

## INSTALLATION AND OPERATION INSTRUCTIONS



Read these instructions carefully before installing, commissioning or maintenance!



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# 1. General information

Ariterm Bio 120-4000 is a cost-effective, resistant and environmentally friendly central heating boiler for different biofuels. The boiler can be used with different fuels. In order to exploit all the features of the boiler, it is important to follow these instructions.

## 1.1 Disclaimer

Bio boiler with accessories is always part of larger assemblies. This document doesn't include complete information of installation, operating and maintenance for assemblies. The designer of the assembly takes responsibility of having good enough know-how and competence of designing assemblies. Assemblies must be designed, assembled and operated in accordance with the local laws and regulations in force.

**Read these instructions with care before installing, commissioning, maintenance, adjusting or when operating the boiler first time or after along break!** Holder of the assembly takes responsibility of that operating personnel are trained and training fulfil the local laws and regulations in force. Operating personnel must be able to recognize the potential risk factors related to usage or the characteristics of the product.

Content of the introductions based on the limited best knowledge of the devise. Besides this document must be familiar with the other instructions of the assembly e.g. the case-tailored automation instructions. Failure to follow these or other instructions related to the assembly can cause damage or danger to persons, property or the environment.

Ariterm Energy Oy is not responsible for any damage if:

- instructions of this document are not followed
- any instructions related to the assembly are not followed
- the product or the assembly being used in violation of uses
- operating personnel of the product or the assembly is incompetent to the task
- other spare parts than supplied or approved by Ariterm being used.

The product has a limited warranty. Modifying product without promise of Ariterm Energy Oy will void the warranty and release manufacturer, Ariterm Energy Oy, from responsibility of manufacturer.

## 1.2 Guarantee

The equipment delivered by Ariterm Energy is guaranteed for 1 year. The guarantee is valid for one year from the start-up date or up to 18 months from the date of delivery. The pressure vessels manufactured by Ariterm are guaranteed for 5 years from the date of delivery. The guarantee covers the faults related to work and raw materials that may appear in the boiler.

The manufacturer is not responsible for the guarantee if the defect is caused by, for example, the following reasons:

- installation error
- external leaks or corrosive conditions
- incorrect use or insufficient maintenance
- freezing
- overheating
- overpressure
- if open expansion is used
- if the installation and operating instructions not followed

The manufacturer is also not responsible for the warranty if the repair has been undertaken without the manufacturer's permission or the warranty card has not been returned to the factory. The manufacturer is not responsible for possible indirect damages and costs caused by the device. The manufacturer reserves the right to decide on the how the warranty repair is carried out.

## 1.3 Decommissioning

An end-of-life boiler is suitable for scrapping. Note! It is recommended to cut the boiler body that was registered, to prevent possible abuses!

## 1.4 Safety

Read carefully these and other instructions of your assembly before installing, adjusting, starting to operate or maintenance the boiler! Marking of the significant safety remarks are divided into two categories which shown below:



**DANGER! Symbol marks a fatal or / and injuring risk when safety instructions been ignored!**



**WARNING! Symbol marks a damage risk for a property or environment when the safety instructions been ignored!**

**NOTE!** –mark means a wink or notice related to the product.

### 1.4.1 Important safety instructions



**Risk of a fire burn and / or explosion of incombustible gases!**

**Opening hatches of the boiler or another device connected is forbidden when boiler being operated or during power blackout or failure!**

**Boiler must be safely shut down and ventilated with care before opening any hatches!**



**Risk of improper use!**

**If the boiler room is not locked the holder must replace quick fastening to fastening that requires tool to be opened.**

**E.g. nuts or bolts can be used for the fastening.**



**Risk of an electric shock or unexpected operation of a device!**

**Before starting any maintenance ensure that all necessary safety switches are turned 'OFF' position and locked!**



**Risk of burns, skin damages, hearing damage, suffocation and / or getting stuck!**

**Entering a furnace or ash chamber alone without any hatch guard and without the proper equipment is forbidden! For servicing or checking, which is required to go inside the boiler, always have a hatch guard. The boiler must be ventilated carefully, ensuring that the temperature is not too high or ash does not contain glowing embers, hazardous residues, objects or pieces.**

**Required equipment that must be used are:  
respiratory protection, skin-covering and ash protective overall / boiler suit, hearing protections and wearable gas monitor!**



**Risk of burning!**

**Opening any piping connection or connection attached to water space of the boiler is forbidden while boiler being operated! Contact with bare metallic parts must be avoided in vicinity of the boiler!**

**If any piping connections, connections or structures attached must be opened or removed because of maintenance, repairing or inspection the draining must be done with care and proper safety equipment must be used! Cooling down the boiler water is advised if possible!**

## 1.5 Information of the Boiler

Mark information of the boiler to the table shown below. This way you will expedite the maintenance, repairing and service situations.

### **INFORMATION OF THE BOILER:**

<b>PROJECT OR SALES ORDER NUMBER</b>	
<b>MANUFACTURING NUMBER AND YEAR</b>	
<b>ASSEMBLY AND COMMISSIONING DATE</b>	
<b>TYPE OF FUEL</b>	
<b>MECHANIC / INSTALLATION COMPANY WITH CONTACT INFORMATION</b>	

**KEEP THESE INSTRUCTIONS AND ELECTRICAL DIAGRAMS PRODUCT IN THE IMMEDIATE VICINITY!**



### 1.5.1 Information of pressure equipment marking

Pressure equipment marking information in accordance with EN 12953-5 is show below. See the correct details from the nameplate of the boiler.

\* Different pressure classes specified by '/' -mark.


#### 120...250 kW

Manufacturer's type of the boiler	Bio 120	Bio 150	Bio 200	Bio 250
<b>Name and address of the manufacturer</b>	Ariterm Energy Oy, Uuraistentie 1, 43101 Saarijärvi, Finland			
<b>Year of manufacture</b>	see the nameplate			
<b>Serial number of the boiler</b>	see the nameplate			
<b>Maximum allowable pressure PS, in bar</b>	4	4	6	6
<b>Maximum water outlet temperature TS, °C</b>	120	120	150	150
<b>Nominal maximum heat output, in kW</b>	120	150	200	250
<b>Hydrostatic test pressure PT, in bar</b>	20	20	20	20
<b>CE mark and Identification mark of the notified body</b>	<b>CE 0424</b>			


#### 300...700 kW

Manufacturer's type of the boiler	Bio 300	Bio 400	Bio 500	Bio 700
<b>Name and address of the manufacturer</b>	Ariterm Energy Oy, Uuraistentie 1, 43101 Saarijärvi, Finland			
<b>Year of manufacture</b>	see the nameplate			
<b>Serial number of the boiler</b>	see the nameplate			
<b>*Maximum allowable pressure PS, in bar</b>	6	6	6 / 10	6 / 10
<b>*Maximum water outlet temperature TS, °C</b>	150	150	150 / 175	150 / 175
<b>Nominal maximum heat output, in kW</b>	300	400	500	700
<b>*Hydrostatic test pressure PT, in bar</b>	20	20	20 / 33	20 / 33
<b>CE mark and Identification mark of the notified body</b>	<b>CE 0424</b>			

### 1000...2500 kW

Manufacturer's type of the boiler	Bio 1000	Bio 1500	Bio 2000	Bio 2500
Name and address of the manufacturer	Ariterm Energy Oy, Uuraistentie 1, 43101 Saarijärvi, Finland			
Year of manufacture	see the nameplate			
Serial number of the boiler	see the nameplate			
*Maximum allowable pressure PS, in bar	6 / 10	6 / 10	6 / 10	6 / 10
*Maximum water outlet temperature TS, °C	150 / 175	150 / 175	150 / 175	150 / 175
Nominal maximum heat output, in kW	1000	1500	2000	2500
*Hydrostatic test pressure PT, in bar	20 / 33	20 / 33	20 / 33	20 / 33
CE mark and Identification mark of the notified body				

### 3000...4000 kW

Manufacturer's type of the boiler	Bio 3000	Bio 4000
Name and address of the manufacturer	Ariterm Energy Oy, Uuraistentie 1, 43101 Saarijärvi, Finland	
Year of manufacture	see the nameplate	
Serial number of the boiler	see the nameplate	
*Maximum allowable pressure PS, in bar	6 / 10	6 / 10
*Maximum water outlet temperature TS, °C	150 / 175	150 / 175
Nominal maximum heat output, in kW	3000	4000
*Hydrostatic test pressure PT, in bar	20 / 33	20 / 33
CE mark and Identification mark of the notified body		

## 1.5.2 Brief functional description

### Connection to the heating water network

The performance values of the boiler are shown on the name plate. The boiler is intended to be connected to a heating water network. The water space of the boiler is connected to the network via flanges. If necessary, a heat exchanger can be used if the pressure of the network is higher than that of the boiler. The network must be designed so that the temperature of the return water does not fall below +70 °C when the boiler is in use, using, for example, a mixing circuit from the flow water (hot) to the return water (cold).

### Connecting the burner

A compatible burner solution is connected to the burner opening of the boiler and, if necessary, an adapter can be used. The operation of the burner is presented in the burner and automation documentation.

### Ash chamber and ash removal

An ash chamber is installed under the boiler, which can be equipped with automatic ash removal equipment if necessary. It is possible to install a compressed air cleaning system on top of the boiler, whose cleaning hatches can be placed either on the side or on top.

### Flue gas control

The boiler must always be connected to the chimney and flue gas fan to ensure sufficient negative pressure (25...45 Pa when using burners supplied by Ariterm Energy). In addition, flue gas cleaning devices must be connected to the boiler, if necessary, in order to meet local emission regulations.

