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Service manual of an Automatic Biomass Burning Assembly, Smok Type, 120kW and 180kW with cast iron head and spring reel

Table of contents

FOR USER

Thank you for buying out device and congratulations on your great choice.

Moderator Spółka z o.o. manufactures boilers based on an original construction solution, developed at the end of 1970's in Hajnówka by eng. Kazimierz Kubacki. Over the last 20 years the boiler has undergone numerous technical changes and improvements. Moreover, we started manufacturing automatic feeders for burning broken-up solid fuels, operating together with the boiler as a complete Automatic Biomass Burning Assemblies AZSB. The following manual is based on the most up-to-date information from the manufacturer. Since the process of introducing structural changes is a continuous procedure, this instruction can only be used for the device, with which it was purchased.

AZSB is designed to heat water to the temperature up to 80 degrees Celsius in central heating and domestic hot water (d.h.w) installations, as well as in technological installations (wood dryers, presses, etc).

The manual was written as an instruction for mounting, operation and maintenance of the device. Please, read it before proceeding with these actions.

1. INTRODUCTION

1.1. SAFETY MANUAL

The basic condition of safe operation of the device is its proper connection to the central heating installation. The manufacturer made all the efforts for the device to be safe in operation. However, it will be possible only after fulfilling the recommended conditions of connecting and operating the device. Failing to implement any of the precautions due to the costs of installing other devices will inevitably affect the safety or higher operational costs in the future.

The devices underwent all the operational examinations and tests with carefully selected accessories (safety valves, thermal protection) and devices. Maintaining the declared high parameters of the operation of the device can be guaranteed only by using the equipment recommended by the manufacturer.

We are warning against using substitute solutions, not tested with the said boiler and without proper approvals (UDT) and certificates (declaration of conformity, CE mark). We are also warning against making any changes in the construction of the device or against failing to follow the described safety instructions.

Failing to follow the warnings may cause serious danger and pose a threat to health and human life.

In case of any doubts, please contact our sales or service department.

Safety instruction for typical operations.

Maintenance – during maintenance the device must be disconnected from power supply. The switcher ***(9, drawing 2.6.)*** must be set to **0 (zero)**. During maintenance, the tightness of connections and the condition of cover seals must always be checked.

Leakage – while filling the tank, attention must be paid to any presence of foreign particles, which can hinder its proper closing.

Head – please, remember, that the head is still hot for a long time after stopping the device. Any works can be performed only after the temperature drops. The head of the burner must not be covered and must be kept clean.

Fire safety – leaving the covers and hatches open or overfilling the tank while operating the burner may be a cause of an immediate fire risk. Too great amount of fuel in the tank will prevent the cover from closing tightly:

- in case of using a BVTS valve with an expansion vessel, a continuous water supply must be provided to the tank, and the correct operation of the valve must be inspected according to the manufacturer's recommendations

- in case of using a beeswax-type valve, every time somebody enters the boiler room (at least every 12-24 hours) please ensure, that the water level in the water tank is sufficient,

- the boiler room must be equipped with a sufficient amount of fire extinguishing equipment (fire department instructions, sufficiently large fire extinguisher, etc.),

- do not store the ash in plastic or paper containers. Do not leave the ash without supervision (even in non-flammable containers),

Protective gear – woodchips, sawdust and ash may contain carbon oxide, dust and allergens. Protective gear must be used while working with these materials. Please, remember, that the ash may contain burning coal pieces. Use proper gloves while working with ash.

Clothing – For your own safety, while working in the boiler room, please use non-melting and non-flammable clothing.

Warning signs

Please, pay attention to warning signs, their meaning and placement on the device. They will help in preventing accidents.

Pay special attention in the boiler room and remember, that different elements of the boiler and installation can be hot. Keep proper distance

The device takes time to start and starts operating without warning. Do not perform any works on the device while it is connected to power supply.

The device can be operated only by a person, who read the following manual.

The transport worm starts operating without warning. Disconnect the power supply before opening the cover.

Do not stand on the cover.

The tank may contain carbon oxide and dust. Ventilate the tank before loading or opening it.

1.2. WARRANTY

The manufacturer grants a 24-month warranty on the device. The warranty covers material defects and manufacturer's errors.

The warranty does not cover any damage resulting from improper using or normal wear. The warranty does not cover the installation and transport costs or damage resulting from transport or repairs and modifications realized without the manufacturer's approval.

Any complaints must always be addressed to the dealer of the device. The complaint must include the following data:

- description of the failure
- a document confirming the purchase of the device
- Boiler power, head power
- Serial number of furnace and Smok

Declaration of conformity

We

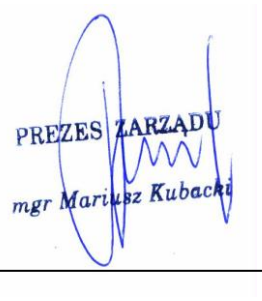
Moderator Spółka z o.o.

11 Listopada 16a
17-200 Hajnówka
tel. (085) 682-75-20

at our own and sole responsibility declare, that the Automatic Biomass Burning Assembly, Smok type, beginning from the serial numer 250, to which the following declaration refers, complies with the following recommendations and standards, if applicable:

Directives	Standards
EMC 204/108/WE	EN-PN ISO 12100
PED 97/23/WE	EN-PN 303-5
LVD 2006/95/WE	
MAD 2006/42/WE	

Hajnówka



1.3. DEVICE TECHNICAL DATA

Parameter	unit	W120A	W180A
Nominal thermal input	kW	120	180
Minimal thermal input	kW	36	54
Boiler class according to PN-EN 303-5		IV	IV
Efficiency with nominal power	%	90	90
Fumes temperature for nominal power	°C	160	160
Water capacity of the boiler	l		
Power consumption	W		
Required chimney draught	Pa	41	
Chimney dimensions	cm x cm	30x30	35x35
	Ø mm	300	350
Chimney minimal height	m	8-10	8-10
Fumes outlet diameter	mm	160	
Power and return spigots diameter		DN50 (G2 screw-in)	DN50 (G2 screw-in)
Max. allowed working pressure	bar	1,5	1,5
Mass of the device	kg		
Fumes stream			

1.4. FUEL

Use only the recommended fuels.

AZSB is adjusted to burn broken-up, sustainable wood- or plant-based fuels (P45 woodchips, several types of sawdust, treebark, peat, briquette with bulk density up to 450kg/m^3, pellets) with relative humidity no higher than 25%. The technical parameters of the device were defined for a fuel with 12.39% humidity and 15779kJ/kg caloric value.

Avoid burning excessively broken-up fuels (especially sawdust), where the amount of dust exceeds 5%, because it may cause explosive burning of dusts. Do not firm the fuel while filling the tank, because it may cause a blockage of the tank.

In case of a fuel with bulk density below 100kg/stere, the device may not reach its nominal power. An example of such fuel can be woodchips from shapers.

Table 1.1. Estimated data regarding different fuels.

Fuel type	Time of burning 1 stere	Weight of 1 stere	humidity
	(h)	*(kg)*	*(%)*
Briquette	**12**	**400**	**10**
Woodchips	**7**	**250**	**20**
Sawdust	**4**	**145**	**20**
Pellets	**22**	**650**	**6**

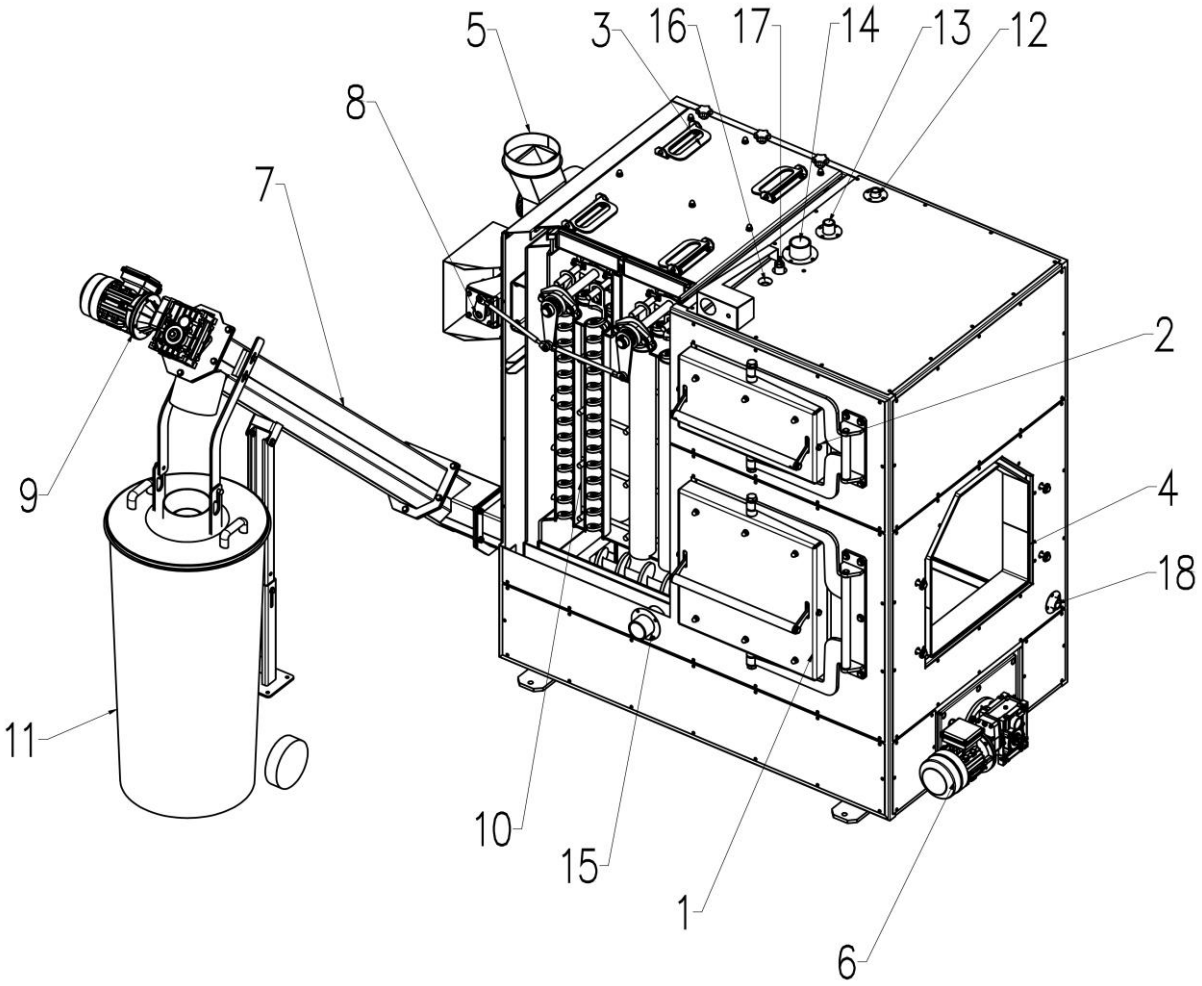
1.5. TECHNICAL DESCRIPTION

AZSB includes devices, which have their own service manuals. Please, use the instruction during maintenance and operation of these devices.

AZSB comprises of a *Moderator*-type exchanger and an Automatic Biomass Burning Feeder (APSB) manufactured by Moderator Sp. z o.o. in Hajnówka.

Exchanger (boiler)

The exchanger is a device transferring the energy contained in fume gases, produced by APSD, to the water in central heating installation. The exchanger is a low-temperature water boiler. It is made of specific boiler iron plates (steel type P265GH). The walls inside the boiler are cooled with water. A great portion of the heat exchange surface comprises of pipes (combustion tubes), wherein spiral turbulence mixers are placed. They significantly increase the effectiveness of heat exchange and allow to automatize the process of cleaning the heat exchange surface. The process comprises of cyclical triggering back and forth motion of the turbulence mixers, which tear off the ash layer, accumulating on the exchange surfaces. The exchanger, as a default, is provided with a cleaning mechanism for combustion tubes and an ash removal system. The exchanger, together with the main parts marked, is presented on the figure below. The basic version of the ash removal system comprises of a horizontal ribbon feeder, running along the ash pan and ash tank, which is placed at the end of the ribbon feeder. The ash is supplied to the tank from below. The extended version of the ash removal system has an additional slanted conveyor and a standard (steel) tank for rubbish. The slanted conveyor transports the ash from the horizontal conveyor to the ash tank.



