D5.2: Report of the state of the art of combustion devices for the selected biofuels

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1. Summary

The present report constitutes Deliverable D5.2: "Report of the State of the art of combustion devices for the selected biofuels" of the Biomasud Plus Project (Horizon2020 / 691763).

The report is a review of the manufacturers of commercial combustion equipment (stoves and boilers) presently existing on the market providing certified designs for the use of Mediterranean biofuels, which are the focus of the Biomasud Plus project.

Following an introduction, the report is divided into the following chapters:

- Chapter 3 presents an overview of the basic combustion principles in biomass heating systems (air staging, stoking).
- Chapter 4 presents an overview of the two main combustion systems under investigation (stoves and boilers) and their subcategories based on fuel type.
- Chapter 5 presents the legislation and European standards on biomass heating systems for the domestic sector.
- Chapters 6 to 12 include a country report for the Biomasud Plus partner countries: Greece, Spain, Italy, Turkey, Portugal, Slovenia and Croatia. The country overview includes information about the applicable legislation for biomass combustion systems for the domestic sector, any available statistical data on biomass use and number of heating systems installed, support mechanisms for the installation of biomass heating systems and, finally, information on national manufacturers of heating systems suitable for use with Mediterranean biofuels. For each manufacturer, the commercially available heating systems they produce are presented.
- Chapter 13 summarizes the main conclusions of the study.

The present report is accompanied by an Annex, which presents detailed information on several biomass heating systems produced by national manufacturers of the Biomasud Plus project focus countries. Information on technical data, efficiency, emissions and cost data were collected through a standardized template, which is presented in the Annex. Additionally, the Annex presents information about biomass heating system from manufacturers located in other countries (e.g. Austria) which produce commercial systems suitable for use with the Biomasud Plus targeted fuels.

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2. Introduction

Heat from combustion of biomass for domestic heating has long been exploited as wood fires have been used for thousands of years. During that time, significant progress has been achieved and several methods have been developed, from open fire pits to the available technologies of today, which include wood- and pellet-firing systems with automated feeding. However, despite the long history of these methods, biomass is one of the most difficult fuels to burn efficiently and “cleanly”, as it generally produces more unburnt compounds (CO, PMs) compared to conventional combustion systems using oil or natural gas [1]. Another difference of heating systems using biomass in comparison with conventional combustion systems is their requirement for regular cleaning of the accumulated ash. Usually, the fuel used by these systems are some form of wood, e.g. firewood from logging, olive branches, wood pellets, etc., but in some cases, other types of biomass is also used, e.g. olive stones, peach kernels.

Heating systems using biomass in the residential sector can be divided into non-continuous feed (batch), e.g. heating with firewood, and continuous feed, e.g. heating with pellets, systems. Keeping a controlled heat output rate while using the highest possible amount of heat released from combustion is one of the main design issues in a non-continuous feed system. Typically, control of the heat rate is performed by reducing the primary air. As this leads to considerable emissions of unburnt compounds, the use of an efficiently designed secondary air supply system is required, to increase burnout efficiency. Alternatively, control of heat output rate is performed through the use of systems which store heat in an intermediate medium, from where it is recovered and released in the heated place.

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3. Overview – combustion principles

3.1. Staged combustion

Combustion technology for biomass appliances is based on staged combustion in order to enable maximum burnout rates. The staging of biomass combustion which takes place in the primary and secondary combustion zones is presented in Figure 1.

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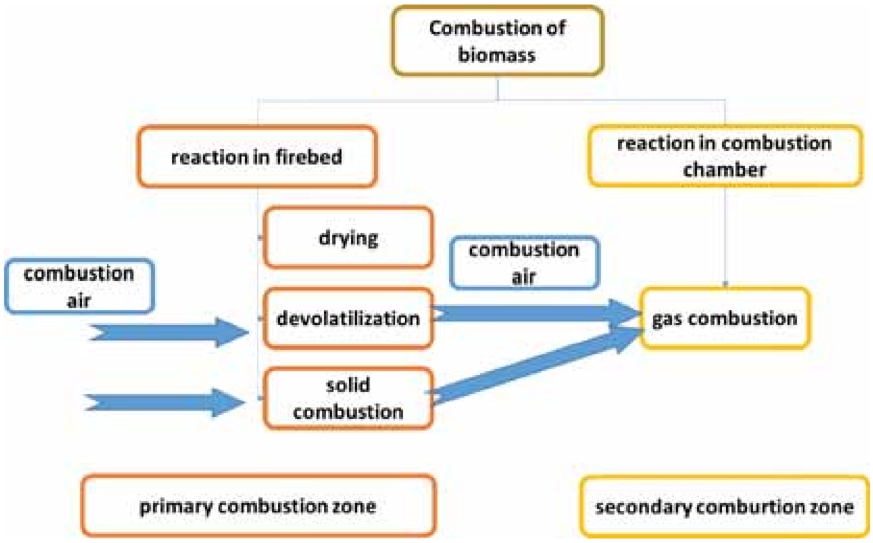

Figure 1 primary and secondary combustion zone in biomass combustion [2]

In the primary combustion zone, drying of the fuel occurs first which is removal of moisture by absorbing heat from within the combustion chamber. Devolatilization follows, in which the volatile gases are released from the solid fuel and proceed to the secondary combustion zone. Finally, the remaining solid charcoal is burnt in the fire bed. Primary air is needed for devolatilization and solid combustion.

In the secondary combustion zone, secondary air is used for the combustion of volatile gases from devolatilization and the gases produced from incomplete combustion. In order to achieve low emissions, the reaction in the secondary combustion zone must be as complete as possible [2].

3.2. Manual stoking

Furnaces (for both boilers and stoves) which burn wood logs from 0.25 up to 1 m in length are manually stoked. Manually stoked furnaces can also work with briquettes as well as with coarse wood chips. There are different configurations of those furnaces, but they are divided in three common, basic categories according to the airflow of the primary air: top burning, through burning and under burning furnace. These designs are illustrated in Figure 2. Numerous combinations and modifications of these three principles are available.

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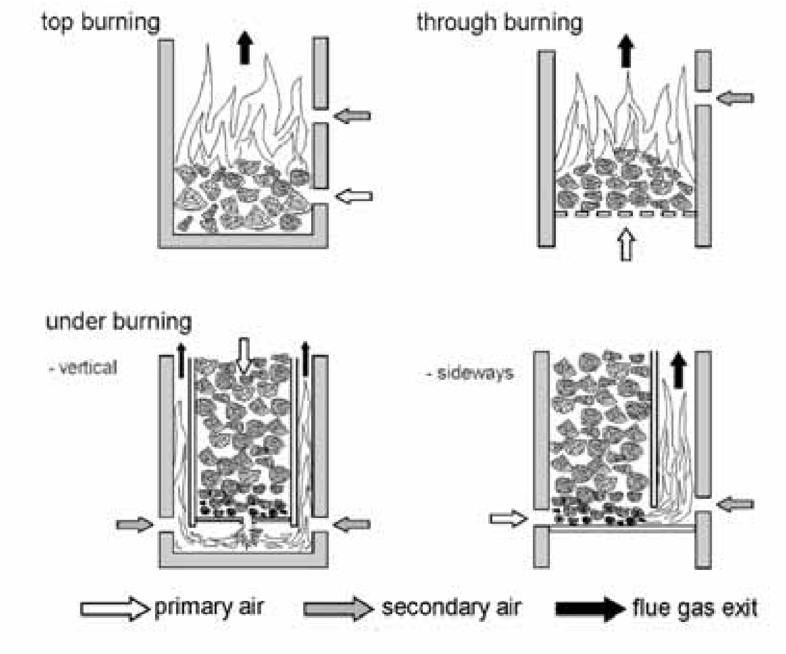

Figure 2 Classification of log wood combustion principles [3]

Through-burning systems are not used for boilers and cannot be consider as state-of the art anymore for them. They are mainly used in stoves fed with small batches of log wood. In through-burning systems the primary air is fed in the combustion chamber from below, through a grate. The wood logs which are stacked on the grate are ignited at the bottom of the batch, initiating the combustion.

In **top burning systems**, the primary air enters the combustion zone sideways. The stack is ignited at the top or in the middle and the combustion reactions are slower than those in through-burning systems. The combustion process is nevertheless discontinuous. This combustion system is suitable for small or medium batches of log wood.

Both combustion systems, through and top-burning, are usually operated with natural draught, meaning that no auxiliary ventilation devices are needed.

Under-burning systems are the latest development in log wood combustion technologies. This principle is a state-of-the-art technology for log wood boilers. The fuel is ignited at the bottom and the combustion gases are led downwards or sideways, resulting in a relatively continuous combustion process. The continuous combustion process and separation of the primary and secondary combustion zones result in very low emissions; a fan is however necessary to ensure proper operation. This fan is usually placed at the flue gas exit of the furnace [2].

3.3. Automated stoking

The development of small-scale pellet burners has taken place to a great extent in Sweden and Austria. Existing combustion technologies for wood chips have been adopted for pellet combustion, and also a new principle has been developed for pellet combustion in small-scale pellet units. Pellet burners are classified into three main types, according to the feed direction of the pellets: top feed, underfeed and horizontal feed [5].

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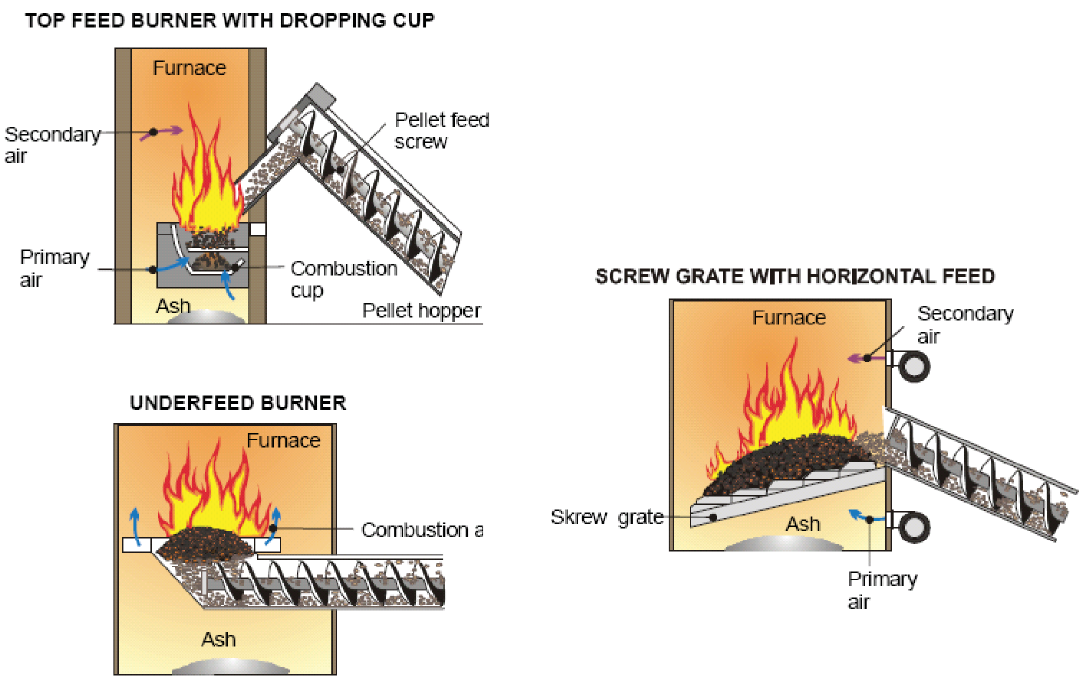

Figure 3: Classification of pellet combustion principles [5]

In **underfeed burners** also called **bottom feed burners** (Figure 4), the wood pellets are loaded into the bottom of the combustion chamber via a discharge auger (screw conveyor). The primary combustion air is introduced via a ring-shaped grate. The secondary combustion of the volatiles produced in the primary combustion zone takes place in the heatproof combustion chamber of the boiler, using secondary air introduced through holes or tubes. The hot flue gases are routed through water filled heat exchanger to deliver their heat to the circulating water. These burners are best suited for fuels with low ash content (wood pellets, wood chips).

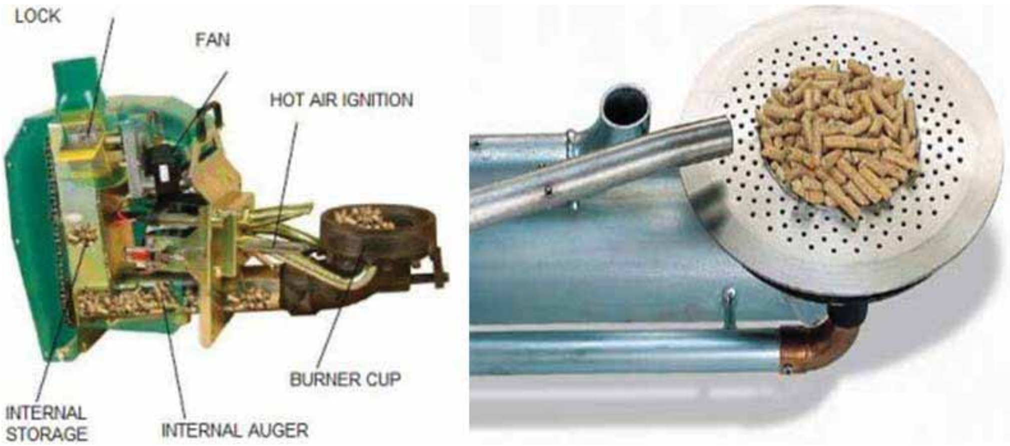

Figure 4: The bottom feed pellet burner (Source: http://www.okofen.at)

Technical advantage: It is easy to determine the pellet level in the burner pot. Burn out material (ashes and drying pellets) automatically fall into the underneath ash pan, therefore, ash does not block air-pellet mixing, leading to high combustion efficiency.

Technical disadvantage: There is a risk of burn-back into the hopper, as burning pellets are in contact with the

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pellet supply screw filled with pellets. It is also possible for an inhomogeneous fire bed to form, allowing the pellets to end up in the ash pan without being completely burned.

In **top feed burners** (Figure 5) pellets are fed on the top of the combustion chamber by gravity. Top feed burners have been specifically developed for pellet combustion in small-scale units. The pellets fall through a shaft onto the fire bed, consisting of either a grate or a retort. Combustion air is supplied directly into the burner pot. The ash is removed manually or mechanically by a dumping grate. This feeding system allows very accurate feeding of pellets according to the current power demand and is thus often used in furnaces with very small nominal heat flows.

Technical advantage: There is significantly less risk of burn-back fire into the hopper as the pellet conveyor system is not in direct contact with fire zone. The proper distance between the combustion retort and the feeding system prevents early ignition of pellets in the feeding system [6]

Technical disadvantage: As the pellets are being loaded on the top of burning pellets, degree of turbulence created up on the combustion bed (by the gravity fall of pellets) is comparatively high.

Figure 5: The top feed pellet burner (source: www.viessmann.de)

In **horizontal feed burners** (Figure 6) the combustion chamber is either fitted with a grate or a pusher plate. The fuel is introduced horizontally into the combustion chamber. During combustion, the fuel is moved or pushed horizontally from the feeding zone to the other side of the pusher plate or the grate. Drying, devolatilization and solid combustion of the fuel take place on the grate and following, the remaining ash drops through the grate into an ash container. Horizontal feed burners can burn wood chips and pellets. Purpose-built horizontal feed systems (with moving grate, and water cooling) are fitted for the use of bark, straw or grain as well. Primary combustion air is fed underneath the pellet bed and secondary combustion air via a ring or pine into the combustion zone.

Technical advantage: This kind of burners develops a little afterheat and therefore, responds quickly when changes are made to the control settings.

Technical disadvantage: As the wood pellets come in contact with the fire zone, there is a risk of burn-back fire into the hopper.

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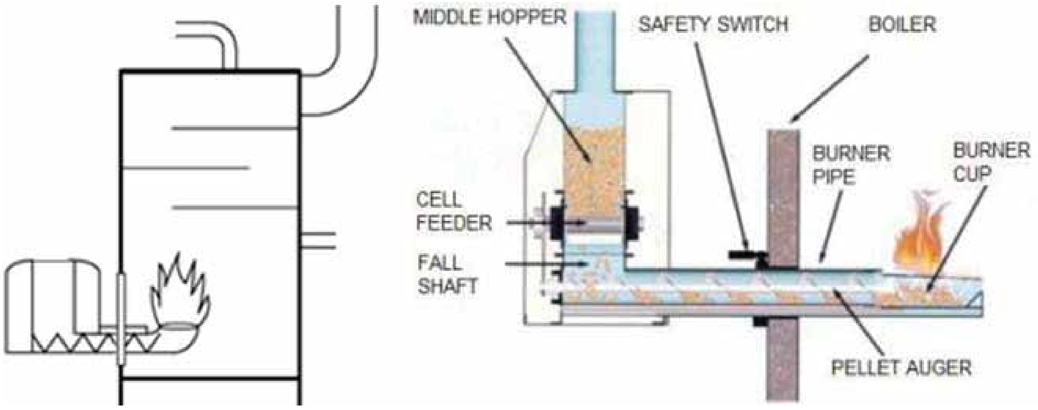

Figure 6: The horizontal feed pellet burner

Pellet burner systems are always operated with a forced draught. The fan can be placed either at the combustion air inlet or at the flue gas exit of the furnace [2].

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4. Types of combustion systems

4.1. Stoves

Stoves are heaters suitable for heating the room in which they are placed, without using pipelines. Heat transfer takes place in the area with both radiation and convection and the relative importance of each of these heat transfer methods changes, depending on the type of stove. The furnace and the walls are constructed or coated with fireproof materials, and removal of ash is performed either through an ash chamber below the combustion grate or directly from the furnace where there is no grate. The combustion control is performed mainly by adjusting the primary air, but an appropriate design of the secondary air system is required to ensure the highest possible efficiency. Most stoves include a glass window at the front of the furnace, which is used both for aesthetic reasons and for the optical monitoring and control of combustion by the user.

4.1.1. Wood stoves

The classification of the stoves according to the air flow in the combustion chamber is shown in Figure 7. In general, woodstoves are classified in one of the following four categories, although there are numerous modifications and changes from model to model:

- Up-draught (or underfire air): the supply of primary air is carried out either from below the combustion grate or the wood placement level (where there is no grate or it is blocked from the produced ash). The wood is pyrolysed during the upflow of the primary air and the exhaust gases are led to the top of the combustion chamber where the secondary air is introduced. The system is often used in simple structures, but the introduction of the cold secondary air may not effectively contribute to the complete combustion.
- Down-draught: the supply of primary air is from the top of the furnace and the flow direction is towards the bottom, passing through the woods and grate. The advantage of this method is that it carries the gases of pyrolysis in the primary combustion zone, which, in conjunction with the secondary air stream, reinfores the complete combustion.
- Cross-draught: the primary air flow is inserted solely at the wood placement level, entering from one side and exiting from the other. The pyrolysis gases are thereby not released directly into the primary air stream, but in an area above the fuel wood. In this way, their output directly to the chimney is avoided, as only those gases are exiting which have passed both through the primary combustion area and the secondary combustion area where the supply of secondary air is inserted.
- S-flow or dual-zone stove: the supply of primary air takes place in the wood placement level, while the pyrolysis gases leave the primary burning zone from the same side. This flow configuration is ensured by placing an appropriate surface over the firewood which forms a separate secondary combustion region. The dual-zone configuration allows the slow burning of wood, while the efficient combustion is both ensured by the better mixing caused by the surface and by supplying of secondary air.

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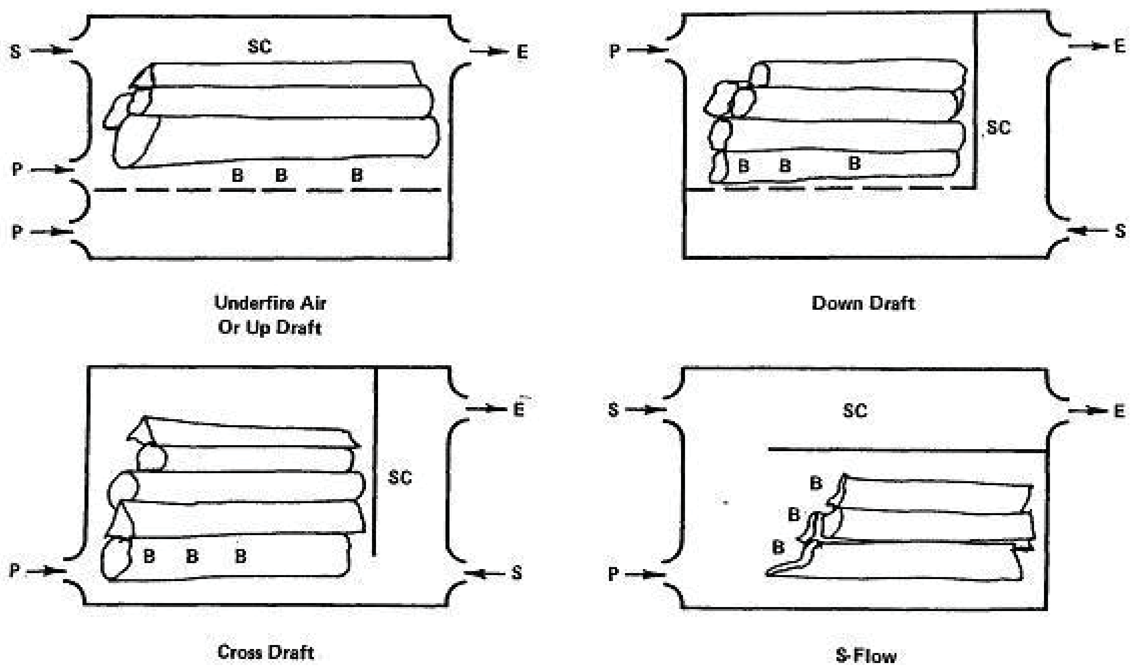

Figure 7: Combustion system in wood stoves. P: Primary air of combustion, S: Secondary air, E: Flue gas Emission, B: Primary Burning zone, SC: Secondary combustion zone [7].

One of the difficulties in achieving a high efficiency is that ignition of smoke can be carried out at temperatures of 540 ^{o}C or higher, which is difficult to achieve outside the primary combustion zone. For this reason, several stoves use ceramic cell catalysts coated with noble metals (usually platinum, rhodium or palladium, or combinations of these) or metal oxides which can reduce the ignition temperature to around 260 ^{o}C. The lifetime of such a catalyst can reach up to six years, provided that proper maintenance is carried out and burning of inappropriate fuel is avoided. Burning of garbage can reduce the time of the catalyst life in two years or less. Figure 8 shows catalytic stove design.

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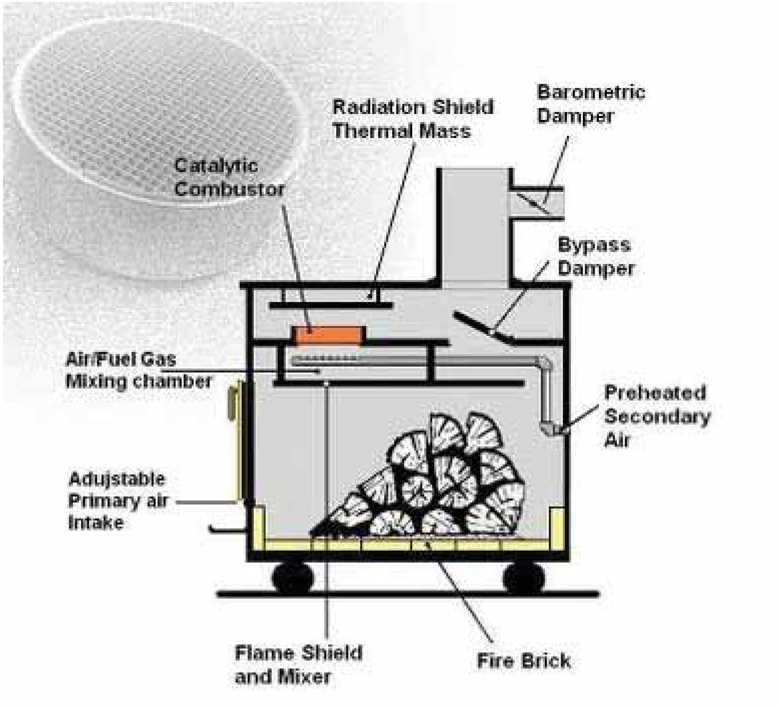

Figure 8: Catalytic stove design. [8]

Similar to the autonomous woodstoves are the energy fireplaces which are essentially a wood stove installed in an existing fireplace or a wood stove walled to give the impression of a fireplace. These systems achieve efficient heating relative to the open fireplaces. Another type of stove, especially popular in Northern Europe, are the heavy stone structures with the capability of heat storage. The heating of wood is carried out at fast rate and exhaust gas is led to the top of the combustion chamber from where it is led downstream to side pipelines. The heat of the exhaust gas is transferred to the mass of the stone, from which it is released at a constant rate as radiation. Simultaneously, the heated room air moves upward in the opposite direction to that of the exhaust gas. These structures are typically lit once or twice a day and, due to the large mass of stone still give heat to the room for a long time after the flame has gone out. A fairly common material for the construction of walls is steatite, characterized by a high heat capacity and heat resistance. Figure 7 shows the operating principle of these systems.

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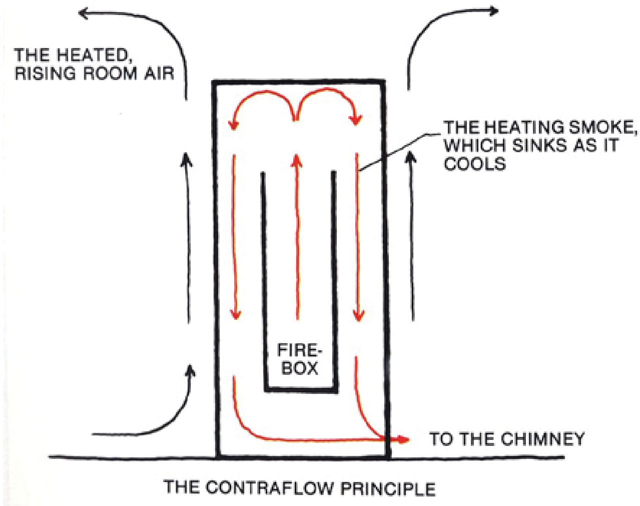

(1)

(2)

Figure 9 Stone-built wood stoves with heat storage. (1): Operating principle of air/smoke counterflow (Source: Maine Wood Heat Co., Inc), (2): Modern woodstove with walls of steatite (Source: NunnaUuni Oy).

4.1.2. Pellet stoves

The operation of a stove with pellets is shown in Figure 10. The main components of such a system are [9]:

- The fuel storage hopper, which is built on top of the stove. The feed is manual, usually by directly emptying the bag of pellets. Typically, the hopper can store about 10 - 25 kg, enough fuel for one or two days of autonomous operation.
- The supply duct for transferring the pellets from the hopper to the burner.
- The burner, the basic construction of which is a flat plate for the combustion of small quantities of pellets. As mentioned above, the feeding of pellets may be done either under the plate (underfed), either horizontally or dropping from above (overfed). The feeding system with drop of pellets provides increased fire protection, as it separates the storage hopper from the flame, and precise control of the quantity fed, but disturbs the flame and leads to an increase of unburnt particles emission and ash. The plate temperature usually is around 150 oC.
- The combustion chamber, which extends about 45 cm above the burner. The shape of the combustion chamber varies from simple and inefficient boxes to cylindrical structures connected with cold air inlets and hot air ducts or even connections with heat exchange surfaces. In order to ensure good fuel combustion, the temperature in the combustion chamber should be between 800 - 1000 ° C. The materials may be silicon carbide, stainless steel or firebricks.
- The ignition system, manual or automatic (electric).
- The primary air supply system, which injects air from the room to the burner. Although the simplest models use the natural flow of air, most of the devices regulate the supply of air with a fan. The air separation into primary and secondary allows better control of combustion and reduced emissions.
- The pipe for hot air output and exit from the combustion chamber. If the stove is connected to the boiler, the

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pipeline passes through heat exchangers before finally brought to a nozzle on top of the boiler from where it is released in the room using a fan.

- The pipe for the removal of exhaust gas and the transfer to the chimney. The gas is drawn out by a fan, which may be identical to that used for the supply of primary air.
- The ash storage space, which is located below the pellet combustion plate. The cleaning is usually necessary every two to four weeks, unless an ash compaction systems has been installed which allows longer periods without cleaning.
- The fireproof glass window in the front of the boiler which is used mainly for aesthetic reasons but also allows visual inspection of combustion.

The automation systems in pellet stoves vary depending on the manufacturer and the cost. The most common is an on / off switch as well as some kind of thermostatic control to regulate the fuel and air supply on the basis of default settings. Some models are connected to a hot water system via integrated boiler, which uses 40-80% of the available heat.

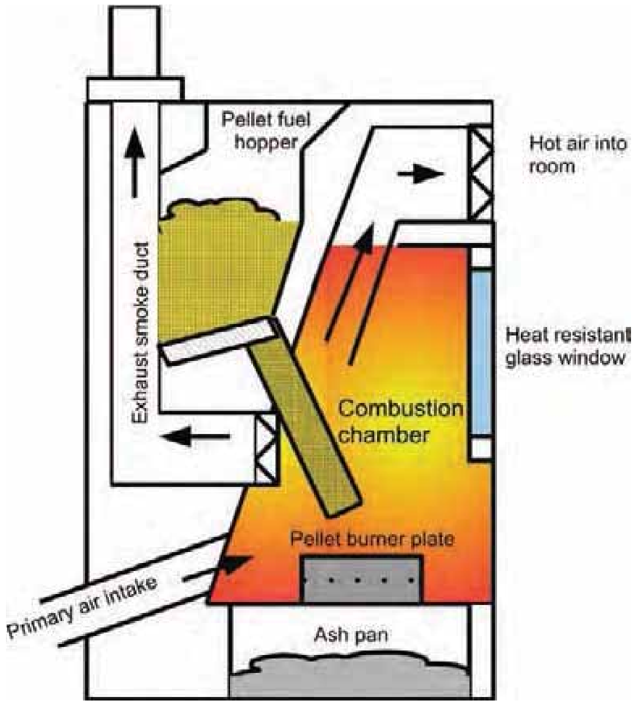

Figure 10: Diagram of pellet stove typical operation [9]

4.2. Boilers

4.2.1. Firewood Boilers

There are three available technologies for boilers with firewood: the over-fire, under-fire and down-draught systems [1], which are shown in Figure 11.

The **over-fire system** is the most simple and cheap technology: combustion occurs simultaneously throughout the fuel. The primary air is introduced by natural flow from the bottom of the furnace from where the ash is removed as well, while from the upper part firewood is supplied and secondary air enters. These systems can be installed

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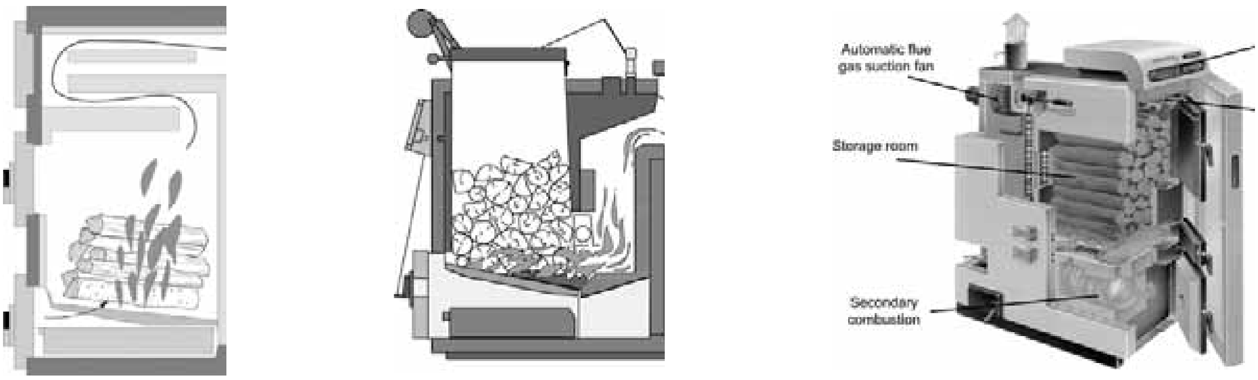
outdoors and are often used for heating farm buildings. At low loads their emissions are particularly high and for this reason their installation is or tends to be abandoned in many countries.

The **under-fire systems** include two combustion chambers: in the first the gasification and partial combustion of biomass takes place, while in the second the combustion of produced gas is completed. These systems can be used for firewood and chips and can achieve more stable combustion conditions, which results in lower emission levels compared to the over-fire systems. However, the investment cost is about 50% larger.

The **down-draught boilers** also have a second combustion chamber which is below the main. Because the resistance to the flow of flue gases is high, the use of a fan for air or flue gases is required. The fan allows precise distribution of the primary and secondary air in the combustion chambers. Such boilers allow very precise control of combustion by using appropriate sensors, but their installation cost is much larger than the other two cases.

In many European countries it is common practice to connect the boiler using firewood with a water tank of a 1 to 5 m^3 capacity which acts as an intermediate heat storage. The use of these tanks allows to optimize the operation of the boiler, at least at the nominal load. For efficient use of the tanks, correct dimensioning and proper insulation is required. The connection with solar panels can help significantly to save fuel.



(1) (2) (3)

Figure 11: Combustion systems in firewood boilers: (1) Over-fire system, (2) Under-fire system, (3) Down-draught system. [1].

4.2.2. Pellet Boilers

Developing of stove models using wood pellets began in the 80s in the Nordic Countries and the US, although a particular growth especially in the last decade was presented. At the same time, in the 90s the first pellet burners were developed for use in central heating boilers. The pellet burners can be used in in existing boilers, replacing oil burners and thus reduce the payback time. Generally, interest in heating systems with pellets increases with increasing prices of fossil fuels. Those systems also present significant advantages compared to conventional combustion systems with biomass, such as reduced emissions, and use of a clean and easy to use and store fuel. The main disadvantages are the requirement for use of electricity for fan operation and, in some cases, for the pellet feed systems and the increased cost of fuel compared to firewood.

An important difference with the intermittent biomass combustion systems, is that the use of pellets allows continuous feed of the fuel, making it possible to control the combustion by adjusting the supply of the fuel rather than by the reduction of the primary air. The fuel supply is performed using a screw, while the combustion air is supplied by an electric fan. The control of operation is performed using thermostats and the ignition of combustion with a spark or a pilot light. Many pellet systems implicate automations, such as ash compaction or

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automatic removal of ash, which aim to limit the maintenance required.

A well designed heating system with pellets can achieve efficiencies of 80% and above. The performance decreases for operation at partial or variable load, while operation with high excess air can drop performance at 50-60%. However, improvement of combustion generally results in increased NOx emissions, the control of which requires proper design of combustion chamber and secondary air system. The control of combustion is usually performed with lambda sensors which designate a constant value of oxygen in the exhaust gas for which the efficiency and the CO concentration in the exhaust gases obtain the optimal values. Apart from the burner geometry, the optimum value of the sensor also depends on the fuel moisture and the operating load, so it is sensitive to changes in these parameters [10].

The pellet burners for domestic heating usually have a capacity of less than 25 kWth. The replacement of an existing oil burner with a pellet burner is possible, provided that the latter is suitable for use with the respective boiler. Generally, the contact of the flame with cold surfaces must be avoided, as the formation of smoke and unburned particles is intensified and the efficiency of the boiler is decreased. Also, as the amount of exhaust gases produced by burning pellets is higher compared to that of a corresponding amount of oil, the installed thermal power of the pellet burner should be lower than that of the oil burner, otherwise the flue gas residence time may not be sufficient for adequate reduction of its temperature and for complete combustion within the furnace. Depending on the feeding system, the burners are divided into those with a vertical development of the flame (overfed and underfed burners) and those with horizontal development of the flame (horizontal burners) .The feeding of the pellets can be performed by a small storage compartment built in to the burner, suitable for one or two days of autonomous operation, which is filled manually or by an automated system connected to a larger storage space. The use of safety systems to prevent flame transmission in the pellet storage space is required on all burner systems and stoves using pellets. Figure 12 shows such an automated feeding system.

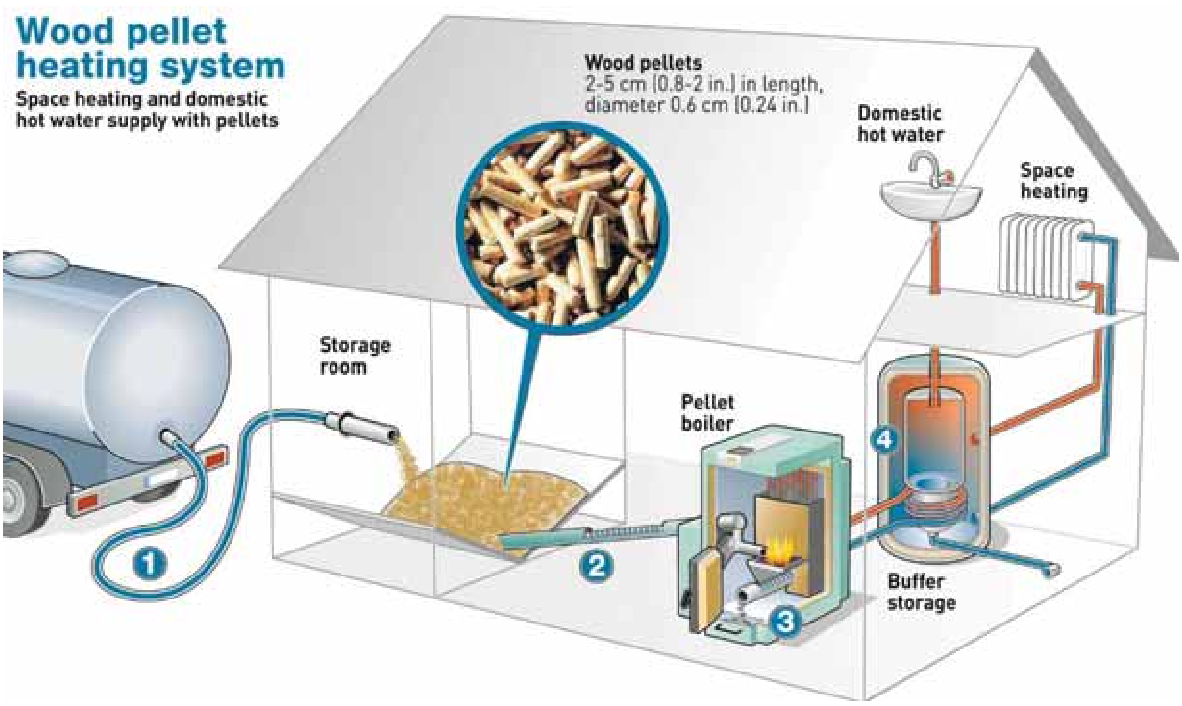

Figure 12: Automated system of residential heating with pellets. (1) Feeding of pellets by a truck directly into storage room, (2)

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automated feeding system to the burner, (3) ash collection point, (4) hot water buffer storage tank (source: German Renewable Energies Agency)

4.2.3. Wood chip boilers

For wood chip furnaces, underfeed burners and horizontal feed burners with or without a grate are fairly common in various designs. Nominal power capacity range for wood chip furnaces is from 14 kW up to over 20 MW.

Concerning small scale systems, the advantages of wood chip boilers over log wood boilers include automatic operation and low emissions due to continuous combustion. On the other hand, more investment in machinery and storage space is required for producing, storing and, if necessary, drying wood chips compared to the case of log wood. In comparison to pellets, wood chips are less expensive and can be produced on site. Wood chip furnaces are often approved for wood pellets as well; specially designed pellet boilers can however not be fired with wood chips [2].

Figure 13 shows an example of an underfeed burner for wood chips and pellets. The principle of a horizontal stoker burner is shown in Figure 14.

Figure 13 Underfeed burner for wood chips and pellets [11]

Figure 14 Horizontal feed burner for wood chips, pellets and grain [12]

5. European standards and legislation on biomass heating systems for the domestic sector

5.1. The EN 303-5 standard for biomass boilers

The EN 303-5:2012 standard specifies requirements and test methods for safety, combustion quality, functional characteristics, labeling and maintenance of central heating boilers with solid fuels (including solid biofuels) with

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maximum nominal thermal power up to 500 kW. Local heating installations, such as fireplaces or stoves, are not included in the scope of the EN 303-5:2012. One of the fundamental objectives of the standard is to ensure that the combustion of biomass boilers leads to low emissions of pollutants. The standard provides a procedure of "type examination", whereby the efficiency and emissions of a boiler is measured at nominal power operation. Depending on the results of this examination, the boiler is classified in Class 3, 4 or 5 according to the order of increased efficiency and reduced emissions. The type examination must take place in a suitable accredited entity, which issues a Type Examination Certificate. Emission limit values according to EN 303-5 standard, for class 3, 4 and 5 are presented in the following tables, Table 1, Table 2 and Table 3 accordingly.

Table 1: Emission limit values according to EN 303-5 standard, class 3

Feeding Method	Nominal Power, Qn (kW)	Emission limits (mg/m³ at a 10% oxygen concentration)			Efficiency (%)
		CO	OGC[1]	Particle matter (PM)	
Manual	<50	5000	150	150	Q<300kW: $\eta_k \geq 67+6 \log Q$ [%] Q>300kW: $\eta_k \geq 82$ [%]
	50-150	2500	100		
	150-500	1200	100		
Automated	<50	3000	100		
	50-150	2500	80		
	150-500	1200	80		

[1]Total Organic Gaseous Carbon

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Table 2: Emission limit values according to EN 303-5 standard, class 4

Feeding Method	Nominal Power, Qn (kW)	Emission limits (mg/m³ at a 10% oxygen concentration)			Efficiency (%)
		CO	OGC[1]	Particle matter (PM)	
Manual	<50	1200	50	75	Q<100kW: $\eta_k \geq 80+2 \log Q$ [%] Q>100kW: $\eta_k \geq 84$ [%]
	50-150				
	150-500				
Automated	<50	1000	30	60	
	50-150				
	150-500				

[1]Total Organic Gaseous Carbon

Table 3: Emission limit values according to EN 303-5 standard, class 5

Feeding Method	Nominal Power, Qn (kW)	Emission limits (mg/m³ at a 10% oxygen concentration)			Efficiency (%)
		CO	OGC[1]	Particle matter (PM)	
Manual	<50	700	30	60	Q<100kW: $\eta_k \geq 87+ \log Q$ [%] Q>100kW: $\eta_k \geq 89$ [%]
	50-150				
	150-500				
Automated	<50	500	20	40	
	50-150				
	150-500				

[1]Total Organic Gaseous Carbon

Oxygen Concentration rate can be easily converted from 10% to 13% buy using the conversion factor 0,727.

According to the standard, each heating boiler should carry a special identification plate (in the language of the boiler destination country), which will contain at least the following information:

- Manufacturer's data (name, address, logo)
- Commercial product name
- Production number and year of manufacture

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- Nominal heat output and power range (in kW) for each fuel type
- Class of the boiler for each fuel tested under the examination procedures
- Maximum permissible operating pressure (in bar)
- Maximum permissible operating temperature (in ° C).
- Water Capacity of the boiler (in liters)
- Electrical data (voltage, frequency, amperage) and power
- The type of fuel, e.g. according to EN 14961

5.2. EN standards for biomass stoves

EN 13240:2001 +a2:2004 “Roomheaters fired by solid fuel - Requirements and test methods” (Incorporating corrigenda September 2003, June 2006 and August 2007) is the main European Standard for room-heating solid fuel stoves, with or without boilers, including those which can be operated with the door open. It covers freestanding appliances and inset (built into the wall) ones only where they can be installed without special modification of their setting. Other types of inset heater are covered by EN 13229. It is not applicable to appliances with fan assisted combustion air.

Among other provisions, it lays down that stoves must be [13]:

- Soundly constructed
- Have means of cleaning their internal flueways
- Be provided with a glove or tool for handling hot surfaces
- When operated according to the manufacturer's instructions, have an Efficiency of at least 50% and CO emission <1%
- Need refuelling no more than every 45 mins. on wood, 1 hour on mineral fuels (intermittent use)
- Be capable of burning unattended for 10 hours on wood, 12 hrs on mineral fuel (if for continuous use)
- Be marked with a label showing the maker's name or mark and the model, plus the following performance data:
    - output to space and to water
    - CO emission at 13% oxygen
    - maximum water operating pressure (if applicable)
    - minimum clearance distances from combustible materials, in mm
    - whether or not for use in a shared flue;
    - whether for continuous or intermittent operation.

EN 14785:2006 “Residential space heating appliances fired by wood pellets - Requirements and test methods” is

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the European Standard for room-heating solid fuel stoves, with or without boilers which burn compressed wood pellets. Among other provisions, EN 14785:2006 lays down that pellet stoves must be [13]:

- Soundly constructed
- Have means of cleaning their internal flueways
- Be provided with a glove or tool for handling hot surfaces
- When operated according to the manufacturer's instructions, have an Efficiency of at least 75% at nominal output
- Have CO emission <0.04% at nominal heat output
- Need refueling no more than every 3 hrs at nominal output, or 6 hrs at reduced output.

5.3. The Ecodesign Directive

The European Union's **Ecodesign Directive (Directive 2009/125/EC)** establishes a framework to set mandatory ecological requirements for energy-using and energy-related products sold in all 28 Member States. The EU Ecodesign Directive covers all energy-related products sold in the domestic, commercial and industrial sectors, with the exception of all means of transport, which are covered by other legislation.

The Ecodesign Directive sets only the frame; specific implementing measures for a particular product group (“Lot”) are elaborated in a subsequent process. The specific Regulations for the Ecodesign requirements for Lot 15 (biomass boilers) and Lot 20 (solid fuel space heaters) were adopted by the Commission in April 2015 and are presented in the following paragraphs.

5.3.1. Ecodesign requirements for solid fuel boilers

COMMISSION REGULATION (EU) 2015/1189 of 28 April 2015 implemented Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel boilers.

Without prejudice to Directive 2010/75/EU of the European Parliament and of the Council, this Regulation establishes Ecodesign requirements for placing on the market and putting into service solid fuel boilers with a rated heat output of up to 500 kW. **Its fulfilment will be compulsory by the 1st of January of 2020**. The requirements to be met from that date on will be based on class 5 of the EN 303-5 standard and are presented in the following table.

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Table 4: Emission limit values and efficiencies for biomass boilers according to EU Ecodesign regulations

Feeding Method	Nominal heat output (kW)	Energy Efficiency (%)	Emission limits (mg/m³ at a 10% oxygen concentration)			
			CO	Organic gaseous compounds (OGC)	Particle matter (PM)	NOx
Manual	≤20	≥75	700	30	60	200 for biomass boilers 350 for fossil fuel boilers
	>20	≥77				
Automated	≤20	≥75	500	20	40	
	>20	≥77				

The Regulation for solid fuel boilers shall not apply to:

(a) boilers generating heat exclusively for providing hot drinking or sanitary water;

(b) boilers for heating and distributing gaseous heat transfer media such as vapour or air;

(c) solid fuel cogeneration boilers with a maximum electrical capacity of 50 kW or more;

(d) non-woody biomass boilers.

5.3.2. Ecodesign requirements for solid fuel local space heaters

COMMISSION REGULATION (EU) 2015/1185 of 24 April 2015 implemented Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for solid fuel local space heaters. Four equipment types are recognised: stoves, stoves using pellets, cookers and open equipment.

This Regulation establishes ecodesign requirements for the placing on the market and for putting into service of solid fuel local space heaters with a nominal heat output of up to 50 kW. **Its fulfilment will be compulsory by the 1st of January of 2022**. The emission and efficiency requirements are presented in the following table.

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Table 5: Emission limit values and energy efficiency for stoves according to EU Ecodesign regulations

Type of space heater		Energy Efficiency (%)	Emission limits (mg/m^3 at a 13% oxygen concentration)					
			CO	Organic gaseous compounds (OGC)	Particle matter (PM)[i]			NOx
					1 mg/m^3	2 g/kg (dry matter)	3 g/kg (dry matter)	
open fronted		≥30	2000	120	50	6	-	200 using biomass 300 using fossil solid fuel
closed fronted	For pellet fuel	≥79	300	60	20	2.5	1.2	
	For non-pellet fuel	≥65	1500	120	40	5	2.4 using biomass 5 using fossil solid fuel	
cookers		≥65	1500	120	40	5	2.4 using biomass 5 using fossil solid fuel	

[(i)]Three methods are allowed for measuring PM emissions, each with its own requirements, only one of the methods needs to be used:

(1) PM measurement by sampling a partial dry flue gas sample over a heated filter. PM measurement as measured in the combustion products of the appliance shall be carried out while the product is providing its nominal output and if appropriate at part load;

(2) PM measurement by sampling, over the full burn cycle, a partial flue gas sample, using natural draft, from a diluted flue gas using a full flow dilution tunnel and a filter at ambient temperature;

(3) PM measurement by sampling, over a 30-minute period, a partial flue gas sample, using a fixed flue draft at 12 Pa, from a diluted flue gas using a full flow

The Regulation for solid fuel local space heaters does not apply to:

(a) solid fuel local space heaters that are specified for the combustion of non-woody biomass only;

(b) solid fuel local space heaters that are specified for outdoor use only;

(c) solid fuel local space heaters of which the direct heat output is less than 6 % of the combined direct and indirect heat output at nominal heat output;

(d) solid fuel local space heaters that are not factory assembled, or are not provided as prefabricated components or parts by a single manufacturer which are to be assembled on site.

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(e) air heating products;

(f) sauna stoves.

6. Country report: Greece

6.1. National legislation on biomass heating systems for the domestic sector

Till November 2011, a long-time ban on biomass combustion for central heating in the urban centers of Greece was in effect. The situation changed with the issuing of the **Ministerial Decree 189533/7.11.2011: "Regulation of issues relating to the operation of stationary furnaces for heating of buildings and water" (Government Gazette B΄ 2654/9.11.2011)**. The Ministerial Degree is applicable to central heating installations for the residential sector, the service sector and the industry (for space heating only) and for hot water/steam production in the service industry. It provides a list of allowable fuels: heating and/or vehicle diesel, gaseous fuels and solid biomass fuels according to EN 14961-1 (heavy fuel oil will be gradually phased out for heating applications).

According to the Ministerial Decree, boilers using solid biofuels in Greece should meet at least the requirements for the efficiency and emissions of Class 3 of ELOT EN 303-5 standard. The limits are shown in Table 1. The Decree also sets an additional limit for NOx emissions which should be no more than 340 mg/m^3 at a 10% oxygen concentration.

Regarding the type of allowed solid biofuels, the Ministerial Decree of 2011 practically allows all solid biomass fuels that can be found in the market. Some further specifications were put in effect by **Ministerial Decree 198/2013 "Solid Biomass Fuels for non-industrial use – requirements and test methods" (Government Gazette B' 2499/04.10.2013)**. Essentially, the fuel specifications and quality assurance requirements (including the Product Declaration) of the applicable EU standards, EN 14961 (parts 1 to 6) and EN 15234 (parts 1 to 6) apply in Greece. An additional requirement is that non-woody biomass pellets, olive stones and olive cake should have an oil content that does not exceed 2% wt on a dry basis.

6.2. Biomass use and heating systems in the domestic heating sector

The evolution of the energy consumption of the household sector in Greece is illustrated in Figure 15 [14]. There are some clear trends, such as the increase of natural gas use from 2005 and its stabilization since 2011 and the decrease of the use of petroleum and the increase in the use of renewable sources (mostly biomass) and electricity since 2011. The latter effect is mostly due to the large increase in the heating oil taxation since 2011, which has led consumers to search for alternative heating solutions for their households, including biomass heating systems and air conditioning units.

The latest detailed survey regarding the energy consumption of the households in Greece has been performed by the Hellenic Statistical Authority and concerns the heating period 2011 – 2012 [15].

According to the survey's findings, the average annual thermal energy consumption for an individual household is 10,244 kWh. 85.9% of this energy is used for space heating, 4.4% for hot water production and 9.7% for cooking. Figure 16 presents the distribution per fuel type of the thermal energy consumption.

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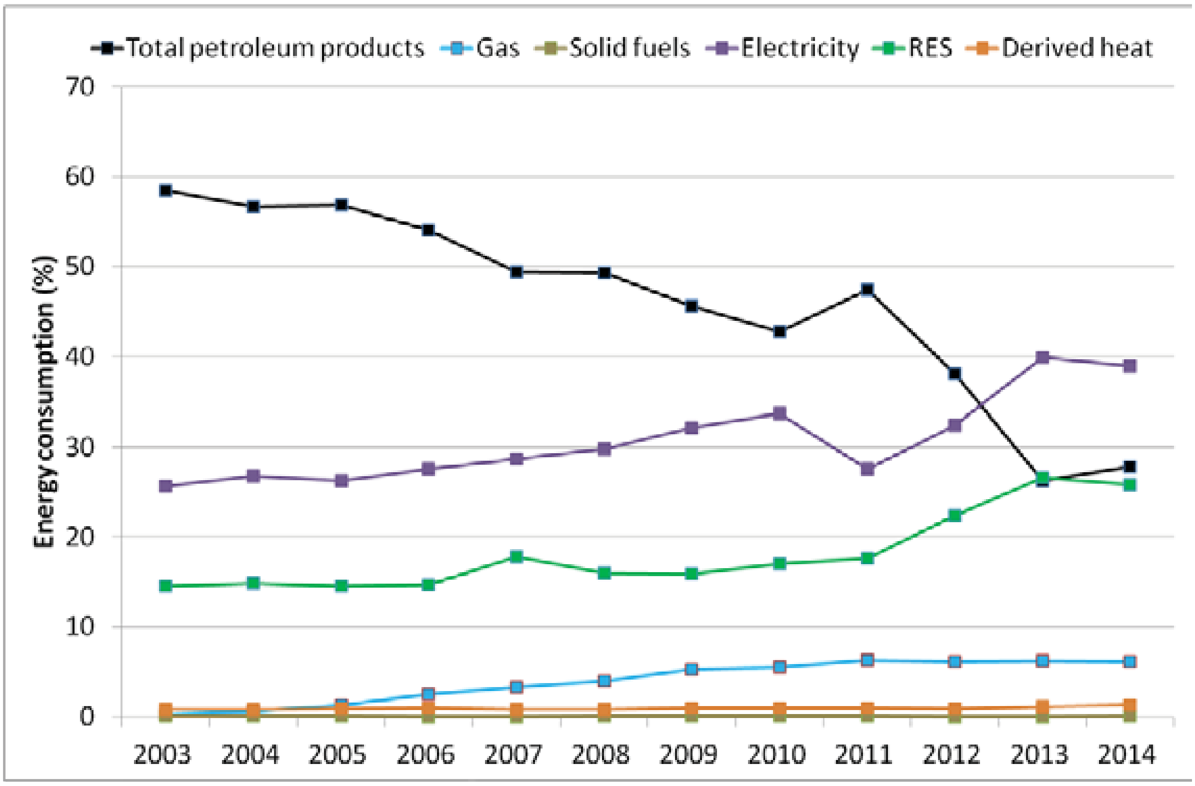

Figure 15: Energy consumption of households in Greece per fuel type, 2003 – 2014 (Source: Eurostat)

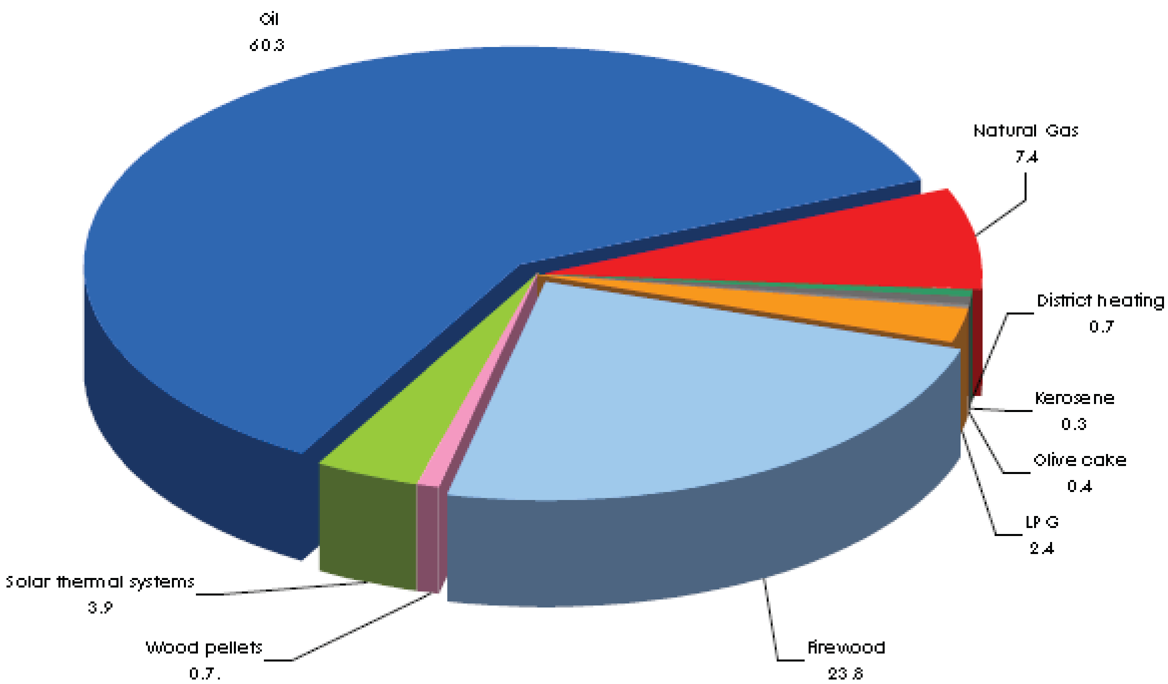

Figure 16: Thermal energy consumption of Greek households per fuel type, 2011 – 2012 (Source: Hellenic Statistical Authority)

Almost all dwellings in Greece (98.9%) have some have some kind of space heating system/equipment. Out of

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these 33.18% use a central heating system with autonomous heating control unit, 17.62% use central heating without autonomy, 48.61% use an independent heating system and 0.59% are connected to district heating networks [16].