### Safety devices

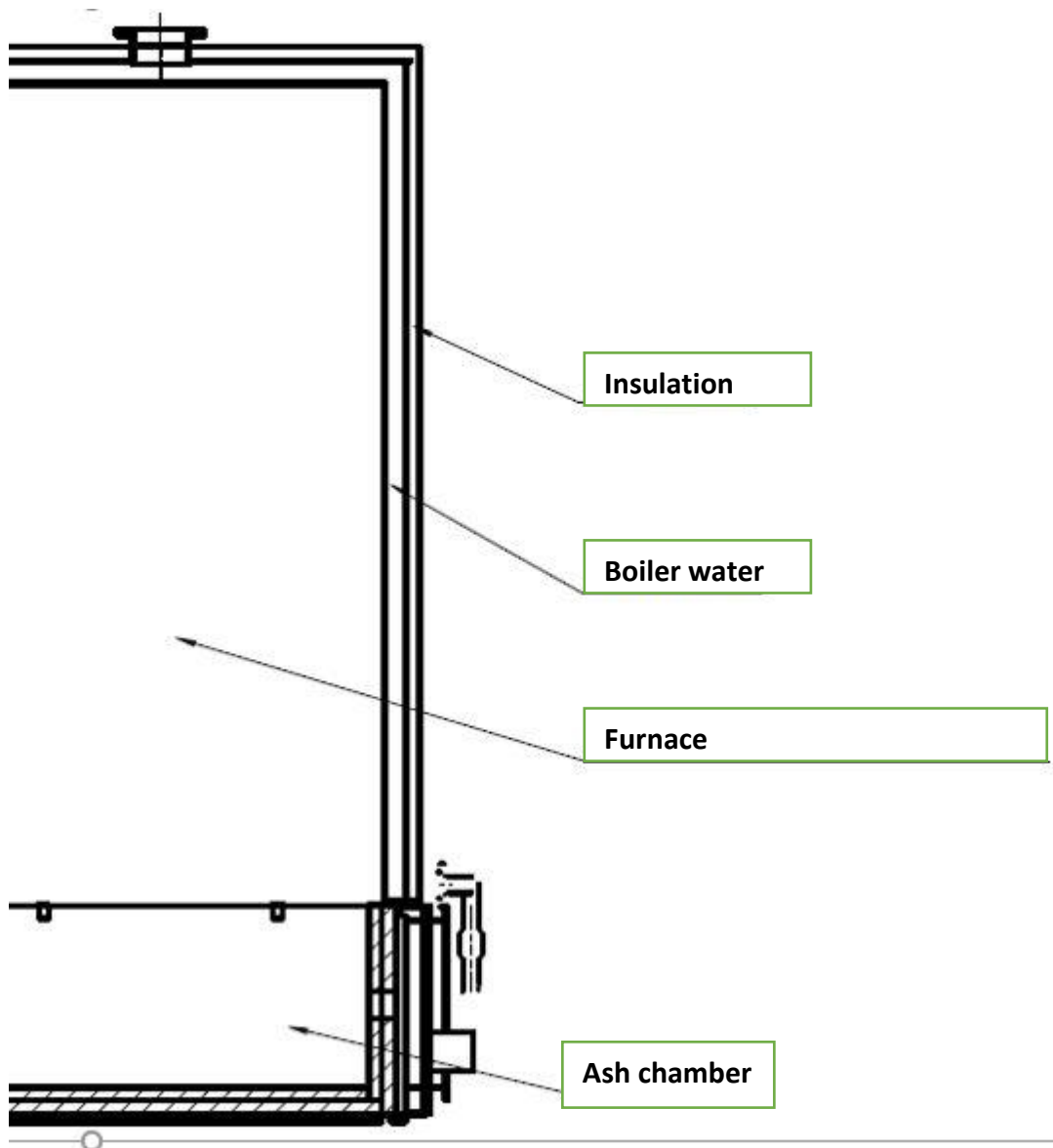
The boiler is delivered without safety devices, unless otherwise agreed. Safety devices must be connected to the boiler in accordance with the regulations, which are connected to an approved safety automation system. A more detailed description of the safety devices is presented in the section [4.1.1](#) and in the system automation documentation (electrical diagrams, user manual, etc.).

## 1.5.3 Fuel

Wood chips and pellets can be used in the boiler. Quality criteria requirements according to the combustion and other technology of the complete equipment. Other fuels must be agreed on a case-by-case basis.

**NOTE!** If having intentions to use other fuels, ask from your reseller suitability of Ariterm Bio boilers.

### 1.5.4 Structure of bio boiler



### 1.6 Pre-design

In pre-design, it is important to make sure the correct dimensioning and equipment compatibility! For example, if you intend to use a burner equipment other than Ariterm, you can ask for a custom-made flange according to the known bolt section and dimensions. When using other burner equipment, the size of the furnace of the boiler must also be checked for the burner (see burner instructions).

### 1.6.1 Permissions and regulations

Before starting to design a boiler system find out the local permissions and regulations from your local authority.

#### Pressure assembly and placement authorization

The boiler is always part of a pressure assembly and local laws and regulations must be noticed!

**NOTE!** Ariterm Bio Boilers have manufactured and designed according EU pressure directive but when connecting boiler to piping circuit it is a new pressure assembly and local regulations and laws. Also, permission for the placement authorization may be required. Ask more from your local authorities. Conformity assessment of pressure equipment must be done, according to the PED 2014/68 / EU classification according to the article 13 (it is recommended to proceed according to Annex III, paragraph 10, MODULE G).

#### Registration of the boiler

Registration of the boiler is required in some countries. Things that influence in registration requirement can be followed:

- Location
- Fuel
- Heat power
- Water volume
- Pressure
- Temperature

See information of your boiler from section [1.5.1](#) and the name plate.

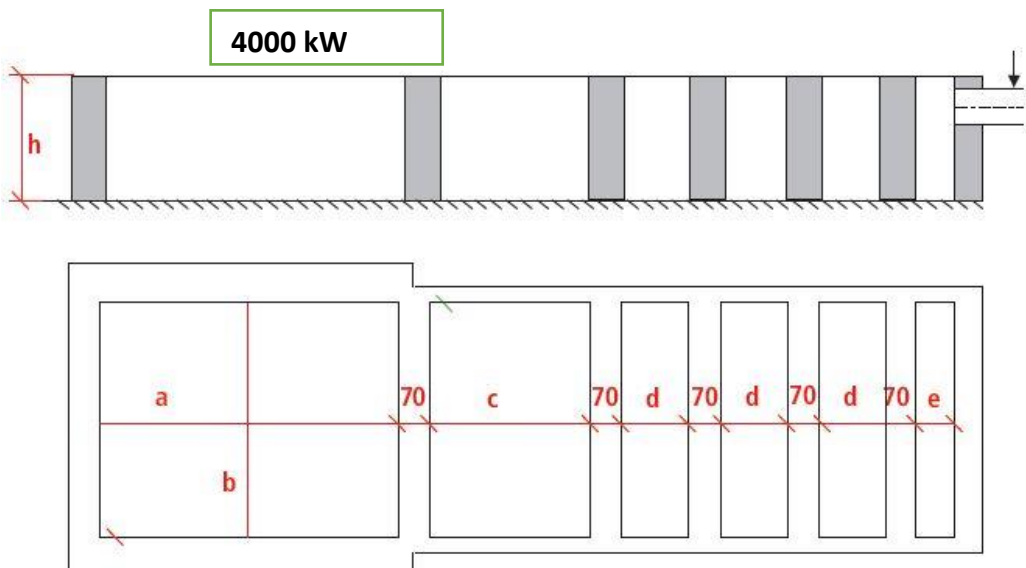
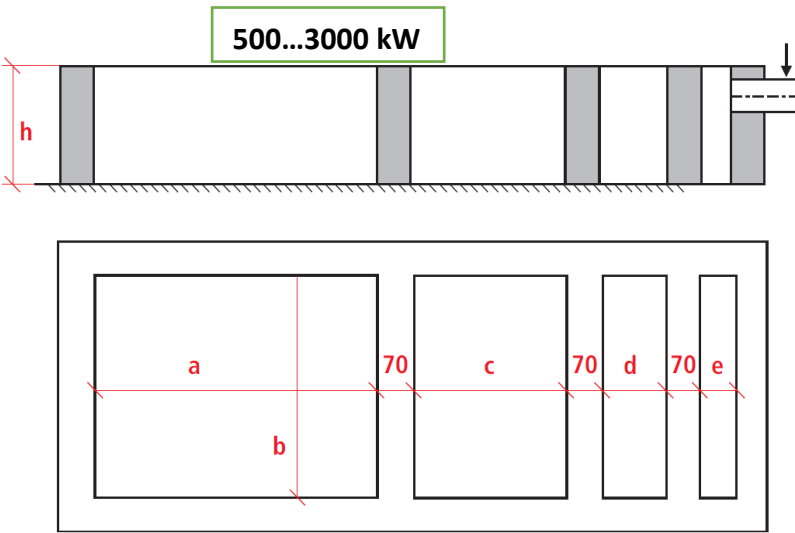
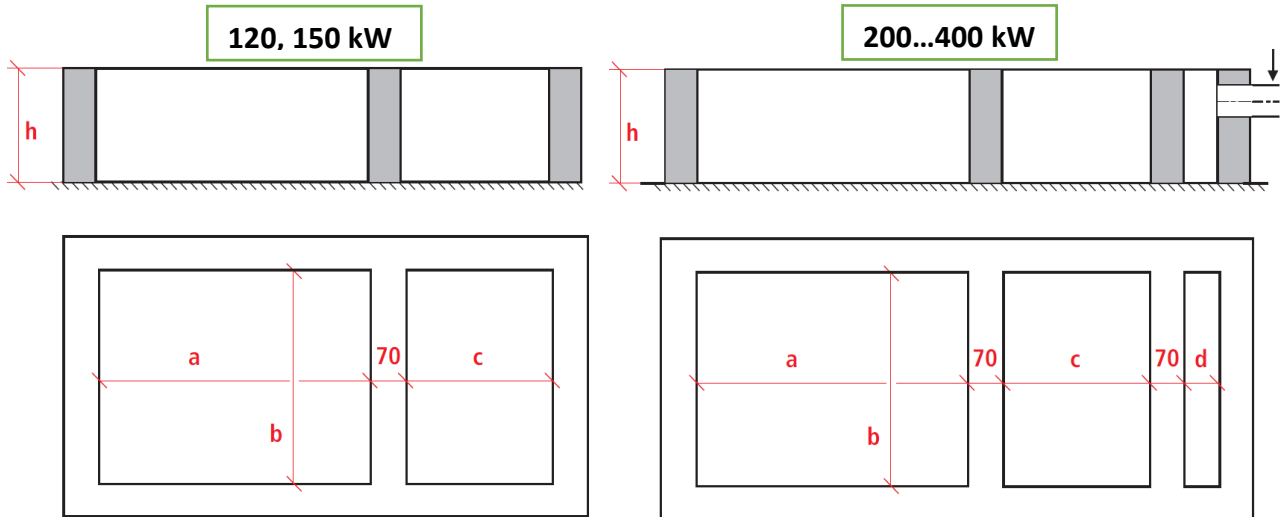
#### Boiler modifications

If attention to do modifications to the pressurized structures of boiler designs must be done and permissions for modification ensure from your local authority before modification. Also, inspections after the modification may be required. When boiler is modified the responsibilities of the product is transferred to the modifier. Ask more from your local authorities.

### 1.6.2 Ash chamber dimensioning

The ash chamber can be created on site in accordance with the dimension drawing by casting concrete or by means of tiles. Alternatively, the boiler can be delivered with a steel stand. The dimension “h” is the minimum height of the ash chamber. The factory-made ash pan is manufactured from steel and is welded to the boiler frame. The ash chamber is insulated by means of wool and an insulating plate. The ash pan is internally lined with ceramic tiles near the furnace.

Power [kW]	a	b	c	d	e	h
	[mm]					
<b>120</b>	825	730	540			300
<b>150</b>	925	730	540		-	300
<b>200</b>	925	730	536	135		300
<b>250</b>	1025	780	536	135		300
<b>300</b>	1125	830	596	155		300
<b>400</b>	1225	930	596	155		300
<b>500</b>	1325	1030	354	334	135	500
<b>700</b>	1625	1230	354	334	135	800
<b>1000</b>	1725	1430	596	374	155	800
<b>1500</b>	2025	1630	596	374	155	800
<b>2000</b>	2325	1730	1040	374	155	1000
<b>2500</b>	2925	1730	1040	374	155	1000
<b>3000</b>	3525	1730	1040	374	155	1000
<b>4000</b>	3601	2606	1083	450	282	1000



### 1.6.3 Stack recommendations and furnace under pressure

In five-draught boilers with a power of over 500 kW, the diameter of the stack is defined according to the flue gas blower to be used (pressure increase / flow rate - pressure loss)

#### Minimum diameter of the stack pipes Bio 500-3000 kW

Boiler power kW	500	700	1000	1500	2000	2500	3000	4000
-----------------	-----	-----	------	------	------	------	------	------

Stack Ø mm	200	250	300	350	400	450	500	500
------------	-----	-----	-----	-----	-----	-----	-----	-----

#### Stack recommendation for Bio 120-400 kW (natural-draught)

Boiler power kW	120	150	200	250	300	400
-----------------	-----	-----	-----	-----	-----	-----

Stack Ø mm (or square side) mm	200	230	250	300	330	350
Stack length m	9	10	12	14	15	15

The values of the table have been calculated using wood chips of good quality (moisture 35 %) and a well-controlled burning process (residual oxygen max 8 %). When using wetter or otherwise different fuel, the stack must be dimensioned on a case-by-case basis.

