly prohibited and dangerous!**

1.3. Data label

The data label of the appliance is placed on the boiler's side cover, on the external part. Make sure that it is properly placed and readable.

On the label it is indicated the serial number and the manufacturing year of the appliance.

1.4. Document information

This document is an integral and indispensable part of the product and must be retained in good condition by the user. Keep it in a safe place for future reference.

If the appliance is sold or transferred to another person, this manual has to always follow the appliance and handed to the new user or installer.

2. TECHNICAL FEATURES AND DIMENSIONS

2.1. Technical features

BIOPLEX boiler is a steel solid fuel boiler, with cylindrical heat exchanger consisted of fire tubes. The furnace system BIOFIRE made of steel plates. The furnace plate and grates that come in contact with fire are made of special refractory cast iron.

The boiler body is made of cold rolled steel St 37.2 STAS 500/2-80~S235 JR SR EN 10025/90 according to DIN 17100. The boiler is designed so that all the parts in contact with exhaust gases are water cooled. The boiler body parts are assembled by welding. Weldings are performed according to standards 288-1 and 288-3 according to DIN 50120, 50121-50145, SR EN 1011.1/2001, by means of electric arc welding (MIG-MAG).

DESCIPTION OF BOILER COMPONENTS

- Steel boiler body with cylindrical heat exchanger
- Removable rear smoke box with inspection cleaning door
- Upper door for cleaning the heat exchanger
- Middle door for ignition and fuel loading, equipped with an inspection flange, which can also be used for a burner mounting
- Lower door for ash removal
- Ash box positioned on the lower part of the fire chamber
- Cast iron catalyst positioned above the furnace
- Rockwool body insulation of 50 mm thickness
- Electrostatically painted external covers
- Control panel for electromechanical operation
- Safety heat exchanger (optional)

DESCIPTION OF FURNACE COMPONENTS

- Steel furnace body
- Feeding auger welded to solid axis
- Combustion air fan
- Feeding motoreducer
- Transmission system with chain wheels
- Transmission system protection cover
- Cast iron combustion plate
- Cast iron grates for manual wood feeding
- Ignition element (optional)
- Fuel silo with protection frame and shuttering lid

2.2. Function principle

2.2.1. Boiler

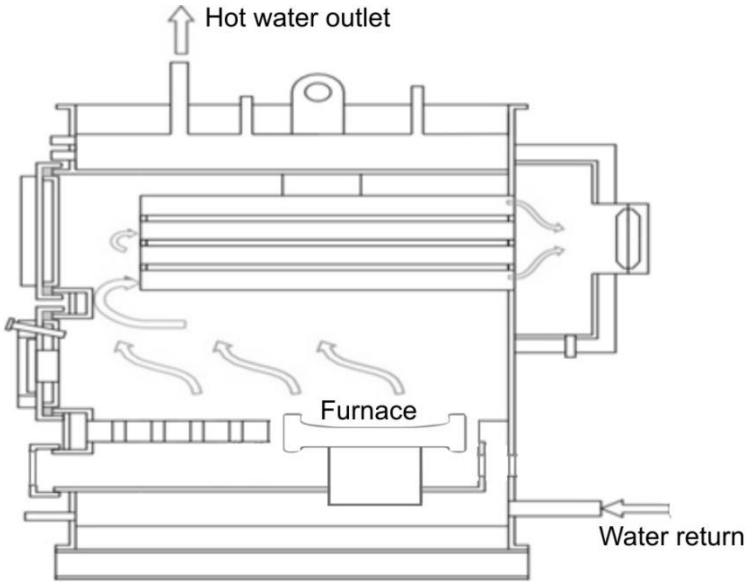


Fig 1. Boiler function

The function of the BIOPLEX boiler is based on natural gas evacuation through the chimney. The fuel is positioned on the grate. The combustion takes place in the fire chamber. During the combustion the flame comes in contact with the side walls of the fire chamber, which are surrounded by water. The fire chamber is of big volume in order to receive big dimension logs and to ensure a long autonomy.

The combustion air is supplied by the fan and distributed through an air distributor, positioned below the fuel grate. The combustion is regulated through the fan, controlled by the control panel.

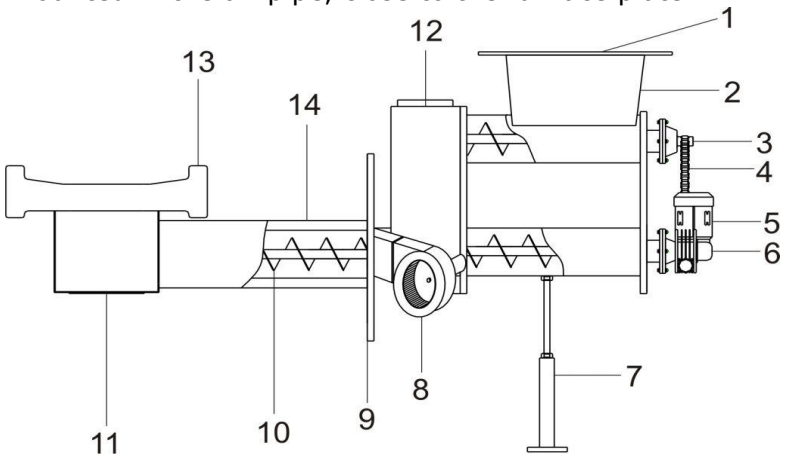
The exhaust gases are guided through the heat exchanger to the smoke box, and afterwards evacuated to the chimney. The smoke box is equipped with an inspection and cleaning door, which also actions as an explosion relief.

The doors have an insulation cord to ensure air-tight closing. Each door is equipped with a screwed handle, which must always be well tightened during the combustion. The flange on the middle door has a rotating clamp, for secondary air adjustment and flame inspection. If necessary, this flange can be removed, and a burner can be placed in its position.

2.2.2. Furnace

The BIOPLEX boiler is equipped with the innovative biomass furnace BIOFIRE. The system is consisted of two axes (BI-AX): The lower axis is the main one, feeding fuel to the furnace, while the upper is the secondary, transporting the fuel from the silo to the main axis. Between the two axes there is a safety DROPBOX device. This device has a metal flap that automatically closes with a spring when the feeding stops. This way the danger of blockage and backfire is eliminated. The motoreducer is mounted on the lower axis, and the transmission is realized through chain wheels. A metal protection cover is places around the transmission system.

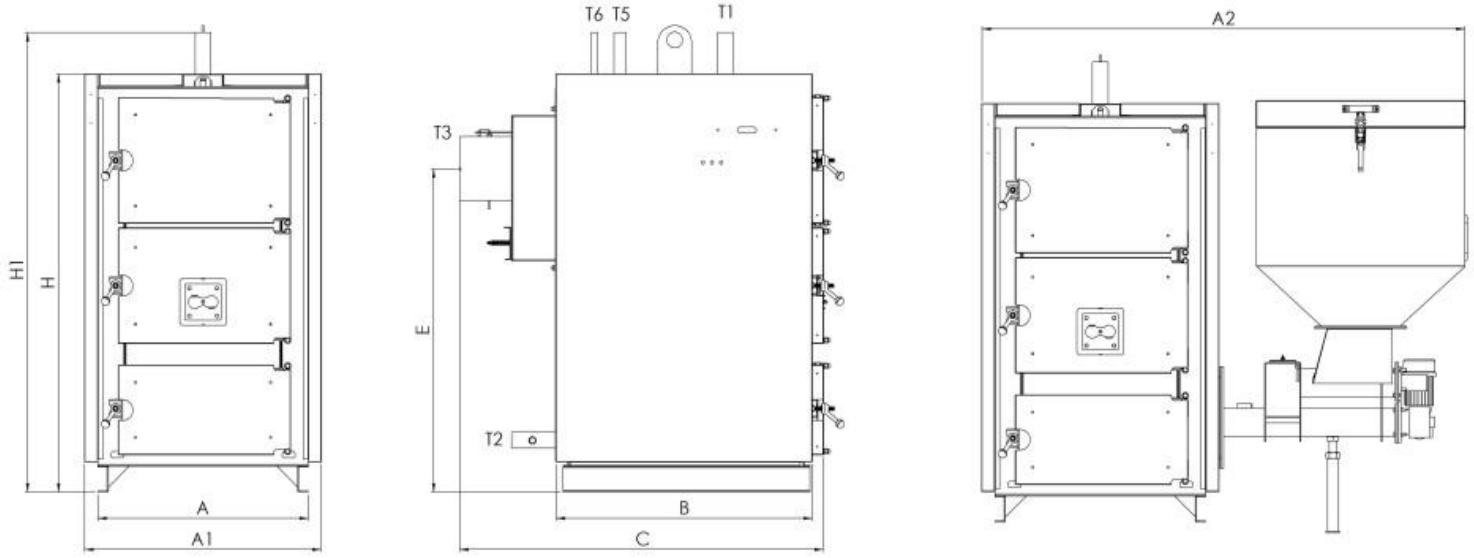
The combustion air is supplied by the fan mounted on the furnace. In case the optional ignition system is installed, there is a 500W ignition element mounted in the air pipe, close to the furnace plate.



