MODERATOR Vento Eko 15,20,25 kW

INSTRUCTION MANUAL

CONTENTS

Due to ongoing research and development, the manufacturer reserves the right to implement changes in the design and documentation of the boiler.

Moderator

Note to user

Thank you for choosing our boiler and congratulations on making the right decision. Moderator Sp. z o.o. manufactures boilers based on original design solutions developed by engineer Kazimierz Kubacki in the late 1970s in Hajnówka. In the thirty years which passed, the boilers have gone through many changes. In their current form, they are a product of highest quality, a result of solid research and development, as evidenced by their high efficiency at about 90%. The boiler is environmentally friendly and meets the currently required standards.

This instruction manual is based on the most recent manufacturer information. As the process of developing the boiler is ongoing, this manual applies only for the boiler it was purchased with. The Moderator boiler is intended for heating water to a maximum of 90^{o}C in central heating and domestic hot water installations and in technological installations (such as wood driers, presses, etc.) in houses, commercial buildings, workshops, farms, and industrial facilities. The manual is designed as a guide in the installation, operation, and maintenance of the boiler. It contains basic information regarding safe utilization of boilers with an automatic retort feeder for pea coal (5-20 mm) and pellet. Please read this manual before attempting any of the said activities.

1. Introduction

1.1. Safety instructions

The fundamental safety requirement for the boiler is its proper connection with the central heating installation. The manufacturer has used all his effort to make the utilization of the device as safe as possible; however, it is only possible after complying with the installation and operation requirements outlined in this manual.

Omission of any actions due to the cost of installing additional equipment would surely affect the safety and increase the operating cost of the device in the future.

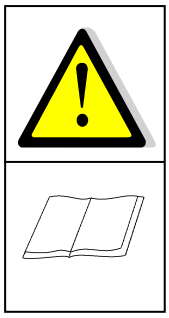
All efficiency studies and tests were conducted using carefully selected accessories (safety valves, thermal protection) and equipment (fan systems). Only using the equipment recommended by the manufacturer ensures achieving the declared, high parameters of functioning.

We caution you from using substitute solutions that have not been tested with this boilers and that do not have the proper approvals (such as the Polish Technical Supervision Office) and certificates (declaration of conformity, EC certificate). We also caution you from making any unauthorized changes in the structure of the boiler.

Noncompliance to these warnings may result in serious danger and risk of injury and death.

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

Warning signs



The boiler can be operated only by persons familiarized with this instruction manual.

Warning. The cleaning hatch under this cover may be hot. Be particularly careful in the boiler room, other elements of the boiler and the installation may also be hot.

This sign appears on the pages of this manual and it signifies danger.
Please pay special attention to this chapter to avoid many dangerous situations in the future.

Remember that the various surfaces in the boiler room can have different temperatures. You must take special care of the fact that the temperature of the hatch will be higher than that of the other elements of the boiler. The same applies for the flue and feed and return pipes. Be extra careful when in the boiler room.

Remember that ash and fuel can cause allergic reactions. We recommend using protective gloves and dust masks.

Remember to keep the boiler room clean. Spilled fuel or fuel left on the floor can be the cause of fire.

1.2. Warranty

The manufacturer grants a 3 year warranty for the boiler, including material and workmanship defects. The manufacturer grants a 1 year warranty for the equipment supplied with the boiler (if purchased): controller, ventilator, and reducer, motor with wiring. The warranty does not cover the elements highlighted in the equipment list (chapter 2.1) as well as consumable elements such as seals.

The warranty does not cover any damages resulting from improper operation or regular wear and tear, reimbursement of installation costs, traveling costs, damages resulting from changes or repairs unauthorized by the manufacturer, indirect losses and losses resulting from non-productive days, and any other economic losses resulting from that.

The purchased devise as well as its additional equipment should be installed by an authorized MODERATOR Sp. z o.o. service unit.

Under penalty of voiding the warranty, the user is obliged to comply with the following guidelines:

1. The start-up of the device is done by a representative of the manufacturer's services unit.
2. The start-up of the boiler should take place within 30 days from issuing the invoice.
3. After the first year of operation the boiler should be subjected to an obligatory paid inspection conducted by the service - this conditions the renewal of the warranty for the remainder of the time.

All warranty claims should always be directed to the seller of the boiler. All warranty claims should contain the following information:

- power of the boiler
- serial number
- date of purchase

Declaration of conformity

We,
Moderator Spółka z o.o.
11 Listopada 16a
17-200 Hajnówka
tel. +48 (0)85 682 75 20,

declare in or sole responsibility that the manufactured boiler, **MODERATOR Vento Eko 15, 20, 25 kW** , beginning with the serial number 0300/2011, to which this declaration applies, meets the requirements of the following norms and directives, if applicable:

Directives	Norms
98/37/WE	EN-PN ISO 12100
97/23/WE	EN-PN 303-5

Hajnówka 2011.03.01

1.3. Fuel

The moderator boiler is suitable for burning as primary fuel:
1) coal classified as 31.2 washed pea coal with the following characteristics:
- granulation 5÷20mm - low swelling (the coal does not stick together during combustion),
- volatile matter content 28÷40%, moisture content <15%,
- Dust content up to 10% (grain granulation below 4mm),
- ash fusion temperature >1150^{o}C.

2) pellets:
- granulation 6÷8mm
- ash content up to 1%.

3) a mixture of pea coal and coal dust can be used as alternative fuel.

In emergency situations, such as long time power outages (1-3 working days), the following may also be used as fuel: chopped wood, chips, saw dust, tree bark, paper, cardboard. In such cases, combustion takes place using the natural draught of the chimney. It must be noted that in such cases, the time from loading to loading is 2-4 hours, and with a cold boiler and weak chimney draught, the smoke can return to the boiler room (especially when loading fuel). Preparation of the boiler for emergency fuel combustion is described further on in the manual. (1.4.)

Using wet fuel has a direct influence on a shorter exploitation of the boiler and its premature wear.

1.4. Technical specifications

This manual concerts boilers of 15, 20, and 25 kWs of power. The Moderator is a boiler with a transverse circulation chamber working with upper combustion. The walls are water cooled and made of quality 5÷6 mm sheet steel and a 4 mm outer shell.

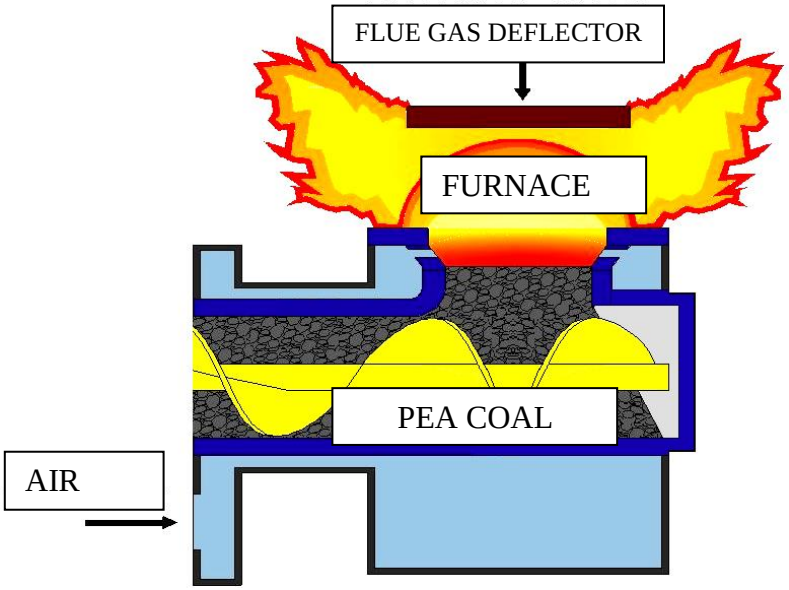


Fig. 1. Lower coal feed retort.

The cubical exchanger consists of a chamber with a self-cleaning retort furnace, above which there is a flue gas deflector (Fig. 1).

The remaining part of the exchanger consists of heat plates which effectively receive the heat from the flowing flue gases. The boiler is thermally insulated and has a chassis. The retort furnace door, load door (for alternative fuel) and the door for cleaning the boiler chambers are located on the front wall of the boiler. Next to the boiler there is a fuel container mounted on the feeder unit. The container has a tightly covered lid. The feeder unit is powered by a motoreducer via an electrical motor (Fig. 2). Mounted on the boiler there also is an electronic controller, which allows for a fully automatic control of the boiler operation.