**NOTE!** When dimensioning the stack, also take into account local laws and regulations, e.g. in special situations, higher than recommended barrels and anti-aircraft lights are required.

**NOTE!** Natural-draught boilers can also be equipped with a flue gas fan if necessary. Ask your reseller for sizing!

#### Furnace under pressure

Ensure sufficient under pressure (25...45 Pa when using Ariterm burners) by sizing suitable under pressure controlled flue gas fan and flue gas duct and stack.

### 1.6.4 Combustion air intake

In the boiler room, there must be a big enough fresh air ventilator so that the air speed in it does not exceed the value of 1.5 m/s.

**NOTE!** Boiler room needs a lot of extra heating up when outside temperature is low and all fresh air needs to be heated up to keep a boiler room temperature in permissible level.

Refer to [2.2](#) for the design values for the combustion air volume flow.



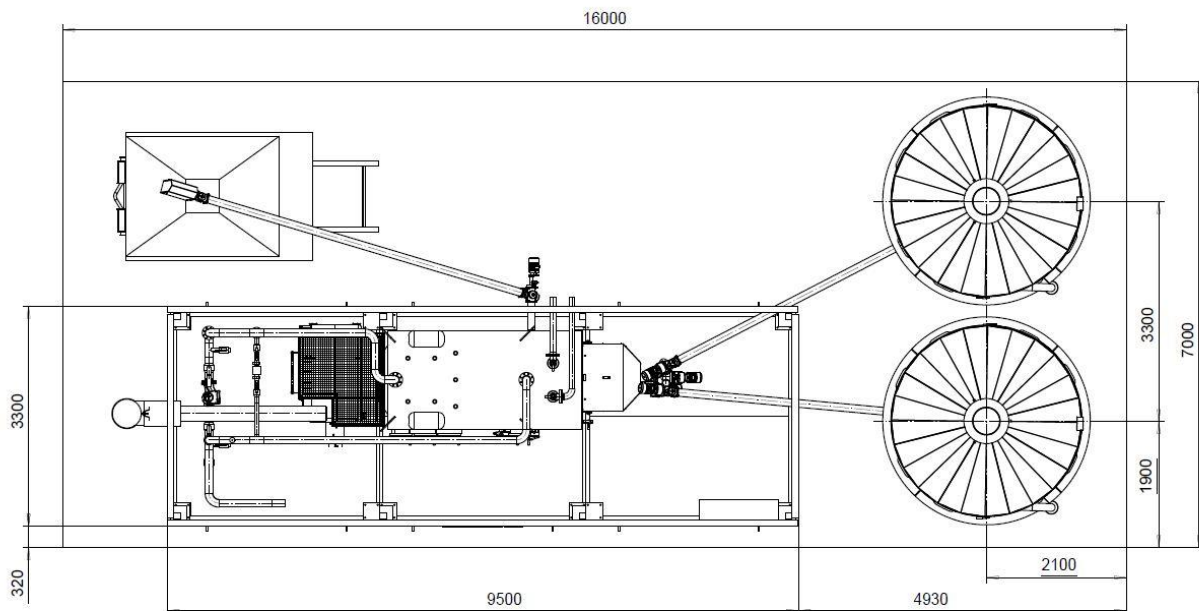
### 1.6.5 Lay-out and foundations

A lay-out design must be done and confirmed before ordering the boiler. The Lay out design defines the right place for the boiler and then it is possible define the e.g. suitable hatches (left, right, top) and accessories.

A boiler system must contain all necessary components and foundations and a boiler house must be designed strong and spacious enough for the designed system. Foundations must be strong enough to support the main components: fuel storage, burner, boiler, flue gas fan and cleaner, stack, water expansion and pressurising system etc. heavy components.

**NOTE!** that when calculating the mass of the boiler remember to add the mass of the filling water!

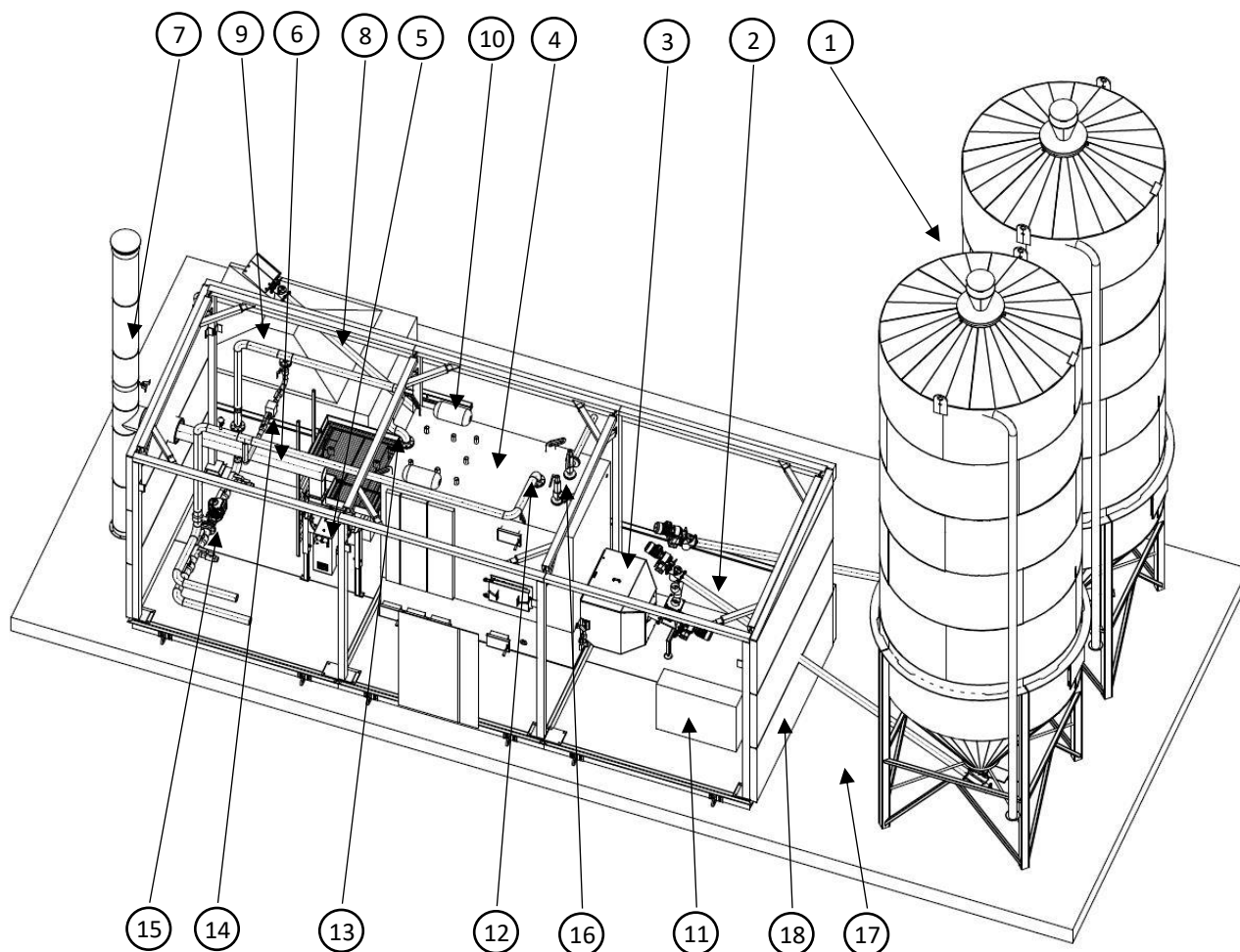
**Example lay-out drawing (with the same equipment than shown in follow page)**



When designing the lay out note follow things:

- There must be an air gap between a boiler and boiler house wall (at least 100 mm!)
- Boiler room and fuel storage must be separated by a wall or etc. (see local fire control and building regulations)
- Ensure that there is space enough for the maintenance
  - It is recommended that a doorway is large enough for the burner and other large components
  - Maintenance
  - At least 1000 mm free space from cleaning hatches is recommended to make cleaning easier
- Note in lay-out that fuel filling and ash removing is easy to perform

## Example of a boiler system with main components



No.	Description	No.	Description
1	Fuel storage (pellet silo shown in figure)	10	*Soot removal equipment (compressed air soot blower in figure)
2	Fuel transmission equipment (Ariterm screw conveyer in figure)	11	Automation and electric centre
3	Burner (Ariterm Multijet for pellet usage in figure)	12	Flow water piping
4	Ariterm Bio Boiler (SP model in figure)	13	Return water piping
5	Flue gas fan and *cleaner (the model in figure equipped with maintenance stand)	14	Return water mixing piping (mixing pump used in figure)
6	Flue gas duct (tubular in figure can be also rectangular)	15	Main circulation pump
7	Stack	16	Safety valves and blowdown piping
8	*Ash transmission equipment (Ariterm screw conveyer in figure)	17	Boiler system foundation
9	*Ash bin (Ariterm movable ash bin in figure)	18	Boiler house (roof and side walls hidden removed from figure)

\*Optional equipment

## **1.7 Transport, storage and package opening**

### **1.7.1 Receipt and acceptance**

The boiler can be safely lifted from the hoist brackets. The transport weight is stamped on the machine plate of the boiler. If the boiler is handled by means of a forklift or another similar machine, it should be noted that the bottom is open in the furnace area. The bottom of the boilers equipped with a factory-made ash pan is closed. The package should be unwrapped as close to the installation site as possible. The factory has insured the boiler against damage during transport from the factory to the first intermediate storage site. It is important for the person who receives the boiler to verify the state of the boiler before its acceptance. In cases of damage, the dealer must be contacted without delay. In addition, the content of the delivery must be checked and all possible deficiencies must be immediately notified to our factory.

### **1.7.2 Storage**

The boiler can be stored outside temporary under a rain cover. However, the preferred option is to store it inside.

**NOTE!** If electrical devices attached see storage instructions from manufacturer's documentation.

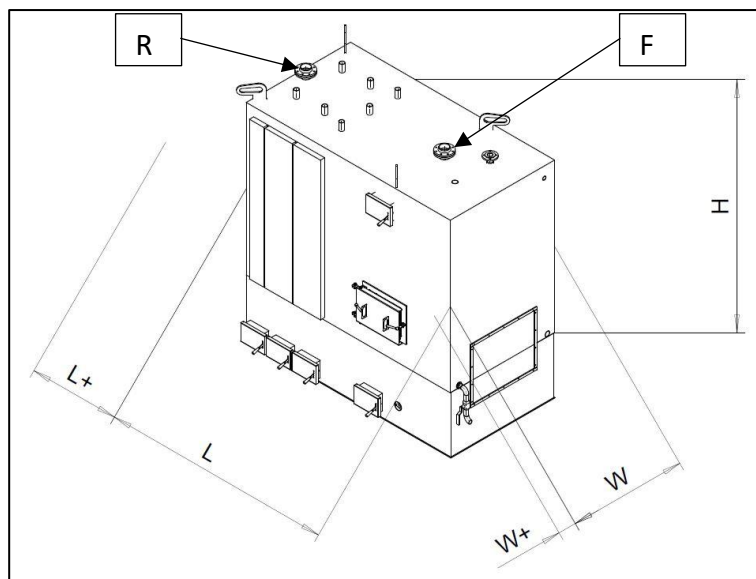
### **1.7.3 Package opening**

After opening the package, open the hatch and check the final inspection report to make sure that all loose accessories are contained in the package. Disposing of the package: the plastic cover is landfill waste and the boards can be burned. Beware of the insulating plates during transport. The hatches and other loose parts should be unfastened during installation.

