LUMO®

TECHNIKA GRZEWCZA

Heating boiler with automatic fuel delivery

BIO-MAX PLUS

Series of types 70 – 300 kW

TECHNICAL INSTRUCTION, USER MANUAL AND INSTALLATION MANUAL

LUMO Technika Grzewcza Sp. z o.o.
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Dear User!

Thank you for purchasing an appliance manufactured by our company. We would like to assure you that the Bio-max Plus heating boiler is a product of the highest quality.
Further, since we attach the utmost importance to your opinion about our company, and also having in mind the constant development and improvement of our products, we would ask you to send us all and any comments concerning the functioning of our appliances and the level of service provided by our partners.

We wish you a pleasant and comfortable usage experience.
LUMO Technika Grzewcza Sp. z o.o.

1. INTRODUCTION

1.1. Preface

The present instructions concern single–function steel Bio-max Plus water heating boilers, which are intended for use with wood pellet powered burners.
The instructions are addressed to users of the abovementioned type of boiler and specialist installers engaged in their assembly, installation and servicing.
It is necessary to read the present instructions before commencing any activities concerning the assembly or operation of the boiler.

1.2. Basic instructions

The proper selection of a boiler should be based on a calculation of the thermal heat demand of the building in which it is to be used. The type and rated thermal power of the boiler is to be determined by the duly authorised system designer.
It should be noted that the sustained and trouble–free operation of Bio-max Plus central heating boilers depends on their proper installation, the method of usage, and the timely and correct performance of maintenance and service activities.

ATTENTION!
The initial start–up and the entirety of repairs may be conducted solely by the Authorised Service Centre.

In order to enjoy full guarantee protection, and also to ensure your safety and comfort of usage of our boiler, please send in the attached **INITIAL START–UP CARD**, properly completed, stamped and signed by the Authorised Service Centre, to the following address:

LUMO TECHNIKA GRZEWCZA SP. Z O.O.
Ul. GŁÓWNA 51 B, KROSNO
62-050 MOSINA
WOJ. WIELKOPOLSKIE.
TELEPHONE/TELEFAX +48 61 8136 525; +48 61 8132 891
e-mail: serwis@lumo.com.pl

ATTENTION!
Failure to send in the INITIAL START–UP CARD, or the sending in of a CARD that has been incompletely filled in or not signed, within two weeks of the date of initial start–up shall void the guarantee for your newly purchased appliance, thus resulting in the user being required to cover the entirety of costs of all and any repair work, including the costs of travel of employees of the Authorised Service Centre.

The following conditions must be fulfilled prior to installation of the boiler:

- The power of heaters should be appropriately selected for individual rooms. An insufficient surface area of heaters will result in the building being inadequately heated, and will also introduce conditions conducive to the deposition of boiler scale, thereby leading to a reduction of the thermal efficiency of the boiler.
- The heating system should be designed in accordance with the currently valid regulations.
- The heating system should not be constructed using pipes and heaters that are internally contaminated.
- Once constructed, the heating system should be purged repeatedly with clean water.
- Bio-max Plus boilers can only be used in central heating systems in which the working medium is clean water with a permissible maximum temperature of up to 100ºC and a maximum working pressure of up to 3 bar. The quality of the water used in the system cannot deviate from the parameters stipulated for domestic water. The addition of any agents, such as antifreeze additives, to the heating water shall be at

the responsibility of the user. LUMO Technika Grzewcza shall not be held liable for any damage that may be caused by the addition of such agents.

- The boiler, pumps and heating system must be properly deaerated.
- The installation of a room regulator and/or a weather–based controller will make it possible to increase the comfort of usage of the boiler and ensure a more efficient utilisation of heat.
- The boiler should be connected to a chimney stack that is resistant to flue condensate (e.g. one fitted with the appropriate chimney liner), this following consultations with the competent professional organisation and in accordance with the currently valid regulations.

ATTENTION!
The boiler should be inspected, duly maintained and adjusted by the Authorised Service Centre once a year (preferably before the heating season).
It is forbidden for the boiler to be operated by persons who are underage!

1.3. Procedure to be followed in the event of a failure

IMMEDIATELY:
– Disconnect the boiler from the electrical system.
– Purge the boiler and the entire central heating system of water (if the failure occurs at a time when there is a risk of water freezing in the system).
– Water should also be drained in the event of a leak which may result in flooding.

ATTENTION!
– It is forbidden to tamper with safety devices.
– Only original spare parts are to be used for repairs.
– It is forbidden to open the boiler doors or washout holes while the boiler is operating.
– The fuel tank cannot be allowed to run until empty.

2. TECHNICAL CONDITIONS FOR INSTALLATION OF THE BOILER. REGULATIONS, PRINCIPLES AND GUIDELINES

2.1. Regulations concerning the room

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Bio-max Plus boilers are to be installed in separate that are purpose–built as boiler rooms, while their location must ensure freedom of access to the boiler from all sides. Proper operation of the boiler and maintenance work cannot be obstructed or hindered by nearby equipment, objects or the walls of the building. It is further necessary to ensure the efficient delivery of fuel and provide access enabling the efficacious removal of ash.
The room in which the boiler is to be installed should have two gravity ventilation channels. The intake channel should be placed at a height of approx. 15 cm above the floor, while the exhaust channel should be located as high up as possible under the ceiling. This arrangement ought to ensure the unhindered supply of fresh air from outside the building and

the efficient ventilation of the boiler room. It is forbidden to use mechanical exhaust ventilation systems.
The boiler room should also be fitted with a floor drain connected to the sewerage system and a draw–off tap connected to the water supply system. The entrance door to the room must open to the outside.
The boiler should be placed on a purpose–built foundation or directly on the floor of the boiler room. The base upon which it is located must be made from inflammable materials and must be able to support the weight of the boiler when it is filled with water.

2.2. Requirements concerning the electrical system

- The boiler is intended for usage with ancillary devices powered from a single–phase alternating current line with a rated voltage of 230 V/50 Hz.
- The boiler and ancillary devices must be connected to an electrical outlet with a ground terminal.

ATTENTION!
The ground terminal must be effectively grounded, while in the case of an electrical system secured with a residual current circuit breaker it must be effectively grounded if the electrical outlet is connected to only two conductors.

- The entirety of electrical connections must be made in accordance with currently valid regulations and the electrical diagrams delivered together with the boiler and ancillary devices.
- No other equipment may be added to the line to which the boiler and ancillary devices are connected.
- Repairs, irrespective of their nature and scope, may be carried out solely following disconnection of the power supply.
- Further, repairs may be carried out EXCLUSIVELY by the Authorised Service Centre or duly authorised persons.
- Any tampering, structural modifications, or the performance of repairs by the user or unauthorised third parties shall result in IMMEDIATE VOIDANCE OF THE GUARANTEE, and is also dangerous, as it substantially increases the risk of serious injury or even death!

2.3. Guidelines concerning selection of the expansion vessel

Bio-max Plus boilers can be used in either open central heating systems protected against pressure increases by an open (overflow) expansion vessel or closed central heating systems protected by a pressure (closed) expansion vessel. All boilers intended for operation in closed systems are factory–fitted with a cooling coil pipe. The coil pipe and thermal protection device must be duly connected.
The appropriate expansion vessel should be selected by the system designer.
The expansion vessel should be installed by the system contractor, who must proceed in accordance with the currently valid regulations.

3. DESCRIPTION OF THE APPLIANCE

Bio-max Plus steel water heating boilers intended for use with wood pellet powered burners are among the most modern solution heating appliances fired with ecological renewable fuels. They are an excellent source of heat for the heating of houses, workshops and other low–capacity structures, fulfilling the demands of users who demand that modern boilers require only minimum service and maintenance (the appliances are fully automated) while ensuring a high level of comfort and low operating costs. The design of the boiler is based on a system of smoke tubes and reversal chambers (triple–pass design), which ensures high combustion efficiency of the appliance and minimises chimney stack loss. The exchanger and combustion chamber are made from high–grade, certified steel sheet. The front of the boiler is fitted with a closing three–way diaphragm, which is used both for installing the burner and cleaning the combustion chamber. In the rear of the boiler is a steel smoke conduit which is used to connect the boiler to the flue gas duct, while in the upper part is a large and easily accessible washout hole, which facilitates cleaning of the heat exchanger and the smoke tubes. A tray for ash is located in the bottom part of the boiler. Ash generated during the combustion process fall directly onto the tray, from which they can be easily and rapidly removed. Furthermore, all boilers are fitted as standard with a fuel storage bin, which can be attached either to the left or the right side of the appliance. The boilers are intended for usage in a closed system, and are additionally provided with a cooling coil pipe for the water block and a SYR 3065 or HONEYWELL TS131 thermal protection device.
Another distinguishing feature of the Bio-max Plus boiler is the very low content of dusts and toxic compounds in flue gases – considerably below the values permitted for the group of solid–fuel fired boilers – which ensures that they are fully ecological.
Every boiler in the standard configuration is a single–function heating appliance, however if it is connected to a hot domestic water heat exchanger (for example the LUMO WCW), it can also be used for the provision of hot domestic water.