Legend

1 Silo flange
2 Fuel box
3 Upper feeding axis
4 Transmission chain
5 Motor
6 Reducer
7 Support leg
8 Fan
9 Boiler flange
10 Lowe feeding axis
11 Mixing chamber
12 Fuel DROPBOX
13 Cast iron plate
14 Lower feeding axis

2.3. Dimensions



DIMENSIONS

Type	Feeding door	A	A1	A2	B	H	H1	E	C	T3	T1-T2	T5	T6
	mm	*mm*									*mm*	*inch*	
MCL-BIO 20	350x480	630	670	1470	560	1280	1380	960	860	195	1½″	1″	¾″
MCL-BIO 28	350x480	630	670	1470	660	1280	1380	960	960	195	1½″	1″	¾″
MCL-BIO 36	350x480	630	670	1470	760	1280	1380	960	1060	195	1½″	1″	¾″
MCL-BIO 45	350x480	630	670	1470	860	1280	1380	960	1160	195	1½″	1″	¾″
MCL-BIO 53	350x480	630	670	1470	960	1280	1380	960	1260	245	2″	1″	¾″
MCL-BIO 60	350x480	630	670	1470	1060	1280	1380	960	1360	245	2″	1″	¾″
MCL-BIO 70	600x360	910	810	1700	860	1600	1720	1240	1280	245	2″	1 ¼″	¾″
MCL-BIO 80	600x360	910	810	1700	980	1600	1720	1240	1380	245	2″	1 ¼″	¾″
MCL-BIO 90	600x360	910	810	1700	1100	1600	1720	1240	1480	245	2″	1 ¼″	¾″
MCL-BIO 100	600x360	910	810	1700	1200	1600	1720	1240	1580	295	2 ½″	1 ¼″	¾″
MCL-BIO 120	600x360	910	810	1700	1330	1600	1720	1240	1680	295	2 ½″	1 ½″	¾″
MCL-BIO 140	600x360	910	810	1700	1580	1600	1720	1240	1750	295	2 ½″	1 ½″	¾″
MCL-BIO 160	600x360	910	810	1700	1830	1600	1720	1240	2000	295	2 ½″	1 ½″	¾″
MCL-BIO 180	600x360	910	810	1700	1830	1600	1720	1240	2300	295	2 ½″	1 ½″	¾″
MCL-BIO 200	500x810	1100	1000	2050	1350	2000	2160	1500	1950	345	3″	2″	2x¾″
MCL-BIO 250	500x810	1100	1000	2050	1600	2000	2160	1500	2200	345	3″	2″	2x¾″
MCL-BIO 300	500x810	1100	1000	2050	1850	2000	2160	1500	2450	395	4″	2″	2x¾″
MCL-BIO 350	500x810	1100	1000	2050	1850	2000	2160	1500	2450	395	4″	2 ½″	2x¾″
MCL-BIO 400	500x810	1100	1000	2050	2100	2000	2160	1500	2650	395	4″	2 ½″	2x¾″
MCL-BIO 450	500x810	1100	1000	2050	2100	2000	2160	1500	2650	395	4″	2 ½″	2x¾″
MCL-BIO 500	1230x520	1540	1440	2400	1600	2400	2650	1750	2300	445	5″	2 ½″	2x¾″
MCL-BIO 550	1230x520	1540	1440	2400	1600	2400	2650	1750	2300	445	5″	2 ½″	2x¾″
MCL-BIO 600	1230x520	1540	1440	2400	1800	2400	2650	1750	25700	445	5″	2 ½″	2x¾″
MCL-BIO 650	1230x520	1540	1440	2400	1800	2400	2650	1750	25700	445	5″	2 ½″	2x¾″
MCL-BIO 700	1230x520	1540	1440	2400	2150	2400	2650	1750	2820	495	6″	2 ½″	2x¾″
MCL-BIO 800	1230x520	1540	1440	2400	2400	2400	2650	1750	3070	495	6″	3″	2x¾″
MCL-BIO 900	1230x520	1640	1540	2400	2600	2870	2650	1750	3350	495	6″	3″	2x¾″

TECHNICAL FEATURES AND DIMENSIONS

BOILER TECHNICAL DATA

Boiler type	Nominal Output*		P_{max}	Fire chamber length	Pellet consumption**	Max. wood length	Silo volume	Weight
	kcal/h	*kW*	*bar*	*mm*	*kg/h*	*mm*	*lit*	*kg*
MCL-BIO 20	20.000	23	3	450	2,0-3,0	400	370	380
MCL-BIO 28	28.000	32	3	550	3,0-4,0	500	370	420
MCL-BIO 36	36.000	41	3	650	4,0-5,0	600	370	460
MCL-BIO 45	45.000	52	3	750	5,0-6,5	700	370	500
MCL-BIO 53	53.000	61	3	850	6,0-7,0	800	370	550
MCL-BIO 60	60.000	69	3	950	7,0-8,5	900	370	600
MCL-BIO 70	70.000	81	3	700	7,5-9,5	650	600	750
MCL-BIO 80	80.000	93	3	820	7,5-9,5	750	600	880
MCL-BIO 90	90.000	104	3	920	8,5-10,0	850	600	930
MCL-BIO 100	100.000	116	3	1080	10,0-11,8	950	600	1000
MCL-BIO 120	120.000	139	3	1200	11,5-14,0	1100	600	1070
MCL-BIO 140	140.000	162	3	1450	12,5-16,0	1350	600	1220
MCL-BIO 160	160.000	186	3	1650	14,0-19,0	1550	600	1470
MCL-BIO 180	180.000	209	3	1650	14,0-19,0	1550	600	1680
MCL-BIO 200	200.000	232	3	1200	20,0-28,0	1100	950	1790
MCL-BIO 250	250.000	291	3	1450	24,0-33,0	1350	950	2010
MCL-BIO 300	300.000	348	3	1700	28,0-39,0	1600	950	2230
MCL-BIO 350	350.000	406	3	1700	33,0-45,0	1600	950	2230
MCL-BIO 400	400.000	464	3	1950	38,0-50,0	1850	950	2750
MCL-BIO 450	450.000	522	3	1950	43,0-55,0	1850	950	2980
MCL-BIO 500	500.000	580	3	1450	85,0-110,0	1350	2000	3500
MCL-BIO 550	550.000	638	3	1450	85,0-110,0	1350	2000	3800
MCL-BIO 600	600.000	696	3	1700	110,0-140,0	1600	2000	4200
MCL-BIO 650	650.000	754	3	1700	110,0-140,0	1600	2000	4700
MCL-BIO 700	700.000	812	3	1935	130,0-165,0	1800	3000	5200
MCL-BIO 800	800.000	928	3	2000	145,0-180,0	1900	3000	5650
MCL-BIO 900	900.000	1.044	3	2300	160,0-210,0	2200	3000	6150

**Nominal output is obtained with good quality wood pellet.*

***Pellet consumption is calculated as average, based on pellet with calorific power 4.800 kcal/kg and external temperature 0°C.*

FURNACE TECHNICAL DATA

Furnace type			BIOFIRE I	BIOFIRE II		BIOFIRE III	BIOFIRE IV
Boiler range			MCL-BIO 20-60	MCL-BIO 70-90	MCL-BIO 100-200	MCL-BIO 250-500	MCL-BIO 550-900
Fan	Type		RV-12RK	RV-06	RV-05	RV-25 RK	RV-21 RK
	Power	*W*	80	80	85	230	250
	Air debit	*m^3/h*	240	350	400	580	900
	Pressure	*Pa*	310	300	300	520	550
	Voltage	*V/Hz*	230/50	230/50		230/50	230/50
	Noise level	*dB*	<60	<60		<60	<60
	Protection		IP 20	IP 20		IP 20	IP 20
Motor	Type		EWM 30-50/300	EWM 30-50/300		MAF 071 AR2-0	MAF 071 AR2-0
	Power	*W*	180	180		370	370
	Voltage	*V/Hz*	230/50	230/50		380/50	380/50
	Protection		IP 54	IP 54		IP 54	IP 54
Silo volume		*lit*	370	600		950	1.500
Weight		*kg*	200	250		320	450

2.4. Fuel

The BIOPLEX series is designed for automatic function with solid fuel of biogenic or fossil nature, with granulation up to 30 mm and humidity up to 20%. The boiler is also able to be used on wood or other solid fuels with manual feeding, without any modification.

This means different types of biomass fuels, such as pellet, agropellet, olive husks, fruit kernels, cereals, granulated carbon. When the fuel used has characteristics that significantly vary from nominal (i.e. carbon, cereals, agricultural residues), it is recommended that they are used in combination with pellet or agropellet at a 50:50 ratio. If you want to use solely carbon as fuel, please contact the manufacturer.

The fuel with the best quality, concidering calorific power, ash content, humidity and standartization, is wood pellet. The less quality of the fuel, the more fuel supply must be provided to achieve the nominal power and of course the most the consumption and the ash remains.

The nominal characteristics of the boiler are calculated for use on wood pellet!

Fuel type	Calorific power	Max diameter	Max humidity	Ash content
	kWh/kg	*mm*	*%*	*%*
Pellet	4,8	6 – 8	<10	<1
Agropellet	4 – 4,2	6 – 10	<10	<5
Coal	5,3 – 6,5	3 – 25	<15	4 – 8
Lignite	1,6 – 3,8	3 – 25	<20	<10
Cereals (oat)	4,2	3 – 6	10 – 13	0,6
Wood chips	4,3	5 – 25	<20	4 - 6
Barks	2,6	5 – 25	<20	8 - 10
Wood	4 – 4,3	-	<20	4 - 8
Wood briquette	5,2	-	<10	<4

Table 1. Characteristics of different types of fuels

Every type of biomass fuel contains a significant amount of humidity, which highly affects its combustion behaviour and calorific value. Boiler output, efficiency and autonomy will significantly diminish as the humidity increases. The nominal data presented in this manual are calculated for humidity content 10%. Maximum allowable humidity content is 20%. If the fuel has bigger humidity, the combustion will be highly imperfect, causing problems to the furnace and the feeder.

For proper and efficient function and a long lifespan, it is strictly recommended that only dry wood is used, with a humidity content of 20%. Practically, this means at least one year dry wood.

In order for the feeding and combustion system to function properly the maximum allowed humidity of the fuel is 20%!

It is prohibited the use of explosive, inflammable materials, plastic, domestic residues, etc.

The boiler is provided with a flange for mounting a burner for use with oil or gas as an alternative fuel. However, this option is an emergency alternative, and it is not recommended that boiler is on stable function on oil or gas. The efficiency will be very low on such fuels.

If a burner is mounted, remove it before you use solid fuel again.

It is prohibited to manually feed solid fuel in the boiler simultaneously with the burner function!

3. BOILER MOUNTING

3.1. Transportation and delivery

The boiler is delivered on wood pallet, well positioned with metal plates. Remove them carefully by unscrewinf the screws holding them in place.

The loading and unloading of the boiler must be performed with a forklift or a crane. A special hook is provided on the upper part of the boiler for lifting.

 **The boiler is very heavy. Do not try to lift by hands or other unsuitable equipment. Danger of injury! Perform all moves with extreme attention and care.**

Remove the boiler packaging with attention. **Keep the packaging material away from chidren since it can be dangerous.** After having unpacked everything, make sure that the appliacne is intact and undamaged. In case of doubt do not use the appliance and inform the supplier.

The BIOPLEX boiler is delivered with the following equipment already fitted and mounted:

- Boiler steel body
- Rockwool insulation mounted on the boiler body and tightened with plastic tapes
- Metal covers mounted on the boiler body
- Turbinators positioned inside the fire tubes
- Cast iron catalyst for the biomass combustion
- Cast iron grates for wood combustion
- Control panel and electrical connections

The furnace system BIOFIRE is already preassembled and mounted on the boiler side flange. It consists of:

- BIOFIRE furnace steel body
- Fuel silo with lid, shutter, inspection window
- Feeder with screw
- Fan
- Motoreducer
- Transmission system with chain wheels
- Protection cover of the mechanism
- Cast iron combustion plate

The following accessories are positioned inside the boiler body. Remove them carefully by opening the middle door.

