

INSTALLATION AND OPERATING GUIDE



Read this guide carefully before mounting, commissioning or maintenance



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1. Introduction

1.1 Provision of release from responsibility

A burner with accompanying devices is always a part of a wider range of equipment. This document does not contain full instructions for mounting, operating and maintenance of the complete equipment package. The designer of equipment package is responsible for designing the equipment package with proper qualification. The equipment package should be designed and installed in accordance with the local regulations and requirements.

Before starting up the system for the first time or after a long break, before installation, commissioning, adjusting or system maintenance, read this manual carefully! The owner of the system must provide proper trained personnel for the use and training must correspond to the local regulations and requirements that are stated for the operations related to the use. The user should also understand and be able to identify the possible hazards while working with the equipment.

This guide's content is based on the limited equipment information that is currently available. Besides this guide, one should also read the instructions for other equipment kit and for example, **instructions for the automation system** which is developed for each case separately. Failing to follow these instructions and instructions for other equipment, may result in the damage to the property or the creation of hazardous situations for personnel, property or environment.

Ariterm Energy Ltd is not liable for any damages if:

- the instructions, stated in this document, are violated
- the instructions, related to the other kit equipment, are violated
- equipment or equipment package is used not for its designated purpose
- user of the equipment or equipment package does not have the proper competency
- spare parts, which Ariterm has not delivered or approved, are used

The product has a limited warranty. The product modifications that are not agreed with Ariterm Energy Ltd, entails the cancellation of the guarantee obligations and releases Ariterm Energy Ltd from obligations of the equipment manufacturer.

1.2 Warranty

The manufacturer grants one (1) year warranty for this device. The warranty is valid from the day of commissioning or up to 18 months from the date of delivery. For pressure vessel that is manufactured by Ariterm Energy Ltd, the warranty is 5 years from the date of delivery. The warranty covers possible work and raw material defects. The warranty does not cover wear parts.

1.3 Decommissioning

The clapped out is suitable for scrap collection. NB! It is recommended that the body of the burner in the pressure register to be punctured to prevent possible misuse!

1.4 Burner data



Please put the burner data in the table below as you receive the product. Thus, the information will always be close at hand while performing repair and maintenance.

BURNER DATA:

Number of project or Ariterm order	
Article and manufacture year	
Mounting and commissioning dates	
Used fuel	
Assembler / Mounting company with contact details	

KEEP THE OPERATION GUIDE AND ELECTRICAL CIRCUITS OF THE PRODUCT IN CLOSE PROXIMITY TO THE PRODUCT.

1.4.1 Pressure device palate details

200...700 kW					
Model	200 kW 4 bar	300 kW 4 bar	400 kW 6 bar	500 kW 6 bar	700 kW 6 bar
Marking standard	EN 12953-5	EN 12953-5	EN 12953-5	EN 12953-5	EN 12953-5
Manufacturer and address	Ariterm Energy Oy, Uuraistentie 1, 43101 Saarijärvi, Finland				
Year of manufacture	See the plate	See the plate	See the plate	See the plate	See the plate
Serial number	See the plate	See the plate	See the plate	See the plate	See the plate
Maximum allowable pressure, bar	4	4	6	6	6
Maximum allowable output temperature, °C	135	135	150	150	150
Maximum allowable heat output, kW	200	300	400	500	700
Hydrostatic test pressure, bar	7	7	10,4	10,4	10,4
Date of the hydrostatic test pressure	See the plate	See the plate	See the plate	See the plate	See the plate
Safety valve set pressure, bar	4	4	6	6	6
Identification mark of the Responsible authority	0424	0424	0424	0424	0424
CE label					
					
1000...2000 kW					
Poltinmalli	1000 kW 10 bar	1500 kW 10 bar	1500 kW 20 bar	2000 kW 10 bar	2000 kW 20 bar
Marking standard	EN 12953-5	EN 12953-5	EN 12953-5	EN 12953-5	EN 12953-5
Manufacturer and address	Ariterm Energy Oy, Uuraistentie 1, 43101 Saarijärvi				
Year of manufacture	See the plate	See the plate	See the plate	See the plate	See the plate
Serial number	See the plate	See the plate	See the plate	See the plate	See the plate
Maximum allowable pressure, bar	10	10	20	10	20
Maximum allowable output temperature, °C	175	175	214	175	214
Maximum allowable heat output, kW	1000	1500	1500	2000	2000
Hydrostatic test pressure, bar	18,4	18,4	36	18,4	36
Date of the hydrostatic test pressure	See the plate	See the plate	See the plate	See the plate	See the plate
Safety valve set pressure, bar	10	10	20	10	20
Identification mark of the Responsible authority	0424	0424	0424	0424	0424
CE label					
					

1.5 Safety

Before starting mounting, commissioning or maintenance, read carefully this manual and the instructions for other equipment kit. The safety related symbols in this document are divided into two groups and are presented below:



DANGER! This symbol indicates a risk of injury or danger to life.



WARNING! This symbol indicates that failing to follow the operating instructions for the product may cause damage to product or environment.

‘NOTE!’-icon highlights the importance of the equipment provisions in the text.



Risk of fire and/or explosion of non-flammable gases!

Opening the hatches or accompanying equipment during operation or sudden power shutdowns is prohibited!

Before opening the hatches or accompanying equipment, turn off the burner and ventilate the room.



Risk of unauthorized operation!

If the burner is installed in an unlocked room, the hatches must be equipped with a locking mechanism that can only be opened with a special tool!

For this purpose you can use for example, nuts and bolts.

**Risk of electric shock or unexpected operation!**

Before maintenance or inspection of the burner, all safety switches of the accompanying equipment must be set to 'OFF' mode and locked!

**Risk of burns, damage to the skin, ears, suffocation and/or getting stuck!**

Going inside the burner alone, without proper equipment, is prohibited! If maintenance or inspection is to be carried out inside the boiler, a hatch guard must be present. The burner and the boiler connected to it must be carefully ventilated, it must be ensured that the temperature is not too high, there is no burning ash, hazardous debris, or any objects in the ash pan.

The necessary equipment includes a protective mask, an ash-impermeable overall, protecting the entire skin and a gas analyzer!

**Risk of burns!**

Opening the pipes or connections during burner operation is prohibited! Avoid touching metal surfaces near the boiler!

If any pipelines or appliances are opened for maintenance, repair or inspection purposes, the burner should be cooled if possible. If an emergency situation requires the opening of a still hot boiler, special care must be taken and necessary protective equipment must be used.

1.6 General description

Ariterm bio-burners correspond to the modern operation and safety requirements, concerning the burning of wood chips and pellets. BioJet Multi -burner is a high efficiency burner, equipped with moving grate bars and water cooling, and is designed to use wood pellets corresponding to ISO 17225-2 standard. The automation system controls the burner by providing fuel and air to the burner. Air, through separate fans, is divided into primary and secondary air and the fuel is converted into gas on the burner's grate bars.

The power supply system can include one or two feeding augers and a fuel storage. Augers and fuel storage are selected according to the used fuel. In multi-screw systems, there is a sensor between the screws, which ensures that fuel is constantly supplied to the burner. If the equipment includes a walking floor storage, the automation controls it.

The grate bars are made of fire-resistant cast iron. BioJet Multi -burner's water cooling is attached to the water circuit of the boiler. The maximum pressure class is 20 bar (1000–1500 kW 10 bar, 2000 kW 10/20 bar).

Burner's automation system controls the equipment based on the water temperature sensor in the boiler. When operating in normal mode, the control logic continuously adjusts the power in the range from 21 to 100 % (**NOTE!** The burner output in kW corresponding to the value of % depends on the burner power settings). If it is necessary that the heat output should be lower than the power in kW, corresponding to 21 %, the burner is set into so-called power standby mode.

More detailed description of the burner operation is can be found in a separate document, which is available upon request.

The protective equipment varies, depending on the fuel and power system that is chosen. Please note that the selected fuel also affects the content of the equipment kit. In paragraph [3.3.3](#), it is shown the standard protective equipment, while using pellets as a fuel.

1.6.1 Brief description of functioning

General part, connection to the main boiler

Burner characteristics (power, pressure, temperature, water volume) are shown in the product nameplate. The burner is designed for connection to the main boiler, which is a part of the equipment kit to produce hot water or steam at low pressure. The water compartment of the burner is connected either directly to the boiler through flanges or to the return / supply circuit. The burner fire chamber (front side) is connected by an adapter as a part of fire chamber of the main boiler. From the back side of the burner, it is connected the fuel supply system and automatic ignition, as well as burning control sensors. The burning control equipment is connected to the burner housing with sensors. The burner is equipped with movable grate bars that distribute the fuel in the front side of the burner and remove the ash from the back side of the burner into the ash pit of the main boiler.

Fuel supply and ignition

The fuel is supplied to the burner with the help of a powered screw with pulse or frequency control. Fuel is ignited automatically by hot air. The ignition is controlled by optical or thermal sensor.

Burning air control

In models with a channel system, burning air is controlled by fans with a frequency converter that maintains the pressure which is set in the air channels. Air in the burning air zone is controlled by dampers and air circulation measurements. In burners, equipped with separate fans, primary air fans are controlled directly based on the airflow in the burning zone. Secondary air fans are controlled based on the set speed. Different burning zones' airflow requirements come from a power controller and in addition, secondary and tertiary air is possible to adjust according to the residual oxygen measurements. With the help of primary air, the fuel is converted to gas, and residual coal is burnt. Secondary and tertiary air is used to burn flue gases and adjust air quantity based on the residual oxygen measurements.

Grate bar movement

Grate bar movement is carried out either by a linear motor or by a hydraulic drive by means of power controller according to the principle of "work/pause". In the system of moving grate bars, layers of moving and fixed fire-bars are alternated. From the back side of grate bars, ash falls into the ash pan, where it can be removed automatically.

Cooling

Burner's cover is cooled by boiler, return or feed water and by this, cooling energy is supplied for heating or vaporization process.

Safety equipment

Fuel supply is equipped with a reverse burning thermostat and an autonomous powder fire extinguishing system. In the cooling circuit, overheat thermostat and safety valve are included. Safety equipment is described more detailed in paragraph [3.3.3](#). The automation system is described in a more detailed way in its own document.

1.6.2 Fuel



RISK OF DAMAGING THE STRUCTURE AND INADEQUATE EQUIPMENT OPERATION!

WHEN USING PELLETS, THAT ARE NOT CORRESPOND TO THE STANDARD ISO 17225-2, CHECK THE THEIR SUITABILITY AS A FUEL FOR THE BURNER FROM YOUR FUEL SUPPLIER OR BURNER SELLER!

INAPPROPRIATE FUEL MAY CAUSE DAMAGE TO THE EQUIPMENT OR ITS INSUFFICIENT WORK!

Wood pellets corresponding to ISO 17225-2 are used as a fuel in the standard burner. If you are going to use other pellets, it must be agreed with Ariterm Energy Ltd. Other types of fuel such as, briquettes, require modernization of the fuel feeding gear and standard version of the burner is not suitable for them.

1.7 Transporting, unloading and storing the equipment

At the factory, the burner is packed for transportation and short-term storing. However, the packaging, depending on the method of transportation and storage location, requires additional protection to avoid e.g. moisture, external damage or an act of vandalism. See fig. 1 below.



Figure 1. Burner, packed for domestic transportation inside Finland.

The burner is always a part of the equipment kit. If you are transporting it by yourself, it is important to tie the packs to each other and to the vehicle in order to avoid damage during transportation and to ensure traffic safety. Driver is always responsible for the correct loading and tightening of the load. Loading and unloading parts must be done carefully to avoid any damages.

Items can be lifted on pallets, or by lifting with the help lifting loops (see figure 2). The equipment can be stored outdoors if it is protected from soil moisture and rain. Long-term storage requires a better storage space. It is recommended to store the equipment indoors, because it has many sensitive parts, such as electric motors and sensors.



Figure 2. poltin nostettuna nostosilmukoista.

1.7.1 Receiving the product and unloading it

When receiving the products, check whether the content of delivery corresponds to what you ordered and the attached final inspection report and device list. In unclear cases, contact the seller of the product. Before starting the mounting, one should carefully read this document for the burner and also the mounting guides for boiler, automation system and fuel storage. Thus, you can confirm that from the mounting point of view of, all the critical aspects and dimensions are considered.

Details of the Ariterm's biosystem should always be assembled by qualified personnel and in accordance with the requirements. Installation is recommended to do in the following order:

1. Install the boiler and the burner in their places, pipes and smoke outlet must not be connected.
2. Install the pellet silo in its place.
3. Install screws between the fuel storage and the burner.
4. It is recommended to do the final and precise installation of the boiler and the burner after the screws are fitted.
5. The installation of pipes and electrical work are performed last.

1.7.2 Installation and operating environment requirements

- The boiler room must be constructed in accordance with building regulations (E9 Construction rules collection, additional information can be obtained from the fire inspector at the location)
- Mounting and operation temperature $0 \pm 40 \text{ }^{\circ}\text{C}$
- Opening for compensating air. Recommended area $5 \text{ cm}^2/\text{kW}$ ($= 0.5 \text{ m}^2/\text{MW}$)
- The humidity of the boiler room is 20...80 % (to avoid moisture condensation).

1.7.3 Necessary connections

- Connecting the motors, drive mechanisms and instrumentation to the logic
- Scheme of burner cooling to boiler or return water
- Water for automatic fire extinguishing (while using wood chips, etc.)
- When using pellets, powder fire extinguishing system is recommended
- Mounting of safety valves and their vent pipes

1.7.4 Space requirements

Please note that for both the burner and feeding screw there must be enough space between the boiler and boiler wall. During the design, it is recommended to provide the necessary space for burner dismantle for maintenance (e.g. the doorways). Between the wall and the boiler, it is recommended to leave at least 1 m of free space on the side where sweeping and maintenance work is performed. Please take into account the requirements for the equipment kit.

Space behind the burner (back side of supply equipment – back wall) **Required opening size for transportation**

1200 mm	L = 1800 mm, K = 2500 mm
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These distances are given for the burner kit, that is mounted on the transport trolley and contains pre-installed air channels and pipelines. Please note that the distance between the boiler and the wall is different for different models.

1.7.5 Water compartment connections and water quality

Water for burner cooling can be taken directly from the bottom side of the boiler, where the water has already been preheated. If the water is taken from the return or supply water circuit to the boiler, it is necessary to ensure that the water temperature of **at least +70 °C** by adding hot water to the return water (mixing circuit) or using an economizer. In addition, burner's cooling circuit must be connected to a pressurizing unit to ensure proper water pressure during normal operation. Water quality must meet with the requirements of standard 12953-10.

1.8 Supply content

HUOM! Polttimiin on voitu sopia lisävarusteita tai tapauskohtaisia räätälöintejä, jotka tulee varmistaa tilausvahvistukselta tai laitteen myyjältä. Alla on lueteltu tyypillisimmät toimituslaajuudet.