Drawing 1.1. Moderator tube boiler for APSB – main parts description.

1 – lower access door of the burning chamber 2 – upper access door of the burning chamber, 3 – upper access cover, 4 – Head-connecting spigot, 5 – exhaust ventilator – smoke flue, 6 – horizontal ash conveyor gearmotor, 7 – slanted ash conveyor, 8 – combustion tubes cleaning mechanism drive, 9 – slanted ash conveyor gearmotor, 10 – cleaning mechanism for combustion tubes, 11 – ash tank, 12 – thermal safety G1/2 screw-in spigot, 13 – safety valve G1 screw-in spigot, 14 – power supply G2 screw-in spigot, 15 – return G2 screw-in spigot, 16 – thermanometer G1/2 screw-in spigot 17 – measuring chamber, 18 – release G3/4 screw-in spigot

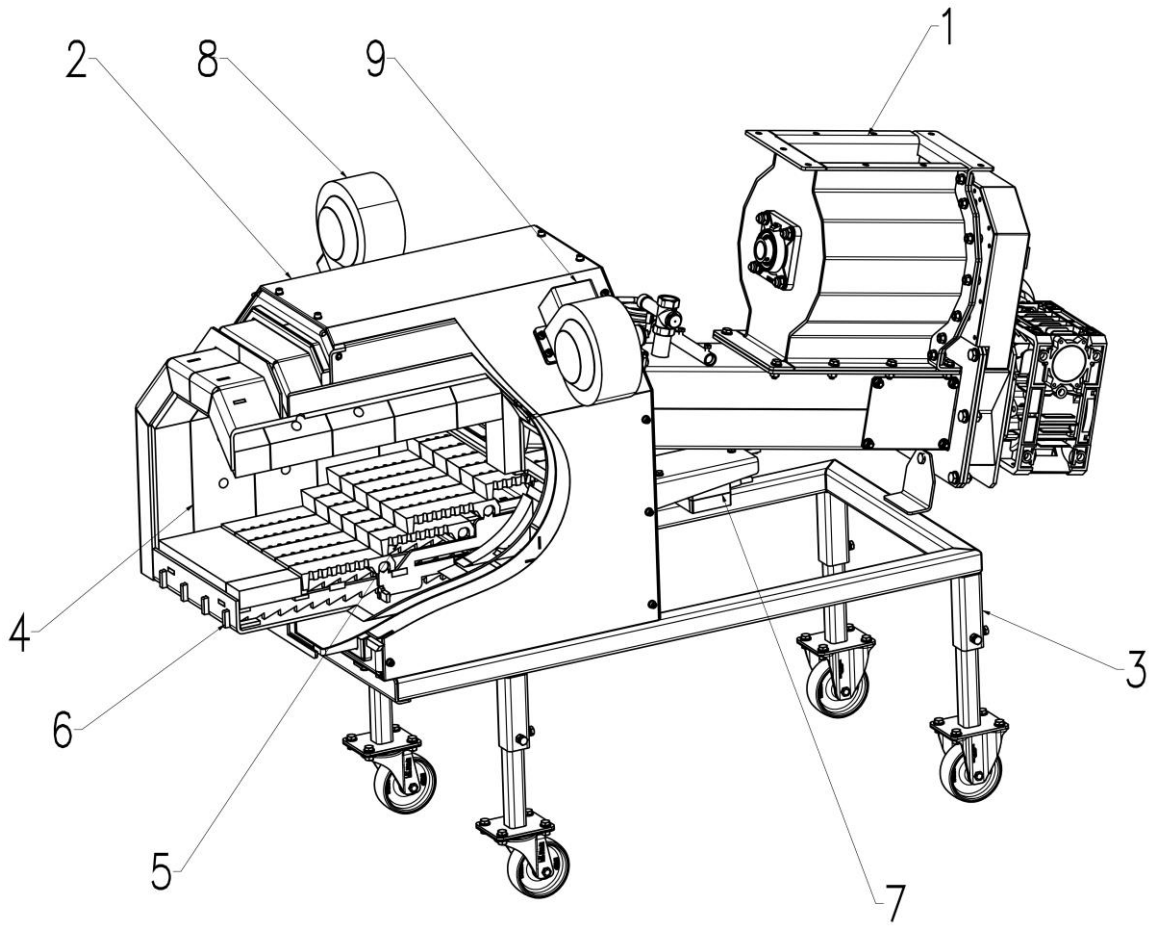
Automatic Biomass Burning Feeder (APSB)

APSB is a complete device, designed to transform the energy contained in the fuel (biomass) into fume gas heating energy

The mail elements of APSB are:

- iron-cast head with a bucket feeder
- spring reel
- fire extinguishing system
- control unit

Iron-cast head

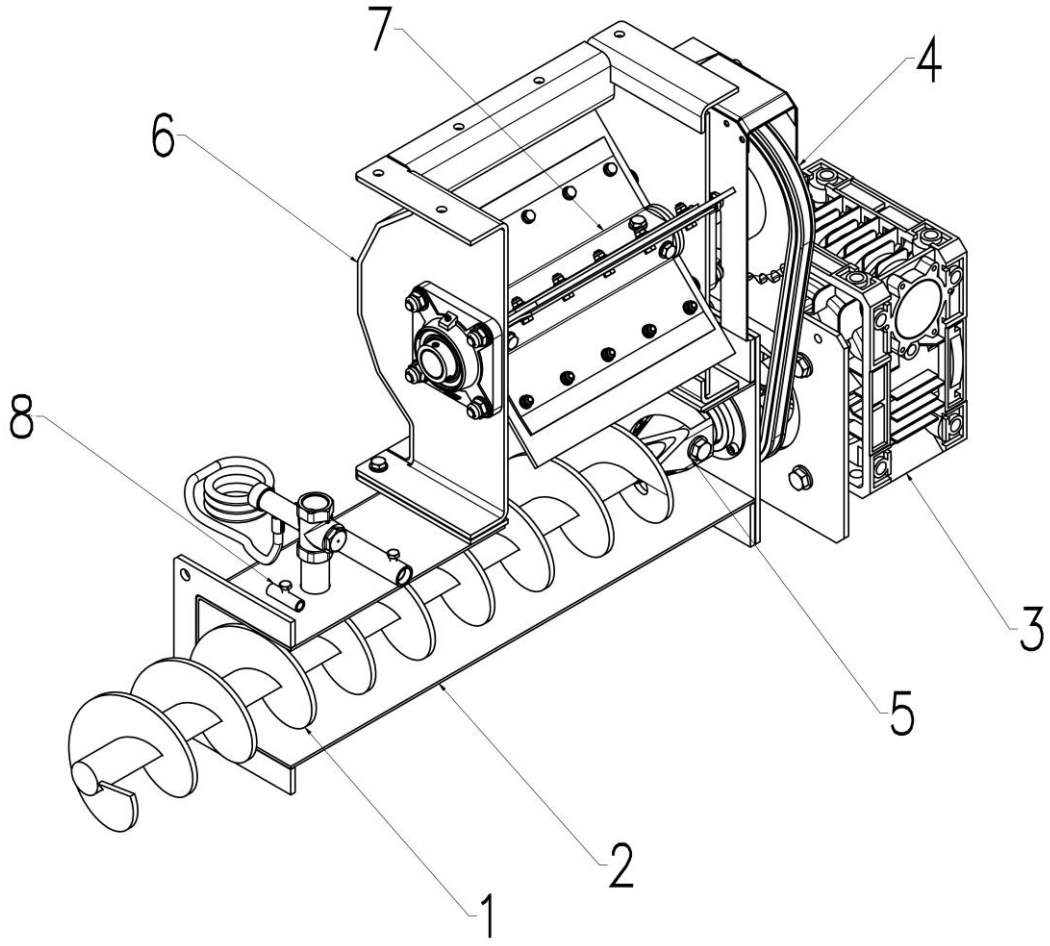


Drawing 1.2. iron-cast head „RA"-type

1 – bucket feeder, 2 – iron-cast head, 3 – frame, 4 – furnace ceramic elements, 5 – movable grate 6 – racks, 7 – grate drive actuator, 8 – secondary air blower, 9 – primary air blower.

The iron-cast head *(Rys.1.2)* is connected to the boiler, so that only the products of burning are conveyed to the furnace chamber of the boiler. The head operates in the following manner. The fuel from the tank is transported onto the furnace of the head with the ribbon feeder, where the burning process is realized at a very high temperature, with the air supplied by the blowers. The furnace of the head is provided with a segmented grate, where every segment moves back and forth with respect to the rest. The movable grate removes the contamination accumulating thereon. The movement of the grate is realized by an electric motor. Racks, placed in the space under the grate, are engaged with the movable grate. They remove the contamination, which fell though the grate, from the head. The furnace of the head is made of ceramic elements, which significantly increase the durability of the head and are easily replaceable. The head with the bucket feeder are placed on the frame, provided with wheels, which facilitates performing service works thereon. An ignition switch is a default equipment of the head.

Bucket feeder



Drawing 1.3. bucket feeder.

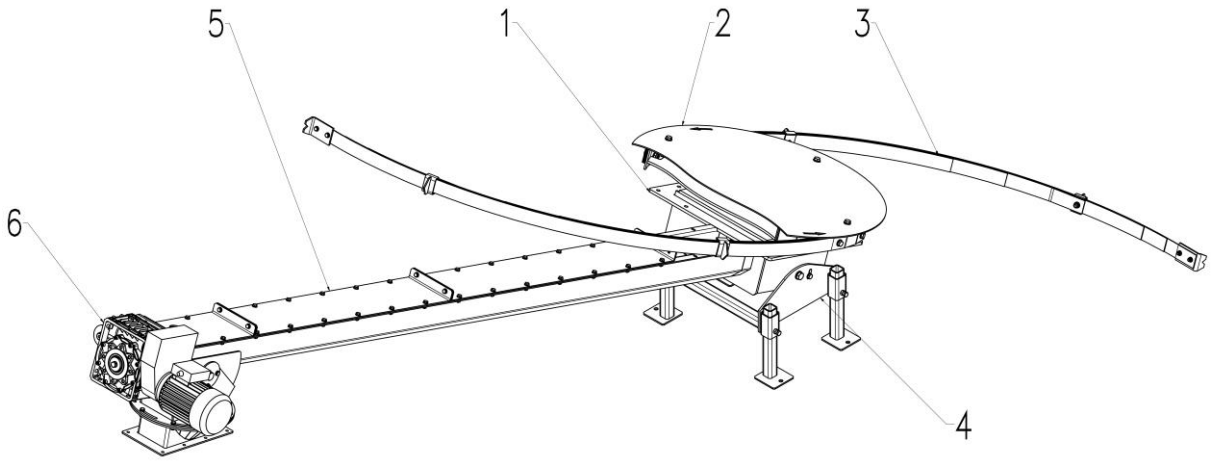
1 – feeder wormshaft, 2 – wormshaft enclosure, 3 – drive motorgear, 4 – chain transmission, 5 – clutch, 6 – dosing feeder enclosure, 7 – dosing feeder rotor, 8 – feeder temperature sensor spigot.

The bucket feeder comprises of two feeders coupled with each other: the ribbon feeder and a rotatable dosing feeder. In operation the fuel is supplied by the spring reel through the upper opening into the gaps between the blades of the rotor, after rotating the rotor by 180°, the fuel is released through the lower opening of the dosing feeder onto the ribbon feeder, which supplies it to the furnace of the head. The rotor of the dosing feeder is equipped with metal-rubber blades, which tightly abut the enclosure in every phase of the operation, thus separating the spring reel from the lower feeder. The feeders are separated in order to protect the fuel tank against fire and facilitate the process of extinguishing the device.

Spring reel

The spring reel is a device designed to be mounted in an already existing or specially prepared for this purpose room and uses the said room as the fuel tank. This solution allows for more efficient use of the said space than in case of a standard tank. The room

designated for mounting the spring reel can be of any shape, but the distance between the wall of the room and the rotational axis of the plate should be between 0.75 m and 1.5 m. It is recommended to construct a bottom in the plane of the reel mounting plate, as well as additional walls, if the room, where the spring reel is to be mounted, is too big. The construction of the reel allows for a great dose of freedom of positioning, thanks to the possibility of regulating the lead angle and head rotation angle with respect to the reel in the horizontal plane.