- Cleaning tools
- Safety kit
- Drainage valve

In the documentation folder you will find:

- Technical manual
- Warranty leaflet
- Declaration of conformity

3.2. Boiler room

3.2.1. General requirements

The boiler must be installed in a special and separate room. This room must be chosen so that it offers easy access for fuel transport, air supply and exhaust gas evacuation. The doors of the boiler room must be metallic, open outwards, and have at least 0,9 m width.

The boiler installation is prohibited in rooms with extensive dust, dangerous gases, and moist spaces.

For the correct boiler function it is necessary that the boiler room has openings for natural ventilation and combustion air supply. It is recommended that two different openings are used for this purpose, positioned on opposite walls and diagonally to ensure good air circulation. The total surface of the openings must be at least 1/12 of the boiler room surface. Forced ventilation is prohibited in the boiler room.

The boiler room must be provided with a drainage channel. All safety devices must be connected to this channel.

The boiler room must have an appropriate fire extinguishing system, according to the regulations in force. In case that the building is designed with a fire alarm system, a smoke detector must be positioned on top of every boiler.

The fuel storage is prohibited in the boiler room. If so, the storage must be separated from the boiler with a non-flammable wall, and proper distanced from the boiler.

3.2.2. Boiler room dimensions

The boiler must be placed on a horizontal plane, with adequate mechanical resistance to support the boiler's weight. The boiler must be positioned in the room in such a way so that it is easily accessible from all the sides. The following dimensions are recommended (see Fig 2)

Distance from the front wall (N):

For boilers up to 100 kW – minimum 1,5 m
For boilers bigger than 100 kW – minimum 2 m

Distance from the rear wall (L):

Appropriate distance for maintenance access. Minimum 0,6 m.

Distance from side walls (M):

For boiler up to 300 KW – minimum 0,6 m
For boilers bigger than 300 kW – minimum 1 m

Boiler room height (H):

For boilers up to 70 kW – minimum 2 m
For boilers 70 to 230 kW – minimum 2,4 m
For boiler 230 to 400 kW – minimum 3 m
For boiler bigger than 400 kW – minimum 3,5 m

Distance between two boilers (P) must be at least 1m.

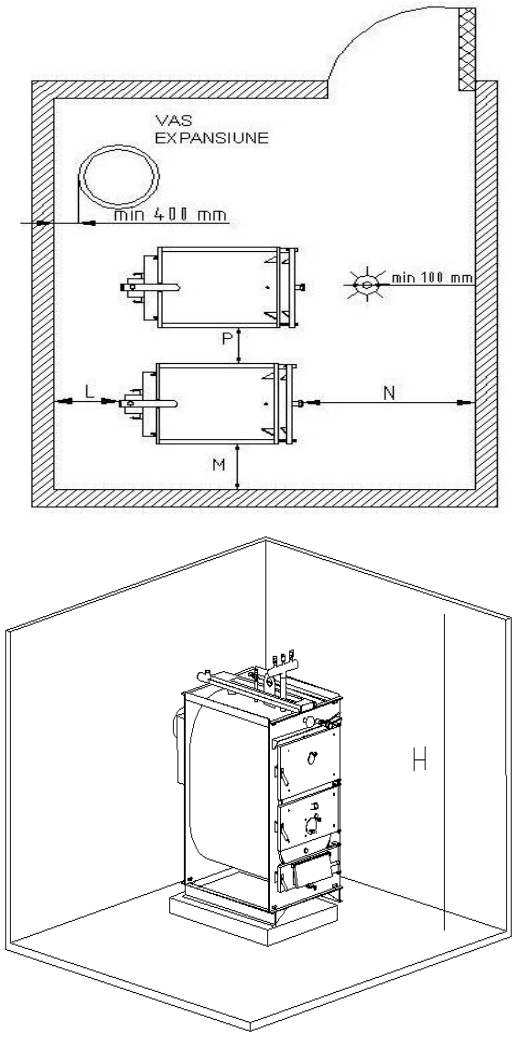


Fig 2. Boiler room dimensions

3.3. Chimney

The chimney installation must supply sufficient draught, air tightness and protection against condensation.

The appropriate chimney installation is very important for the boiler's efficient and safe function!

The chimney must be positioned if possible in the interior of the building. It must be vertical, with no changes in the direction. The cross-section of the chimney can be round or rectangular. If the chimney is installed in the exterior, it must be insulated.

The horizontal part connecting the boiler's chimney pipe with the vertical chimney must have maximum length 2 m. If this distance is bigger, it is recommended to have a 15-30° inclination upwards. The connection with the boiler's chimney pipe must be air-tight.

The chimney must be equipped with a cleaning door at its base. Also cleaning doors are recommended where there are changes in direction and ash can be accumulated. Tactical cleaning is recommended (every 3 months) for efficient boiler function.

A chimney terminal must be installed at the end of the chimney for protection against weather effects and foreign objects entrance. In areas with strong winds a special anti-downdraught terminal is recommended.

The chimney height must exceed the roofline by at least 1 m. If there are other obstacles positioned on the roof, the chimney height must exceed them by at least 1 m. If there are multiple chimneys, minimum distance between them is 0,3m.

Each boiler should be connected to an independent chimney. Connection of multiple boilers to the same chimney is not recommended.

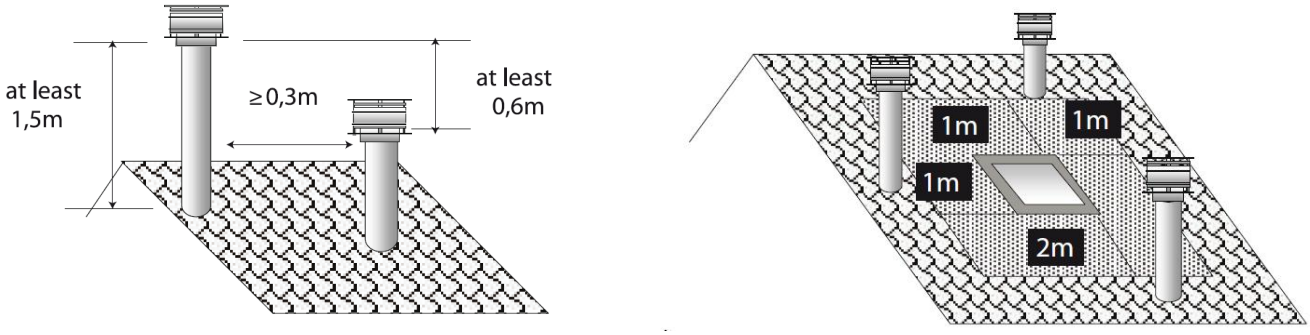


Fig 3. Chimney distances

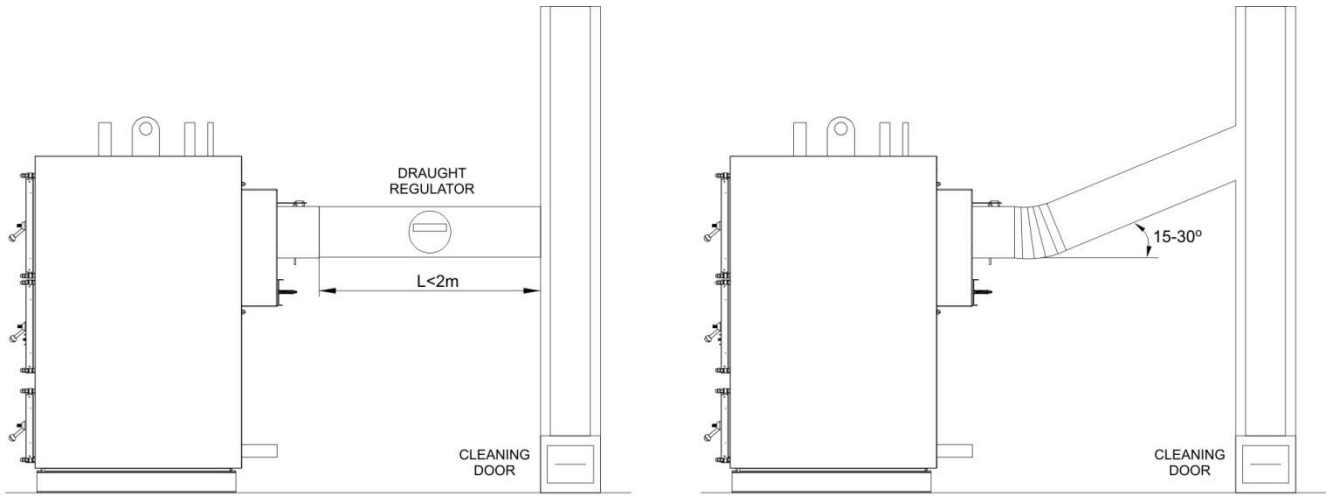


Fig 4. Chimney connection

4. INSTALLATION

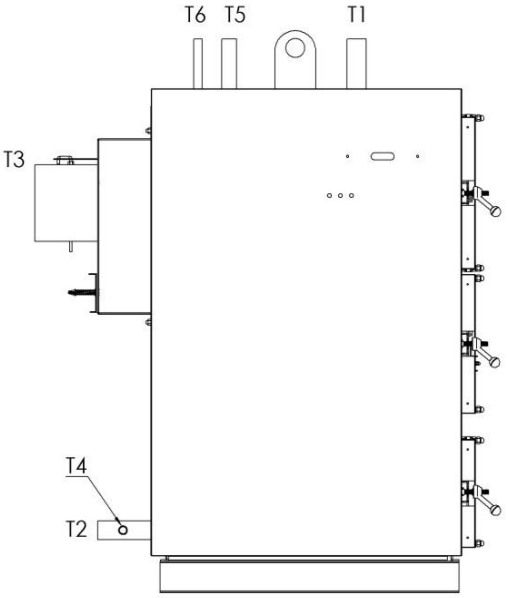
4.1. Hydraulic connections

The boiler is intended for connection with an open expansion vessel network. The boiler can be connected also with closed expansion vessel, if it is equipped with an overheating serpentine (optional).

The boiler is intended for maximum working temperature 90°C and maximum pressure 3 bar for boilers up to 500 kW, and 4 bar for bigger boilers.

When connected with a closed expansion vessel, its volume must be chosen double to a similar installation on liquid or gas fuel.

If a connection pipe is not used, it must be sealed before water fill!