200...700 kW

No.	Part	200 kW [pcs]	300 kW [pcs]	400 kW [pcs]	500 kW [pcs]	700 kW [pcs]
1	BioJet Multi	1	1	1	1	1
2	Hexagon screw M12x20	12	12	12	12	12
3	Washer M12	12	12	12	12	12
4	Heat-resistant silicone	1	1	1	1	1
5	Heat-resistant sealing fabric	1	1	1	1	1
6	Clamping strap (Ø114mm pipe)	2	2	2	2	2
7	Fan G3G146HK0711/12***	*1/1	*0/0	*0/0	*0/0	-
8	Fan G3G180-AD43-71***	*0/0	*1/1	*1/1	*1/1	-
9	Fan CMP-512-2T	*1/1	*0/0	*0/0	*0/0	*0/0
10	Fan CMP-514-2T	*0/0	*1/1	*0/0	*0/0	*0/2
11	Fan CMP-616-2T	*0/0	*0/0	*1/1	*1/1	*2/0
12	Fixing screw for fan M6x12	8	8	8	8	16
13	Fixing nut for fan M6	8	8	8	8	16
15	Spindle motor LA36 iFLEX 150mm	1	1	1	1	1
16	Over heat thermostat heat-THERM-AT 603070/0070-5	1	1	1	1	1

1000...2000 kW with separated fans

No.	Part	1000 kW [pcs]	1500 kW [pcs]	2000 kW [pcs]
1	BioJet Multi	1 + 1	1 + 1	1 + 1
2	Hexagon screw M12x20	12	12	12
3	Washer M12	12	12	12
4	Heat-resistant silicone	1	1	1
5	Heat-resistant sealing fabric	1	1	1
6	Clamping strap (Ø114mm pipe)	2	2	2
7	Fan CMP-514-2T	*0/0	*2/0	*0/0
8	Fan CMP-616-2T	*2/2	*1/0	*3/0
9	Fan CMP-718-2T	*0/0	*0/1	*0/0
10	Fan CMP-820-2T	*0/0	*0/1	*0/3
11	Fixing screw for fan M6x12	16	20	24
12	Fixing nut for fan M6	16	20	24
13	Spindle motor LA36 iFLEX 150mm	1	1	1
14	Over heat thermostat heatTHERM-AT 603070/0070-5	1	1	1

1000...2000 kW with air ducts and trolley

No.	Part	1000 kW [pcs]	1500 kW [pcs]	2000 kW [pcs]
1	BioJet Multi mounted on a trolley (includes pre-mounted air ducts and pipes) + PS-13 pellet feeder (includes powder extinguishing system)	1 + 1	1 + 1	1 + 1
2	Hexagon screw M12x20	12	12	12
3	Washer M12	12	12	12
4	Heat-resistant silicone	1	1	1
5	Heat-resistant sealing fabric	1	1	1
6	Clamping strap (Ø114mm pipe)	2	2	2
8	Fan CMP-922-2T-3	*1/1	*1/1	*0/0
9	Fan CMP-1231-4T-3	*0/0	*0/0	*1/1
10	Fixing screw for fan M6x12	12	12	12
11	Fixing nut for fan M6	12	12	12
12	Air damper NM24A-SR	4	5	6
14	Ignition fan Igniter BM4	2	2	2
15	Spindle motor LA36 iFLEX 150mm	1	1	1
16	Cooling pump TP 50-60/4 A-F-A-BUBE**	1	1	1
17	Differential pressure transmitter PEL-DK	2	2	2
18	Air flow sensor IVL 20	4	5	6
19	Over heat thermostat heatTHERM-AT 603070/0070-5	1	1	1
20	Back fire thermostat heatTHERM-AT 603070/0000-2	1	1	1
21	Optical flame sensor QRB1C A050B40A	1	1	1

* Primary / Secondary

** Can vary case-by-case and is not suitable for above 20 bar pressure or 120 °C water temperature

*** EC fans when connected control centre that supports EC control

2. Technical data**200...700 kW**

Poltin	200 kW, 4 bar	300 kW, 4 bar	400 kW, 4 bar	500 kW, 4 bar	700 kW, 4 bar
Power output range [kW] (= power sustaining mode)	(30), 40...200	(45), 60...300	(60), 80...400	(75), 100...500	(105), 140...700
Fuel feed* [kg/h wood pellets] (= power sustaining mode)	(6,5), 8,7...43,6	(9,8), 13,1...65,4	(13,1), 17,4...87,2	(16,4), 21,8...109	(22,9), 30,5...152,6
Burning air requirement** [Nm ³ /h]	400	600	800	1000	1400
Min. operating temperature [°C]	20	20	20	20	20
Max. operating temperature [°C]	135	135	150	150	150
Max. operating pressure [bar]	4	4	6	6	6
Water volume [dm ³]	30	45	80	80	162

1000...2000 kW

	1000 kW, 10 bar	1500 kW, 10 bar	2000 kW, 10 bar	2000 kW, 20 bar
Power output range [kW] (= power sustaining mode)	(150), 200...1000	(225), 300...1500	(300), 400...2000	(300), 400...2000
Fuel feed* [kg/h wood pellets] (= power sustaining mode)	(33), 44...218	(50), 65...327	(65), 87...436	(65), 87...436
Burning air requirement** [Nm ³ /h]	2000	3000	4000	4000
Min. operating temperature [°C]	20	20	20	20
Max. operating temperature [°C]	175	175	175	214
Max. operating pressure [bar]	10	10	10	20
Water volume [dm ³]	184	330	350	295

All models

Ambient temperature [°C]	+10...45
Relative humidity of ambient air	< 95 %

* Fuel consumption is affected by the full efficiency and quality of pellets. Calculations presented in the table are made at the efficiency of 90% and the heat of pellets burning of 16.5 MJ/kg (limiting value according to ISO 17225-2).

** NTP conditions (1,013 bar, 0 °C)

2.1 Technical data of the electrical components

Equipment	Capacity	Electric power	Current	Voltage	Input / Output
Fan G3G146HK0711/12****	450 m ³ /h, 550 Pa	0,163 kW	1,3 A	1x230 Vac, 50 Hz	0...10 Vdc
Fan G3G180-AD43-71 ****	895 m ³ /h, 625 Pa	0,51 kW	3,15 A	1x230 Vac, 50 Hz	0...10 Vdc
Fan CMP-512-2T*	200 m ³ /h, 380 Pa	0,08 kW	0,55/0,32 A	3x230/400 Vac, 50 Hz	
Fan CMP-514-2T*	400 m ³ /h, 580 Pa	0,18 kW	1,21/0,7 A	3x230/400 Vac, 50 Hz	
Fan CMP-616-2T*	800 m ³ /h, 620 Pa	0,55 kW	2,57/1,49 A	3x230/400 Vac, 50 Hz	
Fan CMP-718-2T*	1000 m ³ /h, 900 Pa	0,75 kW	2,8/1,62 A		
Fan CMP-820-2T*	1400 m ³ /h, 1100 Pa	1,1 kW	4,2/2,4 A	3x230/400 Vac, 50 Hz	
Fan CMP-922-2T-3*	2600 m ³ /h	2,2 kW	7,77/4,47 A	3x230/400 Vac, 50 Hz	
Fan CMP-1231-4T-3*	4740 m ³ /h	2,2 kW	8,36/4,83 A	3x230/400 Vac, 50 Hz	
Control damper NM24A-SR	10 Nm, 95 °/ 150s	2 W / 4 VA		24 Vdc/Vac	0...10 Vdc
Closing damper LF24-S	4 Nm, 95 °/ 150s	5 W / 7 VA		24 Vdc/Vac	open / close
Ignition fan Igniter BM4		1,6 kW	7 A	1x230 Vac, 50 Hz	

Spindle motor LA36 iFLEX 150mm**	10 000 N, 7 mm/s		10,4 A	24 Vdc	24 Vdc
Cooling pump TP 50-60/4 A-F-A BUBE***	17.1 m ³ /h, 4,2 m (head)	0,37 kW	1,90/1,10 A	3x230/400 Vac, 50 Hz	
Differential pressure transmitter PEL-DK	-100... +100 Pa	1,0 VA / 1,5 VA		24 Vdc/Vac	0...10 Vdc or 4...20 mA
Air flow sensor IVL 20	0...20 m/s	1,5 W / 1,5 VA		24 Vdc/Vac	4...20 mA
Over heat thermostat heat-THERM-AT 603070/0070-5	20...150 °C			24 Vdc	NC/NO
Back fire thermostat heatTHERM-AT 603070/0000-2	0...120 °C			24 Vdc	NC/NO
Optical flame sensor QRB1C A050B40A	0...100 %			10 Vdc	0...10 Vdc

* Control requires a frequency converter

** Control requires a power supply of 230 Vac/24 Vdc

*** Can differ if operation conditions outside the pump's capability

**** Requires 0...10 V control

3. Installation



Risk of death, equipment damage or accident!

Boiler mounting must be carried out only by an authorized mounting company. Mounting must be carried out in compliance with applicable laws and regulations. Mounting of pipelines and installation of electrical equipment can be carried out only by an authorized installation company.

Incorrect mounting can cause vapor explosion, electric shock, mechanical danger (compression etc.) or equipment operation with reduced capacity or improper use!

The burner is designed for operation in Ariterm's bio-boilers which output power corresponds to the output power of the used burner. While using a different boiler, the compatibility of the burner should be checked with the seller.

Burner is bolted to the boiler and the joint is sealed with heat-resistant silicone. The joint must be hermetically sealed. The bolts are tightened crosswise. If the boiler's opening for the burner is square, one must use the flange adapter (accessory).

3.1 Before starting

Burner and boiler compatibility



Risk of receiving a disabled kit!

The compatibility of boiler system and other equipment must always be checked!

Incorrect selection of boiler system or other equipment can lead to the concentration of hazardous ash, too high surface temperatures, excessive formation of flue gases or improper system functioning.

Before starting the equipment installation, please make sure that the burner is compatible with the boiler. If the burner is connected to an old boiler or to a boiler that is not produced by Ariterm Energy Ltd, check the size of the burner opening and find out if a separately designed flange adapter is required. In case of using a boiler, which is not produced by Ariterm Energy Ltd, it must also be ensured that the size of its fire chamber is sufficient. This is done because BioJet Multi -burners require a larger fire chambers than e.g. traditional oil burners. If it is necessary, a front fire chamber must be installed between the boiler and the burner which must always be designed in conjunction with Ariterm.

Designing the piping

When designing the piping, operation temperatures and pressures must be taken into account and choose the pipe materials / sizes etc. according to this. Inside the EU, it's recommended to use the standard EN 13480.

NOTE! Make sure that the boiler's return water is warm enough (≥ 70 °C) when designing the piping.



Too cold return water to the boiler causes corrosion and reduce the quality of burning.

3.2 Permits and regulations

Permission for pressure equipment mounting and its content

The burner is always a part of a pressure equipment kit. Hence, while placing the equipment, local regulations must be taken into account.

Particularly, attention must be paid to the following:

- Assessment of pressure equipment compliance, PED 2014/68/EU (EU Directive, Equipment, operating under pressure) in accordance with classification of Article 13 (it is recommended to use directive PED 2014/68/EU, the procedure in accordance with Annex III, paragraph 10, 'Module G')
- If it is necessary, the accommodation project is prepared (in Finland, see the Act about pressure equipment, 1144/2016, § 7)
- Registration of pressure equipment (in Finland, see the Act about pressure equipment, 51 §, Regulation 1549/2016, 6. The limit is 1 MW because solid fuel is used)
- If it is necessary, order the first planned inspection of pressure equipment kit, (in Finland, see the Act about pressure equipment 1144/2016, § 55)
- Control measures (in Finland, see the Act about pressure equipment 1144/2016, § 54)

Structural boiler changes

If the housing of the old pressurized boiler undergoes structural changes, these changes must be made in accordance with the current regulations. Finland complies with the provisions of the Act about pressure equipment 1144/2016, § 76.

In Finland, when making changes to the oil boiler, it must be noted that due to the change in the type of fuel to a solid one, boiler must go under inspection (the Act about pressure equipment, 1144/2016, § 61). This new pressure equipment kit may need to be re-registered. This is done because (in accordance with Resolution 1549/2016, § 6), the requirements for the registration of oil boilers (max. 10 MW and water temperature max. +120 °C, or max. 1 MW and water temperature

above +120°C) differ from the requirements for the registration of boilers with solid fuels (all hot water boilers over 1 MW).

Boiler registration, permission to place pressure equipment

In Finland, in the Act about pressure equipment (1144/2016, § 51), the registration obligation is defined as follows:

"The owner or manager of the boiler must apply for boiler registration at the first planned inspection specified in § 55 if the pressure equipment can create a significant hazard. The owner or manager of the boiler must apply for registration to the controlling organization. The application must include technical data, location, manufacturer, importer, owner and controller of the operation. The owner or manager of the pressure equipment must inform the control organization about all measurements, relating to the location, owner, or manager and controller of the operation.

The Decree of the Council of State specifies more detailed the properties of pressure equipment, which do not create a significant danger, specified in the first paragraph."

3.2.1 Negative pressure inside the fire chamber

For proper burner operation, negative pressure (in the fire chamber 25...45 Pa) is required, which is ensured by a properly sized chimney and flue gas fan, which is controlled by this negative pressure target.

3.3 Mounting and connection

3.3.1 Mounting and burning compartment fastening

The burner is bolted to the boiler and the joint is sealed with heat-resistant silicone. The joint must be hermetically sealed. The bolts are tightened crosswise. If the boiler's opening for the burner is a square, one must use a flange adapter (accessory).

The following figures show the mounting of the burning section:



Figure 3. Extrusion of heat-resistant silicone.



Figure 4. Silicone mass in the burner opening.



Figure 5. Fitting the burning compartment to the boiler's burner hole with a help of a lift.

3.3.2 Mounting of pipelines



Risk of structural damage!

Pipelines must be mounted by qualified and authorized personnel! Authorization must correspond to the type of performed mounting. Incorrect connections may become unusable after a long time after installation.

BioJet Multi -burner is a water-cooled burner and is installed in the boiler water circulation circuit. A T-coupler of 90° DN 15 is installed in the lifting pipe coming from the burner to provide protection from overheating. A cooling water pipe suitable for the burner is fitted with a pump, or the water circulation is ensured by so-called "natural circulation". Circulation of cooling water is ensured by drainage and aeration valves.

NOTE! After mounting the burner and the cooling water pipe, make sure of the following:

- All air is removed
- Direction of pump rotation / flow direction of cooling water is correct
- **Closing valves must be blocked to the "open"-position and their handles removed** so that the burner is connected to safety and pressure maintenance systems.



Risk of vapor explosion and equipment damage!

Closing valves of cooling water circulation must not be closed during operation or burner starting (heating cycle).

Circulation shut-down can damage the burner or cause vapor explosion!



If the boiler water can exceed temperature level of 140 °C even for momentarily, the standard pump for the burner can't be used.

The burner must be equipped with a safety valve to which a drip pipe must fit. The blowing pipe is directed outside (see fig. 7).

For 1500 kW model, a P&ID example is shown below in fig. 6 and fig. 8 shows the pre-installed pipes.

NOTE! P&ID is always made case-by-case according to the operating parameters.