The fuel used for the main heating system is:

- 63.8% oil.
- 12.4% electricity.
- 12.0% biomass. Firewood is the most common fuel (95.41%), followed by wood pellets (3.39%), olive cake (2.34%), wood briquettes (0.28%) and others (0.16%) [16].
- 8.7% natural gas.

Boilers are the most common space heating system (71.12%), followed by stoves (11.61%), portable electric heaters (5.20%), air-conditioning split units (5.17%), fireplaces (4.31%) and others (electric thermal storage systems, district heating and heat pumps) [16].

A supplementary heating system – besides the main arrangement – was found to be used by three out of ten households. The most common energy sources for these supplementary systems are electricity (53.29%), mostly in air conditioning split units and portable electric heaters, and biomass (42.37%), mostly in fireplaces [15], [16].

A report from the Centre for Renewable Energy Sources (CRES) puts the total number of installed biomass boilers in the domestic sector (with capacities lower than 60kW) to 30,700 [17].

Table 6: Number of domestic biomass boilers (<60kW) [17]

Type of fuel	Pellets	Woodchips	Other solid fuel	Total
Number of boilers	1,738	1,765	27,193	30,696

Interviews with boiler manufacturers suggest that the main market for biomass boilers in Greece is the single-family houses (with capacities up to 30 kW) one (around 90% of total sales). Multi-family residences generally take up a very small part of the market due to several issues related to the installation of such systems: lack of consensus between owners, space restrictions for boiler installation and biomass storage, difficulties in feeding a large boiler with bags (bulk delivery of pellets is not yet developed in Greece). Larger scale systems for industrial / service sector represent about 10% of sales.

6.3. Support for purchase of biomass heating systems

An estimated number of 3,500,000 residences were built before 1990, when the Thermal Insulation Regulation was put into effect; these buildings lack thermal protection and have high primary energy demands.

Programme “Saving at Home” funded by the National Strategic Reference Framework 2007-2013 (Φ.Β1/Ε2.1/244/6 ,ΦΕΚ Β’ 54, 26.01.2011) was a co-funded program by both the Greek State and the European Union which was in effect until 31.12.2015, that provided incentives for people to improve the energy efficiency of their home, saving money and energy and increasing its value, by making specific and eligible conversions upon inspection by a special energy auditor.

Eligible homes were all houses, apartment buildings and individual apartments that exclusively satisfy the following criteria:

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- They were located in areas with a price zone lower than or equal to 2,100 € / sq.m.
- They were classified under the Energy Performance Certificate (EPC) in a category less than or equal to D.

There was no limit to the number of properties per citizen, while in apartment buildings those of their owners who do not wish to join the program may participate with own funds. Also vacant apartments inhabited within the last three years could be included.

The following incentives were given, according to the personal and family income of each beneficiary:

Table 7: Incentives for energy efficiency improvement measures according to personal and family income

Beneficiaries category	A1	A2	B
Personal Income	≤ 12,000 €	12,000 € - 40,000 €	**40,000 € - 60,000 €**
Family Income	≤ 20,000 €	20,000 € - 60,000 €	**60,000 € - 80,000 €**
Incentive	**70% Grant** **30% Interest-free Loan (interest rate subsidy 100% up to 31.12.2015)**	**35% Grant** **65% Interest-free Loan (interest rate subsidy 100% up to 31.12.2015)**	**15% Grant** **85% Interest-free Loan (interest rate subsidy 100% up to 31.12.2015)**

For inclusion in the program energy audits were required (before and after the intervention), the cost of which was covered 100% by the program after the successful implementation of the project. The target for savings achieved from program interventions was to increase the Class by at least one category or to achieve primary energy savings of at least 30% of the energy consumption of the reference building.

Eligible measures concern:

1. Installing insulation in the building envelope including the roof and the pilotis space (including additional work such as dismantling and disposal, interventions on the roof eg. replacement of tiles, etc.).
2. Replacement of frames and installation of shading systems (incl. building door, stairwell doors, shutters, blinds, awnings, etc.).
3. Upgrading of space heating and domestic hot water heating system (incl. replacement of boiler equipment and the distribution network, installation of solar panels, control systems and heating autonomy systems etc.).

For the implementation of operations permitting was not required, or even approving of minor building work, except for very special cases.

Among the eligible actions is the replacement of an older burner and/or boiler or the installation of a new oil, gas or RES (biomass, heat pumps, solar thermal, etc) heating system. The eligible funding is 6,000 – 11,000 € (including VAT) for central heating systems depending on boiler size and up to 5,000 for wall-mounted boiler/burners. The maximum eligible budget of interventions, including VAT (which is eligible for the program) may not exceed € 15,000 per property [18]. Replacement of an older burner and/or boiler or installation of a new heating system alone is usually not sufficient for upgrading Energy Class of the building by at least one category according to the regulation of energy performance of buildings, or achieving primary energy savings of at least 30% of the energy consumption of the reference building, so these interventions have to be combined with other

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eligible measures as mentioned above.

6.4. Greek manufacturers of biomass heating systems

A market research has been performed on the biomass combustion systems from the manufacturers and suppliers in Greece. The following three main manufacturers have been contacted in order to obtain information about these systems.

Some profile information for each of these manufacturers is presented in the following.

6.4.1. N. Samaras

Boiler manufacturing factory under the name "N.SAMARAS" (http://www.nsamaras.gr/) was founded in 1957 in Athens, in Athinas Avenue by Nicholas John Samaras, for the construction of oil boilers made of steel. “N. SAMARAS” was responsible for the construction of prefabricated oil boilers which were the first and only ones in Greece which could be assembled in the boiler room. This could solve the major issue of access and transportation.

Figure 17: N. SAMARAS facilities (source:N.Samaras SA)

Since 1972, the first biomass burners (for olive pits) were developed, which were installed onto the body of the oil boiler (with convenient vertical paths). With continuous development and much research, soon, the boiler series Π400 for olive pits had become the factory trademark at the suburbs.

Since 1994, N.SAMARAS manufactures exclusively biomass boilers specializing in "special" solid fuels such as pits, agropelletes, cardoon, shells, sawdust, etc.

Today, the company's management is carried out by John Nicholas Samaras, Mechanical Engineer, with his sons, Nicholas and George, Economist and Mechanical Engineer respectively. The company’s headquarters is located in a private area at Markopoulo Attica, in privately owned facilities of 7000 meters.

Figure 18: N. SAMARAS facilities (source:N.Samaras SA)

Finally, since 2009, the N.SAMARAS supports and installs exclusively in Greece the products of leading Austrian manufacturer of biomass boilers Windhager Zentralheizung AG.

With a sales network and dealers throughout Greece, with exports and quality certified according to ISO 9001-2008, the N.SAMARAS company provides the following biomass boilers series [19]:

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- **ΜΙΛΕ Π (MILE P)** for olive pits, olive pit mixes, wood pellets or agropellets or fruit pits of the size of a peach, or manual feed of WOOD, briquettes etc., with 4 model unit categories (Π35, Π50, Π65, Π80) and a range of nominal thermal output power between 40-93 kW,
- **ΜΙΛΕ BIO (MILE BIO)** for wood, olive pits, olive pit mixes, wood pellets, agropellets, almond, peach, shells, with 4 model unit categories (Bio 35,Bio 50, Bio 65, Bio 80) and a range of nominal thermal output power between 40-93 kW
- **ΜΙΛΕ BIO XL (MILE BIO XL)** (nominal thermal output power 132-210 kW) for wood, olive pits, olive pit mixes, wood pellets, agropellets, almond, peach, shells, with 34 model unit categories (Bio XL 110, Bio XL 160, Bio XL 210) and a range of nominal thermal output power between 132-210 kW

More information on those boilers is given in the ANNEX.

6.4.2. Kombi-Thermodynamiki SA.

THERMODYNAMIKI ltd (http://www.kombi.gr/) was founded in 1973 in the northern Greece at the city of Ptolemaida. It has a main interest in industrial production and retail of heating products. In 1977 THEMODYNAMIKI S.A. was created. In the early 1980s the sales network of the company had spread in the whole of the Greek nation. In 1996, the company started an investment in order to modernize its factory equipment. THERMODYNAMIKI has its industrial facilities of 3200 square meters within an area of 4500 sqm.

THERMODYNAMIKI S.A. (kombi) is today actively involved in the heating (hot water and warm air) industry with an ongoing development of new products and services. The company's goal is to research and develop new heating products with the largest efficiency rate possible and the most environmentally friendly operation, develop products with energy efficiency and take advantage of the renewable sources of energy (photovoltaics, solar power, biomass). The current object of expertise is the industrial production and retail of certified central heating products and also the production of specialized metal constructions.

The rising exporting activity of THERMODYNAMIKI is providing to the company the ability to enter in new national markets. The exports are spread in countries of South East Europe (Albania, Bulgaria, Kosovo, Serbia, FYROM, Slovenia, Bosnia Herzegovina, Moldavia, Poland, Romania, Russia), Central Europe (Austria, Germany), South Europe (Cyprus), West Europe (Great Britain and Ireland) and finally in countries outside Europe, Afghanistan, Irak and Palestine.

In all of its operations THERMODYNAMIKI is practicing the quality assurance system ISO 9001:2000 and all the company products are produced by the EU standards EN and CE certified. The products that THERMODYNAMIKI S.A. is manufacturing are:

- Steel solid fuel and oil/gas boilers
- Energy Fireplaces
- Solid fuel warm air generators
- Complete heating units
- Biomass burning steel boilers
- Steel oil tanks

In particular, technical and economic data for the following biomass combustion systems products of the company

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have been provided [20]:

Biomass boilers models of the series:

- **Kombi kn ,** with 9 model unit categories (18/30, 30/50, 50/80, 80/120, 110/165, 160/220, 200/260, 250/320, 300/380) and a range of nominal thermal output power between 18-300 kW
- **Kombi kn –cpb,** with 2 model unit categories (CPB18 and CPB25) and a range of nominal thermal output between 18-25 kW.

More information on those systems is given in the ANNEX.

6.4.3. Thermostahl S.A.

Thermostahl S.A. (http://www.thermostahl.gr/) is a Greek company having its registered offices in Thessaloniki, which constructs steel boilers for central heating since 1962. Since 1985, Dionisios and Christodoulos Matsios share the administration of Thermostahl S.A.

The company owns private facilities in Thessaloniki, Bucharest Romania and Warsaw Poland. The total investments of the facilities rise over 10,000,000 € and have a surface of 11,000 m^2, with super modern mechanical equipment and with total personnel of 165 employees.

The annual production reaches 12,000 boilers, which are for gas, liquid or solid fuel, with power range from 20 to 5,000 kW.

The company exports to all Balkan countries and S.E. Europe, Romania, Poland, Cyprus, Russia, Spain, Israel, Ukraine.

The company provides the following biomass combustion systems products which are manufactured by the company itself [21]:

Biomass and wood boiler:

- **BIOPLEX**, with 19 model unit categories (HL B-40, HL B-50, HL B-60, HL B-70, HL B-80, HL B-100, HL B-120, HL B-140, HL B-160, HL B-180, HL B-200, HL B-220, HL B-230, HL B-250, HL B-300, HL B-350, HL B-400, HL B-500, HL B-550) and a range of nominal thermal output power between 47-256 kW

Wood boiler:

- **MULTIPLEX MCL,** with 18 model unit categories (40, 50, 60, 70, 80, 100, 120, 140, 160, 180, 200, 220, 250, 300, 350, 400, 500, 600) and a range of nominal thermal output power between 47-698 kW

Pellet boiler:

- **Pelletstar** with 26 model unit categories (Pelletstar 20, Pelletstar 30, Pelletstar 40, Pelletstar 50, Pelletstar 60, Pelletstar 65, Pelletstar 70, Pelletstar 80, Pelletstar 90, PLS 100, PLS 120, PLS 140, PLS 160, PLS 180, PLS 200, PLS 230, PLS 220, PLS 250, PLS 280, PLS 300, PLS 350, PLS 400, PLS 450, PLS 500, PLS 600, PLS 700) and a range of nominal thermal output power between 23-814 kW

More information on those systems is given in the ANNEX.

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6.4.4. I. Nitadoros S.A

I. Nitadoros S.A. Headquarters is located in a private total covered area of 1,000 square meters in Industrial Area of Heraklion, Crete. The company has permanent scientific and technical personnel of 15 people, it is equipped with fully modern machinery and equipment and is certified according to EN ISO 9001:2008 in accordance with international standards, which are applied during design and construction.

Furthermore, the company owns a modern olive oil production unit based in Mesa Mouliana, Sitia, of total covered area of 550 sqm. The area is internationally recognized for its production of P.D.O. (Protected Designation of Origin) Extra Virgin olive oil .

In addition, I. Nitadoros S.A. owns facilities in St. Myron, Heraklion, for processing and producing certified solid biofuels from olive agricultural wastes.

I. Nitadoros S.A. has expanded its activities and provides comprehensive services in the following areas:

- Exclusive Distributor of FLOTTWEG Company in Crete and representation of other specialized firms.
- Import, export, purchase, sale, production, lease, distribution, supply, installation, maintenance, repair and technical service of machinery for all types of industrial machinery equipment and products.
- Studies for approval, design and construction of Building Projects.
- Feasibility Studies for inclusion in business investment laws and investment implementation.
- Traffic & Trasportation Studies and Highway Design & Projects.
- Production - Processing - Marketing of certified Extra Virgin Olive Oil P.D.O.(Protected Designation of Origin) Sitia.
- Production - Processing - Marketing of Agricultural Solid Biofuels, produced of clean olive kernel (without odor and impurities).

Within these activities the company also manufactures modern solid biomass combustion systems, designed in such way that without conversion, it can use as a fuel, olive pits (olive pomace) or pellets as well as firewood, because of security systems and the large combustion chamber available.

- The company provides a solid biomass boiler model with 5 unit categories (55000, 79000, 114000, 150000, 180000) with a range of nominal thermal output power between 64-209 kW

The company is certified according to the European standards, EN ISO 9001:2008 and the manufactured machinery bearing quality certificate CE.

More information on the boilers provided is given in the ANNEX.

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7. Country report: Spain

7.1. National legislation on biomass heating systems for the domestic sector

The **Royal Decree 1027/2007** (Official State Gazette of 29th of August) establishes the **regulations for thermal installations in buildings** (in Spanish: RITE) and the **Royal Decree 238/2013** (Official State Gazette of 13th of April) includes updates of several articles and technical instructions of this document. Their purpose is to establish the energy efficiency and safety requirements of heating facilities during their design and execution, their maintenance and use and to set procedures to verify the compliance with the norms of such facilities: requirements of energy efficiency (IT1.2: 80% for biomass boilers and 65% for biomass stoves), safety requirements (IT1.3), administrative conditions, legal authorization of the facility, execution, and implementation (IT2), use and upkeep of the facility (IT3), periodic energy efficiency inspections (IT4).

Legislation for boilers using solid biofuels up to 500 kW in Spain is aligned to the **UNE-EN 303-5:2012** standard which is identified with the standard as described in paragraph 5. The boilers are classified in Class 3, 4 or 5 according to the order of increased efficiency and reduced emissions which are specified according to Table 1, Table 2 and Table 3.

7.2. Biomass use and heating systems in the domestic heating sector

Knowing the situation of biomass for heating and analysing its evolution over the years is a remaining challenge for everyone. This is an important goal for several reasons.

The first is that it could help the sector itself to make its own future forecasts, especially in the short and medium term.

The second is that it could be useful for providing guidelines to Administration. Knowing what, where and how to do is crucial to take measures to guide and to enhance the development of an activity that is generating energy savings and efficiency. This activity is giving a solution to many underused agroforestry by-products, which generates green and circular economy and new sustainable jobs and helps municipalities to quantify the reduction of emissions of greenhouse gases (GHGs).

The third and most important reason is that this knowledge provides information about this renewable energy source to the general public, giving them objective data (qualitative and quantitative) for helping potential users to decide better and faster its change to biomass.

In order to cover this necessity, AVEBIOM has been collecting data into a database called National Observatory of Biomass Boilers (ONCB) since 2009. Collecting information for this Observatory has not been an easy task. Patience and a high degree of cooperation with manufacturers, equipment and biofuels distributors, installers, public and private institutions and final users have been needed. In spite of that, there are still missing biomass installations in the database, as getting all the data from all the distributors and retailers is not possible.

However, there is enough quantity of data to allow making estimations.

During these 6 years of work in the ONCB's database, AVEBIOM has collected a sample of 48,650 references and 3,875 MW of installed capacity in Spain. Thanks to these references, we were able to estimate that the number of appliances installed in Spain in total is 160,000 until the end of 2015 which corresponds to an installed capacity of 7,275 MW.

Comparing these figures with the previous year, the number of appliances has grown about 25% and around 20%

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in power.

Although the increases are very satisfactory, distribution companies and installers have the feeling that it could have been a much better season. The demand of biofuels and the installation of new appliances have been less than the expected because the last winters have been very warm and the price of the fossil fuels has been very low, which has delayed the decision of purchasing and installing biomass devices.

Since 2014, there has been a significant growth in the number of installed MW in some Spanish regions (Autonomous Communities). The progress in the regions where the installation of biomass devices is supported with public money is remarkable.

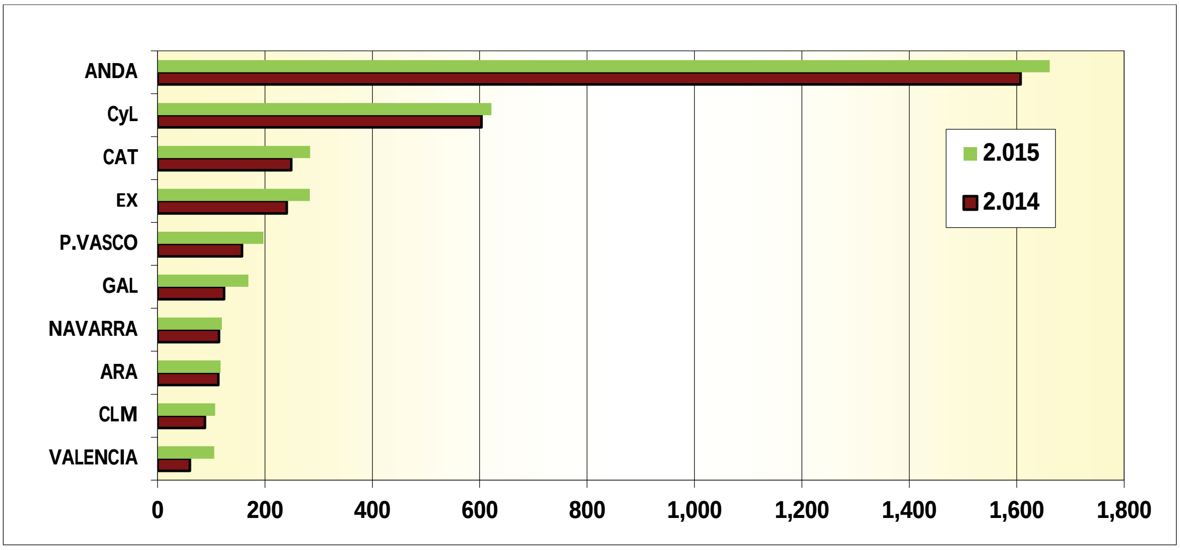

Figure 19: Installed biomass power (MW) in the 10 Regions with the highest values. Source: AVEBIOM

EVOLUTION BY TYPE OF USER

All significant groups which are biomass users grew in number of installations. The high number of public facilities that have been put into operation in 2015 can be remarked (Table 8). The evolution of district heating and the future prospects for this kind of facility are outstanding (Figure 20). There has also been a great response of residences for the elderly and remarkable increases in the number of installations that supply energy from biomass to sports facilities and swimming pools.

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Table 8: Evolution of the number of installations and power by user group for the commercial sector, expressed in accumulated values. Source: AVEBIOM

Commercial Sector	Installations registered 2013	Power (kW) 2013	Installations registered 2014	Power (kW) 2014	Installations registered 2015	Power (kW) 2015
Schools	361	53,695	417	64,380	475	71,295
District Heating	77	67,464	117	139,274	188	200,400
Public buildings	491	45,486	627	50,228	744	57,804
Sport facilities/ swimming pools	188	47,750	258	54,770	306	68,317
Residences for the elderly	142	35,646	187	42,538	235	58,108

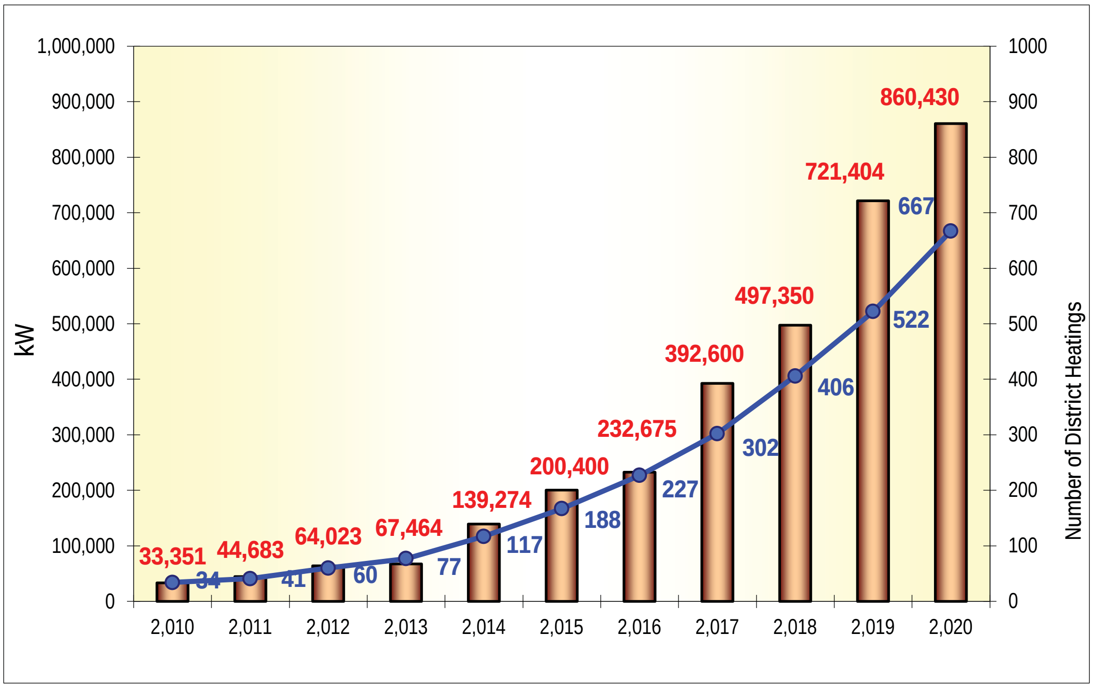

Figure 20: Evolution of the number of district heatings in Spain and its power. Predictions from 2016 to 2020. Source: AVEBIOM

Regarding the use of biomass in the industrial sector, it remains at very high levels in the Agro- farmer sector and in the food industry. In leisure business, including restaurants and hotels, biomass also has an important role.

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Table 9: Evolution of the number of installations and power by user group for the industrial sector, expressed in accumulated values. Source: AVEBIOM

Industrial sector	Installations Registered 2013	Power (Kw) 2013	Installations Registered 2014	Power (Kw) 2014	Installations Registered 2015	Power (Kw) 2015
Agro / Farmer	509	327,016	623	362,356	738	417,680
Alimentary	1,230	1,065,955	1,444	1,238,716	1,703	1,461,563
Wood / Furniture	170	510,398	209	562,312	234	615,760
Leisure	431	46,752	625	62,939	851	84,874
Servicies	209	16,198	289	21,648	364	26,122

EVOLUTION IN THE NUMBER OF DISTRIBUTORS AND INSTALLERS

Considering the data recorded in the ONCB it can be verified that the number of equipment distribution and installation companies has increased. There are already 245 different manufacturers that have devices installed in Spain from a total of 28 countries. Likewise, nearly 1,100 installers have recorded at least one data in the DB application, which means an increase of more than 20% over last year.

There is also a notable activity of the biomass ESCOs (Energy Services Co). Some of the most important exceed 50 MWt installed.

POWER PER INHABITANT RATIO

The average ratio estimated for Spain is 0.15 kW / inhab. From the data (Figure 3), there are 3 regions (Extremadura, Castilla y León and Andalucia) where this ratio exceeds 0.20. This value is still very low compared with the ratio of some Central European territories where biomass has a high level of development (Upper Austria) with a ratio around 1.5 kW / inhab.

The average annual growth for 2015 in Spain is expected to be only 0.012 kW / inhab., which is also a very low figure. It is estimated that this number should not be lower than 0.5 kW / inhab. per year. Thus, the installed capacity each year should always exceed 2,000 MW. Maintaining these average figures, it could be assumed that in 10 years, Spain could reach European average values in the use of biomass.

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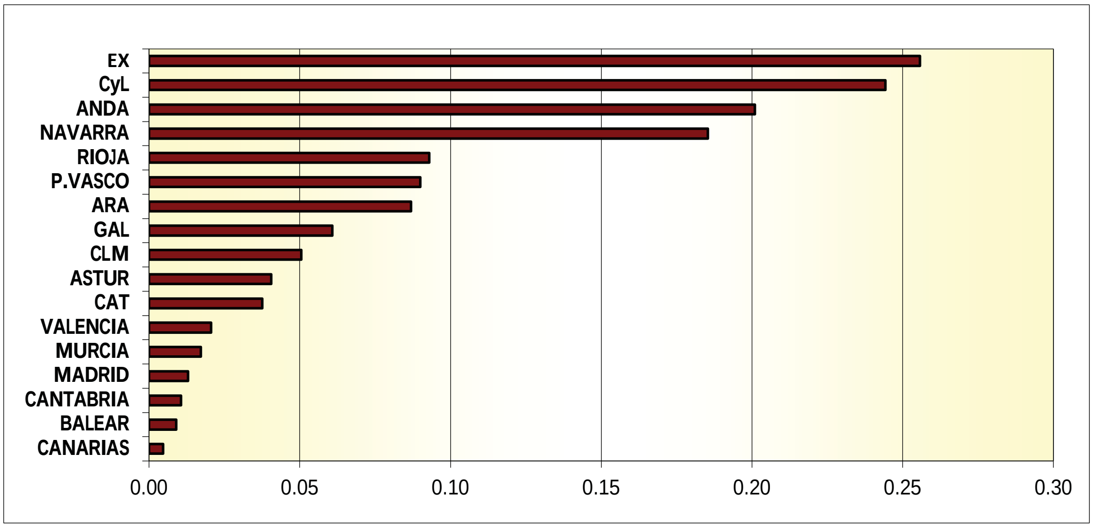

Figure 21: Distribution of the power per inhabitant ratio (kW/inhab.) per Region. Source: AVEBIOM

7.3. Support for purchase of biomass heating systems

At National level there are economic support measures for installing biomass heating facilities in Spain, which are implemented by IDAE (Institute for Energy Diversification and Saving, organism depending on the Ministry of Industry, Energy and Tourism) and there is also a programme called “Proyectos Clima”, which buys verified CO_2 emissions reductions, managed by the Ministry of Agriculture, Food and Environment.

Table 10: Subsidy programmes for the installation of biomass facilities at National level in Spain

Programme	Description	Budget for 2016	More information
PAREER-CRECE	Support programme for energy refurbishing of existing buildings. Loans and direct subsidy. For biomass 25% subsidy and 65% loan	174,426,000 € (for all the categories)	http://www.idae.es/index.php/id.858/relmenu.409/mod.pags/mem.detalle
BIOMCASA II	Programme for the implementation of projects of thermal biomass in buildings. Loans for the installation of biomass heating devices in buildings	848,000 €	http://www.idae.es/index.php/idpag.722/relmenu.407/mod.pags/mem.detalle

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Programme	Description	Budget for 2016	More information
GIT	Financing to authorised firms of Large Thermal Installations running on renewable energies in the building sector. Loan. The launching of this financing programme responds to the need of boosting the implementation of large installations to produce thermal energy in building from the exploitation of renewable energies such as biomass. The maximum financing limit per project will amount to 80% of the value of the eligible investment (the one devoted to thermal generation), with a maximum absolute financing limit per individual project of €3,000,000.	7,873,000 €	http://www.idae.es/index.php/idpag.638/relcategoria.1160/relmenu.385/mod.pags/mem.detalle
Proyectos Clima	Programme of the Ministry of Agriculture, Food and Environment for buying CO_2 emissions reduction (when changing from a fossil fuel boiler to a biomass boiler, for example). These emissions have to be verified by inspection bodies. In 2016 the price for the CO_2 tonne avoided was 9,70 €/tm	20,000,000 € (for all the categories)	http://www.magrama.gob.es/es/cambio-climatico/temas/proyectos-clima/convocatorias-proyectos-seleccionados/Convocatoria_2016.aspx

At regional level there are some Autonomous Communities with economic support measures, but they are often more limited in time. In Table 11 subsidies in several Regions are shown.

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Table 11: Subsidy programmes for the installation of biomass facilities in several Regions of Spain

Programme	Description	More information
Subsidies for Renewable Energies in Murcia	Provides subsidies, according to the Operational Programme ERDF (European Regional Development Fund) Murcia 2014/2020, for companies established in the Region of Murcia, for the execution of investments for the following purposes: energy audits, renewal of equipment and energy consuming installations, improving energy efficiency in production processes, energy generation facilities at the consumption point	http://bit.ly/1RvIzhR
Cantabria subsidies for forest biomass extraction	Subsidies for small companies and forest owners to support silvicultural activities	http://dgmontes.org/web/atencion-a-la-ciudadania/detalle/-/journal_content/56_INSTANCE_DETALLE/16401/3674520
Basque Country Biomass Subsidies	Eligible Biomass activities: - Biomass facilities with boilers for thermal energy production by producing hot water, superheated water or steam. - Boilers for producing hot air, although the nominal power must exceed 70 kW. - New connections to existing district heating facilities.	http://www.eve.eus/Programas-de-ayuda/Biomasa-2016.aspx
Subsidies for Renewable Energies in Castilla la Mancha	Subsidies financed by the European Regional Development Fund, for the use of renewable energy in Castilla la Mancha. These Subsidies are related to the measures that support the clean energy production and ensure a reduction in CO_2 emissions. They are also an instrument to promote the use of clean energies favouring a fully sustainable energy development model.	http://docm.castillalamancha.es/portaldocm/descargarArchivo.do?ruta=2016/01/07/pdf/2015_15522.pdf&tipo=rutaDocm
Galicia Biomass Subsidies	Subsidies for thermal biomass Projects to be carried out in Galicia for individuals and groups. Maximum subsidy: 50% or 50,000€ (120,000 € for groups).	http://www.inega.es/subvencions/subvencions/Energiasrenovables/2016/ficha_renovables2016_0002.html

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7.4. Spanish manufacturers of biomass heating systems

A market research has been performed on the biomass combustion systems from manufacturers and suppliers in Spain. Approximately one hundred Spanish manufacturers of medium-small scale biomass combustion devices have been found. All of them are included in Table 12.

Table 12: Spanish biomass combustion devices manufacturers

Trademark	Company	Product	Website
ARASAF	ARASAF INDUSTRIAL, S.L.	Boilers-Air Heaters	
ARGEMÍ	ARGEMÍ PREFABRICATS, S.L.	Stoves-Fireplaces-Inserts	www.argemiprefabricats.com
BALMASA	BALMASA, S.L.	Stoves-Barbacues-Furnaces	www.chimeneasbalmasa.com
BEROTU	E. PLATERO, S.L.	Stoves	www.berotu.com
BIOCURVE	BIOCURVE, S.L.	Condensation boilers	www.biocurve-heating.com
BIODRAC	DRAC, S.L.	Boilers-Stoves-Burners	www.dracsl.com
BIOMANN-GREEN ECOTHERM-BISOLID	METMANN	Boilers-Stoves	www.metmann.com
BIOSAN	GRUPO BIOSAN	Boilers-Stoves	www.grupobiosan.com
BISONTE-BELLFIRES	GRUPO BISONTE CLIMATIZACIÓN	Stoves-Fireplaces	www.grupobisonte.es <> www.bellfires.nl
BON FOC	BON FOC CALEFACTORS, S.L.	Boilers-Stoves-Air Heaters	www.bon-foc.com
BOSCH-MARIN	BOSCH MARÍN, S.L.	Stoves-Fireplaces	www.boschmarin.com
BRAUX	BRAUX, S.L.	Burners	www.braux.es
BRONPI	BRONPI CALEFACCIÓN, S.L.	Boilers-Stoves-Fireplaces	www.bronpi.com
CALDERAS TOMÀS	FUNDICIONES REUS, S.L.	Air Heaters-Stoves-Burners	www.fundicionesreus.com
CALORMATIC-BIOHIDRO-DUO-BIOBASIC-CALORINTRA	INTRAMEDER, S.L.	Boilers	www.intrameder.com
CALORINTRA			
CALQUEGA	CALQUEGA BIOMASA, S.L.L.	Boilers-Burners-Air Heaters	www.calquega.com
CAMPOS	CHIMENEAS CAMPOS, S.L.	Stoves-Fireplaces	www.chimeneascampos.com
CAÑELLAS	CALDERES CAÑELLAS, S.L.	Boilers	www.calderasbiomasa.net
CARBEL	COCINAS CARBEL, S.L.	Stoves-Fireplaces-Inserts	www.carbel.net
CARLOS HERNANSANZ	CARLOS HERNANSANZ, S.L.	Air Heaters	www.calderasch.es
CHIMENEAS ORTEGA	CHIMENEAS ORTEGA	Fireplaces	www.chimeneasortega.com
CHIMENEAS PÍO	CHIMENEAS PÍO	Fireplaces-Inserts-Barbacues	www.chimeneaspio.com

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CHIMENEAS REDONDO	CHIMENEAS REDONDO, S.L.	Stoves-Fireplaces	www.chimeneasredondo.com
CHIMENEAS SANCHO	CHIMENEAS SANCHO	Stoves-Barbacues-Furnaces	www.chimeneassancho.com
CHIMENEAS SIERRA	CHIMENEAS SIERRA	Fireplaces	www.chimeneassierra.es
CIDE	CIDE, S.L.	Stoves-Fireplaces	www.chimeneascide.com
CIDER	FUNDACIÓN CIDAUT	Boilers	www.cidaut.es/productos-bioenergia/
CORMA	CONSTRUCCIONES CORMA, S.A.	Boilers	
DE LA RUBIA	RECUPERADORES DE CALOR DE LA RUBIA, S.L.	Stoves-Fireplaces	www.delarubia.es
DOMUSA	DOMUSA	Boilers	www.domusa.es
DUCASA	DUCASA CLIMA, S.A.	Stoves	www.ducasa.com
ECOBIOTÉRMICA	AESYSTEMS, S.L.	Burners	www.ecobiotermica.com
ECOFOREST	ECOFOREST, S.A. & VAPORMATRA	Boilers-Stoves	www.ecoforest.es
EFEL-RED-TULP-FABER-VERODESING-ABE	ALSESA	Stoves-Fireplaces-Inserts	www.alsesa.com
EFILUME	EFILUME, S.L.	Stoves	www.efilume.com
EKOSUA	EKOSUA	Stoves	www.ekosua.es
ERRE	CHIMENEAS ERRE	Stoves-Fireplaces	www.chimeneaserre.com
E&M	E&M COMBUSTIÓN	Burners	www.emcombustion.es
FABRIFUEGO-YOLIFER	FABRIFUEGO MÁLAGA, S.L. (FERLUX)	Stoves-Fireplaces	www.fabrifuego.com
FACODY **[Closed]**	FACODY, S.L.	Boilers	www.facody.com
FERLUX	CHIMENEAS FERLUX, S.A.	Stoves-Fireplaces	www.ferlux.es
FIRECO		Stoves	www.fireco.es
FLAXMER	FLAXMER, S.A.	Burners	www.flaxmer.com
FLOTTWEG-PALACÍN ???	JOAQUÍN PALACÍN, S.L.	Boilers	www.jpalacin.com
FOCGRUP	FOCFUTURE DISSENY, S.L.	Fireplaces	www.focgrup.com
FUGAR	CHIMENEAS FUGAR, S.L.	Fireplaces	www.fugar.com
GER	GER, S.A.	Air Heaters	www.gersa.com
HERGOM	INDUSTRIAS HERGÓM, S.A. [HERGOM ALTERNATIVE]	Boilers-Stoves-Fireplaces	www.hergomalternative.com
INCOS	JUAN COSTA RAMISA	Boilers-Burners	www.incoszonda.com
INJOCA	INJOCA, S.L.	Boilers-Burners	www.injoca.es

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INMACON	CHIMENEAS INMACON, S.L.	Fireplaces-Barbacues-Furnaces	www.chimeneasinmacon.com
INMECAL	INNOVACIONES METACALORIFICAS, S.L. [INMECAL]	Boilers	www.inmecal.com
JOSPER	JOSPER, S.A.	Furnaces	www.josper.es
K4a	K4 ALFA ENERGIAS RENOVABLES, S.L.	Boilers	www.k4alfa.com
LACUNZA	CALOR DE VIDA, S.A.L.	Stoves-Fireplaces	www.lacunza.net
LAGUNA	TALLERES LAGUNA, S.L.	Boilers	www.tallereslaguna.es
LARRAGA	CHIMENEAS LARRAGA, S.L.	Fireplaces	www.chimeneaslarraga.com
LASIAN	LASIAN TECNOLOGÍA DEL CALOR, S.L.	Boilers-Stoves	www.lasian.es
LEIROTERM	CHIMENEAS LEIRO, S.A.	Fireplaces	www.leiro.cat
LLCALOR	LLCALOR	Stoves-Fireplaces	www.llcalor.com
LOBFUEGO	LOB FUEGO, S.A.		
LÒGICA	CALDERES ESTANY, S.L.		
LUMBRERAS	QUEMADORES LUMBRERAS, S.L.	Burners	www.quemadoreslumbreras.com
MACRE	CHIMENEAS MACRE, S.L.	Stoves-Fireplaces	
MAXLOR	COBBER	Boilers	www.cobber.es
MEDINA	GRUPO MEDINA	Stoves	www.grupo-medina.es
MEDITERRANEA-MURO	CHIMENEAS MEDITERRANEA MURO, S.L.	Stoves-Fireplaces	www.chimeneasmediterranea.com
MEGALSA	MEGALSA	Stoves	www.megalsa.com
MERKALDE	MERKALDE, S.L.	Boilers	www.merkalde.com
METMANN			
NATURAL FIRE	NATURAL FIRE, S.L.	Burners-Boilers	www.naturalfire.es
NESTOR MARTIN **[Extinguished]**	ECOMASA [TALLERES MARTÍNEZ]-NESTOR MARTIN-EQUATION-	Stoves	
NUTECHIM	NUTECHIM	Stoves-Fireplaces	www.nutechim.com
OCARIZ	OCARIZ, S.A.	Stoves	www.ocariz.es
ONIX	CHIMENEAS GRUPO ONIX	Fireplaces	www.chimeneas.grupoonix.com
PANADERO	PANADERO DENIA, S.L.	Stoves-Fireplaces	www.panadero.com

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PASANQUI ??	PASANQUI, S.L.	Boilers	www.pasanqui.com
Q.H.B. 180	Q.H.B. 180, S.L. [QUEMADORES HORNOS BIOMASA 180]	Burners	www.qhb180.com
R&R	ROFER & RODI CHIMENEAS	Stoves-Fireplaces	www.rofer.com
RESA	TALLERES RESA, S.L.	Fireplaces	www.fer.es
RIMACÓN	RIMACÓN, S.L.	Stoves-Fireplaces-Inserts-Barbacues	www.rimaconsl.com
ROCAL	ROCAL MANUFACTURAS, S.A.	Stoves-Inserts	www.rocal.es
SALGUEDA	INDUSTRIAS SALGUEDA, S.A.	Stoves-Fireplaces-Inserts	www.salgueda.com
SASAC	SASAC ESTUFAS Y ACCESORIOS, S.L.	Stoves-Fireplaces-Inserts	www.sasac.com
SERTEC	SERTEC EXTREMADURA, S.L.	Boilers	www.sertecex.es
TAYSO	HORNOS TAYSO, S.L.	Furnaces	www.hornostayso.com
THECA	[THECA] TALLER HERMANOS CATALINA, S.A.	Stoves	www.theca.es
TNC	CHIMENEAS TNC, S.L.	Stoves-Fireplaces	www.chimeneastnc.com
TRAFORART	CHIMENEAS BARCELONA, S.L.	Fireplaces	www.traforart.es
TUBOCÁS	TUBOCÁS, S.L.U.	Air Heaters-Burners	www.tubocas.net
VAYCORA			
VELILLA	MANEL VELILLA	Stoves-Fireplaces	www.manelivelilla.com
VULCANO	VULCANO ESTUFAS, S.C.	Stoves-Inserts	www.vulcanoestufas.com
XEMENEIES PLA	XEMENEIES PLA	Fireplaces	www.xemeneiespla.cat
ZIDAC		Boilers-Stoves	www.zidacenergias.es

From this list, only Spanish manufacturers of biomass boilers and stoves up to 500 kW for the domestic or residential sector have been considered. The chosen devices can use the biomass selected within the project (olive stones, shells or pruning chips).

The following nine main manufacturers have been contacted in order to obtain information about their equipment. Some profile information for each of these manufacturers is presented in the following pages and the questionnaires with the technical information of their equipment are included in the annex.

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7.4.1. Biocurve

BioCurve's (http://www.biocurve-heating.com) core is a highly skilled technical team, with wide background and engineering degrees, strong environmental commitment and a solid industrial support from several generations of metalworkers.

Central offices, as well as a test bench and showroom are located in Zaragoza, whereas factory facilities can be found in Arrankudiaga (Vizcaya).

The company provides the following biomass boiler series:

- **BCH** for pellet and olive stones, with 8 model unit categories (BCH25, BCH30, BCH40, BCH50, BCH60, BCH70, BCH80, BCH100) and a range of thermal output power of 25-100 KW.

7.4.2. Bronpi

Founded in 1985 in Lucena (Córdoba) by Joaquín Pimentel and Pilar Moyano, Bronpi Calefacción S.L. (http://www.bronpi.com) has its origin in a family business dedicated to the manufacture of accessories for the fireplaces.

At the end of the 1990s, Bronpi Calefacción S.L expanded its production line in the national market to have a comprehensive catalogue of firewood devices.

During this stage, the R&D department was created and Bronpi products were certified with some of the higher quality standards demanded by the European market.

In 2000, the company started its international expansion, being present in the most important international trade fairs of the sector and in more than 20 countries worldwide.

In this year, its own research laboratory was established, where prototypes are created and developed to be subsequently tested by external laboratories. These prototypes are part of the current catalogue of Bronpi.

In 2008, Bronpi Calefacción S.L was recognized with the Alas Award to implantation abroad, awarded by Extenda because of its extensive international experience.

In 2010, Bronpi introduced a new line of Pellet equipment into the market under the BioBronpi brand.

With the clear commitment of the company to renewable energies, in 2011 two new production lines were born: Bronpi Bioetanol, a line of bioethanol fireplaces and Bronpi Ventilation, a line of pipe and ventilation products.

The combination of all manufacturing processes makes Bronpi to have one of the most complete catalogues of the sector.

At the moment, Bronpi Calefacción S.L. has a facility of 10,000 square meters, a staff of over 200 people and a range of more than 300 products that can be found at homes all over the world.

The company provides the following biomass boilers series:

- **CARLOTA** for pellets and olive stones, with 3 model unit categories (Carlota-H-TK, Carlota-H-MF, Carlota-H-NE) and a thermal output of 21.2 KW (pellets) and 23.3 KW (olive stone).

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- **HYDROALASKA-21** for pellets and olive stones, with a thermal output of 21.2 KW (pellets) and 23.3 KW (olive stone).
- **HYDROARTICA** for pellets and olive stones, with 2 model unit categories (Hidroartica-27, Hidroartica-34) and a range of thermal output power of 27.6-34.3 KW (pellets) and 27.6-34.5 KW (olive stone).
- **HYDROBALTICA** for pellets and olive stones, with 2 model unit categories (Hidrobaltica-27, Hidrobaltica-34) and a range of thermal output power of 27.6-34.3 KW (pellets) and 27.6-34.5 KW (olive stone).
- **HYDROPOLAR-21** for pellets and olive stones, with a thermal output of 21.2 KW (pellets) and 23.3 KW (olive stone).
- **KARINA-H** for pellets and olive stones, with a thermal output of 27.6 KW (pellets) and 27.6 KW (olive stone).

7.4.3. Carsan

Carsan (http://www.carsanbio.com) is a young and dynamic company dedicated to the manufacture and distribution of biomass stoves and boilers, with presence at national level and in Portugal. In addition, Carsan is distributor of quality pellet, with certification ENplus A1, A2 and B (ID-Nr. ES302).

Carsan commitment to quality is based on 4 points: continuous development, continuous improvement, punctual delivery and after-sales service to solve issues.

Its main objective is the development of renewable energies and energy efficiency in Spain.

Carsan was founded in 2003. In September 2013 Carsan got the certification ENplus A1, A2 and B for their products. In 2015 Carsan opened a new installation in Madrid and one year later, they launch a new range of products.

The company provides the following biomass combustion boiler series:

- **CLBIO COMBI** for pellets, olive stones, almond shells, milled stones /shells (hazelnut, nut, apricot or similar), with a thermal output of 27 kW.
- **CLBIO COMPACTA** for pellets, olive stones, almond shells, milled stones /shells (hazelnut, nut, apricot or similar), with a thermal output of 24.4 kW.

7.4.4. Domusa

Domusa (http://www.domusa.com) is part of Corporación Mondragón since 1998, together with 257 autonomous and independent businesses and cooperatives, with production subsidiaries and corporate offices in 41 countries and sales in more than 150. Therefore they belong to the most important business group in the Basque Country, which is the tenth biggest company in Spain by number of employees and turnover.

The production activity of Domusa is focussed on the manufacture of Solar Systems for the generation of domestic hot water, cast iron and steel gas or diesel oil boilers, biomass boilers, hot water heat-exchangers, electrical boilers, and diesel burners.

As a result of several years of research, a new technology for burning biomass has been developed, creating a range of boilers with the highest performance.

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As a result of Domusa's commitment to a management model which is directed towards people participation and towards the customer, in 2010 Domusa obtained the Silver Q for excellence in management.

The company provides the following biomass combustion boiler series:

- **BIOCLASS NG 66 AND M** for pellet, hardwood pellet, olive stones and hazelnut shells, with 4 model unit categories (Bioclass NG 66, Bioclass NG M 25/66, Bioclass NG M 43/66, Bioclass NG M 66/66) and a range of thermal output power of 66-132 KW.
- **BIOCLASS NG OD** for pellet, hardwood pellet, olive stones and hazelnut shells, with 2 model unit categories (Bioclass NG 16 OD, Bioclass NG 25 OD) and a range of thermal output power of 15.6-25.3 KW.
- **BIOCLASS NG** for pellet, hardwood pellet, olive stones and hazelnut shells, with 4 model unit categories (Bioclass NG 10, Bioclass NG 16, Bioclass NG 25, Bioclass NG 43) and a range of thermal output power of 10.1-42.7 KW.
- **BIOCLASS NG+DR** for pellet, hardwood pellet, olive stones and hazelnut shells, with 4 model unit categories (Bioclass NG 10+DR, Bioclass NG 16+DR, Bioclass NG 25+DR, Bioclass NG 43+DR) and a range of thermal output power of 10.1-42.7 KW.

7.4.5. Industrias Hergom, S. A.

Founded in 1960 in Santander (Spain), and dedicated to heating products manufacturing since then, Hergóm **(**http://www.hergom.com**)** is today one of the industry´s main companies worldwide, with five manufacturing and operating facilities in Europe and America.

For more than 50 years, Hergóm has gained success and experience in developing wood and biomass heating products, focusing on natural fuels, through research, development and improvement of the efficiency of our products.

Hergóm carries out and guarantees the full production process, including design, manufacture in its own foundry and finishing of the products. In the production process, Hergóm uses selected materials and components to guarantee optimal durability, reliability and performance.

Furthermore, Hergóm makes big investments to meet all specifications required by the European Integrated Environmental Authorization in order to assure a minimal impact in the environment.

The company provides the following biomass boilers series:

- **GREDOS** for pellets, olive stones, almond shells and wood, with 4 model units categories with a nominal thermal output power of 25-50 KW.
- **OLIVA INDUSTRIAL** for pellets, olive stones and almond shells, with 7 model unit categories (Oliva 100, Oliva 130, Oliva 180, Oliva 250, Oliva 350, Oliva 430, Oliva 500) and a range of nominal thermal output power of 100-500 KW.
- **OLIVA DOMESTIC** for pellets, olive stones and almond shells, with 3 model unit categories (Oliva 30, Oliva 50, Oliva 65) and a range of nominal thermal output power of 30-65 KW.

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- **THT** for pellets, olive stones, almond shells and wood, with 7 model unit categories (THT 100, THT 150, THT 200, THT 250, THT 325, THT 400, THT 500) and a range of nominal thermal output power of 100-500 KW.

7.4.6. Intecbio

IntecBIO S.L. (http://www.intecbio.es) was founded in 2010 and has had a continuous technological evolution and an excellent human team that has more than a decade of experience working in the biomass field. The main objective of the Company is the costumer´s satisfaction and to be considered as a reference in biomass sector.

The company provides the following biomass combustion boiler series:

- **ITB CP** for pellets, milled almond shells and olive stones, with 2 model unit categories (ITB 30 CP, ITB 50 CP) and a range of thermal output power of 36-50.2 KW (pellets) and 27.8-48.7 KW (olive stones).
- **ITB DO** for pellets, milled almond shells and olive stones, with 3 model unit categories (ITB 30 DO, ITB 50 DO, ITB 80 DO) and a range of thermal output power of 36-85 KW (pellets) and 27.8-82.5 KW (olive stone).

7.4.7. LASIAN Tecnología del Calor, S. L.

LASIAN Tecnología del calor, S.L. (http://www.lasian.es) was founded in 1967 and manufactures and sells products for providing heat and hot water.

LASIAN has had a continuous technological evolution and an excellent human team with the aim of making boilers as well as other heating components for domestic and industrial use. The main objective of the Company is the costumer´s satisfaction with the highest quality and respect with the environment.

LASIAN has a new working area next to Zaragoza since 2005.

The company provides the following biomass combustion systems products:

- Biomass boilers series:

- **BIOSELECT** for high and low quality pellets, olive stones, almond shells and others, with 4 model unit categories (Bioselect Compact 30, Bioselect 30, Bioselect 45, Bioselect 55) and a range of thermal output power of 31.16-56.74 KW.
- **BORA** with 2 model unit categories (Bora Basic for high quality wood pellets (ENplus A1 / DINplus), Bora EVO for high and low quality wood pellets) with a thermal output of 18-18.5 kW.
- **HELENS** with 2 model unit categories (Helens Basic for high quality wood pellets (ENplus A1 / DINplus), Helens EVO for high and low quality wood pellets) with a thermal output of 22.5 kW.
- **SABA** with 2 model unit categories (Saba Basic for high quality wood pellets (ENplus A1 / DINplus), Saba EVO for high and low quality wood pellets) with a thermal output of 22.5 kW.
- **SHIMA** with 2 model unit categories (Shima Basic for high quality wood pellets (ENplus A1 / DINplus), Shima EVO for high and low quality wood pellets) with a thermal output of 18-18.5 kW.

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- Biomass stove series:

- **ATILAN** with 4 model unit categories (Atilan Basic / Atilan FLOW for high quality wood pellets (ENplus A1 / DINplus), Atilan EVO/ Atilan EVO FLOW for high and low quality pellets, crushed husks, olive stones and others) with a thermal output of 12 kW.
- **ERTA** with 4 model unit categories (Erta Basic / Erta FLOW for high quality wood pellets (ENplus A1 / DINplus), Erta EVO/ Erta EVO FLOW for high and low quality pellets, crushed husks, olive stones and others) with a thermal output of 10.4 kW.
- **FUJI** with 4 model unit categories (Fuji Basic / Fuji FLOW for high quality wood pellets (ENplus A1 / DINplus), Fuji EVO/ Fuji EVO FLOW for high and low quality pellets, crushed husks, olive stones and others) with a thermal output of 10.4 kW.
- **MUSA** with 4 model unit categories (Musa Basic / Musa FLOW for high quality wood pellets (ENplus A1 / DINplus), Musa EVO/ Musa EVO FLOW for high and low quality pellets, crushed husks, olive stones and others) with a thermal output of 12 kW.
- **NILA** with 2 model unit categories (Nila Basic for high quality wood pellets (ENplus A1 / DINplus), Nila EVO for high and low quality pellets, crushed husks, olive stones and others) with a thermal output of 10.4 kW.
- **TEON** with 4 model unit categories (Teon Basic / Teon FLOW for high quality wood pellets (ENplus A1 / DINplus), Teon EVO/ Teon EVO FLOW for high and low quality pellets, crushed husks, olive stones and others) with a thermal output of 12 kW.

7.4.8. Natural Fire

The long experience of its founders in the field of biomass made possible the birth of Natural Fire (http://www.naturalfire.eshttp://www.naturafir.es/), a young and robust company dedicated to the research and manufacture of machinery related to the use of biomass. Today Natural Fire is a pioneer in manufacturing biofuels burners.

With regards to the distribution channel, Natural Fire offers to the users a network of authorized distributors that have the required permissions to carry out the management and the installation of the devices in different parts of Spanish territory, giving all possible support to provide a guarantee in the chain of distribution of its products.

Natural Fire activity in research is continuous and directly applicable to their products by offering improvements affecting performance, durability, safety and making to the customers the use and maintenance easier and bearable. Some of them, recently have been awarded for their innovation and technological contribution.

The company provide the following biomass boiler series:

- **NF-250** for pellets, olive stones, almond shells and others, with a thermal output of 250 kW.

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7.4.9. Tubocás

Tubocás S.L (http://www.tubocas.net), company located in the northeast of the province of Granada, is dedicated to renewable energies, focusing on biomass as fuel for heating systems.

In the 1900s, Tubocás, S. L. started the manufacture of air heaters using biomass in Castilléjar (Granada). Until 2008 Tubocás was specializing in the production of biomass air heaters to be used in chicken farms.

In 2008, Tubocás carried out the introduction of biomass heating systems in the greenhouses of Almería (in tomatoes, cucumbers, peppers and zucchini crops).

In 2014, Tubocás built a new factory in Húescar (Granada) with a surface of 2,800 m^2 in a 40,000 m^2 land, where the company is located at the moment.

These facilities are modern installations divided in two areas: one for the manufacture of air heaters and biomass horizontal flame burners and the other one for the production of high quality pellets.

TUPELLETS is the commercial brand of pellets produced by Tubocás and has the certification ENplus A1 conceded by AENOR and issued by AVEBIOM.

The company provides the following biomass combustion boiler serie:

- **BIOTUCAL** for wood pellet, olive stones, almond/hazelnut/pine nut/walnut shells, chopped stones (peach, apricot, or similar), wood logs, with 2 model unit categories (Biotucal 25, Biotucal 45) and a range of thermal output power of 25-46 KW.

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8. Country report: Italy

8.1. National legislation on biomass heating systems for the domestic sector

In Italy, boilers using solid biofuels should also meet at least the requirements for the efficiency and emissions of Class 3 of EN 303-5 standard as described in paragraph 5. The limits are shown in Table 1.

It is relevant to underline that national support schemes and legislation's developments are considering class 5's requirements as a reference.

Domestic Appliances are regulated by the standards reported in Table 13.

Table 13: Standards for domestic appliances fed with solid biofuels

Heating System	Standard
Pellet-burning Stoves / Inserts / Cookers	UNI EN 14785
Wood-burning Stoves	UNI EN 13240
Wood-burning fireplaces / inserts	UNI EN 13229
Wood-burning cookers	UNI EN 12815
Heat Storage / Slow Heat Stoves	UNI EN 15250

There is still no regulation requiring emission limits for appliances/boilers <500MW. In the coming year, it will be published classification classes based (also) on CO_2 emissions. The reference is "Art. 290, comma 4, D.LGS 152 2006".

Burning biomass is regulated by Legislative Decree 152/2006. Solid wood biomass EU specifications are regulated on UNI EN ISO 17225 (ex UNI EN 14961) and UNI EN ISO 17225-2 (ex EN 14961-2). These standards are applied in Italy too.

8.2. Biomass use and heating systems in the domestic heating sector

In Italy, the consumption of woody biomass in the heating sector is relevant.

It counts about:

- 18 million tons of wood logs
- 3 million tons of wood pellet, making Italy the main residential EU market
- 0,7 million tons of woodchips, a growing market due to the increase of new installations.

Here below are reported the national statistics about thermal energy produced by solid biomass. In 2014 273.000 TJ were produced, corresponding to 6,52 Mtep.

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Table 14: Thermal energy production (GSE, 2015)

	2010 (TJ)	2011 (TJ)	2012 (TJ)	2013 (TJ)	2014 (TJ)
Direct Consumes:	**301.131**	**194.726**	**279.829**	**281.558**	**244.494**
Residential	299.895	192.664	277.893	277.698	237.623
Industry	308	1.104	980	2.300	3.489
Commercial and services	*863*	*891*	*888*	*1.485*	*2.488*
Agriculture	65	67	67	75	894
Derived heat production:	**8.739**	**13.878**	**17.423**	**25.151**	**28.388**
From CHP plants	6.502	11.211	14.345	22.059	25.672
From H only plants	2.237	2.667	3.078	3.092	2.716
Total:	**309.870**	**208.604**	**297.252**	**306.709**	**272.882**

In 2014, 97% of solid biomass used for thermal energy purposes was delivered to residential users.