## 2. Technical information

### 2.1 Dimensions and masses

\* **NOTE!** Ash chamber not included!  
 \*\*Differs when an additional convector used. A preliminary design calculations can be done by adding 15 % more to the mass and water volume. Ask more from your supplier.  
 4 bar / 6 bar / 10 bar models



### 4 / 6 / 10 bar models

Boiler model	Width W [mm]	Extra SB models W+ [mm]	Height H [mm]*	Length L [mm]	Extra add convection L+ [mm]	Flanges Flow F, Return R [DN]	Water volume [dm <sup>3</sup> ]**	Dry mass [kg]**
120	980	+340	1540	1690	-	50	500	1250 / - / -
150	980	+340	1740	1790	-	50	600	1450 / - / -
200	980	+340	1540	1990	-	65	710	1650 / - / -
250	1030	+340	1590	2090	-	65	800	- / 1800 / -
300	1080	+340	1640	2270	-	65	860	- / 2200 / -
400	1180	+340	1840	2370	-	80	1100	- / 2700 / -
500	1285	+340	1845	2615	+404	80	1750	- / 3050 / 3450
700	1485	+340	2145	2915	+404	100	2410	- / 3990 / 4550
1000	1685	+340	2345	3315	+444	100	2850	- / 6320 / 7270
1500	1885	+340	2645	3615	+444	125	4250	- / 8960 / 10100
2000	1985	N/A	2745	4360	+444	150	5400	- / 11650 / 13200
2500	1985	N/A	3045	4960	+444	200	6390	- / 13170 / 14950
3000	1985	N/A	3295	5560	+444	200	7330	- / 14400 / 16950
4000	2886	N/A	3931	6549	-	200	9780	- / 22000 / 22043

## 2.2 Operation specifications

### 4 bar / 6 bar / 10 bar models

Boiler model	Maximum operating pressure [bar, g]	Maximum Operating temperature [°C]	Furnace volume [m3]*	Furnace area [m2]	Furnace heat load [kW/m2]	Design combustion air flow [Nm3/s]*	Replacement air vent [mm]*
120	4 / - / -	120 / - / -	0,7	19,0	6,3	0,07	250x250/ø315
150	4 / - / -	120 / - / -	1,0	22,0	6,8	0,08	300x300/ø315
200	- / 6 / -	- / 150 / -	0,8	25,9	7,7	0,11	300x300/ø400
250	- / 6 / -	- / 150 / -	1,1	30,8	8,1	0,14	350x350/ø400
300	- / 6 / -	- / 150 / -	1,3	33,7	8,9	0,17	350x350/ø450
400	- / 6 / -	- / 150 / -	1,8	43,9	9,1	0,22	450x450/ø500
500	- / 6 / 10	- / 150 / 175	2,2	54,3	9,2	0,28	450x450/ø530
700	- / 6 / 10	- / 150 / 175	3,8	75,2	9,3	0,39	550x550/ø660
1000	- / 6 / 10	- / 150 / 175	5,5	105,2	9,5	0,55	650x650/ø830
1500	- / 6 / 10	- / 150 / 175	8,1	161,2	9,3	0,83	acc. 1...1,2 m/s.
2000	- / 6 / 10	- / 150 / 175	10,2	212,7	9,4	1,10	acc. 1...1,2 m/s
2500	- / 6 / 10	- / 150 / 175	14,3	268,8	9,3	1,38	acc. 1...1,2 m/s
3000	- / 6 / 10	- / 150 / 175	18,7	315,8	9,5	1,65	acc. 1...1,2 m/s
4000	- / 6 / 10	- / 150 / 175	29,0	530	7,55	2,20	acc. 1...1,2 m/s

\* Valid for wood chips and pellet, check also your burner instructions.

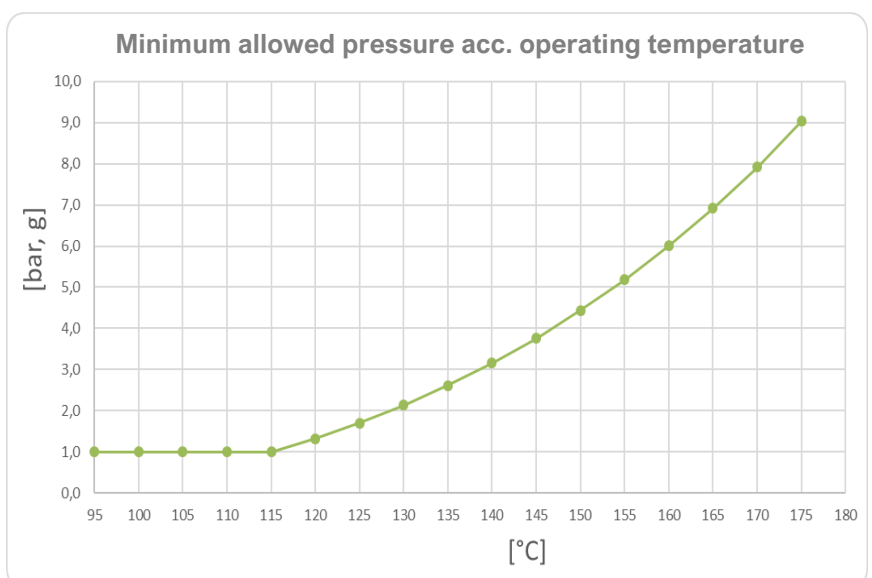
Specification for all Ariterm Bio Boiler:

- Minimum return water temperature: 70 °C
- Minimum flue gas outlet temperature: 105 °C
- Minimum standstill\*\* water temperature: 40 °C  
(prevents a condensation and corrosion in the pressure structures)
- Water quality must meet the requirements of EN 12953-6 standard

\*\* Boiler is in a standstill (idle period) when it is not operating and there is no combustion no and a flue gas flow but the boiler is still connected to the water system. To keep boiler warmed up use e.g. a self-acting temperature control valve (needs another heat supply) or an immersion heater.

Below is a table for the lowest operating pressure according to the operating temperature

Temperature [°C]	Minimum allowed operating pressure [bar, g]
20-95	1,0
100	1,0
105	1,0
110	1,0
115	1,0
120	1,3
125	1,7
130	2,1
135	2,6
140	3,2
145	3,8
150	4,4
155	5,2
160	6,0
165	6,9
170	7,9
175	9,0



## 2.3 Operating environment specifications

- Boiler room temperature: +10...+45 °C
- Boiler room relative humidity: 20...80 %



**Ignoring the operation or operating environment specification can cause damage to the boiler or shorten the lifetime notably!**

**A poor conditioned boiler is a risk factor to persons and property!**

## 3. Installation

The installation must be carried out in compliance with the standards in force. Since the boiler is delivered without accessories such as safety valves and other similar parts, the company responsible for the installation of the boiler must request that the notified body carry out the inspection of the whole device before its commissioning.

The bio boiler series is only intended for use with combustion devices equipped with a burner head. The boiler must not be manually filled in such a way that, for example, fuel is loaded onto the furnace bed.

The boiler has been built in such a way that its lower part is open in correspondence of both the furnace and convection part. Due to this, an installation base must be manufactured for the boiler in accordance with the figure. This installation base serves as ash pan. Ash removal hatches or devices for the mechanical removal of ash can be installed on it. The joint between the boiler and installation base must be sealed extremely carefully by means of a fire-resistant mass. The aim is to prevent gas from leaking between the different ducts of the boiler.

A boiler equipped with a factory-delivered ash pan does not need a separate installation base. NB! The boilers do not contain blast hatches. In the model to be cleaned from the top, a clearance about as high as the boiler must be left on top of the boiler for the cleaning of the convection part. In the model to be cleaned from the side, a space about as wide as the boiler is needed next to the cleanout hatches. It is advisable to equip the 500-700 kW boilers to be cleaned from the side with two-sided convection cleanout hatches (optional). In the models to be automatically cleaned, the above-mentioned dimensions can be slightly smaller. In any case, it must be possible to open the convection hatches in order to carry out possible actions.

**NOTE!** The boilers do not have explosion hatches, and explosion hatch must be installed in the flue if necessary.

### 3.1 Before starting installation

#### Compatibility of the boiler and burner



**Risk of system failure!**

**The compatibility of the burner and other equipment must always ensure!**

**Wrong choice of the burner or other equipment can lead to harmful ash accumulation, too-high surface temperatures, excessive flue gas emissions or deficient activity of the assembly.**

Before starting to installation re-check the compatibility of the boiler and the burner. If a burner which manufactured by another manufacturer than Ariterm Energy will be installed to the new boiler ensure the right burner opening with accessories.

Also ensure the compatibility of other devices and the adequacy of the space in the boiler building.

## 3.2 Mechanical installations

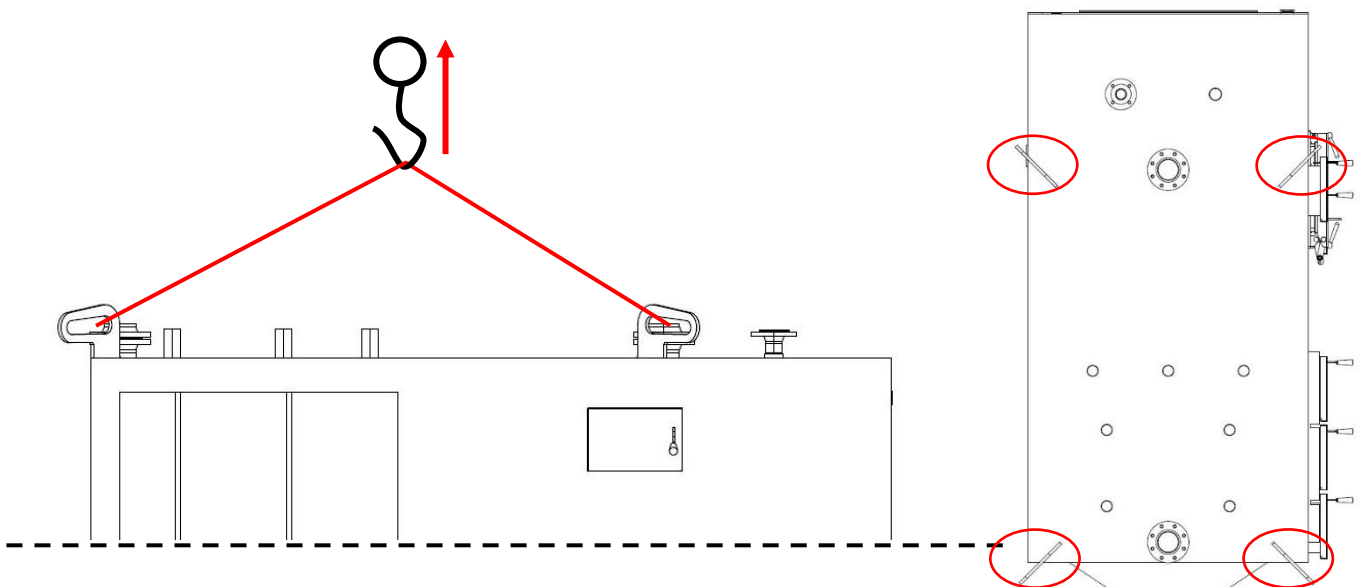
Mechanical installations can be done only by professional. Make sure that you have space enough for the boiler installation including lifting, moving and adjusting.