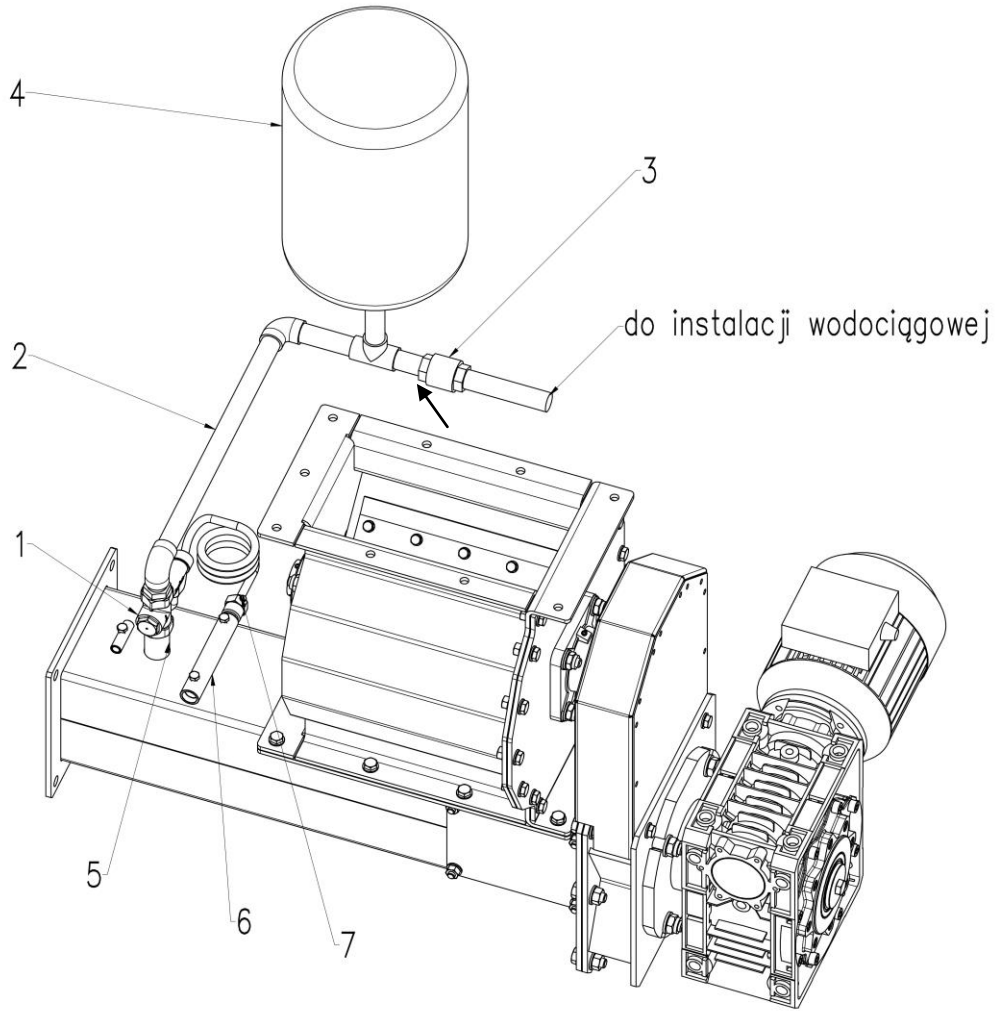


Drawing 1.4. Spring reel

1 – mounting plate, 2 – plate, 3 – spring scooping arms, 4 – base, 5 – feeder, 6 – motorgear

Fire extinguishing system

The fire extinguishing system is for preventing the fire from reaching from the furnace to the fuel container. A BVTS valve with tripping temperature 70^{o}C and capillary 1.3 m, is included with the device, other elements of the system must be provided by the user. The elements of the fire extinguisher system must be connected to the water installation according to the diagram below.



Drawing 1.5. Fire extinguishing system

1 –BVTS valve, 2 – water supplying tubes, 3 – check valve and flow direction 4 – membrane vessel, 5 – feeder deluge spigot, 6 – temperature sensor spigot, 7 – temperature sensor

The piping of the fire extinguishing system must be made of standard elements, dedicated to building water disposal installations, cross-section at least DN15. Membrane vessel must be chosen according to the water installation, in which it is going to operate, the volume of the membrane vessel volume is at least 20 liters. In some devices it is also possible to connect the fire extinguishing system in the upper feeder. In such situation the BVTS valve needs to be mounted in such position, so that the fire extinguishing water can be transported to the upper feeder.

The fire extinguishing system operates in the following manner. When the temperature of the feeder cover at the location of the temperature sensor, reaches 70°C, the BVTS valve opens and the inside of the feeder is flooded with water. The water is supplied till the temperature of the cover reaches 64°C. The membrane vessel with a check valve provide the

minimal amount of water necessary to extinguish the feeder in case of shortage of water from the water installation.

2. MOUNTING.

2.1. SHIPMENT COMPLETENESS CHECK

The shipment includes:

- exchanger, provided with ash-removal gearmotor, exhaust ventilator, thermomanometer and cleaning accessories
- iron-cast head with bucket feeder, provided on a supporting frame
- spring reel
- ash removal system (different versions, depending on the specific order)
- BVTS valve
- control unit
- ash tank
- wheels for the iron-cast head
- connecting elements
- silicon
- technical and transport documentation

2.2. TRANSPORT, CARRYING, UNLOADING AND UNPACKING

Exchanger

In order to facilitate the transport, the exchanger has two wooden beams screwed to the legs. They are situated transversely with respect to the boiler. The boiler must be transported with a forklift or pallet truck by being lifted it from the bottom by the space between the beams. After transporting the boiler to its final location the beams must be removed in the following manner:

- lift the front of the boiler with lifting straps and a forklift or a proper lifter, the lifting sling must be placed in the space between the beams, next to the front beam
- remove the front beam
- lower the front of the boiler
- lift the back of the boiler with lifting straps or a proper lifter, the lifting sling must be placed in the space between the beams, next to the back beam

Spring reel

The reel is provided on two transport pallets, which should be used for transporting the device to the room, where it is going to be installed. After transporting the reel to its destination the transport pallets must be removed. The device must be lifted by its lifting lungs, screwed to the enclosure. After placing the device the lungs must be removed.

Iron-cast head

Iron-cast head with a bucket feeder is provided on one transport pallet as one assembly. After transporting it to its destination the transport pallet must be removed. The device should be lifted by its support frame with proper lifters.

The other elements are placed inside the boiler or on a separate pallet. Unpacking them does not require tools.

	The transport pallet serves only for transport and must not be used as the base.

2.3. BOILER ROOM REQUIREMENTS

The boiler room should comply with PN-87/B-02411 requirements. Here are the most important of them:

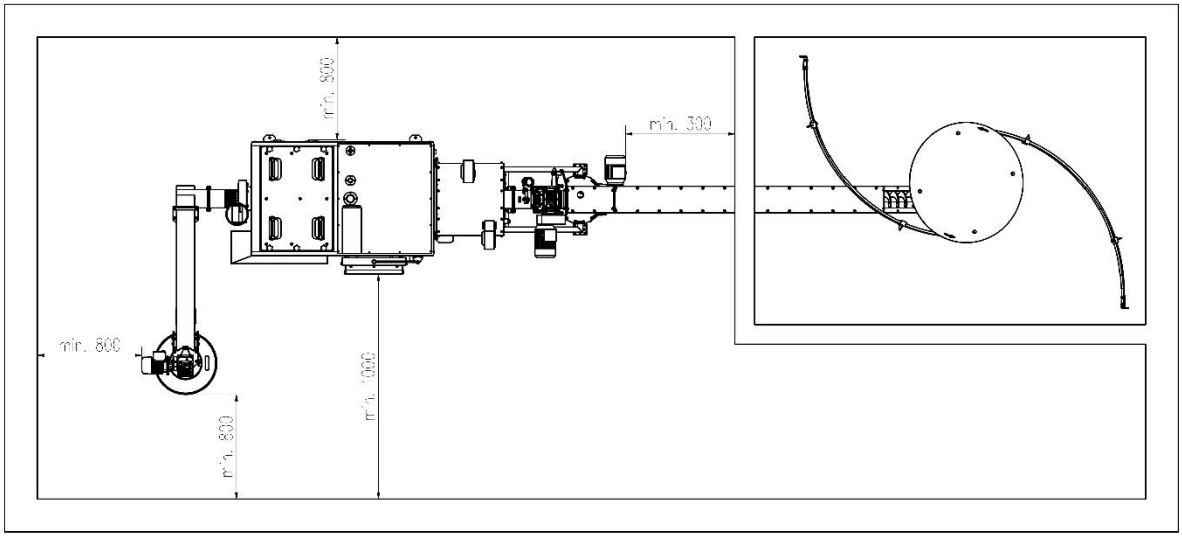
- fire-proof floor,
- steel doors or wooden doors with steel cover, opened to the outside,
- air supplying opening 21x21 cm in the lower part of the boiler room,
- air outlet opening at least 14x14 cm in the upper part of the boiler room,
- water tap,
- sewage well,
- sink,

	Using mechanical ventilation in the boiler room is strictly forbidden.

2.4. DEVICE PLACEMENT

The device must be mounted by a properly qualified and experienced fitter (we advise to use help of a certified center, where the fitters underwent training at Sp. z o. o.). Faulty installation can cause premature wear of the boiler, creates risk of fire or may lead to an explosion.

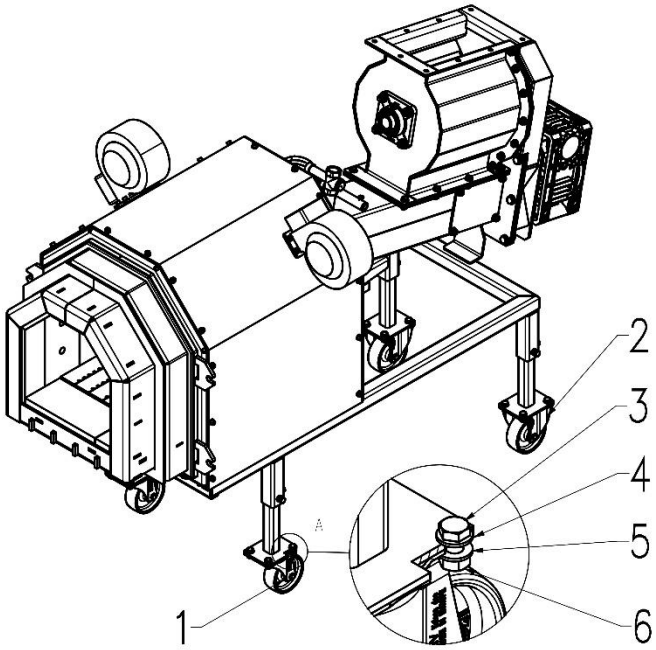
While placing the device, the access to it must be provided in such manner, so that the walls of the boiler room do not obstruct feeding the fuel, cleaning or access to the cleanout. The distance from the front of the boiler (operating side) to the opposite wall should be at least 1 m from the sides and at least 0.8 m from the back of the boiler. The wall, through which the spring reel passes should not be located closer than 0.3 from the bucket feeder drive. If the wall is closer to the device, an opening must be made therein to allow proper servicing of the device. An exemplary placement of the device is presented on the drawing below.



Drawing 2.1. placement of the device in the boiler room.

Connecting the elements of the device should be performed in the following manner:

1. Place the boiler at the pre-planned location.
2. Level the boiler with metal pads of proper thickness. The pads must be placed under the legs of the boiler.
3. Screw wheels onto the wheels of the head, M8x18 screws for this task were placed in the openings of wheel subplates. Screw the steering rollers on the front of the head.



Drawing 2.2. Mounting wheels on the head

1 – steering rollers, 2 – fixed rollers, 3 – M8x18 screw, 4 – pad, 5 – pad,6 – M8 nut,

While seating the device, an access to it must be guaranteed in such manner, that the walls of the boiler room do not obstruct feeding the fuel, cleaning or access to the cleanout. The distance from the front of the boiler (operating side) to the opposite wall should be at least 1 m from the sides and at least 0.8 m from the sides. If the fuel feeder passes through a wall, it should not be closer than 0.3 m from the bucket feeder drive. When the wall is closer, an opening must be made therein to allow proper servicing of the device. An exemplary seating of the device is presented on the drawing 2.1.