Biomass consumption and thermal energy production reflect the amount of installations fed with woody biomass, that count more than 11 million domestic appliances and 500.000 boilers.

80% of domestic appliances are fed with wood logs, even if pellet stoves are increasing their share.

The chart below shows AIEL's estimations about the number of installed boilers divided by biofuel and range of power.

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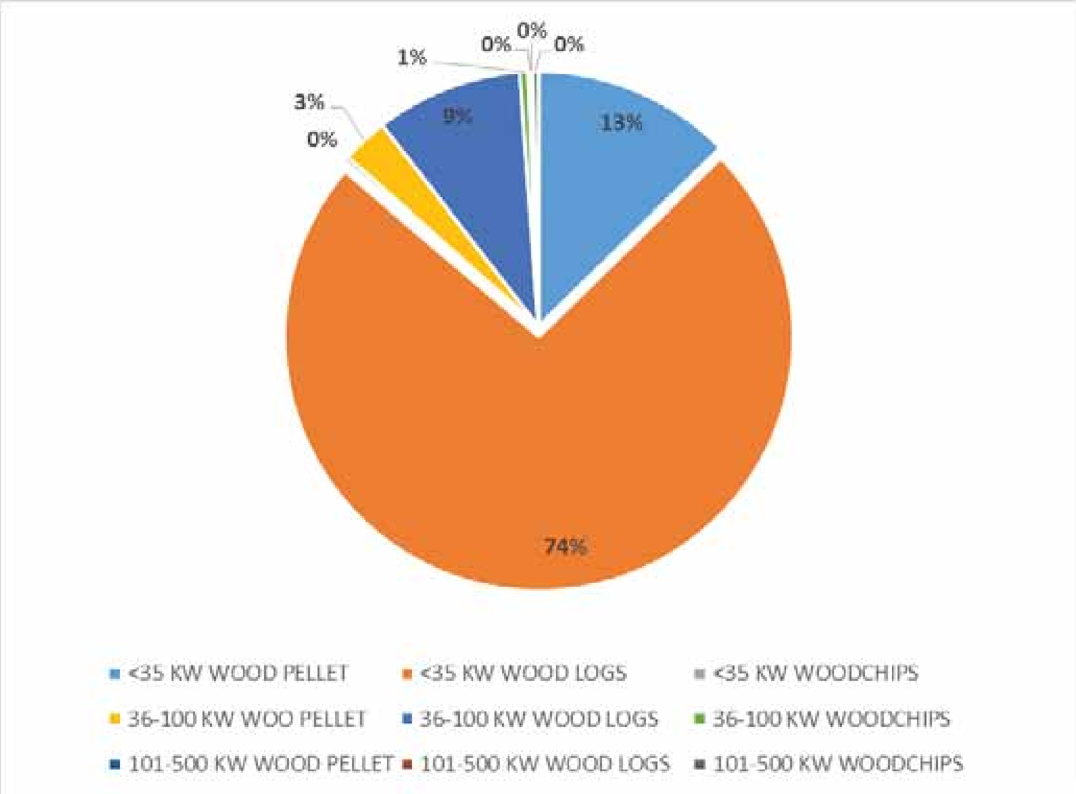

Figure 22: Biomass boilers <500kW installed in Italy

8.3. Support for purchase of biomass heating systems

The national support schemes for the purchase of biomass heating systems are:

1. **Conto Termico 2.0**: this financial support is aimed to requalify the installed heating devices. By replacing a device with high performing biomass fueled technology, the householder receives a bank transfer equal to maximum the 50% of the device's purchase value within 2 years. The new installed device must respect minimum requirements depending on the biomass (pellet, wood logs). the installation must have a rated power below 2MW. More information can be found in www.gse.it.

2. **50% - 65% tax credit**: in case of energy efficiency requalification of the building.

TEE (Efficiency Energy Titles) ore **White Certificates** indirectly support new installations. They are delivered in case of efficiency increasing related to maintenance or new installations. Each Efficiency Energy Title is equal to 1toe (Tonne of oil equivalent). More details and quotations are available at the Energy Markets Managing Authority (GME): http://www.mercatoelettrico.org. In April, 1TEE was quoted €125-129.

In addition, some regional schemes can be available to support new installations.

8.4. Italian manufacturers of biomass heating systems

Here below are listed most of the Italian boilers' manufacturers:

- Climair50 Srl
- CS Thermos Srl

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- D'Alessandro Termomeccanica Srl
- Espe Srl
- La Nordica-Extraflame Spa
- MCZ Group Spa
- Palazzetti Lelio Spa
- Pasqualicchio Srl
- Ungaro Srl
- Uniconfort Srl
- Viessmann Srl

They are all AIEL's members, meaning that most of their products are certified EN 303-5 class 5. In our market there are also many foreign brands, listed in http://www.aiel.cia.it/en/interest-group/caldaie-a-biomasse.html.

Italian main producers of domestic biomass devices are:

- AMG Spa
- Calux Srl
- Caminetti Montegrappa Spa
- Carinci Group Spa
- Car-met Srl
- Castelmonte Srl
- Cerampiù
- Clam soc.coop.
- Clementi Srl
- Cola Spa
- CS Thermos Srl
- De Manincor Spa
- Edilkamin Spa
- Esperia Technology Srl Unipersonale
- Euroalpi by Z.F. S.r.l. Unipersonale
- Eva stampaggi Srl
- Famar Brevetti Srl
- Greithwald Herde Srl
- Gruppo Piazzetta Spa
- Jolly-mec Srl

- Karmek one Srl
- Klover Srl
- La Nordica-Extraflame Spa
- Laminox Srl
- Lincar Srl
- Linea VZ Srl
- MCZ Group Spa
- Palazzetti Lelio Spa
- Pasqualicchio Srl
- Puros Srl
- Ravelli Spa
- Rizzoli Srl
- Thermorossi Spa
- Tmc srl
- Ungaro Srl
- Vulcano Srl

The selection includes all national producers performing a turnover 2014 higher than € 1 million and having a relevant business in this sector.

Among the above listed biomass heating systems manufacturers, the companies including the top performance systems designed to burn Mediterrean biomass are: CS Thermos Srl, D'Alessandro Temromeccanica Srl and Pasqualicchio Srl.

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9. Country report: Turkey

9.1. National legislation on biomass heating systems for the domestic sector

According to the Ministerial Decree [22], boilers using solid biofuels in Turkey should meet at least the requirements for emissions of TS EN 303-5-2013-04 standard, identified with the standard as described in paragraph 5. Efficiency and emission limits are shown in Table 1, Table 2 and Table 3 [23].

There is no strict regulation about usage of biomass (wood pellets, hazelnut shell, apricot kernel, peach shell, walnut shell, pistachio shell) in Turkey. However, according to legislation of Ministry of Environment and Urbanization solid biofuel should meet the emission criteria.

9.2. Biomass use and heating systems in the domestic heating sector

Energy demand of Turkey is increasing year by year depending on increase of population. The energy consumption of the household sector in Turkey is illustrated in Figure 23 [24]. From 1985s up to now, while natural gas usage increased remarkably, the use of petroleum liquid products almost depleted. Although the use of coal in industry has been increased, it has been greatly diminished in domestic. Share of renewable energy in residential sector has been increasing from almost 0% to 5% since 2005. Due to lack of its own sufficient natural gas sources, Turkey pays 34.76-23.45 billion $ (2014-2015) for importation of natural gas [24]. There are new studies to abate this energy deficit. Turkey continues to gain new energy perspectives with EU close relationships. Coal has been replaced with biofuels in domestic use. The initiation of governmental support for purchase of biomass heating systems might promote solid biofuel use in Turkey.

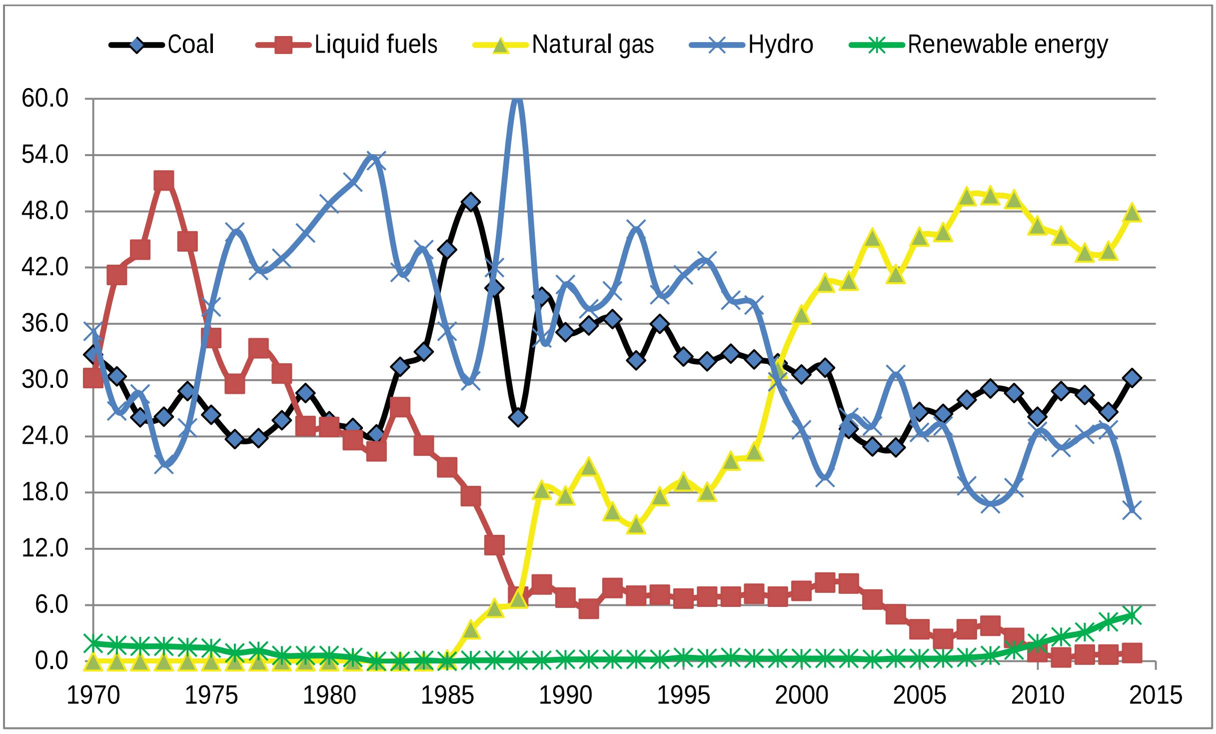

Figure 23. Energy consumption of households in Turkey fuel type, 1970– 2014 (Source: Turkstat)

9.3. Turkish manufacturers of biomass heating systems

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A market investigation has been carried out about manufacturers and suppliers of biomass combustion systems in Turkey. It was determined that there are eight biomass combustion system manufacturers in Turkey. Some profile information about these companies are shown below.

9.3.1. KOZLUSAN Heating Systems

Kozlusan was established in Manisa in 2009. KOZLUSAN manufactures 5000 units of domestic and industrial solid fuel fired heating boilers annually. 50% of its production is exported to the countries of Europe, Far East and South&North America. KOZLUSAN is capable of servicing the demands of its customers with technically trained, handy and well-informed service departments that are located in different parts of the Turkey and the world. Kozlusan manufactures manual and automated feeding pellet boilers, pellet stoves, pellet burners, greenhouse and poultry house heating systems and grain dryer heating systems between the project capacities of 10.000 Kcal/h - 1.000,000 Kcal/h up to the demand of different. KOZLUSAN has a R&D department that focus on creating and producing innovative products. KOZLUSAN has been using thermal, mechanical and electronic quality control tests according to the directives of high quality production standards.

Kozlusan provides the following biomass combustion systems [25]:

KYK-SERIES (Solid Fuel Fired Boiler) with the available capacities between 30.000 Kcal/h - 45.000 Kcal/h, the KYK series have been designed to burn coal, olive husk, olive husk pellet, olive stones, nut shelter very efficiently. The automatic heat exchanger cleaning system is the most noticeable feature of the KYK than other boilers. Because of high heat transfer rate providing construction and chrome turbulators in the heat exchanger section, KYK provides maximum fuel savings.

KOZ-SERIES (Solid Fuel Fired Boiler) with the available capacities between 20.000 Kcal/h - 100.000 Kcal/h, the KOZ series have been designed to burn coal, olive husk, olive husk pellet, olive stones, nut shelter very efficiently. It provides and extra comfort thanks to its automated ignition, automated ash removal (Optional), and automated mixing systems.

PEL-SERIES (Central heating system) with the available capacities between 130.000 Kcal/h up to 1.000,000 Kcal/h, the PEL series have been designed to burn olive husk pellet, industrial pellet and other biomass pellets. Thanks to its double screw feeding mechanization, the possibility of back burn has been eliminated. PEL series have high efficient body. Thanks to its rich mechanical and electronic specifications, PEL series are present solutions for any type of biomass pellet.

More information on those boilers is given in the ANNEX.

9.3.2. OZERTEKNIK (Ifyıl)

Ozerteknik Limited which has been serving in the heating industry for 20 years and has established the Kuzey Kardelen Heat Industry Company in 2009 under the brand name of "İfyıl" and it provides new and innovative solutions to complex heating systems. The Kuzey Kardelen factory was established 20.000 m2 site of which 3000 m2 is in use. The company has made a name for itself in this sector with its 40 experienced personnel, continuously self-improving ethos and its aim to achieve the best results by using the most up to date technology. With its Research & Development department the Kuzey Kardelen Heat Company priorities the principles of efficiency, savings and comfort.

İfyıl exports to more than 10 countries and uses certified sheet metals in each of its different eco – friendly models. Including an all – in – one mechanical construction, with its compact and modern appearance, İfyıl stoves

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have a unique design and ergonomic structure. İfyıl exploits the latest technology by combining the traditional lines with the modern and by blending versatility with quality to produce eco – friendly products fully tested at each stage of production. By means of maximum combustion technology, not only one room but also whole home is heated up equally with low fuel consumption. Additionally, hot water need of a house might be provided with Ifyıl products.

İfyıl provides the following biomass combustion systems [26]:

Troy for pellet with fan and thermal output range 21-4kW

Freedom for pellet with fan and thermal output range 16-4 kW

Crystal for pellet with fan and thermal output range 10-2 kW

Thermal for pellet with fan and thermal output range 6-2 kW

Bosphorus for pellet with fan, cooker and thermal output range 13-4 kW

Pergamon for pellet with fan and thermal output range 6-2 kW

Roaster for wood, briquette with fan, cooker and thermal output range 30-4 kW

Supernova for wood , briquette with fan, cooker and thermal output range 34-4 kW

Star for wood , briquette with fan, cooker and thermal output range 25-6 kW

Sauna for wood , briquette with fan and thermal output range 25-5 kW

Hammam for wood , briquette with fan and thermal output range 25-6 kW

Pellet GT30-60 for pellet and thermal output range 60-30 kW

More information on those stove and boilers is given in the ANNEX.

9.3.3. HOŞSEVEN

Hoşseven Isı ve Yalıtım San. Tic. A.Ş. was founded in 1960 and has been operating on a 20.000 square meter area with 250 employees in Barakfakih Industrial Zone. Company production group includes: Solid Fuel Stoves, Fireplace Stoves, Natural Gas Stoves, Pellet Stoves, Electrical Water Heater Systems, Radiant and Stove Accessories. In 2016, company has started serial production of Solid Fuel Boilers and continue to work with dealers and service points by targeting customer satisfaction in every province of Turkey. Nowadays, company is selling its products to Europe, Asia in over 20 countries. Hoşseven produces all its fireplaces and stoves in its own foundry, taking care of every step from the design to engineering, and to packaging and shipping. Quality, on-time delivery and price in production, distribution and post-sales activities is provided in its service to meet customer expectations. With young and appointed staff, Hoşseven has a duty to contribute to Turkey's rising goals.

Hoşseven provides the following biomass combustion systems [27]:

Lilly for pellet and thermal output range 3-20 kW

Camellia for pellet and thermal output range 24 kW

Violet for pellet and thermal output range 2,2-6,5 kW

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Jessamine for pellet and thermal output range 3-20 kW

More information on those stove and boilers is given in the ANNEX.

9.3.4. DESAN

Desan was established in 1993 in İzmir by Salim Yılmaz Delen. Company is engaged in three sort of work. Company capabilities are conveyor manufacturing, installation of wet and powder paint plants and special machine manufacturing. Desan has been manufactured own design pellet stoves and boiler under special machine manufacturing.

Desan provides the following biomass combustion systems [28]:

DSP01 for pellet with fan and thermal output range 8-10 kW

DSP02 for pellet with fan and thermal output range 8-10 kW

DSP03 for pellet with fan and thermal output range 10-14 kW

DSP03-TURBO for pellet with fan and thermal output range 10-18 kW

DSP04 for pellet with fan and thermal output range 10-14 kW

DSP05 for pellet with fan and thermal output range 10-14 kW

DSP06H-MAX for pellet with fan and thermal output range 10-20 kW

DSP06T-MAX for pellet with fan and thermal output range 10-20 kW

More information on those stove and boilers are given in the ANNEX.

9.3.5. Felluce Isı

Felluce Isı Teknolojileri Ltd. Şti. was established in Konya. Felluce has been serving Heating & Ventilation of many residence, house, site, institution and company with products and manufacturing experience since 2005.

Felluce Isı provides the following biomass combustion systems [29]:

FLC-PST-KC ,PM-PST-KC ,TMF-PST ,FLC-TRB (Air Heater) model biomass combustors are capable to combust Hazelnut shell, walnut shell, pellet, apricot kernel, peach kernel, pine cone and olive oil pomace .

FLC-PST-KC 30/40/60/90 series thermal output range respectively 34/46/69/104 kW .

PM-PST-KC 120/150/200 series thermal output range respectively 139/174/232 kW

TMF-PST 250/300/350/400/450/500 series thermal output range respectively 290/348/407/465/523/581 kW.

More information on those stove and boilers are given in the ANNEX.

9.3.6. Aral Makine

Aral Makina Madeni Eşya San. Ve Tic. Ltd. Şti. was established in Kayseri in 2000. Company manufactures heating stoves, boilers, radiators and spare parts. Aral Makina provides the following biomass combustion systems [30]:

DP10 for pellet with fan and thermal output range 12 kW

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DP12 for pellet with fan and thermal output range 20 kW

More information on those stove and boilers are given in the ANNEX.

9.3.7. Rodos Isı

Rodos Isı is established in Izmir and provides the following biomass combustion systems [31]:

KK25 for wood chips & pellet with fan and thermal output range 6 kW

Rodos 20 for wood chips & pellet with fan and thermal output range 4,8 kW

Rodos 36 for wood chips & pellet with fan and thermal output range 8,2 kW

More information on those stove and boilers are given in the ANNEX.

9.3.8. Yakar Soba (Karmasan)

Karmasan was established in Istanbul. Karmasan provides the following biomass combustion systems [32]:

LOGPEL 25 for pellet with fan and thermal output range 5-23 kW

LOGPEL 40 for pellet with fan and thermal output range 5-30 kW

Prestige 25 for pellet with fan and thermal output range 25 kW

KOZ 20/25/40/60/80/100/130/150/200/400/600/800/1000 for hazelnut shell, pellet and olive pomace

KYK 30/45/70 for hazelnut shell, pellet and olive pomace

More information on those stove and boilers are given in the ANNEX.

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10.Country report: Portugal

10.1. National legislation on biomass heating systems for the domestic sector

The existing legislation for the production of thermal energy in the domestic sector boils down to the **System for Energy Certification of Buildings (SCE)**. The Decree-Law No. 118/2013 of 20 August, that approves SCE, integrates the Regulation on the Energy Performance of Residential Buildings (REH) and the Regulation on the Energy Performance of Services Buildings (RECS). The System constitutes a transposition of the Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010, Energy Performance of Buildings Directive (EPBD), into national law.[33]

This Decree-law is supported through the publication of 6 ordinances and 12 orders that includes the specific calculation methodology, renewable energy account, energy performance certificates (EPC) lay-out, climate data, primary energy conversion factors and others. [34]

SCE establishes the obligation to use solar thermal panels or alternative systems that use renewable energy, such as biomass systems, for space heating and water heating purposes. Boilers and stoves that use biomass as solid fuel must meet the minimum efficiency requirements defined in ordinance No. 349-B / 2013 of November 29th (REH solutions requirements for residential buildings), as shown in the following table:

Table 15: Minimum energy efficiency applicable to biomass boilers and stoves [35]

Appliances		Energy Efficiency (%)	Applicable standards
Boilers fired by solid fuel	Wood	≥ 0.75	EN 12809[1]
	Pellets	≥ 0.85	
Stoves fired by solid fuel		≥ 0.75	EN 12809[2] EN 12809[3] EN 12809[4]

10.2. Biomass use and heating systems in the domestic heating sector

The latest detailed survey regarding the energy consumption of the households in Portugal is the **2010 Survey on Energy Consumption in Households (ICESD 2010)**. This study has been performed by the Directorate-General for Energy and Geology (DGEG) [35] and the Statistics Portugal (INE) and concerns the period of October 2009 - September 2010.

According to the ICESD 2010, Portugal witnessed a change in habits of energy consumption on households in the last decades. With regard to energy consumption in households (excluding fuels used in vehicles), for the

[1] EN 12809:2001 - Residential independent boilers fired by solid fuel - Nominal heat output up to 50 kW -Requirements and test methods

[2] EN 13229:2001 - Inset appliances including open fires fired by solid fuels - Requirements and test methods

[3] EN 13240:2001 - Room heaters fired by solid fuel – Requirements and test methods

[4] EN 14785:2006 - Residential space heating appliances fired by wood pellets –Requirements and test methods

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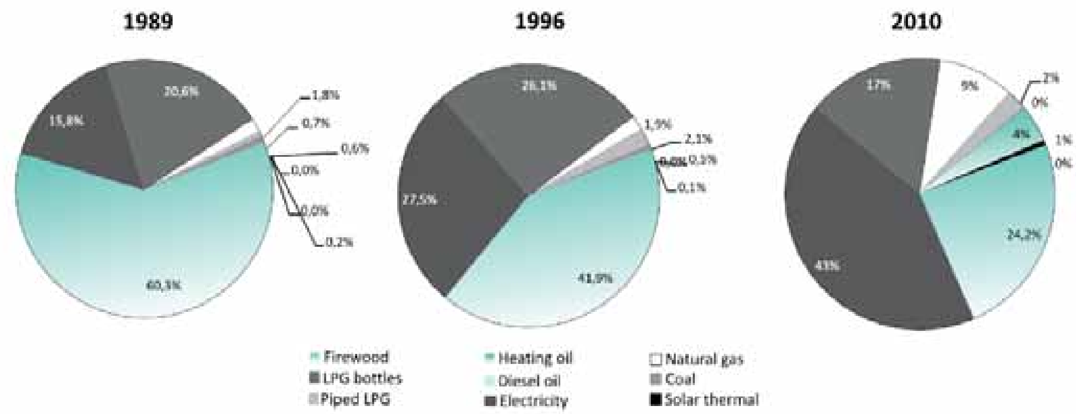
reference period, electricity emerged as the main source of energy consumed in households, representing 42.6% of the total energy consumption. **Firewood was the second main consumed energy source in Portuguese households, with a weight of 24,2% in total energy consumption in homes**, stress being laid on its loss of importance in the past few years (60,3% in 1989 and 41,9% in 1996).[36],[37]



Distribution of energy consumption in households by source type -Portugal, 1989, 1996 and 2010 [34],[36]

Considering the different uses of energy in households, energy used in the kitchen has the highest weight, accounting for over one third (39%), compared to other types of use, followed by water heating with 23%. However, depending on the type of use, the dominant source of energy is different: in the kitchen dominates the use of electricity, while in water heating is predominant the use of LPG bottled.

The consumption of renewable energy (charcoal, firewood and solar thermal) in the domestic sector accounted for about 25% of total energy consumption in households and firewood is the source with a most relevant contribution.[36]

According to the report from the ADENE - Agência de Energia (Energy Agency), “Energy Efficiency trends and policies in Portugal”, in 2010, the beginning of recession period, the energy consumption in household is near to the energy consumption registered in 2000 decreasing from 2010 at 2,4%/year, reaching 2,6 Mtoe in 2013. Private consumption follows the Gross Domestic Product (GDP) trend, remarking the three recession periods, 2003, 2009 and 2011 onward, with a pronounced decreased in the last period. Thus, while between 2000-2008 private consumption had a mild annual growth by 0,2%/year, after 2008 declined at 1,6%/year.[34]

Household final energy consumption evolution by type of energy source characterization as well as the private consumption per household is presented in the figure below.

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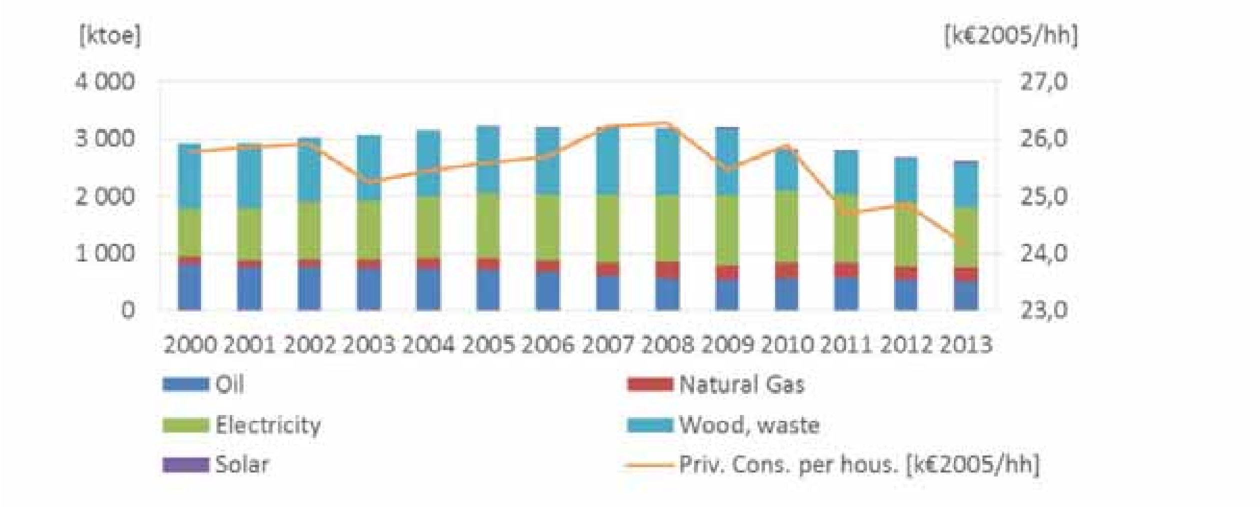

Figure 24: Final energy consumption in residential and private consumption per households[34][37]

The electricity increase 11% over the last 13 years. The solar energy source, although with residual effect, already reflects the residential legislation revised that supported *Energy Performance of Buildings Directive* (EPBD) implementation in Portugal and natural gas has gained expression in the residential energy balance, (+5%from 2000 to 2013).[34]

Nevertheless firewood is the second main consumed energy source in Portuguese households, **with a weight of 29% in total energy consumption in homes (2013).** Wood and oil have been declining falling, in total, around 17% in the total energy residential consumption in the analysed period.[34]

According to the ICESD 2010, the main sources of energy used for **space heating** were, in descending order of importance (in terms of consumption in toe), biomass, heating oil, electricity and LPG. Biomass, mainly firewood, is the most common fuel, which represents about 68% of total energy consumption for space heating.

A breakdown of the distribution of energy consumption in households for space heating by source type is given in the following picture.[36]

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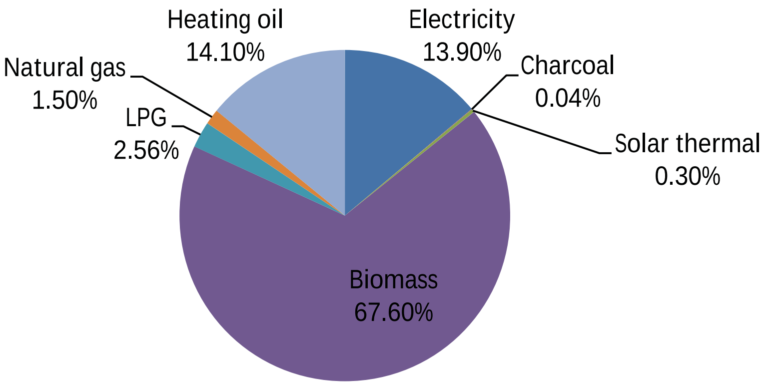

Figure 25: Energy consumption in households for space heating by source type [36]

10.3. Support for purchase of biomass heating systems

Currently, there are no direct financial incentives for purchase of biomass heating systems.

10.4. Portuguese manufacturers of biomass heating systems

A market research has been performed on the biomass combustion systems from the manufacturers and suppliers in Portugal. Some profile information for three main manufacturers is presented in the following.

10.4.1. SOLZAIMA

Solzaima [39] is a leading player in the production of biomass heating solutions in Portugal. They have been manufacturing renewable energy equipment since 1978.

Solzaima's vision has always been to provide a clean, renewable and most cost-effective energy. For this reason, they have dedicated for over 35 years to manufacturing biomass heating solutions and equipment, using firewood and pellets as primary fuel source.

Solzaima´s produces various heating solutions specially dedicated to the residential sector, ranging from insert fires, backboiler fires, free standing fires, wood pellet stoves until biomass boilers.

Solzaima annually equips over 20 000 housing units with its heating solutions, conveying the notion that consumers are attentive to more cost-efficient and ecological options. Solzaima holds ISO 9001 quality certification and ISO 14001 environmental certification.

BIOMASS BOILERS

Solzaima´s offers three series of biomass boilers: automatic boilers, compact wood pellet boilers and wood boilers.

All SOLZAIMA heating units are tested and certified by independent laboratories, in accordance with EN standards, to ensure the consumer is fully informed of the characteristics of the equipment purchased. The SZM a 18 kW, SZM a 24 kW and

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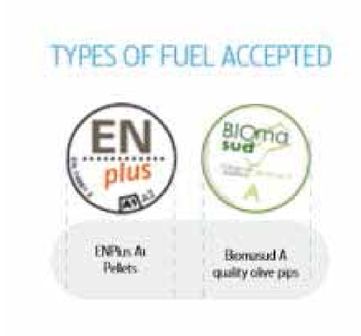
SZM a 30 kW automatic boilers were tested and approved as class 5 by TUV Rheinland laboratories in Germany; The SZM c 18 kW and SZM c 24 kW compact boiler were tested by CEIS laboratories in Spain; The SZM WI 42 kW wood burning boiler was tested by TUV Rheinland laboratories in Germany; Solzaima entire range of pellet boilers are MCS certified

More information on those boilers is given in the ANNEX.

BIOMASS

The wood pellets used must be certified according to ENPlus A1 (EN 14961-2) or DINplus norms, which guarantee the correct level of humidity and resulting ash, thus promoting reduced residue build-up in your unit and its increased durability. The olive pips that can be used in some range of boilers must be BIOMASUD A certified.



10.4.2. TORBEL

TORBEL, S.A. [40] is a Portuguese company founded in 1977. Has over 35 years of experience in providing solutions for heat energy production, industrial dedusting and filtration, drying, and handling & storage.

Their products cover a broad range of application in a variety of industries such as: Wood, Ceramics, Cork, Metal-works, Food, Chemistry, Paper, Cardboard, Plastic, Glass and others.

Torbel boilers are designed to burn different types of biomass: Wood Chips, Sawdust, Pellets, Pine Bark, Bagace and Olive Pit, Agricultural Waste, Municipal Waste, etc.

Biomass boilers are three smoke passes boilers, with a spacious furnace specially built for incinerating solid combustibles of inferior/ low quality (biomass) and to product hot water with a maximum temperature of 105ºC thanks to the calorific energy liberated.

BIOMASS BOILERS

Horizontal Fire Tube Boiler

OperationPrinciple

Torbel manufactures and markets boilers for burning pellets or any other types of biomass. The operating principle consists of feeding biomass into a combustion chamber where it burns. The heat transfer takes place by radiation and convection phenomena. Boilers are selected according to the calorific power required at the consumption sources, ranging between 125.000 and 500.000Kcal/h and may even be higher upon request.

More information on those systems is given in the ANNEX.

Biomass

Boilers can be fed with wood, wood chips, sawdust, nutshells, pine bark, pinecone, marc and olive stone or pellets.

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- Wood: feeding must be done manually;
- All the rest of biomass fuels: automatic feeding with the use of a suitable burner.

Vertical Fire-tube Boiler

Operation Principle:

The operating principle consists of feeding biomass into a combustion chamber where it burns. The hot air generated with the combustion passes through pipes, thus transferring the heat into the water. Boilers are selected according to the calorific power required at the consumption sources. They range between 300.000kcal/h and 4.000.000kcal/h.

Biomass

These boilers accept different types of biomass, including: bark, wood chips, sawdust, pellets or briquettes, bagasse and olive pit.

10.4.3. VENTIL

VENTIL - Engenharia do Ambiente, Lda. [41] is an industrial company that, since 1971, has been evolving activities in the manufacture of equipment for environment protection, with expertise in the development, production and start-up of biomass thermal energy production plants and boilers, environmental control technologies and other innovative solutions.

VENTIL has installed over 700 systems in sectors such as greenhouses, poultry farms, hotels, swimming pools, district heating, wood industries, industrial processes, among others.

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BIOMASS BOILERS

VENTIL boiler is designed for solid fuels and energy recovery. It is of the three-passage flue-gas tube type, with built-in furnace. The combustion is optimized through constant control devices, ensuring compliance with environmental emissions standards.

Biomass Boilers (CVT-S Model) range between 350kW$_{th}$ and 6.000 kW$_{th}$.

VENTIL products are conceived from rigorous specifications and strict accordance with the relevant international standards. VENTIL products carry CE marking as a result of full compliance with all safety regulations safe-guarding the well-being.

More information on those boilers is given in the ANNEX.

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11.Country report: Slovenia

11.1. National legislation on biomass heating systems for the domestic sector

The Renewable Energy Directive (2009/28/EC) prescribes that Slovenia should reach a share of at least 25 % of energy from renewable sources in gross final consumption of energy by 2020. In order to fulfil that obligation, Slovenia adopted **National Renewable Energy Action Plan 2010-2020 (NREAP)** in 2010. NREAP presents national renewable energy policy, followed by expected final energy consumption for period 2010-2020. One of the specific measures prescribed for households is '*Promoting wood biomass boilers in households'.* The scheme is implemented by the Eco Fund, the Slovenian public environmental fund. The authority supervising the scheme is – from 2010 on – the Ministry of the Economy. Involvement in the scheme is voluntary.

Action Plan for Energy Efficiency for the Period 2014 -2020 (AN URE 2020) was adopted in May 2015. AN URE 2020 builds up on already existing instruments but more precisely define responsibilities of the relevant Ministries. This document provides overview of national energy targets and achieved savings and policy measures for implementation of the EU Renewable Energy Directive. AN URE 2020 sets an objective of limiting primary energy usage in 2020 up to 7125 mio. toe, and recognizes the existing building stock as a sector with the highest potentials for energy savings. It also defines '*Co-financing programme for the construction of district heating systems using wood biomass (Measure I.2)'* and enables the allocation of grants for the co- financing of projects for district heating using wood biomass (DHWB). The programme is being implemented as part of the Operational Programme for Environmental and Transport Infrastructure Development 2007 –2013 and will continue under the Operational Programme for the Implementation of European Cohesion Policy 2014 – 2020. Other measures for promoting efficient heating and cooling are:

- Mandatory inspections of combustion appliances for households and small industrial combustion appliances (inspection and cleaning of appliances, measurements of emissions and efficiencies, and the keeping of records by the chimney-sweeping service)
- Inspections of heating systems (new EZ-1 measure, inspections will be conducted by independent certified specialists who will provide an assessment of efficiency and adequacy in relation to the use of the building, and advice on improvements and alternative solutions for replacement, keeping of a register of reports of inspections of heating systems)
- Regular inspections of air-conditioning systems with a rated power of over 12 kW (assessment of efficiency and adequacy, advice on improvements and alternative solutions for replacement, keeping of a register of reports of inspections of air-conditioning systems)
- Advice in selecting, optimizing and using heating systems as part of the ENSVET (free citizens' advice) programme
- Regulations on the energy performance of buildings: mandatory 25 % share of RES, action plan for nearly zero-energy buildings
- Feasibility studies of alternative energy supply systems for new construction and major renovation of buildings with a floor area of over 1 000 m^2 (decentralized RES systems, district or communal heating or cooling, CHP and heat pumps are classed as alternative systems).

Furthermore, the implementation of five measures was envisaged for households in the 2010–2016 period: financial incentives for the energy-efficient renovation and sustainable construction of residential buildings

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(Measure G.1), financial incentives for energy-efficient heating systems (Measure G.2), energy-efficiency scheme for low-income households (Measure G.3), the division and billing of heating costs in multi-apartment and other buildings according to actual consumption (Measure G.4) and the citizens' energy advice network (Measure G.5). For G1 and G2 measures funds are available through Eco Fund as grants and loans at favorable interest rates. Measure G3 was part of the measures G1 and G2 in 2011 – 2012. Grants could also be obtained for investments in RES within the Rural Development Programme – specifically, Measure 121 (Modernization of Agricultural Holdings), Measure 123 (Adding Value to Agricultural and Forestry Products), Measure 311 (Diversification into Non-Agricultural Activities) and Measure 312 (Aid for the Establishment and Development of Micro-Enterprises).

The main legislative document that regulate energy sector is Energy Act (EZ 1), adopted in March 2014. Governed by the provisions of the ten European directives, it arranges the field of energy market, promotes energy efficiency, and renewable energy. The law gives the legal basis for the adoption of the national strategic documents that will define the long-term policy in the area of land use and energy supply in the future. The basic document shall be the Energy Concept of Slovenia (EKS), which should set out the objectives of a competitive, sustainable and reliable energy supply for the next 20 years and a framework for the next 40 years. National Development Energy Plan will be based on EKS, and it should set the framework plan for major investment in energy infrastructure. EZ1, § 322 prescribes that use of renewable energy, cogeneration and excess heat in the district heating systems is compulsory. The end users of heat and fuel have to pay a contribution to the production of heat from renewable sources. There is no contribution if the heat is gained from RES [44]. According to the § 338 the owner of the building has to assure the regular inspection of the heating system. This inspection also includes evaluation of efficiency of the heating system.

From 2013, on force is the *Decree on the emission of substances into the atmosphere from small and medium combustion plants* which was amended in 2015. It defines:

- Criteria for classifying combustion plants;
- Fuel that may be used in combustion plants;
- Evaluation of the emission of substances in the flue gases;
- Limits emissions from combustion plants;
- Measures relating to reducing emissions into the air;
- Operational monitoring of emissions into the air.

Combustion plant is small if the thermal input is less than 1 MW in the use of solid fuel. If the thermal input is more than 1 MW and less than 50 MW, the combustion plant is medium. Allowed solid fuels are: natural wood (firewood, sawdust, cuts, shavings, bark, and cones), wood briquettes and pellets from natural wood and coal, briquettes and coke from coal. Limit values for combustion plants are prescribed by the Decree on the emission of substances into the atmosphere from small and medium combustion plants (Table 16)

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Table 16. Limit values for small and medium combustion plants

		Limit values for the device installed and placed into service by 31 December 2014		Limit values for the device installed and put into service after 31 December 2014	
		CO [g/m³]	Total dust [g / m³]	CO [g / m³]	Total dust [g / m³]
One-room combustion plants	Space heaters with flat hearth	2,0	0,075	1,25	0,04
	Space heaters with filling furnace	2,5	0,075	1,25	0,04
	Devices on solid fuel, which slowly dissipate heat	2,0	0,075	1,25	0,04
	Fireplace inserts (closed operating mode)	2,0	0,075	1,25	0,04
	Refills tiled stoves with flat hearth	2,0	0,075	1,25	0,04
	Refills clay oven with a filling furnace	2,5	0,075	1,25	0,04
	Stoves, solid fuel	3,0	0,075	1,50	0,04
	Heating stoves, solid fuel	3,5	0,075	1,50	0,04
	Pellet stoves without water heat exchanger	0,40	0,05	0,25	0,03
	Pellet stoves with water heat exchanger	0,40	0,05	0,25	0,02
Small combustion plants with rated output power more than 4KW	Natural wood and wood residues	1	0,1	1	0,1
	Wood briquettes and pellets	0,8	0,06	0,8	0,06
Medium combustion plants	On natural wood, wood residues, wood briquettes and pellets	1,5	0,02	1,5	0,02

Source: Decree on the emission of substances into the atmosphere from small and medium combustion plants

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11.2. Biomass use and heating systems in the domestic heating sector

In Slovenia, biomass is an important source of energy, especially for rural population and forest owners. Moreover, households are the largest consumers of wood fuels with a total consumption of 1.24 million tons recorded for last year (Energy balance of the Republic of Slovenia 2015). According to estimates by SORS and SFI, in 2013 around 2 million tons of wood biomass were used for energy and heat production. In the last ten years there is an increasing interest in the production and use of various wood fuels. In Slovenia, 77 % of forests are private owned with more than 200.000 of private forest owners who are using wood for heating within the household.

The structure of final energy consumption by end use for space heating, water heating and cooking in household sector in Slovenia is shown in Figure 26 as performed by the Statistical office Republic of Slovenia (SORS). According to the latest data, wood fuels represent 50,2 % of final energy consumption for space heating, water heating and cooking in households. With 14 % extra light heating oil follows and is losing on consumption after 2010 due to rising prices of fossil fuels, in contrast to wood fuels where there is an upward trend, because wood as a domestic, renewable and affordable energy source became important again. Electricity with 12 % is also gaining on importance after 2013. 10 % of households use natural gas and almost 8 % use district heat. Other energy sources are not so commonly used - less than 3 % per source.

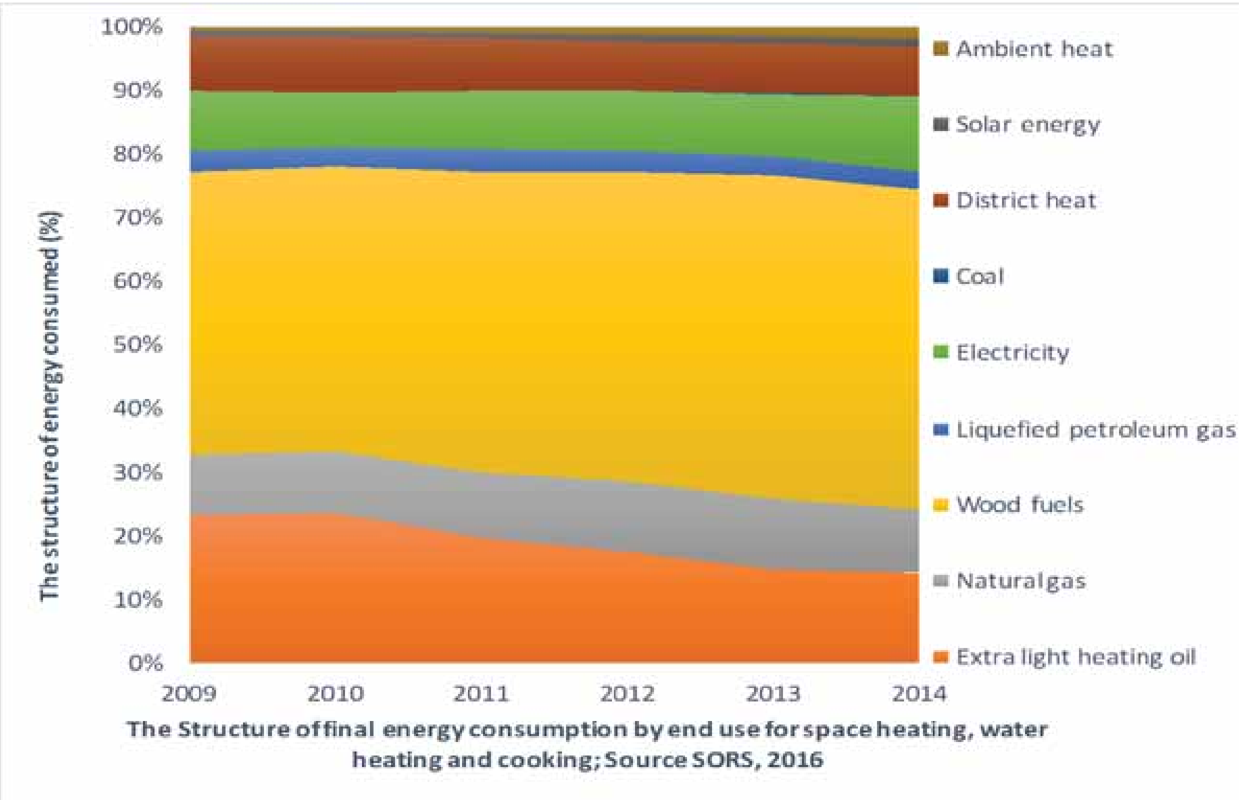

Figure 26: The structure of final energy consumption by end use for space heating, water heating and cooking in households. Source: SORS

The structure of total energy consumption in households is as follows: 60 % of energy is used for space heating, almost 20 % for water heating, the rest 20 % is consumed for operation of electric installations, cooking and

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lighting (SORS). As shown in Figure 27, the proportion of households in Slovenia using wood fuels for heating, more than 40 % of Slovenian households is using wood and the trend is growing which profess that wood is a really important fuel.

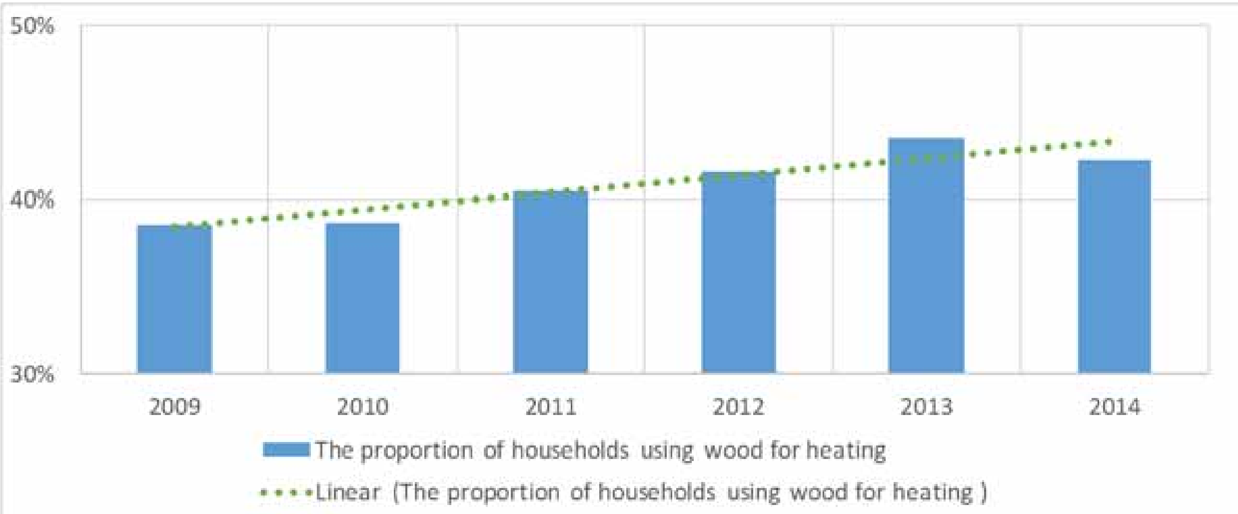

Figure 27: The proportion of households in Slovenia using wood fuels for heating (source: SORS).

The structure of wood fuels used compared with the reducing trend of extra light heating oil use is shown in Figure 28. Not only in rural areas but also in urban areas the use of wood fuels is increasing, especially as pellets but firewood wood is still the most common form of wood fuel in households.

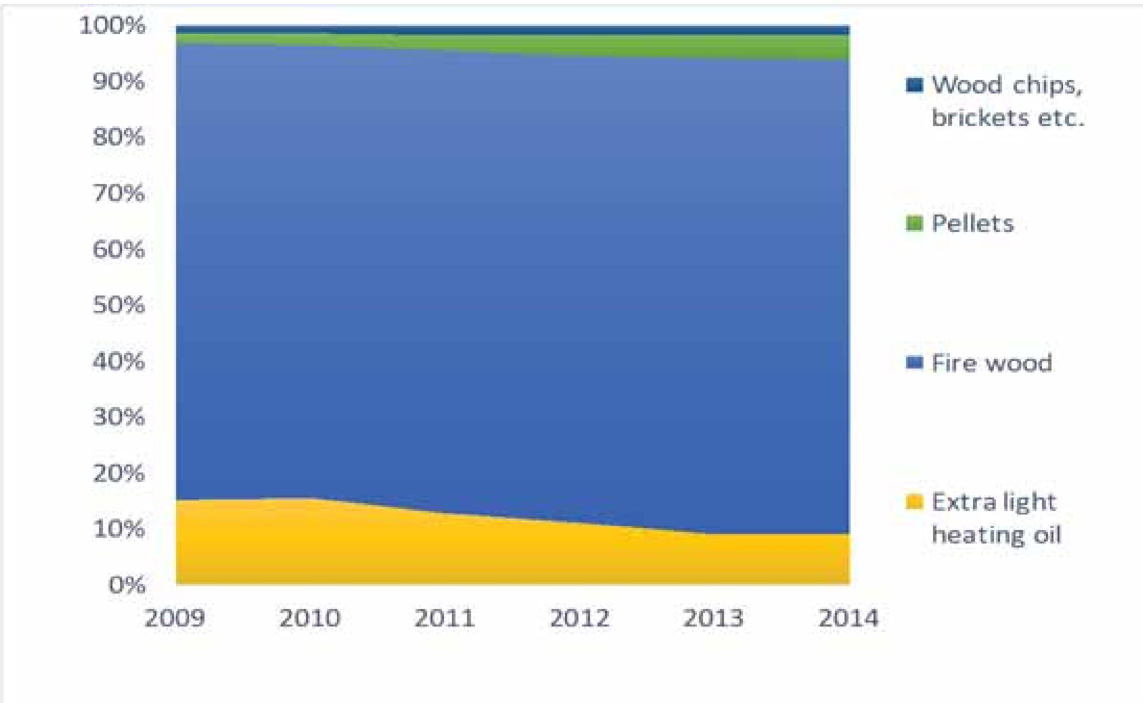

Figure 28: The structure of final energy consumption by two the most common energy source (wood fuels and extra light heating oil; on the basis of the quantity in tones) in Slovenian households. Source: SORS

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In Slovenia all households have some kind of space heating systems/installations. The most common used are central heating systems in residential construction. In multi-apartment buildings there are storey heating systems where closed heating system powers one flat or floor. Local heating devices are also in use, for example furnace or air conditioner, which can heat the space in which it is located. Classic radiator heating is the most often [45].

Slovenia have a large number of households with wood chips/logs/pellets/briquettes boilers. There are also a lot of houses/villages/settlements connected to the biomass district heating systems. The main problems are the conventional systems with old inefficient technologies. The market for all wood fuels in Slovenia is developing rapidly. The State has also contributed to this trend with co-financing the initial investments in modern boilers for central heating and support for the promotional projects.

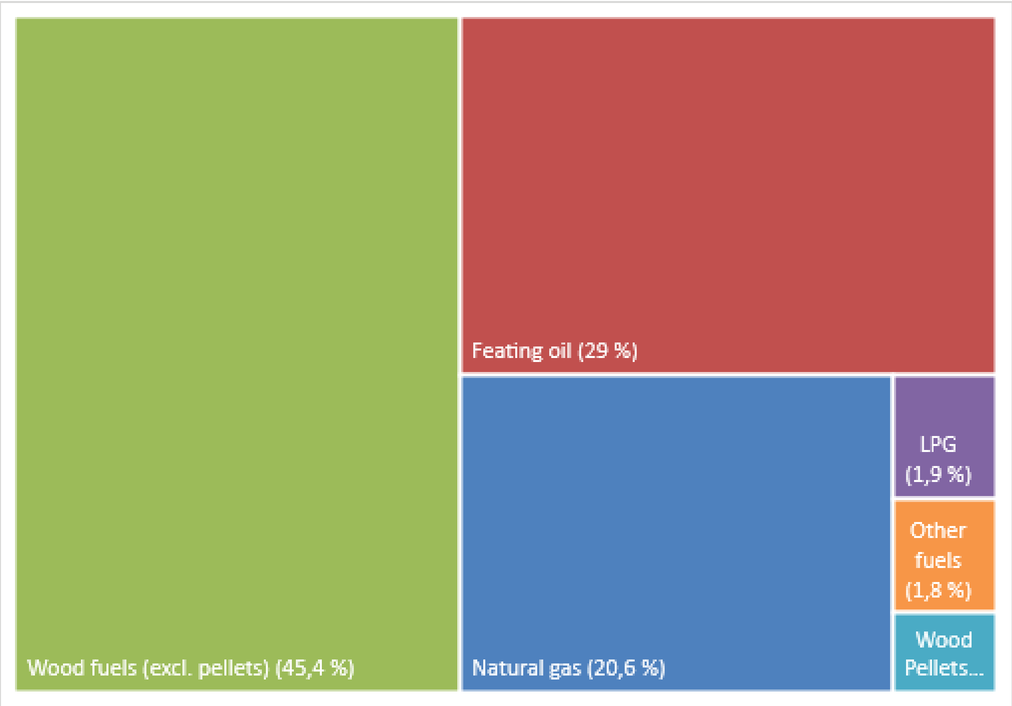

Figure 29: Structure of heating systems according to type of fuels used in households (data from Chimneysweepers data set 2016)

According to estimates by SORS and SFI, around 2 million tons of wood biomass were used for energy and heat production in 2013 (Figure 29). According to available data for Slovenia, more than 40 district heating systems in range of 85 kW to max. 152 MW are currently installed. The total power installed in all district heating systems in Slovenia is estimated at 235 MW with the heat production of 212 GWh/a and electricity production of 31 GWh/a [46]. The largest user of wood biomass is TE-TOL Ljubljana with installed biomass power of 152 MW. Its yearly production of heat is 60 GWh/a, electricity production 31 GWh/a and wood chips consumption 67 000 t/a [46].
The use of wood biomass in households has been slightly increasing, which is evident from the larger number of households using wood for heat production. The share of households using wood fuel for heat production is on the increase – in 2005, this share amounted to 38,9 %, while in 2010 it already amounted to 42,7 % (SORS). Recent SORS data from 2014 shows a household’s fuelwood consumption’s increase of 2 % compared to 2012 [46].

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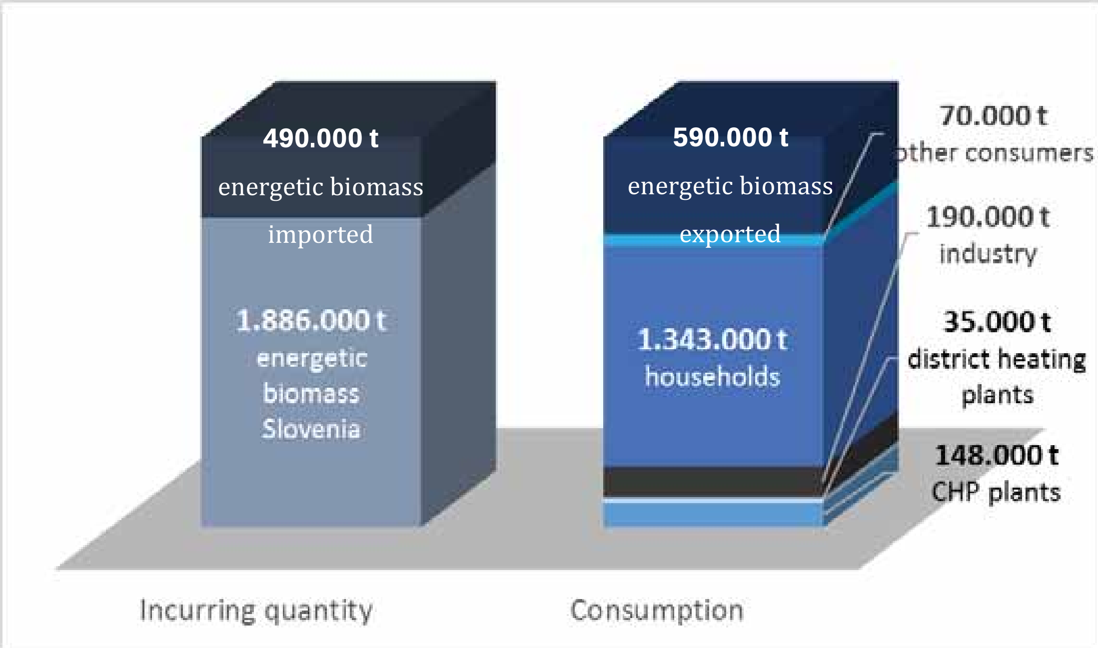

Figure 30: Production and foreign trade of energetic biomass (firewood, wood chips, pellets, briquettes, wood residues) in Slovenia for year 2013 (source: SORS, 2013; Market statement, 2014; analysis and calculation carried out by Slovenian Forestry Institute)

11.3. Support for purchase of biomass heating systems

Eco Fund, Slovenian Environmental Public Fund, is an independent legal entity, with the Ministry of the Environment and Spatial Planning. Its main purpose is to promote development in the field of environmental protection. "It is the only specialized institution in Slovenia that provides financial supports for environmental projects. The financial assistance is offered mainly through soft loans from revolving funds and since the year 2008 through grants. In comparison with commercial banks, Eco Fund's principal advantages in the market for environmental financing are that it provides soft loans at lower interest rates than prevailing commercial market rates and it is able to lend for significantly longer periods than commercial banks. Recent evaluations of the effective interest rates of Eco Fund's loans on the one hand, and those of commercial banks, on the other, have shown that a total of 15 % of the cost of an investments can be saved when opting for Eco Fund's loan.'' [47].
To fulfill its mission Eco Fund use following mechanisms:

- **Loans to individuals (households) for conversion from fossil fuels to renewable energy sources,** energy saving investments, investments in water consumption reduction, connections to sewage system, small waste water treatment plants, replacement of asbestos roofs;
- **Grants to individuals (households)** for investments in electric cars and **for investments in residential buildings (**energy efficiency and **use of renewable energy sources);**
- Loans to legal entities (municipalities and/or providers of public utility services, enterprises and other legal entities) and sole traders for investments in environmental infrastructure, environmentally sound technologies and products, energy efficiency, energy saving investments, and use of renewable energy sources;
- Grants to legal entities (municipalities and/or providers of public utility services, enterprises and other legal entities) for investments in electric cars and buses for public transport on compressed natural gas or biogas;

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- Grants to municipalities for investments in buildings where public education takes place (schools, kindergartens, libraries etc.), newly constructed as low energy and passive buildings or renovated in passive standard.