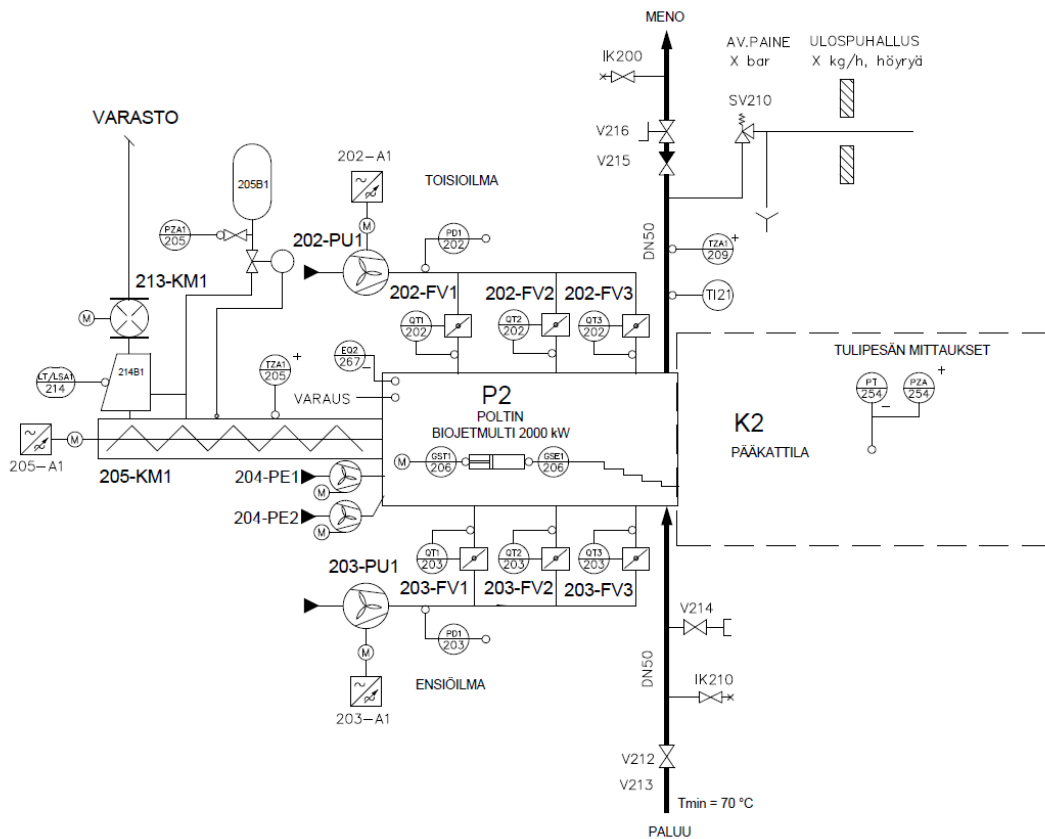


Figure 6. P&ID example for 1500 kW model.

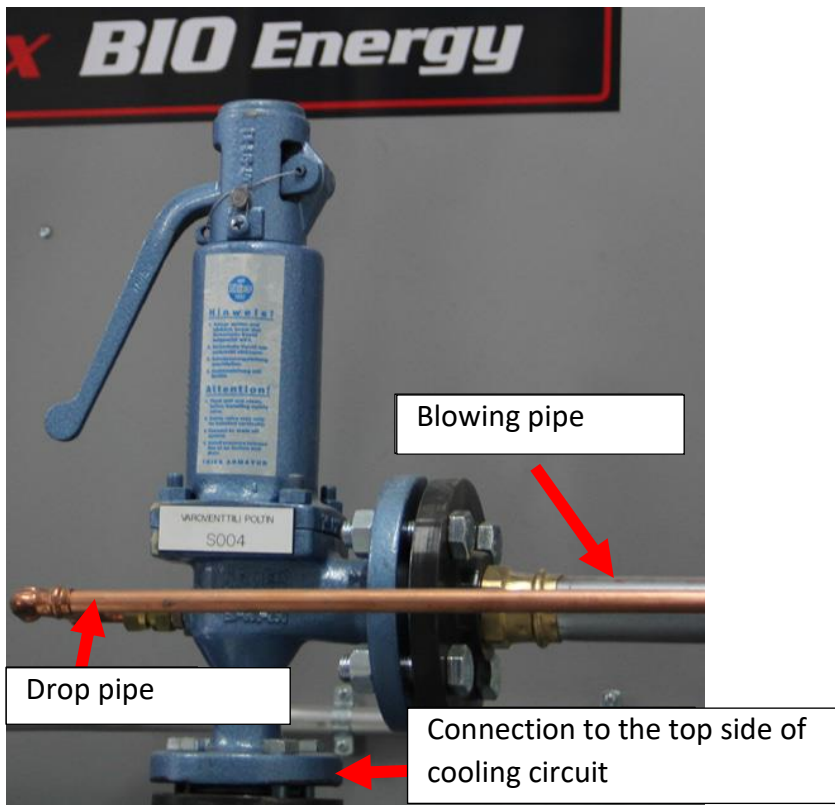


Figure 7. Safety valve in the burner's cooling circuit.

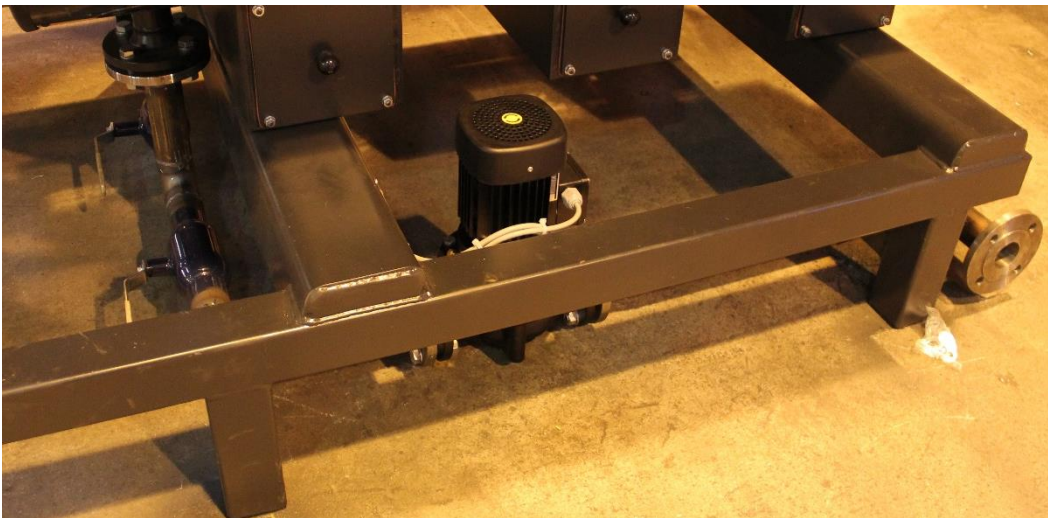


Figure 8. Pre-installed pipes, valves and pump.

NOTE! The standard supply content does not include all the necessary pipelines. The pipelines supplied with the equipment, must be isolated in each case separately so that the temperature of the surface does not exceed local requirements.

Below in fig. 9– 11 is shown an example of the burner connection to the boiler.

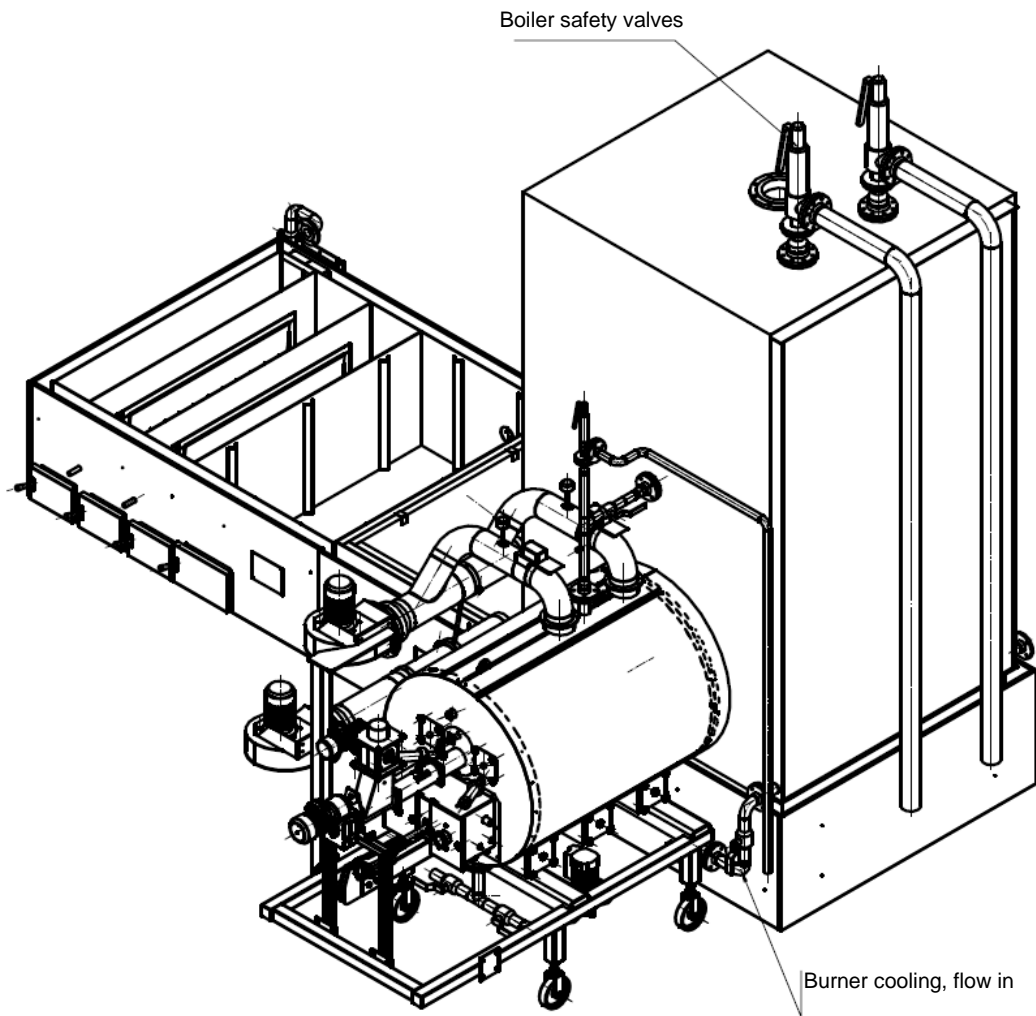


Figure 9. Example of connecting the burner to the main boiler.

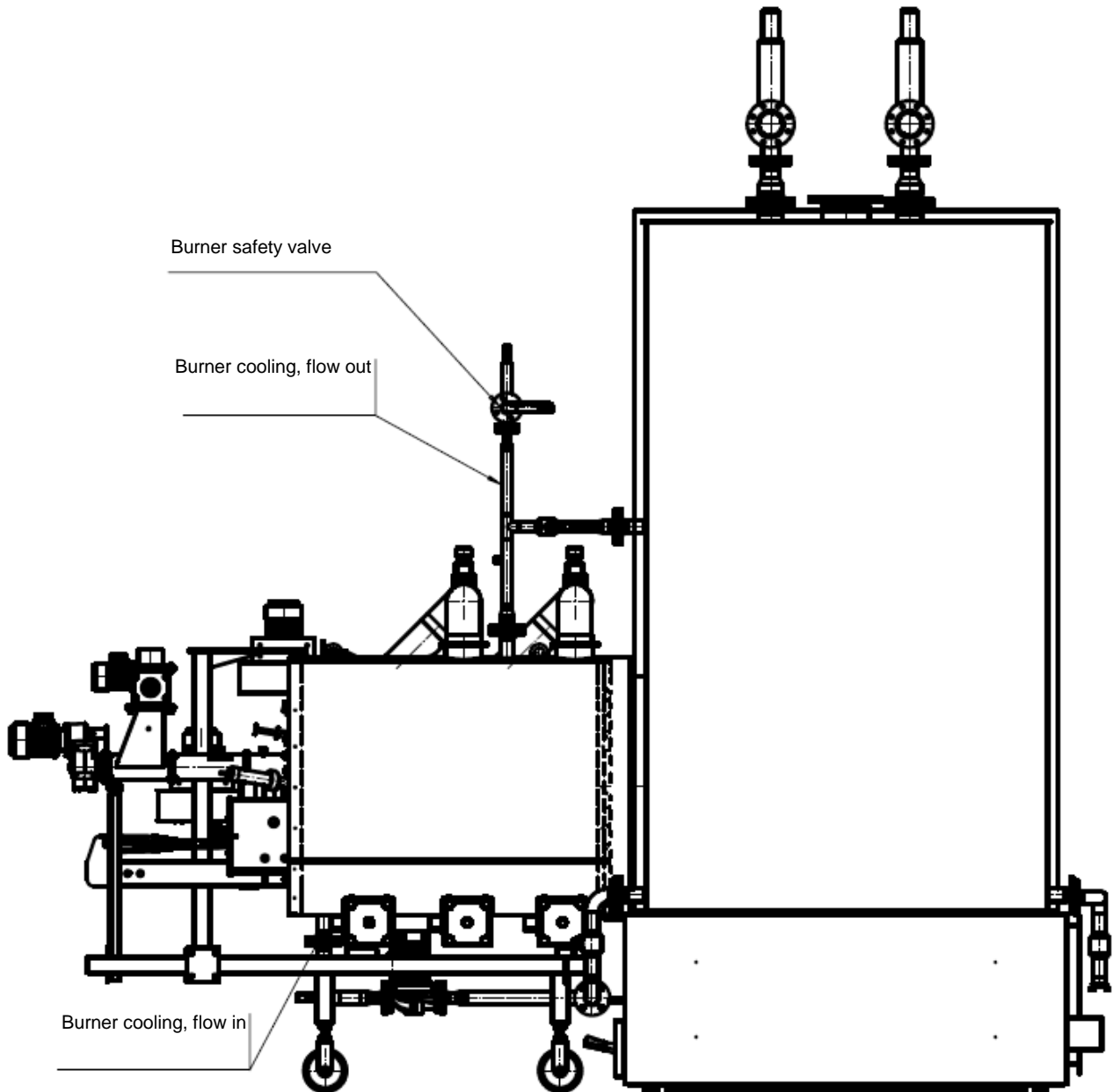


Figure 10. Example of connecting the burner to the main boiler.