### 3.2.1 Lifting

Before starting lifting a boiler lifting plan must be done. In the plan follow things must be noticed:

- Mass of the boiler
- Suitable lifting equipment according the mass and reach
  - rope / chain, crane, etc.
- Ensure that that there is large enough hole or doorway for the boiler into boiler room
  - May require chance to an installation order:
    1. Lifting the boiler
    2. Boiler room finishing (a roof or wall installation)

Try to lift boiler to final position if possible because the only safe method to move a boiler is lifting from the lifting rings shown below!



**Risk of structural damage and an occupational accident!**

**Boiler is designed only to be moved by lifting from the lifting rings!**

**Thrusting or pulling the boiler can cause permanent damage to the structure!**



### 3.2.2 Burner Installation

The burner is attached to the boiler with bolts and are sealed with heat-resistant silicone or gasket. The opening must be sealed so well that connection is absolutely air tight! The bolts are tightened crisscross like car tires. If the boiler burner opening is square in shape, is used an adapter flange (optional).

Below is a series of pictures shows an example of how to install the burner:



**Figure 1** Sealing burner opening with a heat-resistant silicone (also heat-resistant gaskets can be used if available)



**Figure 2** Sealed round shaped burner opening



**Figure 3** Installing a water cooled burner to the burner opening (outside of the boiler)

#### **Burner installation order:**

1. Preparing the liftin or thrusting
  - a. Ensure enough space
  - b. Ensure the capacity of mounting tools (see burner weight from the manufacturer documentation)
2. Sealing the opening
  - a. Fitting must be tight
3. Lift or thrust the burner into opening
  - a. Make sure that burner is installed in correct position
  - b. Locks and other fasteners secured

### 3.3 Pipe installations

The connection of the boiler to the pipe system must be designed and realised in a professional way and in compliance with the regulations in force. The components to be used must be selected considering the high pressure and working temperature of the plant. CE marked components that meet the fundamental safety requirements of the Pressure Device Directive must be used as pressure bearing components.



#### **Risk of structural damage!**

**Use only professional and qualified labour when connecting the pipelines to the boiler! Qualifications must be related to the connections that installed. Incomplete connections may only be broken up long time after the commissioning.**

The most important values from the point of view of the installation and safe use are in the boiler plate (see chapter [1.5.1](#)).

The boiler must be equipped with at least the following accessories (in accordance with the local laws and regulations in force):

- Thermometers for the measurement of the temperature in the supply and return pipes of the boiler
- Manometer for the measurement of the pressure in the boiler.
- boiler thermostat or sensor for the control of the flow water temperature and the fuel input power.
- Overheat protection that stops the fuel feeding process in overheat situations.
- Safety devices that work when the maximum allowable pressure is exceeded = safety valve(s) whose must correspond to the maximum permissible thermal input of the boiler (see chapter [3.3.1](#)), the opening pressure is at most equal to the maximum working pressure of the boiler and blowdown efficiency is sufficient to prevent the boiler pressure from increasing by over 10 % in case of boiling. Installing of any appliance that could block or decrease a flow of the connection between the water space and the safety valve or the safety valve and the blowdown pipe is forbidden!
  - The safety valve must be CE-marked according the Pressure Equipment Directive (Class IV).
- Dry-boiling protection that stops the fuel feeding process when the boiler water level decreases (in boilers with a power of over 120 kW)
- Expansion tank or system for liquid volume changes
  - The use of an open expansion vessel is prohibited.  
The warranty of the pressure vessel is not valid if an open expansion is used
- Connection for fastening the inspection manometer
- Drain valve in the lowest part of the boiler
- Filling group to increase the amount of boiler water
- At the highest part of the heating network is required an air vent for air removal and it is also recommended to install an automatic deaerator.



**Risk of structural damage!**

**The use of an open expansion vessel is prohibited, because in an open system oxygen can dissolve in the water, which leads to premature corrosion!**

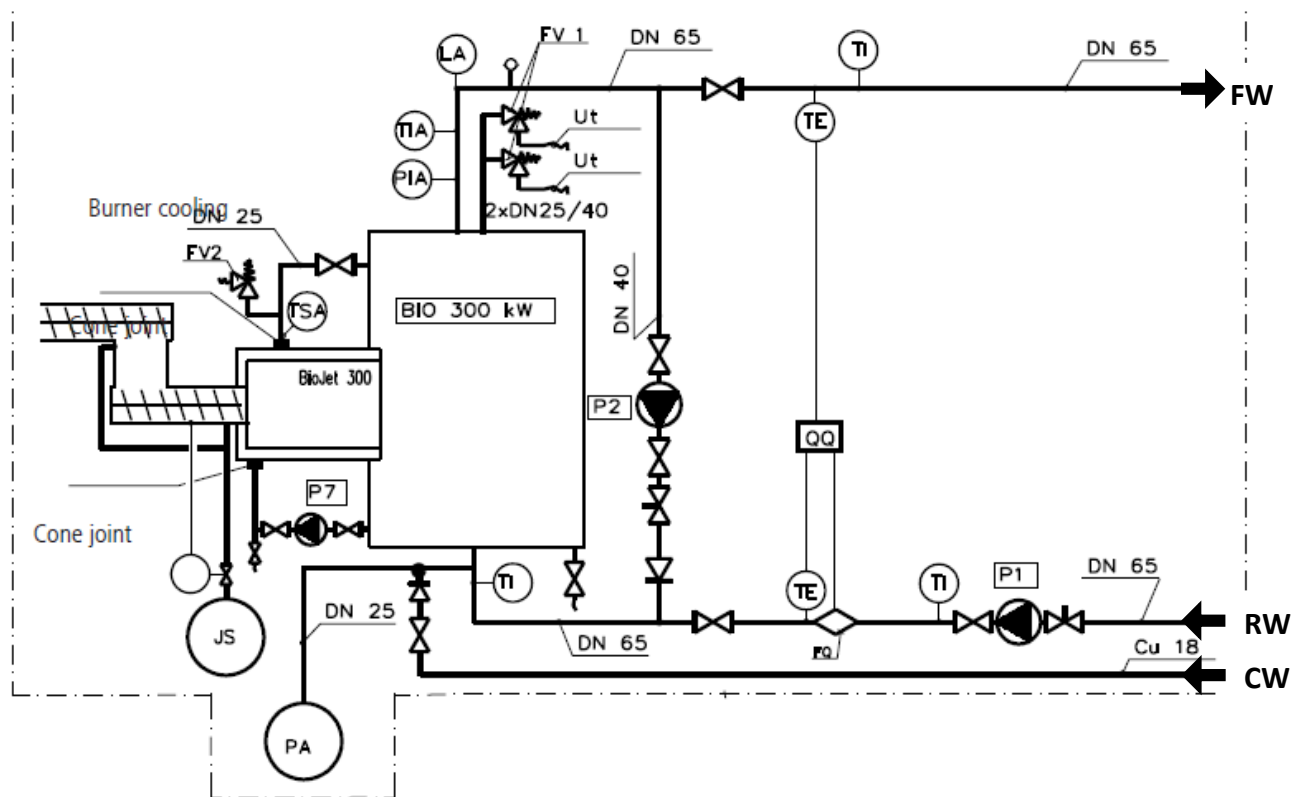


**Risk of structural damage!**

**Too low temperature of return water causes corrosion and degrades efficacy of heating which can lead to damage or shorten the life of the boiler and other equipment significantly!**

**NOTE!** In order to ensure the durability and good operation of the boiler, the return water temperature **should never be less than 70 degrees!** The mixing pump (P2) that can be seen in the connection diagram ensures this. Cold return water increases susceptibility to corrosion and impairs combustion!

### Example of boiler system piping connection diagram



**NOTE!** The pipeline sizes shown in the figure can be used only for a 300-kW system. Check the right connections and pipelines from the case-specific pipeline diagrams and drawings!

### DOMESTIC WATER EQUIPMENT, ACCESSORY (Codes related pipeline connection diagram)

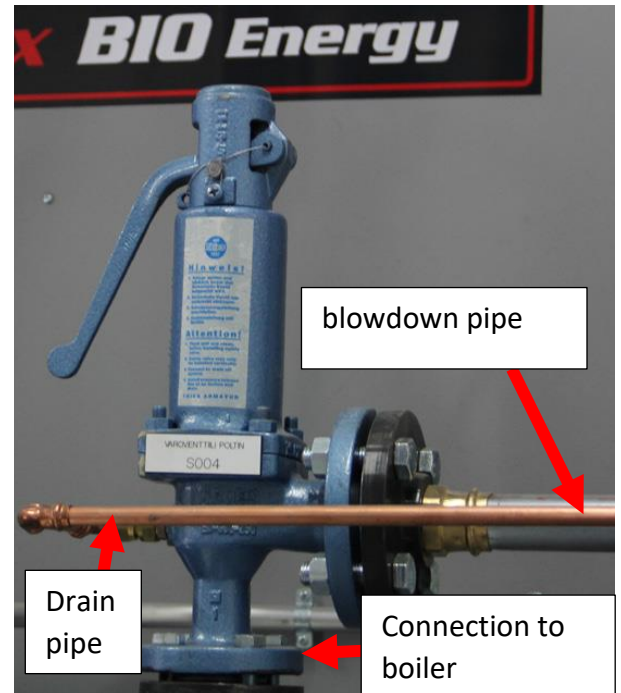
Code	Description	Code	Description
P1	HOT WATER CIRCULATION PUMP	⊗	THROTTLING VALVE
P2	MIXING PUMP	⊗	SHUT-OFF VALVE
P7	COOLING PUMP, BURNER	⊗	CHECK VALVE
FV1	SAFETY VALVES, BOILER	♀	DEAERATOR
FV2	SAFETY VALVE, BURNER	FW	FLOW WATER
LA	DRY-BOILING PROTECTION	RW	RETURN WATER
TIA	OVERHEAT PROTECTION, BOILER	CW	COLD WATER
TSA	OVERHEAT PROTECTION, BURNER	PA	EXPANSION TANK
PIA	PRESSURE PROTECTION	JS	EXTINCTION WATER TANK
QQ	ENERGY METER		
FQ	FLOW TRANSMITTER		
TE	TEMPERATURE TRANSMITTER		
TI	TEMPERATURE GAUGE		

### 3.3.1 Safety valve installation

**Two safety valves must be installed** and their blowdown efficiency must be at least according to the adjacent table. The safety valves must be chosen in accordance with the heating, plumbing and air conditioning plan of the plant in question. The blowdown pipe of the safety valve must be dimensioned and installed in such a way that it does not limit the valve blowdown efficiency and does not cause dangerous situations during the operation of the valve.