2.3.2. FEEDER PLACEMENT

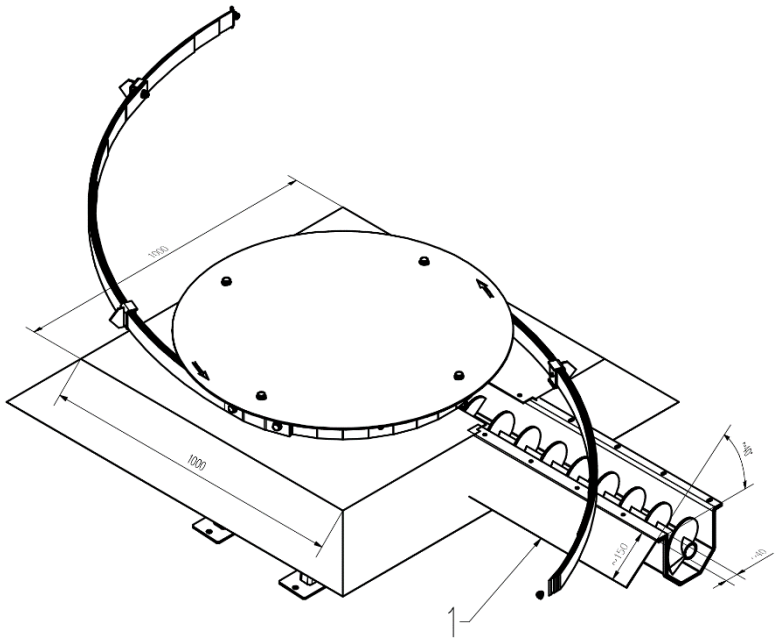
Preparatory actions:

1. Make sure you have all the tools necessary to begin the mounting process (a set of keys, silicone squeezer).

Installing APSB with the spring reel

2. Screw the head to the mounting opening in the boiler.
3. Place the spring reel at the pre-planned location. Join the pouring system of the reel with feeding system of the bucket feeder.

4. Prepare the bottom in the reel mounting plate plane and, if necessary, on the wall plane. The bottom and the walls must be made of steel plate, building panel or planks. The structure of the bottom and the walls must have sufficient deadweight in order to allow for withstanding the load of the fuel. The construction of the bottom should not transfer the load onto the feeder and should not be supported by it. The base, with which the feeder was provided, transfers the load inflicted onto the plate of the feeder and is supposed to facilitate mounting. In case if the encoder arms contact the walls of the room, they must be covered at the place of the contact with a steel plate up to ~40 cm from the bottom. The cover of the feeder must be adjusted to the room by cutting or preparing to size it if necessary. In case when the bottom is not prepared, a slide must be build, according to the drawing below, which will prevent hooking the encoder arms on the feeder cover. The slide must be made on the whole length of the exposed portion of the feeder.



Drawing 2.3. Slide diagram

1 – slide.

5. Tighten the discharge of the reel with silicon.
6. Install the fire extinguishing installation according to the drawing 1.5. Connect water supply to the fire extinguishing installation.
7. Check if the BVTS valve and the whole fire extinguishing system operate properly.
8. Connect the electric installation and sensors (according to the description in chapter 2.7. Mounting the controllers and electric connections).

2.4. CONNECTION TO THE CHIMNEY

Connect the exhaust ventilator with the chimney with proper tubes and fittings, pay attention to the tightness of the connections. Due to the possibility of corrosion it is recommendable to use chimney systems made of refractory steel. The smoke duct should be realized according to the proper norms.

2.5. CONNECTING THE EXCHANGER TO THE CENTRAL HEATING INSTALLATION

Moderator-type exchangers are designated to operate in an open system installation or closed system installation, for power up to 100kW.

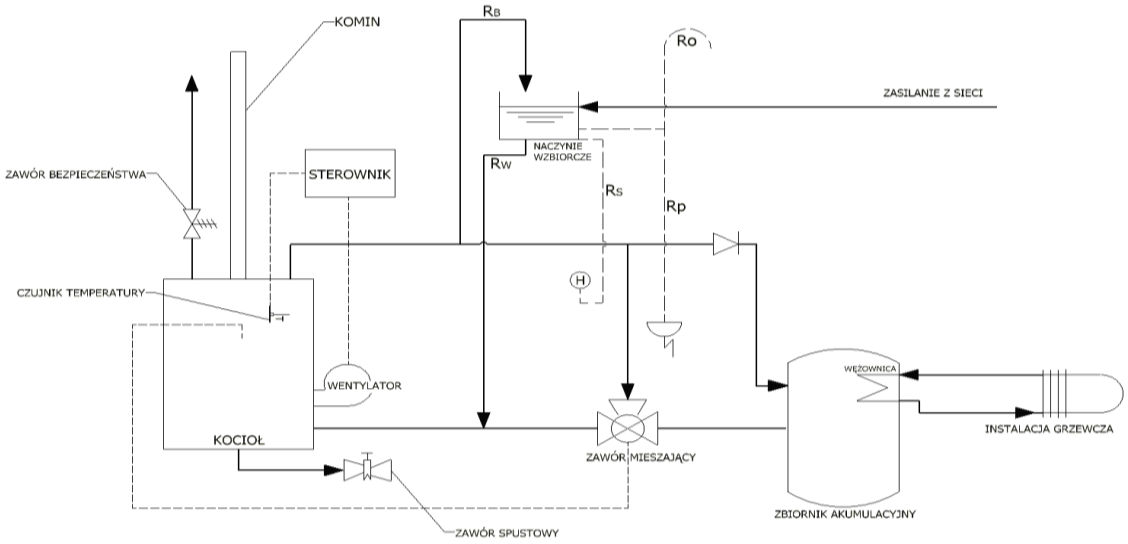
The exchanger (boiler) will operate properly if the temperature inside the furnace chamber is high enough, which means, that the supplied water should have temperature around 70-80°C, and no less than 55°C on return. Such operation parameters will protect the boiler from low-temperature corrosion. In order to ensure the proper operation of the boiler, the manufacturer recommends installing a mixing valve.

Boilers with power of 120kW and 180kW have G2" spigots. Coupling the spigots with the installation should be realized with proper connections.

Filling the boiler and the installation with water should occur through G$^3/_4$" release spigot. This operation must be performed slowly in order to ensure proper venting of the installation. The water to supply the boilers should be free from mechanical and organic contamination and comply with PN-85/C-04601 requirements. The installations operating without losses can be supplied with raw water, as long as its hardness does not exceed 10°n. In such cases water purification process must be realized.

2.6. SECURING THE INSTALLATION

2.6.1. OPEN SYSTEM



Drawing 2.4. An exemplary diagram of installation protection for the boilers operating in open central heating systems.

Moderator-type boilers working in open central heating systems must be connected in compliance with PN-91/B-02413 requirements, where the excess heat in the form of vapor should be released through an open connection (safety tube R_B) to the atmosphere.

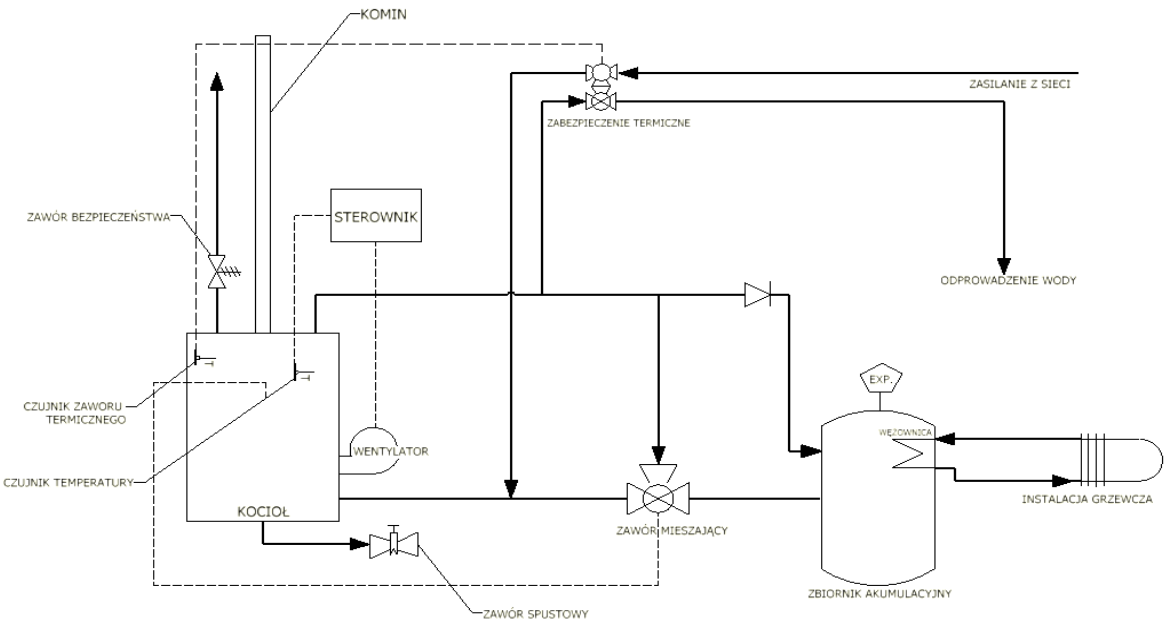
No fitting, which allows for full or partial closure of the flow, must be placed on the R_B, R_W and R_O tubes. The protective devices and tubes must be protected from freezing.

2.6.2. CLOSED SYSTEM

Moderator-type boilers working in open central heating systems must be connected in compliance with PN-B-02414:1999 requirements with provision of the regulation of the minister of infrastructure, dated 12.03.2009 regarding the requirements for technical conditions for buildings and their location. Paragraph 133 section 7 of the said regulations sounds as follows: „It is forbidden to use a solid fuel boiler to power a water closed system heating installation, provided with a membrane extensions vessel, except for a solid fuel boiler with nominal power no higher than 300kW, provided with an excessive heat discharge device".

A thermal protection SYR5067 can be used as an excessive heat discharge device. It is efficient only after ensuring the water pressure of at least 2.3 bar in the sewer system and installing a safety valve. Maximum power operated by the thermal securement SYR5067 is 100kW, thus the devices with higher power should be mounted in an open system.

The thermal securement can be connected only to a source of water, which will ensure its supply in case of a blackout (e.g. water supply network).



Drawing 2.5. An exemplary diagram of installation protection for the boilers operating in closed central heating systems.