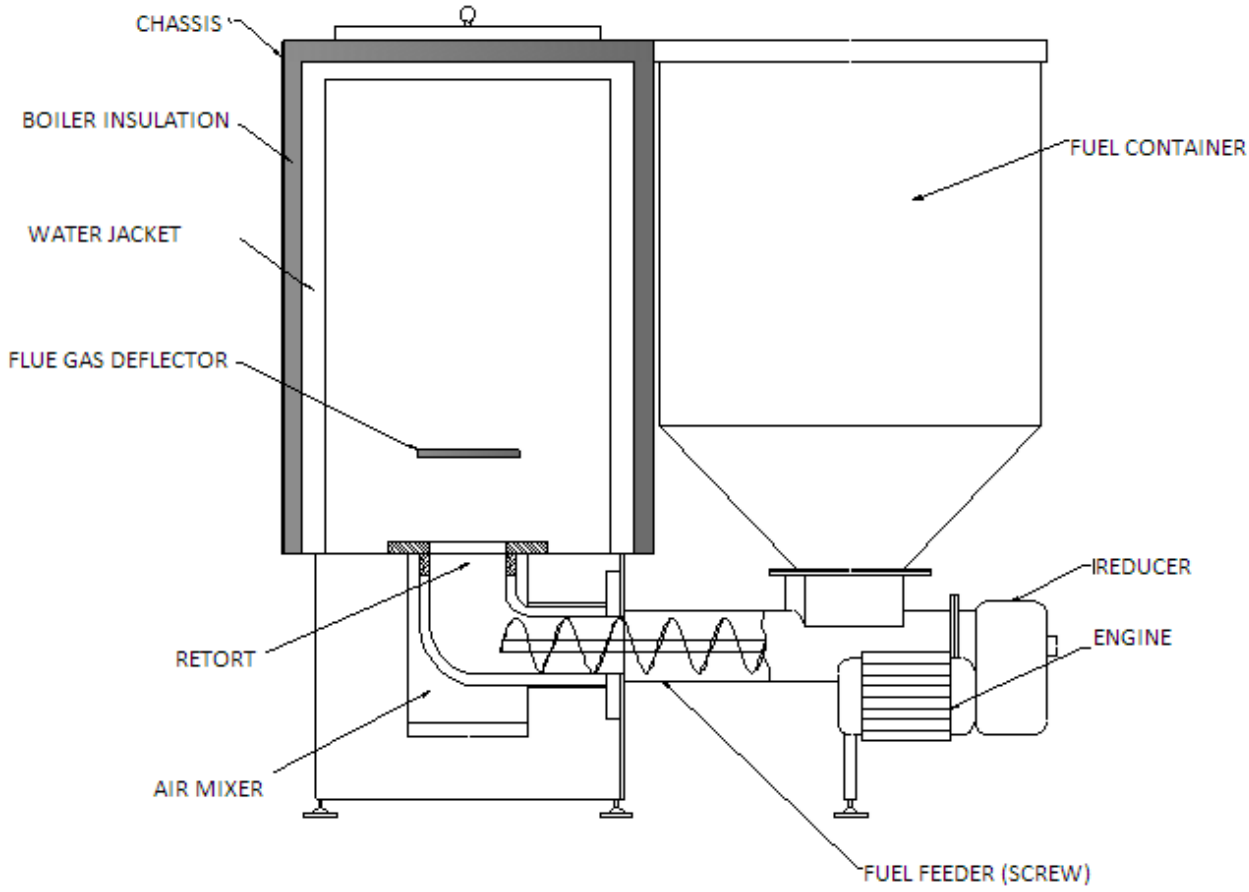


Fig. 2. Schematic diagram of the Moderator boiler.

The cleaning door on the upper part of the boiler are used to clean the chambers of the exchanger (Fig. 9). The boiler is delivered with a cast iron beam grate. The ash drawer is located beneath the grate. The grate, when mounted, is an alternative burning mode in case of power outages.

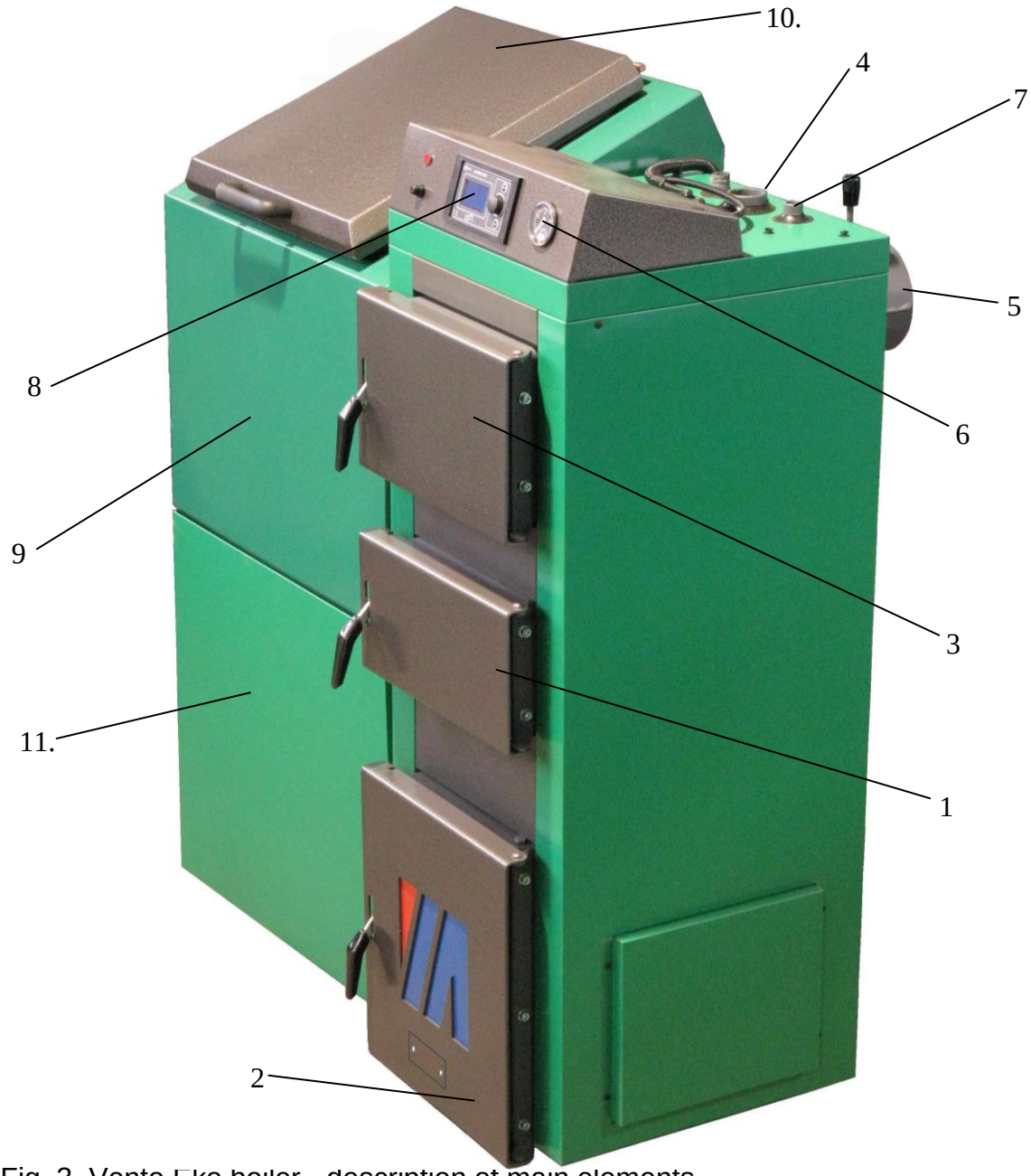


Fig. 3. Vento Eko boiler - description of main elements.

1. Load door
2. Ignition/ash pit door
3. Cleaning door
4. Supply pipe
5. Flue
6. Thermo manometer
7. ½" safety valve coupling
8. Controller
9. Fuel container
10. Container lid
11. Retort feeder cover

Caution! For extreme situations (power outages, lack of fuel), the manufacturer anticipated an emergency solution (for 1-3 days of operation), where it is possible to only burn alternative solid fuels (chopped wood, coal). However, in such case the air needed for combustion can be supplied via a manual damper placed on the ignition/ash pit door (2, Fig. 3). To do this, unscrew the deflector from the hook, place it on the cast iron plate of the retort head (covering the burner opening), and then place the cast iron grate over the head, on the supports welded into the fire pit chamber. The cast iron grate is included in the standard equipment of the boiler. When the boiler is prepared in this manner, the fuel is supplied through the **load door** (1, Fig. 3). Combustion takes place using the natural draught of the chimney. It must be noted that in such cases, the time between fuel loads is 2-4 hours, and with a cold boiler and weak chimney draught, the smoke can return to the room (especially when loading fuel). The boiler allows for the combustion of solid fuels using the feeder blower. In such case, the controller must be switched to operation without feeder.

1.4.1. Pellet combustion

The purchased boiler is capable of burning pellets as its primary fuel. To switch to pellets, the following actions must be done:

- it is necessary to install in the ¾" coupling on the supply pipe a deluge valve and connect it directly with the building water supply line (this is a fire protection), additionally the manufacturer recommends installing a pressure vessel.
- Change the controller settings (by default the controller is set factory settings)

Burning biomass other than the one recommended by the manufacturer is forbidden. Moderator Sp. z o.o. produces automated sets and feeders especially for various biomass. (in case of any doubts please contact our sales department tel. 0856827520). Attempting to burn wood, large pieces of coal, saw dust, briquette, etc., in the retort feeder can seriously damage the device and is dangerous. Combustion of any types of plastics is forbidden.