3.1. Technical specification

Figure No. 1. Section of the boiler with an indication of the direction of flow of flue gases

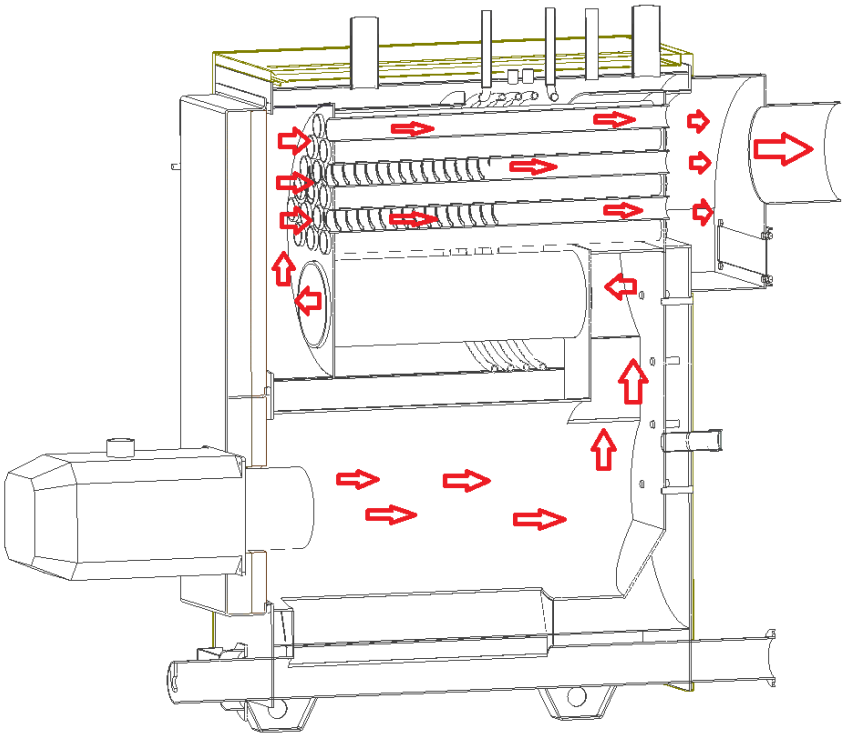
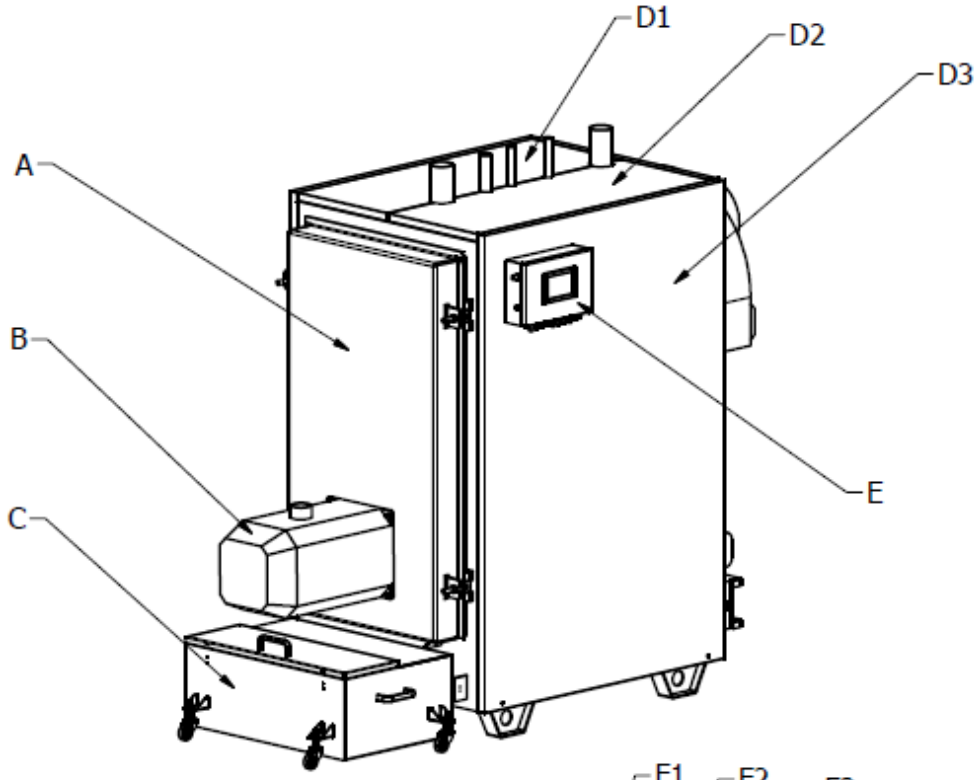
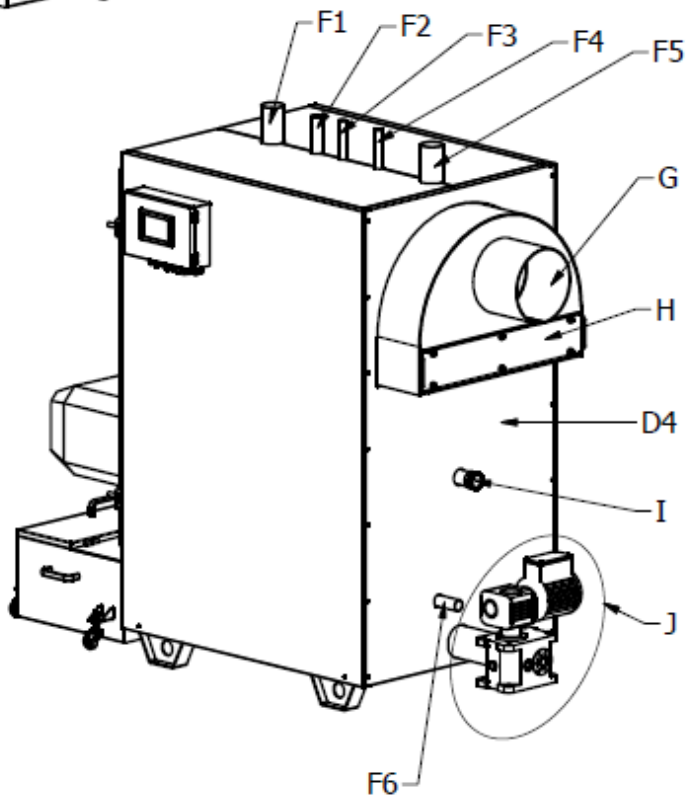


Figure No. 2. Component elements of the boiler



A - drzwi przednie
B - palnik
C - mobilny pojemnik na popiół
D - elementy obudowy:
1-górna lewa
2-górna prawa
3-boczna
4-tylna
E - pulpit sterowniczy
F - króćce:
1-powrotny wody grzewczej
2-zaworu bezpieczeństwa
3-doprowadzający wężownicy schładzającej (tylko dla kotłów 70 i 100 kW)
4-wylotowy wężownicy schładzającej (tylko dla kotłów 70 i 100 kW)
5-zasilający wody grzewczej
6-spustowy wody grzewczej
G - wylot spalin (czopuch)
H - pokrywa wyczystki tylnej
I - wziernik płomienia
J - zespół napędowy automatycznego systemu odpopielania