2.7. MOUNTING THE CONTROLLERS AND ELECTRIC CONNECTION

2.7.1. SAFETY RULES

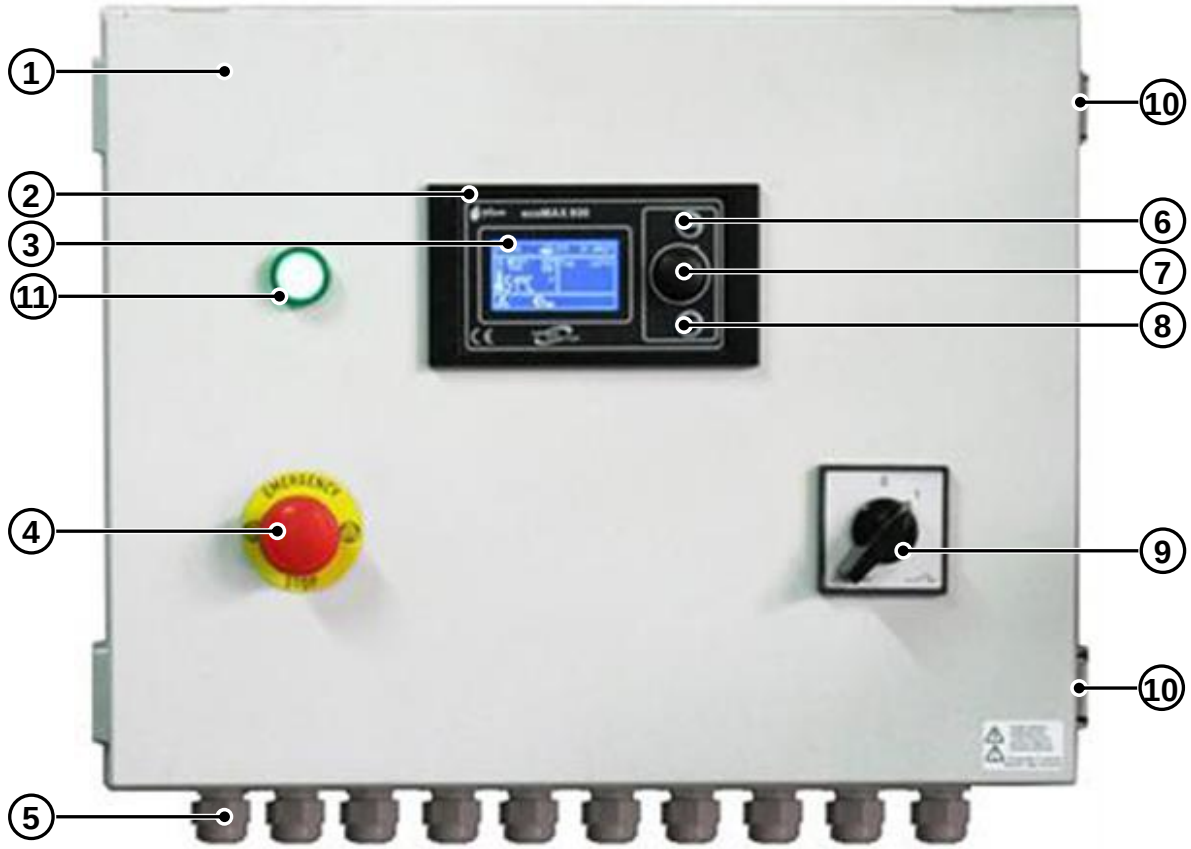
The controllers and electric connections must be installed only by a qualified person.

1. Before connecting the device please, carefully read the boiler and control unit service manual.
2. After turning off the control unit with the keyboard, there might be dangerous voltage in the controller terminals. Before staring the mounting, repairs or maintenance, as well as during any connecting operations, you must at all times disconnect the power supply and check if the terminals and electric wires are energized.
3. The boiler room should be provided with an electric installation compliant with the applicable regulations.
4. The electric installation should end with a socket provided with a protective contact. **Using a socket without a protective terminal connected creates a risk of electric shock!!!**
5. The boiler must be connected to a separate power supply line, secured with C20A three-phase overcurrent protection and a residual current switch (anti-shock).
6. The enclosure, where the electric equipment is installed, must be opened only by a qualified electrician, familiarized with the operation of the device.
7. The enclosure must be secured against opening the cover by unauthorized people, e.g. with a padlock. A clasp on the enclosure allows for using a padlock.
8. The location of the socket for plugging the controller must be chosen in such manner, so that the plug is easily accessible for quick disconnection in an emergency situation.
9. The electric wires should be well secured on the whole of their length. The wires must be placed far from the heated parts of the boiler, particularly far from hot elements of the head, flue pipe and chimney.
10. The control unit must be installed and operated according to the rules of operating electric devices.
11. The controller must not be exposed to water or conditions causing liquefaction of vapor, e.g. abrupt changes of temperature.
12. The controller must be placed such that it is impossible to heat it to a temperature exceeding 50°C. It must not be installed on a wall of the fuel tank.

13. The controller must not be used with a damaged enclosure.
14. Children access to the controller must be prevented.
15. The controller must be disconnected from the network during a storm.

2.7.2. Control units

AZSB and APSB with two feeders are provided with ZAB-14 control unit. The unit is connected to three-phase network with phase-to-phase voltage 400V, 50 Hz.



Drawing 2.6. ZAB-14 control unit seen from the front

1 – cover, 2 – control panel, 3 – display, 4 – emergency stop button, 5 – cable hland 6 – MENU button, 7 – choice/change/confirmation knob, 8 – EXIT button, 9 – Main switch, 10 – cover closing latch, 11 – unit energization signal light

The detailed information regarding the basic parameters, button functions, setting parameters, outlets load capacity etc. is provided in the control unit manual.

2.7.3. CONTROL UNIT INSTALLATION

The control unit must be installed in the boiler room on a wall in a place, where it is easily accessible for the staff.

It is forbidden to install the unit on the boiler, ribbon wire, flues, chimney or fuel tank, as well as on surfaces heated to a temperature excessing 50ºC.

2.7.4. ELECTRIC CONNECTIONS AND MOUNTING ELECTRIC COMPONENTS

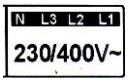
Before plugging the electric connections, the wires (not included) must be placed in the boiler room in accordance with the applicable regulations of this field. The wires must be lead in tubes or cable ducts prepared for this purpose.

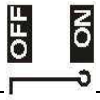
Do not secure the wire routes (ducts) to AZSB structure!

This operation must be performed by a certified electrician. It is recommended to use wires with cross-sections no greater than specified in Table 2.2.

The connections not enclosed in the DTR control unit are listed in the following part of the manual.

Table 2.2. Minimal required wire cross-sections

Circuit	Symbol	Wire type	Wire cross-section
POWER SUPPLY		H05VV-F 300/500V	5x2.5 mm^2
FEEDER (UPPER FEEDER MOTOR)		H05VV-F 300/500V	4x1.5 mm^2
PODAJNIK 2 (LOWER FEEDER MOTOR)		H05VV-F 300/500V	4x1.5 mm^2
IGNITION SWITCH		H03VV-F 300/300V	3x2.5 mm^2
D.H.W. PUMP		H03VV-F 300/300V	3x1 mm^2
CENTRAL HEATING PUMP		H03VV-F 300/300V	3x1 mm^2
BLOWER (primary air)		H03VV-F 300/300V	3x1 mm^2
BLOWER (secondary air)		H03VV-F 300/300V	3x1 mm^2

DRAFT FAN		H03VV-F 300/300V	3x1 mm^2
MOVABLE GRATE		H03VV-F 300/300V	3x1 mm^2
CIRCULATION PUMP		H03VV-F 300/300V	3x1 mm^2
MIXING VALVE ACTUATOR		H03VV-F 300/300V	3x1 mm^2
MIXER CIRCUIT PUMP		H03VV-F 300/300V	3x1 mm^2
ALARM		H03VV-F 300/300V	3x1 mm^2
STB		H03VV-F 300/300V	3x1 mm^2
ASH REMOVAL		H03VV-F 300/300V	3x1 mm^2
CLEANING THE EXCHANGER		H03VV-F 300/300V	3x1 mm^2
FOR CONNECTING THE 96-122 OUTPUTS IT IS RECOMMENDED TO USE THE WIRE TYPE H03VV-F 300/300V CROSS-SECTION 2x0.75 MM^2 OR 3x0.75 MM^2.			

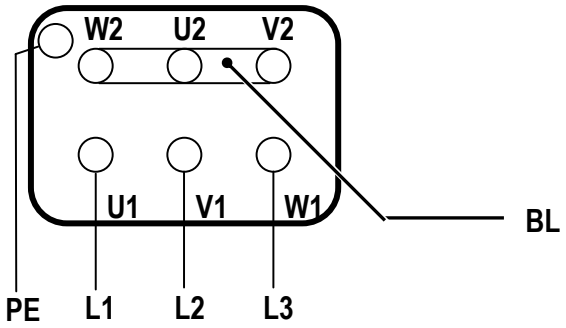
While connecting the wires to the controller remember about using conductor end sleeves, which prevent fraying of the cables. Crimp the through-hole endings on the isolated wires terminals next to the feeder motor.

Tinning the endings of wires connected to screw terminals of terminal strips is forbidden. After prolonged operation it can cause loosening the connections.

THREE-PHASE LOWER AND UPPER FEEDER MOTORS

A wire with cross-section specified in the *Table 2.2* is recommended to connect the motor. The feeder motor windings should be connected in star *(Drawing 2.8)*.

The motors must be connected according to the control unit manual. After connecting the motor check the rotational direction of the worm. To do that enter MANUAL CONTROL and turn on the feeder. The ribbon should turn in a direction causing pushing the fuel out to the head. If it does not occur, do not switch places of the wires connected to U1 i V1 terminals.



Drawing 2.8. Connecting terminals inside the feeders motor box

BL – plate for connecting the terminals

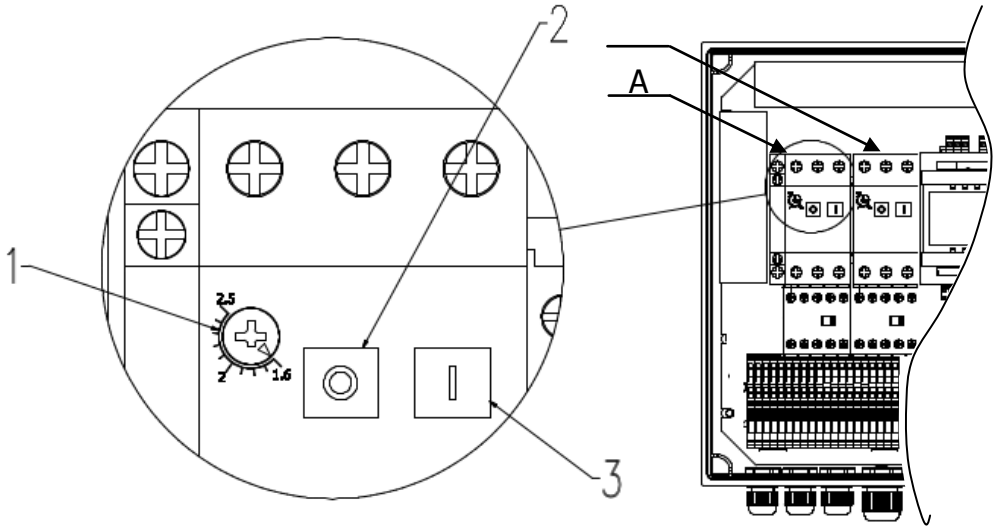
SETTING THE MOTOR SWITCHERS

The motor switchers *(drawing 2.9.)* protect the motors of fuel feeders against the influence of overloading the fuel supply system. The motor switcher must be set with a knob *(1, drawing 2.9.)* to the proper reaction current, that is the rated current of the motor. The value of the rated current is written on the descriptive plaque feeder motor or in the table below.

Table 2.3. Current values for the motor switcher against the motor power

Motor power [kW]	Motor rated current [A]	Current set on the motor switcher [A]
0,55	1,8	1,9
0,75	2,2	2,3
1,1	2,6	2,7

Current must be set for both motor switchers.



Drawing 2.9. Feeders motor switchers

A – UPPER feeder motor switcher, B – LOWER feeder motor switcher, 1 – knob for setting the tripping current value, 2 – off-switch button, 3 – on-switch button

Incorrect setting of the motor switcher (e.g. too high current value) may lead to burning the motor or breaking the gearmotor securement. Too low current value may cause frequent unnecessary tripping of the switcher.

IGNITION SWITCH

After connecting the ignition switch it is recommended to use a wire with cross-section from the *Table 2.2.* Install a socket at the end of the wire (not included) for connecting the ignition switch.

Unplugging the plug of the ignition switch cord results in cancellation of the warranty of the ignition switch.

BLOWERS

Connect the blower to respective terminals, described in the control unit manual. The heads with power 120, 180 kW have two blowers. One is a primary air blower, the other is secondary air blower. Both are connected to one outlet of the unit. It is recommended to use wires with cross-sections no greater than specified in Table 2.2.

The unit terminals for connecting the blower allow for connecting one wire cable each (L, N, PE). To connect more blowers the wire must be branched outside the control unit. To do that use a mounting box, shown on the drawing 2.10. Provide the box with cable glands.

Drawing 2.10. The mounting box for branching the wire connections, manufacturer PAWBOL, P-2 type with an orange 4x6mm2 connector.