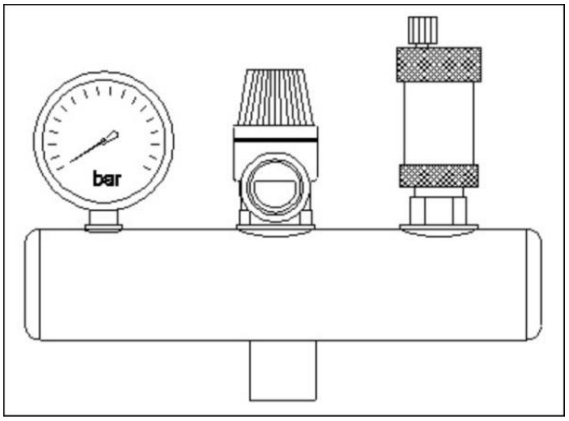


Legend

T1	Outlet
T2	Return
T3	Chimney pipe
T4	Discharge valve connection
T5	Safety kit connection
T6	Additional safety connection

4.2. Safety features

The boiler equipment includes a safety kit, which shall be connected to the corresponding connection pipe T5. The kit consists of a safety valve, an air relief valve and a thermomanometer. Bigger boilers are equipped with two or more safety valves.



Additional safety equipment can be mounted at the connection pipe T6. This can be a dual safety valve (pressure and temperature) or a cooling valve. Alternatively this pipe can be used for connection with the expansion vessel.

Fig 5. Boiler safety kit

4.3. Overheating serpentine

As an optional, the boiler can be equipped with an overheating protection serpentine. This is incorporated in the boiler body, surrounding the fire chamber.

For the function of the safety serpentine, a discharge valve must be installed. The bulb of the valve must be mounted on the boiler's hot water delivery, at maximum distance 1m from the boiler.

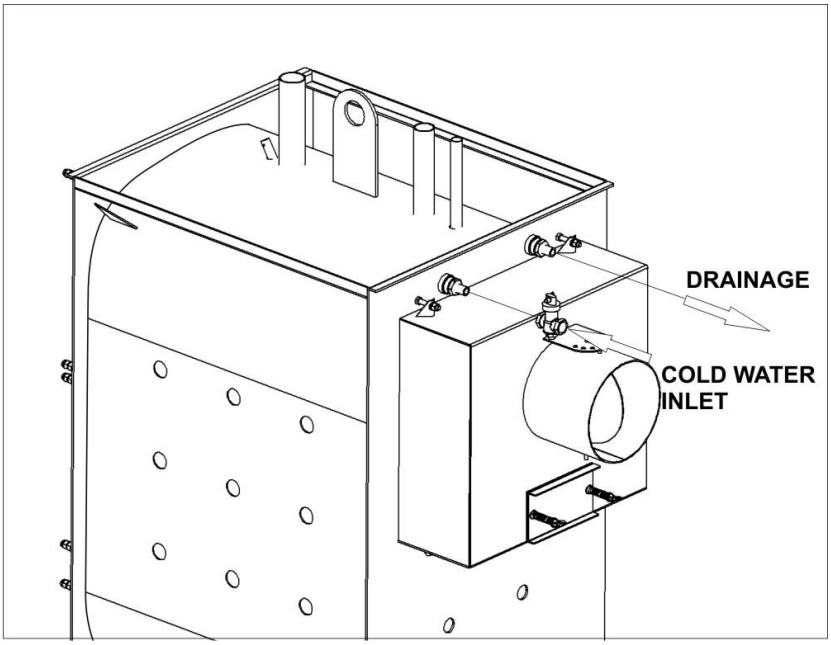


Fig 6. Overheating serpentine connection

The valve can be connected on either side of the serpentine. Attention should be given to the flow direction of the valve. The valve can be fitted on the cold water inlet or hot water outlet. However, we recommend that the valve is fitted on the cold water inlet.

For the protection of the valve, a filter is recommended to be installed on the water line before the valve.

On the opposite side of the serpentine, drainage must be connected.

The correct function of the discharge valve is crucial for the boiler's safety. Verify its function often and replace if defect.

4.4. Return temperature protection

For the correct function of the boiler and for protection against corrosion it is very important to ensure steady temperature at the return of the boiler of at least 55°C.

This can be ensured by installing a recirculation pump between the boiler outlet and return (see connection diagrams).

An alternative variation is by installing at the return of the boiler a three-way thermostatic valve.

4.5. Filling the system

After completing all the hydraulic connections, the circuit may be filled with water. After filling the system, open the radiators air valves to get rid of the air in the installation.

Verify that the installation pressure is according to the technical feature of the boiler. The pressure must be verified through the boiler's manometer. An additional manometer should be installed on the cold water inlet to verify the cold pressure, at the lowest point of the installation, at a point close to the boiler.

The whole installation must remain under nominal pressure for at least 10 minutes. During this period, check that all the connections are tight and there are no water leakages. Make sure that during this period no pressure drop appears.

After firing the boiler, make sure the network functions properly at working temperature and pressure.

 **The hardness of the mains water supply affects the boiler's life span. It is recommended to use a water softener if water hardness exceeds 15°f.**

 **Do not fill the system at the working pressure! When the boiler will be heated, the water pressure will raise. Filling pressure must be at least 1 bar lower than working pressure!**

4.6. Automatic ignition system

As an optional, the furnace can be provided with an automatic ignition system. This consists of the following:

- Ignition element 500W (2 pieces in bigger boilers)
- Control panel Ecomax 800P (technical manual given with the control panel)
- Exhaust temperature sensor

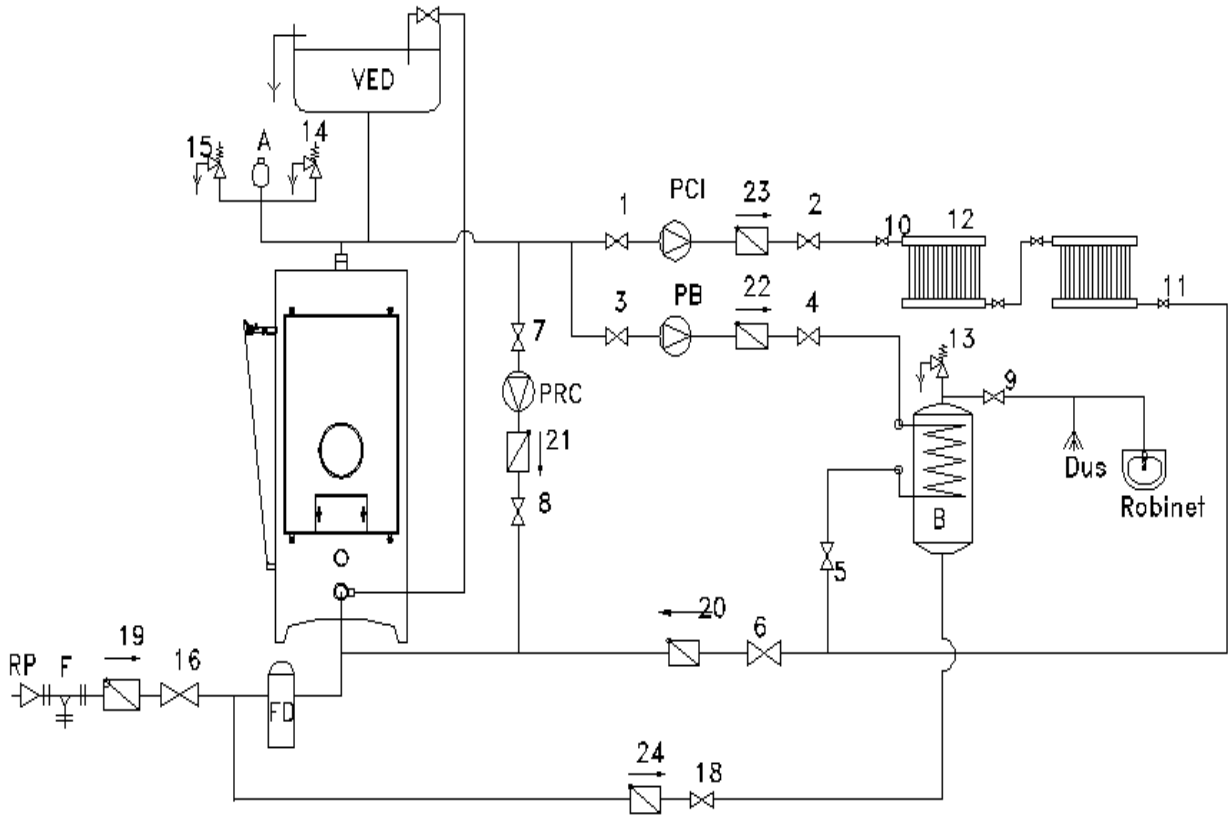
The ignition element is installed in a special inox tube casing, positioned under the furnace cast iron plate. The cables are protected with a silicon layer, resistant to temperature up to 300°C. All the electrical connections are prewired.

The controller is equipped with an exhaust temperature sensor. This must be installed on the chimney, at a distance maximum 1m from the boiler.

 **If the boiler comes with the automatic ignition system, refer to the controller's manual for electrical connections and settings.**

4.7. Connection diagrams

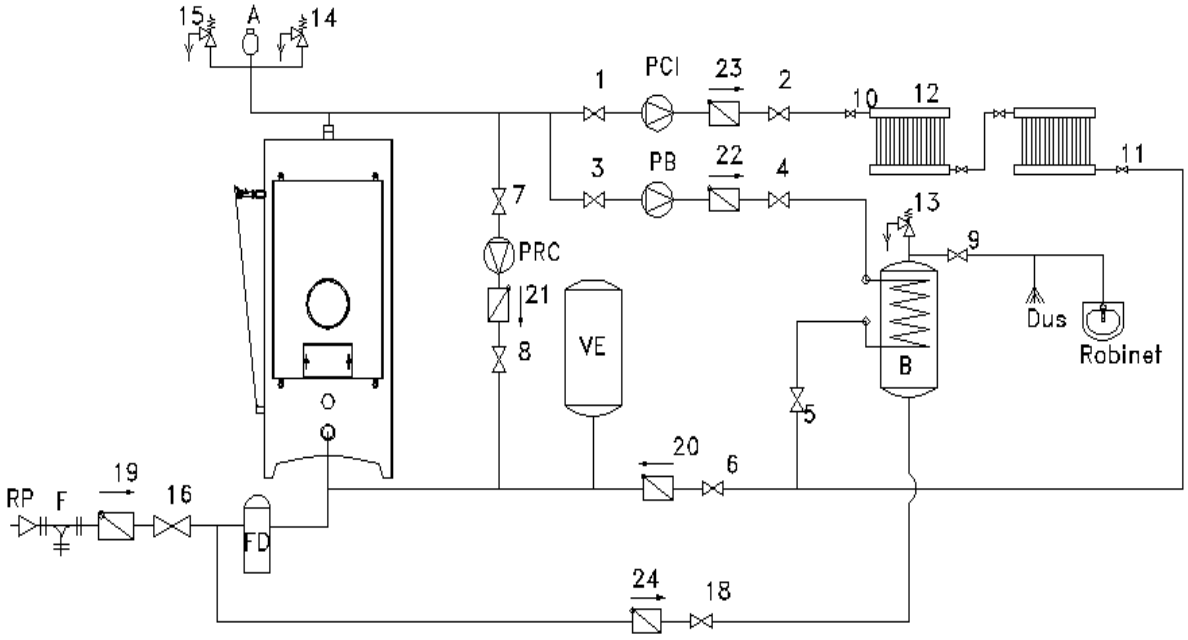
4.7.1. Open expansion vessel connection



Legend

1-9.	Separation valves
10,11.	Radiator valves
12.	Radiators
13-15.	Safety valves
16.	Filling valve
17.	Drainage valve
18.	Cold water valve
19-24.	One-way valves
B	Hot water boiler
VED	Open expansion vessel
PCI	Central heating pump
PRC	Recirculation pump
RP	Pressure reducer
F	Filter
A	Air relief valve
FD	Water softener