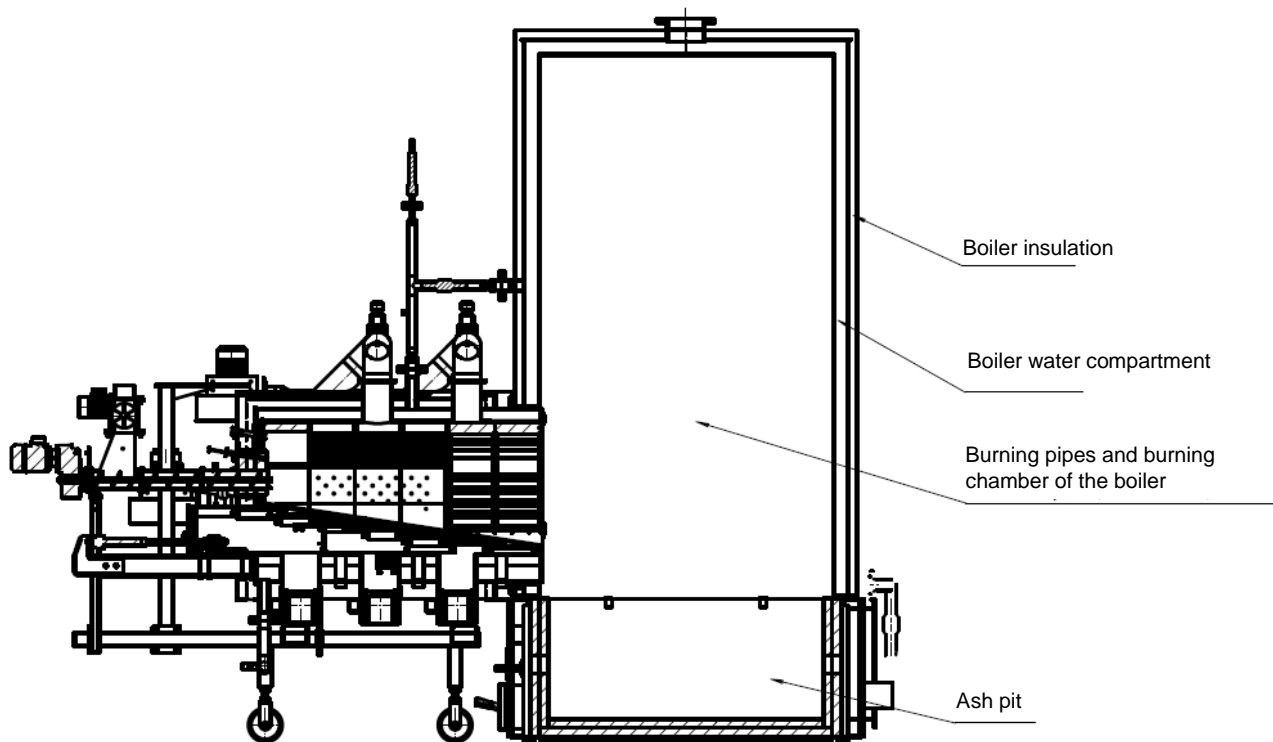


Figure 11. Example of connecting the burner to the main boiler.

3.3.3 Safety systems

Ariterm bio-burner must be equipped with the necessary safety systems that prevent backfiring and overheating. To ensure the equipment's safe operation, safety systems must be installed before equipment commissioning.

Safety systems are shown below (1–8):

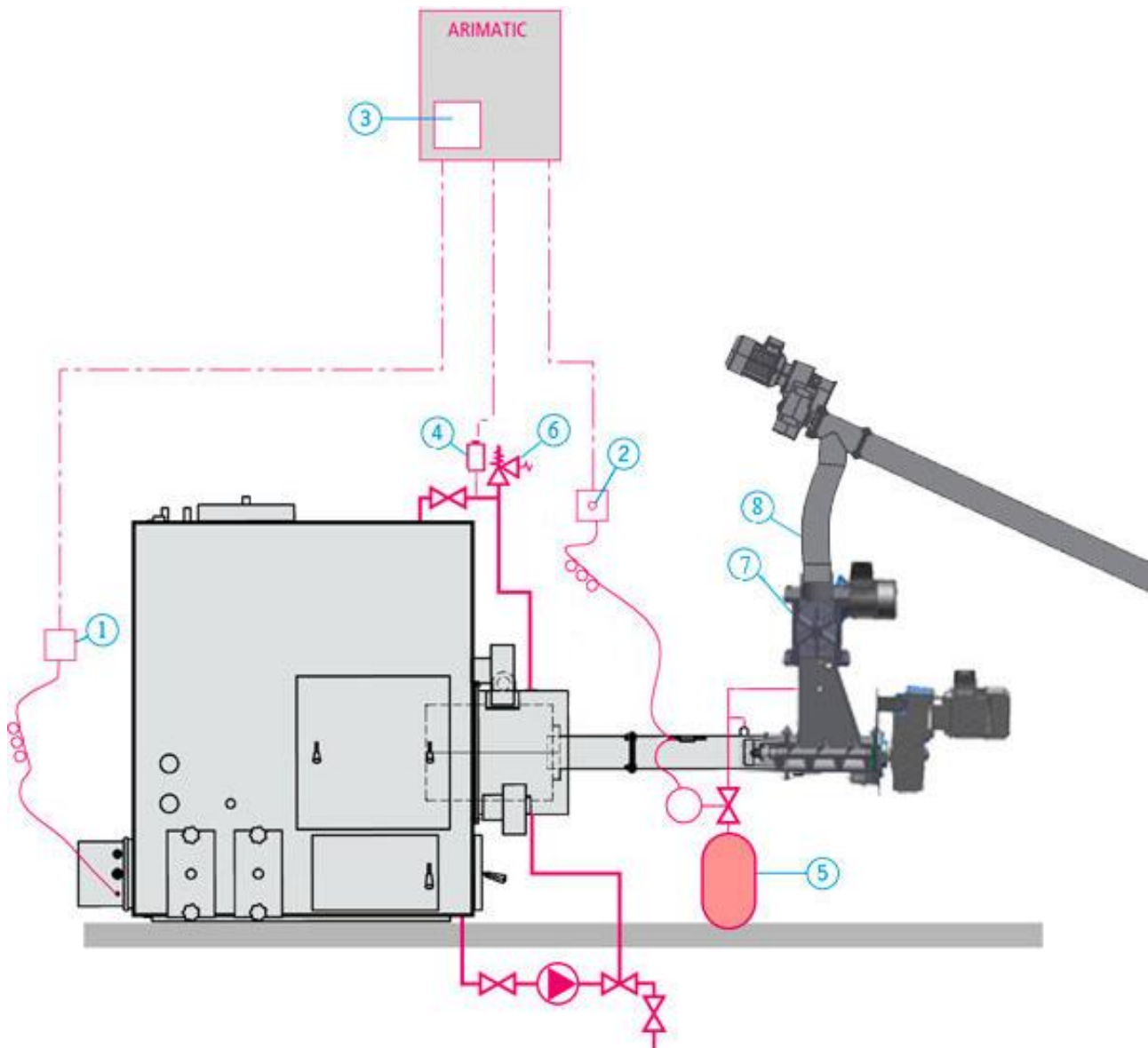


Figure 12. Polttimen turvalaitteisto.

1. Flame monitoring thermostat (not included in the burner set supply)
 - a. Flame monitoring thermostat recognizes from the flue gas temperature if the burner has stopped and prevents the fire chamber filling with unburned fuel.
2. Reverse thermostat reacts to the surface temperature of the feed screw, its sensor is installed in the pocket on the screw surface.
 - a. Reverse burning thermostat starts the burner safety scheme, the purpose of which is to stop the spread of reverse burning when it appears. The set operating temperature is approximately 75 °C. If the reverse burning is spread inside the screw, the thermostat sends a failure signal to the logic circuit. System operation stops excluding the pumps and flue gas extraction. Feed screw operates during the set time (~3 minutes), after which it also stops (for more detailed description, see the documentation about the automation system).

3. Uninterruptible Power Supply (UPS) on the control panel (not supplied with the burner set)
 - a. UPS provides alarm signals if the electric power supply suddenly stops (see wiring diagrams and automation documentation).
4. Overheat protection
 - a. Safety device stops the equipment if the burner cooling system fails due to some reason (for more details, see the documentation about the automation system).
5. Powder fire extinguishing system (fig. 8)
 - a. Powder fire extinguishing system consists of fire extinguisher (+ reserve tank), valve, hose and a red plastic sensor tube.
 - b. The system is triggered when the backfire melts the sensor tube mounted on the screw surface. The vessel valve opens and the powder is directed to the feed screw and the funnel.
 - c. Pressure sensor of the system reacts to the emptying of the tank and sends a signal to the automation system. The cylinder is also equipped with a manometer, which indicates that the system is ready for operation.
 - i. **NOTE!** Open the extinguisher valve slowly and in several phases. This way the gas pressure is distributed evenly, and the tank will not go off unintentionally.
 - ii. As the reverse burn heats the feed screw, the sensor tube melts and the pressure, that keeps the extinguisher valve in closed position, drops. The sensor tube can be reused by cutting off the molten section. The plug must be reinstalled.
 - iii. You can fill an empty cylinder by Ariterm Energy Ltd or an authorized service company, specialized in maintenance of fire extinguishing systems of this type. If necessary, the sensor tube is replaced.
6. Safety valve (not included in the burner set supply)
 - a. The size of the safety valve must be determined and the valve installed in accordance with the regulations. Inside the EU, SFS-EN 12953-8 standard is applied. The safety valve must correspond to the requirements of EN ISO 4126-1.
 - i. The size of the safety valve is determined according with the description in paragraph [1.5.4](#).



Figure 13. Powder fire extinguishing system installed on the feeder

1. red sensor tube
2. black discharge hose
3. white emergency cable



BLOWING PIPES OF SAFETY VALVE MUST BE PLACED SO THAT THEY DO NOT CREATE HAZARDS, AND IN THE OUTBLOW PLACE, IT IS MANDATORY TO ATTACH A WARNING PLATE IN ACCORDANCE WITH THE LOCAL RULES!

INSTALLED SAFETY VALVE ON THE BURNER DOES NOT REMOVE THE NEED OF INSTALLING SEPARATE SAFETY VALVES TO THE BOILER!

7. Rotary lock

- a. Rotary lock is installed between feeder and warehouse, so that the reverse burning does not spread to the warehouse.
 - i. **NOTE!** The tightness of the rotary lock should be checked at least every six months!

8. Drop tube

- a. The drop tube is the last protective device in the circuit. If the fire passes through the rotary lock, the fire will melt the hose, and connection with the warehouse will be cut.
 - i. The drop tube must be at least 500 mm and made from material that melts at a temperature of about 100 °C.
 - ii. **NOTE!** The top and bottom ends of the drop tube must not be located horizontally identically so that hot flue gases cannot spread the fire to the warehouse.

9. Sulkusyötin

- a. Sulkusyötin tekee sulun syöttölaitteiston ja varaston väliin, jotta mahdollinen takapalo ei pääse leviämään varastoon.
 - i. **HUOM!** Sulkusyöttimen tiiveys tulee tarkastaa vähintään 6 kk välein!

10. Pudotusletku

- a. Pudotusletku on ketjussa viimeinen varolaite. Jos palo pääsee leviämään sulkusyöttimen yli, palo sulattaa letkun ja yhteys varastoon katkeaa.
 - i. Pudotusputken on oltava vähintään 500mm pitkä ja materiaalin täytyy sulaa n. 100 °C:een lämpötilassa.
 - ii. **HUOM!** Pudotusputken ylä- ja alapäät eivät saa sijaita suoraan kohdakkain, jotta takapalon kuumat savukaasut eivät pääse leviämään varastoon.

Also, the automation system software should include functions that guarantee the safe operation of the burner. The automation program must correspond to local requirements.

Fuel storage screws should be placed so that the circumferential speed does not exceed 1 m/s. Thus, the temperature of friction does not create a possibility of ignition.

In addition, following safety devices must be provided in the main boiler system:

- Safety valve(s), corresponding to the rated power output

- Explosion hatch or corresponding structure in the smoke channel of the main boiler
- Low pressure meter and sensor-switch of elevated pressure
- Protection against dry boiling of the boiler water
- Sensor-switches of low and high pressure of boiler water
- Thermostat(s) for boiler water overheating
- Circuit breakers for connected electrical appliances in accordance with local regulations
- On the control panel there must be a surge protection for electrical equipment
- Carbon monoxide sensor must be installed in the boiler room, to which a siren and a flashing light signal are connected
- The entire automatic boiler safety system must be tested
 - **NOTE!** Including software

Pay attention to local regulations for the mounting site and possible additional requirements.

3.3.4 Electrical installations



Risk of electric shock and equipment damage!

Wiring must be performed by a qualified electrician in accordance with applicable regulations and using safe components!

Low-quality executed wiring can lead to equipment damage and/or electric shock.

Wiring must be carried out in accordance with the wiring diagrams and documentation of the equipment kit. See the burner automation documentation and the entire system for further information. Changes and additions introduced at the site, that require changes to the wiring diagrams, are not included in the scope of Ariterm, unless otherwise is agreed.

NOTE! It is mandatory to ensure reliable grounding and proper protection against voltage surges for all the equipment.

4. Commissioning and operation

4.1 First start-up and related notifications

It is obligated to start-up the equipment for the first time and put it into operation in the presence of qualified personnel, which is best ensured by a commissioning contract with Ariterm Energy Ltd.

Before starting the commissioning, make sure of the following:

- Protection against reverse burning is performed and it operates properly

- Mechanical and electrical installation are carried out properly, and the equipment kit has passed the necessary start-up checks
- Safety valve operation is checked
- The automation program is tested
- The burner is supplied with power and the availability of high-quality water, air and fuel is ensured
- The protection measurements installed at the time of transportation do not prevent the entry of water or air into the burner and the burner is free from unwanted objects
- The heating network withstands the load
- The availability of spare heater for the duration of the test
- Operational staff is familiarized with the equipment kit functioning and all the instructions!

4.2 Functioning test

Switch on the electrical appliances separately one by one and check the following:

- direction of screw rotation
- operation and rotating direction of burning air and flue gas fans
- grate bar movement and proper stop at the limit switch
- pump operation
- testing and adjustment of the hydraulics
 - checking / connection of the necessary hose connections
 - checking the amount of oil in the container with the cylinders inside (so that it does not pour out when cylinders move backwards)
 - checking the working movements and limit switches' placing

Check the safety equipment:

- Set the reaction temperature of the reverse burning thermostat to such a low level, that the thermostat will give an alarm and then return it to the desired level.
- Set the reaction temperature of the reverse burning system to such a low level that the it goes off. If necessary, heat the sensors carefully.
- Check the overheating protection, dry boiling protection and other connected protective equipment.
- Check the functioning of the alarm signals and remote alarm if they are connected.
- Check the operation of the uninterruptible power supply (UPS).

NOTE! See the functions in the instructions for your automation system.

4.3 Product functioning

Ventus burner is equipped with moving grate bars, water cooling and automatic ignition. The automation controls the burner by feeding fuel and burning air to the burner. Air, by means of separate

fans, is divided into primary and secondary air, and the fuel is converted to gas on moving grate bars. At the end of the burning, ash is dropped from the end of the burner into the ash pit.

The following devices influence the product functioning:

1. Feed screw
 - a. The operating time or the rotation speed is adjusted in accordance with the power output and the amount of fuel for ignition during start-up.
 - i. **NOTE!** If a constant speed is used at low power, ensure that the feed screw is sufficiently cooled.
2. Primary and secondary air fans*
 - a. The pressure difference in the air channels is adjusted.
3. Primary and secondary air control valves*
 - a. The quantity of burning air is adjusted in the burning zones depending on the power output.
4. Moving grate bars
 - a. The driving and stopping periods are set, which determine the time spent on the grate bars in accordance with the power output.
5. Ignition fans
 - a. When switching on, the fuel is ignited. They also assist in the burner's transition from the standby mode to the operation mode.

* In the 1000 kW model, there are no air dampers and the quantity of air is regulated only in accordance with the set values of the fan speed.

In addition, the cooling water pump must constantly work when the burner is running and the boiler and the warehouse equipment must operate so that the fuel in the burner is fed evenly and in there is a negative pressure (25-45 Pa).

4.4 Product settings and adjustments

4.4.1 Adjusting

Burner and boiler must be brought to operating temperature slowly so that the thermal load on the structures would be minimal. Automatic control must be switched off and at the time of temperature increase (~ 1 hour), low power output must be set.

After the boiler and the burner have been warmed up, the burner is adjusted to ensure clean and economical burning. At high power output, the flame should be light yellow (darker at lower power outputs). The burning should be smooth and "smoke tails" should not be formed above the flame. Fine adjustment however, requires the use of flue gas analyzer and it is recommended to use it. The burner should be put into operation with the help of Ariterm Energy Ltd's personnel.