#### Sizing of safety valve

Working pressure	4 bar	6 bar	10 bar
<b>Boiler power kW</b>	Required Blowdown efficiency kg/h (steam)		
150	384	-	-
200	512	-	-
250	640	-	-
300	769	-	-
400	1023	-	-
500	1281	1307	1350
700	1793	1830	1891
1000	2562	2614	2701
1500	3843	3921	4051
2000	5124	5228	5401
2500	6404	6536	6751
3000	7685	7843	8102
4000	-	-	10803



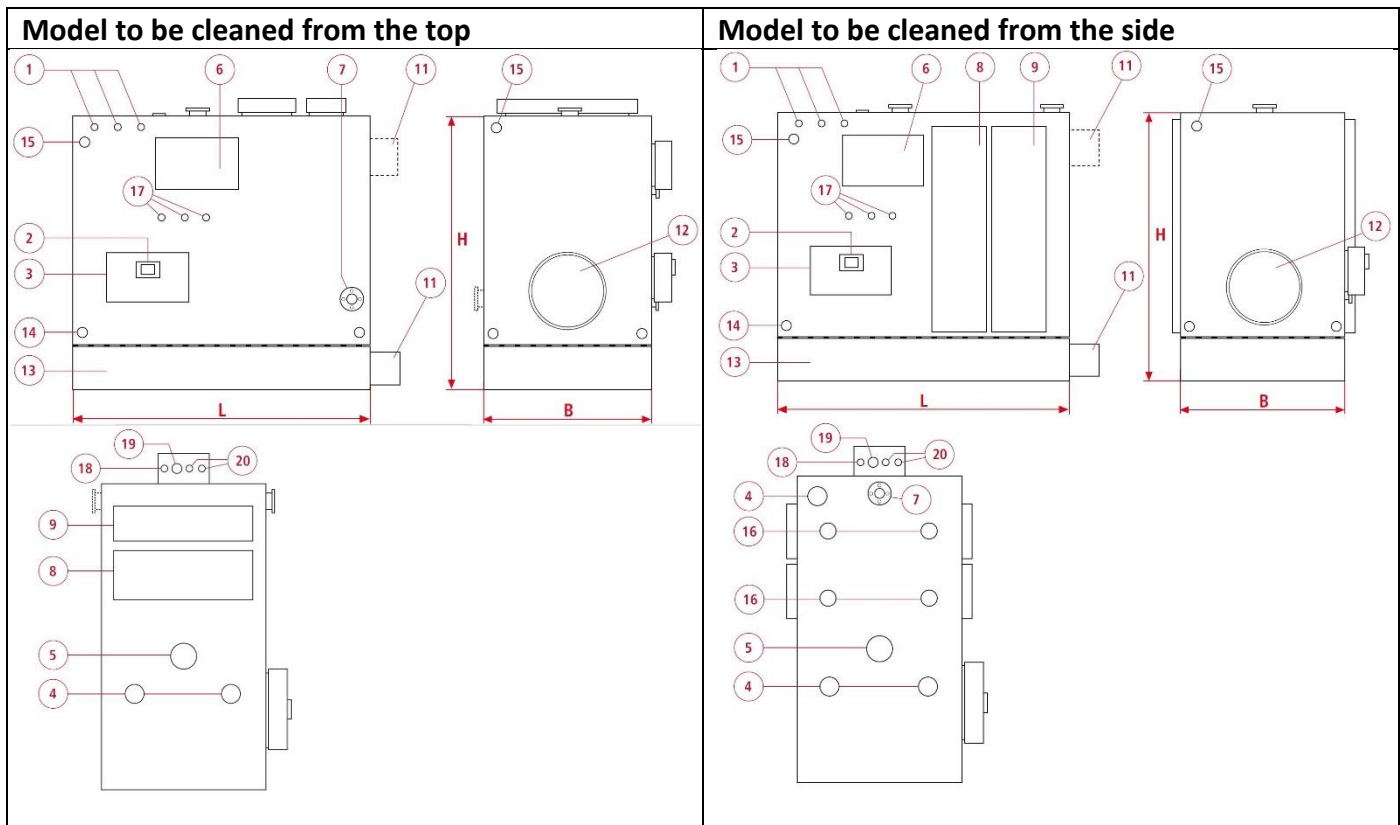
**Risk of danger of death and equipment damage!**

**Only approved and checked safety valves and plans can be used!**

**Improperly dimensioned or improperly installed safety valve can lead to uncontrolled rise of pressure and temperature, which can cause permanently damaging and life-threatening explosion of equipment.**

**NOTE!** For the selection of safety valves in the EU, the requirements of EN 12953-8 should be used and the safety valve must comply with the requirements of EN ISO 4126-1.

### 3.3.2 Boiler fittings



Number	Description	Additional info
1	Fittings for boiler water space sensors	Overheat protection, temperature transmitter, over/under pressure switch (alternatively installed in the output pipe)
2	Flame inspection glass	
3	Burner head / furnace service hatch	
4	Fitting for expansion valve / safety valve	Expansion additionally in boiler circuit
5	Flange for flow piping	
6	Service hatch	
7	Flange for return piping	
8	Front convector cleaning hatch	
9	Back convector cleaning hatch	
10	----	
11	Flue duct	Optional equipment
12	Burner hatch	Alternatively, at side, available in square shape
13	Ash chamber	Optional equipment
14	Inspection units of the boiler water space	Located in the lower corners
15	Fittings for cooling circuit piping for the burner	Needed only for water cooled burners
16	Fittings for automatic soot blowing units	
17	Fittings for furnace measurement units	Over pressure switch, pressure, temperature
18	Fittings for flue gas temperature gauge*	Can be used for flue gas analysis unit
19	Fitting for oxygen analyser*	
20	Fittings for flue gas measurements*	Temperature transmitter, flame control thermostat

\* Alternatively, in a custom-made flue gas duct

### Model to be cleaned from the side:

- 120 - 700 kW, cleaning from the side chosen by the client
- Accessory: 120 - 700 kW, cleaning from both sides
- Recommendation: 500 - 700 kW boilers, cleaning from both sides

**NOTE!** After installing the pipelines and the components following this must be done:

- Flush the pipelines and the boiler (when installing there will always be dirt from welding etc.)
- Remove carefully all air from the boiler circuit
- Check the direction of rotation of the mixing pump or correct operation of the mixing valve
- Perform hydrostatic pressure test
  - No leaks allowed!
  - Safety valve must open at the correct pressure!

## 3.4 Electrical and automation installations



**Risk of electric shock and equipment damage!**

**Electrical installations should only be done by a qualified electrician in accordance with laws and regulations, using safe components!**

**Improper electrical installations can damage the equipment and / or lead to electric shock.**

Electrical installations must be done according to electrical drawings attached. See the burner and automation centre documents.

**NOTE!** Grounding of the all electrical devices must be ensured.

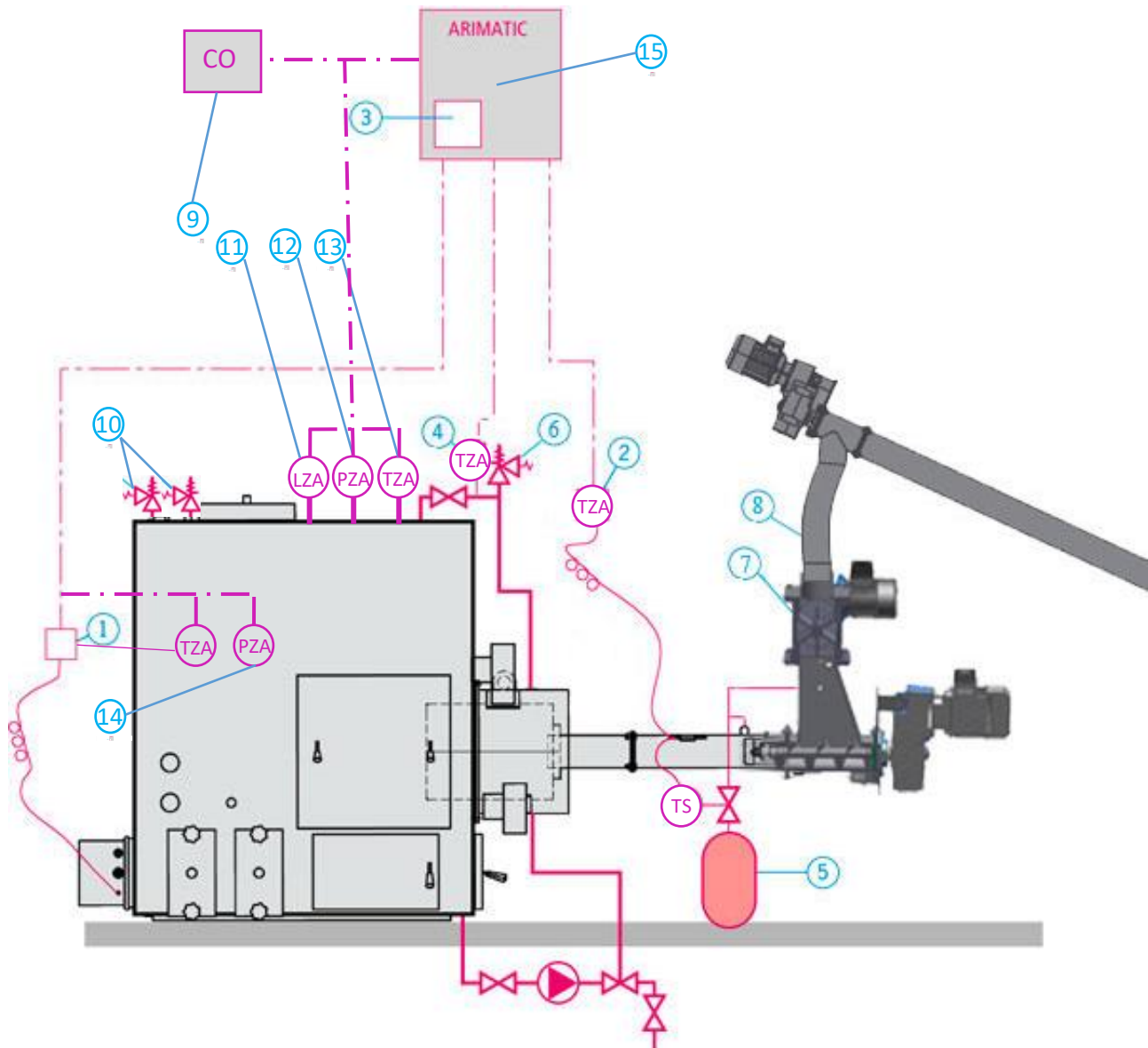
### 3.4.1 Safety systems

Ariterm Bio boiler must be equipped with necessary safety system and equipment in accordance with local laws and regulations in force. The most important safety equipment to be installed are against an over pressure, overheating, dry boiling protection (systems over 120 kW) and back-fire. Also, flame control and CO alarming (installed in boiler room) devices are important. To be sure that the boiler system is safe it is important assemble and test all safety equipment and systems before starting to operate.