1.5. General parameters

Maximum feed water temperature - 90^0 C
Maximum return temperature - 70^0 C
Minimum return temperature - 55^0 C
Working pressure 0 1.5 bar
Thermal efficiency

- pea coal/pellet - 84.6 %

Minimum flue gas temperature – 110^0 C

[mm]	15kW	20kW	25kW
A	820	940	1060
B	1390	1390	1390
C	1495	1495	1495
D	510	510	510
E	1120	1120	1120
F	160	160	180
G	125	125	125
Mass(kg)	373	433	498
Fuel container volume (m3)	0.31	0.31	0.31
Water Volume	65	85	105

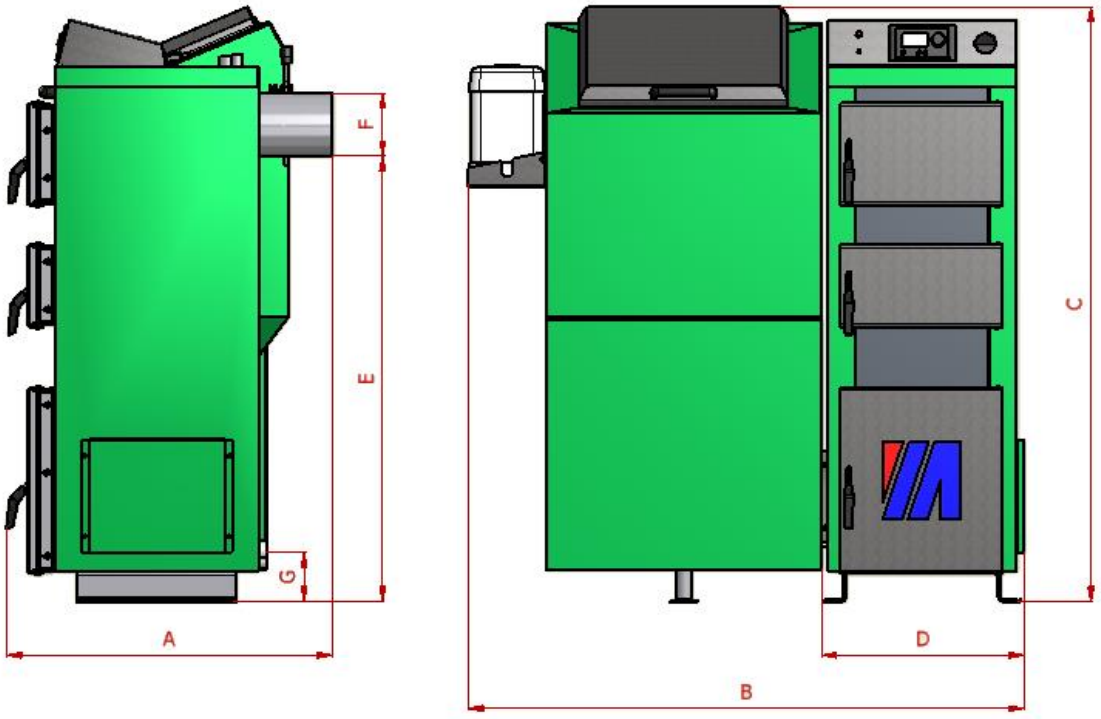


Fig. 4. Basic dimensions of the boiler.

1.6. Retort burner feeder

The burner is delivered separately or together with the boiler. The control system in an integral part of the feeder The feeder consists of a flange for installing the motoreducer, feed chamber with a flange, above which is the container (Fig. 2), covers of the screw and the furnace section (contained inside of the boiler). The furnace section is a casing which creates an air chamber (connected with the blow fan), inside of which there is a cast iron head, crown, and the plate of the furnace. The deflector is an essential element of the retort furnace - it serves as a “flue gas accelerator”.

Working principle

The engine powering the screw via the motoreducer is turned on and off by the controller on the basis of the temperature read from sensors, the blow fan is activated accordingly. The screw transports the fuel to the boiler where it is burned in the furnace with a supply of air through the openings in the top.

Safety elements

When the allowed temperature (98^{o}C) on the screw body is exceeded, the temperature sensor (thermal fuse) stops the boiler from operating. By default, each boiler is equipped with a "fireman" protection - a water tank and a pipe with a wax sealed end. The end of the pipe is screwed into a coupling in the fuel feeder. Exceeding the temperature on the feeder causes the wax to melt and floods the fuel feeder. The feeder duct also has a ¾" coupling, which is to be fitted with a deluge valve connected with the water line. For pea coal combustion, the installation of this valve is recommended, for pellet combustion it is necessary.

Tightness

For the feeder to work properly, the system must be tight. All connections must be sealed, doors closed, and the container lid lowered.

Burner maintenance and cleaning.

The frequency of inspections of the feeding system and burner depends on the quality of the fuel. When using high quality coal, cleaning of the burner can be performed twice per season.

- Attention must be paid to the quality of the fuel at each delivery, especially when changing the supplier
- Cleaning of the burner can be done with an appropriate vacuum cleaner or manually, it is not necessary to disassemble the head.
- to inspect the condition of the head, it must be removed from the boiler
- any deposits, hardenings and coking should be removed using a wire brush or a chisel
- The tip of the screw should be inspected for mechanical deterioration or heat deformities (which influence the formation of deposits in the cast iron knee)
- After cleaning up, check the condition of the seals and whether the screws are turned.

2. Installation

2.1. Equipment

Moderator boilers are shipped assembled.
The basic equipment coming with the boiler includes:
- a cleaning set (not covered by the warranty),

- ash drawer,
- instruction manual for the boiler
- controller instruction manual
- deflector with hook
- cast iron grate
- air damper (manual combustion)

2.2. Boiler room

The boiler room should comply with the requirements set out in PN-87/B-02411. The most important requirements are:

- Steel door or tin covered wooden door, opened to the outside
- fire resistant floor
- a 21x21 cm air supply opening in the lower part of the boiler room
- a 14x14cm minimum exhaust opening in the upper part of the boiler room
- boiler placement should allow for comfortable operation and cleaning

Facilities:

- faucet
- drain
- sink

Use of mechanical ventilation is prohibited.

2.3. Boiler placement

The installation of the boiler should be conducted by a qualified and experienced installer. (We recommend contacting our representatives, whose installers were trained at Moderator Sp. z o.o.). Faulty installation can lead to premature wear of the boiler, cause fire hazard or explosion.

The Moderator is shipped assembled. The boiler can be seated directly on the floor. It should then be levelled with adjustable screws.

When placing the boiler make sure that it is accessible and that the walls of the boiler room do not obstruct fuel load, cleaning the furnace, and access to the side cleaning hatch and fan.

2.4. Connecting the boiler with the chimney

The flue of the boiler should be settled directly in the chimney or via an adapter (available from the producer); after placement the connection of the steel of the flue and the brick of the chimney should be sealed. The outlet of the chimney should be 75 cm above the ridge of the roof. Square or rectangular chimneys must be made of fired brick;

round (usually steel) chimneys should be insulated with 5 cm mineral wool on the whole of its length.

Recommended flue diameters for 15-20 kW boilers:

- square chimney: 16 cm x 16 cm
- round chimney: Φ16 cm

Recommended flue diameters for 25 kW boilers:

- square chimney: 20 cm x 20 cm
- round chimney: Φ20 cm

When settling the flue in the chimney special attention should be paid to the damper lever (space must be reserved for comfortable closing and opening the damper).

Remember that the flue gas entering the chimney is hot and the lever will heat up. Always wear protective gloves when manipulating the lever.

2.5. Connecting the installation

The boiler will function properly when the temperature inside the furnace chamber is high enough, meaning that feed water (leaving the boiler) should be at 70÷80^{o} C, and return water should not be colder than 55^{o} C. These parameters prevent the boiler from low temperature corrosion of material. To ensure proper boiler function the manufacturer recommends installing a mixing valve and a heat accumulator.

The boiler has a G1½ thread connection. The boiler should be connected with the installation using appropriate couplings.

If the boiler is equipped with a thermal safety valve sensor should be installed in a G ½ coupling (7 Fig. 3).
Install a safety valve

Connect the water line using a G ½ valve with an elastic hose, which should be disconnected after loading the water. During filling, all air releases should be opened along the whole installation and gradually be closed until the water flows from the overflow pipe in the expansion tank.

Lossless installations can be loaded with raw water, unless its hardness does not exceed 10n. Otherwise, the water should be treated. Mount the boiler equipment (handles and grips).

Connection of the boiler to the power supply should comply with the PN-891E-05012 norm (see chapter 2.8).

Caution! In case of any welding works when connecting the boiler to the central heating installation, the power supply to the controller should be disconnected, and the controller itself should be covered; temperature sensors should be removed from their couplings and isolated from any surges and damage resulting from welding.
Caution! To increase the utilization effect of the boiler, it is recommended to install a central heating circulation pump.

2.6. Securing the installation

2.6.1. Open vented system

Moderator boilers working in open vented central heating systems should be connected according to the requirements outlined in PN-91/B-02413, where the excess heat in the form steam should be discharged through an open connection (overflow pipe OP) to the atmosphere.

Requirements concerning the installation:

- expansion tank, volume at least 4% of the water load,

shape: cylindrical A type according to PN-91-02413-1-2,
rectangular B type according to PN-91-02413-1-3,

- rising safety pipe (SP) with internal diameter of

25 mm for boilers up to 50kW

- expansion pipe (EP) of 25 mm internal diameter,
- Overflow pipe (OP)

internal diameters as in EP and SP,

- circulation pipe (CP) of 20 mm internal diameter,
- Air escape pipe (AP) and signalling pipe (SgP) of 15 mm internal diameter.

It is forbidden to mount any fittings on SP, EP, and AP which would allow a complete or partial closing of the flow. Safety equipment and pipes should be protected from freezing.