The temperature of flue gases does not influence the burning directly, but it has considerable importance to the overall efficiency. The quantity and composition of ash also indicate the purity of

burning. Too much ash or unburned fuel in the ash are signs that the burning is not clean. Ash should be as small and fine as possible and not granular.

NOTE! Fuel quality has a significant effect on the quantity of ash and equipment adjustment. For example, a transfer from pellet size of 8 mm to 6 mm changes the ratio between burning air and fuel feed and requires system reconfiguration.

NOTE! The effects when changing the settings will be visible only after a few minutes. Before changing the settings again, the burning should be monitored for at least 10 minutes.

NOTE! When changing the settings, the system should run at full load. With a reduced load, the boiler reaches the set temperature too quickly, the burner goes into standby mode and the time for the adjustments is too short. If the boiler is put into operation at a reduced load (for example, in summer), the equipment should be reconfigured when the boiler can be used with its nominal load.

General tips for adjusting the burner

- If there is too much unburned fuel on the grate bars and/or in ash, reduce the feed screw speed and/or increase the burning air fan speed.
- If the tip of the flame is black and the boiler is getting dirty, increase the power of the secondary air fan and/or reduce the fuel feed rate.
- If the flame is bluish and uneven, power of the secondary air fan should be reduced.
- If there are light fractions in the fuel, a part of them flies out of the burner along with the air flow before it has got the time to burn completely. This can be noticed as sparking in the fire chamber of the boiler and by increased amount of ash. This can be avoided by reducing the air flow (fans).
- Transition to a new type of fuel or changing the fuel properties otherwise, requires system reconfiguration.
- If for example, during the replacement of the silo, a sawdust crust is formed on the grate bars, the crust can be broken by moving the fire-bar manually. This way, the combustion can become even again, because the air flow will cover the entire burning area. It is also possible to temporarily change the settings of the primary air fan. **NOTE!** A constant accumulation of sawdust indicates a poor quality of fuel or poor operation of warehouse equipment, which causes damage to pellets by grinding them.
- It is recommended to write down your observations on the "Notes" pages or in a separate document that is stored near the equipment.

Settings for the burner components are described more detailed below.

Feed screw

Searching for the default settings, it is necessary to start by measuring the pellet flow on the feed screws. This is done by filling the feed screw manually. After this, by manual screw control, the fuel moves to a measuring container. While doing so, one should also measure the time taken for this with the accuracy of a second and a period of at least 10 seconds. The measuring container (a scale

tared according to the mass of the container, see the instructions of the scale) and the pellets in it are weighed. The weighing result is divided by the measured time, resulting in mass flow of the pellets in kg/h.

$$\frac{\text{weight}(kg)}{\text{measured time}(s) \times \frac{1}{3600} \left(\frac{h}{s}\right)} = \text{mass flow} \left(\frac{kg}{h}\right)$$

The fuel flow can also be measured as a volumetric flow, but the volume of fuel can fluctuate within one delivery schedule, so this method is not recommended. Based on the mass flow and the pellet calorific value reported by the supplier or corresponding standard definition (corresponding to ISO 17225-2 calorific value ≥ 4.6 kWh/kg), the thermal fuel power can be calculated in kW.

$$\text{mass flow} \left(\frac{kg}{h}\right) \times \text{calorific value of the pellets} \left(\frac{kWh}{kg}\right) = \text{thermal fuel power} (kW)$$

The thermal power needs to be multiplied with the overall efficiency of the burner and boiler set.

$$\text{thermal fuel power} (kW) \times \frac{\text{overall efficiency} (\%)}{100 (\%)} = \text{thermal heating power} (kW)$$

Based on the thermal power for heating, the operation periods for the fuel screws are determined (see [4.2.2](#), Feed screw). The screw power is recommended to be set at 15...20 % above the rated burner power output, so that the burner could respond better to changes in power demand and fuel quality fluctuations for example, during the replacement of the fuel silo. Therefore, the power of the burner, running on high-quality fuel, should set at 80...90 %.

Setting the heat load to a higher value than the rated burner power output results in the increase of burner output to a level of 100 %. This means that fuel is fed to the burner more than the rated power, which can lead to the accumulation of incombustible components in the ashpit, clogging of the grate bar holes and at worst, concentration of unburned gases when stopped after use.

During the operation, attention must be paid to ensure that the burner does not work at full capacity for a long time. If the burner is installed in such way that the heat load can exceed the rated power output, the total power of the burner screws should be set at the rated power level (i.e. 100 % of the burner's output should correspond to 100 % of the rated burner power output). The other way is to set the response delay of the emergency signal for exceeding the nominal power output to **max. 300 s** (from the automation system)!

**Risk of equipment damage and danger to life!**

Operating the burner at a heat output or power rating higher than the rated value is prohibited!

Exceeding the thermal capacity can lead to permanent damage of the burner structures and create a danger to life of surrounding personnel! Protective equipment is designed only for the nominal heat output and may not be enough if the boiler is used at higher heat output!

Burning air fans

The lower fans on the burner are the primary air fans. Adjusting the primary air fans performs, the power output of the burner is also adjusted at the same time. The secondary air fan is used for fine-tuning the burning. Proper settings for air fans are important in terms of optimal burning and burner durability.

The fans are adjusted after feed screw setting. Before starting these operations, you should stock up with a flue gas analyzer and a polarizing glass (e.g. the glass from a welder's mask) to monitor the burning process. The initial setting can be done by eye so that at low power output, the flame is calm and dark yellow there should be no "smoke tails" after the flame, which indicates an improper burning. At high power, the flame can be stronger, and its color should be bright yellow (at full power it must be almost white). The airflow however, should not blow much pellets into the ashpit because this leads to the accumulation of unburned fuel. To monitor the process, it is recommended to use a sight glass because it is difficult to see with an unaided eye whether the pellets fly or not.

More accurate settings should be done using a flue gas analyzer so that different components of the flue gases can be examined more carefully. Burning air should suffice in such a way that at maximum power output the oxygen content would remain in flue gases at a level of at least 4 % of the volume.

NOTE! Ensure that the burning fire chamber and flue gas cleaner are sufficient for the burning process and check the local emission requirements. Ariterm does not guarantee certain emission values or efficiency, if the burner is supplied as an individual equipment except when there is a separate agreement.

4.4.2 Burner adjustment during operation**Pellet and ash accumulation**

The necessity of burner configuration is manifested first, in the drop of flame control level of the boiler. This usually indicates the accumulation of pellets and ash in the front side of the burner. The easiest way to get rid of this cluster (crust) is to move the grate bars manually. If the problem is not solved, it is possible to change the set point of the flue gas extractor so that the negative pressure in the fire chamber gets lower and move the grate bars manually at the same time.

If this also fails to help, then at first, check the flow of the primary air fans. If a smell of smoke is detected near the burner, it is also advisable to check the fan rotation direction because the accumulated crust can change the flow direction. In this case the fan can be turned away from the suction opening. Changing of the flow direction can be checked carefully with a sheet of paper. If the flow direction is incorrect, the paper will not adhere to the suction opening grille. The situation can be corrected by raising the fan power setting in steps of 1 % until the flow direction is restored. In addition, you can continue moving the fire-bars and lower the reduced pressure. If the fire-bars are clogged because of the accumulated mass of sawdust, you can temporarily set the primary air fan values higher than recommended values, until the fire-bars are cleaned.

NOTE! After changing the air flow direction, always check whether the airflow has returned to the desired parameters after the problem has been solved.

When additional fuel burns, the flow resistance decreases, so that the flows can exceed recommended parameters. Too much air on the primary air fan can interfere with the burning and increase the corrosion of the fire-bars because of the temperature effect, which reduces the service life. If the air flows correspond to the recommended parameters (when viewing through the inspection window, burning seems to be good, i.e., the flame is bright), and no smoke or ash accumulation is seen in the burner, then there can be ash in the flame sensor tube, or there can be soot on the surface.



Figure 14. Burning air fan placement. On left, 1000 and 1500 kW on right.

Kuvassa on näkyvissä ensiöpuhaltimet polttimen alla. Puhaltimien kätsiys ja sijoittelu voi hieman vaihdella asennuskohteen mukaan. 1500 kW ja 2000 kW -mallit on varustettu vain kahdella puhaltimella sekä ilmakehällä ja niissä on jatkuva toimiva ilmamäärän mittaus.

Air quantity control measurements

Flow measurements can be made by a different tool, for example, with an anemometer, shown on the figure. Check the suitability and use of your device according to the original instructions. In order



Figure 15. Air quantity measurement from the suction opening.

to accurately measure the air flow, it is recommended that make measurements, apart from the central point, and along the edges of the air opening, because the flow profile, depending on the object, can vary at different points in the opening. Performance of multiple measurements increases measurement reliability. Measurements are recommended to be performed on the suction side because of the compressive capacity of the air.

After all the measurements have been taken, the average value is calculated, which is then compared with the recommended one. It is also important to find out what the burner capacity was at the moment of measurement and compare the readings with the recommended values.

Changing of the flow rate are monitored for a long time (make sure that the burner's power corresponds to the power in previous measurements, so that the results of the measurements are comparable). Decrease of flow rate usually indicates the formation of a pellet and ash peel on the air openings of the fire-bars, and speed increase, in turn, indicates the movement / burning of the pillow.

To calculate the air quantity, it is also necessary to calculate the internal area of the cut of the air opening or channel.

$$\frac{\text{flow rate} \left(\frac{m}{s}\right) \times \text{internal sectional area} (m^2)}{\frac{1}{1000} \left(\frac{m^3}{l}\right)} = \text{air quantity} \left(\frac{l}{s}\right)$$

The flow rate is checked only during the annual maintenance. Model that doesn't have a continuous flow speed monitoring its flowrate must be checked when needed.

NOTE! Performing of reliable control measurements on the burning zones requires drilling of openings for channel measurements. After performing the measurements, the opening should be plugged, for example, with a suitable piece of plastic, in order not to increase unnecessarily losses through the channel.

4.4.3 Settings

Look at the automation instructions on how the burner settings are entered in the automation system interface. The settings can vary, depending on the interface, especially many differences can be found in additional settings and additional functions. Typical settings for the equipment types are shown below.

NOTE! The PID and burner settings are affected by the settings of the frequency converter, as well as the PID controller software is used in the automation system.

NOTE! After commissioning, put the value in the tables below, or take screenshots from the settings page of your interface and save it, so that you can always return to the initial settings, if it is necessary.

Main power control of the burner

Main power regulator of the burner should be adjusted for each case separately. Main power control of the burner is usually set in accordance with the value of the water temperature, going from the boiler to the heating water network. The controller, usually, is a PID controller. The values of the other components are adjusted, according to the burner output.

Primary values of the controller after commissioning: P = ____ | I = ____ | D = ____

Feed screw

	Low power mode (standby mode)	Burner power 21 %	Burner power 50 %	Burner power 75 %	Burner power 100 %
Screw power	%	%	%	%	%
Screw operating time	s	s	s	s	s
Screw pause time	s	s	s	s	s
Ignition (short filling time)	s	Screw power Ignition	%		
Ignition (long filling time)	s	Limit of screw pulses	%		

Models that have fans and dampers

	Ignition compartment	Maintaining (Standby mode)	Burner power 21 %	Burner power 50 %	Burner power 75 %	Burner power 100 %
Control valves of primary air channel 1	m/s	m/s	m/s	m/s	m/s	m/s
Control valves of primary air channel 2	m/s	m/s	m/s	m/s	m/s	m/s
Control valves of primary air channel 3	m/s	m/s	m/s	m/s	m/s	m/s
Pressure difference of primary air channel	Pa					

Control valves of secondary air channel 1	m/s	m/s	m/s	m/s	m/s	m/s
Control valves of secondary air channel 2	m/s	m/s	m/s	m/s	m/s	m/s
Control valves of secondary air channel 3	m/s	m/s	m/s	m/s	m/s	m/s
Pressure difference of secondary air channel	Pa					

Initial value of PID controller for fans: P = 0,6 | I = 180 | D = 0

Initial value of PID controller for fans (after commissioning): P = ____ | I = ____ | D = ____

Initial value of PID regulator for control valves: P = 0,8 | I = 90 | L = 0

Initial value of PID regulator for control valves (after commissioning): P = ____ | I = ____ | D = ____ 0

Models that have separated fans

	Ignition compartment	Maintaining (Standby mode)	Burner power 21 %	Burner power 50 %	Burner power 75 %	Burner power 100 %
Primary air fan 1 power	%	%	%	%	%	%
Primary air fan 2 power	%	%	%	%	%	%
Primary air fan 3 power	%					
Secondary air fan 1 power	%					
Secondary air fan 2 power	%	%	%	%	%	%
Secondary air fan 3 power	%	%	%	%	%	%

Initial value of PID controller for fans: P = 0,5 | I = 30 | D = 0,1

Initial value of PID controller for fans (after commissioning): P = ____ | I = ____ | D = ____

Grate movement

	Maintaining (Standby mode)	Burner power 21 %	Burner power 50 %	Burner power 75 %	Burner power 100 %
Fire-bars operating time	%	%	%	%	%
Fire-bars pause time	s	s	s	s	s
Max. operating time	s	Alarm delay	s		

Ignition fans

Ignition stage 1 (fan is on constantly)	s	Flame limit value (sensor data)	%
Ignition stage 2	s	Flame retardation (sensor data)	s
Ignition fan operates on stage 2	s	Ignition fan operates from the maintenance phase → till the operating mode	s

5. Maintenance

To ensure faultless operation and long service life of the burner, the maintenance of the burner must be carried out regularly and due to the schedule. It is necessary to put performed maintenance and repair actions into the log!

NOTE! Failing to perform the maintenance or not putting them into the log leads to the warranty termination.




5.1 Maintenance and inspection activities


Burner maintenance and maintenance program are shown below. The maintenance program must be followed in the part, where it is possible in terms of the equipment kit.



Letters in parentheses indicate the explanatory figures in the table below.