**NOTE!** All safety devices must be tested to ensure safe operation before the commissioning!

**NOTE!** All safety equipment must be ordered separately if only the Ariterm bio boiler purchased!

Safety equipment shown below (1-15):



1. Flame control thermostat

- a. A flame control thermostat detects flame by flue gas temperature (can be installed into flue gas duct or furnace) if burning has stopped the thermostat will stop (temperature drops below a set point) a fuel feeding to prevent an overfill of the furnace (explosive gases can be formed or even the whole boiler can fall by force of the fuel feeding system).



2. Back-fire thermostat

- a. A back-fire thermostat will react to the raised surface temperature of the burner screw (or another fuel feeding device). See more accurate information from your system's instructions of a fuel feeding, a burner and an automation (most important). Ariterm provides an option of a pulse controlled extinguishing system for a wood chip systems where the temperature sensor detects a raised temperature before the back-fire thermostat and starts to extinguish fire with water before the fuel feeding stops.

3. UPS –battery backup (in automation centre)

- a. A battery backup ensures that all critical safety devices are powered during a blackout. See more info from your system's electric diagrams and automation instructions.

4. Overheating thermostat of a burner cooling circuit

An overheating thermostat reacts the set point of the highest allowed water temperature and the automation system will shut down the burner system when the set point is exceeded. The temperature can rise, for example, because of a water flow interference. The temperature set point cannot be higher than shown in the nameplate of the boiler (see section [1.5.1](#)) but usually other HVCA equipment like pumps demand lower set point value.



**Gas explosion risk!**

**When using a solid fuel the automation system must be design to ensure that the flue gas fan continues operating to prevent the formation of explosive combustion gases mixture.**

**The operation must be taken into account during the design and must tested before commissioning of the boiler!**

5. Extinguishing system

- a. System reacts for a raised temperature of fuel feeding system and starts to extinguish fire with water, powder, gas or etc. When used pellet (or other fuel that swells when water added) fuel it is recommended to use powder based systems because feeding systems could be jammed permanently.

6. (and 10.) Safety valve(s) of the burner cooling circuit
  - a. Safety valves are last protective devices against an over pressure, valve relieves and removes excess pressure from the boiler system. Valves (boiler 2 pcs, burner by demand) must be selected according to heating power (see [3.3.1](#)) and documents of the burner (if a safety valve demanded) and it must fulfil the demands of local regulations and laws. In EU area, may be applied standard EN 12953-8.



**Risk of an explosion and equipment damage!**

**Safety valves of the boiler does not remove the demand for safety valve of the burner cooling circuit!**

**Installing the safety valve of the burner alone can lead to the local overpressure formation in the system!**

7. Closing device
  - a. Closing device is making block between fuel feeding and fuel storage systems to prevent the spread of fire into fuel storage.
    - i. **NOTE!** Closing device can be different than a rotary feeder (e.g. like in picture) and it is not necessary when using another fuel than a pellet.
8. Dropping tube (can be used in pellet use)
  - a. A dropping tube is the last protective device in back-fire protection. If back-fire mages to spread over closing device the dropping tube will melt and blocks the way into fuel storage.
    - i. The minimum length of dropping tube is 500mm and material must melt when temperature exceed 100 °C.
    - ii. **NOTE!** The upper and lower ends cannot be directly aligned in vertically to prevent fire spreading to the fuel storage after tube is melted.
9. Carbon monoxide sensor
  - a. When using solid fuels there is always risk for a forming of a carbon monoxide. Sensor must be installed to boiler room and there must be a sound and light alarming when set point exceeded (it is not recommended to use higher values than 30 ppm, 35 mg/m<sup>3</sup> as a setpoint).
10. Safety valves of the boiler (see 6.)

11. Dry boiling guard (must be installed over 120 kW solid fuel systems)

- a. A dry boiling guard stops the system when sensor is not contact with any water. It is needed in case of water leakage or a steam / air pocket forming.

**NOTE!** An under-pressure switch alone is not enough because the pressure may be in a suitable range, but because of the gas pocket, the pressurized structures of the boiler is not water cooled and the structure can be damaged.

Device must be installed according to the manufacturer's instructions before any closing valve and highest place in the flow piping.



**Risk of an explosion and equipment damage!**

**Under any circumstances the boiler or structures of it must not be heated with flames or any heat source if isn't pressurized with water!**

**The pressure structures are dimensioned to be water cooled and if there is no cooling water flow inside the structures, the temperature of the structure material may increase significantly, thus changing the material properties so that the material cannot withstand the prevailing pressure! This can lead to significant damage to the structures and cause bursting of the structure explosively when the pressurized gas is released from the broken structure causing a life-threat to persons and permanent damage to the entire building!**

12. Pressure switches (under / over pressure)

- a. Pressure switches protect the boiler system from an under and an over-pressure. Set point of the over-pressure switch must be before safety valve operates and under pressure switch before the lowest allowed static pressure according to demand of pumps (NPSH, no cavitation allowed) and raised temperature (no boiling allowed) or another demand in the heating network (see documents of your system).

**NOTE!** E.g. height differences in the network can cause a demand for a higher value of the low setpoint of the pressure.

13. Overheating thermostat of a boiler (see 4.)

#### 14. Overpressure switch

- a. The over-pressure switch protects the furnace of the boiler from overpressure because the boiler is not designed for use as over-pressurised and in case of an over-pressurization the boiler can leak flue gases outside. If the problem causes an overpressure state in the furnace, the combustion process is stopped and the system will be operated in a safe state. When combustion process is stopped a properly sized stack causes a natural draught in the furnace and the boiler will be ventilated. It is not advisable to set the switch to a value greater than +40 Pa.

#### 15. Automation centre and software

- a. Automation centre must include the fault current protection (or installed with electrification)
- b. Components of the centre must meet the requirements
  - i. CPUs, AC drives, fault current protection, etc.
- c. Automation software must meet the essential safety requirements!

Another safety functions and equipment must be added into automation and/or electrification if required.

## 4. Commissioning and operating

### 4.1 Before starting

Before starting the boiler, it must be ensured that the boiler is filled with water and that the valves and flue dampers are open. If the furnace is lined with ceramic tiles, preheating must be carried out with extreme caution. From the point of view of the durability of the heating surfaces, it is useful to use the driest possible fuel. If wood chips with higher water content (over 30 %) are used, tiles must be installed in the furnace in order to obtain a good combustion result. If the boiler must be kept standing, for example, during summer, it must be immediately cleaned and the combustion air ducts must be kept closed in order to prevent corrosion.

#### Ensure follow things before commissioning:

- Back-fire protection is done and tested successfully
- Mechanical and electrical installations and required inspections for the whole system is done successfully
- The safety valves are tested successfully
- The automation software is pre-tested successfully
- Safety system and alarm transferring is installed tested successfully
- Electrification and qualified water supply for the boiler is ensured
- The transportation protections are removed to ensure air and water supply for the boiler and all foreign objects e.g. welding slags must and assembly equipment must be removed
- Ensure enough heat consumption for the commissioning
- Ensure the back-up during the commissioning heating system if heating is crucial e.g. risk of piping freezing,
- Operator personnel have read the all instruction attached to the boiler system with care and trained for operating of the boiler system!

#### 4.1.1 Commissioning

When starting up the boiler recommended to be done in the presence of qualified persons. Ask more about commissioning service from your supplier.

##### Commissioning procedure

1. Ensure that all tests and inspections are done successfully
2. Start one electrical device at the time and ensure the correct rotating direction of the all electric motors and devices attached before adding any fuel.
3. Make preliminary setting into your system (see more from burner and automation instructions attached).
4. First time heat up the system slowly to avoid too high heat stress for the structure of the boiler and avoid to damaging the ceramic parts (may contain moisture).
5. Make final adjusting and testing with normal heat load. Make sure that settings of the burner and/or automation doesn't allow continuous heat output more than shown in the nameplate of the boiler. Only temporary excess of the heat output is allowed but not more than 10 %.



**Risk of an explosion and equipment damage!**

**Using boiler continuous over the nominal heat output is declined!**

**A heat output excess can cause permanent damage to boiler and exposes persons to a danger! Safety system is designed for the nominal heat output and may fail when the heat output is exceeded!**

#### 4.2 Operator training

The persons that will operate the boiler system must be trained for starting to operate the boiler system to prevent wasteful, consumptive or dangerous usage of the system. Below is a list of subjects that have to go through during the induction and training. For more information, see the documentation of the complete system.

Please mark the gone through subjects in the list below (or in the separate sheet) and add new ones if needed.

## Training program

Subject	Check [- / X]
<b>Theory</b>	
<b>Combustion of wood</b>	
Gasification and gas burning	
Coal combustion	
Combustion air distribution: Primary and secondary	
Air volume and the residual oxygen	
Flue gas properties and	
Efficiency: heat losses, incombustible particles, residual oxygen	
<b>Solid fuel properties</b>	
Effect of moisture	
Effect of contaminants, objects, residues etc.	
Ash properties: amount, quality, incombustible particles	
<b>Water</b>	
Effect of air and oxygen in water	
Effect of water hardness	
Effect of temperature	
<b>Automation</b>	
Principle of automation control	
PID controls	
Instrumentation and scaling	
Sources of interference	
<b>Operating</b>	
<b>Automation interface</b>	
Menus and operating	
Actuators: manual, automatic, failure, standby	
Boiler protections and alarms	
Sensor scaling	
Measurements and alarms	
Menus and operating	
Ignition and shutdown	
Settings (fuel transportation, air flow, moving grate, oxygen, flue gas fan, soot blowing, ash screws, valves and pumps)	
Alarm recovery and troubleshooting	
Remote access	
<b>Daily routines</b>	
Checking boiler environment (leaks, smoke, noises)	
Critical measurements	
Checking combustion event and fuel	
<b>Safety</b>	
Safety systems locations, testing, acknowledgment	
Dangers: dry boiling, over pressure, carbon monoxide, solid fuel gases, fire etc	

Subject	Check [- / X]
<b>Maintenance</b>	
Boiler	
Burning equipment	
Fuel transportation	
HVAC equipment	
Flue gas fan, cleaner, soot blowing	
Ash screw	
Automation	
Testing of alarms and field equipment	
Boiler building	
Other (write down)	

### 4.3 Boiler operation

When boiler is operated ensure that mixing pump (or etc.) is running to supply a warm enough return water (**minimum +70 °C**) and flue gas fan (or natural draught) must be running to ensure the suitable under pressure (**25...45 pa**) for the furnace. The flue gases must be **at least +105 °C** in order to prevent condensation of the flue gas that causing corrosion. If the flue gases are cold at low power demand, the convection part of the boiler may partially override or the return water temperature could be raised, if possible.

**NOTE!** The stack or fluegas ducts may require higher temperatures!

For a more detailed program, see chapters [4.3.1](#) and [5.1](#).