In 2014, Eco Fund granted loans (call 51OB14) in about Mio 3.8 EUR in use of renewable energy sources, from which were also financed, heat pumps and 46 wood biomass boilers with a total power of 1 099 kW for individual households. Loans had a floating interest rate of quarterly EURIBOR plus a fixed surcharge of 1.5%. Repayment period was up to 10 years, and maximum amount of a loan was 20.000 EUR. [48],(Eco Fund, 2015, p.21).

In 2014, Eco Fund granted (calls 24SUB-OB14 and 25SUB-OB14) around Mio 18 EUR from which around Mio 1.7 EUR were invested in biomass boilers. Those Mio 1.7 EUR covered installation of biomass boilers with total power of 33.3 MW. [48], (Eco Fund, 2015, pp.24-26)

In 2016, there is **a call 37SUB-OB16** for around Mio 15.8 EUR **of non-refundable financial incentives** to individuals for new investments of renewable energy sources and improved energy efficiency of residential buildings. Subject to public calls are non-refundable financial incentives for citizens to use renewable energy sources and greater energy efficiency in residential buildings for new investments on the territory of whole Slovenia and for some new investment in older residential buildings in the Municipality of Celje , the Municipality of Hrastnik, the Municipality of Kranj, the Municipality of Ljubljana, the Municipality of Maribor, the Municipality of Murska Sobota, the Municipality of Novo Mesto, the Municipality of Trbovlje and the Municipality of Zagorje ob Savi, because they are classified in the class of maximum load and have adopted the Ordinance on air quality plan due to excessive ambient air pollution with PM10 particles [49]. The purpose of call 37SUB-OB16 is to increase the use of renewable energy sources and greater energy efficiency in residential buildings and the reduction of excessive air pollution with PM10 particles, thereby improving the quality of ambient air. New investment is an investment for the execution of one or more of the below mentioned measures that will be implemented after submitting the application for a grant of financial incentives [49]:

A- installation of a solar heating system in a residential building
B- installation of a biomass combustion plant for the central heating of residential buildings
C- installation of heat pumps for central heating residential buildings
D- connection of older one- or two-dwelling buildings in the district heating on the renewable energy source
E installation of energy-efficient wooden building fittings in older residential building
F thermal insulation of facades of older one- or two-dwelling buildings
G thermal insulation of the roof or ceiling, unheated room in the older one- or two-dwelling buildings
H- installation of ventilation with heat recovery air in a residential building
I- construction or purchase of new, nearly zero-energy, one- or two-dwelling buildings
J- comprehensive renovation of older one- or two-dwelling buildings
K- purchase of residential units in three or more apartment building, refurbished into nearly zero-energy class

The amount of non-refundable financial incentives is up to 20% of the recognized investment costs, but not more than € 2000 for the biomass combustion plant for central heating of residential buildings. If the investment is made in an older building in the municipalities with the adopted Ordinance on air quality plan, the amount of non-refundable financial incentives is up to 50% of the recognized investment costs, but not more than € 4000 for the biomass combustion plant for central heating of residential buildings; wherein the incentive is entirely allocated from the Fund for climate change. Eligible costs include:

- Purchase and installation of one combustion plant per housing unit;

- Adaptation of existing or creation of a new connector for air inlet and flue outlet and the chimney sanitation;
- Purchase and installation of fuel tank, transport and security systems, CO sensors, control equipment, heat storage tank, hot water tank, sanitary heat pumps, fittings and other equipment for connection to central heating [49].

Also in 2016, there is a **call (36SUB-SOCOB15) for non-refundable financial incentives for socially weak citizens** to replace old boilers using solid fuels with new combustion plants using wood biomass in residential buildings in the certain municipalities. This call is valid only for municipalities directly mentioned in the call 37SUB-OB16, and for new investments where other preferred heating sources are not defined by local energy concepts. Non-repayable financial incentive may be granted only for the replacement of old heating plants using solid fuels in residential buildings with:

A - new biomass combustion plant, which will be connected to the central heating. The amount of non-refundable financial incentives is up to 100% of the recognized investment costs, but not more than:

- € 8,000 for small heating device on firewood and combined energy sources, which is not one-room heating appliance, basic stove or open fireplace;
- € 6,000 for small combustion plant on pellets, which is not a one-room heating appliance, basic stove or open fireplace;
- €4,000 for a pellet stove with water heat exchanger (fireplace) [49].

B - new, one room heating appliance on biomass that is suitable for heating the room in which it is placed. The amount of non-refundable financial incentives of up to 100% of the recognized investment costs, but not more than € 2000 for one room heating appliance [49].

Also, in 2016 there is a **call 55OB16 for loans** for environmental investments. Interest rate of the loan is equal to three-month EURIBOR + 1.3%, and repayment period is up to 10 years. Loan amount is up to recognized investment costs and a maximum of € 20 000, but not more than the recognized investment costs [49].

Figure 31 shows the number of granted subsidies for the investments into installation of a biomass combustion plant for the central heating of residential buildings.

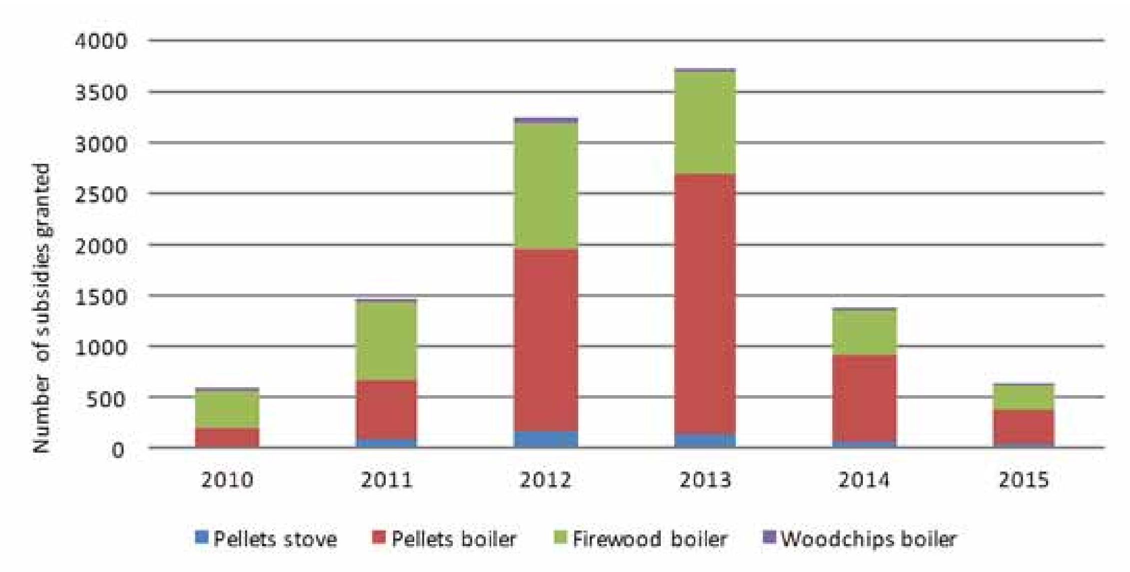

Figure 31: Number of non-refundable incentives holders (source: Eco Fund, 2016)

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11.4. Slovenian manufacturers of biomass heating systems

Individual heating systems (of private buildings) and biomass combustion plants market in Slovenia is very dynamic and there are several domestic production companies struggling on demanding concurrent conditions. Methodology of selection of relevant manufacturers presented below is based on latest (2016, [49]) conditions of Eco Fund's for the purchase and installation of biomass boilers in households. Only investments in boilers and stoves with following characteristics can be subsidized by Eco Fund.

- efficiency at rated output must be greater or equal to 90%,
- value of total dust emissions must be less than 40 mg/m^3 (20 mg/m^3 for pellet stove),
- value of carbon monoxide must be less than 400 mg/m^3 according to standard EN 303-5 (250 mg/m^3 for pellet stove, according to standard DIN EN 14785,
- values of emission combustion plants, i.e. wood chips, pellets or logs, should be set at the benchmark temperature of 273 K and pressure of 101.3 kPa and calculated oxygen content 13% in dry flue gas

To support investors a list with boilers meeting the above limitations is published and regularly updated by Eko Found. This list of boilers was used for selection of domestic boiler producers. The main criteria for the selection was that domestic producer has at least one boiler that meets all environmental and efficiency limits set by the legislation and that is why it is listed among the eligible boilers for subsidy (list published at Eko Found).

Seven Slovenian manufacturers are fulfilling demands for biomass combustion system. Complete list of latest heating systems (boilers, stoves) eligible for subsidies is available at: https://www.ekosklad.si/dokumenti/rd/37SUB-OB16/Seznam_kn.pdf. Those seven domestic manufacturers of biomass heating systems are presented in alphabetical ordered in next sections.

11.4.1. Biodom 27 d.o.o.

Biodom 27 d.o.o. (http://www.biodom27.si) is oriented in the development of high quality biomass combustion systems. Since 1999 they have introduced a number of innovations and improvements that have been realized through the development of pellet boilers brand "Biodom27". Brand is expanding in other EU countries especially in Italy, Romania, Spain, Greece, in other Balkan countries and in Russia.

Company is specialized in the development of pellet boilers and pellet stoves. In 2004 they began with the serial production. At first they were selling boilers mostly in Slovenia, and in 2006 they successfully expanded also to foreign markets. At the moment they export up to 80% of production. In addition, they also sell the brand of pellets "BIOPELET". The company vision is to become one of the leading companies in the European and global level in the field of heating on biomass (firewood and pellets) and maintain a high percentage of presence in the foreign and Slovenian market. The annual production reaches around 1000 pellets combustion systems with power range from 6 to 33 kW.

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The company provides the following biomass combustion plants, manufactured by the company itself:

- Pellet boilers (BIODOM brand): BIODOM 21, Biodom 27 C5 Valter, BIODOM 33, Biodom 27 E, Biodom 27
- Pellet stove of BIODOM brand: Biodom H20

Figure 32: Pellet boiler Bidom 33 (http://www.biodom27.si)

More information on some of those combustion plants is given in the ANNEX: Task 5.2 Questionnaire.

11.4.2. Petrič d.o.o.

Petrič d.o.o. (http://www.petric.si/) is working mainly in construction bussines, mainly focusing on road safety barriers, noise and wind barriers, dry construction, urban furniture, and traffic signalization. In well-equipped metal workshop they manufacture a number of different products and in 2011 they started to manufacture own pellet boiler and sell more than 1000 boilers in 2012. The company has more than 50 employees and has been in operation for more than 25 years [50].

Nowadays they produce inovative designed pellet boiler PP 27A for central heating of individual buildings from 80 to 400 square meter. Boiler has fully automized cleaning systems for heat exchanger and also for ash disposal.

More information on those combustion plants is given in the ANNEX: Task 5.2 Questionnaire.

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Figure 33: Petrič d.o.o. facilities (source: Petrič d.o.o., 2016)

11.4.3. WVTERM, d.o.o.

Company WVterm (http://www.wvterm.si/) from Maribor continues the TVT Boris Kidrič company's tradition in the field of boiler production. The beginning of industrial production reaches back in 1863 when the railway carriage and steam locomotive overhaul facilities were constructed to support new railway Vienna - Trieste. In 1970 the TVT Boris Kidrič company signed a contract with the German STADLER company. Later, TVT became the biggest producer of heating boilers in the former Yugoslavia. Unfortunately, this big company could not avoid the crisis, which appeared after the break-up of Yugoslavia. In 1995 an ownership transformation occurred and a new company WVterm was founded. During the past years WVterm proved to be a vital export oriented company. The changed approach to work enabled better conditions in all fields of operation. The operation economics provides the company with a favourable business partner position.

The company experienced rapid growth during the past years and today employees approx. 80 workers. Due to the local conditions, export orientation was compulsory and today represents over 60% of all production. Partners mainly come from the EU market. Besides the EU market the company is also present in the markets of the former Yugoslavia where the STADLER trademark is still appreciated. Perspective is built on experience upgraded with hard development work and with the aim to develop high quality products.

The conformity of products is guaranteed with the company's TÜV. Restoring the good name of the STADLER TVT® trademark with hard work and quality production is one of the company goals. Besides this, they are also present in the wood biomass market with Bioflamm® and HDG Bavaria trademarks. The company provides HDG boilers in Slovenia and other countries of the former Yugoslavia. Company's production programme is very wide and with its Made in Slovenija products covers almost all areas of hot water boiler production. In the last years, the company increasingly invested in new technologies (the welding technology was modernised with new pulse welding machines and robot welding of boilers and components, preparation of boiler parts is based on top-class laser cutting of sheet metal and CNC technology for sheet metal and pipe forming).

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In 2016 the company merged with a group NRG German financial group, which has in its structure the company Lambion and Maxxtec. The integration will part of those production, marketing activities and the sale of Lambion and Maxxtec products transferred in Maribor. The production volume of the company Lambion is very wide, producing the steam biomass boilers and hot water boilers from 1 to 50 MW and cogeneration. Maxxtec is a company specializing in the production of thermo-oil boilers with output from 0.5 to 30 MW and cogeneration power of 1 to 30 MW.

The company produce oil- and biomass boilers under STADLER brand and provides the following biomass combustion plants, manufactured by the company itself:

- Log boilers (controled combustion): STADLER GT, STADLER TR 15-40 kW, STADLER LT 15-30 kW, STADLER HM 8-15 kW
- Log boilers (clasical): STADLER CENTRAL 17 (7-10 kW); 23 (10-14 kW), 28 (15-19 kW), STADLER EKO and EKOs (12-100 kW), STADLER HS (26-44 kW), STADLER ST (25-40kW)
- Pellet burner: PX, PG and BeQuem
- Pellet boilers: STADLER PELET STAR, STADLER C28 PELET, STADLER ECO PELET, STADLER ECO PELET kompakt

Figure 34: WVterm d.o.o. offer wide range of biomass boilers (source: WVterm d.o.o.., 2016)

More information on some of those combustion plants is given in the ANNEX: Task 5.2 Questionnaire.

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11.4.4. STROJ - energijska tehnika d.o.o.

Company STROJ - energijska tehnika d.o.o. (http://www.ogrevanje-stroj.si) has 40-year tradition based on the development of renewable energy systems and it is considered as the promoter of solar energy.

The company was founded in 1978 by its founder Franc Stroj. His innovativeness is proved by patents and several innovation. The production program is based on the manufacture of combine heating systems (combination of wood fuels and solar systems). Company produce: solar panels, combined boilers, pellet burners, pellet storage, heat accumulators, water heaters - boilers, room fireplaces - stoves, heat pumps and heating systems of the facades.

The company itself produce boilers for combined fuels use, following can use biomass:

- Log or pellet boilers (controled combustion): LAMBDA – UP 20, STROJ OPTE 10 – 40, SOPTTE, SOPTE, SOPE. SPTE, 120 PZ. OP,
- Pellet burner: STROJ

Figure 35: Example of Biomass boilers (http://www.stroj-si.com)

More information on some of those combustion plants is given in the ANNEX: Task 5.2 Questionnaire.

11.4.5. OGREVANJE SEDELJŠAK, KOTLI NA BIO MASO IN DROBILNIKI, d.o.o.

Pioneering companies (http://www.sedeljsak.si/) dates back to 1980, when Justin Sedeljšak developed and began manufacturing wood biomass boilers. In 2007 he founded Ogrevanje Sedeljšak d.o.o., which continues the family tradition.

The company sells integrated solutions for equipping biomass heating systems: consulting, planning and execution of turn-key projects. It produces biomass combustion plants for wood processing industry and program of biomass boilers for domestic heating. All of products - biomass boilers, (also biomass shredders) are the results of own

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development.

Company from 2010 exceeding one million euros of revenues and generate added value about 30 thousand per employee. The main reason for revenue growth are high value-added are wood biomass boilers that are easy to use, with high energy efficiency, lower gas emissions and high degree of automatization of products.

The company provides biomass combustion plants (Pellet boilers, Log boilers, Chips boilers), manufactured by the company itself.

*Figure 36: Example of Biomass boilers (*www.**sedeljsak**.si*)*

More information on some of those combustion plants is given in the ANNEX.

11.4.6. Valtis Ogrevanje d.o.o

Valtis Ogrevanje d.o.o (http://www.waltis-heating.com/) is a company with 30 years of experience in the development and production of boilers for central heating. They are specialised in the development of fully automatic pellet boilers that guarantee the maximum heating comfort. Company is growing and exceeding 1,3 million euros of revenues per year.

The company provides the following biomass boilers, manufactured by the company itself:

- Log boilers (controled combustion): Viva Extreme (19, 25 or 32 kW),
- Log boilers (clasical): WSK 25, WSK 25B, WSK 33
- Pellet boilers: Peletka 25, Pellson X1, Pelson X3, Pellson X5, Pelson X7, Pellson classic, Pellson Doublefire
- Chip boilers: Pellson X15 200 kW

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Figure 37: Schematic section of boiler Peletka 25 (source: Valtis Ogrevanje d.o.o.., 2016)

More information on some of those combustion plants is given in the ANNEX: Task 5.2 Questionnaire.

11.4.7. VALHER ogrevalna tehnika d.o.o.

Boilers under the brand VALHER (http://www.valher.si) are produced since way back in 1971. The modest starting in the furnace began to manufacture the father of the current owner. In the first years the production was held at around 100 m2, and they produced around one hundred units per year. In the nineties, the family tradition of producing boilers for heating was continued by Tomaž Valher. With its own R & D staff and their innovative thinking, the company ten years ago began to develop special pellet boilers, combined boilers for solid fuel and pellets, and recently also log gasification boilers [51].

VALHER ogrevalna tehnika d.o.o. is a company specializing in the development, design and manufacture of biomass boilers for central heating. Their boilers are known for quality workmanship and long life service. Valher pellet boilers meet the standards of both Slovenian and Austrian Eco Fund [51].

The company provides the following biomass combustion plants and combined products, manufactured by the company itself:

- Log boilers (controled combustion): UPX
- Log boilers (clasical): STK, STK15, STK20
- Pellet burner: GP
- Pellet boilers: DKP, STP, PK

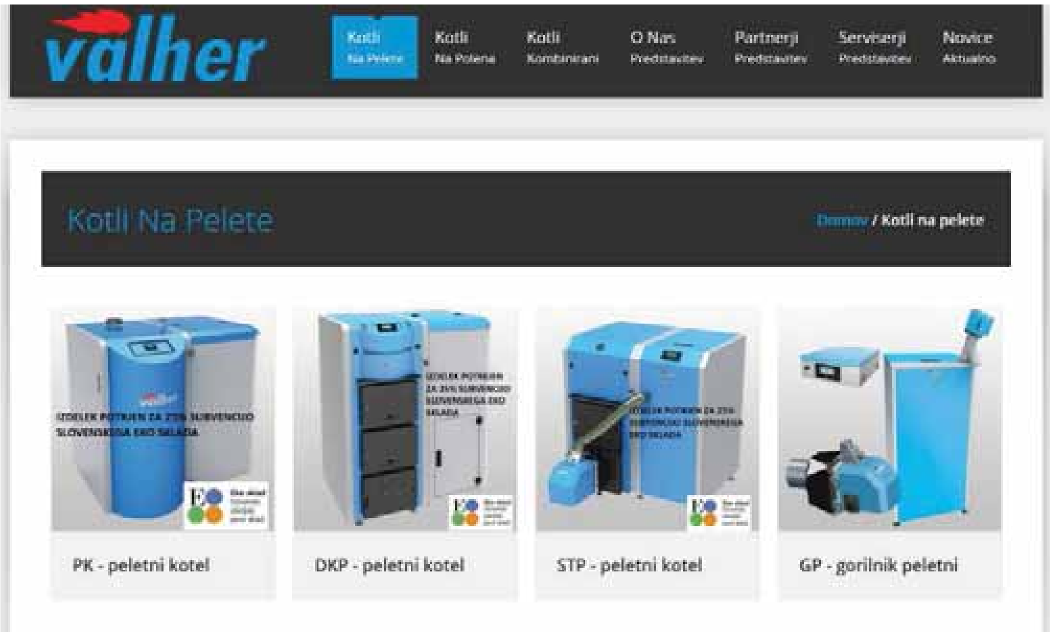

Figure 38: Pellet boilers (http://www.valher.si)

More information on some of those combustion plants is given in the ANNEX.

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12.Country report: Croatia

12.1. National legislation on biomass heating systems for the domestic sector

Based on the Air Protection Act (OG 130/11, 47/14), the Croatian Government has adopted the Regulation on the Levels of the Pollutants in the Air (OG 117/12) and the Regulation on Emission Limits of Air Pollutants from Stationary Sources (OG 117/12, 90/140). The first Regulation primarily lays down the limits and target value for individual pollutants in the air at the state level. The second Regulation primarily lays down the limits for emissions of air pollutants from stationary sources, monitoring and evaluation of emissions, depending on the type of individual emission sources.

In the Regulation on Emission Limits of Air Pollutants from Stationary Sources (OG 117/12, 90/140), the combustion devices are divided depending on the installed thermal input and fuel used as shown in Table 17.

Table 17: Emission limit values for the combustion devices

Combustion device	Solid fuel and biomass	Liquid and gaseous fuel
Small	≥ 0,1 to 1 MW	≥ 0,1 to 3 MW
Medium	≥ 1 to 50 MW	≥ 3 to 50 MW
Large	≥ 50 MW	≥ 50 MW

Therefore, because the typical thermal input of households boilers and furnaces is below 50 kW, the domestic boilers and furnaces are not covered by the emission limits. However, the emission limits apply for the bigger heating systems, eg. in service sector buildings, or district heating sytems.

Limits for biomass fuels for small and medium combustion devices are defined as in Table 18.

Table 18: Limits for biomass fuels for small and medium combustion devices

	Small	Medium
Blackening of the chimney	1	n. a.
Carbon monoxide	1000 mg/m^3	50 mg/m^3
Solid particles	n. a.	150 mg/m^3
Sulphur oxides expressed as SO2	n. a.	2000 mg/m^3
Nitrogen oxides expressed as NO2	n. a.	500 mg/m^3 Turbulent combustion; 300 mg/m^3

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12.2. Biomass use and heating systems in the domestic heating sector

In the period 2000 - 2013, final energy consumption of Croatian households grew from 2,284 ktoe to 2,477 ktoe, ie. 8.5%. In the period 2000 - 2005, energy consumption with climatic corrections steadily grew. Estimated drivers of the increase were mainly colder winter periods and living standard increase, while the population size, the number of households and dwellings have not changed much in Croatia. After 2008 energy consumption with climatic corrections of households started to decrease due to the impacts of the economy crisis, because of energy efficiency measures and significantly warmer winter period after 2011. Figure 39 presents development of household energy consumption between 2000 and 2013 (Source: Energy Efficiency Trends and Policies in Croatia).

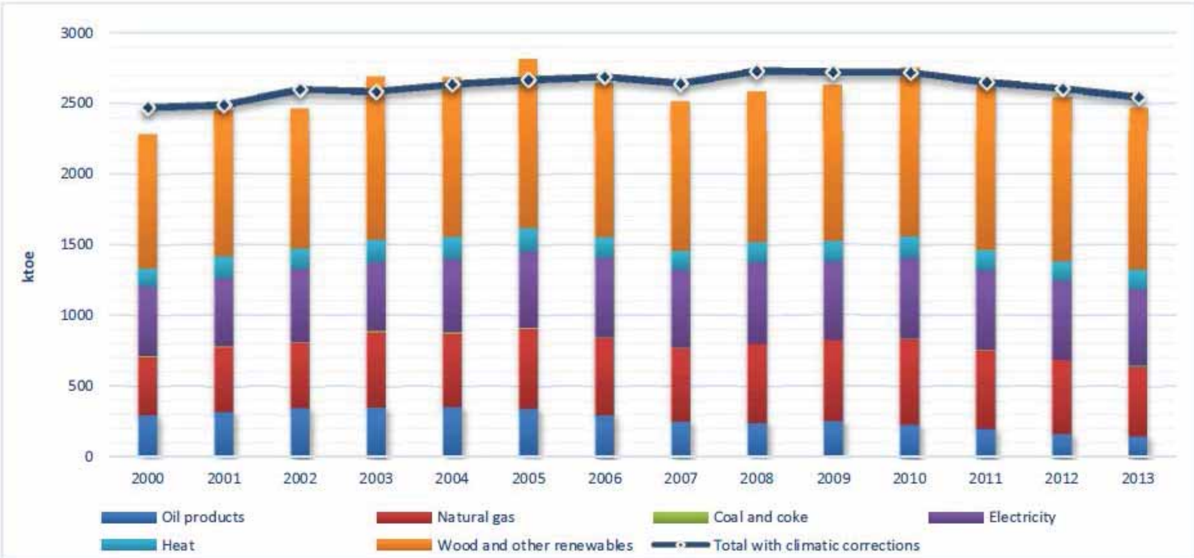

Figure 39: Final households energy consumption in Croatia by energy form (Source: EIHP, 2015)

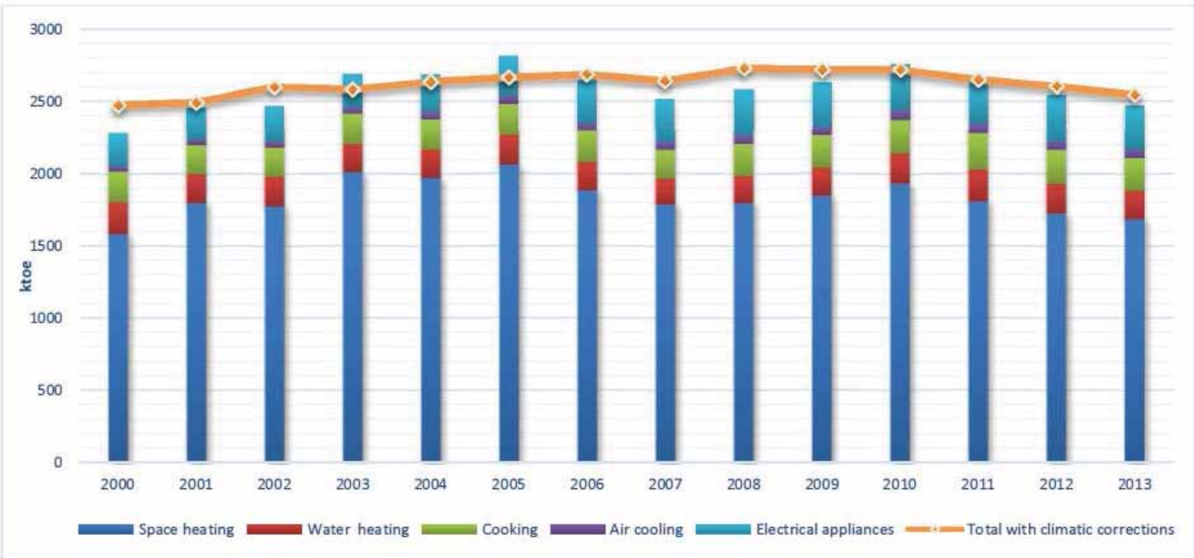

Figure 40: Final households energy consumption in Croatia by end-uses (Source: EIHP, 2015)

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In 2013 the highest market share was for wood and other renewables (46.7%), while electricity and natural gas also took big shares of 21.6% and 19.8% respectively. Oil products, heat and coal and coke realized smaller shares of 6.2%, 5.6% and 0.2% respectively. Compared with 2000, in 2013 shares of wood and other renewables increased from 41.5% by 5.2 percentage points, the share of electricity remained approximately the same (increased by 1.8 percentage points). The share of oil products decreased by more than half, ie. from 13.0% in 2000 to 6.2% in 2013. The share of natural gas grew from 17.9% in 2000 to 19.8% in 2013. Coal and coke has the lowest share in the households final consumption; it decreased from 0.4% in 2000 to 0.2% in 2013. The share of heat remained approximately the same, around 5.6%.

The share of space heating in total energy consumption of households in 2000 and 2013 slightly decreased from 69.2% to 68.0%. The share of water heating decreased from 9.7% in 2000 to 8.1% in 2013. The share of cooking remained around 9%, while the share of energy consumption of electrical appliances increased from 10.1% in 2000 to 12.6% in 2013. Air cooling has the lowest, but increasing share of 1.7% in 2000 to 2.4% in 2013 [52].

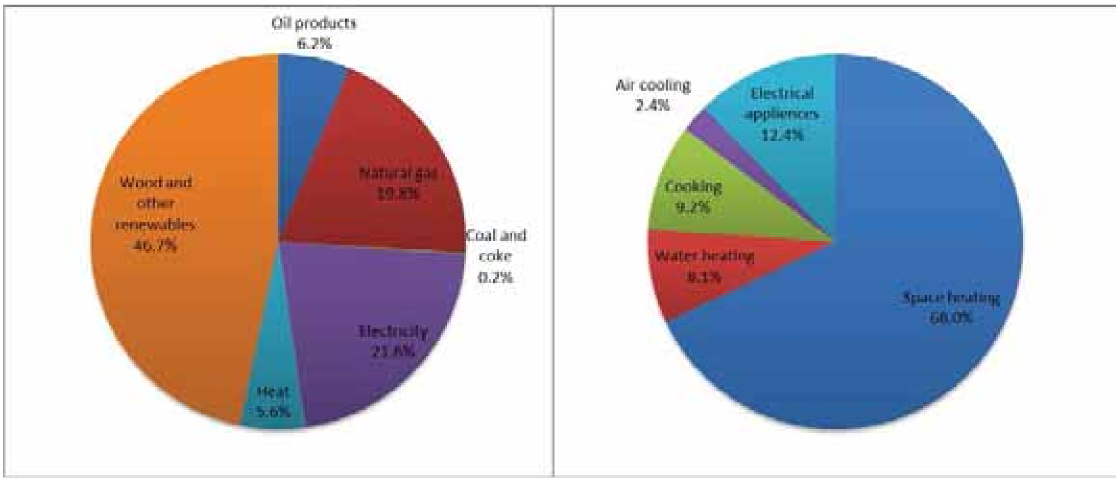

Figure 41: Shares of energy forms in households final energy consumption and shares of energy consumption by end-uses in 2013 (Source: EIHP, 2015)

Croatian Bureau of Statistics published the overview of heating by type of heating and energy used for heating, as shown in Table 19 [53].

Table 19: Overview of heating by type of heating and energy used for heating

Occupied dwellings - total	Central heating from community heating center	Central heating from installation in building or dwelling	Heating with stove	No heating	Unknown	Total
Wood	-	104,190	539,635	-	-	643,825
Coal	-	156	240	-	-	396
Masut	-	1,766	53	-	-	1,819

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Fuel oil	-	54,192	2,865	-	-	57,057
Gas	-	271,504	50,464	-	-	421,968
Other fuels	-	1,123	685	-	-	1,808
Electricity	-	24,598	189,697	-	-	214,295
Solar energy	-	388	182	-	-	570
Unknown	-	1,968	-	-	-	1,968
Total	136,670	559,885	783,82	16,121	61	1,496,558

There is no identified data on the number of biomass combustion devices separated by the biomass type. Thus it means there is no identified data on numbers of existing wood pellet, wood chips or other biomass combustion devices separately.

However, recent research on energy consumption in households and services [53] showed the wood consumption in households and services separated on sub categories. The resulted shares in wood consumptions were:

- fuel wood 98,9%
- pellets 0,4%
- wood briquettes 0,2%
- wood chips 0,5%.

It's obvious that the share of advanced biomass consumption is minor compared to fuel wood consumption. If those shares would apply on heating devices using biomass, ie. 643,825 as in Table 19 above, the resulted number of heating devices by biomass type would be:

- fuel wood 637,005
- pellets 2,402
- wood briquetes 1,176
- wood chips 3,242.[5]

12.3. Support for purchase of biomass heating systems

In Croatia, residences were built before 1987 and the most of them don't have proper thermal protection. These buildings consume 70% of energy for heating, cooling and hot water and with energy efficiency measures can

[5] These calculations should be considered as rough estimate because one bigger device can substitute more smaller and the share of energy used by biomass types don't have to be the same as shares of number of devices by biomass types.

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reduce their consumption around 60%.

„Program of energy renovation of family houses" was implemented by Fond for Environmental Protection and Energy Efficiency every year since 27th March 2014. Details for this year's program (2016) soon will be published by Fond for Environmental Protection and Energy Efficiency [54].

The aim of the program is:

- increasing and improving the energy efficiency of family houses
- reducing the energy consumption and emissions
- saving money

Eligible homes were family houses that satisfy the following criteria:

- Built based on the building permits with the accordance with Building Act (Official Gazette 153
- Gross building area of 600m^3 and a maximum of 3 units
- More than 50% of the area intended for habitation

One house can apply for co-financing of one or more the following measures.

Table 20: The amount of state subsidies for energy renovation of family houses[6]

Measures	Beneficiaries category		
	40%	60%	80%
	A	B	C
Thermal insulation of building envelope	Up to 30.000 HRK	Up to 45.000 HRK	Up to 60.000 HRK
Replacement of external joinery	Up to 30.000 HRK	Up to 45.000 HRK	Up to 60.000 HRK
Installation of gas condensing boilers	Up to 12.000 HRK	Up to 18.000 HRK	Up to 24.000 HRK
Installation system for using RES	Up to 12.000 HRK	Up to 18.000 HRK	Up to 24.000 HRK

[6] According to the exchange rate (average rate) from Croatian National Bank on 4th July 2016 –
1 EUR is 7.522302 HRK

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Maximum amount of incentives for house	Up to 84.000 HRK	Up to 126.000 HRK	Up to 168.000 HRK

A. all other areas
B. high land and mountain areas, the second group of islands
C. areas of special state care, the first group of islands

Eligible measures concern:

- Thermal insulation of building envelope (exterior walls, roof, ceiling, floor…)
- Replacement of external joinery
- Installation of gas condensing boilers
- Installation system for renewable energy sources (solar panels, biomass boilers, heat pumps…

12.4. Croatian manufacturers of biomass heating systems

In the Croatian market there are a few national manufacturers of biomass heating systems and they produce only stoves and boilers for wooden biomass, because the wooden biomass is the main source used in Croatia. During the interview with those national manufacturers they explained that in Croatia there is no demand for the heating systems (stoves and boilers) with focus on Mediterranean biofuels.

12.4.1. Centrometal Ltd.

Manufacturer „Centrometal Ltd." (http://www.centrometal.hr/) was funded in 1965 in Macinec and it became a leading Croatian thermotechnical equipment constructor. The Centrometal Ltd. has the emphasis on manufacturing the equipment which uses renewable energy sources (wood, pellets, wood chip, solar). Since 1991., they sale the wood boilers and a few years ago they started to sale wood pellets boilers.

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Figure 42: Centrometal Ltd. (Source: http://www.centrometal.hr/en/about-us/)

Today Centrometal Ltd. operates on 30 different markets in Europe and employ over 200 workers. The quality of products and management of the company are guaranteed by ISO 9001/2008 certificate [55].

The company provides the following biomass combustion system products which are manufactured by the company itself:

Wood Pellet boilers

- **PelTec** –designed for firing with wood pellets only. Hot water boiler for central heating system with integrated pellet burner, nominal heat output 12, 24, 30 and 48 KW.
- **CM Pelet Set**- delivered ready prepared for integration with the boilers EKO-CK P and EKO-CKB P with a nominal heat output from 14 to 90 kW or EKO-CK and EKO-CKB with an nominal heat output from 14 to 50 kW.
- **EKO-CKS P Unit** (140-560 kW) is designed for burning wood pellets.
- **CentroPlus / CentroPlus-B** - A hot water boiler for central heating systems for firing with solid fuel, solid and oil, solid and wood pellets, oil and wood pellets, with nominal heat outputs of 25, 35 and 49 kW.

Wood chips boilers

- **EKO–CKS Multi Plus-** Hot water boilers with nominal power output 170 – 580 kW are designed for burning with wood chip and wood pellets
- **BIO-CK P Unit-** is designed for burning wood chips, wood shavings, olive pits left after olive processing (olive cake) or solid fuel**.**

Wood pellet stoves

- CentroPelet Z8 and Z12
- CentroPelet ZS10
- CentroPelet ZV 14 and ZV 20-32

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More information on those systems is given in the ANNEX.

12.4.2. Senko Ltd.

Manufacturer Senko Ltd. (http://en.senko.hr/) was funded in 1978. The Senko manufacture classic and central heating cookers and open fireplaces fired by biomass. The company has a surface of 2,000 m^2 with modern technical equipment and employs 40 workers. The company has new product development department, preparation for components for laser cutting; CNC aided welding process of boilers, and a laboratory for quality control and product testing.

The annual production reaches around 1 500 pellet stoves and 80% of that exports to Slovenia, Hungary, Germany, France, Spain, Italy and even to New Zealand. The quality of products and management of the company are guaranteed by ISO 9001:2008 certificate [56].

The products that Senko Ltd. is manufacturing are:

1. Central heating cookers
2. Central heating fireplaces
3. Pellet stoves for central heating
4. Pellet stoves for residential space heating
5. Solid fuel cookers

The company provides the following biomass combustion systems products which are manufactured by the company itself:

Wood Pellet Stoves for central and resident space heating

- Pellet Stove for central heating P 12 WATER+AIR
- Pellet Stove for central heating P 20 WATER+AI
- Pellet Stove for central heating P12 Slim WATER+AIR
- Pellet Stove P7 and P10 AIR

More information on those systems is given in the ANNEX.

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13.Conclusions

A review of the manufacturers of commercial combustion equipment (stoves and boilers) presently existing on the market providing certified designs for the use of Mediterranean biofuels in Greece, Spain, Italy, Turkey, Portugal, Slovenia and Croatia has been performed. An overview of the basic combustion principles in biomass heating systems (air staging, stoking) and of the two main combustion systems under investigation (stoves and boilers) and their subcategories based on fuel type have been presented. Furthermore, the status of national legislation and the status of current biomass use and heating systems for each country have been reported.

In Greece, around 12.0% of the main domestic heating systems use biomass. Overall though, the Greek biomass market is not considered mature enough yet. A main reason for this is that, due to an administrative ban, biomass heating systems were not allowed in the large urban centers until fairly recently (2011). Recent statistics indicate that firewood is the most common biomass fuel (95.41%), followed by wood pellets (3.39%), olive cake (2.34%), wood briquettes (0.28%) and others (0.16%). Average annual thermal consumption in households is 10,244 kWh of which 85.9% is used for space heating, 4.4% for hot water production and 9.7% for cooking. Among the heating systems, boilers are the most common space heating system (71.12%), followed by stoves (11.61%), portable electric heaters (5.20%), air-conditioning split units (5.17%), fireplaces (4.31%) and others (electric thermal storage systems, district heating and heat pumps). The total number of installed biomass boilers in the domestic sector (with capacities lower than 60kW) has been reported to be up to 30,700. Technical characteristics of domestic heating systems have been collected from 4 main manufactures, which provide boilers with capacity in the range of 18 - 810 kW. According to legislation, biomass heating boilers should at a minimum meet the requirements of EN 303-5 Class 3.

In Spain, an installed capacity of 7,275 MW and a total number of 160,000 appliances using biomass has been estimated. Since 2014, there has been a significant growth in the number of installed MW in some Spanish regions (Autonomous Communities) especially in the regions where the installation of biomass devices is supported with public money. The major increase in biomass use has been observed through new connections with district heating systems. Besides this, remarkable increase in the number of installations that supply energy from biomass has also been noted in public buildings, schools, sport facilities/ swimming pools and residencies for the elderly. The average ratio of installed capacity estimated for Spain is 0.15 kW / capita and the average annual growth for 2015 in Spain is expected to be only 0.012 kW / capita. There are nearly 1,100 installers and 245 different manufacturers that have devices installed in Spain from a total of 28 countries, of which approximately 100 Spanish manufacturers of medium-small scale biomass combustion devices have been found. Technical characteristics of domestic heating systems have been collected from 9 main manufactures, who provide boilers with capacity up to 500 kW and stoves with thermal output in the range of 10-12 kW.

In Italy, more than 11 million domestic appliances and 500.000 boilers consuming woody biomass were estimated. 80% of domestic appliances are fed with wood logs, although pellet stoves are increasing their share. 97% of solid biomass used for thermal energy purposes was delivered to residential users in 2014 and a total of 273.000 TJ of thermal energy from biomass consumption were produced. The main manufacturers of domestic heating systems identified in Italy are around 11 and technical characteristics of domestic heating systems have been collected from 3 of them, who provide boilers with capacity range between 15-100 kW and stoves with a thermal output of approx. 9 kW.

In Turkey, use of natural gas has been increased remarkably, while the use of petroleum liquid and coal have decreased. Use of renewable energy in residential sector, including biomass, has been increased from almost 0% in 2005 to 5%. The initiation of governmental support for purchase of biomass heating systems might promote

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solid biofuel use in Turkey. Technical characteristics of domestic heating systems have been collected from 8 main manufacturers in Turkey, which provide boilers with capacity up to 1063 kW (1,000,000 kcal/h).

In Portugal, electricity emerged as the main source of energy consumed in households in the recent years, representing 42.6% of the total energy consumption. Firewood was the second main consumed energy source in Portuguese households, with a share of 29% in total energy consumption in homes (2013), having decreased its share in the past few years (from 60,3% in 1989 and 41,9% in 1996). For space heating of households in particular, the main source of energy used was biomass, followed in descending order of importance (in terms of consumption in toe) by heating oil, electricity and LPG. Biomass, mainly firewood, is the most common fuel, which represents about 68% of total energy consumption for space heating. Since the beginning of recession period in 2010, the energy consumption has been decreasing at 2.4%/year, reaching 2.6 Mtoe in 2013. 3 main Portuguese manufacturers are recorded in this report, which provide boilers with capacity ranging from 18 kW to 6 MW.

In Slovenia, around 2 million tons of wood biomass was used for energy and heat production in 2013. 60% of the energy consumption in the domestic sector is used for space heating, almost 20% for water heating, the remaining 20% is consumed for operation of electric installations, cooking and lighting. According to the latest data, wood fuels represent 50.2 % of final energy consumption for space heating, water heating and cooking in household, with extra light heating oil following, whose use has decreased after 2010 due to rising prices of fossil fuels, covering a share of 14%. Electricity with 12% is also gaining on importance after 2013. 10% of households use natural gas and almost 8% use district heat. The total power installed in all district heating systems in Slovenia is estimated at 235 MW with the heat production of 212 GWh/a and electricity production of 31 GWh/a. The largest district heating using wood biomass is TE-TOL Ljubljana with installed biomass power of 152 MW. Its yearly production of heat is 60 GWh/a, electricity production 31 GWh/a and wood chips consumption 67,000 t/a. Households are the largest consumers of wood fuels with a total consumption of 1.24 million tons recorded for 2015. More than 40% of Slovenian households are using wood for heating, with a growing trend. The share of households using wood fuel for heat production is on the increase – in 2005, this share amounted to 38.9 %, while in 2010 it already amounted to 42,7 %. Recent data from 2014 shows a household's fuelwood consumption's increase of 2 % compared to 2012. Technical characteristics of domestic heating systems have been collected from 7 manufactures, which provide boilers with capacity ranging from 6 to 200 kW.

In Croatia, final energy consumption of Croatian households grew from 2,284 ktoe to 2,477 ktoe, ie. 8.5% in the period 2000 - 2013. In 2013 the highest market share was for wood and other renewables which increased from 41.5% to 46.7%, while electricity and natural gas also took big shares of 21.6% and 19.8% respectively. Oil products, heat and coal and coke covered smaller shares of 6.2%, 5.6% and 0.2% respectively. The share of space heating in total energy consumption of households in 2000 and 2013 slightly decreased from 69.2% to 68.0%. A total of 643,825 heating devices using wood have been reported, of which 104,190 are central heating installations in buildings or dwellings and 539,635 are stoves. According to biomass type, the previous total number of heating devices is divided into 98.9% (637,005) using fuel wood, 0.4% (2,402) using pellets, 0.2% (1,176) using wood briquettes and 0.5% (3,242) using wood chips . In the Croatian market there are a few national manufacturers of biomass heating systems and they produce only stoves and boilers for wooden biomass, because the wooden biomass is the main source used in Croatia. The main manufacturers of domestic heating systems identified in Slovenia are 2 and technical characteristics of domestic heating systems have been collected from them; the capacity range for boilers is between 12-580 kW, while for stoves the thermal output is 7 – 19 kW.

The Annex to this report contains detailed technical characteristics of 78 in total different heating system series from a total of 32 manufacturers coming from the Biomasud Plus focus countries. In addition, 11 heating system

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series, suitable for the types of solid biofuels which are the main focus of Biomasud Plus, from 4 manufacturers located in third countries have also been reported.

A general remark for the technical characteristics of the boilers collected is that several manufacturers did not provide data for emissions; this could indicate that the combustion devices have not undergone type-testing according to the relevant standards..

A summary of types models which the manufacturers of each country produce per type of combustion system are presented in the tables below:

Table 21: Main characteristics of pellet stoves listed in the Annex

Manufacturers	Pellet stoves		
	Series	Models	Capacity range (kW)
LASIAN Tecnología del Calor, S. L. (SP)	Atilan Basic & Flow	2	12
	Erta Basic & Flow	2	10.4
	Fuji Basic & Flow	2	10.4
	Musa Basic & Flow	2	12
	Nila	1	10.4
	Teon Basic & Flow	2	12
DESAN (TR)	DSP	4	8 - 18
Aral Makine (TR)	DP	2	12 / 19.5
OZERTEKNIK (Ifyıl) (TR)	Truva / Abant/ Efes / Gediz	4	2/6 – 4/22
Senko Ltd. (HR)	Pellet stoves	5	7 - 19

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Table 22: Main characteristics of multi-fuel stoves listed in the Annex

Multi-fuel stoves				
Manufacturer	**Series**	**# Models**	**Capacity range (kW)**	**Fuel types**
Bronpi (SP)	Carlota	3	7.2/21.2 – 23.3	Pellets and olive stones
	Karina	1	9/27.6	-//-
LASIAN Tecnología del Calor, S. L. (SP)	Atilan EVO & EVO Flow	2	12	high and low quality pellets, crushed husks, olive stones and others
	Erta EVO & EVO Flow	2	10.4	-//-
	Fuji EVO & EVO Flow	2	10.4	-//-
	Musa EVO & EVO Flow	2	12	-//-
	Nila EVO	1	10.4	-//-
	Teon EVO & EVO Flow	2	12	-//-
CS Thermos Srl (IT)	Thelma120 / Luise120 / Notabene120 / Trendy120 / Cippatina120	1	9.04	Wood pellet (ISO 17225-2, A1); Calibrated wood chips: P16A; M10 (acc. ISO 17225-4)
	VENEXIA	4	15.4 – 22.9	almond shells, hazelnut shell, and other shells in general; olive stones
KOZLUSAN Heating Systems (TR)	Hydro Wood Pellet, Stove Slimpel-40, PEL-100, Prestige-25	4	3/17 - 116	Logs / pellets
Hoşseven Isı ve Yalıtım A.Ş (TR)	Peletli Isıtıcılar	4	2.2 - 24	Pellets / wood
Rodos Isı (TR)	RODOS	3	6 – 8.2	Logs / pellets
Yakar Soba (Karmasan) (TR)	LOGPEL,PRESTIGE	3	5/23 - 30	Logs / pellets

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Table 23: Main characteristics of wood log boilers listed in the Annex

Wood log boilers			
Manufacturer	Series	# Models	Nominal capacity range (kW)
Thermodynamiki S.A. (GR)	Kombi kn	8	18 - 300
Thermostahl S.A. (GR)	Multiplex MCL	18	47 - 698
SOLZAIMA (PT)	SZM WI & W	2	42 / 35
OGREVANJE SEDELJŠAK, KOTLI NA BIO MASO IN DROBILNIKI, d.o.o. (SI)	BIOLIN	4	20 - 60
STROJ - energijska tehnika d.o.o. (SI)	LAMBDA – UP 20	1	20
VALHER ogrevalna tehnika d.o.o. (SI)	UPX	3	20 - 50
Valtis Ogrevanje d.o.o. (SI)	VIVA EXTREME	4	19 - 32
WVTERM, d.o.o. (SI)	GT, LT, TR	4	20 - 30

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Table 24: Pellet boilers listed in the Annex

Pellet boilers				
Manufacturer	**Series**	**# Models**	**Nominal capacity range (kW)**	**Grate technology**
Thermodynamiki S.A. (GR)	Kombi CPB	2	18 / 25	Fixed grate
Thermostahl S.A. (GR)	Pelletstar	9	23 - 105	Depending on burner
		7	116 - 267	Depending on burner
		3	256 - 325	Moving grate
		7	349 - 814	Depending on burner
LASIAN Tecnología del Calor, S. L. (SP)	Bora Basic & EVO	2	18 / 18.5	Fixed burner
	Helens Basic & EVO	2	22.5	Fixed burner
	Saba Basic & EVO	2	22.5	Fixed burner
	Shima Basic &EVO	2	18 / 18.5	Fixed burner
SOLZAIMA (PT)	CZM C	2	18 / 24	N/A
Petrič d.o.o. (SI)	MADE By Petrič	1	32.97	Moving grate
STROJ - energijska tehnika d.o.o. (SI)	OPTE, SOPTE, SOPE	4	27.2 - 50	Fixed grate
VALHER ogrevalna tehnika d.o.o. (SI)	PK	4	20 - 50	Fixed grate
Valtis Ogrevanje d.o.o. (SI)	PELETKA	1	26.47	Fixed grate
WVTERM, d.o.o. (SI)	PELLSON	4	10 - 70	Fixed grate
	PELET STAR, STADLER C 28 PELET, STADLER EKO PELET	4	20 - 40	Fixed grate

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Pellet boilers				
Manufacturer	**Series**	**# Models**	**Nominal capacity range (kW)**	**Grate technology**
Centrometal Ltd. (HR)	PelTec	5	12 - 48	Drop shaft burner grate
	Cm Pelet set	10	14 - 90	Fixed grate
Herz Energietechnik (A)	Pelletstar	2	10 - 60	Fixed grate

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Table 25: Multi-fuel boilers listed in the Annex

Multi-fuel boilers					
Manufacturer	**Series**	**# Models**	**Nominal capacity range (kW)**	**Fuel types**	**Grate technology**
I. Nitadoros S.A. (GR)	-	5	64 - 209	Olive kernel, pellets, chips, fuel wood, pomace wood	volcano type furnace
N. Samaras (GR)	ΜΙΛΕ Π	4	40 - 93	Automatic: Olive pits, mixes of olive pits with woodpellets or agropellets or fruit pits up to the size of peach Manual: wood, briquettes etc.	fixed grate
	ΜΙΛΕ BIO	4	40 - 93	Wood, olive pits, mixes of olive pits, wood pellet, agropellet*, almond, peach, shells	- // -
	ΜΙΛΕ BIO XL	3	132 - 210	- // -	- // -
Thermostahl S.A. (GR)	Bioplex HL-B Unit	19	47 - 640	Pellet, biomass, pits, olive pits, wood, coal	fixed grate
Biocurve (SP)	Condensing boiler BCH	8	25 - 100	Pellets and olive stones	Rotating plate
Bronpi (SP)	HYDROALASKA	1	21.2 / 23.3	- // -	Moving grate
	HYDROARTICA	2	27.6 / 34.5	- // -	- // -
	HYDROBALTICA	2	27.6 / 34.5	- // -	- // -
	HYDROPOLAR	1	23.3	- // -	- // -
Carsan (SP)	CLbio Combi	1	27	Pellets, olive stones almond shells, grounded stones /shells: hazelnut, nut, apricot or similar.	Fixed grate
	CLbio Compacta	1	24.4	- // -	- // -

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Multi-fuel boilers					
Manufacturer	**Series**	**# Models**	**Nominal capacity range (kW)**	**Fuel types**	**Grate technology**
Domusa (SP)	BIOCLASS NG 66 and M	4	66 - 132	hardwood pellets, olive stones and hazelnut shells	Moving grate
	BIOCLASS NG OD	2	15.6 / 25.3	- // -	- // -
	BIOCLASS NG	4	10.1 – 42.7	- // -	- // -
	BIOCLASS NG +DR	4	10.1 – 42.7	- // -	- // -
Industrias Hergom, S. A. (SP)	Gredos	4	25 - 50	Pellets, olive stones, almond shells and wood	Fixed grate
	Oliva Domestic	3	30 - 65	Pellets, olive stones and almond shells	Other
	Oliva Industrial	7	100 - 500	- // -	Fixed grate
	THT	7	100 - 500	Pellets, olive stones, almond shells and wood.	-//-
Intecbio (SP)	ITB CP	2	36 – 50.2	Pellets, triturated almond shells and olive stones	Fixed grate
	ITB DO	3	36 - 85	- // -	- // -
LASIAN Tecnología del Calor, S. L. (SP)	Bioselect	4	31.16 – 56.74	High and low quality pellets, crushed husks, olive stones and others	Fixed burner
Natural Fire (SP)	NF-250	1	250	Pellet. olive stones. almond shells	Fixed or moving grate depending on the burner

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Multi-fuel boilers					
Manufacturer	**Series**	**# Models**	**Nominal capacity range (kW)**	**Fuel types**	**Grate technology**
Tubocás (SP)	BIOTUCAL	2	25 / 46	wood pellet, olive stones, almond/hazelnut/pine nut/walnut shells, chopped stones (peach, apricot, or similar), wood logs (only manually)	Fixed grate
D'Alessandro Temromeccanica Srl (IT)	CS	4	30 - 80	Wood pellets, almond shells, hazelnut shell, and other shells in general; olive stones and olive cake	Fixed grate
Pasqualicchio Srl. (IT)	CS MARINA	4	29 - 92	Wood pellets; olive stones; olive cake	Fixed grate
	CSB MARINA	4	29 - 92	-//-	-//-
Felluce Isı (TR)	FLC-PST-KC,FLC-STK,FLC-PST	4	34 - 104	pellets ,hazelnut shell, apricot kernel, peach kernel, pine cone and olive pomace	N/A
SOLZAIMA (PT)	SZM A	3	18 - 30	Pellets and olive stones	N/A
TORBEL (PT)	BIOMASS BOILER – HORIZONTAL Cal H TB	4	145 - >580	wood, wood chips, sawdust, nutshells, pine bark, pinecone, marc and olive stone or pellets	fixed grate or moving grate (according to the type of fuel)
	BIOMASS BOILER – VERTICAL Cal V TB	4	350 - >870	bark, wood chips, sawdust, pellets or briquettes, bagasse and olive pit	- // -
VENTIL (PT)	CVT-SModel	4	350 - 1160	Wood chips, pellets, olive pits , nut shells (almond , pine nuts), forest residues and waste from the wood industry	Fixed grate

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Multi-fuel boilers					
Manufacturer	**Series**	**# Models**	**Nominal capacity range (kW)**	**Fuel types**	**Grate technology**
STROJ - energijska tehnika d.o.o. (SI)	BIOMAC	4	30 - 100	Wood chips, wood scrapings, sawdust (automatic feeding); logs and wood chunks (manual feeding)	Fixed grate
Centrometal Ltd. (HR)	BIO-CK P Unit	4	25 – 100	Wood chips, wood shavings, olive pits left after olive processing (olive cake) or solid fuel	Fixed grate
KWB Kraft und Wärme aus Biomasse GmbH (A)	KWB Multifire	8	20 - 120	pellets / wood chips / olive stones / miscanthus /short rotation coppice	Rotary grate
	KWB Powerfire	4	130 - 300	pellets / wood chips / olive stones	Rotating grate
Herz Energietechnik (A)	BioMatic BioControl	N/A	220 - 450	Wood chips, pellets, olive stones	Fixed grate
	BioFire	1	500	wood chips, pellets, olive stones	Moving grate
	Firematic	22	20 – 60, 80 – 301, 349 - 499	-//-	Fixed grate (20 – 60 kW) / moving grate (>80 kW)
GUNTAMATIC Heiztechnik GmbH (A)	Powerchip	N/A	20 - 400	wood chips, pellets, miscanthus, energy corn	Moving grate
Fröling Heizkessel- und Behälterbau Ges.m.b.H. (A)	P4 Pellet	10	8 - 105	olive stones, pellets	Fixed grate (special grate for olive pits)
	T4	11	24 - 150	olive pits (depending on the size), nut shells, grape vine, olive cuts (<35% moisture)	Fixed grate

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Multi-fuel boilers					
Manufacturer	Series	# Models	Nominal capacity range (kW)	Fuel types	Grate technology
	Turbomat	7	150 - 499	-//-	Moving grate
	Lambdamat Industry	5	150 - 750	-//-	-//-
	Lambdamat Kommunal	4	300 - 999	-//-	-//-

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Annex to D5.2: Report of the state of the art of combustion devices for the selected biofuels

Grant Agreement N°	691763	**Acronym**	BIOMASUD PLUS
Full Title	Developing the sustainable market of residential Mediterranean solid biofuels		
Work Package (WP)	WP5: Guidelines for Mediterranean solid biofuels appropriate combustion conditions		
Authors	Violidakis Ioannis, Karampinis Emmanouil, Nikolopoulos Nikos, Margaritis Nikos, Malgarinos Ilias (CERTH) Elena Borjabad, Raquel Ramos (CIEMAT), Pablo Rodero Masdemont, Alicia Mira (AVEBIOM) Laura Baù, Valter Francescato (AIEL) Eyüp Şimşek, Mahmut Ateş (TUBITAK) Teresa Almeida, Sónia Figo (CBE) Darja Kocjan, Todora Rogelja, Jaka Klun, Matevž Triplat, Nike Krajnc (SFI) Hajdana Rukavina (ZEZ) Klaus Supancic, Thomas Brunner (BIOS)		
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	PP	Restricted to other programme participants (including the Commission Services)	
	RE	Restricted to a group specified by the Consortium (including the Commission Services)	

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Introduction

The present report is an Annex to Deliverable D5.2: "Report of the State of the art of combustion devices for the selected biofuels" of the Biomasud Plus Project (Horizon2020 / 691763).