DRAFT FAN

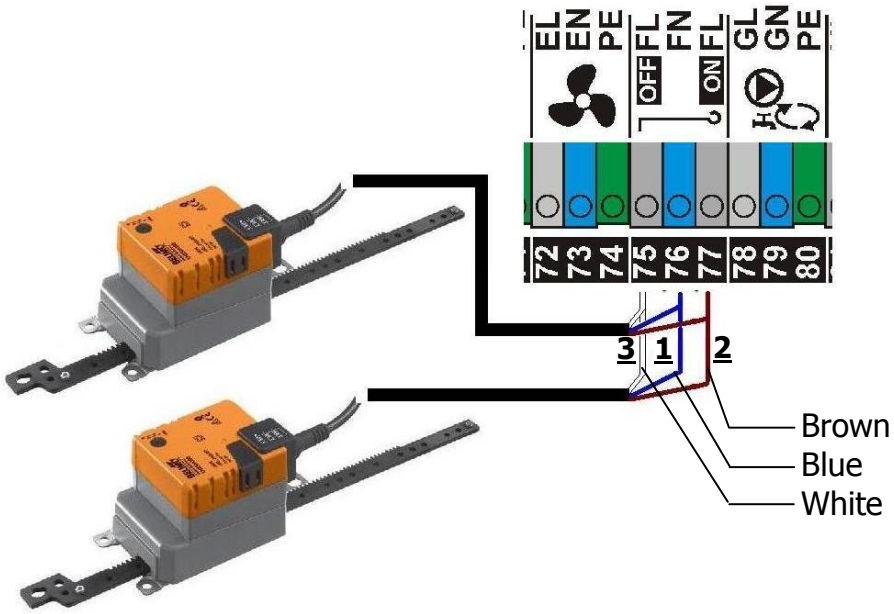
The draft fan can be connected parallel to the primary and secondary air blowers.

MOVABLE GRATE ACTUATORS

The movable grate actuators can be connected to the terminals according to the diagram from the drawing 2.11. The diagram refers to a head with 180 kW power provided with two actuators. In case of heads with one actuator, connect analogously with omitting one actuator from the diagram. The recommended wire cross ı can be found in the *Table 2.2.*

Table 2.4. Connecting the Belimo actuators - terminals.

Terminals: ZAB-14	Colors of Belimo actuator wires	Setting the Belimo switcher
75 L1 (OFF)	3 (white)	
76 N	1 (blue)	
77 L1 (ON)	2 (brown)	



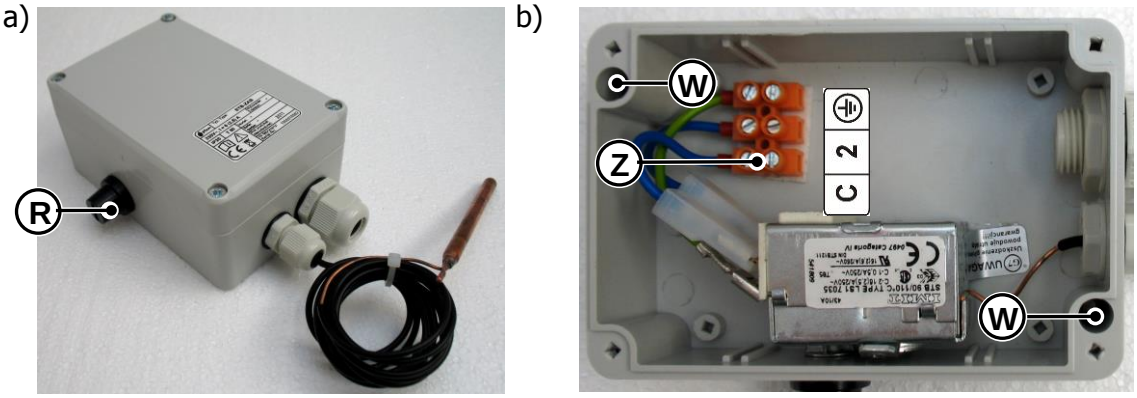
Drawing 2.11. Belimo actuators connection diagram – 180 and 240 kW.

Set points for the movable grate are: *Working time* and *full opening time* can be found in: SERVICE SETTINGS -> MOVABLE GRATE.

SAFETY TEMPERATURE LIMITER – STB

The safety temperature limiter STB *(drawing 2.12)* disconnects the voltage supply to the blower and the feeder after exceeding 95°C in the central heating installation. The limiter is mounted directly on the boiler, with spigots in the back. After screwing off screws remove the cover of the enclosure.

a) b)



Drawing 2.12. STB temperature limiter.

a – view of the limiter, b – limiter connecting terminals

Subsequently mount the box on the boiler with use of 2 openings (W, drawing 2.12b). Connect the wires to the connector *(Z, drawing 2.12.b)*, and the protective wire to the terminal marked as PE. Connect the other two wires to the terminals *C* and *2*. Switching the connections to terminals *C* and *2* does not affect the proper operation of the STB protection. In the control unit connect the wire to the terminals marked as STB. The recommended

cross-section of the wire is provided in the *Table 2.2*. Place the STB capillary and the boiler temperature sensor in the included in AZSB measuring chamber (thermometric tube), which is screwed into one of the spigots.

The current regulations impose using a safety temperature limiter.

In case of tripping the STB the operation of the feeder and the blower operation is stopped. To re-start the operation of the device check the cause of overheating the boiler. Subsequently, after lowering the temperature on the boiler to 50-60°C, screw off a black nut (*R, drawing 2.12.a)* and press the button underneath it with use of e.g. a match.

ASH-REMOVAL

Connect the ash-removal motor to the terminals of the control unit rack, marked as ODPOPIEL/ASH. After connecting the motor check the direction of the ribbon rotation. The ribbon should rotate in the direction causing pushing the ash to the ash tank. If it is not so, the motor winding connection must be changed.

The ash removal system is a standard assembly with 120 kW power.

SENSORS

Connect the electric temperature sensors according to the instructions on the control unit.

Avoid placing the sensor wires together with power supply cables. Keep at least 10 centimeter gap between them.

In order to prolong the sensor wire, use a wire with a cross-section specified in the *Table 2.2* and no longer than 15 meters, because it may affect the accuracy of temperature reading.

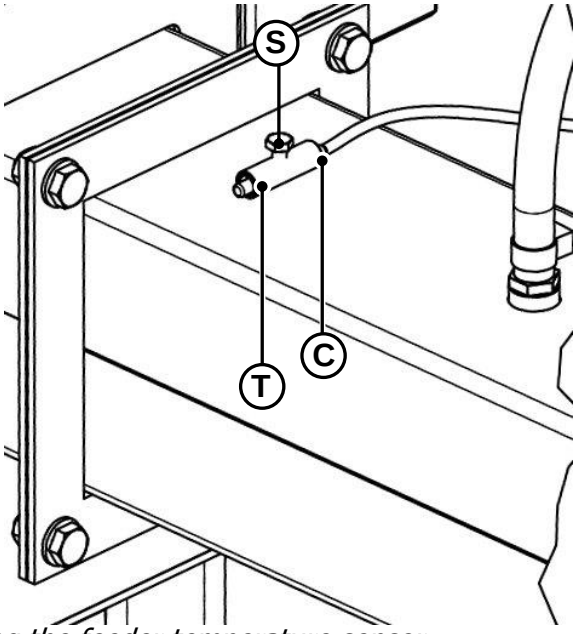
Mount the sensor in dry state. Do not pour oil or other liquids on it!!!

BOILER TEMPERATURE SENSOR

Place the measuring sensor in the measuring well, screwed into the boiler (*17, drawing 1.1.)*.

FUEL SUPPLY TEMPERATURE SENSOR

Measuring sensor *(C, drawing 2.13.)* should be placed in a sleeve (T) and immobilized by screwing in a screw (S). To avoid damaging the metal sensor enclosure, carefully turn the screw by hand or key. Connect the sensor to proper terminals of the box.



Drawing 2.13. Mounting the feeder temperature sensor.

– Sensor pressure screw, T – sensor mounting sleeve

Central heating temperature sensor

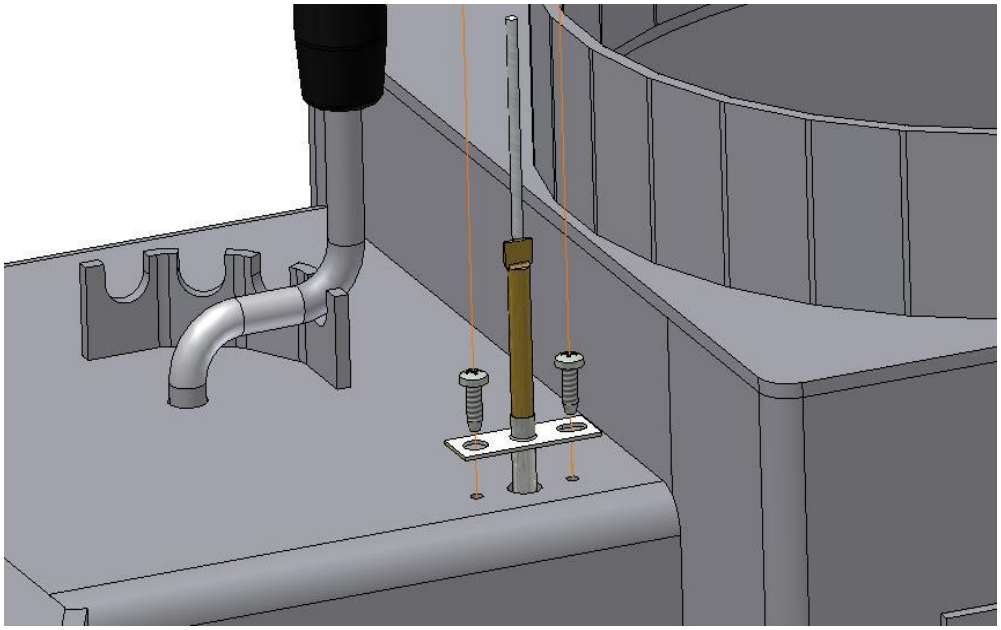
According to the box manual

Weather sensor

According to the box manual

Fumes temperature sensor

Mount the sensor in the opening in the flue *(drawing 2.14.)*.



Drawing 2.14. Mounting the fumes temperature sensor

Connect the fumes temperature sensor electric connections in accordance with the box service manual.

MIXERS ROOM THERMOSTAT 1

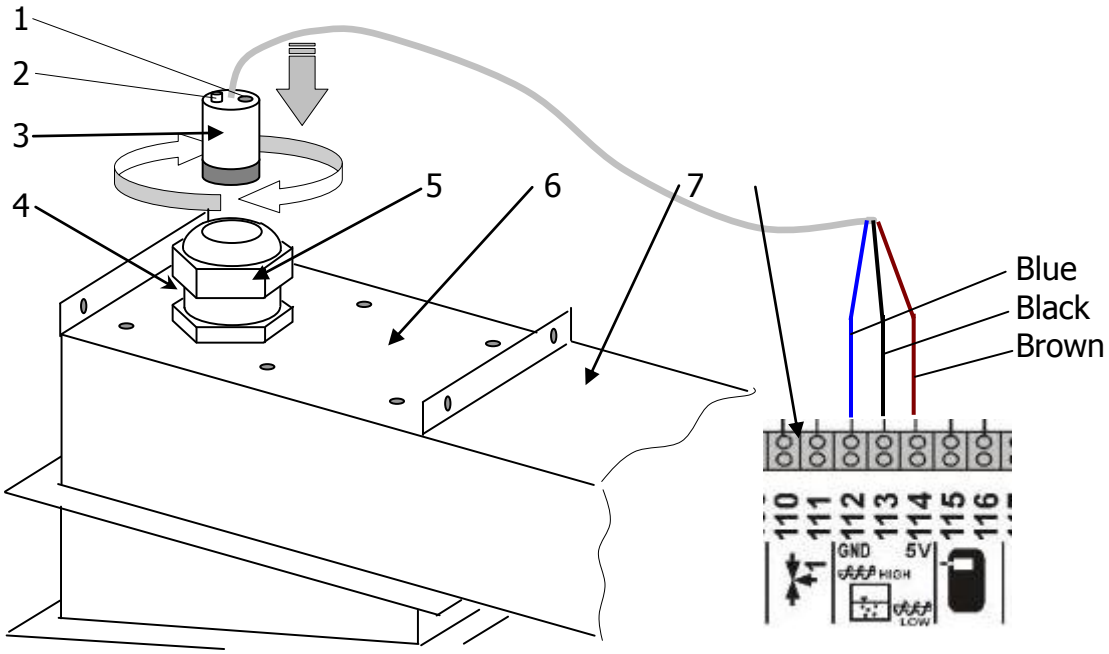
According to the box manual.