Measure	Periodicity				
	2 days	1 month	3 months	6 months	12 months
Visual control of burning process Through the inspection glass for maintenance and boiler (if possible) (a). <ul style="list-style-type: none"> there is no "smoke tail", the brightness of the flame in relation to the burning power (light ... dark yellow) 	X				
Monitoring of burning parameters through the automation system interface. Using the interface, it is recommended to look at the following values and trends, if possible (see the automation system guide): <ul style="list-style-type: none"> Level of optical flame control <ul style="list-style-type: none"> In the operating mode 80 ... 100% (low level – is bad burning or dirty sensor sign) In the maintenance mode, lower indicators are possible 	X				



Measure	Periodicity				
	2 days	1 month	3 months	6 months	12 months
<ul style="list-style-type: none"> • Residual oxygen <ul style="list-style-type: none"> ○ environment with set values • Flue gas temperature <ul style="list-style-type: none"> ○ Not less than 110°C • Boiler return temperature <ul style="list-style-type: none"> ○ Not less than 70°C • Burner power <ul style="list-style-type: none"> ○ Does not oscillate at uniform load 					
<p>Inspection of power extinguishers pressure The arrow must be in the green zone (see 3.3.3.).</p>	X				
<p>Inspection of the overload hose condition The hose must be undamaged; pellets or wooden dust should not be poured from it.</p> <ul style="list-style-type: none"> • Replace the defective hose immediately! 	X				
<p>Visual inspection of fire-bars Through the inspection glass for maintenance and boiler (if possible) (a).</p> <ul style="list-style-type: none"> • Thick crust of ash or slag indicates a too long gap between cleaning, bad setting or bad fuel. <p>NOTE! If there is unburned or significantly burning fuel under the fire-bars, the fire-bars are too worn and cracked. Damaged fire-bars should be repaired immediately, and the burner should be stopped, so that it can be cooled down before the repair. If necessary, contact Ariterm Energy.</p>	X				
<p>Other continuously monitored issues Every time during the inspection visit, it should be checked:</p> <ol style="list-style-type: none"> 1. Smoke tightness <ol style="list-style-type: none"> a. there is no visible smoke from hatches or other connections b. NOTE! A small smell of smoke is allowable, for example, fire chamber 2. Water tightness (water pipes for cooling, safety valve with pipes, housing, operating under pressure, and connections) 	X				

Measure	Periodicity				
	2 days	1 month	3 months	6 months	12 months
<p>3. Check the temperature, pressure and local water level sensor and compare with the automation system, if possible.</p> <p>4. Checking of general cleanliness around the equipment.</p> <p>5. Checking of the ambient temperature, it should be between +10 and +45°C.</p>					
<p>Checking of the ashpin under the fire-bars Checking through the inspection window for the maintenance of ash quantity and, if necessary, cleaning.</p> <p> <u>The burner must be switched off for the cleaning time, because the ashpin is under reduced pressure, because of primary air flow.</u> <u>The fire-bars motor must be disconnected through the automation system because of the squeezing risk.</u></p>		X			
<p>Air quantity control measurements</p> <ul style="list-style-type: none"> See 4.2.2, control measurements of air quantity (b) 		X			
<p>Checking of the condition of the burning air fans</p> <ul style="list-style-type: none"> Check the condition of burning air fans (c). If necessary, the fans should be cleaned and, if necessary, replaced. <p> <u>The burner should be switched off, the safety switches of the fans must be locked in the OFF position.</u></p>		X			
<p>Visual inspection of safety valves Check if the pressure relief points of the safety valves are flowing and whether the air outlet operation is blocked.</p>		X			
<p>Cleaning of the area around the burner Clean the dust around the burner, if possible, weekly.</p> <p></p>		X			

Measure	Periodicity				
	2 days	1 month	3 months	6 months	12 months
<u>The accumulated dust increases the risk of explosion and fire and can damage the bearings.</u>					
<p>Checking the condition of fire extinguishing system</p> <p>Check that the hoses of fire extinguishing system are not damaged (d) and whether they are in their place (see 3.3.3.).</p>					
<p>Checking of the status of fire-bars and ceramic with the switched-off burner</p> <p>Check if there are any serious cracks in the moving (e) or side (f) fire-bars, whether all the parts are in their places and whether they are bent.</p>			X		
<p>Checking of the optical flame sensor</p> <ol style="list-style-type: none"> 1. Carefully pull out the sensor (g) without damaging the attachment mechanism. 2. Check the sensor tube and clean with the help of compressed air and/or round brush. 3. Carefully clean the sensor head with a cloth and soft detergent, if necessary. <p>NOTE! It is also possible to clean the sensor when the burner is running. However, using the automation system, set the delay in displaying the optical observations and make sure that the sensor is not covered too long. Take care that the flame does not extinguish.</p>			X		
<p>Checking of the rotary lock state</p> <p>Controllably, turn off the burner and, if necessary, empty the supply equipment from the fuel. The impeller of the rotary lock (h) must be intact, so that it forms a shutter in case of reverse burning (see the dismantling guide, page 21)</p> <p> <u>Check with the automation system that the power supply is in the stop position and that safety switches (rotary lock and feed screw) are in the "OFF" position</u></p>				X	
Lubrication of bearings				X	

Measure	Periodicity				
	2 days	1 month	3 months	6 months	12 months
<p>Lubricate the bearings of the shutter (i) and screw (j). Lubricate the bearings carefully from the nipple. Check the lubrication intervals according to the separate lubrication instructions.</p> <p> <u>Do not use too much lubricant, because its excess can damage the bearing seal.</u></p>					
<p>Checking of the fire extinguishing system Make sure that the use of the fire extinguisher (d) has not expired.</p>					X
<p>Testing and checking of the cooling water pump Carry out the maintenance and check the cooling water pump (k) in accordance with the manufacturer's instructions.</p>					X
<p>Checking of the gear motors of the feed screw and the rotary lock Check and maintain the geared motors (l) in accordance with the manufacturer's instructions.</p> <p>NOTE! Reducer motors do not require lubrication.</p>					X
<p>Checking and testing of burner sensors</p> <ul style="list-style-type: none"> • Tests of protection from overheating of the cooling cycle (m) <ul style="list-style-type: none"> ○ Write down the setpoint and set the temperature so low, that an alarm will be sent to the automation system. If necessary, use any heat source, such as hot water. • Reverse Burning Thermostat Test (n) <ul style="list-style-type: none"> ○ Similarly check the overheating protection <p> <u>Components, damaged by fire or other heat sources, are not included in the replacement parts under warranty.</u></p> <ul style="list-style-type: none"> • Simultaneously check, whether temperature of supplied and return water, low pressure equipment and residual oxygen meter of the complete equipment kit 					X

Measure	Periodicity				
	2 days	1 month	3 months	6 months	12 months
<p>comply with the manufacturer's instructions.</p> <ul style="list-style-type: none"> • Check with other pressure difference meter (o) of burning air ducts with another pressure difference meter. • Clean the funnel level sensor elements for the ash (p). 					
<p>Testing of the fire-bars motor with switched-off burner</p> <p>Move the mobile fire-bars (q) and check the correctness of their movement! Make sure there is no oil leakage from the hoses or fire-bars assembly. Maintenance of the unit is in accordance with the manufacturer's instructions.</p> <p>NOTE! The substantial heating of moving fire-bars aggregate indicates engine overload. Check if something is blocking the fire-bars movement.</p>					X
<p>Complete burner cleaning and replacement of consumables</p> <ol style="list-style-type: none"> 1. Clean the burner surfaces from ash and sludge. 2. Clear the openings of the moving fire-bars (e) and side fire-bars (f) with a suitable drill or other instrument. 3. Clean the bottom side of the fire-bars through the inspection hatch (r) and the ash removal hatch (s). 4. Remove the splintered parts of the fire-bars and replace them with new ones, grind it, so that there is necessary clearance (in the cold state, usually it is 8 ... 12 mm). 5. Check the fire-bars movement once again during the burner start-up, when the burner is heated up. <p>NOTE! The most worn, but still usable fire-bars are recommended to be pushed to the end of the fire-bars set, where they are worn out more slowly.</p>					X

Measure	Periodicity				
	2 days	1 month	3 months	6 months	12 months
 <p>Between the fire-bars in the cold state there is a gap that decreases due to expansion while heating. If the clearance is too small, the lifetime of the fire-bars motor is shortened, and the one, which is too big, can cause unburned fuel to be accumulated in the ashpin, which causes burner malfunction.</p>					
<p>Testing of control valves operation Using the automation system, manually adjust the burning air flaps (t) and check how freely they move, and whether the response time is as recommended by the manufacturer.</p>					X
<p>Testing of the ignition fan Switch on the ignition fans (u) through the automation system and make sure that they produce enough heat for ignition.</p>  <p><u>Caution, hot air can cause burns!</u></p>					X

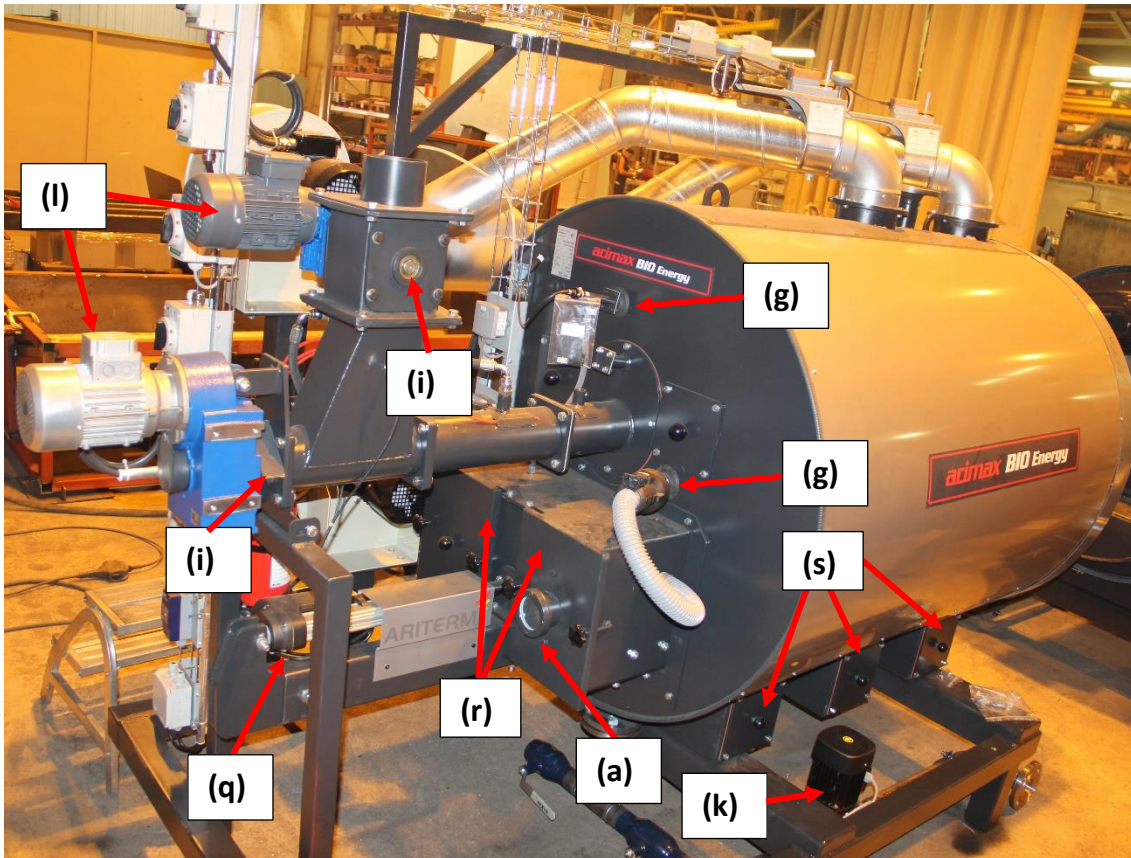


Figure 16. Burner, right front view from the direction of fuel supply.

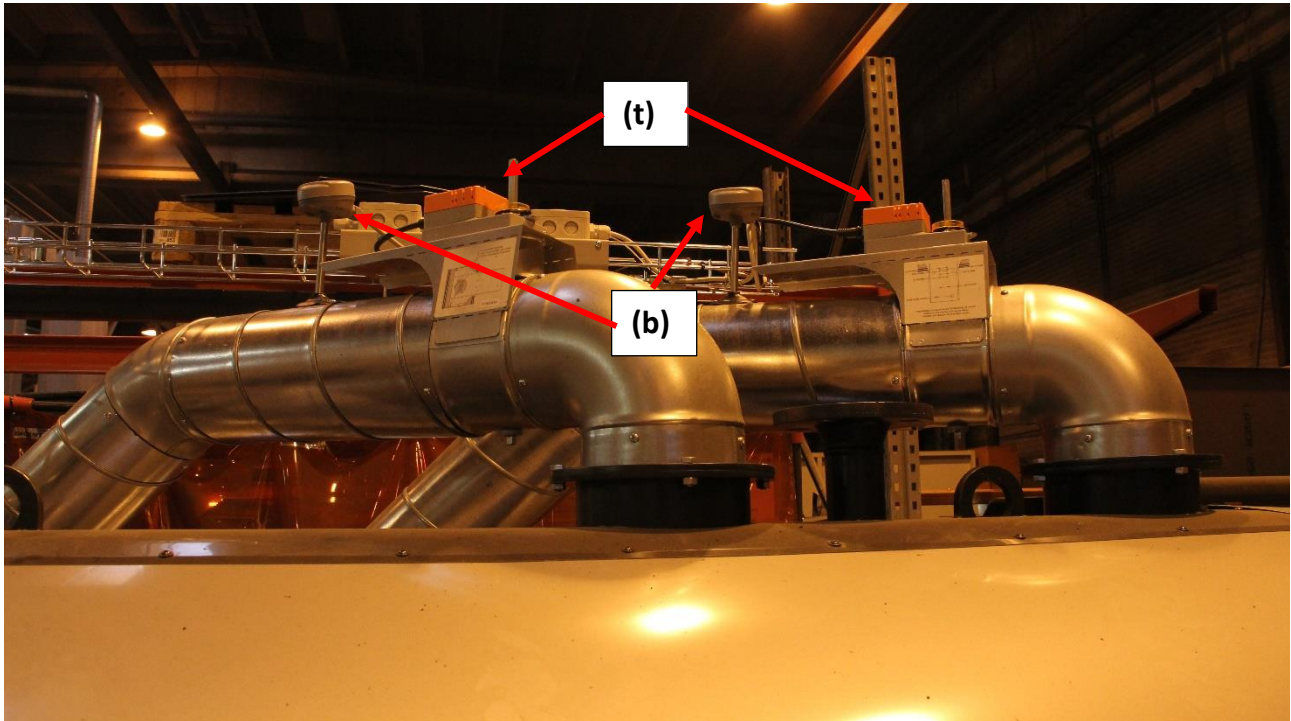


Figure 17. Burner air control (from top).