4.7.2. Closed expansion vessel connection



Legenda

1-9.	Separation valves
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12.	Radiators
13-15.	Safety valves
16.	Filling valve
17.	Drainage valve
18.	Cold water valve
19-24.	One-way valves
B	Hot water boiler
VE	Closed expansion vessel
PCI	Central heating pump
PRC	Recirculation pump
RP	Pressure reducer
F	Filter
A	Air relief valve
FD	Water softener

5. ELECTRICAL CONNECTIONS

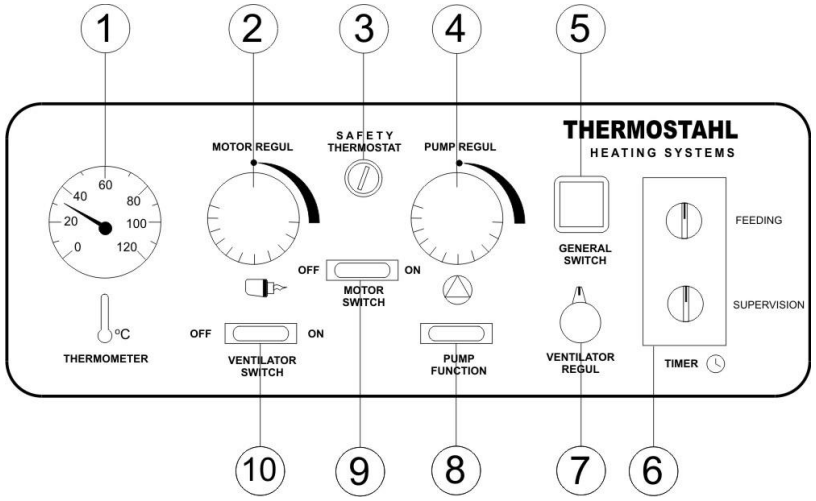
5.1. General instructions

All electrical connection must be performed by an authorized professional, in conformity with the local regulations and the indications of this manual. Connections must be done according to norms EN 60529 and EN 60335-1, and protection norms IP 40 and IP 44.

All wiring must be waterproof insulated. Exposed cables should be protected within plastic channel. The main electrical supply of the boiler must be connected to an independent safety of max 16A. The boiler room lighting must be on a separate circuit.

THERMOSTAHL is not responsible for accidents or malfunctions caused by wrong or bad electrical connections.

5.2. Control panel functions



Legend:

1. Thermometer
2. Furnace thermostat
3. Safety thermostat
4. Pump thermostat
5. General ON/OFF switch
6. Motor timer
7. Fan speed regulator
8. Pump indication lamp
9. Motor switch
10. Fan switch

Fig 7. Control panel

The general switch ON/OFF interrupts the electrical supply to all the devices.

The furnace thermostat interrupts the fan and motor function when the preset boiler temperature has been reached. It is recommended that this temperature is set between 70-90°C. This temperature should never be set below 60°C.

The fan speed regulator regulates the fan rotating speed by means of a dimmer rheostat.

The pump thermostat starts the circulation pump function at the preset temperature. It is recommended that this temperature is set around 45-55°C. The pump indication lamp follows the function of pump.

The safety thermostat will interrupt the fan function if the boiler temperature reaches above 95°C. If so, it needs to be reset manually by unscrewing the plastic cover.

The ventilator and motor switches are used to activate or deactivate the corresponding devices. The switch has an incorporated indication lamp that follows the function of the devices.

The motor timer controls the motor function by means of ON/OFF time intervals. The first timer T1 controls the TIME OFF interval, while the T2 the TIME ON interval.

If a burner is connected to the control panel, it can be connected in the place of the fan and regulated by the fan thermostat.

The control panel offers the possibility to connect with a room thermostat. When the room thermostat contact opens, the furnace function stops.

5.3. Wiring diagram

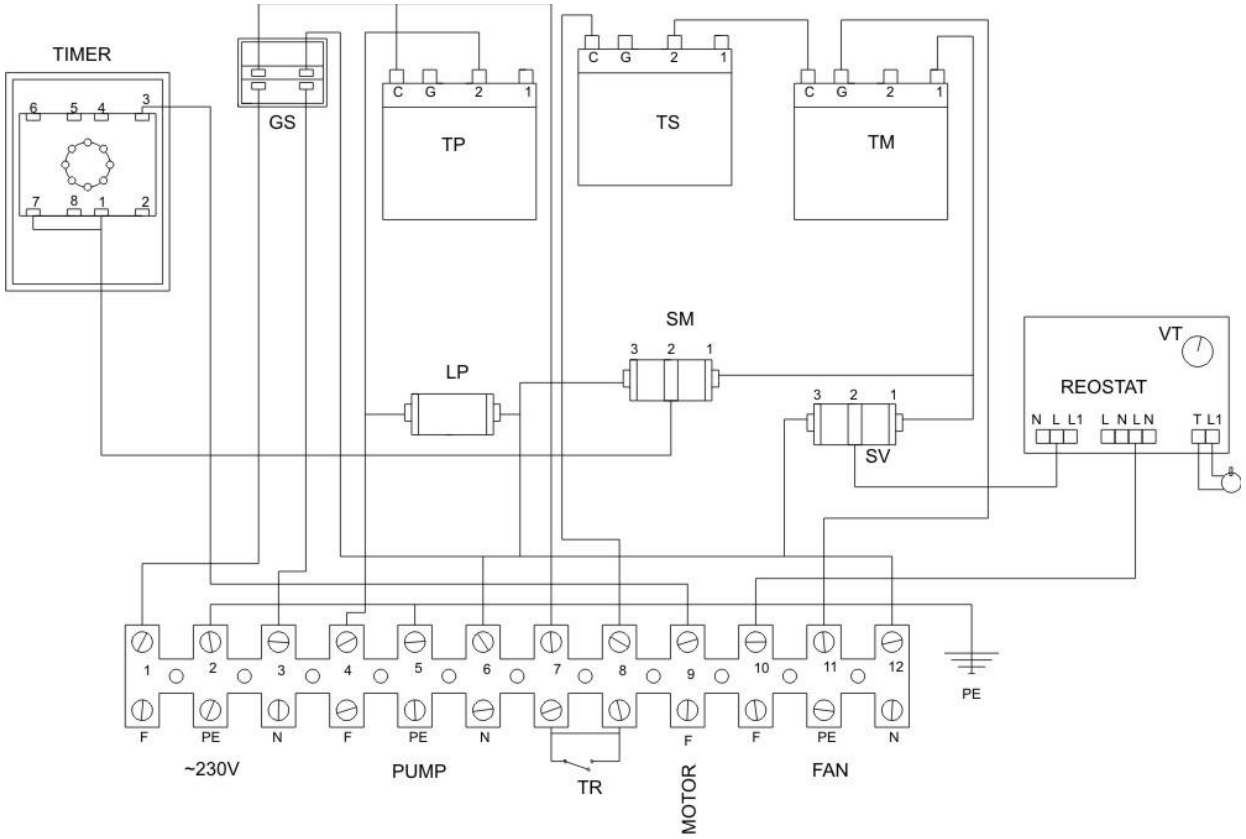


Fig 8. Control panel wiring diagram

Legend:

GS General ON/OFF switch
TS Safety thermostat
TM Furnace thermostat
TP Pump thermostat
VT Fan speed regulator
LP Pump indication lamp
SM Motor switch
SV Fan switch
TR Room thermostat
PE Grounding

Unscrew the control panel back plate to have access to the connection terminals in the interior.

Connect the main electrical supply to the terminals 1,2,3 as indicated. The fan is connected to the terminals 10,11,12 and the pump to the terminals 4,5,6.

The motor phase is connected to the terminal 9, while neutral and grounding together with the fan's at terminals 12 and 11 respectively.

Between the terminals 7,8 there is a jumper. If you want to connect a room thermostat, remove the jumper and connect it to these two terminals.

Attention: The room thermostat must be a simple contact interruptor. It is not allowed to connect a digital thermostat with an electrical signal output!

6. BOILER START-UP

6.1. Initial lighting checks

Before you start the boiler, make the following checks:

- Check that all the hydraulic connections and make sure they are tight. Make sure there is no leakage or moisture on the pipes or other equipment.
- Make sure that the connection with the chimney is air-tight and the chimney installation is properly made.
- Check that the controller bulbs are well inserted and secured in the boiler's case.
- Make sure that the pressure in the network is correct.
- Check that the boiler pump and the central heating pumps function properly.
- Make sure that the connection with the expansion vessel is correct and the expansion volume is sufficient for the boiler. No valves should be installed between the boiler and the expansion vessel.
- Make sure the boiler's separation valves are open.
- Make sure that there is sufficient air supply and natural ventilation in the boiler room.