MIXER TEMPERATURE SENSOR 1

According to the box manual.

VOLUME SENSOR

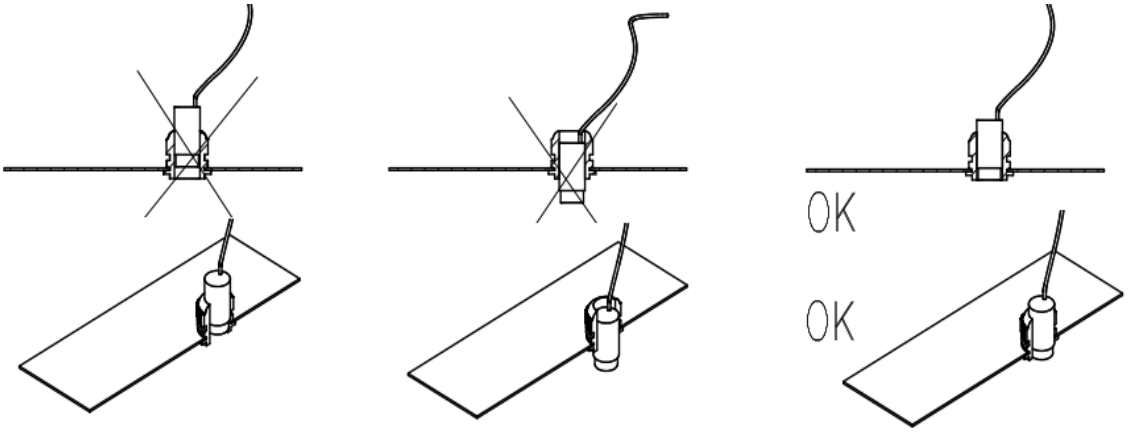
The mode of operation of the volume sensor (bucket overflow) is described in the control unit manual. Connect the sensor to the unit terminals according to the diagram below *(drawing 2.15.)*.



Drawing 2.15. Connecting the volume sensor.

1 – sensitivity adjustment screw, 2 – sensor tripping signal light, 3 – volume sensor, 4 –mounting sleeve, 5 – sleeve nut, 6 – cleanout cover, 7 – upper feeder, 8 – control unit rack

The volume sensor (*3, drawing 2.15.)*. must be placed in a polymer sleeve, *(1)* screwed in the cleanout cover*(6)* of the upper feeder *(7)*. To this end loosen the nut *(5)*. Place the sensor through the nut opening according to the drawing, until leveling the head of the sensor with the gland end *(drawing 2.16.)*. To this end it is best to remove the mounting screws and after rising the cleanout cover look when the sensor head levels with the sleeve. Subsequently, while holding the volume sensor, *(3)* secure the sleeve nut, thus preventing the possibility of displacement of the sensor.



Drawing 2.16. Correct placement of the volume sensor in the mounting sleeve.

Head of the sensor cannot exceed the gland. Risk of damage.

After mounting the sensor, its sensitivity must be adjusted. To this end, screw the adjustment screw *(1, drawing 2.15)* until the light turns on *(2, drawing 2.15.)* with the control unit on. Subsequently, turn the screw in the other direction until the light is off, and then make 1 full turn more.

FUEL LEVEL SENSOR IN THE HEAD

Applies only to the version with ceramic head.

MIXER TEMPERATURE SENSOR 2

According to the unit manual.

3. OPERATION OF THE DEVICE.

3.1. TECHNICAL DESCRIPTION

AZSB operates to generate fume gases through burning the fuel, supplied onto the furnace of the head and exchanging heat between the fume gases and the heating factor. The fuel for the furnace of the head head is supplied from the fuel container with a wormshaft. The burning process is controlled by a controller, where its main goal is to keep the pre-set heating factor temperature. The device, depending on the current temperature of the heating factor, chooses one of 3 powers (100%, 50%, 30%) in the WORK mode when the temperature is lower than the pre-set temperature. If the pre-set temperature is reached, the device activated the SUPERVISION or burning-off mode

3.2. BURNING

Do not pour the fuel directly into the boiler furnace chamber. It creates a risk of damaging the head. While burning fuel (mainly woodchips) with great content of dust, at all times do not open the boiler door during the burner operation. A sudden addition of air may cause an explosion. Do not allow a

situation, when the head is operating while being partly covered with ash. Poor cooling of the head may very quickly lead to damaging the steel cover or emerging cracks in the furnace plates.

3.2.1. LOADING THE FUEL CONTAINER

Loading the fuel container must be performed carefully in order not to cause an excessive fuel dustiness and compression. The fuel compression may cause it to stuck in the tank.

Firming the fuel in the tank is forbidden.

Keep the minimal fuel level in the tank.

3.2.2. FIRING-UP AND SETTING FIRING-UP PARAMETERS

Before beginning the firing-up process set the feeder and blower operation parameters according to the Table 3.2 and the desired boiler temperature. The service parameters are different, depending on whether the set is equipped with the ignition switch or not. Example in the table 3.1.

Table 3.1. exemplary service settings for 120 kW with an ignition switch and without an ignition switch.

Firing-up	***unit***	***Without the ignition switch***	***With the ignition switch***
Ignition test time	sec	0	90
Feeding time - firing-up	sec	0	80
Firing-up airflow	%	60	50
Firing-up time	min.	1	7
Ex.temp.delta	°C	1	6
EmissionT - firing up end	°C	1	100
Air flush period	%	50	50
Air flush delay	min.	3	3
Igniter pre-heating period	sec	1	25
Worktime with min.power	sec	255	240
Burning off			
Burning off time	min.	0	20
Burning off airflow	%	60	67
Cleaning			
Poker p.before inflame	sec	0	30
Poker period after burning off	min.	0	1
Cleaning airflow	%	100	100
Ash removal working period	sec	10	10
Ash removal interval	min.	5	5

Supervision			
Supervision time	min.	∞	60
Feed. time SUPERV	sec.	10	8
Feed interval SUPERV	min.	15	5
Blow-in SUPERV	%	32	32

Minimum airflow output	%	22	22
No fuel detection time	min.	40	40
Emission temp. with no fuel	°C	60	60
Feeder 2-extended operation	sec.	2	2
Maximum burner temperature exceeded.	°C	65	75

Poker	Sec.	1	150

The client receives a box with manufacturer's setting for the given power and fuel, if they were specified in the order. Due to multitude of different fuels, it may be necessary to adjust the pre-set parameters.

In case of damaging the ignition switch, the firing-up process must be performed with manual control mode (in unit menu). Start the feeder and supply the fuel until it reaches the grate. Subsequently, after using a fire starter (paper, cardboard, fire starter for barbecue) fire-up the fuel on the grate and start the blower. In case if the fire is on the whole furnace, press the TOUCH&PLAY button, thus starting the device.

Do not use oil, benzine, solvent and other flammable agents for firing up. Risk of explosion.

The time, after which the device should be switched from the manual mode to the operating mode is dependent on the size of the head and on the type of fuel, and the bigger is the power of the head, the longer is the time. It is caused by the necessity of reaching the minimal temperature by the head, so that the assembly starts working in the automatic mode. The time is between and 5 and 20 minutes.

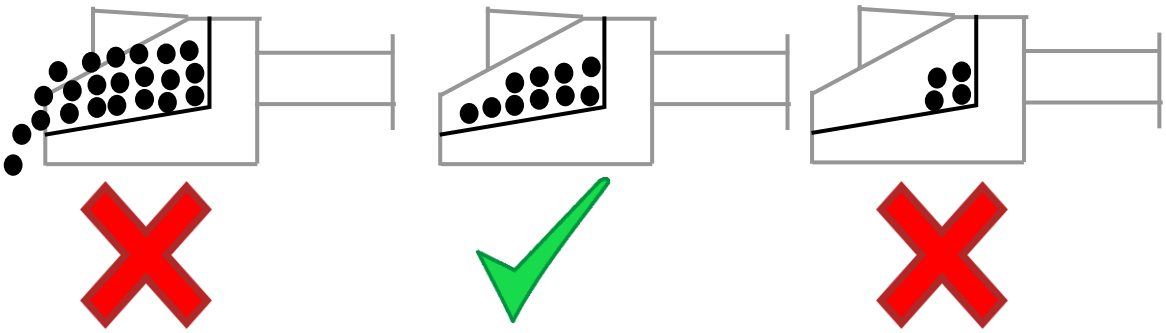
In case of devices with an ignition switch, before the first firing-up the upper feeder must be filled with fuel, and subsequently the device must be started with the TOUCH&PLAY button.

Before first starting the assembly with and ignition switch, the upper feeder must be filled with fuel until the fuel overflows to the bucket feeder.

When the fumes sensor senses a flame, the controller enters the OPERATION mode, and for a time specified in the service menu the head operates with a minimal power, and subsequently the power is gradually increased to maximum.

The characteristic of some fuel types does not allow for automatization of the firing-up process, e.g. sawdust and fine woodchips mix.

In operation, the fuel in the furnace of the head should look like it is specified on the *drawing 3.1* below.



Signs of proper choice of burning parameters:

- light-yellow flame without smoke on the furnace and outside of it
- sides of the furnace and the cover should be covered with light-ashen color tarnish
- walls of the boiler first chamber (furnace chamber) covered with light-ashen colour tarnish
- the fumes from the chimney without signs of smoke (black smoke), „waving" warm air should be observable

SUPERVISION mode

In SUPERVISION mode the time of supplying and brakes should be adjusted so that:

- the temperature of the boiler does not rise, a rise of the temperature temperature should cause tripping the anti-overheating system (STB) and automatic shut-off of the device
- Non-burnt fuel does not flow out from the ash-box
- the sparks from the furnace do not transfer from the feeder passage, because it will cause tripping of the fire-extinguishing system

Adjusting the maximal temperature of the feeder

The sensor measures the temperature on the feeder. The overheating security threshold of the feeder is set in controller service menu. If the feeder temperature rises over

the pre-set value, the regulator will display feeder temperature alarm and set off the lower feeder in order to empty it.

Table 3.2. Burning parameters setting for heads in APSB i AZSB

Type and power of head [kW]	Rodzaj paliwa (rodzaj paliwa używanego do spalania – nie mylić z rodzajem/typem paliwa ustawianym w szafie sterującej) *Type of fuel*	*MODE*											
		OPERATION									*SUPERVISION*		
		100%			50%			30%					
		100% Blow-in output	100% Fedder operation	100% Fedder interval	50% Blow-in output	50% Fedder operation	50% Fedder interval	30% Blow-in output	30% Fedder operation	30% Fedder interval	Feed timie	Feed interval	Blow-in supervision mode
		[%]	**[sec.]**	**[sec.]**	**[%]**	**[sec.]**	**[sek.]**	**[%]**	**[sec.]**	**[sec.]**	**[sec.]**	**[min.]**	**[%]**
GZ 120	chips	44	6	30	40	6	48	35	6	60	6	5	35
	briquette	44	6	25	40	6	40	35	6	50	6	5	35
	sawdust	42	7	8	38	7	12	34	7	16	7	3	35
	sawdust	40	9	5	36	9	8	32	9	10	7	3	35
GZ 180	chips	48	8	30	40	7	48	35	6	60	6	5	35
	briquette	48	8	25	40	7	40	35	6	50	6	5	35
	sawdust	46	9	8	38	8	12	34	7	16	7	3	35
	sawdust	44	11	5	36	10	8	32	9	10	7	3	35
GZ 240	chips	60	5	45	54	5	72	48	5	100	10	5	35
	briquette	60	5	40	54	5	64	48	5	110	10	5	35
	sawdust	56	9	16	50	9	26	45	9	80	14	3	35
	sawdust	54	11	16	48	11	26	43	11	80	14	3	35

The values specified in the table 3.2 are estimated values. The final setting will differ from the ones specified, depending on the calorific value, humidity, single fuel particle size. Starting the device should occur under the setting specifies above. The values should be adjusted depending on the amount of fuel in the head. Do not allow for an overflow of non-burnt fuel particles to the ash box (too much fuel and/or not enough air). Do not allow for burning too small amount of fuel in the initial part of the furnace of the head (not enough fuel and/or too much air).