The Annex includes which presents detailed information on several biomass heating systems produced by national manufacturers of the Biomasud Plus project focus countries (Greece, Spain, Italy, Turkey, Portugal, Slovenia, Croatia). It also includes information about biomass heating system from manufacturers located in other countries (e.g. Austria) which produce commercial systems suitable for use with the Biomasud Plus targeted fuels.

The information was collected through the use of a standardized template, which was sent to the heating system manufacturers. The requested data are presented below.

General information

Manufacturer: The company name along with other profile information (location, website & contact information).

Series name: Commercial name of the series for each individual biomass combustion system.

Photos / schematics: Any relevant photos or schematics of the system available.

Combustion system type: The type of combustion system referred in each case, in particular whether the combustion system is a boiler or stove.

Fuel type: The type of fuel which can be used with the specific type of boiler. Possible options are: Logs / briquettes / pellets / olive kernel / other. Any information provided by the manufacturer about the required fuel quality and/or physical and chemical characteristics are also to be listed here.

Basic design parameters and geometry

Boiler Model Name: The name of each of the models for any of the series of a combustion system.

Nominal thermal output (kW): The thermal output as stated by manufacturer. It can be distinguished in two separate types of thermal output:

Thermal output for Domestic Heating Water (D.H.W.) and warm water supply (kW): The thermal output provided as warm water either for domestic heating or for use

Thermal output for space heating (for stoves) (kW): The thermal output provided for space heating i.e. usually through warm air (applies mainly for stoves)

Output range (min. % of nominal load that can be achieved in continuous operation) (kW): It is the minimum share of the nominal load which the heating system can provide in continuous operation

System dimensions (Width x Height x Length – m or mm): The dimensions of the system. They can be considered both excluding daily fuel storage container and including daily fuel storage container if available. They are usually given in meters or millimeters.

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Net combustion system weight (kg): The weight of the system in an empty state, i.e. without being filled with water or fuel.

Heating surfaces (m^2): The total area of the heating surfaces

Cleaning of heating surfaces (automated / manual): It is specified here whether the cleaning of the heating surfaces is performed manually or automatically.

<u>**Fuel capacity and feeding**</u>

Fuel feeding (pneumatic / auger / manual / other): The method of feeding the fuel into the combustion chamber is determined.

Operation (continuous / intermittent): It is specified whether the operation of the combustion system can be performed continuously or intermittently.

Integrated Hopper / Silo (yes / no): It is specified whether an integrated hopper or silo to store fuel is included with the particular combustion system model.

Integrated Hopper / Silo Capacity (kg): The capacitiy of the hopper or silo (in kg) is specified, if it is included with the combustion system.

Typical fuel consumption (kg/h) [1]**:** A typical value for fuel consumption is specified (in kg/h)

Time between refueling (for intermittent use, stoves) (min / h): The time period in which the system can operate without refueling is specified. This applies to systems with intermittent operation like stoves, that operate without an automated feeding system.

<u>**Combustion technology**</u>

Combustion concept (**separated primary and secondary combustion zone or not):** It is specified whether the combustion technology uses primary and secondary combustion zone or not.

Stoker technology (Manual / automated -screw): It is specified whether there is an automated stoker technology or it is performed manually.

Fuel feeding to the fuel bed (from above / from the side /from below = underfeed stoker): The insertion point of fuel fed to the bed is specified. Possible options are from above, from the side, or from below, through an underfeed stoker.

Grate technology (fixed grate / moving grate / others): The grate technology is specified, which could be fixed, moving or any other type of grate.

Combustion chamber volume (l): The volume of the combustion chamber in litres (or any other unit convenient)

Combustion chamber dimensions (Width x Height x Length) /(m): The dimensions of the combustion chamber. The units could be given in m or mm and the dimensions measured could be (width x height x length) for rectangular chambers or (depth x diameter) for cylindrical.

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[1] At nominal load and minimum load for continuous use (Biomasud Plus fuels).

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Combustion chamber cooling concept (water cooled / air cooled / insulated): It is specified how the combustion chamber is cooled. Possible options include cooling with water, air or insulation of the walls with firebricks or any other medium.

Combustion air streams (primary air / secondary air / others): It is specified whether there is a primary and secondary air zoning of the air stream for combustion.

Combustion air supply (separate air fans / suction due to underpressure in the combustion chamber): The supply method for combustion air is defined. It is specified whether separate fans are used or the air is inserted through suction due to underpressure in the combustion chamber.

Air supply control (flaps / controlled fans): The method for air supply control is specified.

Deashing system (manual / automatic): It is specified whether there is an automatic system for ash removal or if it is manually removed.

Combustion and load control (manual / automatic / lambda sensor / temperature probe / CO sensor): Any means and sensors for control of combustion and load.

Efficiency and Class[2]

Boiler / Stove Efficiency (%): The energy efficiency of the combustion system

Combustion efficiency (related to fuel burnout)%: The combustion efficiency of the furnace

Electricity consumption (Wel/kW of boiler output): The consumption of electricity consumed by the individual systems of the boiler (feeding system, etc.) It is given in kWel per kW of boiler or in total kWel

Class according to EN 303-5:2012 (boilers only) 3 / 4 / 5 / not specified / not applicable: The class in which the boiler belongs, according to boiler standard EN 303-5:2012.

Hydraulics / Water circuit

Number of tubes (#): The number of water tubes connected to the boiler

Hydraulics connections (inches): The diameter of the water tubes and the ports where they connect to the boiler.

Maximum operation pressure (bar): The maximum pressure in which the boiler can be operated.

Tested pressure (bar): The maximum pressure in which the boiler was tested for strength and leaks under a hydrostatic test.

Water volume (l): The water capacity of the boiler i.e. the maximum water volume that the boiler can hold.

Minimum return temperature (°C): The minimum temperature of the water returning to the boiler

Maximum operation temperature (°C): The maximum temperature of the heated water which is reached in the boiler, under normal operation.

[2] At nominal load and minimum load; according to type testing if available for Biomasud-fuels.

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Flue gases / Emissions [3,4]

Chimney / Flue gas connection diameter (mm): The diameter of the chimney and the corresponding flue gas connection to the boiler.

Flue gas temperature (°C): The temperature which the flue gas reaches in the boiler at the output (entering the chimney).

Draught (forced / natural): The method used to drive the flue gas out of the furnace. It could be either forced with fans or with natural circulation of the flue gas

Location of flue gas fan (for forced draught systems): The location where the flue gas fan is situated.

CO (mg / Nm^3 and/or mg/MJ): Carbon monoxide emissions of the boiler

OGC (mg / Nm^3 and/or mg/MJ): Organic gaseous carbon emissions of the boiler

Dust (mg / Nm^3 and/or mg/MJ): Dust emissions of the boiler

NOx (mg / Nm^3 and/or mg/MJ): Nitrogen oxide emissions of the boiler

Other characteristics

Ignition (spark / kindling / other): The method of ignition used in the combustion system. Possible options are either with an ignition system producing a spark or with manual ignition through kindling or other.

Visual inspection of combustion chamber (yes / no): It is specified whether there is an option of visual inspection inside the combustion chamber through a glass window or any other way.

Ash compaction (yes / no): It is specified whether there is a system which compresses ash to ensure more seldom ash cleaning.

Ash chamber dimensions (Width x Height x Length): The dimensions of the ash chamber are specified, given in meters (m) or millimeters (mm).

Typical ash cleaning frequency times per week / month / other: It is determined how often the ash cleaning would be required to be performed per week, month or any other time scale unit convenient.

Other information: Any other useful information for the biomass combustion system is provided.

Cost data

Price range (VAT included): The price of the combustion system is given here, in euros (€), including VAT.

Maintenance cost (typical): The typical amount of maintenance cost in € / year.

[3] O_2 reference level for emission values reported in mg/Nm^3 should be 10% for boilers (EN 303-5:2012) and 13% for stoves (EN 13240:2001 & EN 14785:2006). In the case that different values were used, they are mentioned.
[4] At nominal load and minimum load; according to type testing if available for Biomasud-fuels.

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In the following pages, the questionnaires received from each biomass heating system manufacturer are presented.

DISCLAIMER: All data presented are as provided by the biomass heating system manufacturers. No independent checking cross-checking on their validity was performed.

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1. Greece

1.1. I.Nitadoros SA.

Manufacturer	I. Nitadoros S.A., Address: Π' str., Industrial area of Iraklion, Crete, Greece, P.C. 71601, http://nitadoros.com/ , Tel.: +30 2810 381247, +30 2810 381248, Fax: +30 2810 228929, Email: info@nitadoros.com
Series name	-
Photos / schematics	

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Combustion system type	Pellet and olive pits boiler					
Fuel type	Olive kernel, pellets, chips, fuel wood, pomace wood					
Boiler Model Name	**Units / Characteristics**	**55000**	**79000**	**114000**	**150000**	**180000**
Basic design parameters and geometry						
Nominal thermal output	kW	64	92	133	174	209
	Kcal/h	55000	79000	114000	150000	180000
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	635x1400x570	635x1550x770	700x1680x810	820x1650x860	830x1650x890
System dimensions	m	725x1400x660	730x1550x865	800x1680x910	925x1650x865	840x1650x1000

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(including daily fuel storage container) (Width x Height x Length)						
Net combustion system weight	kg	N/A	N/A	N/A	N/A	N/A
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual
Fuel capacity and feeding						
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger	auger
Operation	continuous / intermittent	Option for both depending on the settings	Option for both depending on the settings	Option for both depending on the settings	Option for both depending on the settings	Option for both depending on the settings
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	l	N/A	N/A	N/A	N/A	N/A
Typical fuel consumption	kg/h	1.2-3.7	1.6-4.8	2.1-6.5	3.0-8.8	4.1-11.9
Time between refueling (for intermittent use, stoves)	h	depending on the settings (0 to as often it is desired)	depending on the settings (0 to as often is desired)	depending on the settings (0 to as often is desired)	depending on the settings (0 to as often is desired)	depending on the settings (0 to as often is desired)
Combustion technology						
Combustion concept	separated primary and secondary combustion zone or	no	no	no	no	no

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	not					
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)	automated (screw)	automated (screw)	automated (screw)
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from below	from below	from below	from below	from below
Grate technology	fixed grate / moving grate / others	No grate-volcano type furnace	No grate-volcano type furnace	No grate-volcano type furnace	No grate-volcano type furnace	No grate-volcano type furnace
Combustion chamber volume	l	N/A	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	mm	N/A	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled / insulated	insulated	insulated	insulated	insulated	insulated
Combustion air streams	primary air / secondary air / others	N/A	N/A	N/A	N/A	N/A
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	manual	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe /	manual / automatic / lambda sensor /	manual / automatic / lambda sensor /	manual / automatic / lambda sensor /	manual / automatic / lambda sensor /	manual / automatic / lambda sensor / temperature probe

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	CO sensor	temperature probe	temperature probe	temperature probe	temperature probe	
Efficiency and Class						
Boiler / Stove Efficiency	%	90-92	90-92	90-92	90-92	90-92
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	N/A	N/A	N/A	N/A	N/A
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable					
Hydraulics / Water circuit						
Number of tubes	#	6	9	12	13	16
Hydraulics connections	inches	N/A	N/A	N/A	N/A	N/A
Maximum operation pressure	bar	3	3	3	3	3
Tested pressure	bar	5	5	5	5	5
Water volume	l	75	100	135	185	220
Minimum return temperature	^oC	51.9	51.9	51.9	51.9	51.9
Maximum operation temperature	^oC	80	80	80	80	80
Flue gases / Emissions						
Chimney / Flue gas connection diameter	mm	N/A	N/A	N/A	N/A	N/A
Flue gas temperature	^oC	N/A	226.5	N/A	N/A	N/A

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Draught	forced / natural	natural	natural	natural	natural	natural
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A
CO	mg / Nm^3 (and/or) mg/MJ	N/A	4.25%	N/A	N/A	N/A
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	40 ppm	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	48	N/A	N/A	N/A
Other characteristics						
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling	kindling
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A
Typical ash cleaning frequency	times per week / month / other	1/week	1/week	1/week	1/week	1/week
Other information						
Cost data						
Price range (VAT included)	€	N/A	N/A	N/A	N/A	N/A
Maintenance cost	€ / year	0-10 (for cleaning	0-10 (for cleaning	0-10 (for cleaning	0-10 (for cleaning	0-10 (for cleaning

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(typical)		and steel brush)	and steel brush)	and steel brush)	and steel brush)	and steel brush)

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1.2. Kombi-Thermodynamiki SA.

Manufacturer	Kombi, THERMODYNAMIKI SA Heating Products Industry, 1st Km Ptolemaidas - Ardassas P.O. Code 50200, P.O. BOX 1, http://www.kombi.gr/ , **Tel:** +30 24630 28013, **Fax:** +30 24630 25753 Email: **Information:** info@kombi.gr **Sales:** sales@kombi.gr
Series name	kn
Photos / schematics	
Combustion system type	Wood boiler

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Fuel type	Fire wood Oil									
Boiler Model Name	**Units / Characteristics**	**18/30**	**30/50**	**50/80**	**80/120**	**110/165**	**160/220**	**200/260**	**250/320**	**300/380**
Basic design parameters and geometry										
Nominal thermal output	kW	18	30	50	80	110	160	200	250	300
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-	-	-	-	-	-
Thermal output for space heating (for stoves)	kW	-	-	-	-	-	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	11.25	22.5	37.5	60	82.5	120	150	187.5	-
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	540x1170 x820	540x127 0x820	610x1290 x910	680x1405 x1080	730x1460 x1245	820x149 0x1420	820x2280 x1460	820x230 0x1460	980x2390 x1700
System dimensions (including daily fuel storage container) (Width x Height x Length)	mm	-	-	-	-	-	-	-	-	-
Net combustion system weight	kg	170	242	300	412	518	654	1018	1032	1400
Heating surfaces	m^2	2.29	2.73	3.6	4.89	7.38	8.97	11.43	13.80	16.99
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual	manual	manual	manual
Fuel capacity and feeding										

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Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	manual	manual	manual	manual	manual	manual
Operation	continuous / intermittent	continuous	continuous	continuous	continuous	continuous	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	-	-	-	-	-	-	-	-	-
Integrated Hopper / Silo Capacity	kg	-	-	-	-	-	-	-	-	-
Typical fuel consumption	kg/h	3,70	7,41	12,35	20	27,5	39,54	49,43	61,78	74,14
Time between refueling (for intermittent use, stoves)	min / h	3-4 times/24 h	3-4 times/24 h	3-4 times/24 h	3-4 times/24 h	3-4 times/24 h	3-4 times/24 h	3-4 times/24 h	3-4 times/24 h	3-4 times/24 h
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or not	Natural draft	Natural draft	Natural draft	Natural draft	Natural draft	Natural draft	Natural draft	Natural draft	Natural draft
Stoker technology	Manual / automated (screw)	manual	manual	manual	manual	manual	manual	manual	manual	manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	from above	from above	from above	from above	from above	from above
Grate technology	fixed grate / moving grate / others	fixed grate with water	fixed grate with water	fixed grate with water	fixed grate with water	fixed grate with water	fixed grate with water	fixed grate with water	fixed grate with water	fixed grate with water
Combustion chamber volume	m^3	0.08	0,10	0,15	0,23	0,541	0,720	0,890	0,890	1,46

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Combustion chamber dimensions (Width x Height x Length)	mm	380X450X 480	380x530 520	450x550x 600	520X600X 740	570X1080 X880	655X110 0X1000	655X1360 X1000	655X138 0X1000	855X1380 X1240
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air	primary air	primary air	primary air	primary air	primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans
Air supply control	flaps / controlled fans	flaps	flaps	flaps	flaps	flaps	flaps	flaps	flaps	flaps
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	temperat ure probe	temperat ure probe	temperat ure probe	temperat ure probe	temperat ure probe	temperat ure probe	temperat ure probe	temperat ure probe	temperat ure probe
Efficiency and Class										
Boiler / Stove Efficiency	%	-	72.09	79.27	-	-	-	-	-	-
Combustion efficiency (related to fuel burnout)	%	-	-	-	-	-	-	-	-	-
Electricity consumption	Wel/kW of boiler output	-	-	-	-	-	-	-	-	-

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Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-	-	-	-	-	-	-	-
Hydraulics / Water circuit										
Number of tubes	#	5	6	7	8	10	11	11	11	13
Hydraulics connections	inches	1	1 ¼	1 ½	2	2 ½	3	3	3	4
Maximum operation pressure	bar	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Tested pressure	bar	4	4	4	4	4	4	4	4	4
Water volume	l	66	110	125	202	254	292	324	353	386
Minimum return temperature	^oC	45	45	45	45	45	45	45	45	45
Maximum operation temperature	^oC	90	90	90	90	90	90	90	90	90
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	180	200	200	200	250	250	300	300	300
Flue gas temperature	^oC	220	220	220	220	220	220	220	220	220
Draught	forced / natural	natural	natural	natural	natural	natural	natural	natural	natural	natural
Location of flue gas fan (for forced draught systems)		-	-	-	-	-	-	-	-	-
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other characteristics										

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Ignition	spark / kindling / other	kindling	kindling	kindling	kindling	kindling	kindling	kindling	kindling	kindling
Visual inspection of combustion chamber	yes / no	-	-	-	-	-	-	-	-	-
Ash compaction	yes / no	-	-	-	-	-	-	-	-	-
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-	-	-	-	-	-
Typical ash cleaning frequency	times per week / month / other	every 3 days	every 3 days	every 3 days	every 3 days	every 3 days	every 3 days	every 3 days	every 3 days	every 3 days
Other information										
Cost data										
Price range (VAT included)	€	900	1100	1320	1775	2965	3466	4588	4910	6060
Maintenance cost (typical)	€ / year	-	-	-	-	-	-	-	-	-

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Manufacturer	Kombi, THERMODYNAMIKI SA Heating Products Industry, 1st Km Ptolemaidas - Ardassas P.O. Code 50200, P.O. BOX 1, http://www.kombi.gr/ , **Tel:** +30 24630 28013, Fax**:** +30 24630 25753 Email: **Information:** info@kombi.gr **Sales:** sales@kombi.gr				
Series name	Kombi CPB				
Photos / schematics					
Combustion system type	Pellet boiler				
Fuel type	Pellet				
Boiler Model Name	**Units / Characteristics**	**CPB18**	**CPB25**	**-**	**-**

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Basic design parameters and geometry					
Nominal thermal output	kW	18	25		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-
Thermal output for space heating (for stoves)	kW	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	90%	90%		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.6 X 1.04 X 0.565	0.6 X 1.04 X 0.565		
Net combustion system weight	kg	125	125		
Heating surfaces	m^2	-	-		
Cleaning of heating surfaces	automated / manual	manual	manual		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger		
Operation	continuous / intermittent	intermittent	intermittent		
Integrated Hopper / Silo	yes / no	yes	yes		
Integrated Hopper / Silo Capacity	kg	110	110		

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Typical fuel consumption	kg/h	3.6	5.0		
Time between refueling (for intermittent use, stoves)	min / h	-	-		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	no	no		
Stoker technology	Manual / automated (screw)	-	-		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above		
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate		
Combustion chamber volume	l	27	31		
Combustion chamber dimensions (Width x Height x Length)	m	400X400X radius 200mm	400X450X radius 200mm		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled		
Combustion air streams	primary air / secondary air / others	primary air and secondary air	primary air and secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	suction	suction		
Air supply control	flaps / controlled fans	controlled fans	controlled fans		

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Deashing system	manual / automatic	manual	manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic/ temperature probe	automatic / temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%	90,20	90,00		
Electricity consumption	Wel/kW of boiler output	-	-		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#	11	14		
Hydraulics connections	inches	1′′	1′′		
Maximum operation pressure	bar				
Tested pressure	bar	4,5	4,5		
Water volume	l	50	50		
Minimum return temperature	°C	40	40		
Maximum operation temperature	°C	88	88		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	800	800		
Flue gas temperature	°C	120	120		
Draught	forced / natural	forced	forced		

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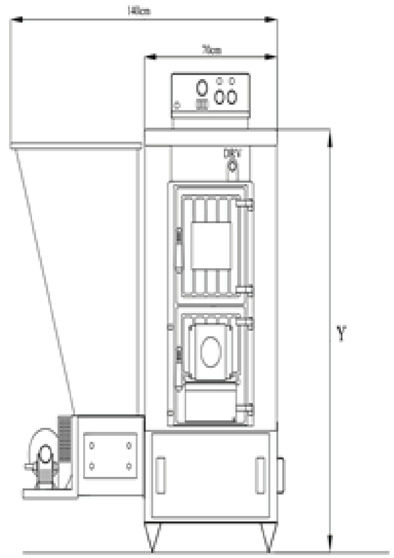
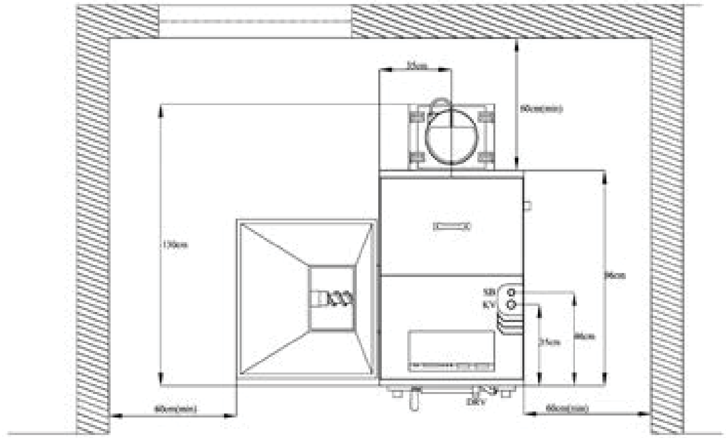
Location of flue gas fan (for forced draught systems)		Yes, at the exit	at the exit		
CO	mg / Nm^3 (and/or) mg/MJ	63,52	-		
OGC	mg / Nm^3 (and/or) mg/MJ	<2	-		
Dust	mg / Nm^3 (and/or) mg/MJ	37,35	-		
NOx	mg / Nm^3 (and/or) mg/MJ	-	-		
Other characteristics					
Ignition	spark / kindling / other	spark	spark		
Visual inspection of combustion chamber	yes / no	yes	yes		
Ash compaction	yes / no	no	no		
Ash chamber dimensions (Width x Height x Length)	mm	300mmx180mmx120mm	300mmx180mmx120mm		
Typical ash cleaning frequency	times per week / month / other	1/ week	1/ week		
Other information					
Cost data					
Price range (VAT included)	€	1750	1890		
Maintenance cost (typical)	€ / year	40,00	40,00		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

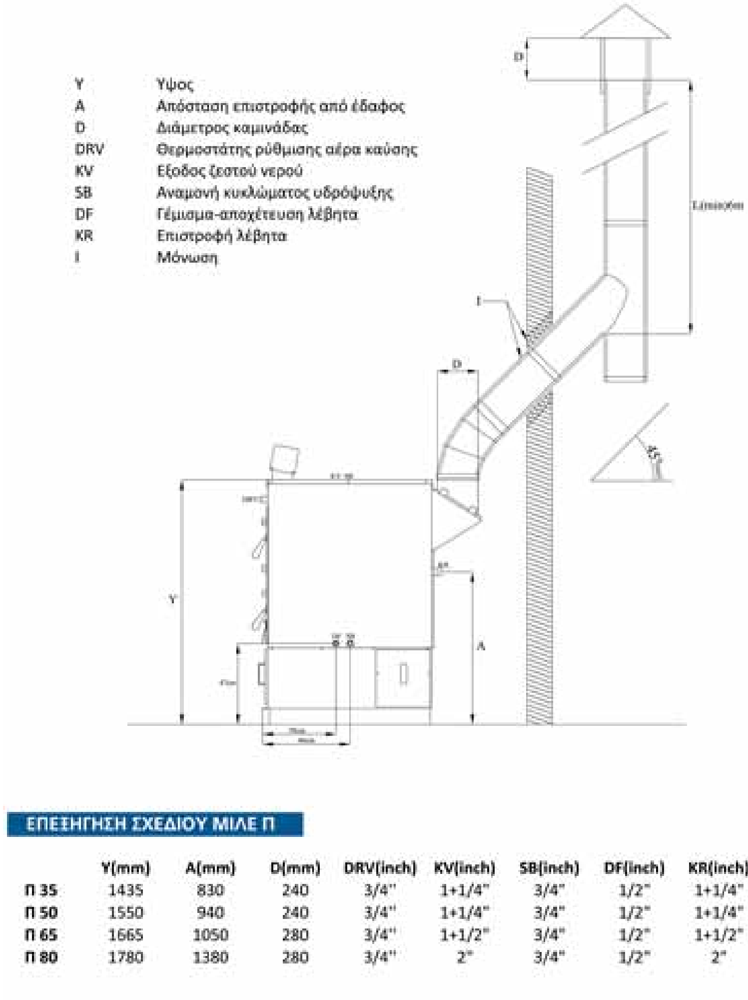
1.3. N.Samaras SA

Manufacturer	"N.SAMARAS SA" ("Ν.ΣΑΜΑΡΑΣ") , 32nd km. Lavriou Ave., PO Box 20009 / PC 19003, Markopoulo-Attica , http://www.nsamaras.gr , Tel. 22990 63480, Fax 22990 63481, Email info@nsamaras.gr
Series name	ΜΙΛΕ Π (MILE PI)
Photos / schematics	 

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763



	Y(mm)	A(mm)	D(mm)	DRV(inch)	KV(inch)	SB(inch)	DF(inch)	KR(inch)
Π 35	1435	830	240	3/4''	1+1/4"	3/4"	1/2"	1+1/4"
Π 50	1550	940	240	3/4''	1+1/4"	3/4"	1/2"	1+1/4"
Π 65	1665	1050	280	3/4''	1+1/2"	3/4"	1/2"	1+1/2"
Π 80	1780	1380	280	3/4''	2"	3/4"	1/2"	2"

Combustion system type	Boiler

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel type	Olive pits, mixes of olive pits with woodpellets or agropellets or fruit pits up to the size of peach pits fed through Silo automatically, or wood, briquettes etc. with manual feed				
Boiler Model Name	**Units / Characteristics**	**Π 35**	**Π 50**	**Π 65**	**Π80**
Basic design parameters and geometry					
Nominal thermal output	kW	40	58	75	93
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	40 kW with heat exchanger	58 kW with heat exchanger	75 kW with heat exchanger	93 kW with heat exchanger
Thermal output for space heating (for stoves)	kW	40	58	75	93
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	16	23	30	37
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	W1,38XL1,33XH1,45	W1,38XL1,33XH1,57	W1,38XL1,33XH1,69	W1,38XL1,33XH1,80
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	W1.38XL1.33XH1,65	W1.38XL1.33XH1,76	W1.38XL1.33XH1,87	W1.38XL1.33XH1,99
Net combustion system weight	kg	476	510	544	578
Heating surfaces	m^2	5,277	5,897	6,569	7,300

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Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	auger	auger	auger
Operation	continuous / intermittent	Continuous with thermostatic stop	Continuous with thermostatic stop	Continuous with thermostatic stop	Continuous with thermostatic stop
Integrated Hopper / Silo	yes / no	Yes	yes	yes	yes
Integrated Hopper / Silo Capacity	l	216	216	216	216
Typical fuel consumption	kg/h	8,75	12,50	16,25	20,00
Time between refueling (for intermittent use, stoves)	min / h	16,0 h	11,2 h	8,6 h	7,0 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	Mixed and Self-Regulated in A and B zone	Mixed and Self-Regulated in A and B zone	Mixed and Self-Regulated in A and B zone	Mixed and Self-Regulated in A and B zone
Stoker technology	Manual / automated (screw)	Manual	Manual	Manual	Manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below	From below	From below	From below
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion chamber volume	l	146	167	188	209
Combustion chamber dimensions (Diameter x Height)	mm	Vertical Cylinder Φ480XH810	Vertical Cylinder Φ480XH925	Vertical Cylinder Φ480XH1040	Vertical Cylinder Φ480XH1155
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled Insulated	Water cooled Insulated	Water cooled Insulated	Water cooled Insulated
Combustion air streams	primary air / secondary air / others	Primary air with spraying in 3 successive combustion levels	Primary air with spraying in 3 succesive combustion levels	Primary air with spraying in 3 succesive combustion levels	Primary air with spraying in 3 succesive combustion levels
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	One Fan and underpressure due to natural draft	One Fan and underpressure due to natural draft	One Fan and underpressure due to natural draft	One Fan and underpressure due to natural draft
Air supply control	flaps / controlled fans	Input through air shutter	Input through air shutter	Input through air shutter	Input through air shutter
Deashing system	manual / automatic	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	manual	manual	manual	manual
Efficiency and Class					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Boiler / Stove Efficiency	%	82	82	82	82
Combustion efficiency (related to fuel burnout)	%	91.8	91.8	92.7	93
Electricity consumption	Wel total	425	425	425	425
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3
Hydraulics / Water circuit					
Number of tubes	#	6	6	6	6
Hydraulics connections	Inches	1+1/4”	1+1/4”	1+1/2”	2”
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	6	6	6	6
Water volume	l	110	125	140	155
Minimum return temperature	°C	55	55	55	55
Maximum operation temperature	°C	90	90	90	90
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	250	250	300	300
Flue gas temperature	°C	185	190	220	235

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Draught	forced / natural	natural and forced	natural and forced	natural and forced	natural and forced
Location of flue gas fan (for forced draught systems)		No	No	No	No
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Other characteristics					
Ignition	spark / kindling / other	Kindling in the beginning of season	Kindling in the beginning of season	Kindling in the beginning of season	Kindling in the beginning of season
Visual inspection of combustion chamber	yes / no	Yes	yes	yes	yes
Ash compaction	yes / no	No	no	no	no
Ash chamber dimensions (Width x Height x Length)	m	1) 0,47X0,27X0,55 2) 0,30X0,55X0,50	1) 0,47X0,27X0,55 2) 0,30X0,55X0,50	1) 0,47X0,27X0,55 2) 0,30X0,55X0,50	1) 0,47X0,27X0,55 2) 0,30X0,55X0,50
Typical ash cleaning frequency	times per week / month / other	1 per 20 days with olive kernel of good quality	1 per 20 days with olive kernel of good quality	1 per 20 days with olive kernel of good quality	1 per 20 days with olive kernel of good quality

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Other information					
Cost data					
Price range (VAT included)	€	3.000	3.200	3.400	3.600
Maintenance cost (typical)	€ / year	100	100	100	100

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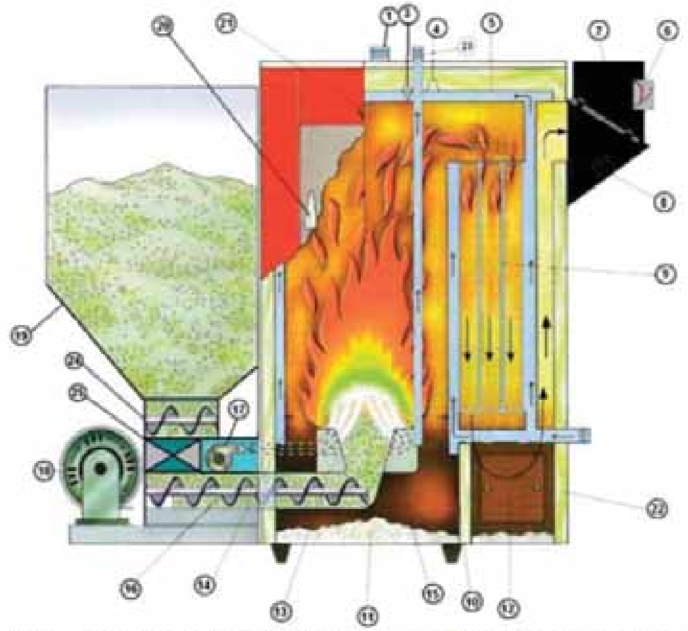
Manufacturer	“N.SAMARAS SA” ("Ν.ΣΑΜΑΡΑΣ") , 32o km. Lavriou Ave., PO Box 20009 / PC 19003, Markopoulo-Attica , http://www.nsamaras.gr , Tel. 22990 63480, Fax 22990 63481, Email info@nsamaras.gr
Series name	ΜΙΛΕ ΒΙΟ (MILE BIO)
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763



- 1 Προσαγωγή νερού στο ανώτερο σημείο του λέβητα
- 2 Επιστροφή από δίκτυο θέρμανσης
- 3 Κυάθιο 3/4" για την τοποθέτηση των αισθητηρίων του πίνακα οργάνων NS 100
- 4 Σημείο ανάρτησης για ανύψωση-μεταφορά λέβητα
- 5 Θυρίδα καθαρισμού αυλών με εύκολο πέρασμα συρματόβουρτσας
- 6 Διάφραγμα ρύθμισης ελκυσμού
- 7 Ρυθμιζόμενης κλίσης έξοδος καμινάδας Φ250 ή Φ300
- 8 Θυρίδα καθαρισμού εξόδου καυσαερίων
- 9 Κάθετοι αεραυλοί (6 τμχ) 2ης διαδρομής καυσαερίων
- 10 Μούφα εκκένωσης λέβητα
- 11 Συρτάρι απομάκρυνσης στάχτης εστίας καύσης
- 12 Θυρίδα απομάκρυνσης στάχτης 2 - 3ης διαδρομής
- 13 Εστία χυτοσίδηρη τύπου volcano, διαιρούμενη και αποσπώμενη,
- 14 Σημεία στήριξης (προαιρετικής) σχάρας ξύλων
- 15 Αέρας καύσης υπό κλίση που προσδίδει τυρβώδη ροή στα καυσαέρια
- 16 Χυτοσίδηρος κοχλίας κατεργασμένος σε CNC με θερμική σκλήρυνση
- 17 Φυσητήρας αέρα καύσης με ρυθμιστικό διάφραγμα
- 18 Κινητήρας με μειωτήρα μετάδοσης κίνησης μέσω αλυσίδας - γραναζιών - κουζνέτου
- Κωνικό βιδωτό σιλό με σίτα συγκράτησης αντικειμένων
- 20 Χερούλια πορτών με ασφαλή λαβή
- 21 Υποδοχή 3/4" για (προαιρετικό) θερμοστατικό ρυθμιστή διαφράγματος αέρα
- 22 Περιμετρική μόνωση υαλοβάμβακα 50mm
- 23 Υποδοχή 3/4" για (προαιρετική) θερμοστατική βαλβίδα εκτόνωσης 90°C 3 bar στο κύκλωμα υδρόψυξης του λέβητα
- 24 1ος κοχλίας μεταφοράς καυσίμου προς αποτροπέα
- 25 Αποτροπέας (Περιστροφική βάνα αποτροπής επιστροφής φλόγας)

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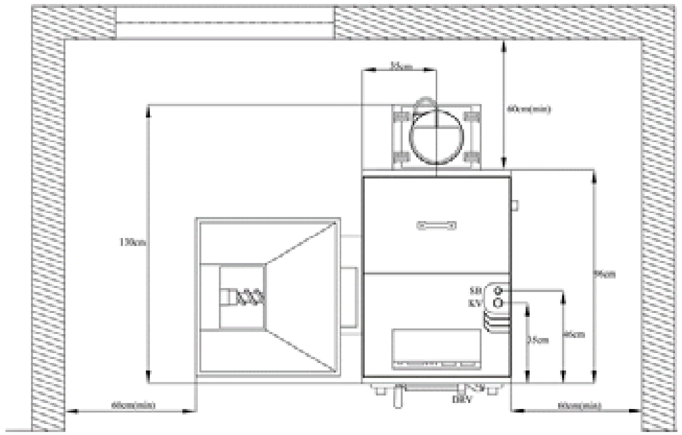

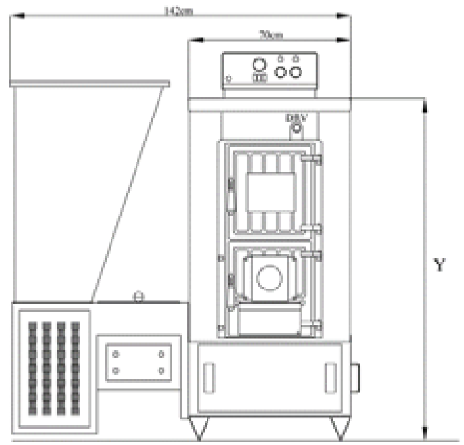

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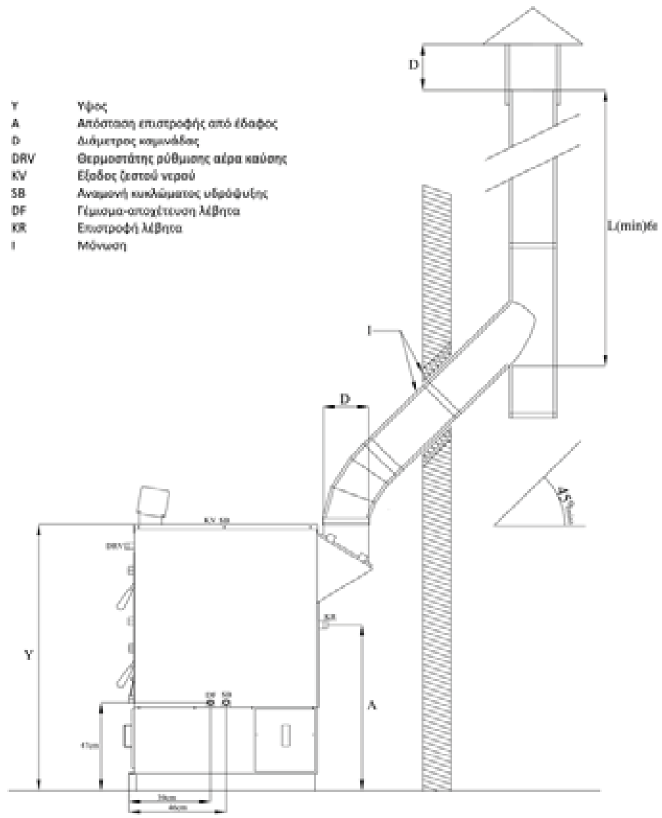
Y	Ύψος
A	Απόσταση επιστροφής από έδαφος
D	Διάμετρος καμινάδας
DRV	Θερμοστάτης ρύθμισης αέρα καύσης
KV	Έξοδος ζεστού νερού
SB	Αναμονή κυκλώματος υδρόψυξης
DF	Γέμισμα-αποχέτευση λέβητα
KR	Επιστροφή λέβητα
I	Μόνωση



ΕΠΕΞΗΓΗΣΗ ΣΧΕΔΙΟΥ ΜΙΛΕ ΒΙΟ

	Y(mm)	A(mm)	D(mm)	DRV(inch)	KV(inch)	SB(inch)	DF(inch)	KR(inch)
BIO 35	1435	830	240	3/4"	1+1/4"	3/4"	1/2"	1+1/4"
BIO 50	1550	940	240	3/4"	1+1/4"	3/4"	1/2"	1+1/4"
BIO 65	1665	1050	280	3/4"	1+1/2"	3/4"	1/2"	1+1/2"
BIO 80	1780	1380	280	3/4"	2"	3/4"	1/2"	2"

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Combustion system type	Boiler				
Fuel type	Wood, olive pits, mixes of olive pits, wood pellet, agropellet*, almond, peach, shells *It is recommended agropellet to be consisting of at least 3 different plants.				
Boiler Model Name	**Units / Characteristics**	**Bio 35**	**Bio 50**	**Bio 65**	**Bio 80**
Basic design parameters and geometry					
Nominal thermal output	kW	40	58	75	93
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	40 kW with heat exchanger	58 kW with heat exchanger	75 kW with heat exchanger	93 kW with heat exchanger
Thermal output for space heating (for stoves)	kW	40	58	75	93
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	16	23	30	37
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	W1,38XL1,33XH1,45	W1,38XL1,33XH1,57	W1,38XL1,33XH1,1,68	W1,38XL1,33XH1,80
System dimensions (including daily fuel	m	W1,38XL1,33XH1,65	W1,38XL1,33XH1,77	W1,38XL1,33XH1,88	W1,38XL1,33XH1,99

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storage container) (Width x Height x Length)					
Net combustion system weight	kg	548	582	616	650
Heating surfaces	m^2	5,277	5,897	6,569	7,300
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger
Operation	continuous / intermittent	Continuous with thermostatic stop with INVERTER	Continuous with thermostatic stop with INVERTER	Continuous with thermostatic stop with INVERTER	Continuous with thermostatic stop with INVERTER
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	l	216	216	216	216
Typical fuel consumption	kg/h	8,75	12,50	16,25	20
Time between refueling (for intermittent use, stoves)	min / h	16 h	11,2 h	8,6 h	7,0 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	Mixed and Self-Regulated in A and B zone	Mixed and Self-Regulated in A and B zone	Mixed and Self-Regulated in A and B zone	Mixed and Self-Regulated in A and B zone
Stoker technology	Manual / automated (screw)	Manual	Manual	Manual	Manual

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Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below	From below	From below	From below
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	146	167	188	209
Combustion chamber dimensions (Diameter x Height)	mm	Vertical Cylinder Φ480XH810	Vertical Cylinder Φ480XH925	Vertical Cylinder Φ480XH1040	Vertical Cylinder Φ480XH1155
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled Insulated	Water cooled Insulated	Water cooled Insulated	Water cooled Insulated
Combustion air streams	primary air / secondary air / others	Primary air with spraying in 3 successive combustion levels	Primary air with spraying in 3 succesive combustion levels	Primary air with spraying in 3 succesive combustion levels	Primary air with spraying in 3 succesive combustion levels
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	One Fan and underpressure due to natural draft	One Fan and underpressure due to natural draft	One Fan and underpressure due to natural draft	One Fan and underpressure due to natural draft
Air supply control	flaps / controlled fans	Input through air shutter	Input through air shutter	Input through air shutter	Input through air shutter
Deashing system	manual / automatic	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe /	manual	manual	manual	manual

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	CO sensor				
Efficiency and Class					
Boiler / Stove Efficiency	%	82	82	82	82
Combustion efficiency (related to fuel burnout)	%	91.8	91.8	92.7	93
Electricity consumption	Wel total	425	425	425	425
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3
Hydraulics / Water circuit					
Number of tubes	#	6	6	6	6
Hydraulics connections	inches	1+1/4”	1+1/4”	1+1/2”	2”
Maximum operation pressure	Bar	3,5	3,5	3,5	3,5
Tested pressure	Bar	6	6	6	6
Water volume	l	110	125	140	155
Minimum return temperature	^{o}C	55	55	55	55
Maximum operation temperature	^{o}C	90	90	90	90
Flue gases / Emissions					

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Chimney / Flue gas connection diameter	mm	250	250	300	300
Flue gas temperature	^oC	185	190	220	235
Draught	forced / natural	natural and forced	natural and forced	natural and forced	natural and forced
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Other characteristics					
Ignition	spark / kindling / other	Kindling only in the beginning	Kindling only in the beginning	Kindling only in the beginning	Kindling only in the beginning
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x	m	1) 0,47X0,27X0,55 and 2) 0,30X0,58X0,50	1) 0,47X0,27X0,55 and 2) 0,30X0,58X0,50	1) 0,47X0,27X0,55 και 2) 0,30X0,58X0,50	1) 0,47X0,27X0,55 και 2) 0,30X0,58X0,50

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Length)					
Typical ash cleaning frequency	times per week / month / other	1 per 20 days with olive kernel of good quality 1 per year with wood pellet of 0,5% ash content	1 per 20 days with olive kernel of good quality 1 per year with wood pellet of 0,5% ash content	1 per 20 days with olive kernel of good quality 1 per year with wood pellet of 0,5% ash content	1 per 20 days with olive kernel of good quality 1 per year with wood pellet of 0,5% ash content
Other information					
Cost data					
Price range (VAT included)	€	3.700	3.900	4.100	4.300
Maintenance cost (typical)	€ / year	150	150	150	150

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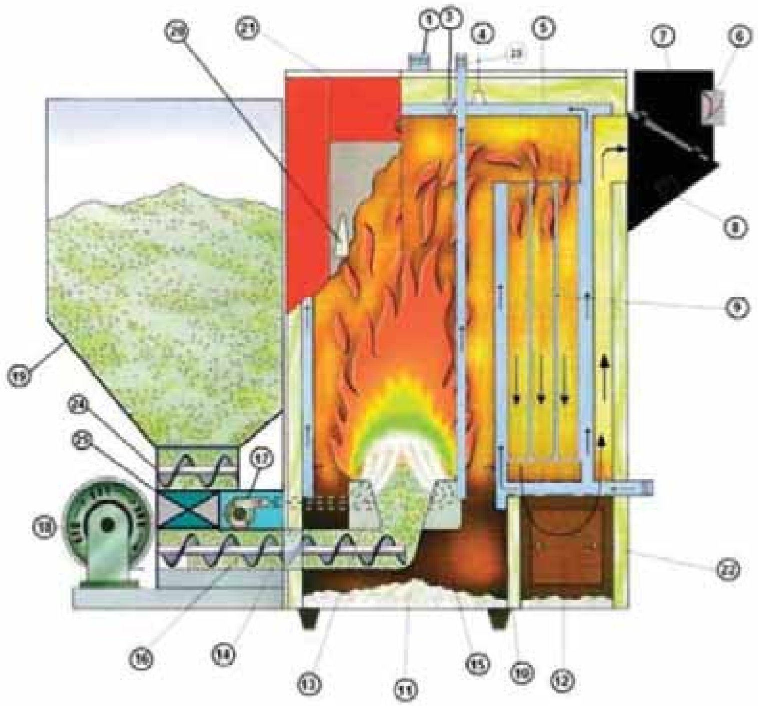
Manufacturer	"N.SAMARAS SA" ("Ν.ΣΑΜΑΡΑΣ") , 32o km. Lavriou Ave., PO Box 20009 / PC 19003, Markopoulo-Attica , http://www.nsamaras.gr , Tel. 22990 63480, Fax 22990 63481, Email info@nsamaras.gr
Series name	ΜΙΛΕ BIO XL (MILE BIO XL)
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Wood, olive pits, mixes of olive pits, wood pellet, agropellet*, almond, peach, shells *It is recommended agropellet to be consisting of at least 3 different plants.				
Boiler Model Name	Units / Characteristics	BIO XL 110	BIO XL 160	BIO XL 210	
Basic design parameters and geometry					

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Nominal thermal output	kW	132	176	210	
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	132 kw with heat exchanger	176 kw with heat exchanger	210 kw with heat exchanger	
Thermal output for space heating (for stoves)	kW	132	176	210	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	52	70	84	
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	W1,70XL1,70XH1,65	W1,70XL1,70XH1,77	W1,70XL1,70XH1,90	
System dimensions (including daily fuel storage container) (Width x Length x Height)	m	W1,70XL1,70XH1,85	W1,70XL1,70XH1,97	W1,70XL1,70XH2,10	
Net combustion system weight	kg	682	792	902	
Heating surfaces	m^2	8,741	11,643	13,846	
Cleaning of heating surfaces	automated / manual	manual	manual	manual	

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	
Operation	continuous / intermittent	Continuous with thermostatic stop with INVERTER	Continuous with thermostatic stop with INVERTER	Continuous with thermostatic stop with INVERTER	
Integrated Hopper / Silo	yes / no	yes	yes	yes	
Integrated Hopper / Silo Capacity	l	430	430	430	
Typical fuel consumption	kg/h	27,5	38,70	45,00	
Time between refueling (for intermittent use, stoves)	min / h	10,20 h	7,26 h	6,21 h	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	Mixed and Self-Regulated in A and B zone	Mixed and Self-Regulated in A and B zone	Mixed and Self-Regulated in A and B zone	
Stoker technology	Manual / automated (screw)	Manual	Manual	Manual	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below	From below	From below	
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	

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Combustion chamber volume	l	267	288	309	
Combustion chamber dimensions (Diameter x Height)	mm	Vertical Cylinder Φ480XH925	Vertical Cylinder Φ480XH925	Vertical Cylinder Φ480XH925	
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled Insulated	Water cooled Insulated	Water cooled Insulated	
Combustion air streams	primary air / secondary air / others	Primary air with spraying in 3 successive combustion levels	Primary air with spraying in 3 succesive combustion levels	Primary air with spraying in 3 succesive combustion levels	
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Two Air Fans and underpressure due to natural draft	Two Air Fans and underpressure due to natural draft	Two Air Fans and underpressure due to natural draft	
Air supply control	flaps / controlled fans	Input through air shutter	Input through air shutter	Input through air shutter	
Deashing system	manual / automatic	manual	manual	manual	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	manual	manual	manual	
Efficiency and Class					
Boiler / Stove Efficiency	%	80	78	76.5	

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Combustion efficiency (related to fuel burnout)	%	90.2	88.5	86	
Electricity consumption	Wel total	485	485	485	
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	2	2	2	
Hydraulics / Water circuit					
Number of tubes	#	11	18	25	
Hydraulics connections	inches	2”	2+1/2”	3”	
Maximum operation pressure	bar	3	3	3	
Tested pressure	bar	6	6	6	
Water volume	l	170	185	200	
Minimum return temperature	°C	55	55	55	
Maximum operation temperature	°C	90	90	90	
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	350	350	400	
Flue gas temperature	°C	210	210	215	
Draught	forced / natural	natural and forced	natural and forced	natural and forced	

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Location of flue gas fan (for forced draught systems)		No	No	No	
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
Other characteristics					
Ignition	spark / kindling / other	Kindling only in the beginning	Kindling only in the beginning	Kindling only in the beginning	
Visual inspection of combustion chamber	yes / no	yes	yes	yes	
Ash compaction	yes / no	no	no	no	
Ash chamber dimensions (Width x Height x Length)	m	1)480X270X550 2)500X750X500	1)480X270X550 2)500X750X500	1)480X270X550 2)500X750X500	
Typical ash cleaning frequency	times per week / month / other	1 per 20 days with olive kernel of good quality 1 per year with wood pellet of 0,5% ash content	1 per 20 days with olive kernel of good quality 1 per year with wood pellet of 0,5% ash content	1 per 20 days with olive kernel of good quality 1 per year with wood pellet of 0,5% ash content	

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Other information					
Cost data					
Price range (VAT included)	€	5.600	6.600	7.600	
Maintenance cost (typical)	€ / year	200	200	200	

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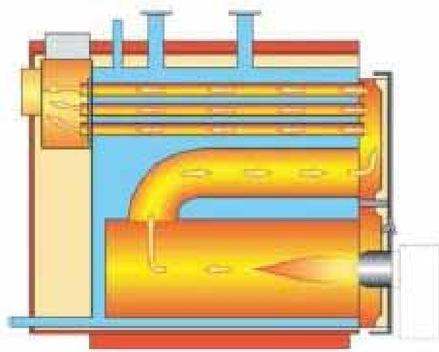
1.4. Thermostahl S.A.