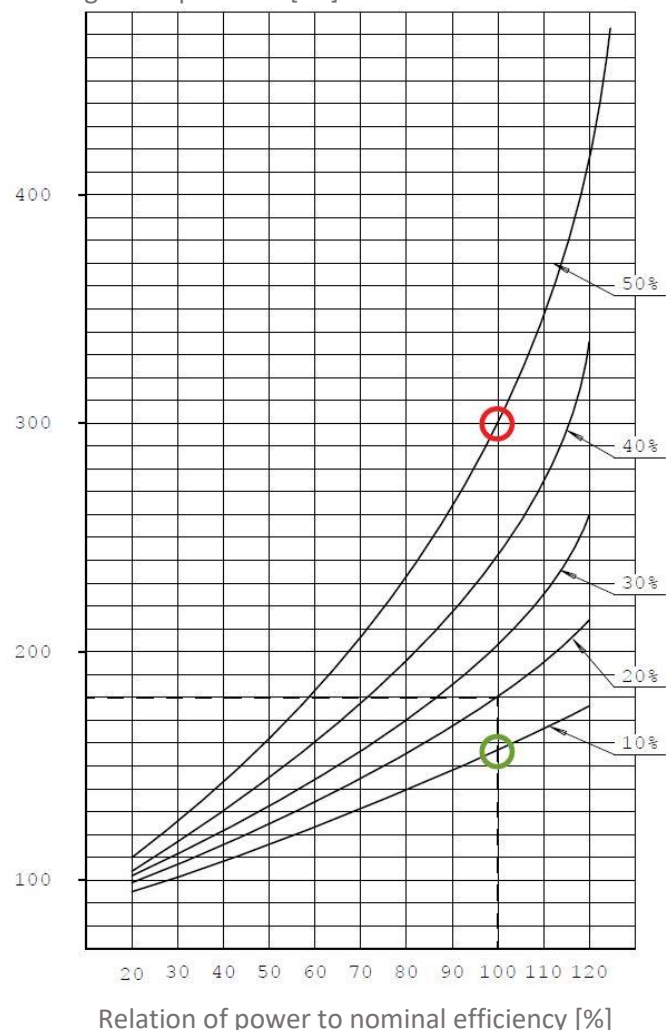
### 4.3.1 Daily operating

The Arimax Bio 120 - 3000 boilers are intended for use with automatic feeding devices. Instructions on the control and alarm functions related to fuel feeding and burning have been included in the operating instructions of the devices in question. From the point of view of the safe use of the boiler, it is important to follow all instructions of the devices to be connected to this boiler. From the point of view of the boiler, it is important to follow the following things: Influence of fuel moisture on flue gas temperature at different loads:

- Tightness of the hatches.
- Boiler water temperature and pressure.
- Ash accumulation; the ash surface must not touch the burner head.
- Changes in the flue gas heat; an increase in the flue gas temperature means that cleaning is needed.

Continuous operating routines shown in operating and maintenance program section [5.1](#)

Flue gas temperature [C °]



### 4.3.2 Influence of fuel moisture on flue gas temperature at different loads.

- The efficiency decreases with increasing fuel moisture. Fuel consumption increases.
- The efficiency increases with decreasing fuel moisture. Fuel consumption is low.

- Increased humidity results in decreased efficiency. Fuel consumption will increase.
- Dry fuel means higher efficiency. Fuel consumption will be optimal



#### **Risk of the corrosion!**

**While using crops as fuel, have to make sure by pipe connections and valves, that the inlet water temperature is at least 80°C to prevent formation of corrosive condensation on heating surfaces. It is also important to regularly control the heating surfaces of the boiler. It is good to comprehend that every fuel has its own impact on boiler's operating life.**



## 5. Service and maintenance

In order to ensure the cost-effective and safe operation of the boiler, preventive maintenance should be carried out on the boiler and the devices connected to it, the emissions should be regularly measured and the safety/alarm devices tested.

### 5.1 Maintenance and operation program

The following operation and maintenance program should be followed to maintain the warranty. It is useful to keep a record of following-up the program because, in the event of a defect in the warranty, the owner must prove that the program has been followed.

Operation	Check	Action	Frequency
<b>Operative</b>			
Checking return water temperature of the boiler (must be at least <u>70 °C</u> )	X	X*	2...3 x week (continuous)
Checking flue gas temperature of the boiler (must be at least <u>105 °C</u> )	X	X*	2...3 x week (continuous)
Checking the residual oxygen level** (see values form your system or burner instruction)	X	X*	2...3 x week (continuous)
Basic perception: no annoying noises, no leaks of water, flue gas, fuel, gear oil or etc., condition of combustion	X		1 x week
General tidiness (safety)		X	1 x week
Cleaning of the ash chamber and ash removal	X	X*	1 x month
<b>Maintenance</b>			
Complete cleaning of the boiler		X	2 x year
Cleaning of under pressure connections		X	2 x year
External water tightness	X		2 x year
Condition of hatch gaskets and replacement*	X	X*	2 x year
Condition of hatch ceramics and replacement*	X	X*	2 x year
Condition and adjustment* of hinges and latches	X	X*	2 x year
Condition and cleaning* of the flue ducts (tightness)	X	X*	2 x year
Condition and replacement* of the boiler ceramics**	X	X*	2 x year
Condition and cleaning* of the fire surfaces (visual)	X	X*	2 x year
Testing analogue gauges with reference meter	X		1 x year
Condition and maintenance* of the ventilation air fan / intake	X	X*	1 x year
Condition and maintenance* of pumps, valves and other HVCA equipment**	X	X*	1 x year

Operation	Check	Action	Frequency
<b>Safety equipment</b>			
Testing flue gas flame control switch (flue gas duct or furnace)		X	2 x year
Testing back-fire protection		X	2 x year
Testing boiler water overheating thermostat		X	2 x year
Testing dry boiling guard**		X	2 x year
Testing under and over-pressure switches		X	2 x year
Testing over-pressure switch of the furnace		X	2 x year
Testing GSM -alarm / alarm transferring**		X	2 x year
Testing safety valve (pressure test for opening pressure)		X	1 x year

\*Action done if needed

\*\*If available

## 5.2 Cleaning

The furnace is cleaned through the fire hatch of the boiler. The boilers equipped with a furnace shelf also have a service hatch in the upper part of the furnace. The burner or firing equipment is serviced through the fire hatch. The cleanliness of the convectors significantly affects the efficiency of the boiler. In the model to be cleaned from the top, the convection part is cleaned from the hatches located on the top of the boiler by vertically brushing all gaps. In the model to be cleaned from the side, the convection part is best cleaned by means of a rotating brush used with a drilling machine.

The detached soot flows to the ash pan located under the convector and from there it is removed after cleaning.

**NOTE!** The boiler is easier to clean if it is first let to cool down for a moment. The burner must not be on during cleaning! The flue gas exhauster should be kept on during sweeping. This reduces the amount of ash that accumulates in the boiler room.

### 5.2.1 Sweeping of a top cleaned model



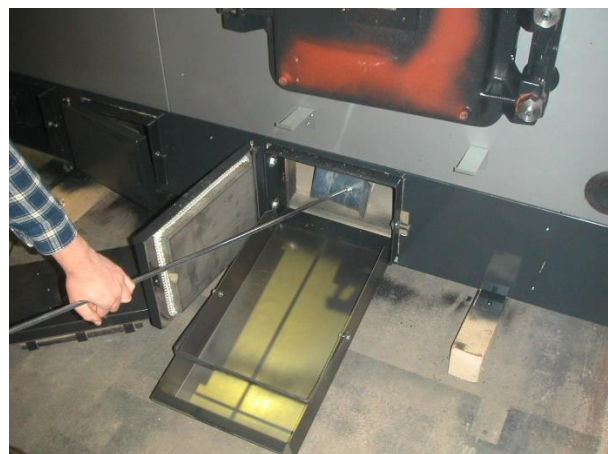
1. Open the sweeping hatches located on the top of the boiler.



2. Fasten the brush part to the handle and brush one duct at a time.



3. Push the brush down and then pull it up.



4. Sweep the ash fallen onto the ash chamber and put in the ash box.

## 5.2.2 Sweeping of a side cleaned model



1. Open the sweeping hatches located on the side of the boiler.



2. Fasten the rotating brush to the handle and then these to the drilling machine.



3. Push the brush to the convection part.



4. Correct grip: one hand on the drilling machine.

**NOTE!** Evenly clean the convection part using a rotating brush (a few gaps at a time). Keep the handle horizontal the whole time. Repeat the same procedure until the convection part is completely cleaned.



5. Sweep the ash fallen onto the ash pan and put it in the ash box.



6. The furnace does not usually require separate cleaning. Correctly regulated combustion keeps the furnace clean. An ash shelf is installed under the furnace hatch.

### 5.3 Damage repairing

If the boiler is damaged during the guarantee time the original spare parts must be used (see chapter [5.4](#))! Ask parts from your reseller. Simple parts can be replaced by a professional person. If a damage causes need for a structure repair for the pressurized parts and the repair corrective action plan must be done (welding drawings etc.) be in contact with your reseller.

Repairing the pressurized structure must be always fulfill the regulations of the pressure equipment directive.

When components or equipment repaired follow the manufacturer's instructions.

## 5.4 Common spare parts

Part	Model / additional info	Ariterm title
<b>Brush arm</b>	Ø22 x 1000 mm	17638
Brush arm	Ø22 x 1500 mm	17637
Brush arm	Ø22 x 2000 mm	17636
Rotating brush arm	L = 1000 mm	10298
Rotating brush arm	L = 500 mm (extension)	8640
Scraper plate	M12 connection	1321
Ball knob	P40xM12 SK	17659
Combustion chamber brush	85 x 110	13104
Brush	50 x 130	13104
Rotating brush (incl. M12 nut)	Ø130 / M12	3495
Cleaning hatch	A240/A340-3150, Bio	Q24003
Cuff D79/31	Tpe -plastic 3/4IN 224075	5789
Fire resist vault ceramic	57X123X275	1602
Handle	GN 99.5-125-M16	1392
Hinge end sleeve	BIO 700-2000	1315
Hinge for filling hatch		10992
Hinge for filling hatch	Bio 120-2000 5417	1280
Isolation ceramic	1000X302X50 Thermax HD 1200	13399
Isolation ceramic	50x320x435 BHL	15838
Lock handle	GN300-92-M12-SW	379
Observation glass	4x78x96	10021
Observations class	D3X79	14731
Oil burner hatch isolation stone		14314
Packing rope	20x20, Uses in convection hatches	13020
Packing rope	25x30	1508
Packning (fiberglass) with silicone surface	16x16	5138
Polyamide sleeve	SB-L-02	10183
Pressure spring	LO=60 3X19X60 MM	5109
Reflector stone	for upper service hatch, Bio 200-3000	15812
Reflector stone	for upper service hatch, Bio 200-3000, 42x200x300	8766
Reflector stone	under convection hatch, Bio 1000kW B51021 628x346x50	1452
Reflector stone	under convection hatch, Bio 1500kW B51521a 720x338x50	10227

Part	Model / additional info	Ariterm title
Reflector stone	under convection hatch, Bio 2000-3000kW B52021b 50x379x550	1832
Reflector stone	under convection hatch, Bio 200kW B420-21a 686x298x50	10930
Reflector stone	under convection hatch, Bio 250kW B425-21a 736x298	10931
Reflector stone	under convection hatch, Bio 300kW B430-21a 786x338x50	10932
Reflector stone	under convection hatch, Bio 400kW B440-21a 886x338x50	10933
Reflector stone	under convection hatch, Bio 500kW B50521a 420x116x50	10032
Reflector stone	under convection hatch, Bio 700kW B50721b 510x106x50	10033
Regulation nut	H25, H26 P.4131137/2	3646
Screw hook	DIN444 M16X120	3326
Service hatch	353x465 Bio 120-3000, BioComp 200-300	QBHL0001
Service hatch isolation ceramic	Bio 200-3000kW	13648
Tightening nut	H25, H26 P.4131137/1	3644
Tightening pin	BIO 120-2000 5419	1282











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