3.2. Technical parameters

Figure No. 3. Boiler installation dimensions

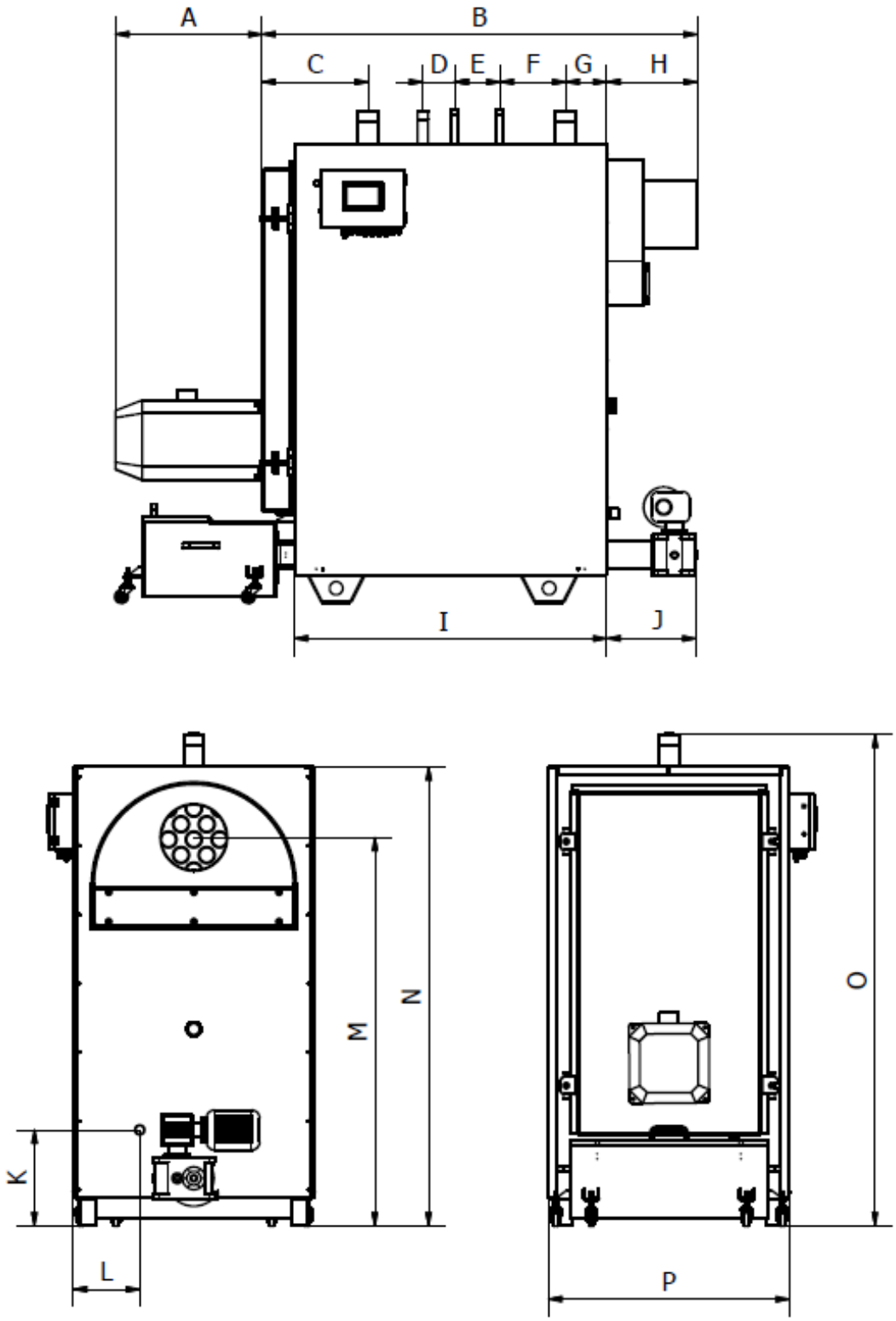


Table No. 1. Boiler technical parameters

Parameter	Unit	Boiler rated power [kW]					
		70	100	150	200	250	300
Thermal power range	kW	21–70	30–100	45–150	60–200	75–250	90–300
Efficiency at rated power	%	95,5	90,9	91,3	92,1	93,3	92,7
Maximum operating pressure	bar	3					
Required flue draft	mbar	0.20–0.30					
Boiler water capacity	l	250	445	720	930	1164	1239
Flue gas temperature at rated power	°C	157	140	175	124	122	121
Flue gas temperature at minimum power	°C	78	90	102	105	104	103
Flue gas stream at rated power	kg/s	0,02897	0,04115	0,06642	0,8835	0,8722	0,8633
Flue gas stream at minimum power	kg/s	0,01155	0,02556	0,04030	0,04936	0,04855	0,04712
Smoke conduit diameter	mm	Ø 200	Ø 250				
Water flow resistance for ΔT = 10 K	mbar	17,3	33,8	67,8	94,9	92,2	91,1
Boiler class according to EN 303-5:2012	-	5					
Temperature regulator adjustment range	°C	50–90					
Minimum water temperature at boiler return	°C	45					
Fuel class or type	-	Class C1 according to EN 303-5:2012 Pressed wood – pellets manufactured in accordance with PN–EN ISO 17225–2:2014–07					
Voltage	V/Hz	230/50					
Electrical terminal	A	6					
Power consumption in standby	W	3					
Power consumption under nominal operating conditions	W	234	278	630	660	680	700
Power consumption under minimum operating conditions	W	191	227	557	585	590	610
Maximum cold water temperature at cooling coil pipe inlet	°C	10					
Maximum cold water pressure at cooling coil pipe inlet	bar	6					
Maximum sound intensity during boiler operation	dB	61					

Parameter	Unit	Boiler rated power [kW]					
		70	100	150	200	250	300
Dimension A	mm	430	530	715	690	690	720
Dimension B	mm	1540	1630	2230	2630	2320	2360
Dimension C	mm	415	400				
Dimension D	mm	90					
Dimension E	mm	130	170	340	510	510	510
Dimension F	mm	140	200				
Dimension G	mm	155					
Dimension H	mm	315	340				
Dimension I	mm	1105	1170	1770	2170	1900	1940
Dimension J	mm	265					
Dimension K	mm	270	260				
Dimension L	mm	225	290				
Dimension M	mm	1210	1475				
Dimension N	mm	1375	1725				
Dimension O	mm	1490	1815			2150	
Dimension P	mm	710	905			1060	
Stub connector F1	R”	1 1/2 (GZ)			2 (GZ)		
Stub connector F2	R”	1 1/4 (GZ)					
Stub connector F3	R”	3/4 (GZ)					
Stub connector F4	R”	3/4 (GZ)					
Stub connector F5	R”	1 1/2 (GZ)			2 (GZ)		
Stub connector F6	R”	1 (GZ)					

4. INSTALLATION OF THE BOILER

4.1. Preparations for installation of the boiler

Before proceeding with the installation of the boiler, it is required to check the following:

- Whether the newly purchased boiler is free of defects, faults and mechanical damage that could have been caused during, for example, transport.
- Whether the central heating system has been properly executed and is free of any contamination, rust, etc., which could interfere with the proper functioning of the boiler (e.g. by increasing flow resistance, etc.).
- Whether the flue duct has been fitted with a chimney liner made from acid resistant steel, is unobstructed, and possesses the requisite flue draft.
- Whether the room in which the boiler is to be located is provided with a properly functioning gravity ventilation system.
- Whether the electrical system is of the proper voltage (230 V), whether the phase conductor (L) is correctly located, and whether the outlet has a ground terminal that is in good working order.

4.2. Location of the boiler

The boiler should be located in a separate room, purpose–built exclusively as a boiler room. The location must satisfy the requirements of currently regulations pertaining to rooms intended for the installation therein of appliances powered by specific types of fuel.
The floor beneath the boiler should have a slight fall in the direction of the floor drain, and also be made from inflammable materials which will support the weight of the boiler. The boiler itself must be precisely levelled. The location of the appliance should be planned in such a way as to ensure that it can be freely accessed from all sides. Such access is indispensable for the proper performance of operational, service and maintenance activities. The minimum distances from walls which must be kept when determining the placement of the boiler have been presented in the following figure.

Figure No. 4. Minimum distances from walls

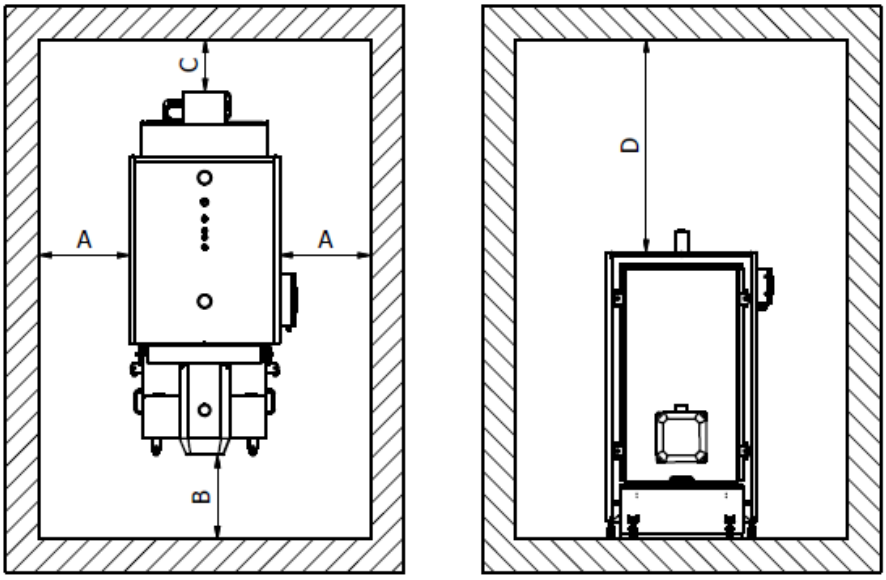


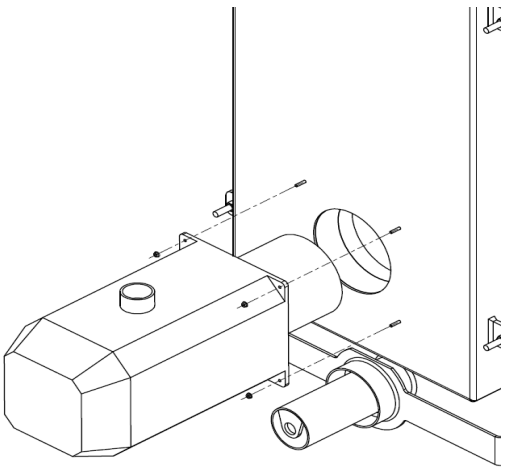
Table No. 2. Minimum distances from walls

Dimension	Unit	Boiler rated power [kW]					
		70	100	150	200	250	300
A	mm	900					
B	mm	1,700	1,800	2,200	2,400	2,600	2,800
C	mm	500					
D	mm	1,125	775				

4.3. Installation of the burner

Installation of the burner consists solely in attaching it by means of screws to the boiler door. The pertinent detailed technical information (screw thread diameters, diameters, etc.) has been set forward in the burner instruction manual and documentation.