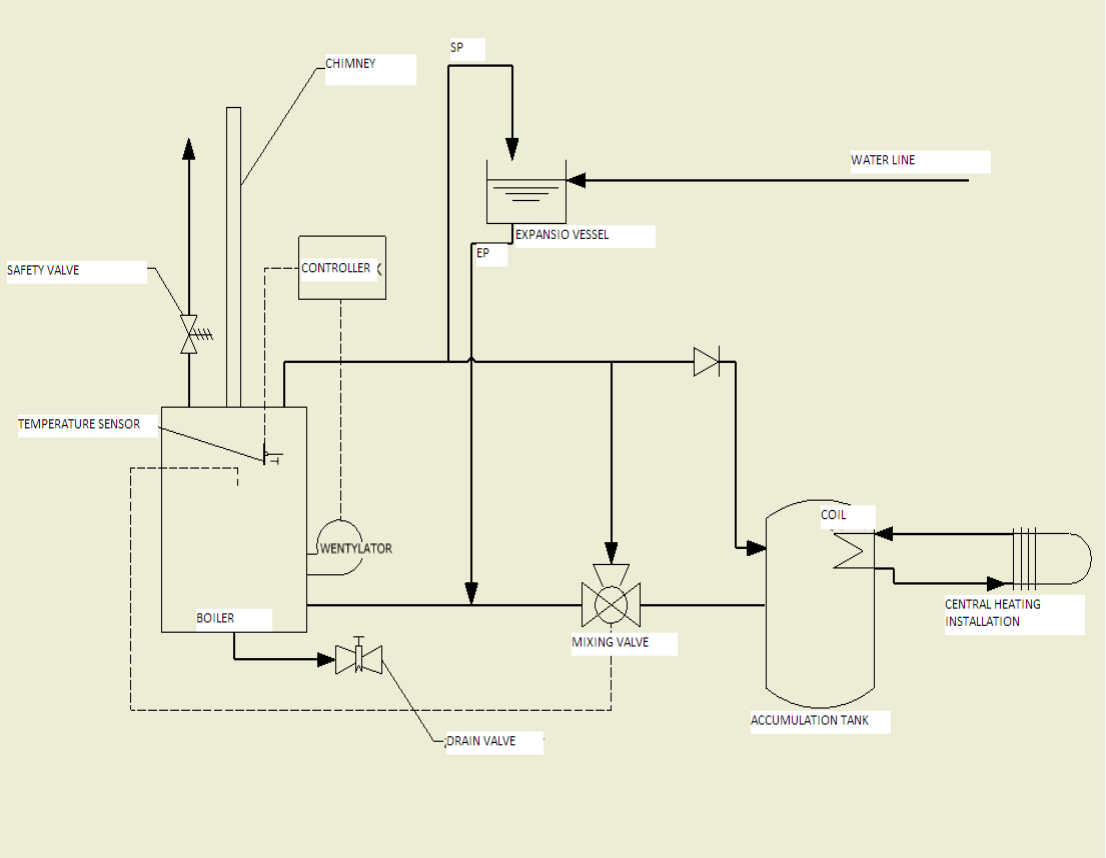


Fig. 4. Safety schematics for boilers working in open vented central heating systems.

2.6.2. Sealed system

Moderator boilers working in sealed systems should be equipped in a blower system (designed by Moderator Sp. z o.o. to cooperate with a Moderator boiler, we caution you from installing other blower systems), a safety valve, and additional thermal protection which allows a safe discharge of excess heat energy. The couplings welded in the upper part of the boiler shell are intended for installing those protections.

Moderator boilers are manufactured according to EN-PN 303-5, which allows the boiler to work in a sealed system, after meeting certain requirements.

Special attention must be paid when the boiler is adapted for manual load. The SYR 5067 thermal protection, recommended by the manufacturer, is only effective when the pressure in the water line is not lower than 2.3 bar and safety valve is installed.

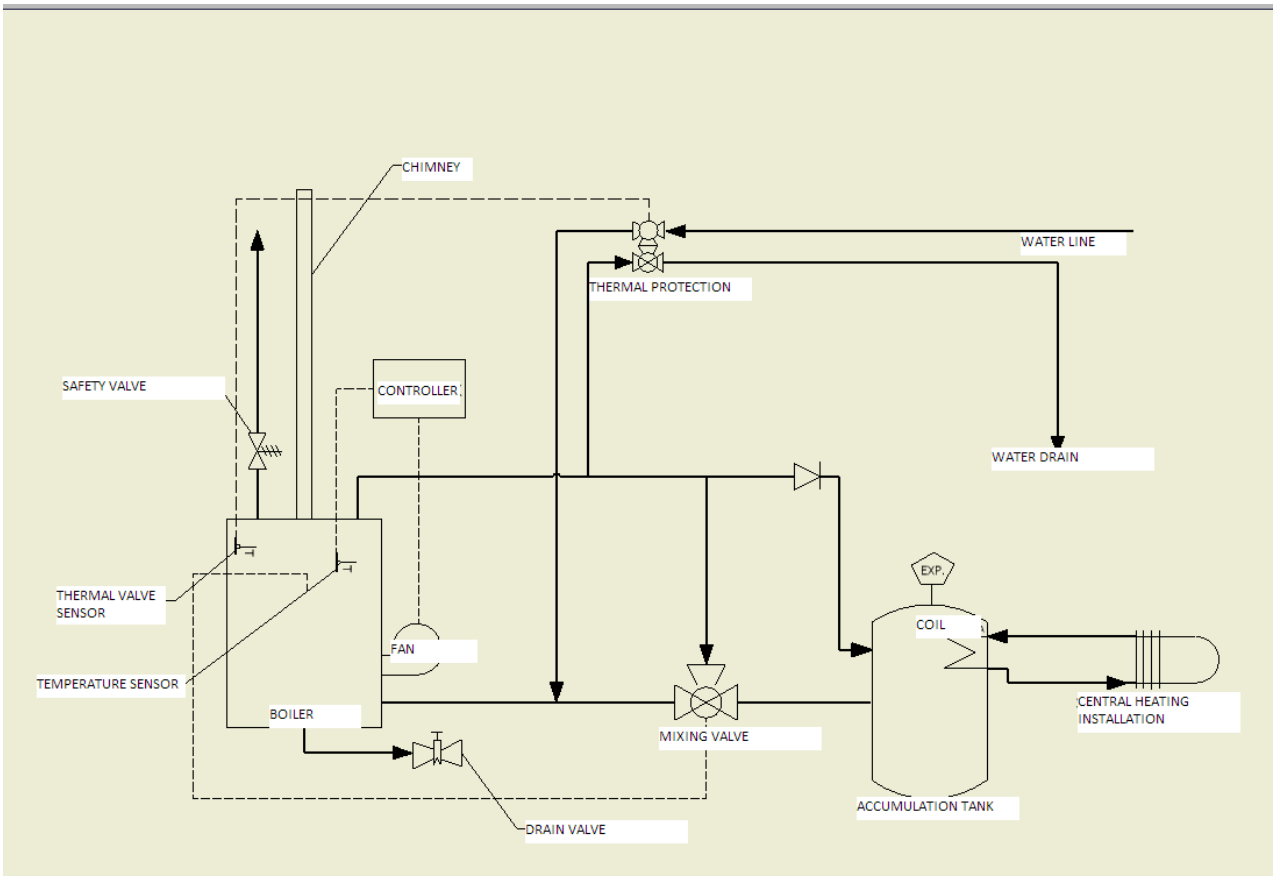


Fig. 5. Safety schematics for boilers working in sealed central heating systems.

This means that the system may not work properly when using water from a private supply (where, for example, lack of electricity prevents from starting the water pump) or in places with frequent water outages.

In such cases, the boiler should be installed in an open vented installation, or only used in automatic mode (without the possibility of manual load and solid fuel combustion). The automatic version has a thermostatic valve which stops the device when the temperature reaches 95ºC.

Installing the boiler without a faultless excess heat discharge device is forbidden!