Manufacturer	Thermostahl									
Series name	Pelletstar									
Photos / schematics	  									
Combustion system type	Pellet Boiler									
Fuel type	Wood Pellet A' quality (4800 kcal/h)									
Boiler Model Name	**Units / Characteristics**	**Pelletstar 20**	**Pelletstar 30**	**Pelletstar 40**	**Pelletstar 50**	**Pelletstar 60**	**Pelletstar 65**	**Pelletstar 70**	**Pelletstar 80**	**Pelletstar 90**

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Basic design parameters and geometry										
Nominal thermal output	kW	23	35	47	58	70	75	81	93	105
	Kcal/h	20000	30000	40000	50000	60000	65000	70000	80000	90000
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	570x1500x800	570x1500x800	570x1500x900	570x1500x1000	570x1500x1100	620x1380x1100	620x1380x1200	620x1380x1300	620x1380x1400
System dimensions (including daily fuel storage container) (Width x Height x Length)	mm	1000x1500x1000	1000x1500x1000	1100x1500x1000	1100x1500x1000	1100x1500x1100	-	-	-	-
Net combustion system weight	kg	-	-	-	-	-	-	-	-	-
Heating surfaces	m^2	-	-	-	-	-	-	-	-	-
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual	manual	manual	manual
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger	auger	auger	auger	auger	auger
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes	yes	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	l	470	470	740	740	740	740	1000	1000	1000

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Typical fuel consumption	kg/h	2.5-3.5	2.5-3.5	3-4	3.7-4.2	3.7-4.2	5.2-9	6.5-11	7.8-13	9.5-16
Time between refueling (for intermittent use, stoves)	h	40-55	40-55	40-55	40-55	40-55	24-55	24-55	24-55	24-55
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or not	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner
Stoker technology	Manual / automated (screw)	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner
Grate technology	fixed grate / moving grate / others	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner
Combustion chamber volume	l	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Length x Diameter)	mm	390x400	390x400	490x400	590x400	690x400	550x450	650x450	750x450	850x450
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled
Combustion air streams	primary air / secondary air / others	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner
Combustion air supply	separate air fans / suction due to	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans

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	underpressure in the combustion chamber									
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner
Efficiency and Class										
Boiler / Stove Efficiency	%	91	91	91	91	91	-	-	-	-
Combustion efficiency (related to fuel burnout)	%	92	92	92	92	92	-	-	-	-
Electricity consumption	Wel/kW of boiler output	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3	3	3	3	3
Hydraulics / Water circuit										
Number of tubes	#	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hydraulics connections	inches	1+1/4”	1+1/4”	1+1/4”	1+1/2”	1+1/2”	1+1/2”	1+1/2”	1+1/2”	2”
Maximum operation pressure	bar	3	3	3	3	3	3	3	3	3
Tested pressure	bar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Water volume	l	90	90	110	130	140	160	195	225	250
Minimum return temperature	°C	60	60	60	60	60	60	60	60	60
Maximum operation temperature	°C	90	90	90	90	90	95	95	95	95
Flue gases / Emissions										

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Chimney / Flue gas connection diameter	mm	150	150	150	150	150	160	160	180	180
Flue gas temperature	^oC	160	160	160	160	160	140-160	140-160	140-160	140-160
Draught	forced / natural	natural	natural	natural	natural	natural	natural	natural	natural	natural
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other characteristics										
Ignition	spark / kindling / other	Automatic with electric resistance (spark)	Automatic with electric resistance (spark)	Automatic with electric resistance (spark)	Automatic with electric resistance (spark)	Automatic with electric resistance (spark)	N/A	N/A	N/A	N/A
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no	no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Typical ash cleaning frequency	times per week / month / other	2/week	2/week	2/week	2/week	2/week	2/week	2/week	2/week	2/week
Other information										

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Cost data										
Price range (VAT included) for boiler	€	800-1200	1000-1400	1200-1600	1400-1600	1600-2000	1800-2200	2000-2400	2200-2600	2400-2800
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Manufacturer	Thermostahl
Series name	Pelletstar
Photos / schematics	  

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Combustion system type	Pellet Boiler									
Fuel type	Wood Pellet A' quality (4800 kcal/h)									
Boiler Model Name	**Units / Characteristics**	**PLS 100**	**PLS 120**	**PLS 140**	**PLS 160**	**PLS 180**	**PLS 200**	**PLS 230**		
Basic design parameters and geometry										

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Nominal thermal output	kW	116	140	163	186	209	233	267		
	Kcal/h	100000	120000	140000	160000	180000	200000	230000		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	750x1600 x1450	750x1600 x1550	750x1600 x1650	750x1600 x1750	860x2100 x1500	860x2100 x1700	860x2100 x1900		
System dimensions (including daily fuel storage container) (Width x Height x Length)	mm	1550x160 0x1450	1550x160 0x1650	1550x160 0x1850	1550x160 0x1850	1800x210 0x1500	1800x210 0x1700	1800x210 0x1900		
Net combustion system weight	kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual	manual		
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger	auger	auger	auger		
Operation	continuous / intermittent	intermitte nt	intermitte nt	intermitte nt	intermitte nt	intermitte nt	intermitt ent	intermitte nt		

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Integrated Hopper / Silo	yes / no	yes	yes	yes	yes	yes	yes	yes		
Integrated Hopper / Silo Capacity	l	1000	1000	1000	1000	1400	1400	1400		
Typical fuel consumption	kg/h	9-15	11-18	13-20	15-22	15-24	19-28	23-36		
Time between refueling (for intermittent use, stoves)	min / h	40-80 h	40-80 h	40-80 h	40-80 h	2-3 days	2-3 days	2-3 days		
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or not	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Stoker technology	Manual / automated (screw)	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Grate technology	fixed grate / moving grate / others	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Combustion chamber volume	l	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Combustion chamber dimensions (Length x Diameter)	mm	700x500	900x500	1100x500	1200x500	900x590	1100x590	1300x590		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled		

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Combustion air streams	primary air / secondary air / others	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans		
Air supply control	flaps / controlled fans	controlled fans	controlle d fans	controlled fans	controlled fans	controlled fans	controlle d fans	controlled fans		
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual	manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner		
Efficiency and Class										
Boiler / Stove Efficiency	%	92	92	92	92	92	92	92		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner	Dependin g on burner		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Hydraulics / Water circuit										
Number of tubes	#	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

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Hydraulics connections	inches	2”	2”	2 ½ ”	2 ½ ”	3”	3”	3”		
Maximum operation pressure	bar	3	3	3	3	3	3	3		
Tested pressure	bar	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Water volume	l	320	350	380	410	430	470	520		
Minimum return temperature	^oC	60	60	60	60	70	70	70		
Maximum operation temperature	^oC	90	90	90	90	95	95	95		
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	220	220	250	250	300	300	300		
Flue gas temperature	^oC	140-160	140-160	140-160	140-160	140-160	140-160	140-160		
Draught	forced / natural	natural	natural	natural	natural	natural	natural	natural		
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A	N/A		
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

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Other characteristics										
Ignition	spark / kindling / other	Automated	Automated	Automated	Automated	N/A	N/A	N/A		
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes	yes		
Ash compaction	yes / no	no	no	no	no	no	no	no		
Ash chamber dimensions (Width x Height x Length)	mm	N/A	N/A	N/A	N/A	600x150x 100x	600x150x 100x	600x150x 100x		
Typical ash cleaning frequency	times per week / month / other	2/week	2/week	2/week	2/week	2/week	2/week	2/week		
Other information										
Cost data										
Price range (VAT included)	€	3000-3500	3300-3800	3600-4100	4000-4500	5500-6000	6200-6700	7000-7500		
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

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Manufacturer	Thermostahl				
Series name	Pelletstar				
Photos / schematics	As previous				
Combustion system type	Pellet Boiler				
Fuel type	Wood Pellet A' quality (4800 kcal/h)				
Boiler Model Name	**Units / Characteristics**	**PLS 220**	**PLS 250**	**PLS 280**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	256	290	325	
	Kcal/h	220000	250000	280000	
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	

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System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	980x2050x1850	980x2050x2100	980x2050x2350	
System dimensions (including daily fuel storage container) (Width x Height x Length)	mm	1880x2050x1850	1880x2050x2100	1880x2050x2350	
Net combustion system weight	kg	N/A	N/A	N/A	
Heating surfaces	m^2	N/A	N/A	N/A	
Cleaning of heating surfaces	automated / manual	manual	manual	manual	
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	
Operation	continuous / intermittent	intermittent	intermittent	intermittent	
Integrated Hopper / Silo	yes / no	yes	yes	yes	
Integrated Hopper / Silo Capacity	l	1700	1700	1700	
Typical fuel consumption	kg/h	28-37	32-42	40-55	
Time between refueling (for intermittent use, stoves)	h	28-65	28-65	28-65	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or	Depending on burner	Depending on burner	Depending on burner	

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	not				
Stoker technology	Manual / automated (screw)	Depending on burner	Depending on burner	Depending on burner	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	Depending on burner	Depending on burner	Depending on burner	
Grate technology	fixed grate / moving grate / others	moving grate	moving grate	moving grate	
Combustion chamber volume	l	N/A	N/A	N/A	
Combustion chamber dimensions (Length x Diameter)	mm	1100x600	1400x600	1600x600	
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	
Combustion air streams	primary air / secondary air / others	Depending on burner	Depending on burner	Depending on burner	
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	
Deashing system	manual / automatic	manual	manual	manual	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Depending on burner	Depending on burner	Depending on burner	

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Efficiency and Class					
Boiler / Stove Efficiency	%	91	91	91	
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	
Electricity consumption	Wel/kW of boiler output	Depending on burner	Depending on burner	Depending on burner	
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A	N/A	
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A	N/A	
Hydraulics connections	inches	2 ½ “	2 ½ “	3”	
Maximum operation pressure	bar	3	3	3	
Tested pressure	bar	N/A	N/A	N/A	
Water volume	l	450	510	600	
Minimum return temperature	°C	60	60	60	
Maximum operation temperature	°C	95	95	95	
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	300	300	300	

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Flue gas temperature	^oC	160/180	160/180	160/180	
Draught	forced / natural	natural	natural	natural	
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
Other characteristics					
Ignition	spark / kindling / other	Automatic with electric resistance	Automatic with electric resistance	Automatic with electric resistance	
Visual inspection of combustion chamber	yes / no	yes	yes	yes	
Ash compaction	yes / no	no	no	no	
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	
Typical ash cleaning frequency	times per week / month / other	2/week	2/week	2/week	
Other information					
Cost data					
Price range (VAT included)	€	8500-9200	9000-9700	9500-10200	
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	

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Manufacturer	Thermostahl
Series name	Pelletstar
Photos / schematics	 

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	  									
Combustion system type	Pellet Boiler									
Fuel type	Wood Pellet A’ quality (4800 kcal/h)									
Boiler Model Name	**Units / Characteristics**	**PLS 300**	**PLS 350**	**PLS 400**	**PLS 450**	**PLS 500**	**PLS 600**	**PLS 700**	**...**	
Basic design parameters and geometry										
Nominal thermal output	kW	349	407	465	523	581	698	814		
	Kcal/h	300000	350000	400000	450000	500000	600000	700000		
Thermal output for Domestic Heating Water (D.H.W.) and	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

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warm water supply										
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	1200x2000x 1950	1200x20 00x2100	1200x20 00x2250	1200x20 00x2350	1200x20 00x2450	1200x20 00x2650	1200x20 00x2850		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Net combustion system weight	kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual	manual		
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger	auger	auger	auger		
Operation	continuous / intermittent	intermittent	intermit tent	intermit tent	intermitt ent	intermitt ent	intermit tent	intermitt ent		
Integrated Hopper / Silo	yes / no	Yes	yes	yes	yes	yes	yes	yes		
Integrated Hopper / Silo Capacity	l	4180	4180	4180	4180	4180	4180	4180		

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Typical fuel consumption	kg/h	51-68	56-75	75-100	100-125	120-130	130-150	140-165		
Time between refueling (for intermittent use, stoves)	min / h	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or not	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Stoker technology	Manual / automated (screw)	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Grate technology	fixed grate / moving grate / others	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Combustion chamber volume	l	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Combustion chamber dimensions (Width x Height x Length)	mm	1000x750	1150x750	1250x750	1350x750	1450x750	1650x750	1850x750		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled		
Combustion air streams	primary air / secondary air / others	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		

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Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans		
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans		
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual	manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Efficiency and Class										
Boiler / Stove Efficiency	%	91	91	91	91	91	91	91		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner	Depending on burner		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Hydraulics / Water circuit										
Number of tubes	#	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Hydraulics connections	inches	3”	3”	4”	4”	4”	6”	6”		

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Maximum operation pressure	bar	3	3	3	3	3	3	3		
Tested pressure	bar	6	6	6	6	6	6	6		
Water volume	l	800	900	1000	1100	1200	1300	1400		
Minimum return temperature	^{o}C	60	60	60	60	60	60	60		
Maximum operation temperature	^{o}C	95	95	95	95	95	95	95		
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	300	300	350	350	400	400	400		
Flue gas temperature	^{o}C	160-180	160-180	160-180	160-180	160-180	160-180	160-180		
Draught	forced / natural	natural	natural	natural	natural	natural	natural	natural		
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A	N/A		
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Other characteristics										

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Ignition	spark / kindling / other	Automatic with electric resistance	Automatic with electric resistance	Automatic with electric resistance	Automatic with electric resistance	Automatic with electric resistance	Automatic with electric resistance	Automatic with electric resistance		
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes	yes		
Ash compaction	yes / no	no	no	no	no	no	no	no		
Ash chamber dimensions (Width x Height x Length)	m	840x450x600	840x450x600	840x450x600	840x450x600	500x400x500	500x400x500	500x400x500		
Typical ash cleaning frequency	times per week / month / other	2/week	2/week	2/week	2/week	2/week	2/week	2/week		
Other information										
Cost data										
Price range (VAT included)	€	11000-12000	12000-13000	13000-14000	14000-15000	16000-16500	18000-19500	20000-22000		
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

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Manufacturer	Thermostahl
Series name	Bioplex HL-B Unit
Photos / schematics	   

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Combustion system type	Biomass Boiler									
Fuel type	Pellet, biomass, pits, olive pits, wood, coal									
Boiler Model Name	**Units / Characteristics**	**HL B-40**	**HL B-50**	**HL B-60**	**HL B-70**	**HL B-80**	**HL B-100**	**...**		
Basic design parameters and geometry										
Nominal thermal output	kW	47	58	69	81	93	116			
	Kcal/h	40000	50000	60000	70000	80000	100000			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A			
Thermal output for space	kW	N/A	N/A	N/A	N/A	N/A	N/A			

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heating (for stoves)										
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	670x850x1.350	670x950x1.350	670x1050x1350	670x1150x1350	670x1250x1350	670x1350x1350			
System dimensions (including daily fuel storage container) (Width x Height x Length)	mm	1500x900x1350	1500x950x1350	1500x1050x1350	1500x1150x1350	1500x1250x1350	1500x1350x1350			
Net combustion system weight	kg	380	420	460	500	550	600			
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A			
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual			
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger	auger	auger			
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent			
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes	yes	yes			
Integrated Hopper / Silo Capacity	l	370	370	370	370	370	370			
Typical fuel consumption	kg/h	2-3	3-4	4-5	5-6.5	6-7	7-8.5			
Time between refueling (for intermittent use, stoves)	h	24-48	24-48	24-48	24-48	24-48	24-48			
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or	no	no	no	no	no	no			

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	not									
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated	automated	automated			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from below	from below	from below	from below	from below	from below			
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate			
Combustion chamber volume	l	200	236	272	308	344	380			
Combustion chamber dimensions (Width x Height x Length)	mm	N/A	N/A	N/A	N/A	N/A	N/A			
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled			
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air	primary air	primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans			
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans			
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	manual	manual	manual	manual	manual	manual			
Efficiency and Class										

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Boiler / Stove Efficiency	%	85	85	85	85	85	85			
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A			
Electricity consumption	Wel/kW of boiler output	400	400	400	400	400	400			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3	3			
Hydraulics / Water circuit										
Number of tubes	#	N/A	N/A	N/A	N/A	N/A	N/A			
Hydraulics connections	inches	1+ ½”	1+ ½ ”	1+ ½”	1+ ½ ”	2”	2”			
Maximum operation pressure	bar	2.5	2.5	2.5	2.5	2.5	2.5			
Tested pressure	bar	5	5	5	5	5	5			
Water volume	l	105	125	150	175	200	225			
Minimum return temperature	°C	70	70	70	70	70	70			
Maximum operation temperature	°C	95	95	95	95	95	95			
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	195	195	195	195	245	245			
Flue gas temperature	°C	140	140	140	150	150	150			
Draught	forced / natural	natural	natural	natural	natural	natural	natural			
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A			
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			

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Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Other characteristics										
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling	kindling	kindling			
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes			
Ash compaction	yes / no	no	no	no	no	no	no			
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A			
Typical ash cleaning frequency	times per week / month / other	2/week	2/week	2/week	2/week	2/week	2/week			
Other information										
Cost data										
Price range (VAT included)	€	2500-3000	2700-3200	2900-3400	3100-3600	3300-3700	3500-4000			
Maintenance cost (typical)	€ / year									

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Manufacturer	Thermostahl									
Series name	Bioplex HL-B Unit									
Photos / schematics	  									
Combustion system type	Biomass boiler									
Fuel type	Pellet, biomass, pits, olive kernel, wood, coal									
Boiler Model Name	**Units / Characteristics**	**HL B-120**	**HL B-140**	**HL B-160**	**HL B-180**	**HL B-200**	**HL B-220**	**...**		
Basic design parameters and geometry										
Nominal thermal output	kW	139	162	186	209	233	256			

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	Kcal/h	120000	140000	160000	180000	200000	220000			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A			
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	910x1300x1570	910x1400x1570	910x1500x1570	910x1650x1570	910x1900x1570	910x2150x1570			
System dimensions (including daily fuel storage container) (Width x Height x Length)	mm	1730x1300x1570	1730x1400x1570	1730x1500x1570	1730x1600x1570	1730x1700x1570	1730x1800x1570			
Net combustion system weight	kg	880	930	1000	1070	1220	1470			
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A			
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual			
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger	auger	auger			
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent			
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes	yes	yes			
Integrated Hopper / Silo Capacity	L	600	600	600	600	600	600			
Typical fuel consumption	kg/h	7.5-9.5	8.5-10	10-11.8	11.5-14	12.5-16	14-19			

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Time between refueling (for intermittent use, stoves)	min / h	24-56	24-56	24-56	24-56	24-56	24-56			
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or not	no	no	no	no	no	no			
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated	automated	automated			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from below	from below	from below	from below	from below	from below			
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate			
Combustion chamber volume	l	525	488	534	609	710	860			
Combustion chamber dimensions (Width x Height x Length)	mm	N/A	N/A	N/A	N/A	N/A	N/A			
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled			
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air	primary air	primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans			
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans			

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Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	manual	manual	manual	manual	manual	manual			
Efficiency and Class										
Boiler / Stove Efficiency	%	85	85	85	85	85	85			
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A			
Electricity consumption	Wel/kW of boiler output	520	520	520	520	520	520			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3	3			
Hydraulics / Water circuit										
Number of tubes	#	N/A	N/A	N/A	N/A	N/A	N/A			
Hydraulics connections	inches	2”	2”	2+ ½”	2+ ½”	2+ ½”	2+ ½”			
Maximum operation pressure	bar	2.5	2.5	2.5	2.5	2.5	2.5			
Tested pressure	bar	5	5	5	5	5	5			
Water volume	l	260	290	330	360	420	480			
Minimum return temperature	^oC	70	70	70	70	70	70			
Maximum operation temperature	^oC	95	95	95	95	95	95			
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	295	295	295	295	295	295			
Flue gas temperature	^oC	160-170	160-170	160-170	160-170	160-170	160-170			
Draught	forced / natural	natural	natural	natural	natural	natural	natural			

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Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A			
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Other characteristics										
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling	kindling	kindling			
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes			
Ash compaction	yes / no	no	no	no	no	no	no			
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A			
Typical ash cleaning frequency	times per week / month / other	3/week	3/week	3/week	3/week	3/week	3/week			
Other information										
Cost data										
Price range (VAT included)	€	5300-6000	5500-6200	5700-6400	5900-6600	6100-6800	6300-7000			
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A			

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Manufacturer	Thermostahl									
Series name	Bioplex HL-B Unit									
Photos / schematics	As previous									
Combustion system type	Biomass Boiler									
Fuel type	Pellet, biomass, pits, olive kernel, wood, coal									
Boiler Model Name	**Units / Characteristics**	**HL B-230**	**HL B-250**	**HL B-300**	**HL B-350**	**HL B-400**	**HL B-500**	**HL B-550**		
Basic design parameters and geometry										
Nominal thermal output	kW	267	291	349	407	465	581	640		
	Kcal/h	230000	250000	300000	350000	400000	500000	550000		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
System dimensions (excluding daily fuel storage container)	mm	1100x1600x2150	1100x1850x2150	1100x2100x2150	1100x2350x2150	1100x2350x2150	1100x2600x2150	1100x2600x2150		

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(Width x Height x Length)										
System dimensions (including daily fuel storage container) (Width x Height x Length)	mm	1730x1600x2150	1730x1850x2150	1730x2100x2150	1730x2350x2150	1730x2350x2150	1730x2600x2150	1730x2600x2150		
Net combustion system weight	kg	1600	1790	2010	2230	2230	2750	2980		
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual	manual		
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger	auger	auger	auger		
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent		
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes	yes	yes	yes		
Integrated Hopper / Silo Capacity	l	950	950	950	950	950	950	950		
Typical fuel consumption	kg/h	18-23	20-28	24-33	28-39	33-45	38-50	43-55		
Time between refueling (for intermittent use, stoves)	h	12-24	12-24	12-24	12-24	12-24	12-24	12-24		
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or not	no	no	no	no	no	no	no		
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated	automated	automated	automated		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from below	from below	from below	from below	from below	from below	from below		

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Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate		
Combustion chamber volume	l	890	1070	1250	1435	1435	1620	1620		
Combustion chamber dimensions (Width x Height x Length)	mm	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled		
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air	primary air	primary air	primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans		
Air supply control	flaps / controlled fans	controlle d fans	controlle d fans	controlle d fans	controlle d fans	controlle d fans	controlle d fans	controlle d fans		
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual	manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	manual	manual	manual	manual	manual	manual	manual		
Efficiency and Class										
Boiler / Stove Efficiency	%	85	85	85	85	85	85	85		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not	3	3	3	3	3	3	3		

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	applicable									
Hydraulics / Water circuit										
Number of tubes	#	-	-	-	-	8	-	6		
Hydraulics connections	inches	3”	3”	4”	4”	4”	4”	4”		
Maximum operation pressure	bar	3	3	3	3	3	3	3		
Tested pressure	bar	5.5	5.5	5.5	5.5	5.5	5.5	5.5		
Water volume	l	620	720	820	920	920	1020	1020		
Minimum return temperature	^oC	70	70	70	70	70	70	70		
Maximum operation temperature	^oC	95	95	95	95	95	95	95		
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	345	345	395	395	395	395	395		
Flue gas temperature	^oC	170	170	170	170	170	170-200	170-200		
Draught	forced / natural	natural	natural	natural	natural	natural	natural	natural		
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A	N/A		
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Other characteristics										
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling	kindling	kindling	kindling		

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Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes	yes		
Ash compaction	yes / no	no	no	no	no	no	no	no		
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Typical ash cleaning frequency	times per week / month / other	4/week	4/week	4/week	4/week	4/week	4/week	4/week		
Other information										
Cost data										
Price range (VAT included)	€	9000-10000	10000-11000	12000-13000	13200-14200	14300-15300	15500-16500	16000-17000		
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

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Manufacturer	Thermostahl
Series name	Multiplex MCL
Photos / schematics	 
Combustion system type	Wood boiler
Fuel type	Main fuel: wood

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	Alternative: Coal									
Boiler Model Name	**Units / Characteristics**	**40**	**50**	**60**	**70**	**80**	**100**		**...**	
Basic design parameters and geometry										
Nominal thermal output	kW	47	58	69	81	93	116			
	Kcal/h	40000	50000	60000	70000	80000	100000			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A			
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	670x850x 1350	670x950 x1350	670x105 0x1350	670x115 0x1350	670x125 0x1350	670x135 0x1350			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A			
Net combustion system weight	kg	280	300	330	370	400	430			
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A			
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual			
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger /	manual	manual	manual	manual	manual	manual			

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	manual / other									
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent			
Integrated Hopper / Silo	yes / no	no	no	no	no	no	no			
Integrated Hopper / Silo Capacity	kg	N/A	N/A	N/A	N/A	N/A	N/A			
Typical fuel consumption	kg/h	4-5	5-7	6-8	7-10	9-14	10-16			
Time between refueling (for intermittent use, stoves)	min / h	4-6	4-6	4-6	4-6	4-6	4-6			
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or not	no	no	no	no	no	no			
Stoker technology	Manual / automated (screw)	manual	manual	manual	manual	manual	manual			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	from above	from above	from above			
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate			
Combustion chamber volume	l	200	236	272	308	344	380			
Combustion chamber dimensions (Width x Height x Length)	mm	N/A	N/A	N/A	N/A	N/A	N/A			
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled			
Combustion air streams	primary air /	primary	primary	primary	primary	primary	primary			

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	secondary air / others	air	air	air	air	air	air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans			
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans			
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	manual	manual	manual	manual	manual	manual			
Efficiency and Class										
Boiler / Stove Efficiency	%	75	75	75	75	75	75			
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A			
Electricity consumption	Wel/kW of boiler output	100	100	100	100	100	100			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3	3			
Hydraulics / Water circuit										
Number of tubes	#	N/A	N/A	N/A	N/A	N/A	N/A			
Hydraulics connections	inches	1+ ½ ”	1+ ½ ”	1+ ½ ”	1+ ½ ”	2”	2”			
Maximum operation pressure	bar	2.5	2.5	2.5	2.5	2.5	2.5			
Tested pressure	bar	5	5	5	5	5	5			
Water volume	l	125	145	175	195	220	245			
Minimum return temperature	^oC	60	60	60	60	60	60			

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Maximum operation temperature	°C	95	95	95	95	95	95			
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	195	195	195	195	245	245			
Flue gas temperature	°C	140	140	140	140	140	140			
Draught	forced / natural	natural	natural	natural	natural	natural	natural			
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A			
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Other characteristics										
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling	kindling	kindling			
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes			
Ash compaction	yes / no	no	no	no	no	no	no			
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A			
Typical ash cleaning frequency	times per week / month / other	3/week	3/week	3/week	3/week	3/week	3/week			
Other information										

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Cost data										
Price range (VAT included)	€	1000-1500	1150-1700	1400-2000	1500-2100	1600-2200	1700-2300			
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A			

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Manufacturer	Thermostahl									
Series name	Multiplex MCL									
Photos / schematics										
Combustion system type	Wood boiler									
Fuel type	Main fuel: Wood Alternative: Coal									
Boiler Model Name	**Units / Characteristics**	**120**	140	**160**	**180**	**200**	**220**		**...**	
Basic design parameters and geometry										
Nominal thermal output	kW	139	162	186	209	233	256			
	Kcal/h	120000	140000	160000	180000	200000	220000			
Thermal output for Domestic	kW	N/A	N/A	N/A	N/A	N/A	N/A			

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Heating Water (D.H.W.) and warm water supply										
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	910x1300x1570	910x1400x1570	910x1500x1570	910x1650x1570	910x1900x1570	910x2150x1570			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A			
Net combustion system weight	kg	560	610	670	750	850	950			
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A			
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual			
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	manual	manual	manual			
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent			
Integrated Hopper / Silo	yes / no	no	no	no	no	no	no			
Integrated Hopper / Silo Capacity	kg	N/A	N/A	N/A	N/A	N/A	N/A			
Typical fuel consumption	kg/h	12-18	15-20	17-24	20-27	23-30	25-34			
Time between refueling (for intermittent use, stoves)	h	4-6	4-6	4-6	4-6	4-6	4-6			
Combustion technology										

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Combustion concept	separated primary and secondary combustion zone or not	no	no	no	no	no	no			
Stoker technology	Manual / automated (screw)	manual	manual	manual	manual	manual	manual			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	from above	from above	from above			
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate			
Combustion chamber volume	l	525	488	534	609	710	860			
Combustion chamber dimensions (Width x Height x Length)	mm	N/A	N/A	N/A	N/A	N/A	N/A			
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled			
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air	primary air	primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans			
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans			
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual			
Combustion and load control	manual / automatic / lambda sensor /	manual	manual	manual	manual	manual	manual			

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	temperature probe / CO sensor									
Efficiency and Class										
Boiler / Stove Efficiency	%	75	75	75	75	75	75			
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A			
Electricity consumption	Wel/kW of boiler output	100	100	100	100	100	100			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3	3			
Hydraulics / Water circuit										
Number of tubes	#	N/A	N/A	N/A	N/A	N/A	N/A			
Hydraulics connections	inches	2”	2”	2+ ½ ”	2+ ½ ”	2+ ½ ”	2+ ½ ”			
Maximum operation pressure	bar	3	3	3	3	3	3			
Tested pressure	bar	5	5	5	5	5	5			
Water volume	l	260	290	330	360	420	480			
Minimum return temperature	^oC	60	60	60	60	60	60			
Maximum operation temperature	^oC	95	95	95	95	95	95			
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	245	245	245	295	295	295			
Flue gas temperature	^oC	160-170	160-170	160-170	160-170	160-170	160-170			
Draught	forced / natural	natural	natural	natural	natural	natural	natural			
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A			
CO	mg / Nm^3	N/A	N/A	N/A	N/A	N/A	N/A			

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	(and/or) mg/MJ									
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Other characteristics										
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling	kindling	kindling			
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes			
Ash compaction	yes / no	no	no	no	no	no	no			
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A			
Typical ash cleaning frequency	times per week / month / other	3/week	3/week	3/week	3/week	3/week	3/week			
Other information										
Cost data										
Price range (VAT included)	€	2100-2600	2500-3000	2800-3300	3000-3700	3500-4200	4100-5000			
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A			

Manufacturer	Thermostahl

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Series name	Multiplex MCL									
Photos / schematics	As previous									
Combustion system type	Wood boiler									
Fuel type	Main fuel: Wood Alternative: Coal									
Boiler Model Name	**Units / Characteristics**	**250**	**300**	**350**	**400**	**500**	**600**		**...**	
Basic design parameters and geometry										
Nominal thermal output	kW	291	349	407	465	581	698			
	Kcal/h	250000	300000	350000	400000	500000	600000			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A			
Thermal output for space heating (for stoves)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	1100x1600x2150	1100x1850x2150	1100x2100x2150	1100x2350x2150	1100x2600x2150	1100x2600x2150			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A			
Net combustion system weight	kg	900	1100	1300	1500	1700	1700			

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Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A			
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual	manual			
Fuel capacity and feeding										
Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	manual	manual	manual			
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent	intermittent	intermittent			
Integrated Hopper / Silo	yes / no	no	no	no	no	no	no			
Integrated Hopper / Silo Capacity	l	N/A	N/A	N/A	N/A	N/A	N/A			
Typical fuel consumption	kg/h	40-60	60-80	75-100	100-120	120-150	140-180			
Time between refueling (for intermittent use, stoves)	h	4-6	4-6	4-6	4-6	4-6	4-6			
Combustion technology										
Combustion concept	separated primary and secondary combustion zone or not	no	no	no	no	no	no			
Stoker technology	Manual / automated (screw)	manual	manual	manual	manual	manual	manual			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	from above	from above	from above			
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate			
Combustion chamber volume	l	890	1070	1250	1435	1620	1620			
Combustion chamber dimensions	mm	N/A	N/A	N/A	N/A	N/A	N/A			

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(Width x Height x Length)										
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled	water cooled	water cooled			
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air	primary air	primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans			
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans			
Deashing system	manual / automatic	manual	manual	manual	manual	manual	manual			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	manual	manual	manual	manual	manual	manual			
Efficiency and Class										
Boiler / Stove Efficiency	%	78	78	78	78	78	78			
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A			
Electricity consumption	Wel/kW of boiler output	100	100	100	100	100	100			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3	3			
Hydraulics / Water circuit										
Number of tubes	#	0	0	I114x3	I114x4	0	I114x6			
Hydraulics connections	inches	3”	3”	3”	4”	4”	4”			
Maximum operation pressure	bar	3	3	3	3	3	3			

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Tested pressure	bar	5	5	5	5	5	5			
Water volume	l	620	720	820	920	1020	1100			
Minimum return temperature	^oC	60	60	60	60	60	60			
Maximum operation temperature	^oC	90	90	90	90	90	90			
Flue gases / Emissions										
Chimney / Flue gas connection diameter	mm	345	345	395	395	395	395			
Flue gas temperature	^oC	160-170	160-170	160-170	160-170	160-170	160-170			
Draught	forced / natural	natural	natural	natural	natural	natural	natural			
Location of flue gas fan (for forced draught systems)		N/A	N/A	N/A	N/A	N/A	N/A			
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A			
Other characteristics										
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling	kindling	kindling			
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes			
Ash compaction	yes / no	no	no	no	no	no	no			
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A			

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Typical ash cleaning frequency	times per week / month / other	3/week	3/week	3/week	3/week	3/week	3/week			
Other information										
Cost data										
Price range (VAT included)	€	4500-5200	5000-6000	6000-7000	7000-8000	8000-9000	9300			
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A			

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2. Spain

2.1. BIOCURVE

Manufacturer	BioCurve, S.L. CEEI-Aragón, nave 8. C/ María de Luna 11. 50018 Zaragoza (Zaragoza, Spain) Tel. 0034 976 516 633. http://www.biocurve-heating.com/ Email: biocurve@biocurve-heating.com
Series name	Condensing boiler BCH
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler								
Fuel type	Pellets and olive stones								
Boiler Model Name	**Units / Characteristics**	**BCH25**	**BCH30**	**BCH40**	**BCH50**	**BCH60**	**BCH70**	**BCH80**	**BCH100**
Basic design parameters and geometry									
Nominal thermal output	kW	25	30	40	50	60	70	80	100
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	25	30	40	50	60	70	80	100
Thermal output for space heating (for stoves)	kW	-	-	-	-	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	7.5	9	12	15	18	21	24	30
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.69x1.46 x0.85	0.69x1.46 x0.85	0.69x1.66 x0.85	0.69x1.66 x0.85	0.69x1.66 x0.85	0.69x1.66 x0.85	0.84x1.76 x1.1	0.84x1.7 6 x1.1
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.14x1.46 x0.85	1.14x1.46 x0.85	1.14x1.66 x0.85	1.14x1.66 x0.85	1.14x1.66 x0.85	1.14x1.66 x0.85	1.29x1.76 x1.1	1.29x1.7 6x1.1
Net combustion system weight	kg	385	385	415	415	415	415	550	550
Heating surfaces	m^2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	Automated	Automated	Automated	Automated	Automated
Fuel capacity and feeding									
Fuel feeding	pneumatic / auger / manual / other	pneumatic / auger	pneumatic / auger	pneumatic / auger	pneumatic / auger	pneumatic / auger	pneumatic / auger	pneumatic / auger	pneumatic / auger
Operation	continuous / intermittent	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous

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Integrated Hopper / Silo	yes / no	Optional	Optional	Optional	Optional	No	No	No	No
Integrated Hopper / Silo Capacity	kg	280	280	280	280	-	-	-	-
Typical fuel consumption	kg/h	5.3/1.6	6.3/1.9	8.3/2.5	10.2/3.2	12.3/3.8	13.5/4.2	15.9/5.1	19.8/6.2
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	-.	-	-	-	-
Combustion technology									
Combustion concept	separated primary and secondary combustion zone or not	Separated primary and secondary combustio n zone	Separated primary and secondary combustio n zone	Separated primary and secondary combustio n zone	Separated primary and secondary combustio n zone	Separated primary and secondary combustio n zone	Separated primary and secondary combustio n zone	Separated primary and secondary combustio n zone	Separated primary and secondary combusti on zone
Stoker technology	Manual / automated (screw)	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker
Grate technology	fixed grate / moving grate / others	Rotating plate	Rotating plate	Rotating plate	Rotating plate	Rotating plate	Rotating plate	Rotating plate	Rotating plate
Combustion chamber volume	l	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled

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Combustion air streams	primary air / secondary air / others	Primary air / secondary air	Primary air / secondary air	Primary air / secondary air	Primary air / secondary air	Primary air / secondary air	Primary air / secondary air	Primary air / secondary air	Primary air / secondary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlle d fans
Deashing system	manual / automatic	Auto	Auto	Auto	Auto	Auto	Auto	Auto	Auto
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic / lambda sensor / temperatu re probe	Automatic / lambda sensor / temperatu re probe	Automatic / lambda sensor / temperatu re probe	Automatic / lambda sensor / temperatur e probe	Automatic / lambda sensor / temperatur e probe	Automatic / lambda sensor / temperatur e probe	Automatic / lambda sensor / temperatu re probe	Automatic / lambda sensor / temperat ure probe
Efficiency and Class									
Boiler / Stove Efficiency	%	101.5%	101.5%	100.6%	102%	102%	101.7%	105%	105.3%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	0.10	0.11	0.12	0.13	0.16	0.19	0.21	0.26
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	5	5	5	5	5
Hydraulics / Water circuit									
Number of tubes	#	2	2	2	2	2	2	2	2
Hydraulics connections	inches	1 ¼”	1 ¼”	1 ½”	1 ½”	1 ½”	1 ½”	2”	2”
Maximum operation pressure	bar	3	3	3	3	3	3	5	5

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Tested pressure	bar	6	6	6	6	6	6	10	10
Water volume	l	78	78	112	112	112	112	213	213
Minimum return temperature	^oC	No limit	No limit	No limit	No limit	No limit	No limit	No limit	No limit
Maximum operation temperature	^oC	90	90	90	90	90	90	90	90
Flue gases / Emissions									
Chimney / Flue gas connection diameter	mm	150	150	200	200	200	200	200	200
Flue gas temperature	^oC	50	48	46	44	44	45	39	39
Draught	forced / natural	Forced	Forced	Forced	Forced	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	39	34	25	16	18	20	21	25
OGC	mg / Nm^3 (and/or) mg/MJ	3	3	2	<1	<1	<1	<1	<1
Dust	mg / Nm^3 (and/or) mg/MJ	39	37	32	27	26	26	25	24
NOx	mg / Nm^3 (and/or) mg/MJ	147	153	166	179	178	177	175	173
Other characteristics									
Ignition	spark / kindling / other	Resistance by hot airflow	Resistance by hot airflow	Resistance by hot airflow	Resistance by hot airflow	Resistance by hot airflow	Resistance by hot airflow	Resistance by hot airflow	Resistance by hot airflow
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes	yes	yes	yes
Ash compaction	yes / no	yes	yes	yes	yes	yes	yes	yes	yes
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Typical ash cleaning frequency	times per week / month / other	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Other information		Condensing boiler	Condensing boiler	Condensing boiler	Condensing boiler	Condensing boiler	Condensing boiler	Condensing boiler	Condensing boiler
Cost data									
Price range (VAT included)	€	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maintenance cost (typical)	€ /año	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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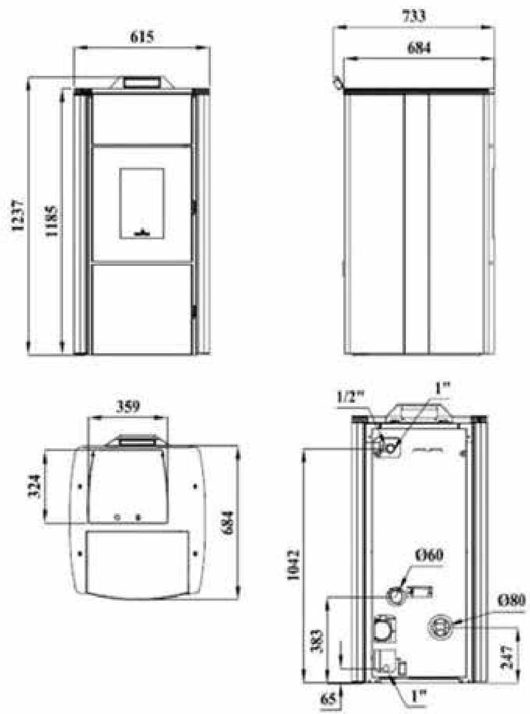
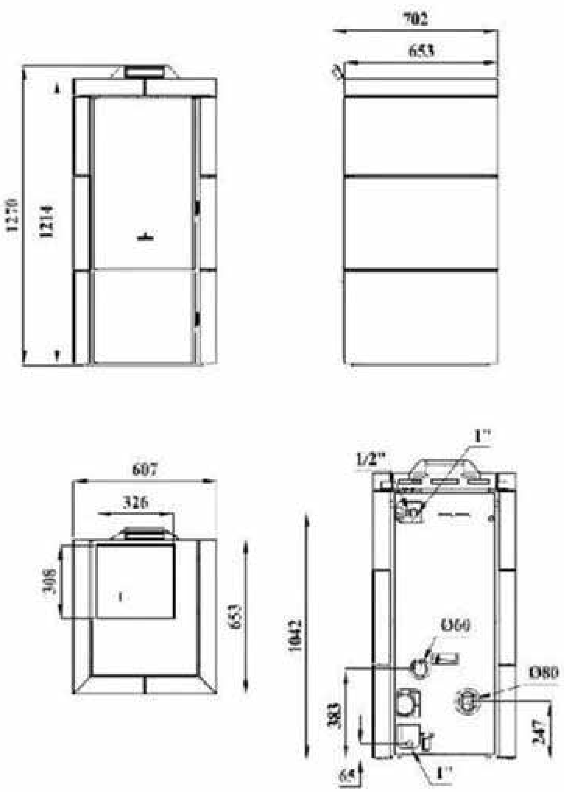
2.2. BRONPI

Manufacturer	BRONPI CALEFACCION SL. Carretera Córdoba-Málaga, Km. 78.2 .Nacional 331. Salida Autovía 62 Lucena Sur. 14900 Lucena (Córdoba. Spain) Tel. 0034 957 502 750. Fax. 0034 957 591 725. http://www.bronpi.com/. Email: bronpi@bronpi.com
Series name	Carlota

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

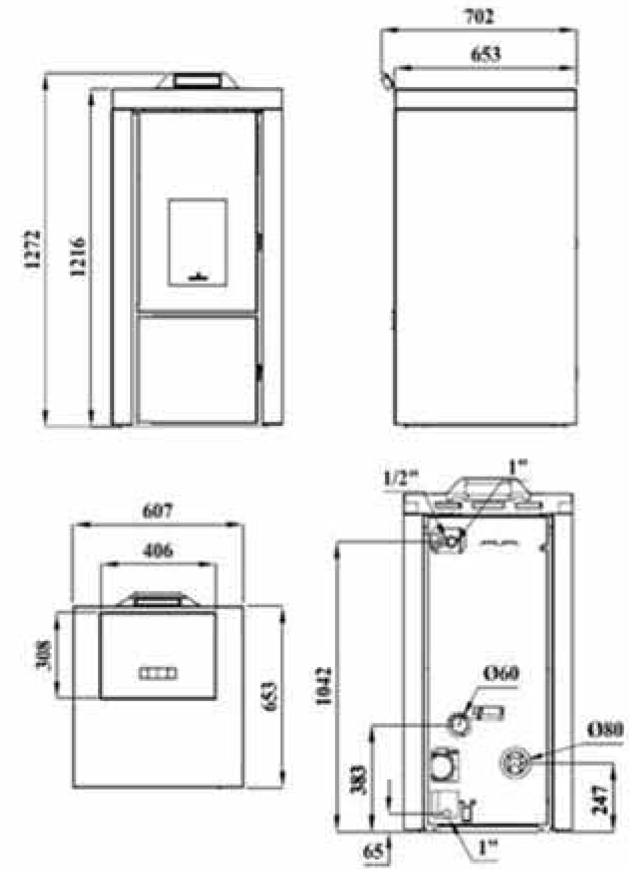
Photos / schematics	  **CARLOTA-H-TK**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763



CARLOTA-H-MF

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	  **CARLOTA-H-NE**
Combustion system type	Stove

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel type	Pellets and olive stones				
Boiler Model Name	**Units / Characteristics**	**CARLOTA-H-TK**	**CARLOTA-H-MF**	**CARLOTA-H-NE**	
Basic design parameters and geometry					
Nominal thermal output	kW	7.2/21.2 pellet 23.3 olive stone	7.2/21.2 pellet 23.3 olive stone	7.2/21.2 pellet 23.3 olive stone	
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	6.9/20.3 pellet 20 olive stone	6.9/20.3 pellet 20 olive stone	6.9/20.3 pellet 20 olive stone	
Thermal output for space heating (for stoves)	kW	6.9/20.3 pellet 20.3 olive stone	6.9/20.3 pellet 20.3 olive stone	6.9/20.3 pellet 20.3 olive stone	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.615 x 1.237 x 0.684	0.607 x 1.270 x 0.653	0.607 x 1.272 x 0.653	
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.615 x 1.237 x 0.684	0.607 x 1.270 x 0.653	0.607 x 1.272 x 0.653	
Net combustion system weight	kg	220	205	198	
Heating surfaces	m^2	0.81	0.81	0.81	
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger	Auger	
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	

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Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	
Integrated Hopper / Silo Capacity	l	73	73	73	
Typical fuel consumption	kg/h	1.5/4.9 pellet 5.6 olive stone	1.5/4.9 pellet 5.6 olive stone	1.5/4.9 pellet 5.6 olive stone	
Time between refueling (for intermittent use. stoves)	min / h	9.8/32 pellet 9.6 olive stone	9.8/32 pellet 9.6 olive stone	9.8/32 pellet 9.6 olive stone	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	
Stoker technology	Manual / automated (screw)	Automated (screw)	Automated (screw)	Automated (screw)	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	
Grate technology	fixed grate / moving grate / others	Moving grate	Moving grate	Moving grate	
Volumen de la cámara de combustión	l	19	19	19	
Combustion chamber dimensions (Width x Height x Length)	m	0.292 x 0.504 x 0.132	0.292 x 0.504 x 0.132	0.292 x 0.504 x 0.132	
Combustion chamber cooling concept	water cooled / air cooled /	Water and air cooled	Water and air cooled	Water and air cooled	

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans	Controlled fans	
Deashing system	manual / automatic	Manual	Manual	Manual	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe	
Efficiency and Class					
Boiler / Stove Efficiency	%	91/96% pellet 92% olive stone	91/96% pellet 92% olive stone	91/96% pellet 92% olive Stone	
Combustion efficiency (related to fuel burnout)	%	94%	94%	94%	
Electricity consumption	Wel/kW of boiler output	0.15/0.25 (0.5 switch on)	0.15/0.25 (0.5 switch on)	0.15/0.25 (0.5 switch on)	
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-	-	
Hydraulics / Water circuit					
Number of tubes	#	4	4	4	

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Hydraulics connections	inches	1”	1”	1”	
Maximum operation pressure	bar	2.4 (pellet and olive stone)	2.4 (pellet and olive stone)	2.4 (pellet and olive stone)	
Tested pressure	bar	1.5 (pellet and olive stone)	1.5 (pellet and olive stone)	1.5 (pellet and olive stone)	
Water volume	l	25	25	25	
Minimum return temperature	^oC	45-55	45-55	45-55	
Maximum operation temperature	^oC	40/80	40/80	40/80	
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	
Flue gas temperature	^oC	58/147 pellet 135 olive stone	58/147 pellet 135 olive stone	58/147 pellet 135 olive stone	
Draught	forced / natural	Forced	Forced	Forced	
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	
CO	% at 13% O_2 nominal power % at 13% O_2 minimal power	0.016 (pellet and olive stone) 0.012 (pellet and olive stone)	0.016 (pellet and olive stone) 0.012 (pellet and olive stone)	0.016 (pellet and olive stone) 0.012 (pellet and olive stone)	
OGC	mg / Nm^3 (and/or) mg/MJ	6 mg/Nm^3. 13% O_2	6 mg/Nm^3 13% O_2	6 mg/Nm^3 13% O_2	
Dust	mg / Nm^3 (and/or) mg/MJ	18 mg/Nm^3 13% O_2	18 mg/Nm^3 13% O_2	18 mg/Nm^3 13% O_2	

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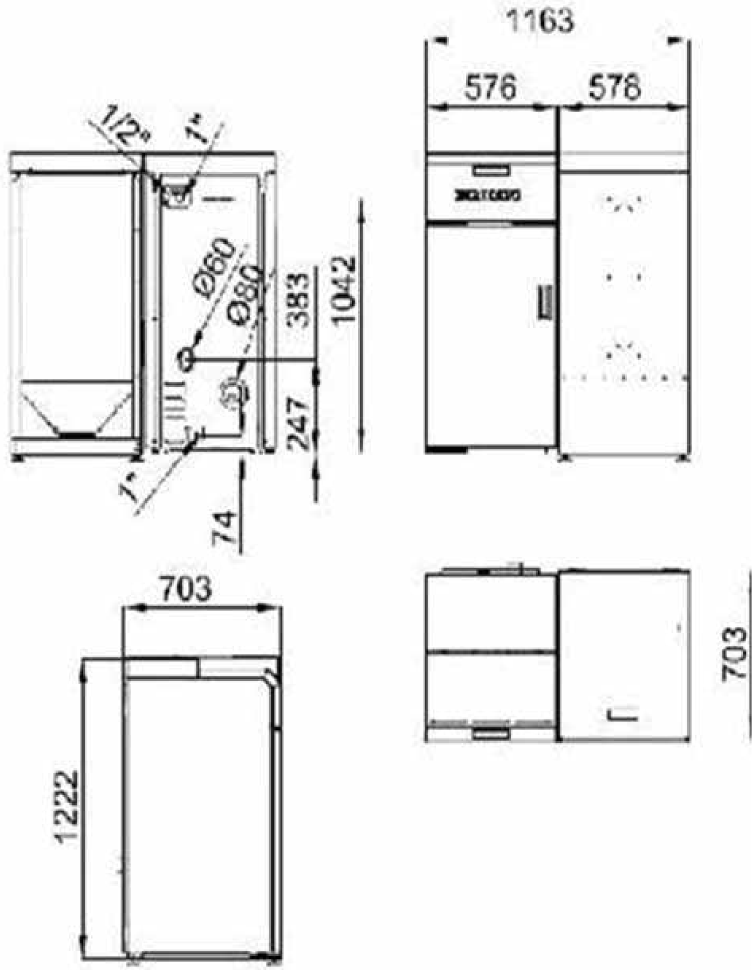
NOx	mg / Nm^3 (and/or) mg/MJ	116 mg/Nm^3 13% O_2	116 mg/Nm^3 13% O_2	116 mg/Nm^3 13% O_2	
Other characteristics					
Ignition	spark / kindling / other	Automatic	Automatic	Automatic	
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	
Ash compaction	yes / no	No	No	No	
Ash chamber dimensions (Width x Height x Length)	m	0.275 x 0.223 x 0.148	0.275 x 0.223 x 0.148	0.275 x 0.223 x 0.148	
Typical ash cleaning frequency	times per week / month / other	Once a week	Once a week	Once a week	
Other information					
Cost data					
Price range (VAT included)	€	N/A	N/A	N/A	
Maintenance cost (typical)	€ / year	120.00	120.00	120.00	
Manufacturer	BRONPI CALEFACCION SL. Carretera Córdoba-Málaga, Km. 78.2 .Nacional 331. Salida Autovía 62 Lucena Sur. 14900 Lucena (Córdoba. Spain) Tel. 0034 957 502 750. Fax. 0034 957 591 725. http://www.bronpi.com/. Email: bronpi@bronpi.com				
Series name	HYDROALASKA				

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Photos / schematics	 

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Combustion system type	Boiler				
Fuel type	Pellets and olive stones				
Boiler Model Name	**Units / Characteristics**	**HYDROALASKA-21**			
Basic design parameters and geometry					
Nominal thermal output	kW	7.2/21.2 pellet 23.3 olive stone			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	6.9/20.3 pellet 20 olive stone			
Thermal output for space heating (for stoves)	kW	-			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.576 x 1.222 x 0.703			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.163 x 1.222 x 0.703			
Net combustion system weight	kg	268			
Heating surfaces	m^2	0.81			
Cleaning of heating surfaces	automated / manual	Automated			
Fuel capacity and feeding					

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Fuel feeding	pneumatic / auger / manual / other	Auger			
Operation	continuous / intermittent	Intermittent			
Integrated Hopper / Silo	yes / no	Yes			
Integrated Hopper / Silo Capacity	l	361			
Typical fuel consumption	kg/h	1.5/4.9 pellet 5.6 olive stone			
Time between refueling (for intermittent use. stoves)	min / h	48/157 pellet 46 olive stone			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No			
Stoker technology	Manual / automated (screw)	Automated (screw)			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above			
Grate technology	fixed grate / moving grate / others	Moving grate			
Combustion chamber volume	l	19			
Combustion chamber dimensions (Width x Height x Length)	m	0.292 x 0.504 x 0.132			

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Combustion chamber cooling concept	water cooled / air cooled / insulated	Water and air cooled			
Combustion air streams	primary air / secondary air / others	Primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber			
Air supply control	flaps / controlled fans	Controlled fans			
Deashing system	manual / automatic	Manual			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe			
Efficiency and Class					
Boiler / Stove Efficiency	%	91/96% pellet 92% olive stone			
Combustion efficiency (related to fuel burnout)	%	94%			
Electricity consumption	Wel/kW of boiler output	0.15/0.25 (0.5 switch on)			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A			
Hydraulics / Water circuit					
Number of tubes	#	4			

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Hydraulics connections	inches	1”			
Maximum operation pressure	bar	2.5 (pellet and olive stone)			
Tested pressure	bar	1.5 (pellet and olive stone)			
Water volume	l	25			
Minimum return temperature	^oC	45-55			
Maximum operation temperature	^oC	40/80			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80			
Flue gas temperature	^oC	58/147 pellet 135 olive stone			
Draught	forced / natural	Forced			
Location of flue gas fan (for forced draught systems)		Flue gas duct			
CO	mg / Nm^3 (and/or) mg/MJ	0.016% (pellet and olive stone)-at 13% O_2 nominal power 0.012% (pellet and olive Stone)-at 13% O_2 reduced power			
OGC	mg / Nm^3 (and/or) mg/MJ	6 mg/Nm^3 10% O_2			
Dust	mg / Nm^3 (and/or) mg/MJ	18 mg/Nm^3 10% O_2			
NOx	mg / Nm^3 (and/or) mg/MJ	116 mg/Nm^3 10% O_2			
Other characteristics					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Ignition	spark / kindling / other	Automatic			
Visual inspection of combustion chamber	yes / no	No			
Ash compaction	yes / no	No			
Ash chamber dimensions (Width x Height x Length)	m	0.275 x 0.223 x 0.148			
Typical ash cleaning frequency	times per week / month / other	Once a week			
Other information					
Cost data					
Price range (VAT included)	€	N/A			
Maintenance cost (typical)	€ / year	120.00			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	BRONPI CALEFACCION SL. Carretera Córdoba-Málaga, Km. 78.2 .Nacional 331. Salida Autovía 62 Lucena Sur. 14900 Lucena (Córdoba. Spain) Tel. 0034 957 502 750. Fax. 0034 957 591 725. http://www.bronpi.com/. Email: bronpi@bronpi.com
Series name	HYDROARTICA

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

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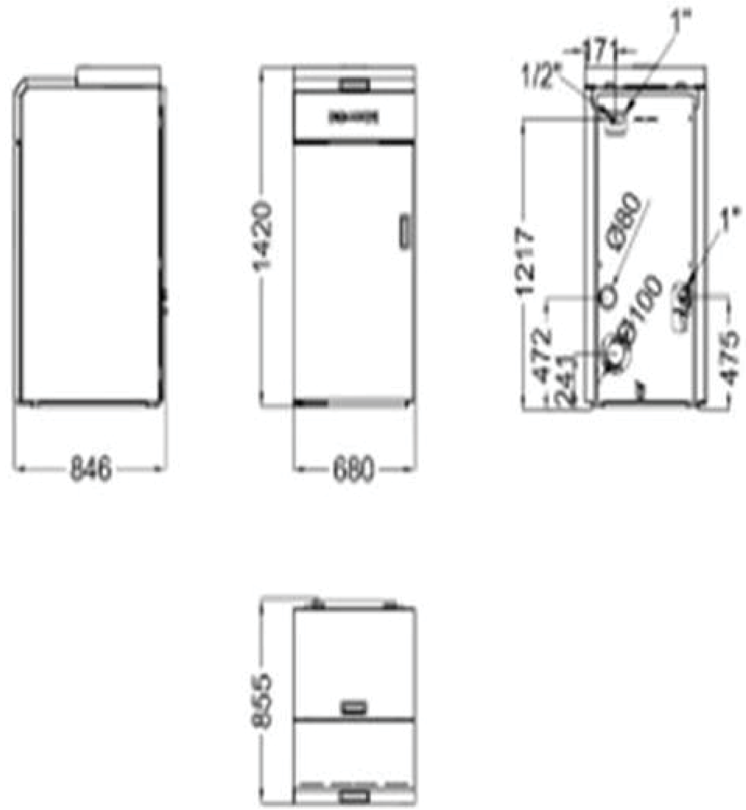
<tr><td>Photos / schematics</td><td>

HYDROARTICA-27</td></tr>
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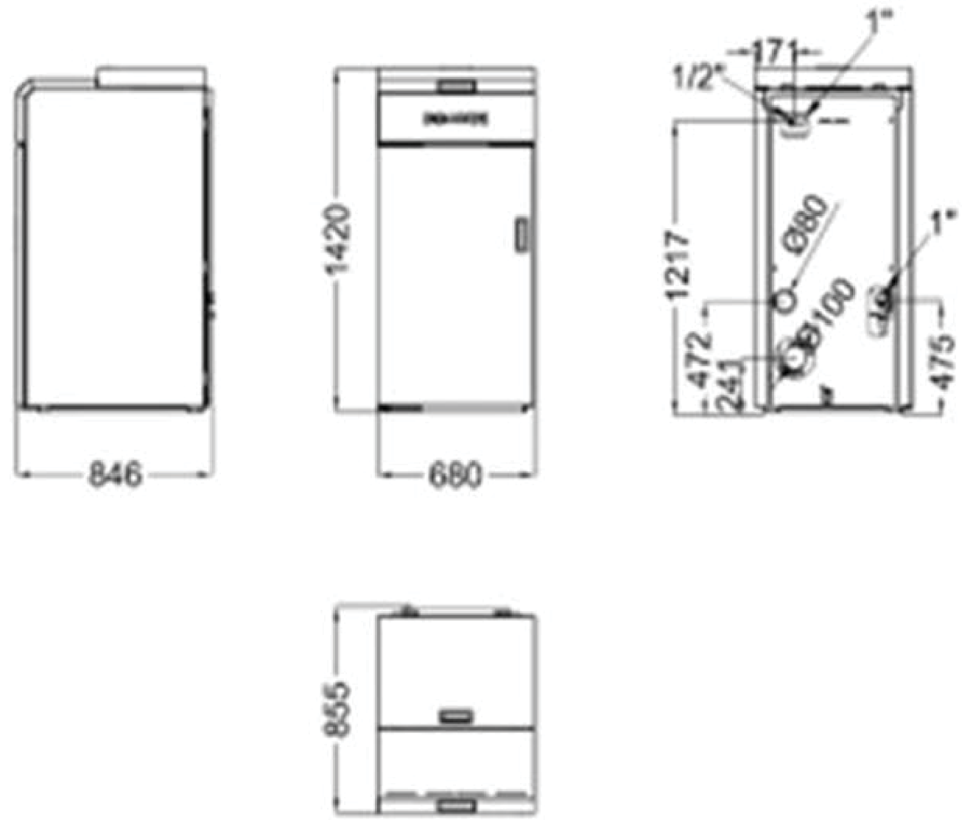
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763



HYDROARTICA-34

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Pellets and olive stone				
Boiler Model Name	**Units / Characteristics**	**HYDROARTICA-27**	**HYDROARTICA-34**		
Basic design parameters and geometry					
Nominal thermal output	kW	9/27.6 pellet 27.6 olive stone	12/34.3 pellet 34.5 olive stone		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	8/25.7 pellet 25.4 olive stone	10.4/31.4 pellet 31.3 olive stone		
Thermal output for space heating (for stoves)	kW	-	-		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.680 x 1.420 x 0.855	0.680 x 1.420 x 0.846		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.680 x 1.420 x 0.855	0.680 x 1.420 x 0.846		
Net combustion system weight	kg	293	310		
Heating surfaces	m^2		1.80 m^2		
Cleaning of heating surfaces	automated / manual	Automated	Automated		
Fuel capacity and feeding					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel feeding	pneumatic / auger / manual / other	Auger	Auger		
Operation	continuous / intermittent	Intermittent	Intermittent		
Integrated Hopper / Silo	yes / no	Yes	Yes		
Integrated Hopper / Silo Capacity	l	154	154		
Typical fuel consumption	kg/h	1.9/6 pellet 6.5 olive stone	2.5/7.6 pellet 8.3 olive stone		
Time between refueling (for intermittent use. stoves)	min / h	16/53 pellet 17 olive stone	40/13 pellet 32 olive stone		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated (screw)	Automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above		
Grate technology	fixed grate / moving grate / others	Moving grate	Moving grate		
Combustion chamber volume	l	40	40		
Combustion chamber dimensions (Width x Height x Length)	m	0.412 x 0.665 x 0.148	0.412 x 0.665 x 0.148		
Combustion chamber cooling concept	water cooled / air cooled /	Water and air cooled	Water and air cooled		

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans		
Deashing system	manual / automatic	Manual	Manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%	91/96% pellets 92% olive stone	92/96% pellets 92% olive stone		
Combustion efficiency (related to fuel burnout)	%	94%	94%		
Electricity consumption	Wel/kW of boiler output	0.15/0.25 (0.5 switch on)	0.15/0.25 (0.5 switch on)		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A		
Hydraulics / Water circuit					
Number of tubes	#	4	4		
Hydraulics connections	inches	1”	1”		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Maximum operation pressure	bar	2.4 (pellet & olive stone)	2.4 (pellet & olive stone)		
Tested pressure	bar	1.5 (pellet & olive stone)	1.5 (pellet & olive stone)		
Water volume	l	45	65		
Minimum return temperature	°C	45-55	45-55		
Maximum operation temperature	°C	40/80	40/80		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	100	80		
Flue gas temperature	°C	55/116 pellet 108 olive stone	56/138 pellet 135 olive stone		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	0.017% (pellet) and 0.03% (olive stone) – at 13% O_2 nominal power 0.002% (pellet) - at 13% O_2 reduced power	0.018% (pellet) and 0.03% (olive stone) – at 13% O_2 nominal power 0.02 (pellet)) - % at 13% O_2 reduced power		
OGC	mg / Nm^3 (and/or) mg/MJ	6 mg/Nm^3 10% O_2	6 mg/Nm^3 10% O_2		
Dust	mg / Nm^3 (and/or) mg/MJ	12 mg/Nm^3 10% O_2	18 mg/Nm^3 10% O_2		
NOx	mg / Nm^3 (and/or) mg/MJ	131 mg/Nm^3 10% O_2	116 mg/Nm^3 10% O_2		
Other characteristics					