Figure No. 5. Attaching the burner to the boiler



4.4. Guidelines concerning fuel quality

In order to ensure the proper, ecological and fuel–efficient functioning of Bio-max Plus boilers, it is recommended to use pellet fuel satisfying the requirements of standard PN–EN ISO 17225–2:2014–07.
Certified fuels from reliable sources are recommended. The fuels used should be of an appropriately low humidity and have a low content of volatile substances. Minimum fuel quality requirements have been presented in the following table.

Table No. 3. Minimum fuel quality requirements

Humidity content (in working condition)	≤ 12%
Ash content (in working condition)	≤ 0.5%
Calorific value	> 17 MJ/kg
Fuel class	C1 according to EN 303-5:2012

When adding fuel to the tank it is necessary to pay particular attention to mechanical contaminants (e.g. stones), which could damage the ancillary devices of the boiler (the burner, feeding mechanisms, automatic ash removal system) and lead to failures for which the equipment manufacturer shall not be held liable.

4.5. Connection to the central heating water system

Bio-max Plus boilers are factory–fitted with externally threaded stub connectors: a supply stub connector, a return stub connector, a drainage stub connector and a safety stub connector (the diameters of stub connectors for various boiler power ratings have been given in *Table No. 1*). These stub connectors and their corresponding joints are used to connect the boiler to the central heating system in the appropriate manner (so as not to mix up "supply" with "return", for example).
Connections must be made in accordance with the design and currently valid regulations, as appropriate for the specific system type (i.e. open or closed).

- Before connecting the boiler, it is necessary to thoroughly clean the system of all possible contaminants (dirt, rust, etc.).
- Do not use any magnetisers in the system.
- Cut–off valves should be installed between the boiler and the central heating system in order to enable dismantling of the boiler without it being necessary to purge the whole system of water.
- In order to protect the boiler against excessively low heating water temperatures at the heating system return (below 45°C), which could lead to its premature corrosion, it is required to install a three–way or four–way mixing valve and/or a boiler feed pump.
- Ensuring proper circulation in the central heating system will make it possible to achieve a difference in temperature between supply and return of less than or equal to 15°C.
- Water filters should be installed at the heating water return from the central heating system.
- Boilers with a power rating in excess of 100 kW must be fitted with a parametric water level sensor. Depending on the type of sensor, this should be installed on the boiler in accordance with the attached instruction manual.

ATTENTION!
Pipe/plumbing fittings do not constitute an element of the boiler's original factory fittings/equipment. The purchase of such devices and their connection to the boiler is entirely the responsibility of the user.

Once the boiler is installed, it is necessary to:

- Fill the entire heating circuit with water.
- Carefully deaerate the entire central heating system and the boiler. This step will need to be repeated a number of times during the first few days of operation of the completed central heating system (it is recommended to supplement manual deaeration with the introduction of fixed automatic deaerators into the system).
- Precisely verify the leaktightness of the connection between the boiler and the central heating system.

Do not install thermostatic valves on heaters located in the room in which the room temperature regulator is to be installed, this because:

- Temperature control is taken over entirely by the regulator which works together with the central heating pump and boiler.
- In the event of any change of the temperature set with the regulator, it would be necessary to correct the settings of the thermostatic valves.
- In the event of an inconsistency in this setting, the valves could close and cause the boiler to function abnormally.
- Thermostatic valves may be installed in all other rooms, and may be used to regulate the temperature as required.

4.6. Guidelines concerning water quality

The quality of water used to fill the boiler and the system is of critical importance for their longevity and trouble–free operation. Inappropriate boiler water parameters will result in the deposition of boiler scale and may result in the production of corrosion foci, which may in turn lead to equipment failures. The guarantee does not cover boiler damage due to corrosion or the deposition of boiler scale. The water used to fill the boiler and the entire heating system should satisfy the requirements set forward in pertinent standards and local regulations.

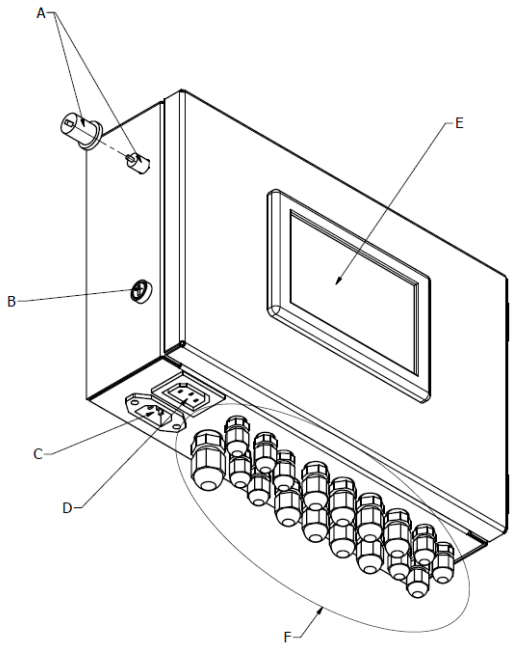
The treatment technology applied to water intended for filling the boiler and the system should allow attainment of the following parameters:

- pH value > 8.5
- Total hardness < 20°f
- Free oxygen content < 0.05 mg/l
- Chloride content < 60 mg/l

4.7. Connection to the electrical system

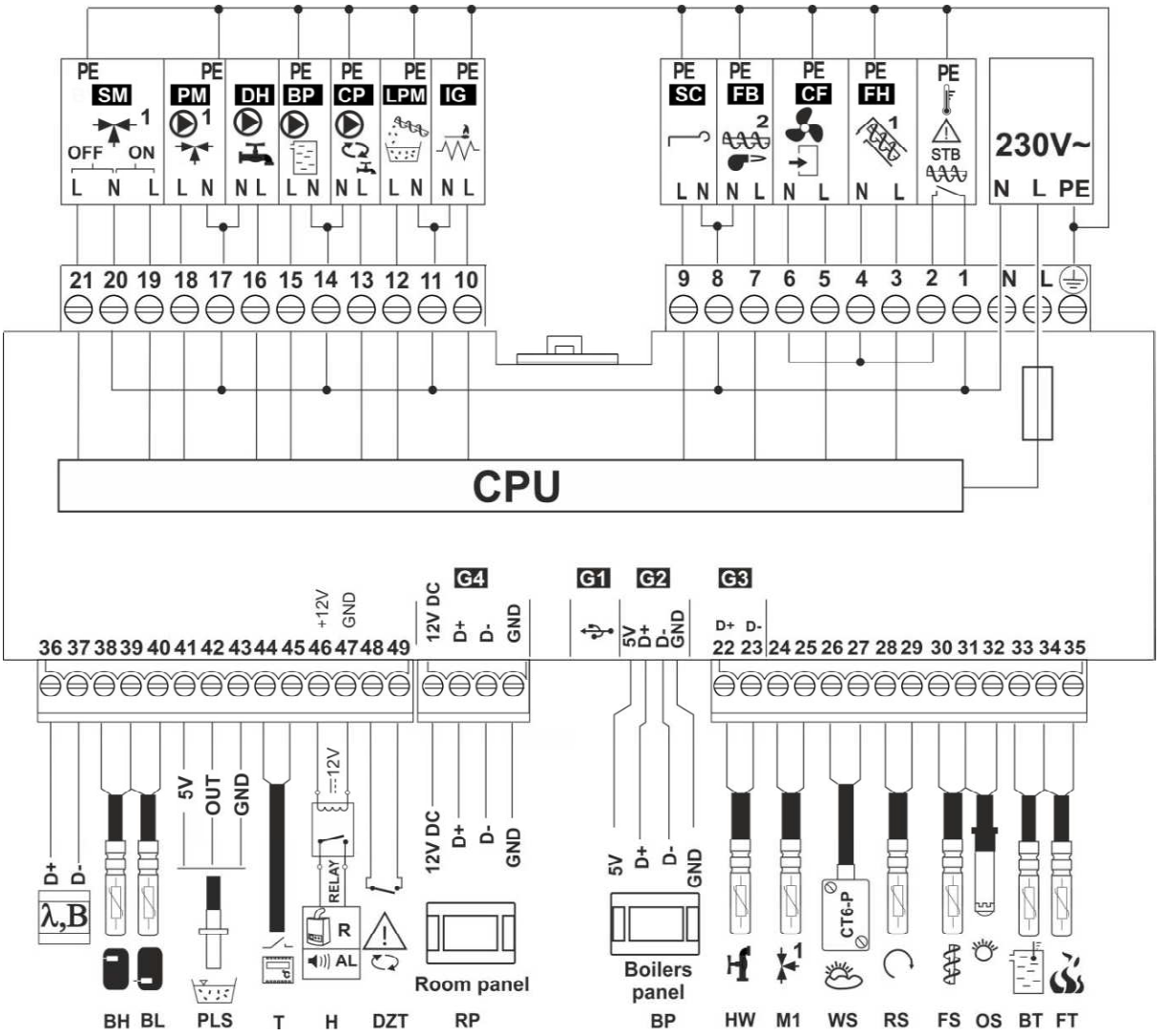
Bio-max Plus boilers can be powered from alternating current line 230 V/50 Hz fitted with a protective conductor. The power lead and all ancillary devices (pumps, mixing valves, room regulator, etc.) are to be connected through the terminal strip. The pertinent technical details and locations of the corresponding terminals have been presented in the following diagrams and described in the instruction manual and the documentation attached to the controller. The power lead and ancillary devices are to be connected in accordance with the markings on the terminal strip, paying particular attention to the order of the "L" and "N" terminals.