2.6.3. Thermal protection

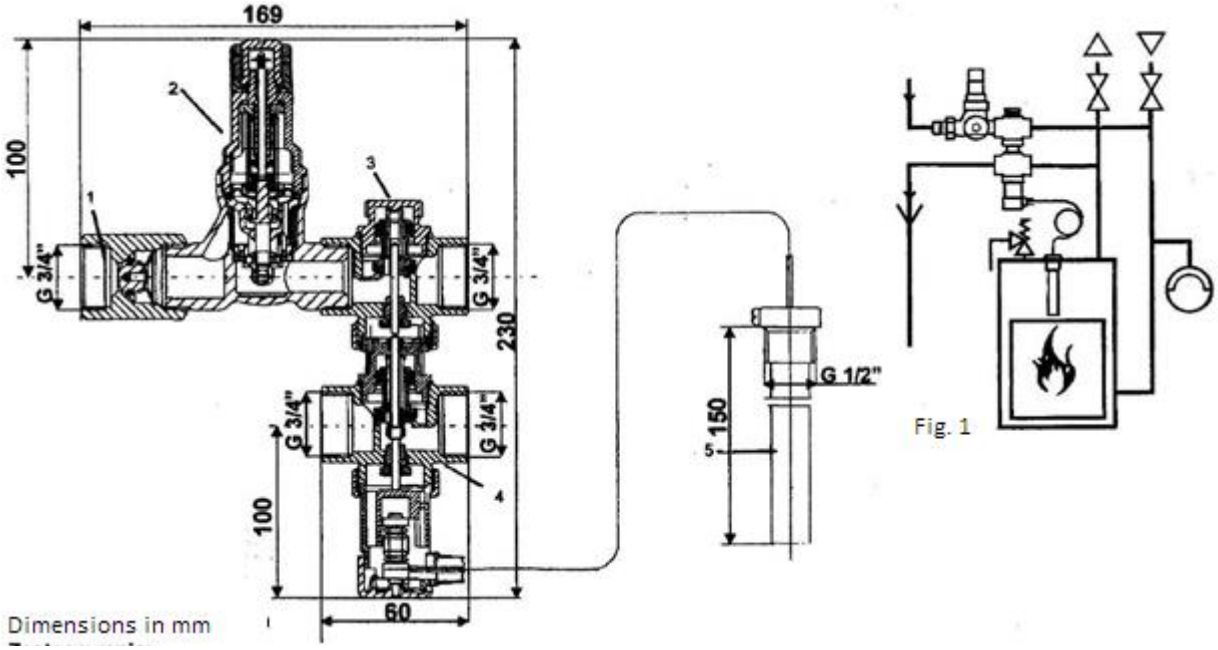


Fig. 1

The 5067 thermal safety valve is intended for solid fuel boilers equipped with thermostatic valves in accordance to Polish Norm PN-EN303-5. It is recommended for boilers without cooling coils. Fig. 1 shows the installation method; in close proximity to the boiler it is important to lead the pipes so that there are no pressure losses.

Function: The thermal safety combination includes the following components check valve (1), pressure reducing valve (2), temperature activated inlet valve (3), temperature activated outlet valve (4), temperature probe (5). The pressure reducing valve (2) is connected with the water supply line. The outlet of the inlet valve (3) leads to the heating return line. The outlet of the inlet valve leads to the drain. The temperature probe is mounted in the hottest place available, preferably the top section of the boiler. The reducing valve has a fixed setting of 1.2 bars, therefore the working pressure in the device should be 0.2-0.3 bars higher. This prevents the safety valve from opening. It is recommended to use a safety valve of at least 2 bars. After exceeding the set opening temperature of approx. 90°C the inlet valve (3) begins to open. To maintain stable pressure in the installation, the outlet valve opens at 97°C. After opening the outlet valve, hot water leaves the installation and is replaced by cold water from the supply, cooling down the boiler. After the temperature on the boiler drops down to 94°C the outlet valve is closed. Thanks to the thermally activated inlet valve and the temperature, to proper working pressure is restored in the installation. When the temperature reaches 88°C the inlet valve is also closed.

Installation:

The thermal safety device is activated by two independent, inlet and outlet valves. The body of the device is made from brass, other elements in direct contact with water are made of stainless steel and temperature resistant plastic. All sealing elements are made of flexible and temperature and wear resistant rubber elastomer. The springs are made from stainless spring steel. The sensor and copper prove, and the sleeve is nickel plated.

The valve is activated by the double temperature sensor. The device bleeds air spontaneously. The valve elements and sealing can be disassembled and cleaned without changing the opening setting. The compact head of the temperature sensor can be dismantled for a comfortable installation of the valve body. The capillary from the sensor to the valve is protected with a special, metal elastic hose.

Reducing valve working pressure:	1.2 bar (fixed)	
Max. inlet water pressure:	16 bar	
Min. required inlet water pressure:	2.3 bar	
Temperature	Opening:	Closing:
Inlet valve:	90°C +0/-2°C	88°C +0/-2°C
Outlet valve:	97°C +0/-2°C	94°C +0/-2°C
Maximum working temperature:	135°C	
Capillary:	1300 mm – standard length	
Weight:	1.5 kg	

2.7. Electrical connection

Electrical installation and connection rules

1. Before connecting the device please read the manual for the boiler and controller.
2. Before commencing installation, repairs or maintenance, or during any connection works, the device should be disconnected from the power supply. Ensure that the clamps and leads are not charged.
3. The boiler room should be equipped with a 230V/50Hz electrical installation, according to the rules regulating this matter.
4. Electrical installation (of any kind) should end in an electrical socket with a zero contact. **Using a socket without a connected zero contact may result in electrocution!!!**
5. The boiler should be connected separately to a lead line protected with an appropriate quick fuse and a residual current circuit breaker. The value and type of the fuse is outlined in the documentation of the controller. **No other devices should be connected** to this line.
6. The housing with the electrical equipment can only be opened by a competent electrician, who is familiar with the how the device functions.
7. The electrical socket for connecting the boiler should be located so that the plug is readily accessible and the boiler can be disconnected in emergency situations.
8. The wires should be connected away from the elements of the boiler which heat up, especially the hot parts of the flue.
9. The regulator cannot be susceptible to flooding and other conditions which would endanger it with condensation, like sudden temperature changes.
10. The regulator cannot be used when the chassis is damaged.
11. Children should not be allowed access to the regulator.
12. The controller should be disconnected during a storm.

2.7.1. Controller - description, functioning, operation

The automatic control of the boiler is based on a microchip ecoMAX 800R regulator by PLUM. The control process takes place by steering the temperature of the water in the boiler. Also, the temperature of the feeder is also controlled (the sensor is installed in the feeding duct). This is in order to prevent any possible return of the flame to the container.

1. Signaling lamp (red)
2. STB safety temperature limiter
3. EcoMAX 800R regulator panel
4. Thermomanometer

Fig. 2.7.1. Control system elements - front panel.

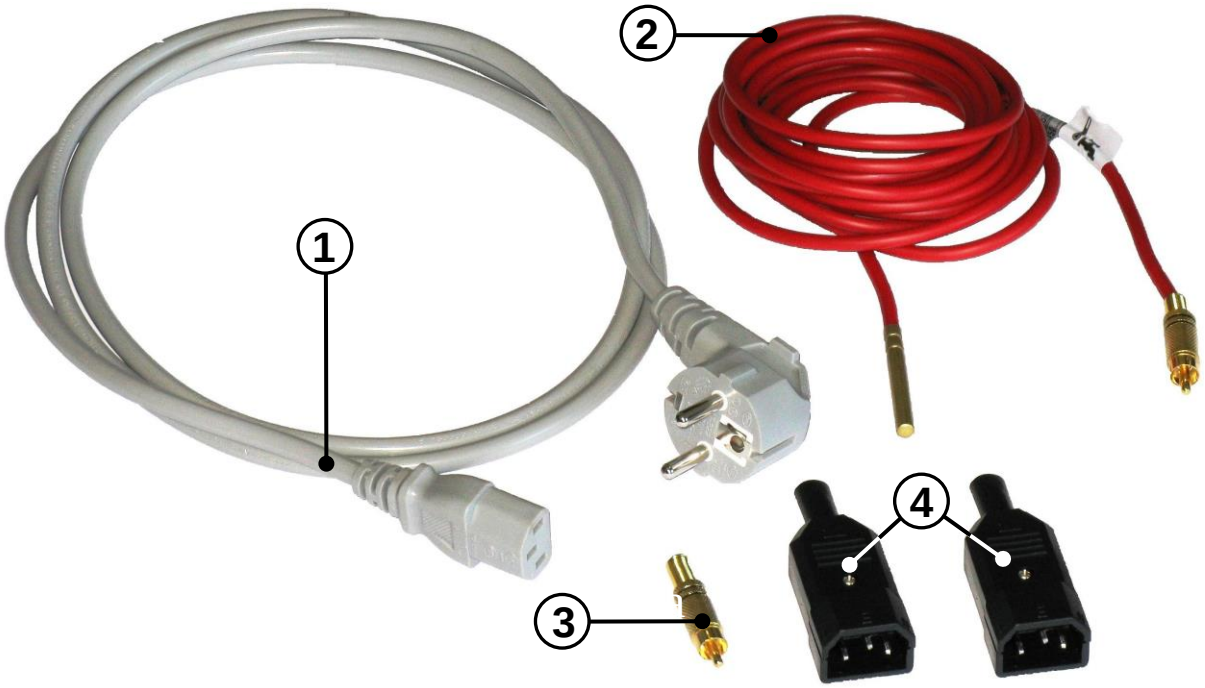
Fig. 2.7.1 presents the elements of the control system. *Regulator panel* **(3)** is used for entering the parameter settings. Specific information about the basic parameters, button functions, parameter settings, lead capacities, etc. are contained in the regulator manual supplied with the boiler. A thermomanometer **(4)** is installed next to the controller. It displays the temperature and pressure in the central heating system, also in the case of a power outage. The *temperature limiter* **(2)** prevents from overheating the water in the boiler. In the case of its activation (when the temperature exceeds 95°C) the feeder and blower fan are disabled. Such situations are indicated by turning on the signal lamp **(1).** For the boiler to start functioning once again, unscrew the black screw on the temperature limiter and press the button beneath it. The button can be pressed with, for example, a match. When pressed, a characteristic “click” is heard.

The button should be pressed after the temperature on the boiler falls to about 50°C.

The boiler regulator can also be connected with the mixing valve actuator, mixing pump, domestic water pump, central heating pump, domestic water temperature sensor, mixer temperature sensor, external temperature sensor, return temperature sensor, room thermostat, room panel. The devices listed above are standard boiler equipment.