 **Do not store inflammable materials or fuel close to the boiler! Before you light the boiler make sure the boiler room is clear and safe.**

6.2. Start-up

To correctly start up the BIOPLEX boiler follow the next steps:

- Make sure the silo is full with fuel.
- Make sure the chimney damper is positioned in horizontal position (completely open).
- Open the middle door (feeding door) to have visual supervision of the feeding procedure.
- Turn the control panel on from the general switch and activate only the motor from the corresponding switch. Keep the fan deactivated during this step.
- Set the first timer T1 to maximum and the second T2 to zero, in order to fill the furnace with fuel. Fill it until the fuel level reaches the cast iron plate and covers a small part of it.
- Stop the motor function from the motor switch.
- Using sheets of thin paper or other ignition material, light the fuel placed in the furnace. Wait several minutes until the flame stabilizes and covers the entire plate surface.
- Close the middle door of the boiler. Turn on the fan by the corresponding switch. During this step the motor must remain deactivated.
- When the flame is fully developed, activate both the motor and the fan. Set the furnace thermostat to the required temperature.
- Follow the instructions given in the chapter Combustion Regulation to correctly regulate the combustion.

 **It is prohibited to light the boiler with inflammable or explosive liquids.**

6.3. Checks to carry after initial start-up

During the first start-up you need to carefully check the air-tightness of all the connections, especially the doors and the connection with the chimney.

Check that the thermostats function properly and devices operate accordingly. Wait for the boiler to reach the preset temperature and make sure the fan stops properly and the flame falls down.

Check the temperature and pressure rise in the network. Make sure it is according to the indications. Check if there is any water leakage in the network.

After burning of the fuel is completed, check the situation inside the boiler. If the walls are too black, it means that there is insufficient air supply. If there is condensation forming on the

boiler walls, it means that the pump operation starts at a low temperature or the fuel has too big humidity content. Make sure you set the pump according to the indications and you install a return temperature protection system as indicated.

6.4. Fuel loading

In order to correct add fuel to the boiler follow the next steps:

- Stop the fan function by turning the fan thermostat to zero. Wait 30 seconds for the fume to exit the boiler.
- Open the middle door slowly to avoid leakage of smoke. Load a sufficient amount of fuel. Each loading should be regulated according to the boiler output and the heat demand. Never load too much to fuel to fill all the fire chamber volume! Maximum fuel should be 70-80% of the fire chamber volume.
- Close the door and secure with the handle.
- Start again the fan function by putting the thermostat to the preset temperature.

When loading fuel in the boiler do not throw them but position them carefully.

6.5. Combustion regulation

After completing the start-up procedure and closing the door, set the required temperature to the furnace thermostat (noted "Motor Regul"). After the fan and motor are activated, have a look at the quantity of fuel fed to the furnace and the shape of it on the cast iron plate.

The timer must be set in such a way, so that the quantity of fuel fed is stable to a level where it makes a small hill over the plate, covering almost half of its surface (middle picture). If the fuel accumulates covering all the plate surface (left picture), it means the feeding is too big and must be reduced. If the level of the fuel is below the plate (right picture), it means the feeding is too small and must be increased.

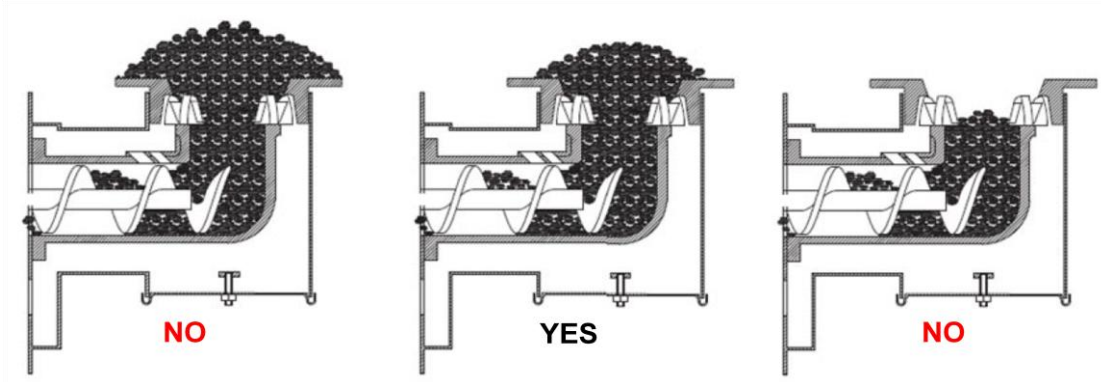


Fig 9. Fuel feeding regulation

The feeding depends on two parameters: the feeding time (timer T1) and the stop time (time T2). When you want to increase the feeding, increase the feeding time and reduce the stop time. When you want to reduce the feeding, reduce the feeding time and increase the stop time. These two timers must be set together, and with not too big difference (the ratio between TIME ON/TIME OFF must be between 0,5-0,9). This way you achieve a stable feeding and fire in the furnace.

After regulating the feeding, observe the flame shape and color through the flange provided on the middle door. The flame will have to occupy about two thirds of the fire chamber and quietly lick the cylindrical heat exchanger. Its shape must be fully developed and with not too many detachments at the flame end. Its color must be vivid orange-yellow, not too transparent.

The combustion quality is regulated through the air delivery. By positioning the fan damper you regulate the air pressure and by the control panel speed regulator you regulate the fan

speed. The combination of these two will result to the optimum air delivery in order to accomplish perfect combustion.

GENERAL SUGGESTIONS

- The flame needs to have reasonable dimensions and fill up the fire chamber as told.
- The flame must not be **too red** (**too low air supply**).
- The flame must not have **big detachments and sparkles** (**too high air supply**).
- The flame must not be **too small**. If it is slow, easily influenced by air currents and the chimney draught, it means that the **air supply is too low.**
- The **smoke at the chimney** must be clear-grey. Black smoke means **lack of air supply**.
- If **too much ash and big coal pieces** fall down to the ash box **reduce the air supply**. The flame is too fast, dry, and might make a noise.

6.6. Chimney damper adjustment

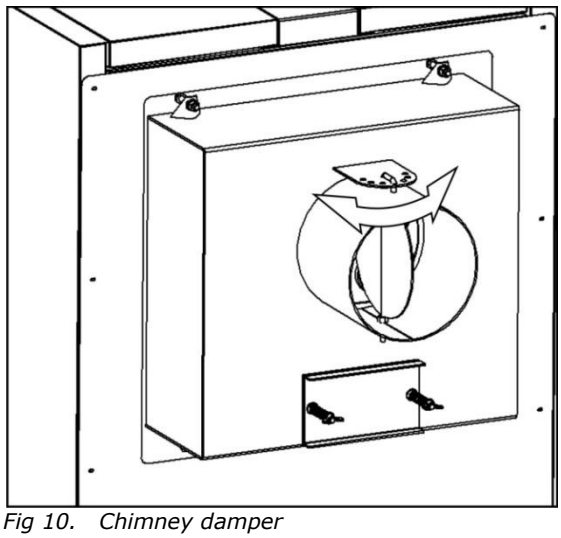


Fig 10. Chimney damper

The boiler chimney pipe is equipped with a damper. This can be set in various positions to throttle the exhaust gases.

At nominal function of the boiler this damper should be normally open. Also it should always be at open position at boiler start-up.

If the chimney draught is too big and the gases are evacuated too fast, set this damper at a side position by inserting the positioner at a different hole.

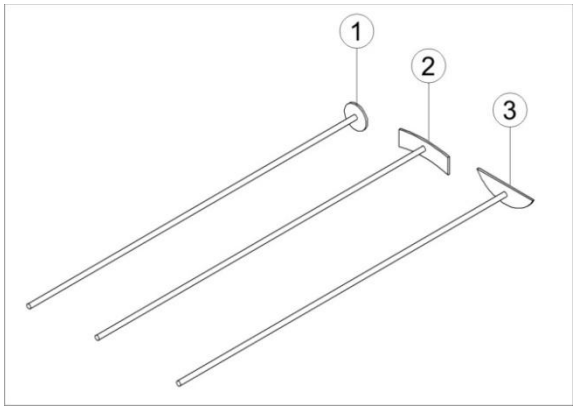
If a burner is installed, it is recommended that the damper is in completely closed position.

7. SERVICE AND MAINTENANCE

7.1. Cleaning

7.1.1. Cleaning the boiler

Solid fuel boiler require regular cleaning in order to function properly and efficient. **Cleaning must be effected at least once a week.** The boiler is equipped with three cleaning tools appropriate for the cleaning procedure of the boiler, as shown in Fig 11.



Legend:
1. Tubes cleaning tool
2. Heat exchanger cleaning tool
3. Ash cleaning tool

Fig 11. Boiler cleaning tools

The boiler function must be stopped before cleaning! Make sure all the devices are stopped, and the boiler has cooled down. It is strictly prohibited to clean the boiler while in function!

Open the upper door to have access to the heat exchanger. Remove the turbinators from the tubes, and clean the tubes with the appropriate tool. Afterwards clean the exterior surface of the cylindrical heat exchanger with the exchanger cleaning tool, as shown in Fig 12. With the same tool, scrape the ash and any other remains from the side walls of the boiler.

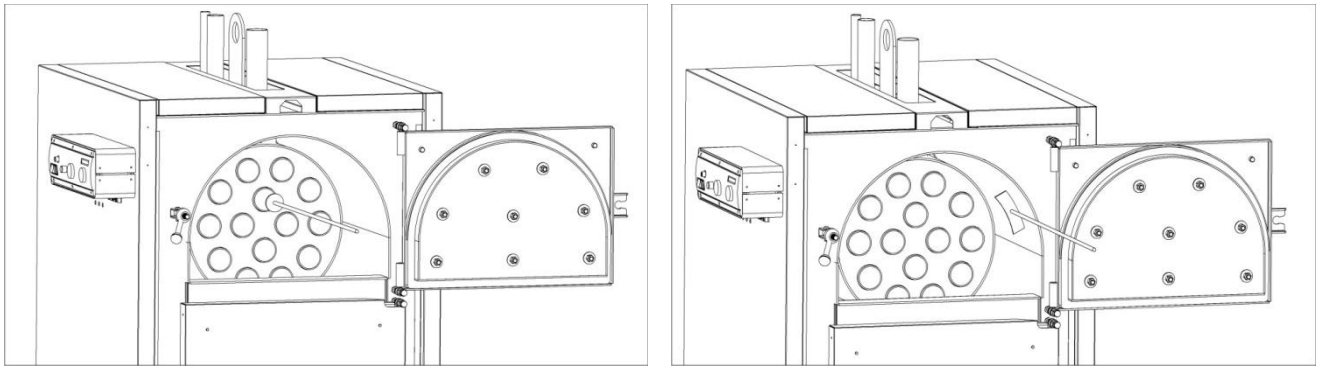
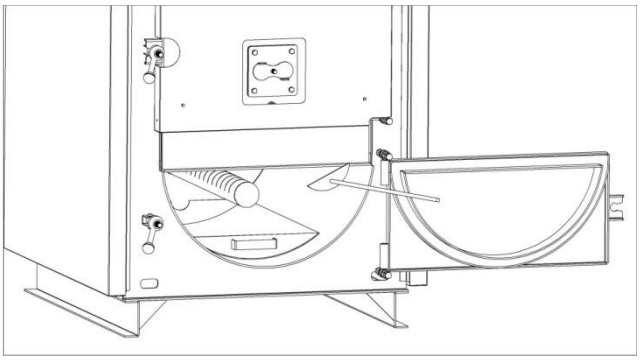


Fig 12. Cleaning of the heat exchanger



Open the lower door of the boiler and remove the ash box. Empty all the containing ash. With the ash cleaning tool you can scrape the lower surface of the boiler for any residues of ash.