Figure No. 6. Control panel with terminal connectors



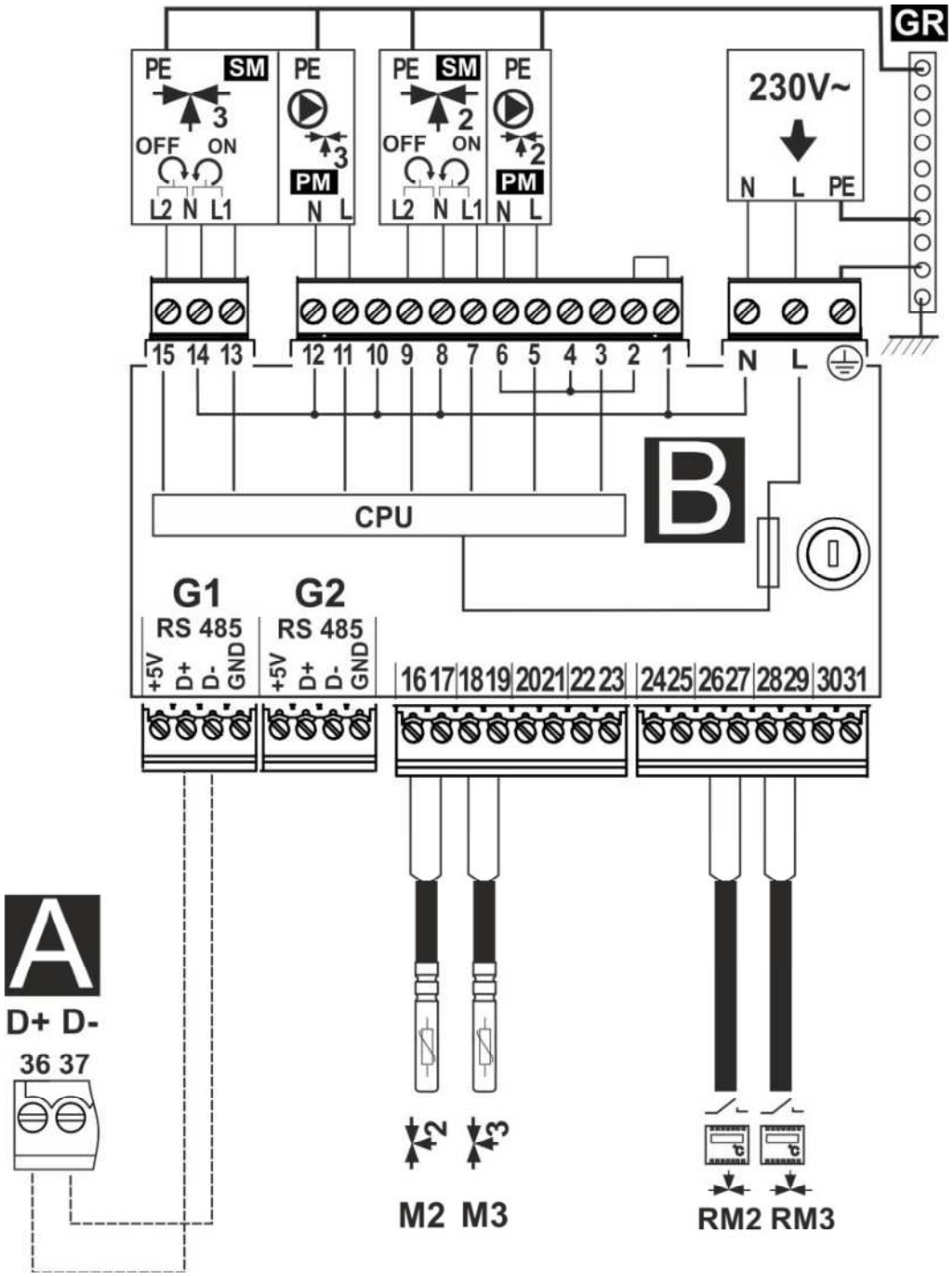
A - termostat bezpieczeństwa (STB)
B - bezpiecznik
C - gniazdo zasilania sieciowego 230V
D - gniazdo zasilania systemu automatycznego odpopielania
E - wyświetlacz z ekranem dotykowym
F - wyjścia przewodów osprzętu

Figure No. 7. Wiring diagram – ecoMAX860P Standard and ecoMAX860P Touch



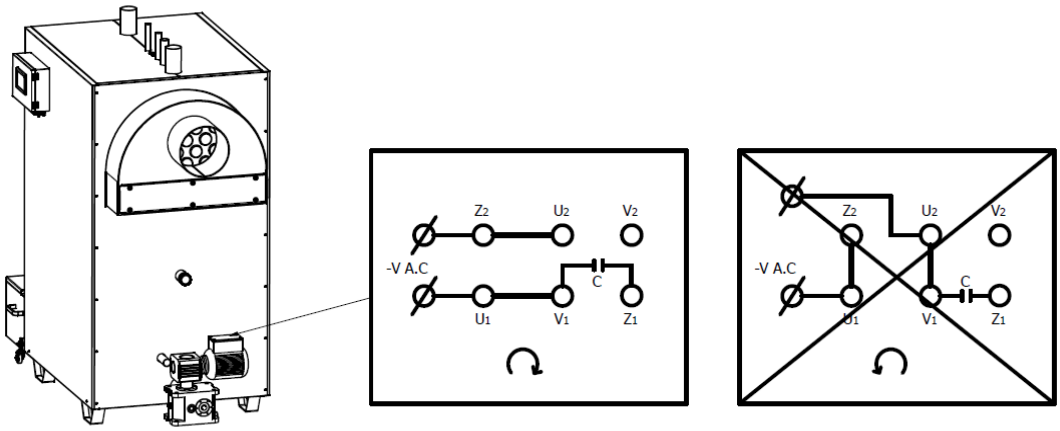
λ – Lambda probe module, **B** – module handling additional heating circuits, **BH** – upper buffer temperature sensor, type CT4, **BL** – lower buffer temperature sensor, type CT4, **PLS** – fuel level sensor, **T** – room thermostat (NO/NC), **H** – voltage out to reserve boiler control or alarm signalling, **RELAY** – 12 V relay, **DZT** – boiler door open status sensor, **RP** – ecoSTER TOUCH room panel with room thermostat function, **BP** – control panel, **HW** – hot domestic water temperature sensor, type CT4, **M1** – regulated circuit temperature sensor (mixer 1), type CT4, **WS** – weather–based temperature sensor, type CT6-P, **RS** – return water temperature sensor, type CT4, **FS** – feeding mechanism temperature sensor, type CT4, **OS** – optical flame brightness sensor, **BT** – boiler temperature sensor, type CT4, **FT** – flue gas temperature sensor, CT2S.
L N PE – power supply, 230 V~, **CPU** – control, **STB** – safety temperature limiter in, **FH** – main feeding mechanism, **CF**– burner blowing fan, **FB** – burner feeding mechanism, **SC** – rotary motor for burner cleaning, **IG** – lighter, **LPM** – additional external feeding mechanism, **CP** – hot domestic water circulating pump, **BP** – boiler pump, **DH** – hot domestic water pump, **PM** – mixer pump, **SM** – mixer servo–motor.