2.7.2. Electrical connections

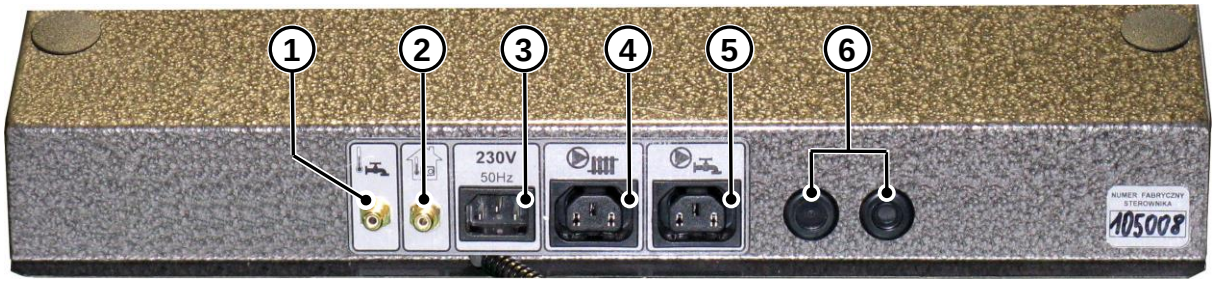
The boiler is supplied with elements which are used for connecting the power supply and other devices which work with the regulators (fig. 2.7.2).



1. Power cord
2. Domestic water temperature sensor.
3. RCA plug for terminating the wire connecting the controller with a room thermostat.
4. Computer male plugs for connecting the wires for central heating pump and the domestic water pump.

Fig. 2.7.2. Additional accessories.

The picture below presents the plugs for the power cord and devices working with the boiler.



1. Domestic water temperature sensor socket
2. Room thermostat socket
3. Power socket
4. Connector socket for the central heating pump.
5. Connector socket for the domestic water pump.
6. Cableways for connecting additional devices.

Fig. 2.7.3. Connector sockets - controller rear

Power connection

Connection of the boiler to the electrical installation consists in plugging one end of the power cord (**(1)** fig. 2.7.2) to a socket marked as 230V~ 50Hz on the rear of the boiler (**(3)** fig 2.7.3). The other end is plugged into the electrical socket.

In case of any damage to the power cord, replace it with a wire of the same type, diameter no lower than 3x0,75mm$^{2.}$

Central heating circulation pump connection

These activities should be carried out by a person qualified to perform electrical installation works.

Connect the central heating circulation pump to socket (**(4)** fig 2.7.3) with a wire no lower than 3x0,75mm^2. The pump wire should be terminated with a computer plug (**(4)** fig. 2.7.2).

Domestic hot water pump connection

These activities should be carried out by a person qualified to perform electrical installation works.

Connect the domestic water tank load pump to socket (**(5)** fig 2.7.3) with a wire no lower than 3x0,75mm^2. The pump wire should be terminated with a computer plug (**(4)** fig. 2.7.2).

Domestic water tank temperature sensor should be connected to input (**(1)** fig.2.7.3)

Notes on periodic maintenance

Maintenance consists in periodic inspections of the conditions of electrical wires which are accessible outside to the boiler. In case of any mechanical or thermal damage (melted insulation) the device must be deactivated, disconnected from the electrical line, and the defect removed. When in doubt please contact the manufacturer of the boiler. The controller panel should be kept clean and protected from flooding.

Connecting additional devices working with the regulator

Devices such as a mixing valve actuator, mixing pump, domestic water pump, central heating pump, domestic water temperature sensor, mixer temperature sensor, external temperature sensor, return temperature sensor, room thermostat, room panel can be connected using the cableways (**(6)** fig. 2.7.3) in the body of the regulator.

3. Fuel burning

3.1. Igniting the boiler

Before activating the boiler, it must be checked whether the boiler and the central heating installation are filled with water, and whether all the valves are open.
Before initial start-up please read the manual for the controller. Start-up is executed by the service unit.

Ignition

The first thing to do is filling up half of the fuel tank with proper coal, activating the fuel feeding screw until coal appears in the furnace at the level of the blow openings of the burner. Place some “kindling fuel” or paper on the coal, cover it with pieces of wood and light them. When the wood is fired up (approx. 3 minutes) cover it with coal. Next, cover the air inlet on the fan and activate it in the controller; close the door. When the coal begins to burn uncover the damper and leave the flame until fully ignited (approx. 6 min.). After reaching a stable level of embers, switch the controller to automatic mode. In this mode both the blower and fuel feeder are activated. Set the required temperature (usually 60-80 ^{o}C). From this point on, the boiler is working automatically.

Emergency ignition of the boiler can only be conducted after making sure that the installation is tight and properly filled with water. Mount the damper, (belonging to the boiler equipment) on the ash tray door (fig. 6). Remove the flue gas deflector (fig. 7) and put it on the retort head (covering the furnace opening of the retort). Next, mount the cast iron beam grate, also included in the boiler equipment. Spread the grates along the whole length of the furnace chamber.

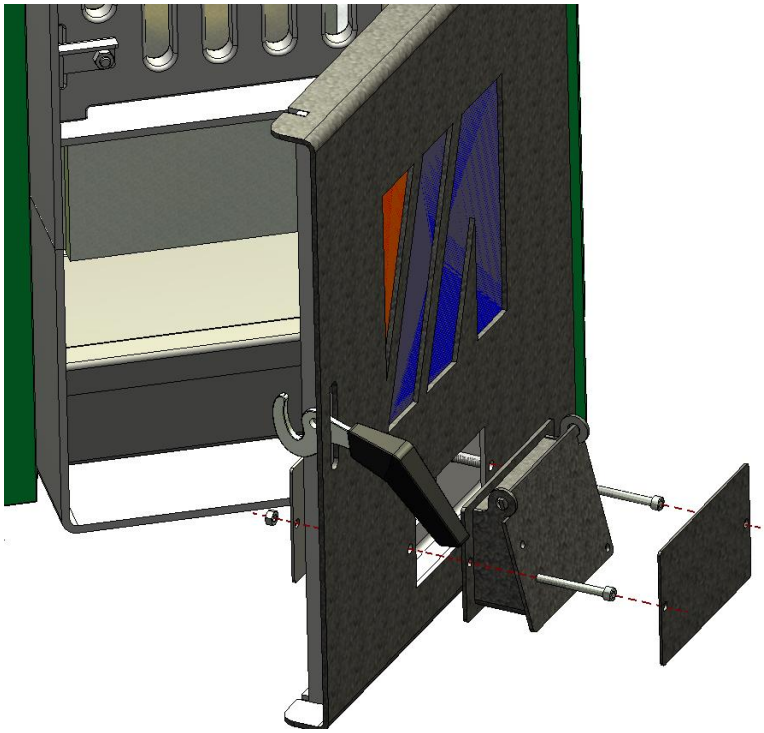


Fig. 6. - Air damper installation

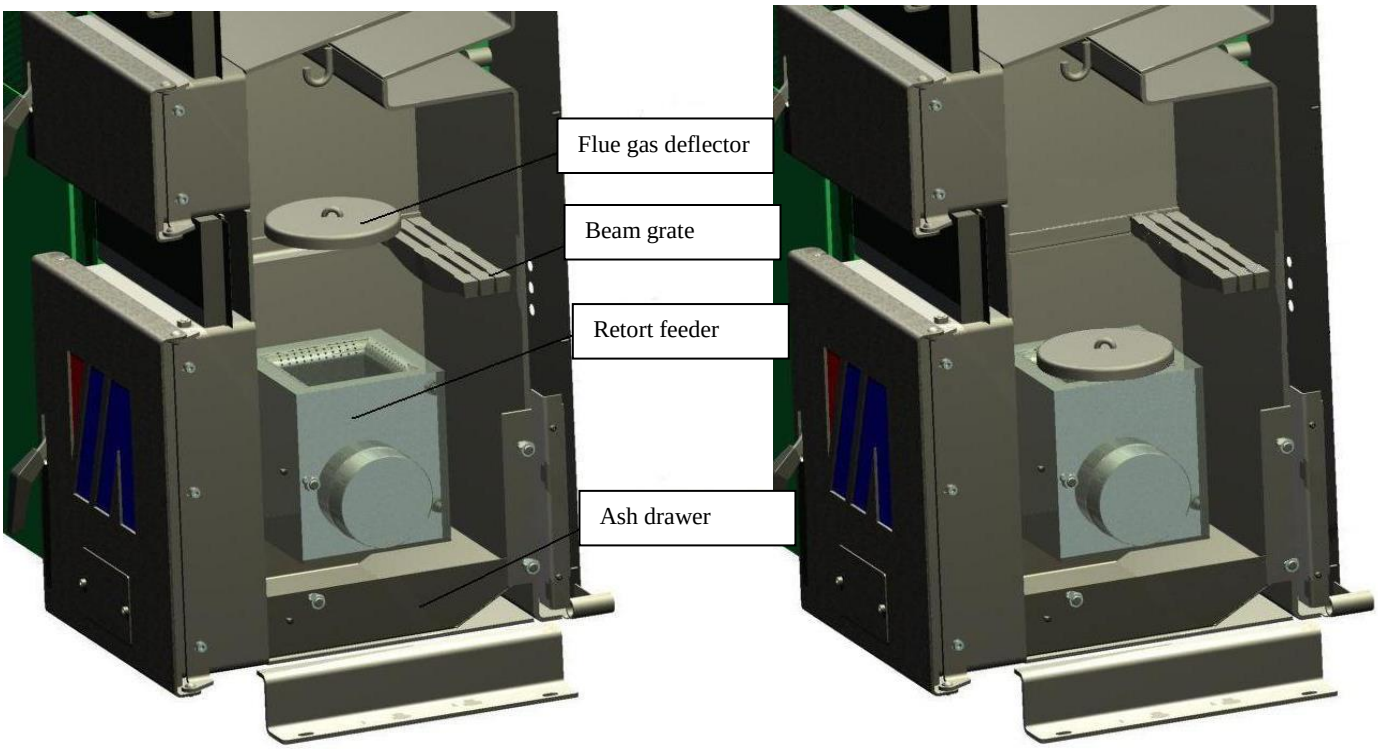


Fig. 7. Preparing the boiler for manual load

Ignition should be done with dry wood for approx. 1.5 hours, gradually reaching 80^{o}C. For emergency ignition (manual load) use the load door of the boiler (fig. 3).