3.2.3. CONTINUOUS OPERATION

After about 1 hour from setting the working parameters, the device can be left without supervision for a period between loading fuel. Due to the lack of uniformity of fuel, the settings of feeding and brake time of the feeder, as well as the power of the blower, must be controlled. Adjust if necessary.

3.3. CLEANING AND MAINTENANCE

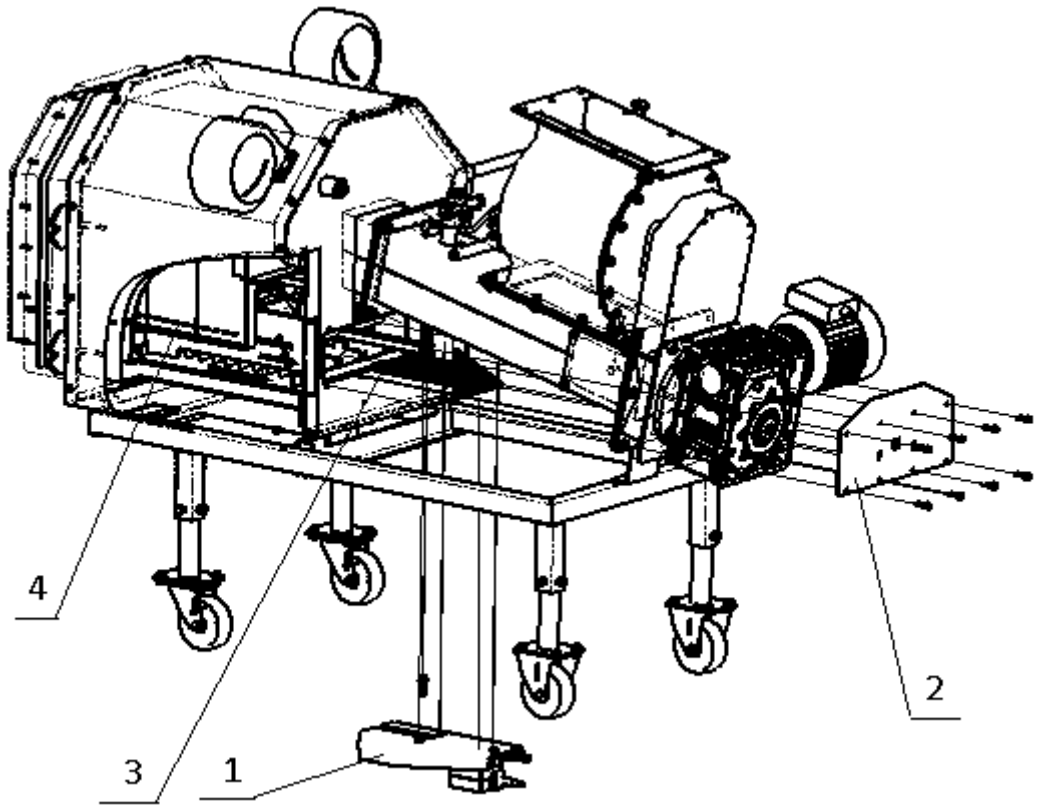
3.3.1. CLEANING THE EXCHANGER

The boiler is equipped with fire tubes cleaning system and ash-removal system, but in order to preserve the high effectiveness of the exchanger, it is necessary to clean the exchange surface. The boiler must be cleaned with the cleaning gear included with the device, after burning-off the device. Ash-removal from the ash box consists of emptying the ash tank when it is full.

In case of heavy contamination of the boiler, it is acceptable to use carbon-deposits removal chemical factors, but only such, which are admitted to trading (have the CE sign and service manual).

3.3.2. CLEANING THE HEAD

The head is equipped with a self-cleaning movable grate and a system for cleaning the space under the grate, which significantly prolongs the period between cleaning operations. During the heating season cleaning the head consists of removing the sand and ash, which fell through the grate into the head. In order to clean the inside of the head remove the actuator support with the actuator *(1 drawing 3.2)* and demount the stopper of the cleaning opening of the head *(2 drawing 3.2)* and remove the sand and ash from the space under the grate (*3 drawing 3.2).* This operation was diagrammatically presented on the drawing below. Controlling the amount of ash in the space under the grate must be performed at least once a month, and it must be cleaned when necessary. Do not allow the situation, when the ash in the space under the grate contact the grate. In case of fuels, which are heavily contaminated or have low sintering temperature (e.g. straw, sunflower shells, oat grain) it may be necessary to remove the carbon contamination from the furnace (*4, drawing 3.2)* with the cleaning equipment.



Drawing 3.2. Head cleaning diagram

1 – actuator support with actuator, 2 – stopper, 3 – space under the grate, 4 – furnace

After the heating season the head must be disconnected from the boiler and the furnace must be inspected. Remove the carbon deposits from the furnace elements, check the surfaces (for cracks), clean the ventilation openings. After the cleaning remount the head. In case of damaging the sealings while servicing, replace them for new ones.

3.4. TURNING OFF THE DEVICE

3.4.1. REGULAR STOPPAGE OF AZSB

Boiler

After burning the fuel open the doors and turn on the exhaust fan. Remove the ash and clean the boiler. Do not drain the circulating water. Cooling time is equal to firing-up time.

Feeder

If the fuel in the tank is supplied on an ongoing basis, the feeder works without stop. Stopping the device, e.g. in order to remove the ash, is performed after setting the **burning-off** mode.

3.4.2. EMERGENCY AZSB STOPPAGE

Boiler

In case of emergency states, such as: the temperature exceeding 100^0C, cracking of elements of installation and lower water load, control-measure and safety devices failure and a sudden rise of pressure:

- remove the fuel from the grate and move it outside the boiler room
- lower the circulating water temperature by introducing cold water to the water load, just at during filling
- turn on the exhaust ventilator

In case of boilers operating in closed systems, an emergency state may be any state which occurred as a result of an electric blackout (pumps operation stop) or leaving the boiler doors open. Central heating installation should be protected with a safety valve, set to 2 bars, additionally the manufacturer protects the boiler with a safety valve set to 2.5 bars, but in an emergency situation such preventive measures are not sufficient. The boiler must be additionally protected by a thermal security valve, which in case of an occurrence of an emergency state is going to remove hot water from the boiler, at the same time supplying the water shortage with cold water from the water installation, thus cooling the boiler and lowering the pressure. (chapter 2.6).

Please, remember, that an occurrence of an emergency state is particularly probable during summer, during hearing the domicile hot water. While predicting such situations, it is worth considering to mount a heat accumulator, capable of taking over the excessive heating power, inevitable in such situations.

Treating the burning fuel with water is forbidden.

Feeder

An emergency stoppage of the device is realized after switching the power supply switcher to „0” (zero).

4. PROBLEM SOLVING, CONDITIONS OF SAFE OPERATION

The basic condition of a safe operation of the boiler is installing the boiler and securing it according to Polish standards.

In order to keep the safe conditions of operating the boiler, the following rules must be followed:

- use protective gloves and goggles
- do not block the feeding lids and ash pan doors
- Use portable lamps with 24 V voltage

- keep order in the boiler room
- care for good technical condition of the boiler and its installation
- avoid heating brakes in the winter period

In case of suspecting freezing of water in the installation check the passability of the safety tubes. The water permitted to the installation should return with an overflow pipe to the extension vessel. In case of lacking passability it is forbidden to fire-up the boiler, and in case of its operation act as during an emergency stop of the boiler (see 3.6.).

4.1. INSTALLING THE FUEL TANK IN A NON-HEATED ROOM

Installing the fuel tank in a non-heated room does not pose a problem in the operation of the tank per se. Humidity condensation, caused by a change of weather conditions may cause freezing of the device and freezing of fuel to the walls of the tank in case of a temperature drop outside.

4.2. ANTI-FROST SECURITY

The damages caused by the frost can be prevented by insulating the feeder wire and the underside of the tank or insulating these elements together with installing a defrosting device.

Warning: in spite of these actions, especially in case of using woodchips, the fuel may get stuck in the feeder. Any remains of it must be removed before the beginning of the new heating season and at least once during this period.

If there is a water tank in the same room, an anti-freezing agent must be used.

Warning: gas pressure drops along with a temperature drop. In such case the gas springs of the lid of the tank will operate differently.

4.3. PROBLEM SOLVING

No.	Failure	Cause	Removal method
1	Fire burn-back to the fuel feeder	- fuel shortage or too low fuel level in the tank - stucking of fuel - tank cover opened	- supply the fuel in the tank - mix the fuel - check the tightness of the cover
		- wormshaft is blocked	- find the failure and remove its cause
		- too weak chimney draught	- use an exhaust fan, improve the

			draught
2	Fuel stuck in the tank	- using woodchips with dust content greater than 5%, - too humid fuel (over 40%), which freezes to walls in winter period	- change fuel - add a portion of dry fuel and mix well
3	Smoke in the feeder	- head contamination - non-passable chimney - doors and lids of the boiler not closed	- clean the ash from the head - clean the chimney - close the lids and doors of the boiler
4	The wormshaft does not rotate	- power shortage - wormshaft blocked - damaged wormshaft and gears	- point 4.3.1. - change the wormshaft, change the gears
5	Too loud operation of the feeding assembly	- damaged bearing of the electric motor - oil leakage from the gearmotor - damaged gear bearing - Alien body in the feeder (e.g. metal)	- change the bearing - remove the leakage, supply the oil - replace the bearing - demount the wormshaft, remove the alien body
6	Quick accumulation of carbon deposits in the furnace of the head	- excessively contaminated fuel	- do not burn coal, coke, coal fines, plastic and rugs, use fuel in accordance with the instruction - remove the carbon deposit
7	The boiler does not reach the desired temperature	- contaminated fan - contaminated furnace, non-passable blower openings of the head - too humid fuel, - improper settings of the controller	- Clean the blades ot the fan - remove the ash from the head through the cleaning opening - load proper fuel - set proper feeding and brake times

4.3.1. PROCEDURE IN CASE OF WORMSHAFT BLOCKAGE

If the wormshaft for feeding fuel does not rotate properly in spite of properly working control system, the following operations must be performed:

- Change the rotation direction of the blocked feeder. While in the manual mode, turn on the blocked feeder for several seconds, and then turn on the feeder in its proper direction and check if the problem is solved. If so, turn on the device normal mode, if not, realize the following points.
- Open the control opening and carry out an examination
- Remove the element responsible for the failure (stones, roots etc.)
- Ensure, that the wormshaft works uninterrupted, close tightly the control opening
- Turn on the normal operation mode

Warning: electric works can be performed only by people with proper qualifications.

5. SPARE PARTS

5.1. MAIN SPARE PARTS LIST

No.	Name of the part	Part number
1.	Electric motor with motorgear	10
2.	Gear	6
3.	Wormshaft	4
4.	Main electric box	-
5.	Iron-cast head (GZ120RA, GZ180RA)	5
6.	Movable grate segment	-

Part numbers refer to the drawing 1.5.

5.2. LIST OF WEAR PARTS*

No.	Name of the part
1.	Door sealings
2.	Ash tank
3.	Oil in gears

***WARNING: the abovementioned parts are not included in the warranty, in case of a necessity of their change, we offer them separately paid at Moderator Sp. z o.o. service point at the client's request.**

6. DISPOSAL

In case of a proper operation the boiler is going to operate seamlessly for about 15 years. After this period its further operation may be unjustifiable on economic grounds. The boiler is made of materials, which can be completely recycled. It is recommendable to pass it to a devices breaking company.

In case of a feeder, the period of seamless operation of the head (if it is properly used and serviced) should be several years (7 to 9). After this period it might be necessary to replace the iron-cast furnace inserts. If the repairs cease to be cost-efficient, the best solution is disposing of the head. In case of the disposal, the easiest way is to give the head to a specialized breaking company.

7. SERVICE

The most up-to-date list of representatives of Moderator authorized services in Poland can be found on the website www.moderator.com.pl under SERVICE → SERVICE REPRESENTATIVES. Link below

http://www.moderator.com.pl/pl/serwis/serwis/przedstawiciele-serwisu.html