Figure No. 8. Wiring diagram – additional module B for ecoMAX860P Standard and ecoMAX860P Touch regulators



M1 – regulated circuit temperature sensor (mixer 2), type CT4, **M2** – regulated circuit temperature sensor (mixer 3), type CT4, **RM2** – room thermostat, mixer 2, **RM3** – room thermostat, mixer 3.
L N PE – power supply, 230 V~, **GR** – grounding strip, **PM2**/**PM3** – pump, mixer 2/3, **SM2**/**SM3** – servo–motor, mixer 2/3, **CPU** – control, **A** – executory module of the ecoMAX860P Standard and ecoMAX860P Touch regulator.

Figure No. 9. Connection diagram of the automatic ash removal system unit

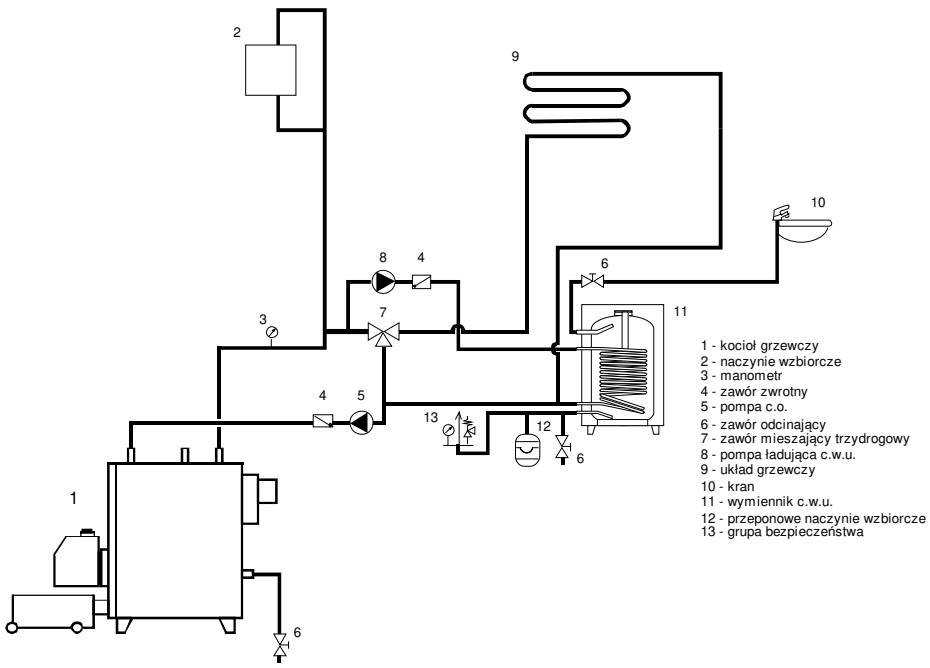


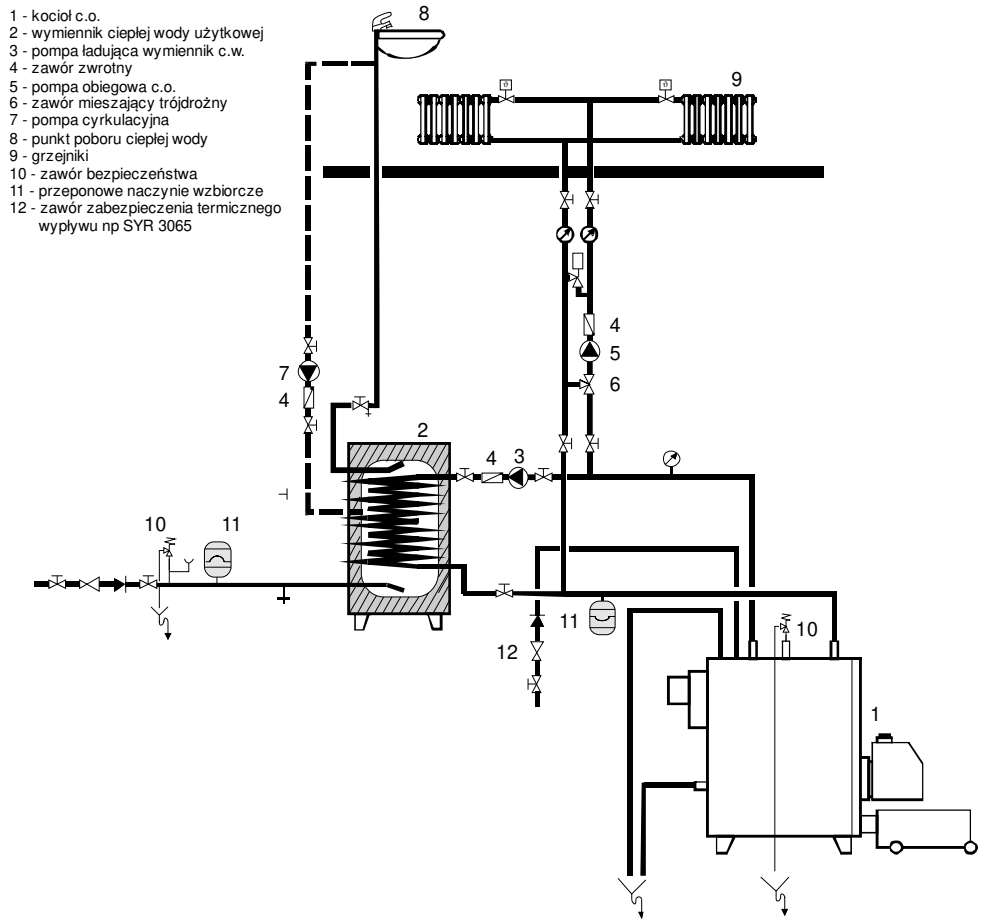
ATTENTION!
Electrical connections and all associated items of work may be performed solely by the Authorised Service Centre.

4.8. Connection to the domestic hot water exchanger (option)

The exchanger should be selected on the basis of calculations of the hot water requirement for a specific number of intake points and residents. The type, capacity and throughput of the exchanger are to be determined by the duly authorised system designer.
The following figure presents an exemplary diagram of a system comprising a LUMO WCW hot domestic water exchanger and a Bio-max Plus boiler.

Figure No. 10. Exemplary diagrams of a system comprising a boiler and an exchanger in an open and closed central heating system





4.9. Connection of the boiler to a chimney stack system

The role of the chimney stack consists in effecting the proper discharge of combustion products from the boiler outside the building in which the boiler room is located. The correct flue draft depends on a number of factors, such as: the difference between the temperature of flue gases and ambient; the length of the smoke conduit, its shape, section, roughness, cleanness, etc.

The proper selection of chimney parameters must ensure the required flue draft of 0.2 – 0.3 mbar. Such a flue draft will ensure the proper functioning of equipment under negative pressure. This in turn will protect against the risk of combustion products being released by the boiler into the boiler room and the concentration of CO in the combustion chamber.

While Bio-max Plus boilers operate in their lower power range, the temperature of flue gases may regularly fall by more than 100°C directly at the boiler outlet and by no more than a few/a dozen or so degrees at the top of the chimney. This may result in the appearance of large quantities of condensate with an aggressive reaction in the flue duct, which will have a detrimental effect on both the flue duct (the possible appearance of stains and blooms on the internal walls of rooms directly adjacent to the chimney) and the boiler (corrosion). Thus, in order to prevent this exceptionally harmful phenomenon, it is recommended to use chimney systems insensible to humidity – including double–wall chimneys and chimney liners made from acid resistant and stainless steels. The section of the flue duct used must correspond to the section of the flue gas stub connector in the boiler, while if the shape of the section is altered, its surface area cannot be changed (reduced).

The connection of the boiler flue gas stub connector with the chimney should be carefully insulated and be as short as possible (a route no longer than 7 m), while

maintaining a small upward ascending angle. Sharp turns should also be avoided, and elbows ought to be kept to a minimum.
It is forbidden to install any heat exchangers, this in order to ensure the optimal utilisation of flue gas heat. The entirety of work, as well as the licence for connecting the boiler to the flue duct, must be arranged and agreed with the competent professional organisation and executed thereby.

ATTENTION!
It is forbidden to connect any other appliances to the flue duct used by the boiler, or to utilise it for any additional purposes (e.g. ventilation).