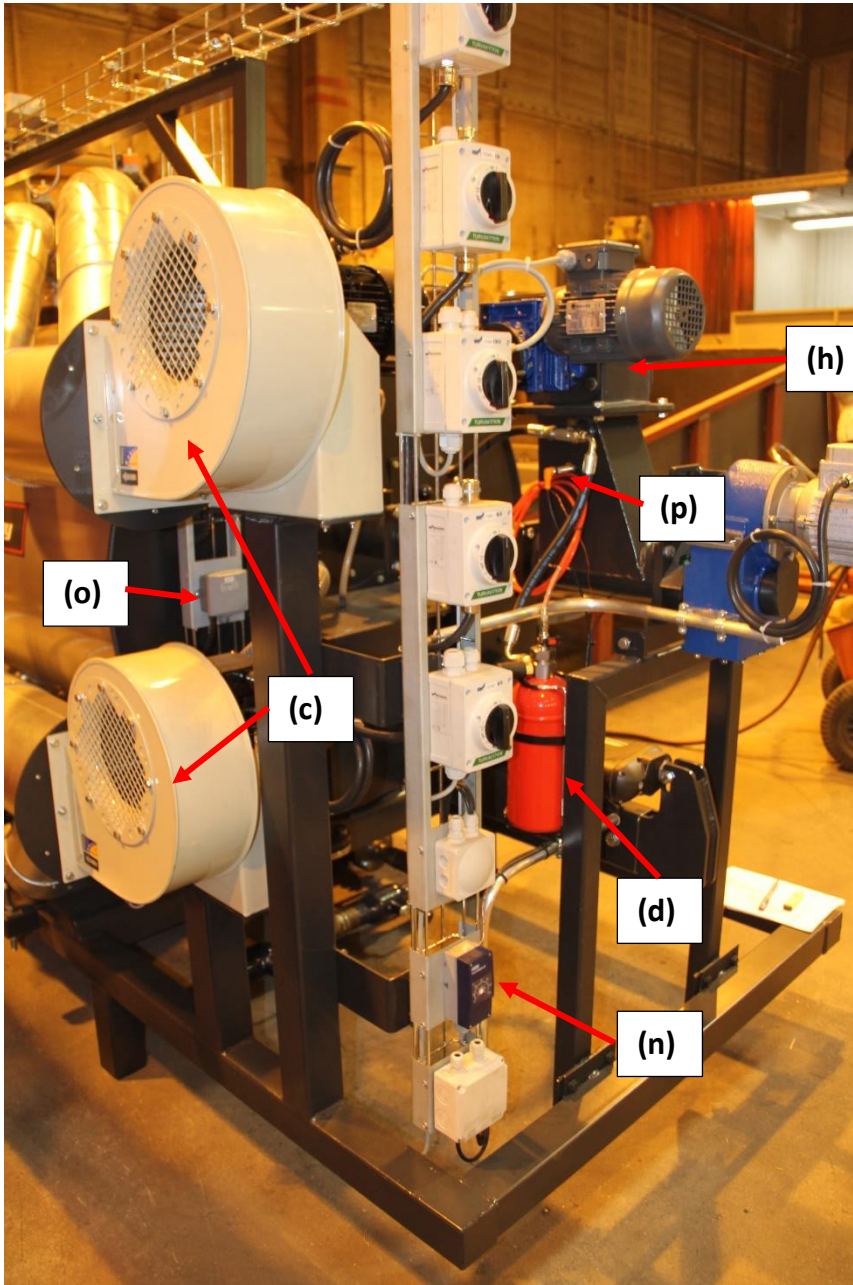
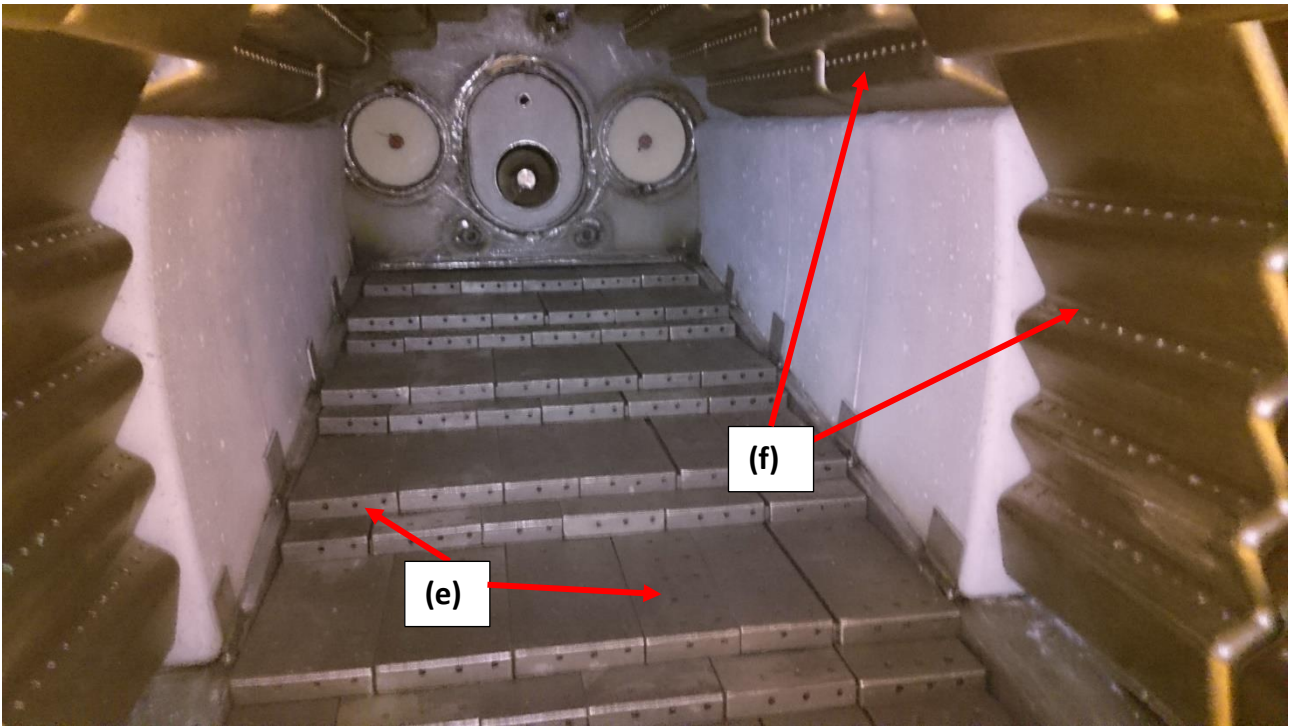
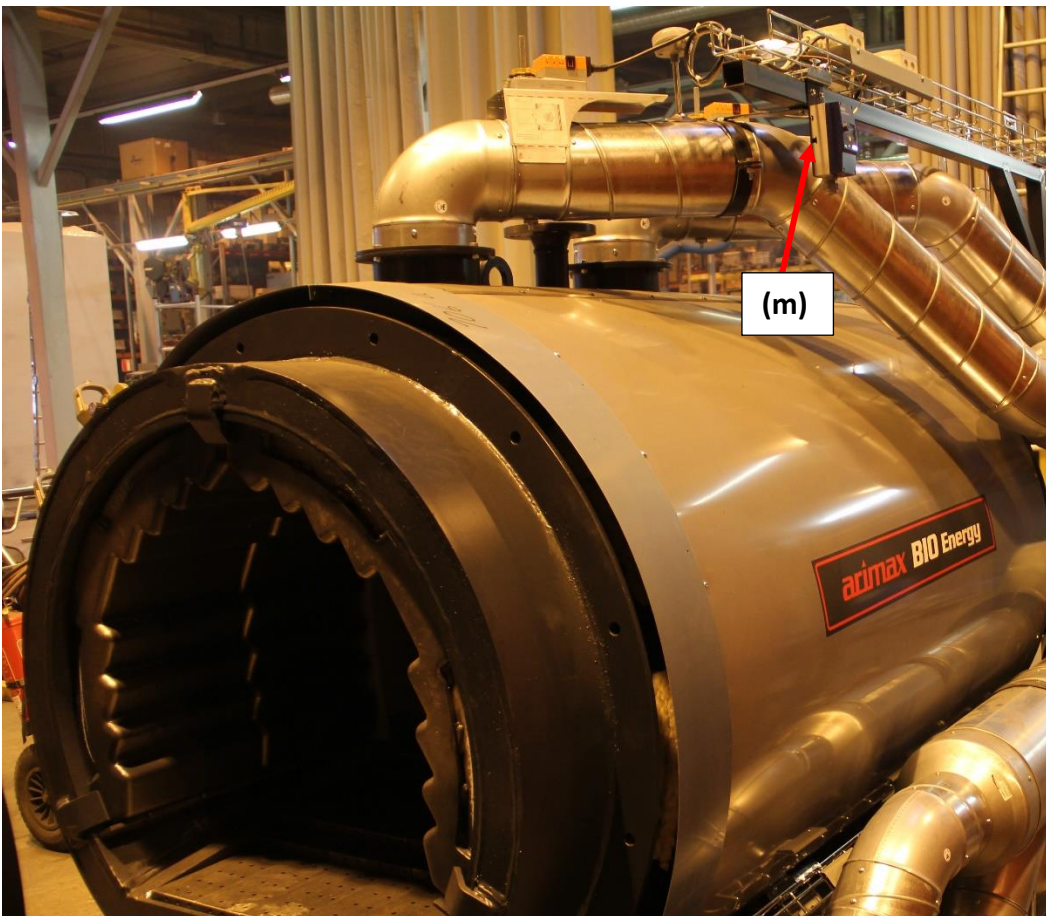


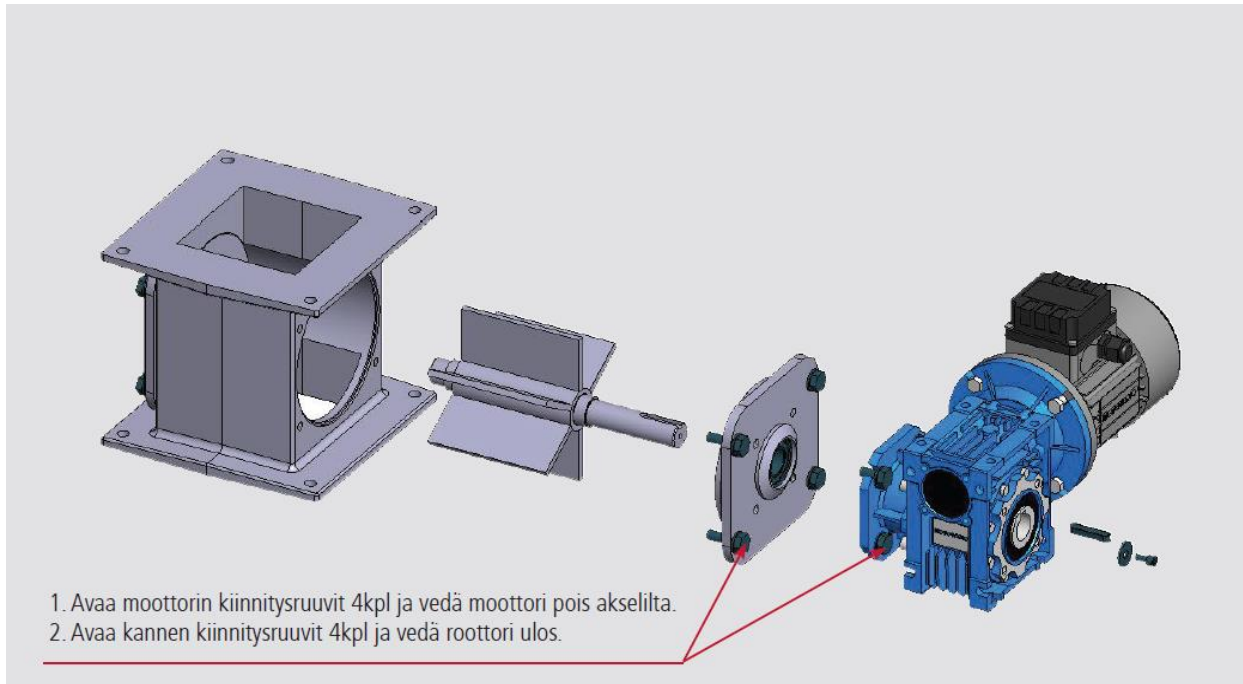
Figure 18. Burner, left front view from the direction of fuel supply.



Kuva 19. Burner from the inside.



Kuva 20. Burner, right back view from the direction of fuel supply.



Kuva 21. Rotary lock dismantling.

5.2 Spare parts

Spare parts are classified by criticality for parts A, B and C:

- Spare parts A are recommended to be purchased and stored on the site.
- Spare parts B are recommended to be reserved in Ariterm warehouse.
- Spare parts C are recommended to be ordered separately from the supplier.

5.2.1 Spare parts for all models

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Sytytyspuhallin	Leister	Igniter BM4	13734	No	B	-
Letku ilma/kaasu automaattisyytykselle	Ariterm	38mm 5970 805 038 - MTD	15028	No	B	-
Karamoottori	Linak	150mm LA36 iFLEX MJ200-400, J07657	17023	No	A	1
Optinen liekinvalvonta-anturi	Siemens	QRB1C-A050B40A	15839	No	A	1
Yliämpösuoja	Kübler	Jumo 603070/0070-5	15905	No	B	-

5.2.2 200 kW model spare parts

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Paloilmapuhallin (EC)	Ebmpapst	G3G146HK071 1/12	15823	No	B	-
Paloilmapuhallin	Sodeca	CMP-512-2T	13370	No	B	-
Kondensaattori (EC)	Ariterm	1,5 µF 358-TKO015-I6	14138	No	B	-
Arinalohko	Ariterm	200KW BJ20060B	13873	Yes	A	4
Liikkuva arinaelementti	Ariterm	75mm leveä Biojet Multi 200-2000 BJM500-152E	16292	Yes	A	6
Kiinteä arinaelementti	Ariterm	75mm leveä Biojet Multi 200-2000 BJM500-151E	16291	Yes	A	6
Liikkuva arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-156F	16296	Yes	A	3
Kiinteä arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-155F	16295	Yes	A	3
Sivukeraami vasen 1	Ariterm	BJM 200 BJM200-L093	17253	Yes	A	1
Sivukeraami oikea 1	Ariterm	BJM 200 BJM200-R093	17250	Yes	A	1
Sivukeraami vasen 2	Ariterm	BJM 200 BJM200-L094	17254	Yes	A	1
Sivukeraami oikea 2	Ariterm	BJM 200 BJM200-R094	17251	Yes	A	1
Sivukeraami vasen 3	Ariterm	BJM 200 BJM200-L095	17255	Yes	A	1
Sivukeraami oikea 3	Ariterm	BJM 200 BJM200-R095	17252	Yes	A	1
Säteilyholvi	Ariterm	Biojet 200 kW BJ-20070a	10348	Yes	A	2

5.2.3 300 kW model spare parts

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Paloilmapuhallin (EC)	Ebmpapst	G3G180-AD43-71	15831	No	B	-
Paloilmapuhallin	Sodeca	CMP-514-2T	13346	No	B	-

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Kondensaattori (EC)	Ariterm	1,5 µF 358-TKO015-I6	14138	No	B	-
Arinalohko	Ariterm	300KW BJ30060C	13875	Yes	A	6
Liikkuva arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-154F	16294	Yes	A	6
Kiinteä arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-153F	16293	Yes	A	6
Liikkuva arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-156F	16296	Yes	A	3
Kiinteä arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-155F	16295	Yes	A	3
Sivukeraami vasen 1	Ariterm	BJM300 BJM300-L160	17903	Yes	A	1
Sivukeraami oikea 1	Ariterm	BJM300 BJM300-R160	17904	Yes	A	1
Sivukeraami vasen 2	Ariterm	BJM300 BJM300-L161	17901	Yes	A	1
Sivukeraami oikea 2	Ariterm	BJM300 BJM300-R161	17905	Yes	A	1
Sivukeraami vasen 3	Ariterm	BJM300 BJM300-L162	17902	Yes	A	1
Sivukeraami oikea 3	Ariterm	BJM300 BJM300-R162	17900	Yes	A	1
Säteilyholvi	Ariterm	Biojet 300 kW 60 ast. BJ-30070A	10723	Yes	A	2

5.2.4 400 kW model spare parts

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Paloilmapuhallin (EC)	Ebmpapst	G3G180-AD43-71	15831	No	B	-
Paloilmapuhallin	Sodeca	CMP-616-2T	13372	No	B	-
Kondensaattori (EC)	Ariterm	1,5 µF 358-TKO015-I6	14138	No	B	-
Arinalohko	Ariterm	400-500KW BJ50060C (1.4776)	13290	Yes	A	5