The ash must be disposed in an appropriate container! Do not throw the ash together with the domestic garbage. Be careful since ash might contain hot particles, even long time after stop.

Fig 13. Removing the ash

7.1.2. Cleaning the chimney box

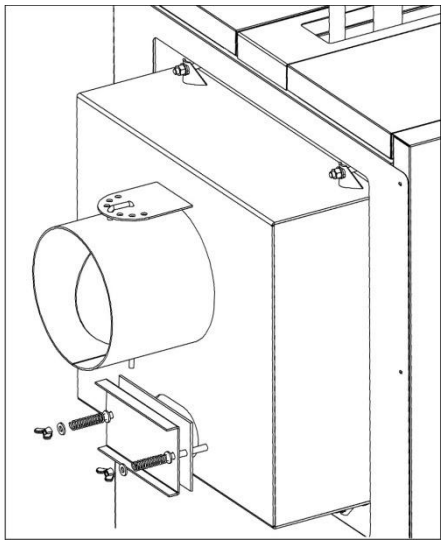


Fig 14. Cleaning the chimney box

To ensure efficient and safe function of the boiler, you must clean the chimney box from ash residues **at least every 3 months.**

The ash box is equipped with a cleaning door for this purpose, as shown in Fig 14. In order to open the door, unscrew the wing nuts, remove the washers and springs that keep it in place.

Clean the interior of the chimney box and remove all the ash and residues.

Put back the door the same way as removed.

The springs must not be omitted! They act as safety in order of explosion of exhaust gases in the chimney box.

7.1.3. Cleaning the furnace

The furnace should be regularly cleaned according to the ash deposits, but not less than once a week. To clean the furnace follow the next steps:

- Stop the furnace function by the control panel and leave it to cool down completely.
- Clean the surface of the cast iron plate from ashes and other deposits. Make sure the air holes are clean and free from obstacles.
- Clean the ashes and deposits at the perimeter around the plate.
- After you turn on again the furnace, ensure the fuel feeding is performed freely and the fuel is evenly distributed at the plate surface.
- Check the function of the motoreducer and the fan. Clean from dust if needed.

7.2. Maintenance intervals

7.2.1. Daily maintenance

The pressure of the network must be daily verified to be within the allowed limits. Make sure that all the safety devices and pumps function properly.

7.2.2. Weekly maintenance

The boiler must be cleaned every 3-4 days or at least once a week, depending on the ash quantity accumulated on the boiler walls and in the heat exchanger. Cleaning procedure must be performed according to the instruction given in the corresponding paragraph.

Check the quantity of ash accumulated in the ash box. The ash disposal can be performed every 1-2 weeks, depending on the ash quantity formed.

7.2.3. Monthly maintenance

Check the doors and the sealing cord. Make sure the contact with the boiler is air-tight. If ash has accumulated on the sealing cord, clean it.

Check the fan and make sure it functions properly. Clean from dust and check that the air passage is clear of obstacles and dust.

Remove the turbinators from the heat exchanger and check their condition.

It is recommended that you clean the chimney box of the boiler and the chimney pipes at least every 3-4 months, in order to assure efficient and safe function of the boiler.

7.3. Basic service procedures

7.3.1. Service after overheating

If overheating occurs, the safety valves of the boiler must open. If the boiler is equipped with an overheating protection coil, cold water will enter the coil to protect the boiler.

Make sure the boiler pump is working. In case of blackout open all the valves of the system to let hot water out of the boiler. In any case a blackout protection UPS is recommended to be installed on the boiler pump.

If the chimney damper is not fully opened, put it in fully open position.

All safety devices must lead to drainage! After overheating, make sure that all the water from the safety devices has drained, and the system has filled with cold water. Check the pressure and the temperature of the boiler.

At overheating, the safety thermostat will activate, and cut electrical supply to the fan. In that case, you need to manually reset the safety thermostat and put the system back in function. Unscrew the plastic cover of the safety thermostat and press the switch. Put the plastic cover back.

Verify the causes of the overheating! If it happens again, check the installation and function of the pumps and safety devices!

7.3.2. Service after feeder blockage

If a blockage occurs to one of the feeders, you will have to remove the axes in order to clean the feeding tubes. The same procedure is applicable at the annual maintenance procedure.

Before proceeding to any of the following steps, make sure the boiler function is stopped, the boiler is cool, and it is disconnected from the electricity. Do not try to do any works while the motor is working and the control panel is activated! Risk of injury!

REMOVING THE UPPER AXIS

- Remove the protection cover of the transmission system.
- Remove the two gears from the axes by unscrewing the headless inserted screws keeping them in place. **You do not need to unmake the chain! Remove them all together with the chain.**
- Unscrew the four nuts from the back side of the flange (see Fig 15)

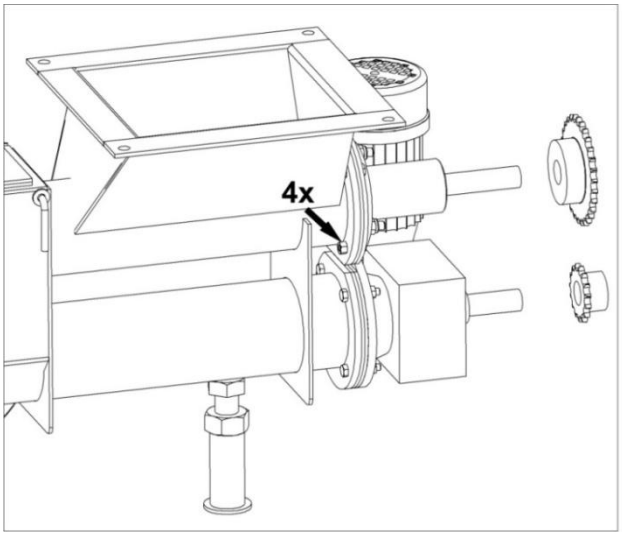


Fig 15. Removing the upper axis flange

- Remove the whole feeder together with the bearings and supporting disk (see Fig 16).

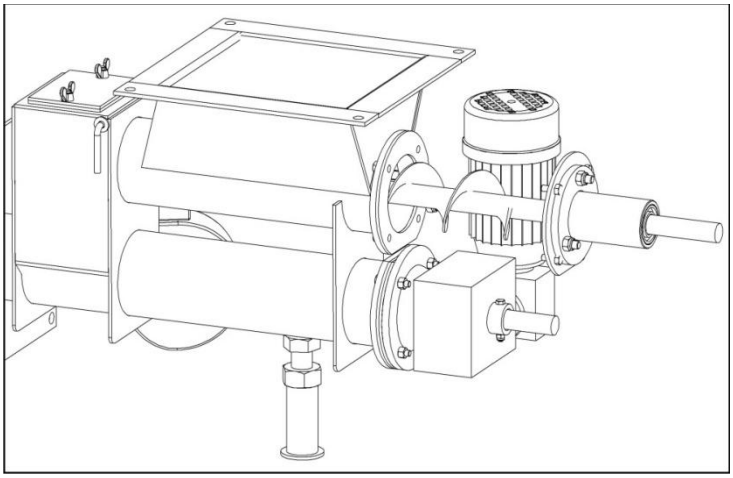


Fig 16. Removing the upper axis

- **When putting back together, it is absolutely necessary to put the rubber gasket at its position!**

REMOVING THE LOWER AXIS

- Remove the protection cover of the transmission system.
- Remove the two gears from the axes by unscrewing the headless inserted screws keeping them in place. **You do not need to unmake the chain! Remove them all together with the chain.**
- Unscrew the four nuts keeping the motor in place and remove it (see Fig 17).

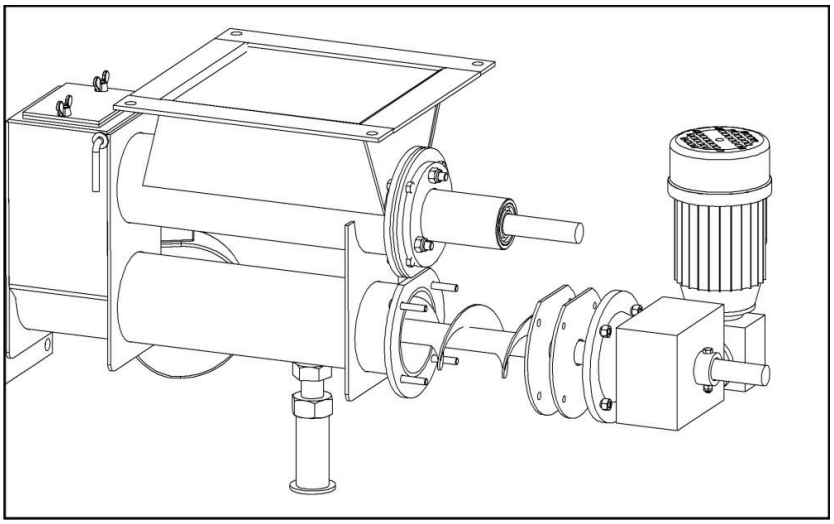


Fig 17. Removing the lower axis

- Remove the support disk and the feeder.
- **When putting back together, it is absolutely necessary to put the rubber gasket at its position!**

7.3.3. Service after motor bolt breakage

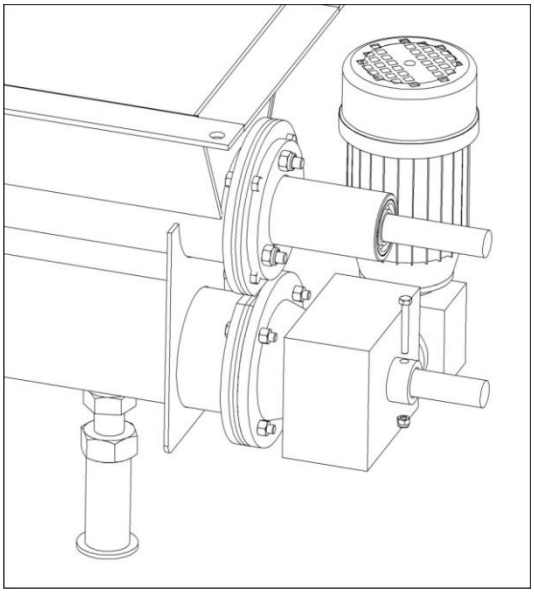


Fig 18. Motor protection bolt replacement

The connection between the motoreducer and the lower axis is realized through a protection bolt. This is designed in such a way so that it breaks in case of feeder blockage, to protect the motor from burning.