ATTENTION!
The chimney stack should be constructed in accordance with the standards and regulations in force at the location of installation of the boiler.

DEAR USER!
LUMO TECHNIKA GRZEWCZA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM THE IMPROPER INSTALLATION OF THE BOILER OR FAILURE TO OBSERVE THE CONDITIONS AND GUIDELINES SET FORWARD IN THE PRESENT INSTRUCTION.

5. OPERATION

5.1. Preparations for start–up of the boiler

Before proceeding with the initial start–up of the boiler, it is necessary to perform a fresh inspection of the appliance and its ancillary devices, and in particular:

- to carry out an internal inspection of the boiler – water filling inspection,
- to carry out an inspection of moving elements, particularly those which operate under pressure, and also to close all doors, washout holes, etc.
- to inspect all valves (in particular the deaerating valves which account for the operational safety of the appliance),
- to verify the technical condition of secondary, measurement and regulating devices, including burner and boiler automatics,
- to carry out a visual inspection of the external condition of the boiler – its housing, insulation, etc.
- to inspect the condition and correctness of execution of all systems cooperating with the boiler – the chimney stack, the ventilation system, the electrical system and the fuel system,
- to inspect the pressure in the system, and increase it if necessary,
- to verify fulfilment of industrial work safety and fire safety requirements at the point of installation of the boiler,
- to check the fuel level in the tank and add fuel if necessary.

If all the guidelines have been fulfilled and the appropriate burner has been correctly fitted to the boiler, the initial start–up may be proceeded with.

5.2. Initial start–up of the boiler

ATTENTION!
The boiler requires precise regulation!
The initial start–up may be conducted solely by the Authorised Service Centre. This operation is paid, while the Authorised Service Centre must make the requisite entries and duly stamp the Guarantee Card and the Initial Start–up Card, which shall be countersigned by the user.

In order to carry out the start–up of the boiler, it is necessary to:

- Place and connect the boiler in accordance with the guidelines set forward in the present instruction.
- Connect the supplied burner, controller and fuel feeding mechanism as described in their respective instruction manuals.
- Fill the boiler and the system with water. Carefully deaerate the boiler and the system. Before start–up, check the proper functioning and leaktightness of individual components of the boiler, burner and system.
- If a circulation pump is installed, it should be activated now.
- Pour fuel into the storage bin. Close the cover, paying particular attention to its proper adherence.
- Activate the controller and the burner, and proceed in accordance with the data given in the instruction manuals delivered together with these two devices.
- During initial start–up there may occur the phenomenon of boiler sweating. In this event it will be necessary to intensify the combustion process in order to attain a temperature of 70–80ºC at the boiler in order to dry off and properly heat up both the boiler and the flue duct. This phenomenon may reoccur over a period of approx. 2 weeks.
- In order to increase the longevity of the boiler, it is recommended to maintain a water temperature in the boiler of no less than 60ºC.

ATTENTION!
Before adding fuel to the storage bin, it is recommended to switch off the boiler.
During operation it is necessary to regularly inspect the leaktightness of the boiler, and in particular of the connection between the boiler and the flue duct, and also to make sure that an adequate level of water is maintained in the system.

CRITICALLY IMPORTANT!
During operation certain elements of the appliance (for example the smoke conduit) may attain high temperatures, in excess of 100ºC. Direct contact with these elements may result in serious burns. It is therefore necessary to exercise particular care.

CRITICALLY IMPORTANT!
Cold water may be added only when the boiler block has cooled down. It is forbidden to cool down the hot boiler using compressed air or water, for this may cause the block to crack.

5.3. Situations in which start–up of the boiler is prohibited

It is forbidden to start–up the boiler in the following instances:

- If acceptance testing by a unit of the Office of Technical Supervision is required, but has not been performed.
- The burner, fuel feeding mechanism or boiler controller is damaged, or its proper functioning is impaired.
- It has been determined that the flue gas discharge system is functioning incorrectly.
- There is no water or an insufficient quantity of water in the boiler.
- It has been determined that a safety device or measurement apparatus is functioning incorrectly.
- There exists a risk of fire or any other risk to human health and life.

6. INSPECTIONS AND MAINTENANCE

CRITICALLY IMPORTANT!
Before commencing any maintenance operations, it is necessary to disconnect the boiler and its ancillary devices from the power supply, and if necessary wait until they completely cool down.

6.1. General guidelines

- It is recommended to carry out a comprehensive inspection and perform maintenance operations on the boiler and its ancillary devices at least once a year, preferably before the start of the heating season.
- The entirety of repairs, inspections, adjustments and maintenance may be performed solely by the Authorised Service Centre.
- In the course of every inspection and maintenance operation it is necessary to verify the correct functioning of all safety systems and the leaktightness of the water system, the flue gas discharge system, and the ventilation system.
- The above operations are not considered as guarantee repairs.
- The boiler room should at all times be maintained in a state of order and cleanliness.
- In the event of any irregularities in the functioning of the boiler, burner, controller or any other ancillary device installed in the boiler room, particularly if the device in question impacts usage safety, it is necessary to immediately remove the malfunctioning component or contact the Authorised Service Centre for the purpose of carrying out repairs.

6.2. Maintenance activities which may be performed by the user

The user of the appliance should himself perform the following:

- Periodically – at least once a year – clean the water filters.
- At least once every 3 months inspect the water level in the central heating system and, if necessary, add water.

- Deaerate, whenever necessary, the central heating system and the boiler.
- Once every 3 months clean the surfaces of the boiler exchanger and the burner furnace.
- Maintain the room in which the boiler is installed in a state of order and cleanliness, and not allow it to be used for any other purposes.
- Once every two days check the level of fuel in the tank.
- Regularly, at least once a week, inspect the ash container and if necessary empty its contents.

6.3. Maintenance activities performed by the Authorised Service Centre

ATTENTION!
The entirety of activities described under the present point are to be performed solely by the Authorised Service Centre!
Regular and professional boiler maintenance is indispensable in order to ensure the proper and reliable functioning of the appliance, guarantees optimal fuel consumption, and helps protect the natural environment against the toxic processes which occur in the course of combustion.

6.3.1. Recommended intervals and scope of service operations

Once a year (every 12 months):

- Inspection of the functioning of regulating and safety devices, including the safety valve and the safety temperature limiter (STB).
- Inspection of the ventilation system.
- Inspection of the leaktightness and adherence of doors and washout holes, and of the efficiency of packing cords.
- Inspection of the insulating elements of the boiler.
- Flue gas analysis.
- Cleaning the part of the boiler exchanger which comes into contact with flue gases.
- Checking the cleanness and technical condition of elements of the burner, in particular the following: furnace, motoreducers, fans, photocells, heater, downpipe and spirals of the external and internal feeding mechanisms.
- Adjustment of the burner and inspection of the correctness of settings of boiler and burner automatics.

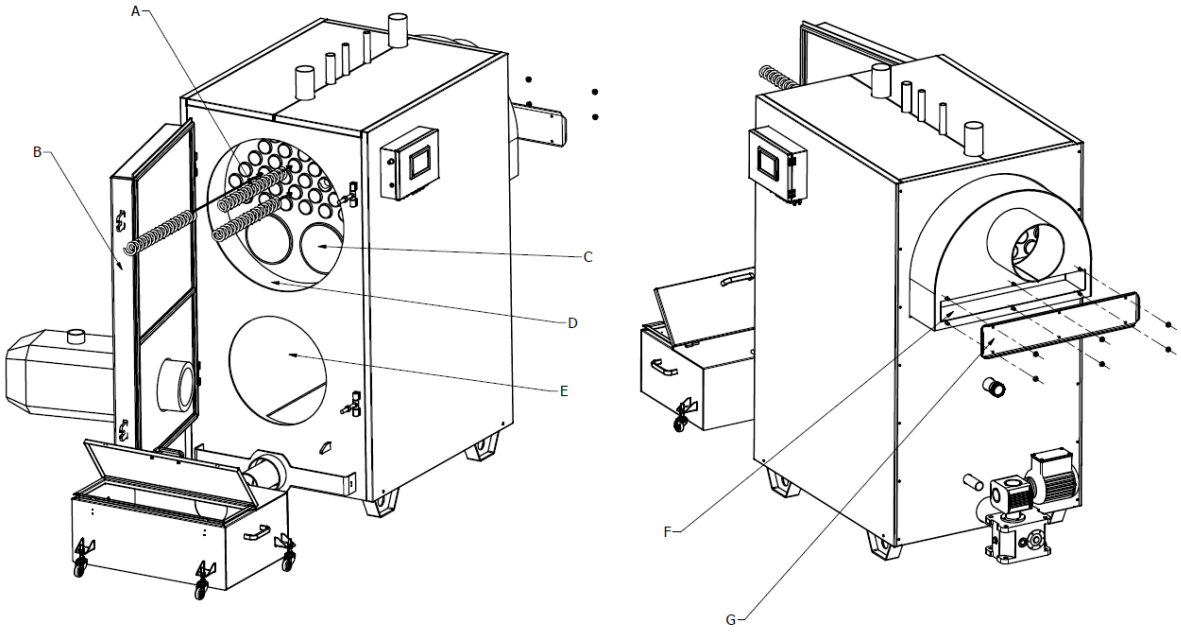
ATTENTION!
Flue ducts and ventilation channels must be periodically inspected and cleaned by technicians from the COMPETENT PROFESSIONAL ORGANISATION. It is necessary for this operation be carried out once every 3 months (Regulation of the Minister of Internal Affairs and Administration of 7 June 2010 on the Fire Protection of Buildings, other Building Structures, and Premises – Journal of Laws No. 109, Item 719, of 2010).