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Liikkuva arinaelementti	Ariterm	75mm leveä Biojet Multi 200-2000 BJM500-152E	16292	Yes	A	8
Liikkuva arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-154F	16294	Yes	A	4
Kiinteä arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-153F	16293	Yes	A	4
Kiinteä arinaelementti	Ariterm	75mm leveä Biojet Multi 200-2000 BJM500-151E	16291	Yes	A	8
Liikkuva arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-156F	16296	Yes	A	4
Kiinteä arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-155F	16295	Yes	A	4
Sivukeraami 1 vasen	Ariterm	BJM400-L160	17451	Yes	A	1
Sivukeraami 1 oikea	Ariterm	BJM400-R160	17447	Yes	A	1
Sivukeraami 2 vasen	Ariterm	BJM400-L161	17452	Yes	A	1
Sivukeraami 2 oikea	Ariterm	BJM400-R161	17448	Yes	A	1
Sivukeraami 3 vasen	Ariterm	BJM400-L162	17453	Yes	A	1
Sivukeraami 3 oikea	Ariterm	BJM400-R162	17449	Yes	A	1
Sivukeraami 4 vasen	Ariterm	BJM400-L163	17454	Yes	A	1
Sivukeraami 4 oikea	Ariterm	BJM400-R163	17450	Yes	A	1
Säteilyholvi	Ariterm	Biojet 400-500 kW BJ-50070a	10356	Yes	A	2

5.2.5 500 kW model spare parts

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Paloilmapuhallin (EC)	Ebmpapst	G3G180-AD43-71	15831	No	B	-
Paloilmapuhallin	Sodeca	CMP-616-2T	13372	No	B	-
Kondensaattori (EC)	Ariterm	1,5 µF 358-TKO015-I6	14138	No	B	-
Arinalohko	Ariterm	400 - 500KW BJ50060C (1.4776)	13290	Yes	A	7
Liikkuva arinaelementti	Ariterm	75mm leveä Biojet Multi 200-2000 BJM500-152E	16292	Yes	A	10
Liikkuva arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-154F	16294	Yes	A	5
Kiinteä arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-153F	16293	Yes	A	10
Kiinteä arinaelementti	Ariterm	75mm leveä Biojet Multi 200-2000 BJM500-151E	16291	Yes	A	5
Liikkuva arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-156F	16296	Yes	A	5
Kiinteä arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-155F	16295	Yes	A	5
Sivukeraami vasen 1	Ariterm	BJM 500 BJM500-L160B	17220	Yes	A	1
Sivukeraami oikea 1	Ariterm	BJM 500 BJM500-R160B	17216	Yes	A	1
Sivukeraami vasen 2	Ariterm	BJM 500 BJM500-L161A	17221	Yes	A	1
Sivukeraami oikea 2	Ariterm	BJM 500 BJM500-R161A	17217	Yes	A	1
Sivukeraami vasen 3	Ariterm	BJM 500 BJM500-L162A	17222	Yes	A	1
Sivukeraami oikea 3	Ariterm	BJM 500 BJM500-R162A	17218	Yes	A	1

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Sivukeraami vasen 4	Ariterm	BJM 500 BJM500-L163A	17223	Yes	A	1
Sivukeraami oikea 4	Ariterm	BJM 500 BJM500-R163A	17219	Yes	A	1
Säteilyholvi	Ariterm	Biojet 400-500 kW BJ-50070a	10356	Yes	A	2

5.2.6 700 kW model spare parts

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Paloilmapuhallin	Sodeca	CMP-514-2T	13346	No	B	-
Paloilmapuhallin	Sodeca	CMP-616-2T	13372	No	B	-
Arinalohko	Ariterm	700-1000 KW BJ70060D, 1.4826	13291	Yes	A	5
Liikkuva arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-154F	16294	Yes	A	15
Liikkuva arinaelementti	Ariterm	75mm leveä Biojet Multi 200-2000 BJM500-152E	16292	Yes	A	5
Kiinteä arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-153F	16293	Yes	A	15
Kiinteä arinaelementti	Ariterm	75mm leveä Biojet Multi 200-2000 BJM500-151E	16291	Yes	A	5
Kiinteä arinaelementti	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-153F	16293	Yes	A	5
Liikkuva arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-156F	16296	Yes	A	5
Kiinteä arinaelementti ilman ponttia	Ariterm	100mm leveä Biojet Multi 200-2000 BJM500-155F	16295	Yes	A	5
Sivukeraami vasen 1	Ariterm	BJM 700-1000 BJM1000-L160A	16852	Yes	A	1

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Sivukeraami oikea 1	Ariterm	BJM 700-1000 BJM1000-R160A	16856	Yes	A	1
Sivukeraami vasen 2	Ariterm	BJM 700-1000 BJM1000-L161	16853	Yes	A	1
Sivukeraami oikea 2	Ariterm	BJM 700-1000 BJM1000-R161	16857	Yes	A	1
Sivukeraami vasen 3	Ariterm	BJM 700-1000 BJM1000-L162	16854	Yes	A	1
Sivukeraami oikea 3	Ariterm	BJM 700-1000 BJM1000-R162	16858	Yes	A	1
Sivukeraami vasen 4	Ariterm	BJM 700-1000 BJM1000-L163	16855	Yes	A	1
Sivukeraami oikea 4	Ariterm	BJM 700-1000 BJM1000-R163	16859	Yes	A	1
Säteilyholvi	Ariterm	Biojet 700 kW BJ-70070A	13258	Yes	A	2

5.2.7 1000 kW model spare parts

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Syöttöruuvien Vaihde moottori*	Motovario	CS052 0,55 kW 19 rpm	10536	No	A	1
Pudotusletku*	Etra	Timberduc Pur 531E	14237	Yes	A	3 m
Sulkusyötin	Ariterm	SSP-11-000	14966	Yes	A	1
Sulkusyöttimen vaihde moottori	Motovario	NMRV050	15809	No	A	1
Paloilmapuhallin	Sodeca	CMP-616-2T	13372	No	B	-
Paloilmapuhallin*	Sodeca	CMP-922-2T-3, LG270 / RD270	17517 / 17578	No	B	-
Paloilman Sulkupelti*	Belimo	NM24A-SR	16089	No	B	-
Ilmanvirtaus-lähetin*	Produal	IVL 20 1130050	16458	No	A	1
Paine-erolähetin*	Produal	PEL-DK +-100 Pa	15097	No	A	1
Syöttöruuvi*	Ariterm	PRS114-680 PRS114-690	7986	Yes	A	1
Laippalaakeri*	Asahi	UCF-206 FK	1014	Yes	A	1
Painelaakerilevy*	Christian Berner	54945B D100/D32	1087	Yes	A	1

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Tiiviste*	Tampereen Tiiviste-teollisuus	Aramit PS08-503 2x140x140	13658	No	B	-
Varapullo, sammutusjärjestelmä*	Dafo	55-1612-01	VPJ01	No	A	1
Takapalo-termostaatti*	Kübler	Jumo 603070/0002-5	16218	No	A	1
Arinalohko	Ariterm	700-1000 kW BJ70060D, 1.4826	13291	Yes	A	7
Kiinteä arinaelementti 75 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-151C	16291	Yes	A	6
Liikkuva arinaelementti 75 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-152C	16292	Yes	A	6
Kiinteä arinaelementti 100 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-153C	16293	Yes	A	18
Liikkuva arinaelementti 100 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-154C	16294	Yes	A	18
Liikkuva arinaelementti ilman ponttia 100 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-156D	16296	Yes	A	6
Kiinteä arinaelementti ilman ponttia 100 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-155D	16295	Yes	A	6
Keraaminen sivuarina vasen 1	Ariterm	BJM 700-1000 BJM1000-L160A	16852	Yes	A	1
Keraaminen sivuarina vasen 2	Ariterm	BJM 700-1000 BJM1000-L161	16853	Yes	A	1
Keraaminen sivuarina vasen 3	Ariterm	BJM 700-1000 BJM1000-L162	16854	Yes	A	1
Keraaminen sivuarina vasen 4	Ariterm	BJM 700-1000 BJM1000-L163	16855	Yes	A	1
Keraaminen sivuarina oikea 1	Ariterm	BJM 700-1000 BJM1000-R160A	16856	Yes	A	1
Keraaminen sivuarina oikea 2	Ariterm	BJM 700-1000 BJM1000-R161	16857	Yes	A	1

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Keraaminen sivuarina oikea 3	Ariterm	BJM 700-1000 BJM1000-R162	16858	Yes	A	1
Keraaminen sivuarina oikea 4	Ariterm	BJM 700-1000 BJM1000-R163	16859	Yes	A	1

*Only with air duct version

5.2.8 1500 kW model spare parts

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Syöttöruuvien Vaihdevoottori*	Motovario	CS052 1,1 kW, 38 rpm	15075	No	A	1
Pudotusletku*	Etra	Timberduc Pur 531E	14237	Yes	A	3 m
Sulkusyötin*	Ariterm	SSP-11-000	14966	Yes	A	1
Sulkusyötin vaihdevoottori*	Motovario	NMRV050	15809	No	A	1
Paloilmapuhallin*	Sodeca	CMP-922-2T-3, LG270 / RD270	17517 / 17578	No	B	-
Paloilmapuhallin	Sodeca	CMP-820-2T	13374	No	B	-
Paloilmapuhallin	Sodeca	CMP-718-2T	13345	No	B	-
Paloilmapuhallin	Sodeca	CMP-616-2T	13372	No	B	-
Paloilmapuhallin	Sodeca	CMP-514-2T	13346	No	B	-
Paloilman Sulkupelti*	Belimo	NM24A-SR	16089	No	B	-
Ilmanvirtauslähetin*	Pro dual	IVL 20 1130050	16458	No	A	1
Paine-erolähetin*	Pro dual	PEL-DK +-100 Pa	15097	No	A	1
Syöttöruuvi*	Ariterm	PRS114-680 PRS114-690	7986	Yes	A	1
Laippalaakeri*	Asahi	UCF-206 FK	1014	Yes	A	1
Painelaakerilevy*	Christian Berner	54945B D100/D32	1087	Yes	A	1
Tiiviste*	Tampereen Tiiviste-teollisuus	Aramit PS08-503 2x140x140	13658	No	B	-
Varapullo, sammutusjärjestelmä*	Dafo	55-1612-01	VPJ01	No	A	1
Takapalo-termostaatti*	Kübler	Jumo 603070/0002-5	16218	No	A	1
Arinalohko	Ariterm	Arinalohko 1500 kW BJ150060B	14880	Yes	A	7

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Kiinteä arinaelementti 75 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-151C	16291	Yes	A	12
Liikkuva arinaelementti 75 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-152C	16292	Yes	A	12
Kiinteä arinaelementti 100 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-153C	16293	Yes	A	18
Liikkuva arinaelementti 100 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-154C	16294	Yes	A	18
Kiinteä arinaelementti ilman ponttia 100 mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-155D	16295	Yes	A	6
Liikkuva arinaelementti ilman ponttia 100mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-156D	16296	Yes	A	6
Keraaminen sivuarina vasen 1	Ariterm	BJM 1500 BJM1500-L160	16844	Yes	A	1
Keraaminen sivuarina vasen 2	Ariterm	BJM 1500-2000 BJM1500-L161	16845	Yes	A	1
Keraaminen sivuarina vasen 3	Ariterm	BJM 1500-2000 BJM1500-L162	16846	Yes	A	1
Keraaminen sivuarina vasen 4	Ariterm	BJM 1500-2000 BJM1500-L163	16847	Yes	A	1
Keraaminen sivuarina oikea 1	Ariterm	BJM 1500 BJM1500-R160	16848	Yes	A	1
Keraaminen sivuarina oikea 2	Ariterm	BJM 1500-2000 BJM1500-R161	16849	Yes	A	1
Keraaminen sivuarina oikea 3	Ariterm	BJM 1500-2000 BJM1500-R162	16850	Yes	A	1
Keraaminen sivuarina oikea 4	Ariterm	BJM 1500-2000 BJM1500-R163	16851	Yes	A	1

*Only with air duct version

5.2.9 2000 kW model spare parts

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Syöttöruuvien Vaihde moottori*	Motovario	CS052 1,1 kW, 38 rpm	15075	No	A	1
Pudotusletku*	Etra	Timberduc Pur 531E	14237	Yes	A	3 m
Sulkusyötin*	Ariterm	SSP-11-000	14966	Yes	A	1
Sulkusyötin vaihde moottori*	Motovario	NMRV050	15809	No	A	1
Paloilmapuhallin*	Sodeca	CMP-1231-4T-3 RPA-38	17003	No	B	-
Paloilman Sulkupelti*	Belimo	NM24A-SR	16089	No	B	-
Ilmanvirtaus-lähetin*	Produal	IVL 20 1130050	16458	No	A	1
Paine-erolähetin*	Produal	PEL-DK +-100 Pa	15097	No	A	1
Syöttöruuvi*	Ariterm	PRS114-680 PRS114-690	7986	Yes	A	1
Laippalaakeri*	Asahi	UCF-206 FK	1014	Yes	A	1
Painelaakerilevy*	Christian Berner	54945B D100/D32	1087	Yes	A	1
Tiiviste*	Tampereen Tiiviste-teollisuus	Aramit PS08-503 2x140x140	13658	No	B	-
Varapullo, sammutusjärjestelmä*	Dafo	55-1612-01	VPJ01	No	A	1
Takapalo-termostaatti*	Kübler	Jumo 603070/0002-5	16218	No	A	1
Arinalohko	Ariterm	Arinalohko 1500 kW BJ150060B	14880	Yes	A	8
Kiinteä arinaelementti 75mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-151C	16291	Yes	A	14
Liikkuva arinaelementti 75mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-152C	16292	Yes	A	14
Kiinteä arinaelementti 100mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-153C	16293	Yes	A	21
Liikkuva arinaelementti 100mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-154C	16294	Yes	A	21

Spare part name	Manufacturer / Supplier	Model name	Ariterm Art. No.	Wearing part	Criticality	Recommended on site [pcs]
Kiinteä arinaelementti ilman ponttia 100mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-155D	16295	Yes	A	7
Liikkuva arinaelementti ilman ponttia 100mm leveä	Ariterm	Biojet Multi 200-2000 BJM500-156D	16296	Yes	A	7
Keraaminen sivuarina oikea 1	Ariterm	BJM 2000 BJM2000-R164	16861	Yes	A	1
Keraaminen sivuarina oikea 2	Ariterm	BJM 1500-2000 BJM1500-R161	16849	Yes	A	1
Keraaminen sivuarina oikea 2	Ariterm	BJM 2000 BJM2000-R165	16863	Yes	A	1
Keraaminen sivuarina oikea 3	Ariterm	BJM 1500-2000 BJM1500-R162	16850	Yes	A	1
Keraaminen sivuarina oikea 4	Ariterm	BJM 1500-2000 BJM1500-R163	16851	Yes	A	1
Keraaminen sivuarina vasen 1	Ariterm	BJM 2000 BJM2000-L164	16860	Yes	A	1
Keraaminen sivuarina vasen 2 BJM	Ariterm	1500-2000 BJM1500-L161	16845	Yes	A	1
Keraaminen sivuarina vasen 2	Ariterm	BJM 2000 BJM2000-L165	16862	Yes	A	1
Keraaminen sivuarina vasen 3	Ariterm	BJM 1500-2000 BJM1500-L162	16846	Yes	A	1
Keraaminen sivuarina vasen 4	Ariterm	BJM 1500-2000 BJM1500-L163	16847	Yes	A	1

*Only with air duct version



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