If this bolt breaks, follow these steps to replace it:

- Remove the two gears from the axes by unscrewing the headless inserted screws keeping them in place. **You do not need to unmake the chain! Remove them all together with the chain.**
- Unscrew the nut and remove the broken bolt.
- Introduce a new bolt M6x50 and tighten with the nut from the other side.
- Verify the causes of the breakage. If there is an obstacle in the feeding pipe remove it.

7.3.4. Service after power blackout

In case there is a power blackout, it is absolutely necessary to perform some checks and take some safety measures to avoid overheating. The solid fuel has all the time a certain amount of fuel in the fire chamber, which will not stop burning immediately.

For safety reasons it is recommended you have installed a UPS with a battery, which assures function of the boiler pump at least for 30 minutes.

- Remove the amount of fuel that is still burning in the furnace. Due to power blackout, there is risk of backfire to the silo.
- Turn the control panel to OFF.
- When the power is restored, turn on the control panel and make sure all the devices function properly.

7.3.5. Replacement of the ignition element

In case you need to replace the ignition element follow the instructions:

- Turn OFF the control panel and disconnect from electricity.
- Disconnect the connection wires of the ignition element and loosen the plastic tap holding them in place.
- Remove the fan by unscrewing the four screws keeping it in place.
- Remove the furnace plate. The ignition element is positioned inside the INOX tube casing.
- Remove the ignition element from the tube and insert in position the new one.
- When you position back the furnace plate, be careful to fix it correctly with the fixing tooth, as shown on Fig 19.

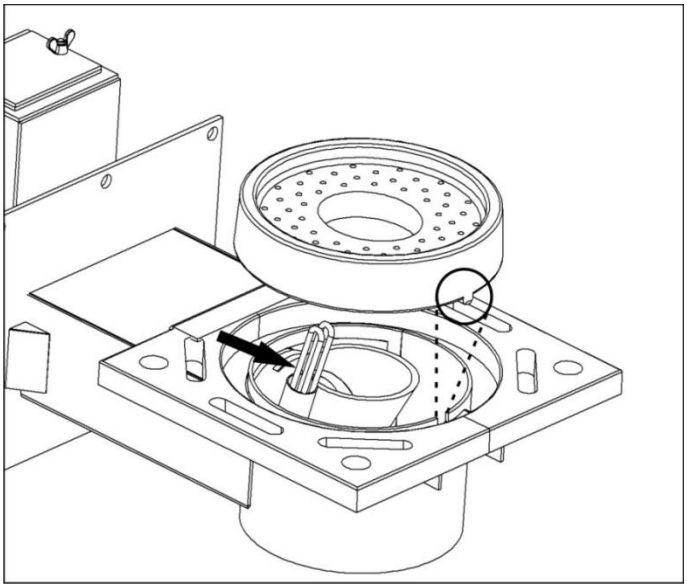


Fig 19. Removing the ignition element

7.4. Maintenance after long stop

7.4.1. Maintenance of the boiler

It is necessary to perform a general maintenance and cleaning of the boiler after the heating season. Clean thoroughly all the surfaces of the boiler as described in the corresponding paragraph. Also clean the chimney box, and all the chimney parts where ash might be deposited. After cleaning all the ash, empty the ash box and leave the boiler clean for the next winter season.

After long stop of the boiler, before you put in function you need to perform the following checks:

- Check the condition of the electric cables and the sensors. Make sure they are not damaged. Check that the thermometer indicates the correct temperature and all the thermostats function properly. Make sure the bulbs are properly positioned in the case.
- Make a general check of the chimney and make sure it is clean and free of obstacles.
- Verify the pressure in the heating network and the boiler.

Do not empty the water of the boiler and the heating installation after the heating season! It will corrupt all the installation and especially the boiler.

- Check that all the valves are working properly. Replace them if necessary. Pay special attention so that all the safety equipment of the boiler functions properly!
- Make sure all the ball valves of the boiler and other relative equipment are open.
- Check the function of the pumps. They might be blocked after long stop.
- Check that there have been no modifications to the installation and the boiler room (ventilation openings, chimney, doors).
- Check the fan and clean from dust. Turn it manually to ensure it is not blocked.

7.4.2. Maintenance of the furnace

It is necessary to perform a general maintenance and cleaning of the furnace after the heating season. The maintenance of the furnace should only be done when the boiler is stopped, cool and the power deactivated. For easier maintenance it is recommended to leave all the fuel in the silo be consumed before you proceed to works. The maintenance procedure includes the following steps:

 **Do not attempt to do any maintenance or service to the furnace while working! There is serious danger of burning! Wait until the boiler is cool and deactivate from the electricity.**

- Make sure the silo is empty. If not, empty manually the silo before proceeding to any works. Open the silo cleaning door if necessary to remove any remaining fuel.
- Remove the silo from the furnace body by unscrewing the bolts.
- Remove the motoreducer which is mounted on the lower axis. See instruction in chapter 7.3.2.
- Check the motoreducer. Check the oil level in the reducer and add oil if necessary.
- Remove the two feeders. Check them and make sure they are in good shape and not deformed.
- Clean the tubes where the feeders are inserted. Remove any fuel or ash remains.
- Remove the cast iron plate of the furnace.
- Clean thoroughly the elbow underneath the plate, form where the fuel is provided. It is very important to be clean of any obstacles that could block the feeding.
- Clean very well all the holes on the plate surface. If they are blocked use a sharp tool to clean them.
- Put together all the pieces in the reverse order. Check all the sealing material between the connections. Make sure they are in good shape and provide an air-tight sealing. Tighten well the screws to ensure an air-tight connection.
- After putting together the axes and the chain wheels, make the chain has a good grip on the wheels and the rotation is performed freely. Grease carefully the chain and the wheels.

 **Attention: All the connections (boiler-furnace, furnace-silo, inspection doors, etc.) must be air tight! If not there is high danger of backfire to the silo!**

8. TROUBLESHOOTING

Problem	Cause	Solution
The lamps of the control panel do not light	- no electrical supply to the lamp - the control panel is not connected to electricity - lamp defect - electric cable defect	- check/replace the lamp - connect to electricity - check/replace the cables
The boiler does not reach set temperature	- fan blocked - air passages are blocked - boiler is not cleaned - incorrect boiler start-up - insufficient water in the system - too big pump debit - boiler under dimensioned - bad quality fuel used - insufficient chimney draught	- check/replace the fan, check the function of the fan regulator and thermostat - clean the air passages - clean the boiler - start the boiler correctly - fill the system - regulate the pump speed - change the fuel used - check/clean the chimney
High temperature in the boiler, but low temperature at the radiators	- too high hydraulic resistance in the heating network - thermostatic mixing valve is connected wrong	- increase the pump speed - check/replace the mixing valve
Condensation formation in the fire chamber	- too big boiler power - too low return temperature in the boiler - fuel with excessive humidity	- load less fuel in the chamber - install a return protection system/thermostatic valve - change the fuel used
Smoke coming out of the doors	- boiler doors not regulated - defect sealing cord of the door - insufficient chimney draught - too high air supply by the fan	- regulate the doors so that the sealing cord stays tight - check/replace the sealing cord - check/clean the chimney - reduce the air speed
Smoke coming back to the silo	- chimney not cleaned/blocked - fire tubes blocked, boiler not cleaned - furnace air holes blocked - insufficient air supply and ventilation of the boiler room - too low flame and fuel level - bad air regulation - wrong fuel ignition - bad chimney connection/ insufficient chimney draught - damaged sealing	- check the chimney, clean it - clean the boiler and the tubes - clean the furnace and the air holes - check the air supply and ventilation - regulate correctly the fuel feeding - check the ignition procedure - check the chimney connection and draught - check all the connections sealing, do not leave the silo lid open while in function
The fan does not function or it makes a lot of noise	- set temperature reached - disconnected by safety thermostat - capacitor/motor defect - bad electrical connection of the fan	- correct boiler function - reset manually - check/replace the fan - check the electrical connection of the fan
The feeder does not function/fuel not fed to the furnace	- feeder blocked from obstacle - feeder is burnt or damaged - no electricity to motor - damaged motor/reducer - connection pin broken	- remove the axes and the obstacle - bad combustion regulation/bad chimney draught - replace feeder - check the electrical connections -replace the motoreducer - replace the connection pin

9. WARRANTY

1. **Warranty duration is 3 years for all boiler parts under pressure, 1 year for other electro-mechanical equipment.** The warranty period starts from the date of installation, but no longer than 120 days from the day of purchase.
2. The warranty covers costs of replacing parts that have been proved to be defect, and any work that is connected with replacing these parts. Costs related to removing defect parts or products, transportation, etc. are not covered by the producer's warranty.
3. The producer will not accept to cover warranty terms in case of the following:
   - Maltreating the product and bad conditions of transportation and loading-unloading.
   - Wrong installation, failing to apply the directions given in the manual.
   - Improper use of the product.
   - Damages that have been cause by using improper fuels, with dimensions or characteristics different from those described in the manual.
   - Damages from freezing if not necessary measures are taken against anti-freezing.
   - Incident of explosion due to use of impropriate chemical substances.
   - Electrical shocks that may harm electrical parts of the appliance.
4. Warranty is only valid if the installation is performed by a professional installer, authorized by the producer, according to the local legislation and the instructions of this manual.
5. Warranty does not cover function problems or damages that are caused by bad chimney installation, failing to respect the instruction of this manual and local legislation.
6. Warranty is not valid if the boiler cleaning, maintenance and service intervals are not respected and the directions given are not followed.
7. Warranty is not valid if the maintenance is not performed by an authorized professional according the instructions given and at the time intervals given.
8. Warranty does not cover costs related to emergency incidents like: earthquake, fire, electrical blackout, robbery.
9. Warranty is not valid if the hardness of the water is over the allowed limits and no water softening protection is installed.
10. The warranty is not transferable in case of reselling or replacing the product. A new warranty should be accorded to the new user.

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