3.2. Fuel burning

After igniting and reaching the set temperature, the fuel feeder and air bower will turn on only for short periods of time in order to sustain combustion (according to regulator settings), until the temperature decreases enough for the automatics to reactivate the feeder and blower. The automatic controller has a detailer instruction manual which allows it to be programmed at will in terms of set temperature. Changes in the controller regarding coal feeding and cycle parameters are prohibited! The controller also prevents the boiler from overheating and deactivates the whole system in case of lack of fuel or ember return to the fuel container. Only one trained person is needed for operation. The boiler is operated only once per 24h. The operation time does not exceed 15 mins/day.

It is recommended to burn out the boiler at feed water temperature of 70-80^{o}C for the first 3-4 days. Next ignitions can take place based on the programming of boiler operation in the controller, according to the guidelines in the controller manual.

During automated operation, the fuel in the boiler is combusted totally when it reaches the edge of the furnace, and the ash and slag fall down to the ash tray. The furnace is therefore self-cleaning, and the boiler only needs the ash removed every one to four days, depending on the amount of fuel burned daily. In normal operation, inspect and refill the fuel container periodically, so that the fuel level is always at minimum in the least

for the flame not to die out. Minimum amount of coal in the container is approximately 20 cm from the bottom of the container. At lower fuel levels, the container may start scattering dust.

Caution: in case of manual boiler load, fragmented fuels, where dust content exceeds 5%, should be avoided.

During operation and activated blower, the grate door should not be opened. During operation, the door of the ash tray should be closed.

3.3. Cleaning the boiler

Ash should be removed when the flame is low and the blower is deactivated. To save fuel, the inside chambers of the boiler and the spaces between the elements of the combustion chamber should be kept clean. Decrease in the chimney draught signals necessary cleaning. Lack of air makes the boiler to return smoke. During cleaning, ventilate the boiler room well.

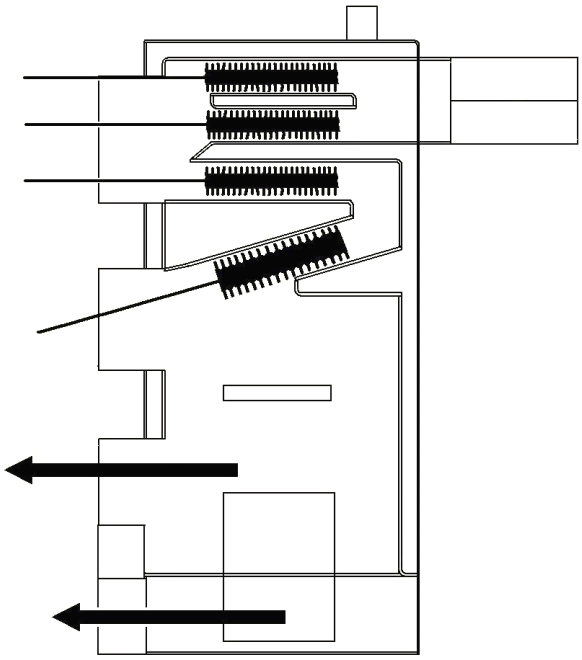


Fig. 8 Boiler (exchanger) cleaning schematics.

Always conduct cleaning when the boiler is extinguished.

In the case of large dirt residue it is allowed to use chemicals which remove exhaust carbon, but only those which are regular commercial products (which have the EC certificate and use manual).

The flue gases from a clogged chimney are dangerous. The chimney and flue should be kept clean; they should be cleaned before every heating season.

Always conduct cleaning when the boiler is extinguished.

In the case of large dirt residue it is allowed to use chemicals which remove exhaust carbon, but only those which are regular commercial products (those which have safety signs).

3.4. Programmed shutdown of the boiler

Shutdown occurs by stopping the fuel supply to the boiler that is by turning off the controller. The cool down time is roughly the same as the ignition time. After the heating season is over, the boiler must be cleaned and all doors opened. Remove the ash, clean the boiler. Do not drain the circulation water.

3.5. Emergency shutdown of the boiler

In emergency situations, such as temperature exceeding 100 degrees, cracks in the installation components, water leaks, failures of sensors or controllers, or safety devices, sudden rise in pressure, you should:

- Turn off the controller,
- Remove the embers from the retort burner
- open all doors of the boiler

In the case of sealed system boilers, the emergency can be caused by a power outage (stopping the pumps) or leaving the boiler door open. The central heating installation should be protected with a safety valve set to 2.0 bars; additionally, the manufacturer safeguarded the boiler with a safety valve with a factory setting at 2.5 bars, however in emergency situations these measures may prove insufficient. The boiler must be protected with a thermal safety valve which in an emergency will remove the hot water from the boiler and refill the system with cold water from the water supply line, cooling down the boiler and lowering the pressure (Ch. 2.6) Such situations are especially dangerous when the boiler is working in manual load mode with the automated cycles turned off. Please remember that reaching an emergency state is especially probable in the summer, when only domestic water is heated. Anticipating such situations, it is worth considering to install a heat accumulator which would take over excess heat power.

It is forbidden to pour water on hot fuel.

4. Boiler malfunction

Type of malfunction	Cause	Solution
The boiler smokes, black liquid in the furnace chamber*	No draught	Tightly wall up the connection between the flue and the chimney duct
	Chimney diameter too small	Expand the chimney diameter, for example by demolishing the wall between a ventilation duct (at least 2 m from the base of the Moderator), remove flue gas turbulators.
	Another boiler (for example, in the kitchen) connected to the same chimney	Seal the connection between the other boiler and the chimney to prevent sucking up of cold air.
	Blocked chimney duct	Clean the chimney duct
	Frequent use of wet fuel	Burn some dry fuel, remove flue gas turbulators
	Dirty exchanger	Clean the internal surfaces of the boiler, clean the flue gas turbulators
Too rapid fuel combustion, although the feeder is working correctly	Ash tray not tight	Tighten the ash tray, close the door more tightly
	Too large chimney diameter	Decrease the chimney diameter, install a damper
	Low quality fuel	Use coal in accordance to ch. 1.3
The boiler does not reach the proper working temperature	Dirty exchanger	Clean the internal surfaces of the boiler, clean the flue gas turbulators
	Low quality or too moist fuel	Use coal in accordance to ch. 1.3
	Blower system or controller not functioning	Check connection of all plugs
	Improper settings of controller parameters - lowering of furnace in the retort	Adjust the controller - increase the fuel feeding time, decrease the time between feeds - see controller manual
The feeder discards not fully burnt fuel	Improper settings of controller parameters - elevating of furnace in the retort	Adjust the controller - increase the fuel feeding time, decrease the time between feeds - see controller manual
	Improper settings of controller parameters - too little air	Adjust the controller - increase the blower RPMs - see controller manual
The feeder jams, pulls the safety pin	Low quality, improper granulation of fuel	Use coal in accordance to ch. 1.3
	Foreign object in the feeder	Remove the feeder, dismantle and clean it, put in new pin

* this is a normal situation on start-up. During regular use this will not reoccur

In the case of finding ”leakages” in the boiler, if the water collects in the lower part of the boiler, the tightness of the couplings connected with the installation must be inspected first. In case of actual leaking, contact the producer.

4.1. Maintenance and repairs

In the heating season, maintenance on the boiler consists in regular clean ups. Special care must be paid on the burner connection area - do not allow for any dust or as accumulations. After the heating season, the boiler needs to be thoroughly cleaned, internal surfaces should be conserved with oil.

5. Safe operation conditions

The basic condition for safe operation is the preparation of the installation and safety measures in accordance to Polish norms.
To preserve safe operating conditions, please abide to the following rules:

- Use protective gloves and eyewear
- do not block the covers and doors
- avoid opening the doors when the fan is activated
- use 24V portable lamps
- keep the boiler room clean
- maintain the boiler and its installation in a good technical condition
- pay attention to the tightness of the installation
- electrical installation can be serviced only by a qualified electrician
- in the winter season, avoid intervals in heating

If you suspect freezing of water in the installation, check the water flow in the safety pipes. Water added to the installation should flow from the overflow pipe from the expansion tank. In case of obstruction, do not ignite the boiler follow the instructions for emergency shutdown (ch. 3.5).