6.3.2. Maintenance of the boiler block

In order to ensure the complete combustion of fuel and thereby optimal boiler efficiency, it is recommended to maintain the appropriate cleanness of the walls of the combustion chamber, the smoke tubes of the heat exchanger, and the reversal chambers. To this end:

- Switch off the burner, pumps and power supply on the control panel. Remove the plug of the power lead from the electrical outlet.
- Disconnect plugs which connect the burner electrically with the boiler.
- If necessary, remove the burner. Burner maintenance and adjustments are separate operations, and have been described in detail in the instruction and user manual delivered together with the burner.
- Remove the locking screws and open the front door of the burner in order to gain access to the combustion chamber and the smoke tubes.
- Remove the flue gas turbulators (coils) from the smoke tubes. Use a round steel brush seated on a cleaning rod to carefully clean the smoke tubes and the reversal chamber of contaminants.
- Using the steel brush, carefully clean the combustion chamber of contaminants.
- Check the seals of the front door.
- Clean the flue gas turbulators with the seal brush and replace them in the smoke tubes. Assemble the components of the boiler by performing the disassembly steps in reverse order.
- Remove the screw of the rear washout hole. Remove the cover, empty the trays and carefully clean the flue gas exhaust chamber of contaminants (a vacuum cleaner may be used for this purpose). Check the seals, slide in the trays and replace the washout hole cover. Screw down the locking screws.

Figure No. 11. Elements of the boiler block which require maintenance



A – Flue gas turbulator (coil) **E – Combustion chamber**

B – Front door
C – Smoke tubes
D – Reversal chamber
F – Rear washout hole with trays
G – Rear washout hole cover

6.3.3. Burner maintenance

Burner maintenance operations have been described in detail in the instruction manual delivered together with the burner. Recommendations given by the manufacturer must be followed at all times. Following the completion of maintenance, the burner is to be reinstalled on the boiler.

ATTENTION!
During each subsequent start–up of the boiler it is necessary to check the correctness of installation of the screws securing the front door of the burner and the washout hole.

The burner should be adjusted in accordance with the recommendations provided by its manufacturer, paying particular attention to ensure that the combustion parameters attained (total efficiency, flue gas temperature, etc.) are concordant with the parameters set forward in Table No. 1 of the present instruction.

6.4. Verifying the operation of boiler components

ATTENTION!
The entirety of activities described under the present point are to be performed solely by the Authorised Service Centre!

6.4.1. General guidelines

During each inspection and maintenance operation performed on the boiler and burner it is necessary to verify the correctness of operation of safety systems and the leaktightness of water fittings and safety devices.
The boiler undergoes partial quality control both during and after production, and is also subjected to a comprehensive final inspection. In the event of any difficulties with starting up the boiler, which may arise in spite of these thorough quality control procedures, it is necessary to check the following:

- Is a voltage of 230 V/50 Hz present at the terminals and is the order of “L” and “N” terminals concordant with the markings on the terminal strip of the boiler’s control panel?
- Is fuel with parameters concordant with the those stipulated by the burner manufacturer being delivered to the burner?
- Are the electrical connections of the control panel, burner and ancillary devices of the boiler correct?

6.4.2. Checking the functioning of the safety device which prevents the permitted heating water temperature being exceeded

In order to verify the correctness of functioning of the thermostat which protects the upper threshold value of boiler heating water temperature (STB), it is necessary to perform the following:

- Start up the boiler. Set the maximum heating water temperature for the boiler.
- Remove the sensor of the controller adjusting thermostat from the boiler capillary tube, thus leaving only the safety thermostat sensor (STB) installed in the capillary tube.
- Allow the boiler to operate in this condition until the maximum set temperature is exceeded and appliance activates an emergency stop.
- Once the boiler cools down, unscrew the cap of the safety thermostat cover and press the red button located immediately underneath. The boiler should now resume operation.

6.4.3. Checking the functioning of heating water temperature adjusters

In order to check the heating water adjusting thermostat, set a certain temperature (preferably at two extreme positions – the lowest and the highest) and compare the values obtained with those given by a thermometer.

6.4.4. Checking the functioning of burner safety devices

The method of checking the correctness of functioning of internal burner safety devices has been described in detail in the instruction manuals delivered with the burner. Recommendations given by the manufacturer must be followed at all times during such checks.
All and any failures caused by the incorrect functioning of the burner or brought about intentionally are displayed on the control panel. Once a failure is rectified, the associated notification will be removed automatically from the control panel.

6.4.5. Checking the functioning of the device which monitors the water level in the boiler (boilers with a power rating in excess of 100 kW)

The method of checking the functioning of the device which monitors the heating water level in the boiler has been described in detail in the instruction manual delivered with the sensor. Recommendations given by the manufacturer must be followed at all times during such checks.
A decrease in the heating water level in the boiler will activate an emergency stop. Once the failure is rectified and the water level sensor restarted, the boiler will automatically resume operation.

7. Selected industrial work safety and fire safety issues

- Before the initial start–up of the boiler, it is necessary to read the present technical and operational documentation.
- It is strictly forbidden to use any additives in order to light up the fuel.
- It is forbidden to open or interfere with the functioning of any live equipment or devices.
- The room in which the boiler is installed and its fuel stored must be provided with firefighting equipment.
- Bystanders and children must be prevented access to the location where the boiler is installed and operated.

- Ensure that heating system equipment is operated and handled solely by persons who are duly trained and authorised.
- Periodically inspect the condition of all systems, including the electrical system and the chimney stack.
- Do not cut off and do not obstruct the circulation of air in the ventilation system.
- Periodically inspect or commission the inspection of flue gases, and if necessary carry out an adjustment of the burner and boiler (particularly when the producer/supplier of fuel is changed).
- Before commencing any maintenance operations, it is necessary to disconnect the boiler and its ancillary devices from the power supply.
- All irregularities and defects should be reported to the appropriate persons.
- Maintain the location where the boiler is installed in a state of order and cleanliness.
- Whenever necessary, use only dry powder or snow fire extinguishers.

8. Exemplary defects and methods of their rectification

A detailed list of typical defects which may occur during operation of the controller and burner, and of methods of their rectification, has been set forward in a separate instruction delivered together with these devices. The following table presents a few possible emergency conditions which may occur during operation of the boiler.

No.	Type of defect	Possible cause	Method of rectification
1.	No readings on the boiler controller display	▪ No power ▪ Incorrect connection of controller plugs and leads ▪ The controller has got damp ▪ Damaged display	▪ Check the electrical connection of the boiler ▪ Check the correctness of installation of plugs and whether the controller has been properly connected ▪ Replacement/repair of the controller
2.	The feeding screw of the ash removal system does not turn when activated	▪ The motoreducer is not receiving power ▪ Incorrect connection of power leads ▪ Mechanical blockage of the feeding screw ▪ Motoreducer damaged ▪ Controller damaged	▪ Check the correctness of installation of plugs and whether the controller has been properly connected ▪ Check the correctness of connection of the motoreducer ▪ Check whether the feeding screw is unobstructed and can turn freely; if necessary remove any obstructions from the ash removal system pipe
3.	The boiler does not reach the set temperature	▪ The boiler has been selected incorrectly for the area of the building which requires heating ▪ One of the boiler sensors is damaged ▪ The boiler temperature sensor has been installed incorrectly in the capillary tube ▪ The boiler power has been set too low	▪ Verify whether the boiler has been properly selected ▪ Check the sensors ▪ Inspect the placement of the boiler temperature sensor ▪ Check and if necessary correct the burner settings
4.	The boiler is emitting smoke	▪ Obstructions in the chimney stack ▪ Obstructions in the connection between the boiler and the chimney stack ▪ Contaminated boiler exchanger ▪ Damaged or worn boiler packing cords or sealing elements	▪ Remove any obstructions from the chimney stack and flue ducts ▪ Inspect and if necessary replace the packing cords and sealing elements