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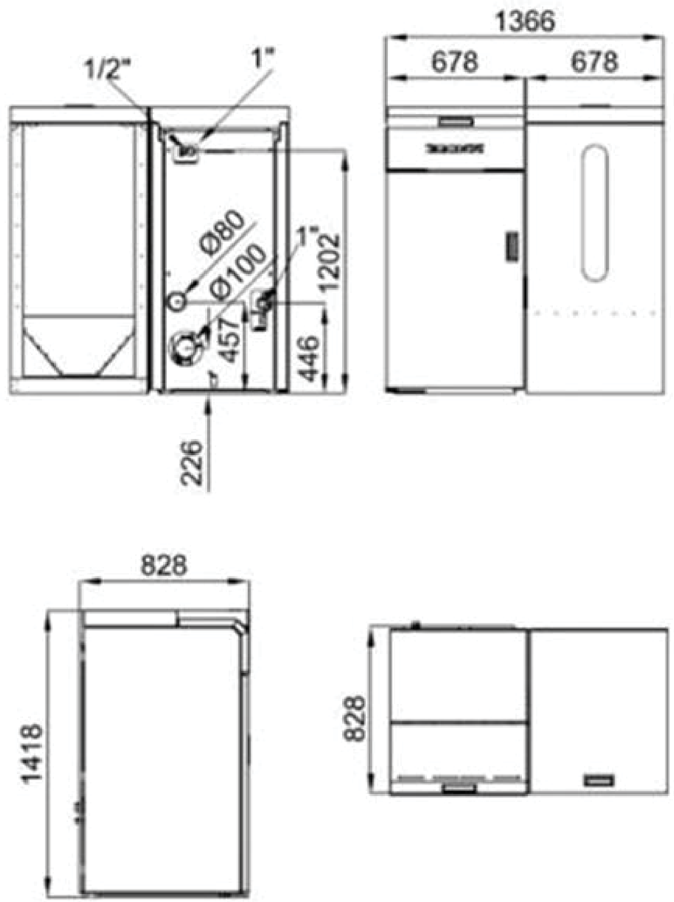
Ignition	spark / kindling / other	Automatic	Automatic		
Visual inspection of combustion chamber	yes / no	yes	yes		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	0.332 x 0.183 x 0.163	0.332 x 0.183 x 0.163		
Typical ash cleaning frequency	times per week / month / other	Once a week	Once a week		
Other information					
Cost data					
Price range (VAT included)	€	N/A	N/A		
Maintenance cost (typical)	€ / year	120.00	120.00		

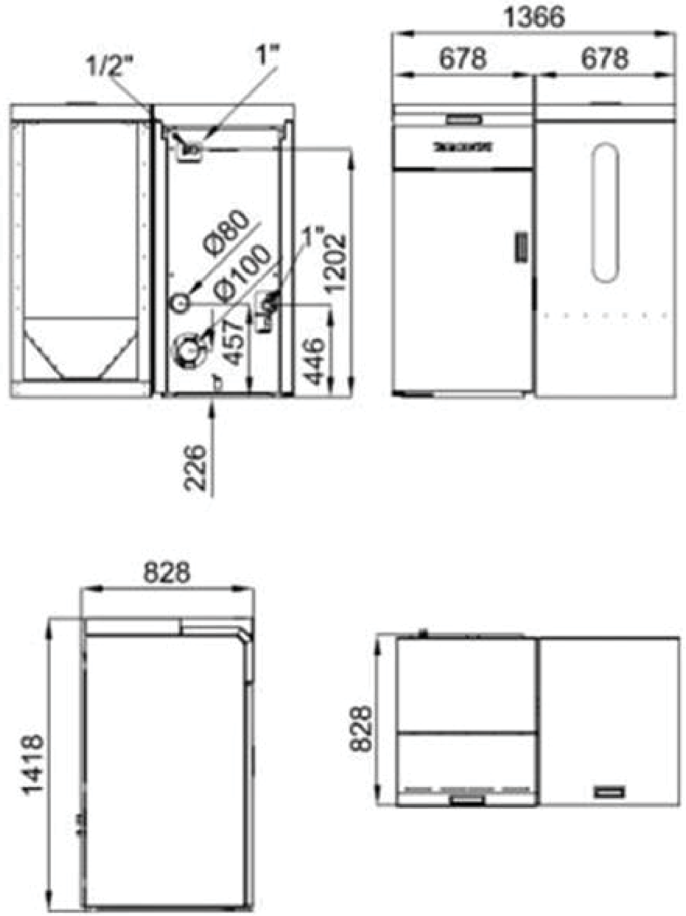
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	BRONPI CALEFACCION SL. Carretera Córdoba-Málaga, Km. 78.2 .Nacional 331. Salida Autovía 62 Lucena Sur. 14900 Lucena (Córdoba. Spain) Tel. 0034 957 502 750. Fax. 0034 957 591 725. http://www.bronpi.com/. Email: bronpi@bronpi.com
Series name	HYDROBALTICA

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Photos / schematics	  **HYDROBALTICA-27**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763



HYDROBALTICA-34

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Pellets and olive stone				
Boiler Model Name	**Units / Characteristics**	**HYDROBALTICA-27**	**HYDROBALTICA-34**		
Basic design parameters and geometry					
Nominal thermal output	kW	9/27.6 pellet 27.6 olive stone	12/34.3 pellet 34.5 olive stone		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	8/25.7 pellet 25.4 olive stone	10.4/31.4 pellet 31.3 olive stone		
Thermal output for space heating (for stoves)	kW	-	-		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.678 x 1.420 x 0.828	0.607 x 1.270 x 0.653		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.366 x 1.420 x 0.828	0.607 x 1.27 x 0.653		
Net combustion system weight	kg	353	205		
Heating surfaces	m^2		1.80		
Cleaning of heating surfaces	automated / manual	Automated	Automated		
Fuel capacity and feeding					

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Fuel feeding	pneumatic / auger / manual / other	Auger	Auger		
Operation	continuous / intermittent	Intermittent	Intermittent		
Integrated Hopper / Silo	yes / no	Yes	Yes		
Integrated Hopper / Silo Capacity	l	615	615		
Typical fuel consumption	kg/h	1.9/6 pellet 6.5 olive stone	1.5/4.9 pellet 5.6 olive stone		
Time between refueling (for intermittent use. stoves)	min / h	57/210 pellet 68 olive stone	9.8/32 pellet 9.6 olive stone		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated (screw)	Automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above		
Grate technology	fixed grate / moving grate / others	Moving grate	Moving grate		
Combustion chamber volume	l	40	40		
Combustion chamber dimensions (Width x Height x Length)	m	0.412 x 0.665 x 0.148	0.412 x 0.665 x 0.148		
Combustion chamber cooling concept	water cooled / air cooled /	Water and air cooled	Water and air cooled		

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans		
Deashing system	manual / automatic	Manual	Manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Lambda sensor	Automatic Lambda sensor		
Efficiency and Class					
Boiler / Stove Efficiency	%	91/96% pellet 92% olive stone	91/96% pellet 92% olive stone		
Combustion efficiency (related to fuel burnout)	%	94%	94%		
Electricity consumption	Wel/kW of boiler output	0.15/0.25 (0.5 switch on)	0.15/0.25 (0.5 switch on)		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A		
Hydraulics / Water circuit					
Number of tubes	#	4	4		
Hydraulics connections	inches	1”	1”		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Maximum operation pressure	bar	2.5 (pellet and olive stone)	2.4 (pellet and olive stone)		
Tested pressure	bar	1.5 (pellet and olive stone)	1.5 (pellet and olive stone)		
Water volume	l	45	65		
Minimum return temperature	°C	45-55	45-55		
Maximum operation temperature	°C	40/80	40/80		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	100	80		
Flue gas temperature	°C	55/116 pellet 108 olive stone	56/138 pellet 135 olive stone		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	0.017% (pellet) and 0.03% (olive stone) –at 13% O_2 nominal power 0.002% (pellet) -at 13% O_2 reduced power	0.018% (pellet) and 0.03% (olive stone) –at 13% O_2 nominal power 0.02% (pellet)) -at 13% O_2 reduced power		
OGC	mg / Nm^3 (and/or) mg/MJ	6 mg/Nm^3 10% O_2	5 mg/Nm^3 10% O_2		
Dust	mg / Nm^3 (and/or) mg/MJ	12 mg/Nm^3 10% O_2	18 mg/Nm^3 10% O_2		
NOx	mg / Nm^3 (and/or) mg/MJ	131 mg/Nm^3 10% O_2	102 mg/Nm^3 10% O_2		
Other characteristics					
Ignition	spark / kindling /	Automatic	Automatic		

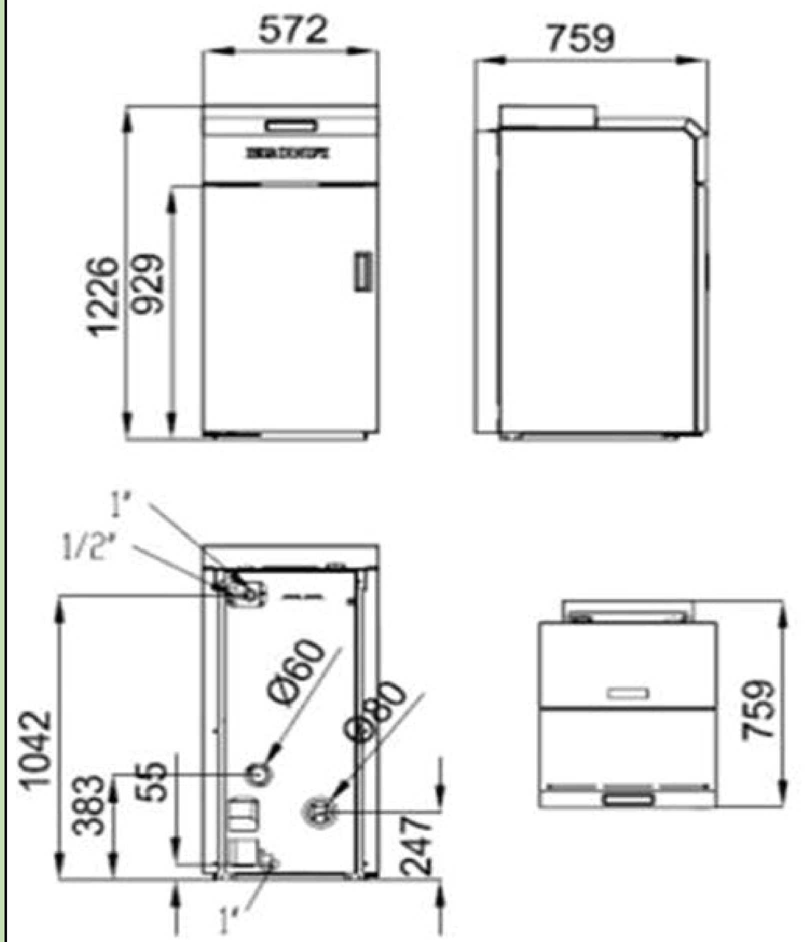
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	other				
Visual inspection of combustion chamber	yes / no	No	Yes		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	0.332 x 0.183 x 0.163	0.332 x 0.183 x 0.163		
Typical ash cleaning frequency	times per week / month / other	Once a week	Once a week		
Other information					
Cost data					
Price range (VAT included)	€	N/A	N/A		
Maintenance cost (typical)	€ / year	120.00	120.00		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	BRONPI CALEFACCION SL. Carretera Córdoba-Málaga, Km. 78.2 .Nacional 331. Salida Autovía 62 Lucena Sur. 14900 Lucena (Córdoba. Spain) Tel. 0034 957 502 750. Fax. 0034 957 591 725. http://www.bronpi.com/. Email: bronpi@bronpi.com
Series name	HYDROPOLAR

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Photos / schematics	  **HYDROPOLAR-21**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Pellets and olive stone				
Boiler Model Name	**Units / Characteristics**	**HYDROPOLAR-21**			
Basic design parameters and geometry					
Nominal thermal output	kW	7.2/21.2 pellet 23.3 olive stone			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	6.9/20.3 pellet 20 olive stone			
Thermal output for space heating (for stoves)	kW	-			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.572 x 1.226 x 0.759			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.572 x 1.226 x 0.759			
Net combustion system weight	kg	225			
Heating surfaces	m^2	0.81			
Cleaning of heating surfaces	automated / manual	Automated			
Fuel capacity and feeding					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel feeding	pneumatic / auger / manual / other	Auger			
Operation	continuous / intermittent	Intermittent			
Integrated Hopper / Silo	yes / no	Yes			
Integrated Hopper / Silo Capacity	l	73			
Typical fuel consumption	kg/h	1.5/4.9 pellet 5.6 olive stone			
Time between refueling (for intermittent use. stoves)	min / h	9.8/32 pellet 9.6 olive stone			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No			
Stoker technology	Manual / automated (screw)	Automated (screw)			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above			
Grate technology	fixed grate / moving grate / others	Moving grate			
Combustion chamber volume	l	19			
Combustion chamber dimensions (Width x Height x Length)	m	0.292 x 0.504 x 0.132			
Combustion chamber cooling concept	water cooled / air cooled /	Water and air cooled			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	insulated				
Combustion air streams	primary air / secondary air / others	Primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber			
Air supply control	flaps / controlled fans	Controlled fans			
Deashing system	manual / automatic	Manual			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe			
Efficiency and Class					
Boiler / Stove Efficiency	%	91/96% pellet 92% olive stone			
Combustion efficiency (related to fuel burnout)	%	94%			
Electricity consumption	Wel/kW of boiler output	0.15/0.25 (0.5 switch on)			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A			
Hydraulics / Water circuit					
Number of tubes	#	4			
Hydraulics connections	inches	1”			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Maximum operation pressure	bar	2.4 (pellet y olive stone)			
Tested pressure	bar	1.5 (pellet y olive stone))			
Water volume	l	25			
Minimum return temperature	°C	45-55			
Maximum operation temperature	°C	40/80			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80			
Flue gas temperature	°C	58/147 pellet 135 olive stone			
Draught	forced / natural	Forced			
Location of flue gas fan (for forced draught systems)		Flue gas duct			
CO	mg / Nm^3 (and/or) mg/MJ	0.016% (pellet and olive stone) – at 13% O_2 nominal power 0.012% (pellet) -at 13% O_2 reduced power			
OGC	mg / Nm^3 (and/or) mg/MJ	6 mg/Nm^3 10% O_2			
Dust	mg / Nm^3 (and/or) mg/MJ	18 mg/Nm^3 10% O_2			
NOx	mg / Nm^3 (and/or) mg/MJ	116 mg/Nm^3 10% O_2			
Other characteristics					
Ignition	spark / kindling /	Automatic			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	other				
Visual inspection of combustion chamber	yes / no	Yes			
Ash compaction	yes / no	No			
Ash chamber dimensions (Width x Height x Length)	m	0.275 x 0.223 x 0.148			
Typical ash cleaning frequency	times per week / month / other	Once a week			
Other information					
Cost data					
Price range (VAT included)	€	N/A			
Maintenance cost (typical)	€ / year	120.00			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	BRONPI CALEFACCION SL. Carretera Córdoba-Málaga, Km. 78.2 .Nacional 331. Salida Autovía 62 Lucena Sur. 14900 Lucena (Córdoba. Spain) Tel. 0034 957 502 750. Fax. 0034 957 591 725. http://www.bronpi.com/. Email: bronpi@bronpi.com
Series name	Karina
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Stove				
Fuel type	Pellet and olive stone				
Boiler Model Name	**Units / Characteristics**	**KARINA-H**			
Basic design parameters and geometry					
Nominal thermal output	kW	9/27.6 pellet 27.6 olive stone			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	8/25.7 pellet 25.4 olive stone			
Thermal output for space heating (for stoves)	kW	8/25.7 pellet 25.4 olive stone			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.660 x 1.402 x 0.716			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.660 x 1.402 x 0.716			
Net combustion system weight	kg	263			
Heating surfaces	m^2	N/A			
Cleaning of heating surfaces	automated / manual	Automated			
Fuel capacity and feeding					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel feeding	pneumatic / auger / manual / other	Auger			
Operation	continuous / intermittent	Intermittent			
Integrated Hopper / Silo	yes / no	Yes			
Integrated Hopper / Silo Capacity	l	92			
Typical fuel consumption	kg/h	1.9/6 pellet 6.5 olive stone			
Time between refueling (for intermittent use. stoves)	min / h	10/31.5 pellet 10.1 olive stone			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No			
Stoker technology	Manual / automated (screw)	Automated (screw)			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above			
Grate technology	fixed grate / moving grate / others	Moving grate			
Combustion chamber volume	l	40			
Combustion chamber dimensions (Width x Height x Length)	m	0.412 x 0.665 x 0.148			
Combustion chamber cooling concept	water cooled / air cooled /	Water and air cooled			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	insulated				
Combustion air streams	primary air / secondary air / others	Primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber			
Air supply control	flaps / controlled fans	Controlled fans			
Deashing system	manual / automatic	Manual			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe			
Efficiency and Class					
Boiler / Stove Efficiency	%	93/96% pellet 94% olive stone			
Combustion efficiency (related to fuel burnout)	%	94%			
Electricity consumption	Wel/kW of boiler output	0.15/0.25 (0.5 switch on)			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-			
Hydraulics / Water circuit					
Number of tubes	#	4			
Hydraulics connections	inches	1”			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Maximum operation pressure	bar	2.4 (pellet y olive stone)			
Tested pressure	bar	1.5 (pellet y olive stone)			
Water volume	l	45			
Minimum return temperature	ºC	45-55			
Maximum operation temperature	ºC	40/80			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	100			
Flue gas temperature	ºC	55/116 pellet 108 olive stone			
Draught	forced / natural	Forced			
Location of flue gas fan (for forced draught systems)		Flue gas duct			
CO	mg / Nm^3 (and/or) mg/MJ	0.017% (pellet and olive stone) – at 13% O_2 nominal power 0.002% (pellet) -at 13% O_2 reduced powerr			
OGC	mg / Nm^3 (and/or) mg/MJ	6 mg/Nm^3 13% O_2			
Dust	mg / Nm^3 (and/or) mg/MJ	12 mg/Nm^3 13% O_2			
NOx	mg / Nm^3 (and/or) mg/MJ	131 mg/Nm^3 13% O_2			
Other characteristics					
Ignition	spark / kindling /	Automatic			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	other				
Visual inspection of combustion chamber	yes / no	Yes			
Ash compaction	yes / no	No			
Ash chamber dimensions (Width x Height x Length)	m	0.332 x 0.183 x 0.163			
Typical ash cleaning frequency	times per week / month / other	Once a week			
Other information					
Cost data					
Price range (VAT included)	€	N/A			
Maintenance cost (typical)	€ / year	120.00			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

2.3. CARSAN

Manufacturer	Carsan Biocombustibles. C/ Rafael Pillado Mourelle 6 P.I. Rio de Janeiro. nave B25 – B26 28110 – Algete (Madrid. Spain). Tel. 0034 916 287 492. http://carsanbio.com/. Dpto de Administración: administración@carsanbio.com. Dpto de Pedidos: pedidos@carsanbio.com. Dpto de Soporte: soporte@carsanbio.com Ctra. Nnal.323A. km 149. 18640 El Padul (Granada. Spain). Tel. 0034 916 287 492 / 0034 916 287 494
Series name	Marca: CLbio; Modelo: Combi

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Photos / schematics	 **CLbio Combi**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Pellets, olive stones almond shells, grounded stones /shells: hazelnut, nut, apricot or similar.				
Boiler Model Name	**Units / Characteristics**	**COMBI**			
Basic design parameters and geometry					
Nominal thermal output	kW	27			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	25.6			
Thermal output for space heating (for stoves)	kW	-			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	8.8			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.18 x 1.4 x 0.88			
Net combustion system weight	kg	250			
Heating surfaces	m^2	N/A			
Cleaning of heating surfaces	automated / manual	Manual			
Fuel capacity and feeding					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel feeding	pneumatic / auger / manual / other	Manual			
Operation	continuous / intermittent	Intermittent			
Integrated Hopper / Silo	yes / no	Yes			
Integrated Hopper / Silo Capacity	kg	120			
Typical fuel consumption	kg/h	6.66			
Time between refueling (for intermittent use. stoves)	min / h	-			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	N/A			
Stoker technology	Manual / automated (screw)	Double auger			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From the side			
Grate technology	fixed grate / moving grate / others	Fixed grate			
Combustion chamber volume	l	65			
Combustion chamber dimensions (Width x Height x Length)	m	N/A			
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion air streams	primary air / secondary air / others	Primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans			
Air supply control	flaps / controlled fans	Controlled fans			
Deashing system	manual / automatic	No			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Manual			
Efficiency and Class					
Boiler / Stove Efficiency	%	84.9%			
Combustion efficiency (related to fuel burnout)	%	N/A			
Electricity consumption	Wel/kW of boiler output	0.15			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3			
Hydraulics / Water circuit					
Number of tubes	#	N/A			
Hydraulics connections	inches	1 ¼”			
Maximum operation pressure	bar	3			
Tested pressure	bar	4.5			

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Water volume	l	65			
Minimum return temperature	^oC	55			
Maximum operation temperature	^oC	80			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	200			
Flue gas temperature	^oC	185			
Draught	forced / natural	Natural			
Location of flue gas fan (for forced draught systems)		-			
CO	mg / Nm^3 (and/or) mg/MJ	498 mg/Nm^3 10% O_2			
OGC	mg / Nm^3 (and/or) mg/MJ	N/A			
Dust	mg / Nm^3 (and/or) mg/MJ	N/A			
NOx	mg / Nm^3 (and/or) mg/MJ	N/A			
Other characteristics					
Ignition	spark / kindling / other	Automatic			
Visual inspection of combustion chamber	yes / no	Yes			
Ash compaction	yes / no	No			
Ash chamber dimensions (Width x Height x Length)	m	N/A			
Typical ash cleaning frequency	times per week / month / other	Weekly			
Other information					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Cost data					
Price range (VAT included)	€	3509			
Maintenance cost (typical)	€ / year	N/A			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	Carsan Biocombustibles. C/ Rafael Pillado Mourelle 6 P.I. Rio de Janeiro. nave B25 – B26 28110 – Algete (Madrid. Spain). Tel. 0034 916 287 492. http://carsanbio.com/. Dpto de Administración: administración@carsanbio.com. Dpto de Pedidos: pedidos@carsanbio.com. Dpto de Soporte: soporte@carsanbio.com Ctra. Nnal.323A. km 149. 18640 El Padul (Granada. Spain). Tel. 0034 916 287 492 / 0034 916 287 494
Series name	Marca: CLBio. Modelo: Compacta

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Photos / schematics	 **CLBio Compacta**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Pellets, olive stones, almond shells, grounded stones /shells: hazelnut, nut, apricot or similar				
Boiler Model Name	**Units / Characteristics**	**COMPACTA**			
Basic design parameters and geometry					
Nominal thermal output	kW	24.4			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	21.5			
Thermal output for space heating (for stoves)	kW	-			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	9.9			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.09 x 1.2 x 0.93			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.09 x 1.2 x 0.93			
Net combustion system weight	kg	380			
Heating surfaces	m^2	N/A			
Cleaning of heating surfaces	automated / manual	Automated			
Fuel capacity and feeding					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel feeding	pneumatic / auger / manual / other	Manual			
Operation	continuous / intermittent	Continuous			
Integrated Hopper / Silo	yes / no	Yes			
Integrated Hopper / Silo Capacity	kg	100			
Typical fuel consumption	kg/h	5.15			
Time between refueling (for intermittent use. stoves)	min / h	-			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	N/A			
Stoker technology	Manual / automated (screw)	Automated			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below			
Grate technology	fixed grate / moving grate / others	Fixed grate			
Combustion chamber volume	l	N/A			
Combustion chamber dimensions (Width x Height x Length)	m	N/A			
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion air streams	primary air / secondary air / others	Primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans			
Air supply control	flaps / controlled fans	Controlled fans			
Deashing system	manual / automatic	Automatic			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic			
Efficiency and Class					
Boiler / Stove Efficiency	%	93.68%			
Combustion efficiency (related to fuel burnout)	%	N/A			
Electricity consumption	Wel/kW of boiler output	0.325			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A			
Hydraulics / Water circuit					
Number of tubes	#	N/A			
Hydraulics connections	inches	1 ¼”			
Maximum operation pressure	bar	3			
Tested pressure	bar	4.5			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Water volume	l	70			
Minimum return temperature	^oC	55			
Maximum operation temperature	^oC	90			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	145			
Flue gas temperature	^oC	118			
Draught	forced / natural	Forced			
Location of flue gas fan (for forced draught systems)		Flue gas duct			
CO	mg / Nm^3 (and/or) mg/MJ	275 mg/Nm^3 10% O_2			
OGC	mg / Nm^3 (and/or) mg/MJ	N/A			
Dust	mg / Nm^3 (and/or) mg/MJ	N/A			
NOx	mg / Nm^3 (and/or) mg/MJ	124			
Other characteristics					
Ignition	spark / kindling / other	Automatic			
Visual inspection of combustion chamber	yes / no	Yes			
Ash compaction	yes / no	No			
Ash chamber dimensions (Width x Height x Length)	m	0.75x0.5			
Typical ash cleaning frequency	times per week / month / other	Monthly			
Other information					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

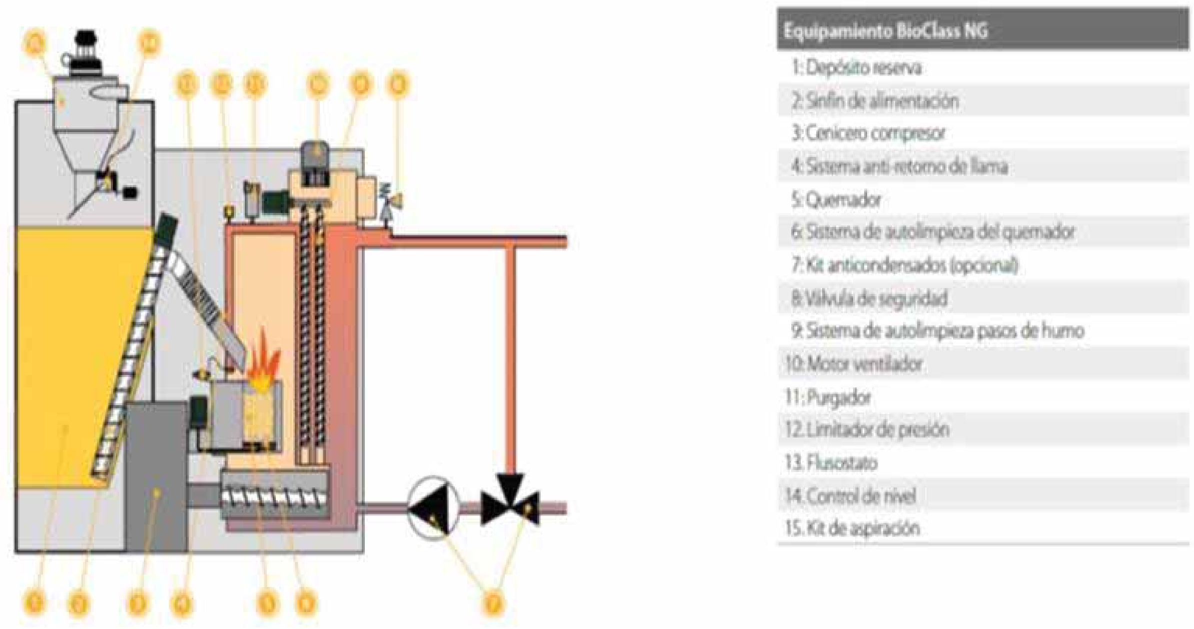
Cost data					
Price range (VAT included)	€	4399			
Maintenance cost (typical)	€ / year	200			

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

2.4. DOMUSA

Manufacturer	DOMUSA. S. COOP. Bº San Esteban s/n. 20737 Errezil (País Vasco. Spain) Tel. 0034 943 81 38 99. Fax. 0034 943 38 09 24. http://www.domusa.es/. E-mail: info@domusa.es
Series name	BIOCLASS NG 66 and M
Photos / schematics	 **BIOCLASS NG 66**

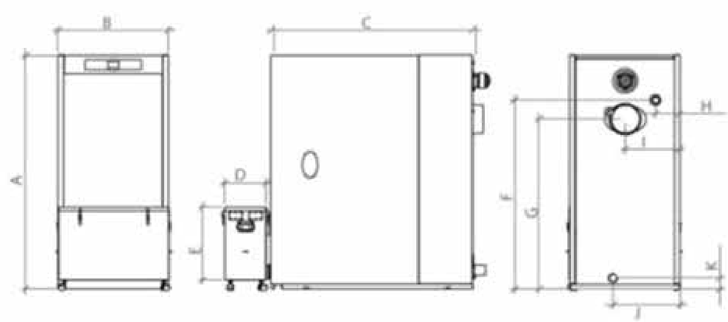
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763



This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

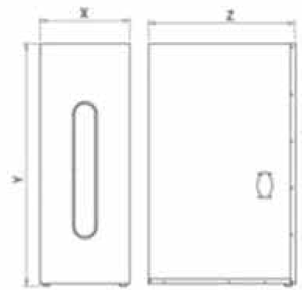
Dimensiones

Bioclass NG 66



Modelo	A	B	C	D	E	F	G	H	Y	J	K	Ø Salida de humos mm
Bioclass NG 66	1.526	670	1.235	260	445	1.195	1.110	130	335	562	113	175

Depósito reserva 66 NG



Modelo	X	Y	Z
Depósito reserva 66 NG	800	1.420	900

Amplia gama de accesorios

Silo

Tubo flexible

Equipamiento para silo artesanal

Boca de llenado Storz

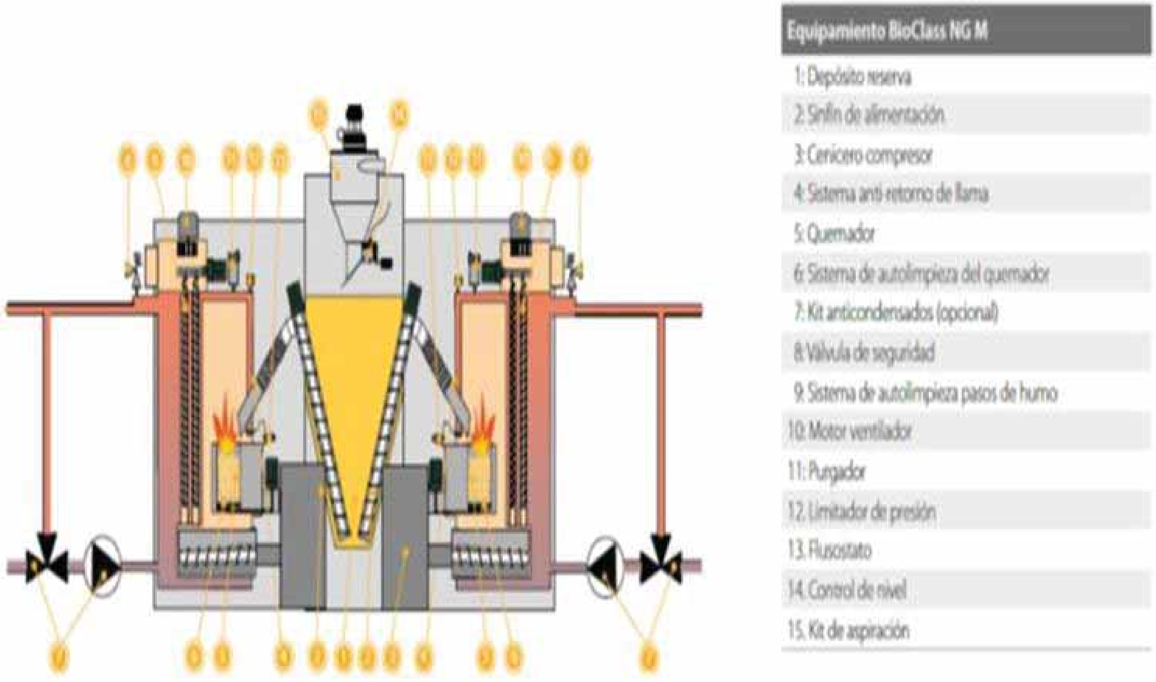
Boquilla de aspiración

Lona de protección de impacto

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

BIOCLASS NG M

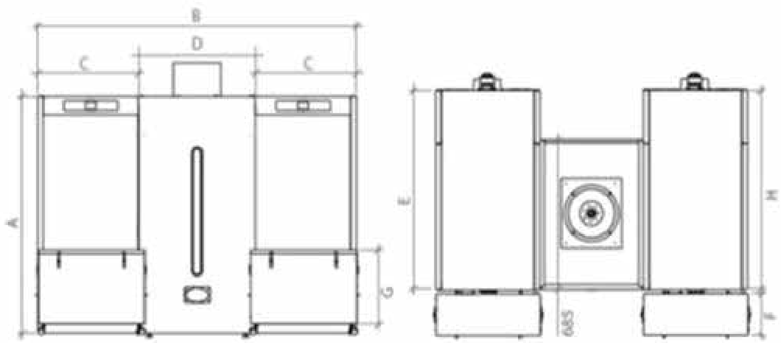
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763



This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Dimensiones

Bioclass NG M



Modelo	A	B	C	D	E	F	G	H
BioClass NG M 25/66	1.525	2.015	670	800	1.310	250	440	1.235
BioClass NG M 43/66	1.525	2.015	670	800	1.310	250	440	1.235
BioClass NG M 66/66	1.525	2.015	670	800	1.420	250	440	1.235

Opciones	Código	Precio €
Sonda acumulador A.C.S	CELC000300	14
Sonda para depósito de inercia	CELC000300	14
Kits hidráulicos		ver pág. 91
Depósito de inercia BT DUO		ver pág. 25-26
Depósito de inercia BT		ver pág. 23-24
Silo 2.2. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO008	2.202
Silo 3.2. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO009	2.409
Silo 5.0. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO010	2.641
Tubo flexible (15 m)	CFER000164	188
Boquilla aspiración para depósito de obra	TKITBIO016	65
Boca de llenado Storz	COTR000057	144
Lona de protección de impacto	COTR000060	72
Kit anticondensados 66 (válvula anticondensados + bomba de alta eficiencia)	TKITBIO055	265

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Pellets, hardwood pellets, olive stones and hazelnut shells.				
Boiler Model Name	**Units / Characteristics**	**BIOCLASS NG 66**	**BIOCLASS NG M 25/66**	**BIOCLASS NG M 43/66**	**BIOCLASS NG M 66/66**
Basic design parameters and geometry					
Nominal thermal output	kW	66	91.3	108.7	132
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	66 with heat exchanger	91.3 with heat exchanger	108.7 with heat exchanger	132 with heat exchanger
Thermal output for space heating (for stoves)	kW	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	18	24.9	29.4	36
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.47 x 1.526 x 1.235	2.015 x 1.525 x 1.485	2.015 x 1.525 x 1.485	2.015 x 1.525 x 1.485
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.47 x 1.526 x 1.235	2.015 x 1.525 x 1.485	2.015 x 1.525 x 1.485	2.015 x 1.525 x 1.485
Net combustion system weight	kg	486	826	894	972
Heating surfaces	m^2	N/A	N/A	N/A	N/A
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	Automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger /	Pneumatic	Pneumatic	Pneumatic	Pneumatic

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	manual / other				
Operation	continuous / intermittent	Intermitent with electronic control	Intermitent with electronic control	Intermitent with electronic control	Intermitent with electronic control
Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	Yes
Integrated Hopper / Silo Capacity	kg	340	340	340	340
Typical fuel consumption	kg/h	15	50	24	30
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	-
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Moving grate	Moving grate	Moving grate	Moving grate
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled	Water cooled	Water cooled
Combustion air streams	primary air /	N/A	N/A	N/A	N/A

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	secondary air / others				
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	Separate air fans
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans
Deashing system	manual / automatic	Automatic	Automatic	Automatic	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic	Automatic	Automatic	Automatic
Efficiency and Class					
Boiler / Stove Efficiency	%	94.8	94.85	94.6	94.8
Combustion efficiency (related to fuel burnout)	%	95.2	95.4	94.9	95.2
Electricity consumption	Wel/kW of boiler output	0.544	1.029	1.029	1.088
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	5
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A	N/A	N/A
Hydraulics connections	inches	1-1/4”	1-1/4”	1-1/4”	1-1/4”
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	4.5	4.5	4.5	4.5
Water volume	l	154	227	258	308

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Minimum return temperature	°C	25	25	25	25
Maximum operation temperature	°C	80	80	80	80
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	175	150-175	150-175	175
Flue gas temperature	°C	N/A	N/A	N/A	N/A
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	183 mg/Nm^3 10% O_2	145 mg/Nm^3 10% O_2	120 mg/Nm^3 10% O_2	183 mg/Nm^3 10% O_2
OGC	mg / Nm^3 (and/or) mg/MJ	4 mg/Nm^3 10% O_2	4 mg/Nm^3 10% O_2	4 mg/Nm^3 10% O_2	4 mg/Nm^3 10% O_2
Dust	mg / Nm^3 (and/or) mg/MJ	16 mg/Nm^3 10% O_2	17 mg/Nm^3 10% O_2	17 mg/Nm^3 10% O_2	16 mg/Nm^3 10% O_2
NOx	mg / Nm^3 (and/or) mg/MJ	177 mg/Nm^3 10% O_2	175 mg/Nm^3 10% O_2	183 mg/Nm^3 10% O_2	177 mg/Nm^3 10% O_2
Other characteristics					
Ignition	spark / kindling / other	Automatic ignition	Automatic ignition	Automatic ignition	Automatic ignition
Visual inspection of combustion chamber	yes / no	N/A	N/A	N/A	N/A
Ash compaction	yes / no	Yes	Yes	Yes	Yes
Ash chamber dimensions (Width x Height x Length)	m	0.605 x 0.46 x 0.46	0.42 x 0.50 x 0.86 0.605 x 0.46 x 0.46	0.60 x 0.50 x 0.86 0.605 x 0.46 x 0.46	0.605 x 0.46 x 0.46
Typical ash cleaning frequency	times per week / month / other	6.000 Kg pellet burned	9.000 Kg pellet burned	10.000 Kg pellet burned	12.000 Kg pellet burned
Other information					
Cost data					

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Price range (VAT included)	€	8.900	13.200	16.375	16.650
Maintenance cost (typical)	€ / year	140	140	140	140

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

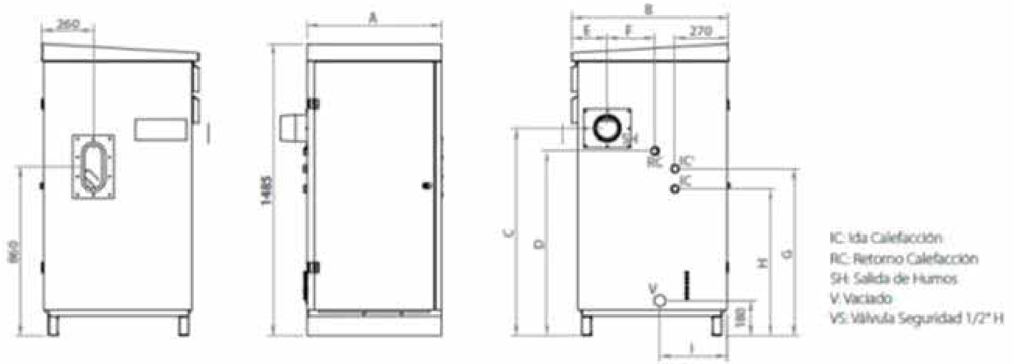
Manufacturer	DOMUSA. S. COOP. Bº San Esteban s/n. 20737 Errezil (País Vasco. Spain) Tel. 0034 943 81 38 99. Fax. 0034 943 38 09 24. http://www.domusa.es/. E-mail: info@domusa.es
Series name	BIOCLASS NG OD
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Equipamiento BioClass NG OD	
1: Envolvente estanco	8: Bomba de circulación
2: Depósito de reserva	9: Ida de calefacción
3: Sensor de presión de aire	10: Ida de calefacción opcional
4: Control de nivel de combustible	11: Retorno
5: Quemador	12: Válvula de seguridad
6: Llave de vaciado	13: Salida de gases
7: Vaso de expansión	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Dimensiones



Modelo	IC/RC/IC'	Cotas (mm)								
		A	B	C	D	E	F	G	H	I
BioClass NG 16 OD	1" H	680	795	1055	940	180	235	850	745	335
BioClass NG 25 OD		820	860	1135	1015	195	315	925	823	354

Modelo	Potencia nominal kW	Rendimiento a potencia nominal %	Potencia carga parcial kW	Rendimiento a carga parcial %	Depósito de reserva incluido	Volumen de agua en caldera L	Código	Precio €
BioClass NG 16 OD	15,6	93,5	4,2	88,5	SI	55	TBIO000064	**5.319**
BioClass NG 25 OD	25,3	95	6,9	92	SI	73	TBIO000065	**5.539**

Opciones	Código	Precio €
Sonda ambiente Lago FB OT+	CELC000295	**115**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Pellets, hardwood pellets, olive stones and hazelnut shells				
Boiler Model Name	**Units / Characteristics**	**BIOCLASS NG 16 OD**	**BIOCLASS NG 25 OD**		
Basic design parameters and geometry					
Nominal thermal output	kW	15.6	25.3		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	15.6 with heat exchanger	25.3 with heat exchanger		
Thermal output for space heating (for stoves)	kW	-	-		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	4.2	6.9		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.234 x 0.795 x 1.485	1.374 x 0.86 x 1.485		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.234 x 0.795 x 1.485	1.374 x 0.86 x 1.485		
Net combustion system weight	kg	400	511		
Heating surfaces	m^2	N/A	N/A		
Cleaning of heating surfaces	automated / manual	Automated	Automated		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger /	Manual	Manual		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	manual / other				
Operation	continuous / intermittent	Intermittent with electronic control	Intermittent with electronic control		
Integrated Hopper / Silo	yes / no	Yes	Yes		
Integrated Hopper / Silo Capacity	kg	225	225		
Typical fuel consumption	kg/h	3.4	5		
Time between refueling (for intermittent use. stoves)	min / h	-	-		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated	Automated		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above		
Grate technology	fixed grate / moving grate / others	Moving grate	Moving grate		
Combustion chamber volume	l	N/A	N/A		
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A		
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled		
Combustion air streams	primary air /	N/A	N/A		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	secondary air / others				
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans		
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans		
Deashing system	manual / automatic	Automatic	Automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic	Automatic		
Efficiency and Class					
Boiler / Stove Efficiency	%	93.5%	95%		
Combustion efficiency (related to fuel burnout)	%	95%	96%		
Electricity consumption	Wel/kW of boiler output	0.485	0.485		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A		
Hydraulics connections	inches	1”	1”		
Maximum operation pressure	bar	3	3		
Tested pressure	bar	4.5	4.5		
Water volume	l	55	73		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Minimum return temperature	^oC	25	25		
Maximum operation temperature	^oC	80	80		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	125	150		
Flue gas temperature	^oC	N/A	N/A		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	120 mg/Nm^3 10% O_2	45 mg/Nm^3 10% O_2		
OGC	mg / Nm^3 (and/or) mg/MJ	6 mg/Nm^3 10% O_2	<5 mg/Nm^3 10% O_2		
Dust	mg / Nm^3 (and/or) mg/MJ	25 mg/Nm^3 10% O_2	20 mg/Nm^3 10% O_2		
NOx	mg / Nm^3 (and/or) mg/MJ	180 mg/Nm^3 10% O_2	170 mg/Nm^3 10% O_2		
Other characteristics					
Ignition	spark / kindling / other	Automatic ignition	Automatic ignition		
Visual inspection of combustion chamber	yes / no	N/A	N/A		
Ash compaction	yes / no	Optional	Optional		
Ash chamber dimensions (Width x Height x Length)	m	0.36 x 0.40 x 0.86	0.42 x 0.50 x 0.86		
Typical ash cleaning frequency	times per week / month / other	750 Kg pellet burned	1.000 Kg pellet burned		
Other information					
Cost data					

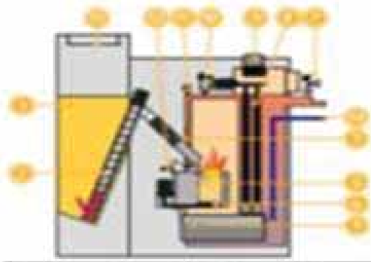
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Price range (VAT included)	€	5.319	5.539		
Maintenance cost (typical)	€ / year	140	140		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	DOMUSA. S. COOP. Bº San Esteban s/n. 20737 Errezil (País Vasco. Spain) Tel. 0034 943 81 38 99. Fax. 0034 943 38 09 24. http://www.domusa.es/. E-mail: info@domusa.es
Series name	BIOCLASS NG
Photos / schematics	  **BIOCLASS NG**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

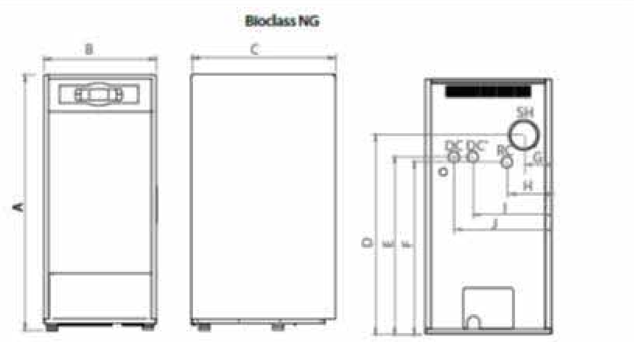


Equipamiento BioClass NG	
1: Depósito reserva (no incluido)	8: Sistema de autolimpieza pasos de humo
2: Sinfín de alimentación	9: Motor ventilador
3: Sistema anti-retorno retorno de llama	10: Purgador
4: Cenicero	11: Limitador de presión
5: Quemador	12: Flusostato
6: Sistema de autolimpieza del quemador	13: Rejilla de carga
7: Válvula de seguridad	14: Sistema anticondensados

Equipamiento HTP	
Vee: Vaso de expansión ACS	Vs: Válvula de seguridad
BA: Bomba de primario ACS	R: Resistencia eléctrica (opcional)
Vr: Válvula de retención	Ac: Acumulador de acero inoxidable
Ll: Válvula de llenado	

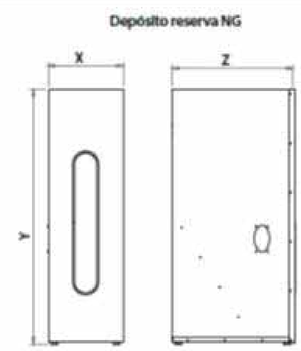
This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Dimensiones



DC: Ida calefacción
DC': Ida calefacción opcional
RC: Retorno calefacción
SH: Salida de humos

Modelo	A	B	C	D	E	F	G	H	I	J	Ø Salida de humos mm
BioClass NG 10	1.310	543	730	960	860	835	155	260	340	440	125
BioClass NG 16	1.310	543	730	960	860	835	120	225	305	400	125
BioClass NG 25	1.310	670	794	1.050	935	905	145	235	410	510	150
BioClass NG 43	1.310	670	960	1.050	935	905	145	235	410	510	150



Modelo	X	Y	Z
Depósito reserva S NG	404	1525	685
Depósito reserva L NG	800	1525	685
Depósito reserva LCS NG	800	1525	685
HTP 100 - 150	477	1310	913
HTP 130 - 200	700	1310	913

Modelo	Potencia nominal kW	Rendimiento a potencia nominal %	Potencia carga parcial kW	Rendimiento a carga parcial %	Volumen de agua en caldera L	Código	Precio €
BioClass NG 10	10,1	93,5	2,9	88,3	46	TBIO000051	**3.381**
BioClass NG 16	15,6	93,5	4,2	91,5	55	TBIO000052	**3.523**
BioClass NG 25	25,3	95	6,9	91,2	73	TBIO000053	**3.743**
BioClass NG 43	42,7	94	11,4	91,2	104	TBIO000054	**4.222**

Depósitos de reserva	Capacidad de combustible kg. pellet	Código	Precio €
Depósito reserva S NG	195	TBIO000036	**296**
Depósito reserva L NG	350	TBIO000037	**352**
Depósito reserva LCS NG	350	TBIO000038	**364**

Depósitos de reserva con ACS	Capacidad de combustible kg. pellet	Capacidad ACS L	Clase de eficiencia energética	Código	Precio €
HTP 100 - 150	150	100	C	TBIO000039	**1.050**
HTP 130 - 200	200	130	C	TBIO000040	**1.150**

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Opciones	Código	Precio €
Sonda acumulador A.C.S	CELC000300	14
Sonda para depósito de inercia	CELC000300	14
Cenicero compresor 10 NG	TKITBIO024	450
Cenicero compresor 16 NG	TKITBIO025	461
Cenicero compresor 25 NG	TKITBIO026	470
Cenicero compresor 43 NG	TKITBIO027	510
Kits hidráulicos		ver pág. 91
Depósito de inercia BT DUO		ver pág. 25-26
Depósito de inercia BT		ver pág. 23-24
Sistema de aspiración CVS (Más info en la pág. 106)	TKITBIO057	1.150
Silo 2.2. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO008	2.202
Silo 3.2. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO009	2.409
Silo 5.0. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO010	2.641
Acoplamiento para depósito de reserva L con Sistema de aspiración CVS (solo para BioClass NG)	TKITBIO041	33
Tubo flexible (15 m)	CFER000164	188
Boquilla aspiración para depósito de obra	TKITBIO016	65
Boca de llenado Storz	COTR000057	144
Lona de protección de impacto	COTR000060	72
Kit para hueso de aceituna 10/16	TKITBIO030	60
Kit para hueso de aceituna 25	TKITBIO032	62
Kit para hueso de aceituna 43	TKITBIO034	65
Kit para hueso de aceituna 10/16 HTP 100-150	TKITBIO046	60
Kit para hueso de aceituna 25 HTP 100-150	TKITBIO047	62
Kit para hueso de aceituna 43 HTP 100-150	TKITBIO048	65
Resistencia eléctrica HTP (solo para HTP)	TKITBIO043	90
Protección catódica HTP (solo para HTP)	TKITBIO044	260
Bomba de alta eficiencia 10/16	TKITBIO036	150
Bomba de alta eficiencia 25/43	TKITBIO037	160
Kit de sensor de nivel S	TKITBIO061	75
Kit de sensor de nivel L	TKITBIO062	75
Sonda ambiente Lago FB OT+	CELC000295	115

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Combustion system type	Boiler				
Fuel type	Pellets, hardwood pellets, olive stones and hazelnut shells				
Boiler Model Name	**Units / Characteristics**	**BIOCLASS NG 10**	**BIOCLASS NG 16**	**BIOCLASS NG 25**	**BIOCLASS NG 43**
Basic design parameters and geometry					
Nominal thermal output	kW	10.1	15.6	25.3	42.7
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	10.1 with heat exchanger	15.6 with heat exchanger	25.3 with heat exchanger	42.7 with heat exchanger
Thermal output for space heating (for stoves)	kW	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	2.9	4.2	6.9	11.4
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.543 x 1.31 x 0.73	0.543 x 1.31 x 0.73	0.67 x 1.31 x 0.794	0.67 x 1.31 x 0.96
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	With silo S: 0.947x1.525x0.73 With silo L: 1.343x1.525x0.73 With HTP 100/150: 1.02x1.31x0.913 With HTP 130/200: 1.243x1.31x0.913	With silo S: 0.947x1.525x0.73 With silo L: 1.343x1.525x0.73 With HTP 100/150: 1.02x1.31x0.913 With HTP 130/200: 1.243x1.31x0.913	With silo S: 1.074x1.525x0.794 With silo L: 1.47x1.525x0.794 With HTP 100/150: 1.147x1.31x0.913 With HTP 130/200: 1.37x1.31x0.913	With silo S: 1.074x1.525x0.96 With silo L: 1.47x1.525x0.96 With HTP 100/150: 1.147x1.31x0.96 With HTP 130/200: 1.37x1.31x0.96
Net combustion system weight	kg	190	210	300	368

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Heating surfaces	m^2	N/A	N/A	N/A	N/A
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	Automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Pneumatic (Optional)	Pneumatic (Optional)	Pneumatic (Optional)	Pneumatic (Optional)
Operation	continuous / intermittent	Intermittent with electronic control	Intermittent with electronic control	Intermittent with electronic control	Intermittent with electronic control
Integrated Hopper / Silo	yes / no	Silo S Silo L HTP 100/150 HTP 130/200 (Optional)	Silo S Silo L HTP 100/150 HTP 130/200 (Optional)	Silo S Silo L HTP 100/150 HTP 130/200 (Optional)	Silo S Silo L HTP 100/150 HTP 130/200 (Optional)
Integrated Hopper / Silo Capacity	kg	Silo S: 200 kg Silo L: 340 kg HTP 100/150: 150 kg HTP 130/200: 200 kg (Optional)	Silo S: 200 kg Silo L: 340 kg HTP 100/150: 150 kg HTP 130/200: 200 kg (Optional)	Silo S: 200 kg Silo L: 340 kg HTP 100/150: 150 kg HTP 130/200: 200 kg (Optional)	Silo S: 200 kg Silo L: 340 kg HTP 100/150: 150 kg HTP 130/200: 200 kg (Optional)
Typical fuel consumption	kg/h	2.3	3.4	5	9
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	-
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual /	Automated	Automated	Automated	Automated

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	automated (screw)				
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Moving grate	Moving grate	Moving grate	Moving grate
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled	Water cooled	Water cooled
Combustion air streams	primary air / secondary air / others	N/A	N/A	N/A	N/A
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	Separate air fans
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans
Deashing system	manual / automatic	Automatic	Automatic	Automatic	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic	Automatic	Automatic	Automatic

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Efficiency and Class					
Boiler / Stove Efficiency	%	93.5%	93.5%	95%	94%
Combustion efficiency (related to fuel burnout)	%	96%	95%	96%	94.5%
Electricity consumption	Wel/kW of boiler output	0.485	0.485	0.485	0.485
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	5
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A	N/A	N/A
Hydraulics connections	inches	1”	1”	1-1/4”	1-1/4”
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	4.5	4.5	4.5	4.5
Water volume	l	46	55	73	104
Minimum return temperature	^oC	25	25	25	25
Maximum operation temperature	^oC	80	80	80	80
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	125	125	150	150
Flue gas temperature	^oC	N/A	N/A	N/A	N/A
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	110 mg/Nm^3 10% O_2	120 mg/Nm^3 10% O_2	45 mg/Nm^3 10% O_2	25 mg/Nm^3 10% O_2
OGC	mg / Nm^3	7 mg/Nm^3	6 mg/Nm^3	<5 mg/Nm^3	<5 mg/Nm^3

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	(and/or) mg/MJ	10% O_2	10% O_2	10% O_2	10% O_2
Dust	mg / Nm^3 (and/or) mg/MJ	25 mg/Nm^3 10% O_2	25 mg/Nm^3 10% O_2	20 mg/Nm^3 10% O_2	20 mg/Nm^3 10% O_2
NOx	mg / Nm^3 (and/or) mg/MJ	180 mg/Nm^3 10% O_2	180 mg/Nm^3 10% O_2	170 mg/Nm^3 10% O_2	193 mg/Nm^3 10% O_2
Other characteristics					
Ignition	spark / kindling / other	Automatic ignition	Automatic ignition	Automatic ignition	Automatic ignition
Visual inspection of combustion chamber	yes / no	N/A	N/A	N/A	N/A
Ash compaction	yes / no	Optional	Optional	Optional	Optional
Ash chamber dimensions (Width x Height x Length)	m	0.36 x 0.33 x 0.86	0.36 x 0.40 x 0.86	0.42 x 0.50 x 0.86	0.60 x 0.50 x 0.86
Typical ash cleaning frequency	times per week / month / other	650 Kg pellet burned	750 Kg pellet burned	1.000 Kg pellet burned	1.350 Kg pellet burned
Other information					
Cost data					
Price range (VAT included)	€	3.381	3.523	3.743	4.222
Maintenance cost (typical)	€ / year	140	140	140	140
Manufacturer	DOMUSA. S. COOP. Bº San Esteban s/n. 20737 Errezil (País Vasco. Spain) Tel. 0034 943 81 38 99. Fax. 0034 943 38 09 24. http://www.domusa.es/. E-mail: info@domusa.es				
Series name	BIOCLASS NG +DR				

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Photos / schematics	  **BIOCLASS NG+DR**

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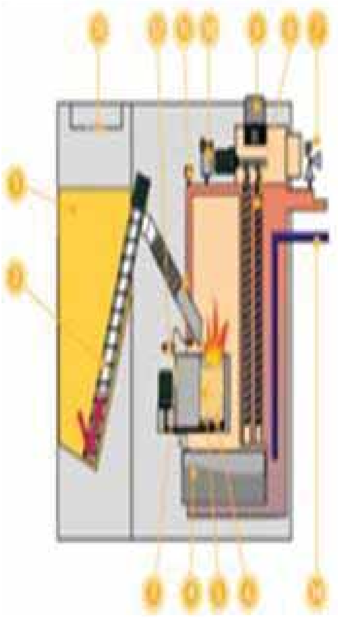