It is forbidden to:

- pour water on the furnace
- ignite the boiler with flammable liquids

6. Three-way valve connection

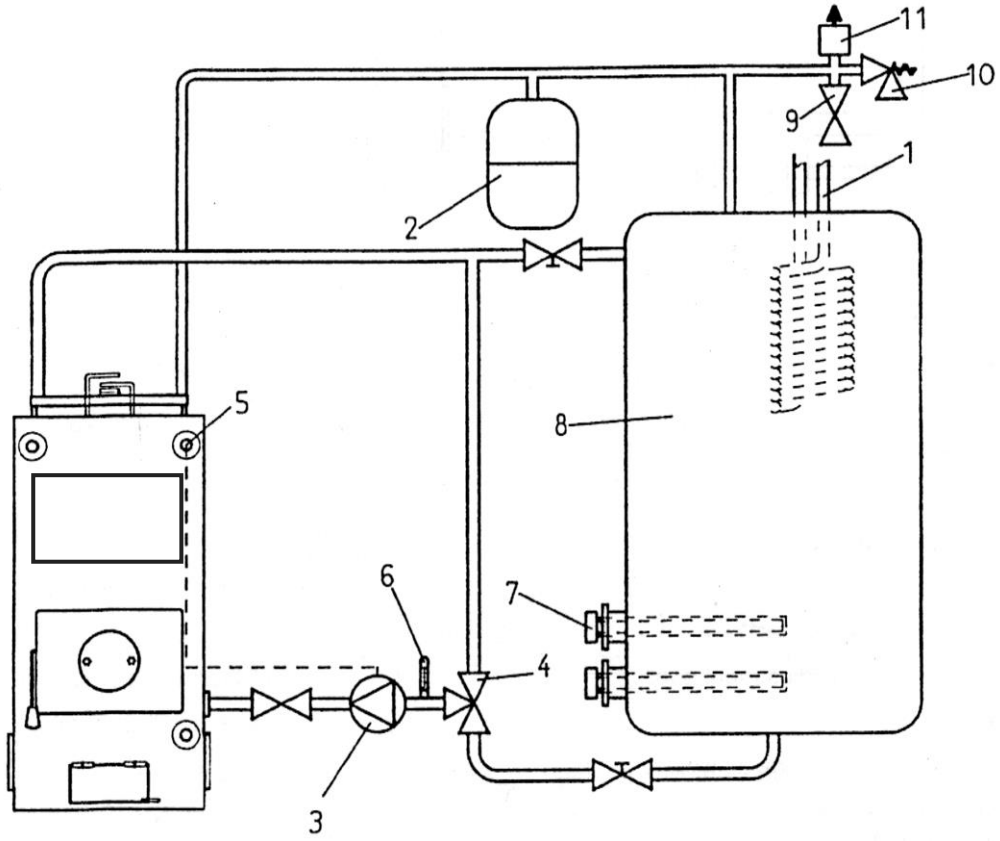


Fig. 9. **Three-way valve connection schematics**

1. Coil
2. Expansion vessel
3. Water pump
4. Three-way mixing valve
5. Pump sensor
6. Thermometer
7. Electrical heater
8. Accumulation tank (domestic water tank)
9. Safety valve
10. Air valve
11. Automatic air vent

7. Storage and transport

The boilers can be stored in unheated buildings, necessarily with roofing and ventilation The boilers must be transported in an upright position Lifting and lowering of the boilers should be done with mechanical lifts, for example, a forklift When elevating the boiler, it is forbidden to lift it with straps connected to any protruding elements such as doors, handles, screws, etc., as it may result in an accident and damage the boiler.

8. Recycling

With appropriate operating conditions, the boiler will work faultlessly for approx. 15 years. After such time, its further utilization may prove economically unsound. The boiler is made of materials which can be fully recycled. It is best to hand it over to a company specialising in recycling or machine dismantling.

9. Refitting the boiler (left/right)

In the Eko Vento Boiler it is possible to place the retort with the tank on either the left or right side of the exchanger thanks to the installation opening on the lateral walls of the exchanger.

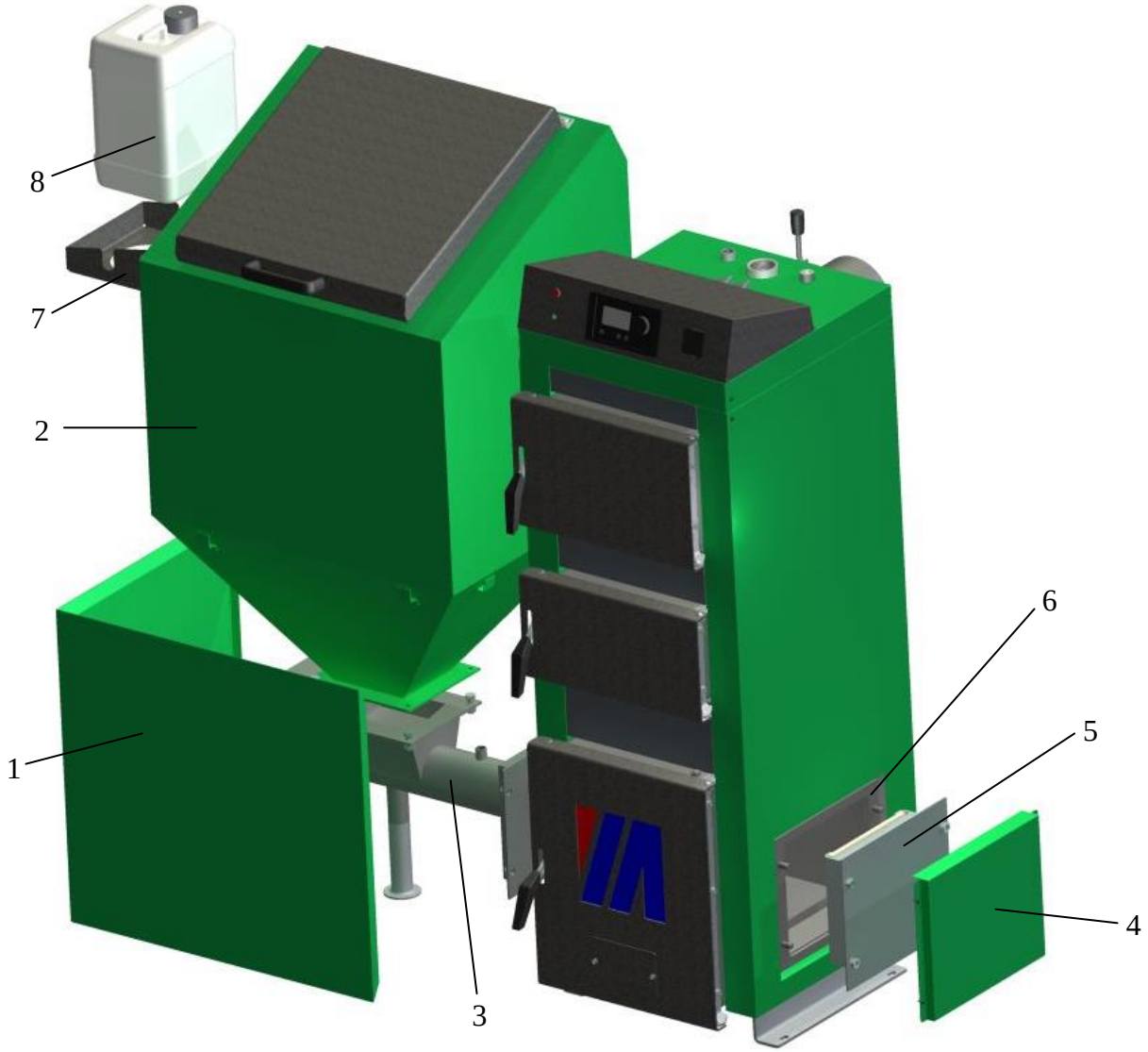


Fig. 10. Disassembly of the feeder

Disconnect electrical wires, remove cover 1 from hooks (Fig. 10), dismount the container 2 and feeder 3, unscrew the cover 4 and stopper 5, mount the feeder in frame 6, unscrew the support 7 and water tank 8 - mount on the other side of the container 2, screw the container 2 to the feeder 3, put the cover 1 on the hook, mount the cover 4 and stopper 5 on the hole previously used by the feeder, reconnect the electrical wiring.

10. Technical specification of the boiler

Factory number of the boiler:

Power (kW)	15.	20.	25.
Required draught (mbar)	0.25	0.27	0.29
Water Volume (l)	67	80	95
Flue gas temperature (^{0} C) Nominal power Q - wood - coal Minimal power Q_{min} - wood - coal	 165 175 165 150	 165 175 165 150	 165 175 165 150
Flue gas mass flow (kg/s) Nominal power Q - wood - coal Minimal power Q_{min} - wood - coal	 0.020 0.016 0.007 0.004	 0.024 0.018 0.009 0.006	 0.036 0.024 0.014 0.010
Water resistance (mbar)	1.0	1.0	1.0
Boiler class	3	3	3
Necessary water pressure for thermal protection (bar)	1.2	1.2	1.2
Recommended minimal volume of accumulation tank (l)*	300	300	350

*The accumulation tank is not necessary if the required volume is below 300 litres.