Equipamiento BioClass NG + DR	
1: Depósito reserva (incluido)	8: Sistema de autolimpieza pasos de humo
2: Sinfín de alimentación	9: Motor ventilador
3: Sistema anti-retorno de llama	10: Purgador
4: Cenicero	11: Limitador de presión
5: Quemador	12: Flusostato
6: Sistema de autolimpieza del quemador	13: Rejilla de carga
7: Válvula de seguridad	14: Sistema anticondensados

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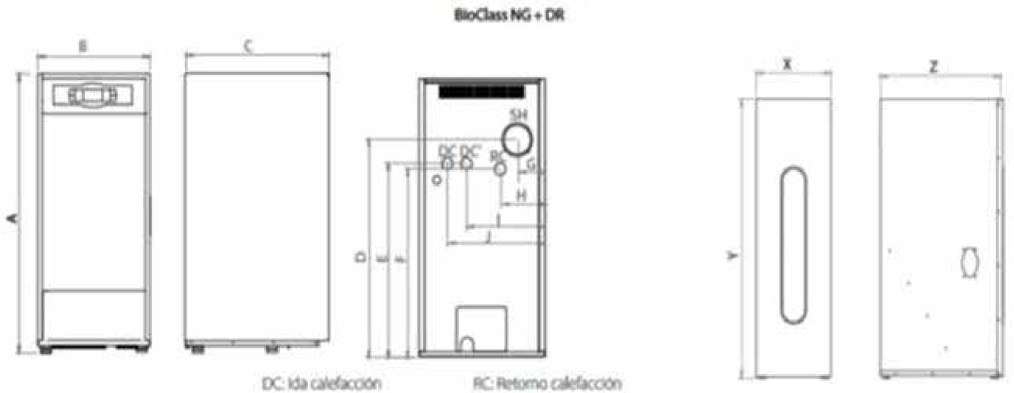
Dimensiones



DC: Ida calefacción
DC': Ida calefacción opcional
RC: Retorno calefacción
SH: Salida de humos

Modelo	A	B	C	D	E	F	G	H	I	J	X	Y	Z	Ø Salida de humos mm
BioClass NG 10+DR	1.310	543	730	960	860	835	155	260	340	440	400	1.310	685	125
BioClass NG 16+DR	1.310	543	730	960	860	835	120	225	305	400	400	1.310	685	125
BioClass NG 25+DR	1.310	670	794	1.050	935	905	145	235	410	510	400	1.310	685	150
BioClass NG 43+DR	1.310	670	960	1.050	935	905	145	235	410	510	400	1.310	685	150

Modelo	Potencia nominal kW	Rendimiento a potencia nominal %	Potencia carga parcial kW	Rendimiento a carga parcial %	Depósito de reserva incluido	Capacidad de combustible kg. pellet	Volumen de agua en caldera L	Código	Precio €
BioClass NG 10+DR	10,1	93,5	2,9	88,3	SI	142	46	TBIO000045	**3.571**
BioClass NG 16+DR	15,6	93,5	4,2	91,5	SI	142	55	TBIO000046	**3.713**
BioClass NG 25+DR	25,3	95	6,9	91,2	SI	142	73	TBIO000047	**3.933**
BioClass NG 43+DR	42,7	94	11,4	91,2	SI	142	104	TBIO000048	**4.412**

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agreement No. 691763

Opciones	Código	Precio €
Sonda acumulador ACS	CELC000300	14
Sonda para depósito de inercia	CELC000300	14
Cenicero compresor 10 NG	TKITBIO024	450
Cenicero compresor 16 NG	TKITBIO025	461
Cenicero compresor 25 NG	TKITBIO026	470
Cenicero compresor 43 NG	TKITBIO027	510
Kits hidráulicos		ver pág. 91
Depósito de inercia BT DUO		ver pág. 25-26
Depósito de inercia BT		ver pág. 23-24
Sistema de aspiración CVS (Más info en la pág. 106)	TKITBIO057	1.150
Silo 2.2. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO008	2.202
Silo 3.2. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO009	2.409
Silo 5.0. (Con prueba de acoplamiento y toma Storz) (Más info en la pág. 106)	TKITBIO010	2.641
Acoplamiento para Sistema de aspiración CVS	TKITBIO049	33
Tubo flexible (15 m)	CFER000164	188
Boquilla aspiración para depósito de obra	TKITBIO016	65
Boca de llenado Storz	COTR000057	144
Lona de protección de impacto	COTR000060	72
Kit para hueso de aceituna 10/16	TKITBIO030	60
Kit para hueso de aceituna 25	TKITBIO032	62
Kit para hueso de aceituna 43	TKITBIO034	65
Kit para hueso de aceituna 10/16 HTP 100-150	TKITBIO046	60
Kit para hueso de aceituna 25 HTP 100-150	TKITBIO047	62
Kit para hueso de aceituna 43 HTP 100-150	TKITBIO048	65
Bomba de alta eficiencia 10/16	TKITBIO036	150
Bomba de alta eficiencia 25/43	TKITBIO037	160
Kit de sensor de nivel S	TKITBIO061	75
Kit de sensor de nivel L	TKITBIO062	75
Sonda ambiente Lago FB OT+	CELC000295	115

Amplia gama de accesorios

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Combustion system type	Boiler				
Fuel type	Pellets, hardwood pellets, olive stones and hazelnut shells				
Boiler Model Name	**Units / Characteristics**	**BIOCLASS NG 10+DR**	**BIOCLASS NG 16+DR**	**BIOCLASS NG 25+DR**	**BIOCLASS NG 43+DR**
Basic design parameters and geometry					
Nominal thermal output	kW	10.1	15.6	25.3	42.7
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	10.1 with heat exchanger	15.6 with heat exchanger	25.3 with heat exchanger	42.7 with heat exchanger
Thermal output for space heating (for stoves)	kW	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	2.9	4.2	6.9	11.4
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.543 x 1.31x0.73	0.543 x 1.31 x 0.73	0.67 x 1.31 x 0.794	0.67 x 1.31 x 0.96
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.943 x 1.310 x 0.73	0.943 x 1.310 x 0.73	1.07 x 1.310 x 0.794	1.07 x 1.310 x 0.96
Net combustion system weight	kg	230	250	340	408
Heating surfaces	m^2	N/A	N/A	N/A	N/A
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	Automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger /	Pneumatic	Pneumatic	Pneumatic	Pneumatic

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	manual / other	(Optional)	(Optional)	(Optional)	(Optional)
Operation	continuous / intermittent	Intermittent with electronic control	Intermittent with electronic control	Intermittent with electronic control	Intermittent with electronic control
Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	Yes
Integrated Hopper / Silo Capacity	kg	170	170	170	170
Typical fuel consumption	kg/h	2.3	3.4	5	9
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	-
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Moving grate	Moving grate	Moving grate	Moving grate
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled	Water cooled	Water cooled
Combustion air streams	primary air /	N/A	N/A	N/A	N/A

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	secondary air / others				
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	Separate air fans
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans
Deashing system	manual / automatic	Automatic	Automatic	Automatic	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic	Automatic	Automatic	Automatic
Efficiency and Class					
Boiler / Stove Efficiency	%	93.5%	93.5%	95%	94%
Combustion efficiency (related to fuel burnout)	%	96%	95%	96%	94.5%
Electricity consumption	Wel/kW of boiler output	0.485	0.485	0.485	0.485
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	5
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A	N/A	N/A
Hydraulics connections	inches	1”	1”	1-1/4”	1-1/4”
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	4.5	4.5	4.5	4.5
Water volume	l	46	55	73	104

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Minimum return temperature	°C	25	25	25	25
Maximum operation temperature	°C	80	80	80	80
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	125	125	150	150
Flue gas temperature	°C	N/A	N/A	N/A	N/A
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	110 mg/Nm^3 10% O_2	120 mg/Nm^3 10% O_2	45 mg/Nm^3 10% O_2	25 mg/Nm^3 10% O_2
OGC	mg / Nm^3 (and/or) mg/MJ	7 mg/Nm^3 10% O_2	6 mg/Nm^3 10% O_2	<5 mg/Nm^3 10% O_2	<5 mg/Nm^3 10% O_2
Dust	mg / Nm^3 (and/or) mg/MJ	25 mg/Nm^3 10% O_2	25 mg/Nm^3 10% O_2	20 mg/Nm^3 10% O_2	20 mg/Nm^3 10% O_2
NOx	mg / Nm^3 (and/or) mg/MJ	180 mg/Nm^3 10% O_2	180 mg/Nm^3 10% O_2	170 mg/Nm^3 10% O_2	193 mg/Nm^3 10% O_2
Other characteristics					
Ignition	spark / kindling / other	Automatic ignition	Automatic ignition	Automatic ignition	Automatic ignition
Visual inspection of combustion chamber	yes / no	N/A	N/A	N/A	N/A
Ash compaction	yes / no	Optional	Optional	Optional	Optional
Ash chamber dimensions (Width x Height x Length)	m	0.36 x 0.33 x 0.86	0.36 x 0.40 x 0.86	0.42 x 0.50 x 0.86	0.60 x 0.50 x 0.86
Typical ash cleaning frequency	times per week / month / other	650 Kg pellet burned	750 Kg pellet burned	1.000 Kg pellet burned	1.350 Kg pellet burned
Other information					

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Cost data					
Price range (VAT included)	€	3.571	3.713	3.933	4.412
Maintenance cost (typical)	€ / year	140	140	140	140

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2.5. HERGOM

Manufacturer	Industrias Hergom. S.A. 39110 Soto de la Marina (Cantabria. España). Tel. 0034 942 587 000. Fax. 0034 942 587 001. http://www.hergom.com . Email: hergom@hergom.com
Series name	Gredos
Photos / schematics	

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	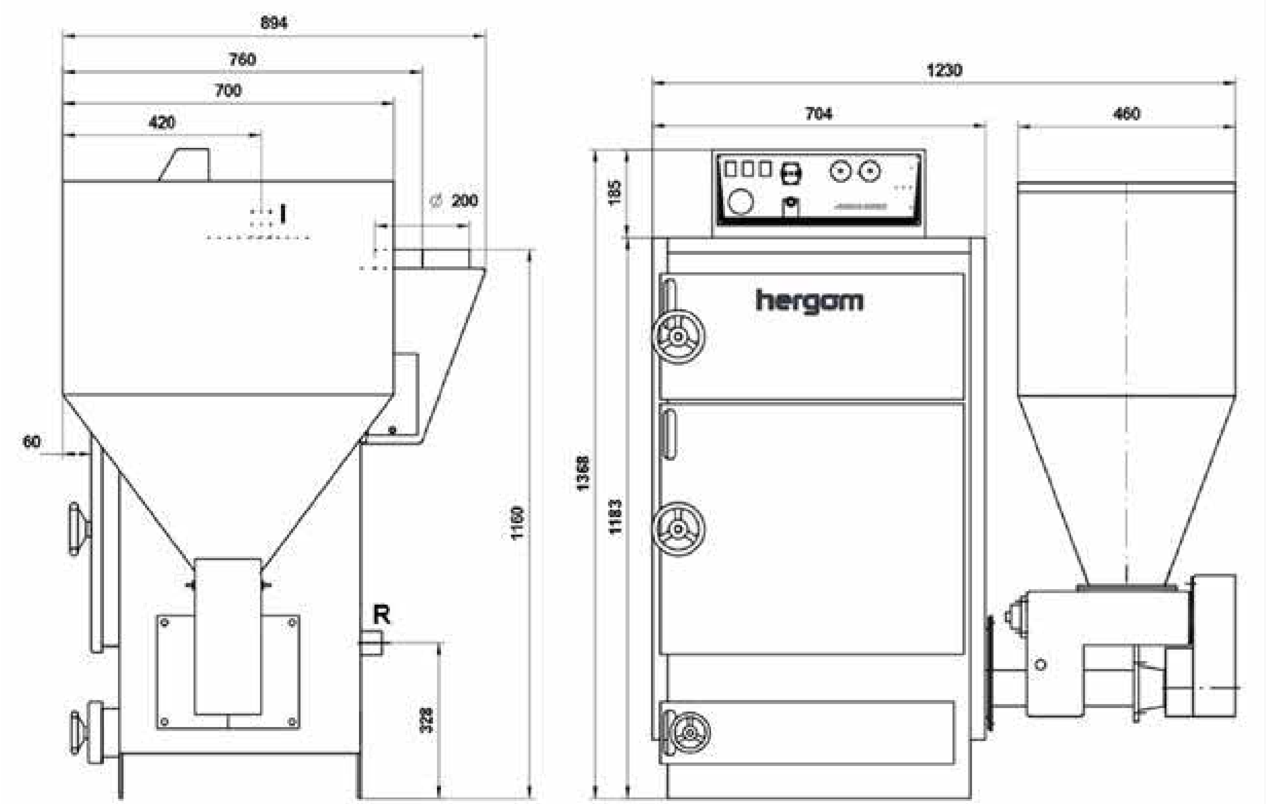
Combustion system type	Boiler

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Fuel type	Pellets, olive stones, almond shells and wood				
Boiler Model Name	**Units / Characteristics**	**GREDOS**	**GREDOS**	**GREDOS**	**GREDOS**
Basic design parameters and geometry					
Nominal thermal output	kW	25	30	40	50
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A
Thermal output for space heating (for stoves)	kW	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.704 x 1.368 x 0.894	0.704 x 1.457 x 0.889	0.704 x 1.29 x 1.345	0.704 x 1.29 x 1.465
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.230 x 1.368 x 0.894	1.230 x 1.457 x 0.889	1.467 x 1.29 x 1.345	1.467 x 1.29 x 1.465
Net combustion system weight	kg	350	400	450	500
Heating surfaces	m^2	1.67	2	2.67	3.34
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	Manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Double auger	Double auger	Double auger	Double auger
Operation	continuous /	Intermittent	Intermittent	Intermittent	Intermittent

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	intermittent				
Integrated Hopper / Silo	yes / no	No			
Integrated Hopper / Silo Capacity	kg	200	200	450	450
Typical fuel consumption	kg/h	6.1	7.3	9.2	11.5
Time between refueling (for intermittent use. stoves)	min / h	33 h	27 h	49 h	39 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	Only primary combustion	Only primary combustion	Only primary combustion	Only primary combustion
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From the side	From the side	From the side	From the side
Grate technology	fixed grate / moving grate / others	Fixed grate	Fixed grate	Fixed grate	Fixed grate
Combustion chamber volume	l	60	76	95	125
Combustion chamber dimensions (Width x Height x Length)	m	Ø 0.45 x 0.46	Ø 0.45 x 0.513	Ø 0.45 x 0.657	Ø 0.45 x 0.862
Combustion chamber cooling concept	water cooled / air cooled / insulated	Insulated	Insulated	Insulated	Insulated
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	Primary air

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Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	Separate air fans
Air supply control	flaps / controlled fans	Flaps	Flaps	Flaps	Flaps
Deashing system	manual / automatic	Manual	Manual	Manual	Manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Manual	Manual	Manual	Manual
Efficiency and Class					
Boiler / Stove Efficiency	%	> 87%	> 87%	> 87%	> 87%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	0.189	0.189	0.655	0.655
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3
Hydraulics / Water circuit					
Number of tubes	#	12	13	15	15
Hydraulics connections	inches	1”	1 ¼”	1 ¼”	1 ¼”
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	4.5	4.5	4.5	4.5
Water volume	l	60	76	95	125
Minimum return temperature	^{o}C	60	60	60	60
Maximum operation temperature	^{o}C	90	90	90	90

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Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	200	200	200	200
Flue gas temperature	^oC	157	157	157	157
Draught	forced / natural	Natural	Natural	Natural	Natural
Location of flue gas fan (for forced draught systems)		-	-	-	-
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	72 mg/Nm^3 10% O_2	72 mg/Nm^3 10% O_2	72 mg/Nm^3 10% O_2	72 mg/Nm^3 10% O_2
Other characteristics					
Ignition	spark / kindling / other	Manual/ spark	Manual/ spark	Manual/ spark	Manual/ spark
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	No	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	0.455 x 0.065 x 0.470	0.455 x 0.065 x 0.470	0.46 x 0.065 x 0.565	0.47 x 0.65 x 0.770
Typical ash cleaning frequency	times per week / month / other	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly
Other information					
Cost data					
Price range (VAT included)	€	4000	5000	6000	8000

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Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A

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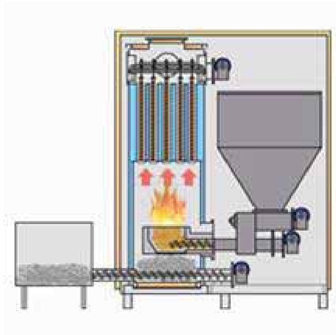
Manufacturer	Industrias Hergom. S.A. 39110 Soto de la Marina (Cantabria. España). Tel. 0034 942 587 000. Fax. 0034 942 587 001. http://www.hergom.com . Email: hergom@hergom.com
Series name	Oliva Domestic
Photos / schematics	 

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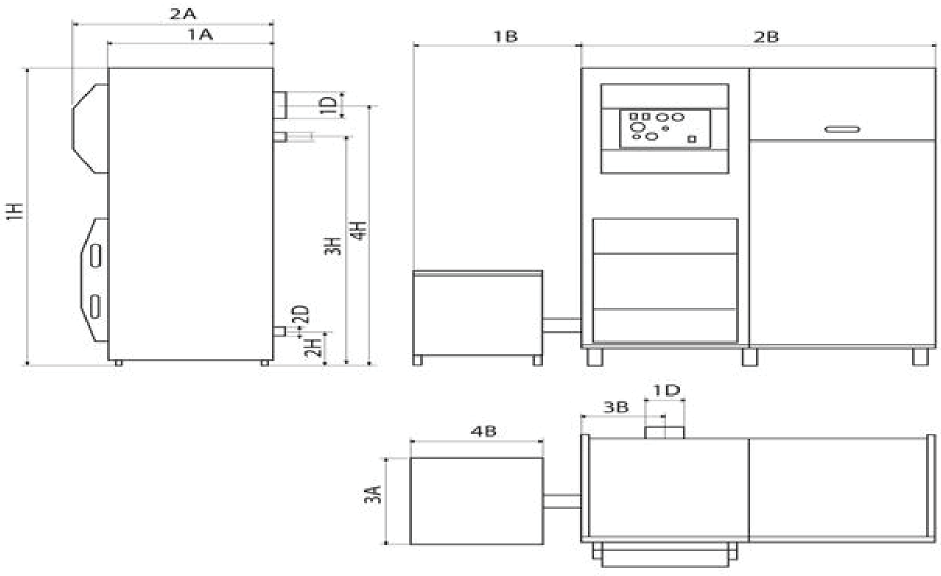

Modelo	kW*	Kcal/h*	1A	2A	3A	1B	2B	3B	1H	2H	3H	4H	Chimenea 1D	Ida/Retorno 2D	Tolva estándar
Oliva 30	35	30.100	610	610	510	750	1.360	510	1.760	200	1.390	1.550	150	1"	200 l.
Oliva 50	50	43.000	715	715	510	750	1.650	510	1.760	205	1.405	1.550	180	1 1/2"	200 l.
Oliva 65	65	55.900	790	790	510	750	1.750	510	1.850	205	1.460	1.600	180	1 1/2"	200 l.

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Combustion system type	Boiler				
Fuel type	Pellets, olive stones and almond shells				
Boiler Model Name	**Units / Characteristics**	**OLIVA 30**	**OLIVA 50**	**OLIVA 65**	
Basic design parameters and geometry					
Nominal thermal output	kW	30	50	65	
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	
Thermal output for space heating (for stoves)	kW	-	-	-	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.615 x 1.76 x 0.7	0.66 x 1.835 x 0.715	0.77 x 1.865 x 0.795	
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.61 x 1.76 x 2.11	0.715 x 1.76 x 2.4	0.79 x 1.85 x 2.5	
Net combustion system weight	kg	350	390	460	
Heating surfaces	m^2	2.3	3.3	4.3	
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger /	Double auger	Double auger	Double auger	

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	manual / other				
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	
Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	
Integrated Hopper / Silo Capacity	kg	180	200	220	
Typical fuel consumption	kg/h	N/A	N/A	N/A	
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	
Grate technology	fixed grate / moving grate / others	Others	Others	Others	
Combustion chamber volume	l	111	147	206	
Combustion chamber dimensions (Width x Height x Length)	m	Ø0.421x0.798	Ø0.492x0.775	Ø0.567x0.816	
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled	Water cooled	

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Combustion air streams	primary air / secondary air / others	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	
Air supply control	flaps / controlled fans	Flaps	Flaps	Flaps	
Deashing system	manual / automatic	Automatic	Automatic	Automatic	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Manual	Manual	manual	
Efficiency and Class					
Boiler / Stove Efficiency	%	> 87%	> 87%	> 87%	
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	
Electricity consumption	Wel/kW of boiler output	2.37	2.43	2.43	
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A	N/A	
Hydraulics connections	inches	1”	1 ½”	1 ½”	
Maximum operation pressure	bar	3	3	3	

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Tested pressure	bar	4.5	4.5	4.5	
Water volume	l	112	127	165	
Minimum return temperature	^oC	60	60	60	
Maximum operation temperature	^oC	90	90	90	
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	180	180	
Flue gas temperature	^oC	N/A	N/A	N/A	
Draught	forced / natural	Forced	Forced	Forced	
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
Other characteristics					
Ignition	spark / kindling / other	Semiautomatic (optional)	Semiautomatic (optional)	Semiautomatic (optional)	
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	
Ash compaction	yes / no	Yes	Yes	Yes	
Ash chamber dimensions (Width x Height x Length)	m	0.315 x 0.345 x 0.395	0.315 x 0.345 x 0.395	0.315 x 0.345 x 0.395	
Typical ash cleaning frequency	times per week / month / other	Everyday or weekly	Everyday or weekly	Everyday or weekly	

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Other information					
Cost data					
Price range (VAT included)	€	10000	13000	15000	
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	

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Manufacturer	Industrias Hergom. S.A. 39110 Soto de la Marina (Cantabria. España). Tel. 0034 942 587 000. Fax. 0034 942 587 001. http://www.hergom.com . Email: hergom@hergom.com
Series name	Oliva Industrial
Photos / schematics	 

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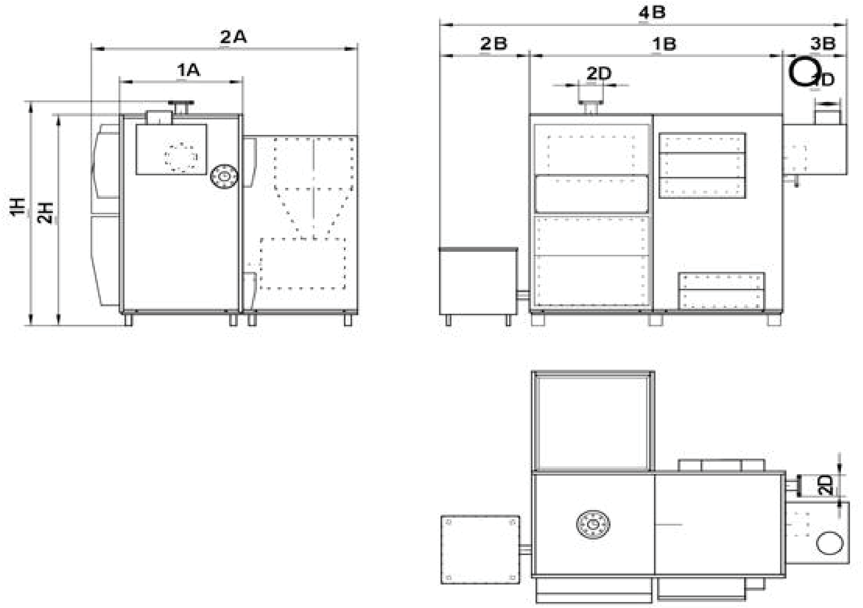

Modelo	kW*	Kcal/h*	1A	2A	1B	2B	3B	4B	1H	2H	Chimenea 1D	Ida/Retorno 2D	Tolva estándar
Oliva 100	100	86.000	840	2.000	1.650	750	300	2.700	1.450	1.350	180	2"	200 l.
Oliva 130	130	111.8000	870	2.000	1.800	750	300	2.850	1.800	1.700	200	2"	200 l.
Oliva 180	180	154.800	950	2.100	1.900	750	300	2.950	1.850	1.750	200	3"	200 l.
Oliva 250	250	215.000	1.000	2.150	2.000	750	400	3.150	2.050	1.950	200	DN80	200 l.
Oliva 350	350	301.000	1.200	2.250	2.500	750	400	3.650	2.500	2.400	250	DN80	200 l.
Oliva 430	430	369.000	1.450	2.900	2.950	850	500	4.300	2.400	2.300	300	DN80	200 l.
Oliva 500	500	430.000	1.450	2.900	2.950	850	500	4.300	2.600	2.500	300	DN80	200 l.

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Combustion system type	Boiler							
Fuel type	Pellets. olive pits and almond shells							
Boiler Model Name	**Units / Characteristics**	**OLIVA 100**	**OLIVA 130**	**OLIVA 180**	**OLIVA 250**	**OLIVA 350**	**OLIVA430**	**OLIVA 500**
Basic design parameters and geometry								
Nominal thermal output	kW	100	130	180	250	350	430	500
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thermal output for space heating (for stoves)	kW	-	-	-	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.84 x 1.45 x 2.7	0.87 x 1.8 x 2.85	0.95 x 1.85 x 2.95	1 x 2.05 x 3.15	1.2 x 2.5 x 3.65	1.45 x 2.4 x 4.3	1.45 x 2.6 x 4.3
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	2 x 1.45 x 2.7	2 x 1.8 x 2.85	2.1 x 1.85 x 2.95	2.15 x 2.05 x 3.15	2.25 x 2.5 x 3.65	2.9 x 2.4 x 4.3	2.9 x 2.6 x 4.3
Net combustion system weight	kg	350	390	460	756	933	1322	1556
Heating surfaces	m^2	7	9	12	17	23.5	29	33.5
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	Automated	Automated	Automated	Automated
Fuel capacity and feeding								

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Fuel feeding	pneumatic / auger / manual / other	Double auger	Double auger	Double auger	Double auger	Double auger	Double auger	Double auger
Operation	continuous / intermittent	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Integrated Hopper / Silo	yes / no	No	No	No	No	No	No	No
Integrated Hopper / Silo Capacity	kg	200	200	200	200	200	200	200
Typical fuel consumption	kg/h	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	-	-	-	-
Combustion technology								
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From the side	From the side	From the side	From the side	From the side	From the side	From the side
Grate technology	fixed grate / moving grate / others	Fixed grate	Fixed grate	Fixed grate	Fixed grate	Fixed grate	Fixed grate	Fixed grate
Combustion chamber volume	l	290	354	471	596	1273	1827	2031
Combustion chamber dimensions	m	Ø0.58 x 1.1	Ø0.63x1.137	Ø0.69 x 1.26	Ø0.74x1.386	Ø0.94x1.835	Ø1.14 x 1.79	Ø1.14 x 1.99

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(Width x Height x Length)								
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled
Combustion air streams	primary air / secondary air / others	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans
Air supply control	flaps / controlled fans	Flaps	Flaps	Flaps	Flaps	Flaps	Flaps	Flaps
Deashing system	manual / automatic	Automatic	Automatic	Automatic	Automatic	Automatic	Automatic	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Temperature probe	Temperature probe	Temperature probe	Temperature probe	Temperature probe	Temperature probe	Temperature probe
Efficiency and Class								
Boiler / Stove Efficiency	%	> 90%	> 90%	> 90%	> 90%	> 90%	> 90%	> 90%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Electricity consumption	Wel/kW of boiler output	2.25	2.25	2.25	3	3	3.24	3.24
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	5	5	5	5
Hydraulics / Water circuit								
Number of tubes	#	38	38	44	34		72	
Hydraulics connections	inches	2”	2”	3”	DN80	DN80	DN80	DN80
Maximum operation pressure	bar	3	3	3	3	3	3	3
Tested pressure	bar	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Water volume	l	91	106	121	206	302	360	465
Minimum return temperature	°C	60	60	60	60	60	60	60
Maximum operation temperature	°C	93	93	93	93	93	93	93
Flue gases / Emissions								
Chimney / Flue gas connection diameter	mm	180	200	200	200	250	300	300
Flue gas temperature	°C	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Draught	forced / natural	forced	forced	forced	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other characteristics								
Ignition	spark / kindling / other	Automatic	Automatic	Automatic	Automatic	Automatic	Automatic	Automatic
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ash compaction	yes / no	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ash chamber dimensions (Width x Height x Length)	m	0.35 x 0.4 x 0.715	0.35 x 0.395 x 0.715	0.35 x 0.395 x 0.76	0.35 x 0.395 x 0.86	0.35 x 0.395 x 0.96	0.45 x 0.45 x 1.26	0.45 x 0.45 x 1.153
Typical ash cleaning frequency	times per week / month / other	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly
Other information								
Cost data								
Price range (VAT included)	€	27000	33000	36000	44000	57000	72000	90000
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Manufacturer	Industrias Hergom. S.A. 39110 Soto de la Marina (Cantabria. España). Tel. 0034 942 587 000. Fax. 0034 942 587 001. http://www.hergom.com . Email: hergom@hergom.com
Series name	THT
Photos / schematics	 

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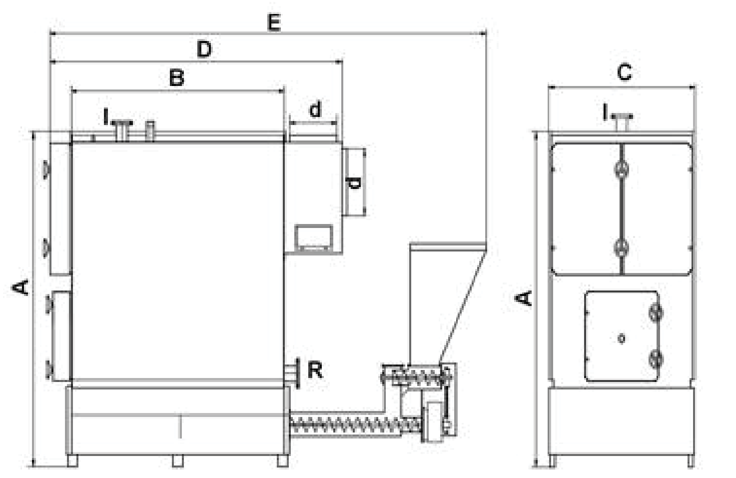

Modelo	kW*	Kcal/h*	A	B	C	D	E	Chimenea (d)	Conexiones (I/R)
THT 100	100	86.000	1550	1130	850	1650	2800	300	2"
THT 150	150	129.000	1550	1680	850	2230	3350	350	2"
THT 200	200	172.000	1850	1510	950	2060	3260	350	DN65PN10
THT 250	280	240.800	1850	1850	950	2440	3590	400	DN65PN10
THT 325	350	301.000	2070	1680	1250	2300	3400	400	DN80PN10
THT 400	400	344.000	2070	2050	1250	2680	3900	450	DN80PN10
THT 500	500	430.000	2070	2260	1250	2930	4150	450	DN80PN10

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agreement No. 691763

Combustion system type	Boiler							
Fuel type	Pellets, olive stones, almond shells and wood.							
Boiler Model Name	**Units / Characteristics**	**THT 100**	**THT 150**	**THT 200**	**THT 250**	**THT 325**	**THT 400**	**THT 500**
Basic design parameters and geometry								
Nominal thermal output	kW	100	150	200	250	350	400	500
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thermal output for space heating (for stoves)	kW	-	-	-	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	N/A	N/A	N/A	N/A	N/A	N/A	N/A
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.65 x 1.55 x 0.85	2.23 x 1.55 x 0.85	2.06 x 1.85 x 0.95	2.44 x 1.85 x 0.95	2.3 x 2.07 x 1.25	2.68 x 2.07 x 1.25	2.93 x 2.07 x 1.25
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	2.8 x 1.55 x 0.85	3.35 x 1.55 x 0.85	3.26 x 1.85 x 0.95	3.59 x 1.85 x 0.95	3.4 x 2.07x1.25	3.9 x 2.07x1.25	4.15 x 2.07x1.25
Net combustion system weight	kg	700	789	890	1100	1600	2300	2900
Heating surfaces	m^2	6.7	10	13.5	19	23.5	27	33.5
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	Automated	Automated	Automated	Automated
Fuel capacity and feeding								

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Fuel feeding	pneumatic / auger / manual / other	Double auger	Double auger	Double auger	Double auger	Double auger	Double auger	Double auger
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Integrated Hopper / Silo	yes / no	No	No	No	No	No	No	No
Integrated Hopper / Silo Capacity	kg	200	200	200	200	200	200	200
Typical fuel consumption	kg/h	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	-	-	-	-
Combustion technology								
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker	From below = underfeed stoker
Grate technology	fixed grate / moving grate / others	Fixed grate	Fixed grate	Fixed grate	Fixed grate	Fixed grate	Fixed grate	Fixed grate
Combustion chamber volume	l	300	500	550	900	1100	1400	1600
Combustion chamber dimensions	m	0.62 x 0.57 x	0.62 x 0.57 x	0.72 x 0.83 x	0.72 x 0.83 x	0.94 x 0.89 x	0.94 x 0.89 x	0.94 x 0.89 x

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(Width x Height x Length)		1	1.54	0.95	1.7	1.5	1.84	2.1
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled	Water cooled
Combustion air streams	primary air / secondary air / others	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air	Primary air and secondary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans	Separate air fans
Air supply control	flaps / controlled fans	Flaps	Flaps	Flaps	Flaps	Flaps	Flaps	Flaps
Deashing system	manual / automatic	Manual	Manual	Manual	Manual	Manual	Manual	Manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Manual	Manual	Manual	Manual	Manual	Manual	Manual
Efficiency and Class								
Boiler / Stove Efficiency	%	> 87%	> 87%	> 87%	> 87%	> 87%	> 87%	> 87%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Electricity consumption	Wel/kW of boiler output	1.23	1.23	1.23	1.23	2.1	2.1	2.83
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3	3	3
Hydraulics / Water circuit								
Number of tubes	#	26	26	38	38	64	64	70
Hydraulics connections	inches	2”	2”	DN65PN10	DN65PN10	DN80PN10	DN80PN10	DN80PN10
Maximum operation pressure	bar	3	3	3	3	3	3	3
Tested pressure	bar	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Water volume	l	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minimum return temperature	°C	60	60	60	60	60	60	60
Maximum operation temperature	°C	90	90	90	90	90	90	90
Flue gases / Emissions								
Chimney / Flue gas connection diameter	mm	300	350	350	400	400	450	450
Flue gas temperature	°C	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Draught	forced / natural	Natural	Natural	Natural	Natural	Natural	Natural	Natural
Location of flue gas fan (for forced draught systems)		-	-	-	-	-	-	-
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dust	mg / Nm^3	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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	(and/or) mg/MJ							
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other characteristics								
Ignition	spark / kindling / other	Manual	Manual	Manual	Manual	Manual	Manual	Manual
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ash compaction	yes / no	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Typical ash cleaning frequency	times per week / month / other	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly	Everyday or weekly
Other information								
Cost data								
Price range (VAT included)	€	16000	20000	23000	28000	35000	42000	50000
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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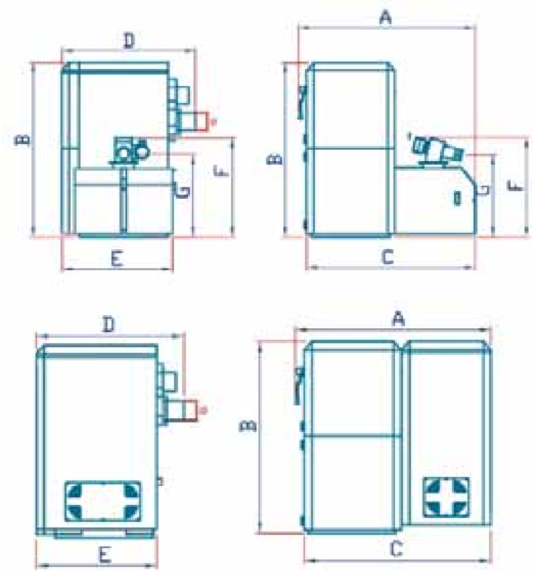
2.6. INTECBIO

Manufacturer	IntecBIO S.L. C/ Irlanda, 15 - Pol. Ind. La Catalana. 18360 Huétor Tájar (Granada. Spain). Tel.0034 958 047 029. Fax. 0034 958 912 482. http://www.intecbio.es.EMAIL. info@intecbio.es
Series name	ITB CP
Photos / schematics	 

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Combustion system type	Boiler				
Fuel type	Fixed grate				
Boiler Model Name	**Units / Characteristics**	**ITB 30 CP**	**ITB 50 CP**		
Basic design parameters and geometry					
Nominal thermal output	kW	36 pellets 27.8 olive stone	50.2 pellets 48.7 olive stone		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	28.7 pellets 23.1 olive stone	45.5 pellets 43.6 olive stone		
Thermal output for space heating (for stoves)	kW	-	-		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	32%	32%		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.57 x 1.18 x 0.90	0.68 x 1.41 x 1.05		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.25 x 1.18 x 0.90	1.40 x 1.41 x 1.05		
Net combustion system weight	kg	400	537		
Heating surfaces	m^2	0.39 m^2	0.56 m^2		
Cleaning of heating surfaces	automated / manual	Semi-Automatic (lever moves	Semi-Automatic (lever moves		

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		springs)	springs)		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger/Hopper	Auger/Hopper		
Operation	continuous / intermittent	Continuous	Continuous		
Integrated Hopper / Silo	yes / no	Yes (optional)	Yes (optional)		
Integrated Hopper / Silo Capacity	kg	130	150		
Typical fuel consumption	kg/h	6.8 nominal 2.18 partial	9.25 nominal 2.96 partial		
Time between refueling (for intermittent use. stoves)	min / h	-	-		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated (screw)	Automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below	From below		
Grate technology	fixed grate / moving grate / others	Fixed grate	Fixed grate		
Combustion chamber volume	l	36	69		
Combustion chamber dimensions	m	0.32 x 0.22 x 0.49	0.45 x 0.25 x 0.61		

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(Width x Height x Length)					
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled		
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans		
Air supply control	flaps / controlled fans	Electronically controlled fans	Electronically controlled fans		
Deashing system	manual / automatic	Manual	Manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%	90% pellets 90% olive stone	90.1% pellets 90% olive stone		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	0.325	0.325		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A		

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Hydraulics / Water circuit					
Number of tubes	#	3	3		
Hydraulics connections	inches	flow/return: 1¼” Emptying: 1”	flow/return: 1¼” Emptying: 1”		
Maximum operation pressure	bar	3	3		
Tested pressure	bar	1.5	1.5		
Water volume	l	84	105		
Minimum return temperature	°C	50	50		
Maximum operation temperature	°C	90	90		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	175		
Flue gas temperature	°C	260	290		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	0.43 % vol. 10% O_2 pellets 0.73 % vol. 10% O_2 olive stone	0.18 % vol. 10% O_2 pellets 0.07 % vol. 10% O_2 olive stone		
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
Other characteristics					
Ignition	spark / kindling / other	Automatic	Automatic		

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Visual inspection of combustion chamber	yes / no	Yes	Yes		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	0.33 x 0.09 x 0.42	0.45 x 0.09 x 0.52		
Typical ash cleaning frequency	times per week / month / other	Biweekly	Biweekly		
Other information					
Cost data					
Price range (VAT included)	€	6237	6962		
Maintenance cost (typical)	€ / year	80 – 120 € / year	80 – 120 € / year		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	IntecBIO S.L. C/ Irlanda. 15 - Pol. Ind. La Catalana. 18360 Huétor Tájar (Granada. Spain). Tel.0034 958 047 029. Fax. 0034 958 912 482. http://www.intecbio.es.EMAIL. info@intecbio.es
Series name	ITB DO
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Pellets, triturated almond shells and olive stones.				
Boiler Model Name	**Units / Characteristics**	**ITB 30 DO**	**ITB 50 DO**	**ITB 80 DO**	
Basic design parameters and geometry					
Nominal thermal output	kW	36 pellets 27.8 olive stone	50.2 pellets 48.7 olive stone	85 pellets 82.5 olive stone	
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	28.7 pellets 27 olive stone	45.5 pellets 43.6 olive stone	78.5 pellets 74.6 olive stone	
Thermal output for space heating (for stoves)	kW	-	-	-	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	32%	32%	32%	
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.57 x 1.18 x 0.95	0.68 x 1.41 x 0.99	0.68 x 1.41 x 1.14	
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.15 x 1.18 x 0.95	1.33 x 1.41 x 0.99	1.33 x 1.41 x 1.14	
Net combustion system weight	kg	307	420	520	
Heating surfaces	m^2	0.39	0.56	0.66	
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	
Fuel capacity and feeding					

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Fuel feeding	pneumatic / auger / manual / other	Auger/Hopper	Auger/Hopper	Auger/Hopper	
Operation	continuous / intermittent	Continuous	Continuous	Continuous	
Integrated Hopper / Silo	yes / no	Yes (optional)	Yes (optional)	Yes (optional)	
Integrated Hopper / Silo Capacity	kg	130	150	150	
Typical fuel consumption	kg/h	6.8 nominal 2.18 partial	9.25 nominal 2.96 partial	15.74 nominal 4.7 partial	
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	
Stoker technology	Manual / automated (screw)	Automated (screw)	Automated (screw)	Automated (screw)	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below	From below	From below	
Grate technology	fixed grate / moving grate / others	Fixed grate	Fixed grate	Fixed grate	
Combustion chamber volume	l	36	69	86	
Combustion chamber dimensions (Width x Height x Length)	m	0.32 x 0.22 x 0.49	0.45 x 0.25 x 0.61	0.45 x 0.25 x 0.76	
Combustion chamber cooling concept	water cooled /	Water cooled	Water cooled	Water cooled	

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	air cooled / insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	
Air supply control	flaps / controlled fans	Electronically controlled fans	Electronically controlled fans	Electronically controlled fans	
Deashing system	manual / automatic	Manual	Manual	Manual	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe	
Efficiency and Class					
Boiler / Stove Efficiency	%	81 pellets 80.2 olive stone	81.2 pellets 75.8 olive stone	81 pellets 80.2 olive stone	
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	
Electricity consumption	Wel/kW of boiler output	0.325	0.325	0.325	
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A	N/A	
Hydraulics / Water circuit					
Number of tubes	#	3	3	3	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Hydraulics connections	inches	flow/return: 1¼” Emptying: 1”	flow/return: 1¼” Emptying: 1”	flow/return: 1¼” Emptying: 1”	
Maximum operation pressure	bar	3	3	3	
Tested pressure	bar	1.5	1.5	1.5	
Water volume	l	84	105	145	
Minimum return temperature	°C	50	50	50	
Maximum operation temperature	°C	90	90	90	
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	175	200	
Flue gas temperature	°C	260	290	295	
Draught	forced / natural	Natural	Natural	Natural	
Location of flue gas fan (for forced draught systems)		-	-	-	
CO	mg / Nm^3 (and/or) mg/MJ	0.43 % vol. 10% O_2 pellet 0.73 % vol. 10% O_2 olive stone	0.18 % vol. 10% O_2 pellet 0.07 % vol. 10% O_2 olive stone	0.18 % vol. 10% O_2 pellet 0.07 % vol. 10% O_2 olive stone	
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	
Other characteristics					
Ignition	spark / kindling / other	Automatic	Automatic	Automatic	
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	

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Ash compaction	yes / no	No	No	No	
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	
Typical ash cleaning frequency	times per week / month / other	Weekly	Weekly	Weekly	
Other information					
Cost data					
Price range (VAT included)	€	4.727	5.283	7.288	
Maintenance cost (typical)	€ / year	80 – 120 €/year	80 – 120 €/ year	80 – 120 €/ year	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

2.7. LASIAN

Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain).Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Bioselect
Photos / schematics	 **Bioselect Compact 30**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Bioselect

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	High and low quality pellets, crushed husks, olive stones and others.				
Boiler Model Name	**Units / Characteristics**	**Bioselect Compact 30**	**Bioselect 30**	**Bioselet 45**	**Bioselect 55**
Basic design parameters and geometry					
Nominal thermal output	kW	31.16	31.16	45	56.74
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	31.16	31.16	45	56.74
Thermal output for space heating (for stoves)	kW	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	9.78	9.78	13.5	15.19
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.752 x 1.646 x 0.807			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.460 x 1.646 x 1.120	0.752 x 1.646 x 0.807	0.899 x 1.738 x 1.132	0.979 x 1.738 x 1.227
Net combustion system weight	kg	305	305	320	370
Heating surfaces	m^2	N/A	N/A	N/A	N/A
Cleaning of heating surfaces	automated / manual	Automated	Automated	Automated	Automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger	Auger	Auger	Auger	Auger

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	/ manual / other				
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Integrated Hopper / Silo	yes / no	Yes	No	No	No
Integrated Hopper / Silo Capacity	kg	400	N/A	N/A	N/A
Typical fuel consumption	kg/h	1.8 – 6.7	1.8 – 6.7	2.7 – 9.9	3.4 – 12.1
Time between refueling (for intermittent use. stoves)	min / h	-	-	-	-
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From the side	From the side	From the side	From the side
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner	Fixed burner	Fixed burner
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled	Water cooled	Water cooled
Combustion air streams	primary air /	Primary air and	Primary air and	Primary air and	Primary air and

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	secondary air / others	secondary air	secondary air	secondary air	secondary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans	Separate air fans	Separate air fans
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan	Controlled fan	Controlled fan
Deashing system	manual / automatic	Automatic	Automatic (optional)	Automatic (optional)	Automatic (optional)
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%	92.7%	92.7%	93.5%	94%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	0.021-0.042	0.021-0.042	0.032-0.047	0.04-0.05
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	4	4	4	4
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A	N/A	N/A
Hydraulics connections	inches	1”	1”	1 1/2”	1 1/2”
Maximum operation pressure	bar	4	4	4	4

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Tested pressure	bar	6	6	6	6
Water volume	l	89	89	103	121
Minimum return temperature	^oC	55	55	55	55
Maximum operation temperature	^oC	90	90	90	90
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	150	180	180
Flue gas temperature	^oC	140-230	140-230	140-230	140-230
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	317-227 mg/Nm^3 10% O_2	317-227 mg/Nm^3 10% O_2	454.4-243 mg/Nm^3 10% O_2	546-253 mg/Nm^3 10% O_2
OGC	mg / Nm^3 (and/or) mg/MJ	12.1-2.3 mg/Nm^3 10% O_2	12.1-2.3 mg/Nm^3 10% O_2	7.8-2.1 mg/Nm^3 10% O_2	5-1.9 mg/Nm^3 10% O_2
Dust	mg / Nm^3 (and/or) mg/MJ	19.1-48.7 mg/Nm^3 10% O_2	19.1-48.7 mg/Nm^3 10% O_2	28.8-49.4 mg/Nm^3 10% O_2	35.3-49.9 mg/Nm^3 10% O_2
NOx	mg / Nm^3 (and/or) mg/MJ	218-238 mg/Nm^3 10% O_2	218-238 mg/Nm^3 10% O_2	202.4-210.4 mg/Nm^3 10% O_2	192-192 mg/Nm^3 10% O_2
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor	Electrical resistor	Electrical resistor
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	Yes	Yes (optional)	Yes (optional)	Yes (optional)
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Typical ash cleaning frequency	times per week / month / other	It depends on the fuel	It depends on the fuel	It depends on the fuel	It depends on the fuel

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Other information					
Cost data					
Price range (VAT included)	€	6.050	5.220	6.150	7.200
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Bora
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Bora Basic: high quality wood pellets (ENplus A1 / DINplus). Bora EVO: high and low quality wood pellets.				
Boiler Model Name	**Units / Characteristics**	**Bora Basic**	**Bora EVO**		
Basic design parameters and geometry					
Nominal thermal output	kW	18	18.5		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	12	16		
Thermal output for space heating (for stoves)	kW	5.5	2.5		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	6.2	5.6		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.570 X 1.158 X 0.580	0.570 X 1.238 X 0.580		
Net combustion system weight	kg	149	152		
Heating surfaces	m^2	N/A	N/A		
Cleaning of heating surfaces	automated / manual	Manual	Manual		

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger		
Operation	continuous / intermittent	Intermittent	Intermittent		
Integrated Hopper / Silo	yes / no	Yes	Yes		
Integrated Hopper / Silo Capacity	kg	25	35		
Typical fuel consumption	kg/h	1.3-3.7	1.3-4.2		
Time between refueling (for intermittent use. stoves)	min / h	6-19 h	8-27 h		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated	Automated		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above		
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner		
Combustion chamber volume	l	N/A	N/A		
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A		
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated		

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan		
Deashing system	manual / automatic	Manual	Manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%	91.5%	91%		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	0.050-0.150	0.050-0.150		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A		
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A		
Hydraulics connections	inches	¾ “	¾ “		
Maximum operation pressure	bar	1.5	2		

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Tested pressure	bar	3	4		
Water volume	l	N/A	N/A		
Minimum return temperature	^oC	55	55		
Maximum operation temperature	^oC	90	90		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80		
Flue gas temperature	^oC	184.4	155		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	312-208 mg/Nm^3N 13% O_2	270-194 mg/Nm^3 13% O_2		
OGC	mg / Nm^3 (and/or) mg/MJ	2 mg/Nm^3 13% O_2	4 mg/Nm^3 13% O_2		
Dust	mg / Nm^3 (and/or) mg/MJ	18 mg/Nm^3 13% O_2	13 mg/Nm^3 13% O_2		
NOx	mg / Nm^3 (and/or) mg/MJ	138 mg/Nm^3 13% O_2	121 mg/Nm^3 13% O_2		
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor		
Visual inspection of combustion chamber	yes / no	Yes	Yes		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A		
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days		

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Other information					
Cost data					
Price range (VAT included)	€	3.340	4.310		
Maintenance cost (typical)	€ / year	N/A	N/A		

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Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Helens
Photos / schematics	

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Combustion system type	Boiler				
Fuel type	Helens Basic: high quality wood pellets (ENplus A1 / DINplus). Helens EVO: high and low quality wood pellets				
Boiler Model Name	**Units / Characteristics**	**Helens Basic**	**Helens EVO**		
Basic design parameters and geometry					
Nominal thermal output	kW	22.5	22.5		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	20	20		
Thermal output for space heating (for stoves)	kW	2.5	2.5		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	5.6	5.6		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.570 X 1.238 X 0.580	0.570 X 1.238 X 0.580		
Net combustion system weight	kg	194	197		
Heating surfaces	m^2	N/A	N/A		
Cleaning of heating surfaces	automated / manual	Manual	Manual		

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger		
Operation	continuous / intermittent	Intermittent	Intermittent		
Integrated Hopper / Silo	yes / no	Yes	Yes		
Integrated Hopper / Silo Capacity	kg	35	35		
Typical fuel consumption	kg/h	1.3-5.3	1.3-5.3		
Time between refueling (for intermittent use. stoves)	min / h	6.5-27 h	6.5-27 h		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated	Automated		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above		
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner		
Combustion chamber volume	l	N/A	N/A		
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A		
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated		

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan		
Deashing system	manual / automatic	Manual	Manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%	90%	90%		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	0.050-0.150	0.050-0.150		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A		
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A		
Hydraulics connections	inches	¾ “	¾ “		
Maximum operation pressure	bar	2	2		

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Tested pressure	bar	4	4		
Water volume	l	N/A	N/A		
Minimum return temperature	^oC	55	55		
Maximum operation temperature	^oC	90	90		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80		
Flue gas temperature	^oC	177	177		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	270-236 mg/Nm^3 13% O_2	270-236 mg/Nm^3 13% O_2		
OGC	mg / Nm^3 (and/or) mg/MJ	4 mg/Nm^3 13% O_2	4 mg/Nm^3 13% O_2		
Dust	mg / Nm^3 (and/or) mg/MJ	9 mg/Nm^3 13% O_2	9 mg/Nm^3 13% O_2		
NOx	mg / Nm^3 (and/or) mg/MJ	121 mg/Nm^3 13% O_2	121 mg/Nm^3 13% O_2		
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor		
Visual inspection of combustion chamber	yes / no	Yes	Yes		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A		
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days		

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Other information					
Cost data					
Price range (VAT included)	€	4.665	4.820		
Maintenance cost (typical)	€ / year	N/A	N/A		

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Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Saba
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Saba Basic: high quality wood pellets (ENplus A1 / DINplus). Saba EVO: high and low quality wood pellets.				
Boiler Model Name	**Units / Characteristics**	**Saba Basic**	**Saba EVO**		
Basic design parameters and geometry					
Nominal thermal output	kW	22.5	22.5		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	20	20		
Thermal output for space heating (for stoves)	kW	2.5	2.5		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	5.6	5.6		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.570 X 1.238 X 0.580	0.570 X 1.238 X 0.580		
Net combustion system weight	kg	173	176		
Heating surfaces	m^2	N/A	N/A		
Cleaning of heating surfaces	automated / manual	Manual	Manual		

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger		
Operation	continuous / intermittent	Intermittent	Intermittent		
Integrated Hopper / Silo	yes / no	Yes	Yes		
Integrated Hopper / Silo Capacity	kg	35	35		
Typical fuel consumption[5]	kg/h	1.3-5.3	1.3-5.3		
Time between refueling (for intermittent use. stoves)	min / h	6.5-27 h	6.5-27 h		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated	Automated		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above		
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner		
Combustion chamber volume	l	N/A	N/A		
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A		

[5] At nominal load and minimum load for continuous use (Biomasud Plus fuels).

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Combustion chamber cooling concept	water cooled / air cooled / insulated	Insulated	Insulated		
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan		
Deashing system	manual / automatic	Manual	Manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%	90%	90%		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	0.050-0.150	0.050-0.150		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A		
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A		

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Hydraulics connections	inches	¾ “	¾ “		
Maximum operation pressure	bar	2	2		
Tested pressure	bar	4	4		
Water volume	l	N/A	N/A		
Minimum return temperature	°C	55	55		
Maximum operation temperature	°C	90	90		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80		
Flue gas temperature	°C	177	177		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	270-236 mg/Nm^3 13% O_2	270-236 mg/Nm^3 13% O_2		
OGC	mg / Nm^3 (and/or) mg/MJ	4 mg/Nm^3 13% O_2	4 mg/Nm^3 13% O_2		
Dust	mg / Nm^3 (and/or) mg/MJ	9 mg/Nm^3 13% O_2	9 mg/Nm^3 13% O_2		
NOx	mg / Nm^3 (and/or) mg/MJ	121 mg/Nm^3 13% O_2	121 mg/Nm^3 13% O_2		
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor		
Visual inspection of combustion chamber	yes / no	Yes	Yes		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A		

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Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days		
Other information					
Cost data					
Price range (VAT included)	€	4.180	4.660		
Maintenance cost (typical)	€ / year	N/A	N/A		

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Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Shima
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Boiler				
Fuel type	Shima Basic: high quality wood pellets (ENplus A1 / DINplus). Shima EVO: high and low quality wood pellets.				
Boiler Model Name	**Units / Characteristics**	**Shima Basic**	**Shima EVO**		
Basic design parameters and geometry					
Nominal thermal output	kW	18	18.5		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	12	16		
Thermal output for space heating (for stoves)	kW	5.5	2.5		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	6.2	5.6		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.570 X 1.158 X 0.580	0.570 X 1.238 X 0.580		
Net combustion system weight	kg	170	173		
Heating surfaces	m^2	N/A	N/A		
Cleaning of heating surfaces	automated / manual	Manual	Manual		

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger		
Operation	continuous / intermittent	Intermittent	Intermittent		
Integrated Hopper / Silo	yes / no	Yes	Yes		
Integrated Hopper / Silo Capacity	kg	25	35		
Typical fuel consumption	kg/h	1.3-3.7	1.3-4.2		
Time between refueling (for intermittent use. stoves)	min / h	6-19 h	8-27 h		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated	Automated		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above		
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner		
Combustion chamber volume	l	N/A	N/A		
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A		
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated		

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan		
Deashing system	manual / automatic	Manual	Manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%	91.5%	91%		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	0.050-0.150	0.050-0.150		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A		
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A		
Hydraulics connections	inches	¾ "	¾ "		
Maximum operation pressure	bar	1.5	2		

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Tested pressure	bar	3	4		
Water volume	l	N/A	N/A		
Minimum return temperature	°C	55	55		
Maximum operation temperature	°C	90	90		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80		
Flue gas temperature	°C	184.4	155		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	312-208 mg/Nm^3 13% O_2	270-194 mg/Nm^3 13% O_2		
OGC	mg / Nm^3 (and/or) mg/MJ	2 mg/Nm^3 13% O_2	4 mg/Nm^3 13% O_2		
Dust	mg / Nm^3 (and/or) mg/MJ	18 mg/Nm^3 13% O_2	13 mg/Nm^3 13% O_2		
NOx	mg / Nm^3 (and/or) mg/MJ	138 mg/Nm^3 13% O_2	121 mg/Nm^3 13% O_2		
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor		
Visual inspection of combustion chamber	yes / no	Yes	Yes		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	N/A	N/A		
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days		

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Other information					
Cost data					
Price range (VAT included)	€	3.750	4.630		
Maintenance cost (typical)	€ / year	N/A	N/A		

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Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Atilan
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Stove				
Fuel type	Atilan Basic / Atilan FLOW: high quality wood pellets (ENplus A1 / DINplus). Atilan EVO/ Atilan EVO FLOW: high and low quality pellets, crushed husks, olive stones and others.				
Boiler Model Name	**Units / Characteristics**	**Atilan Basic**	**Atilan EVO**	**Atilan FLOW**	**Atilan EVO FLOW**
Basic design parameters and geometry					
Nominal thermal output	kW	12	12	12	12
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-
Thermal output for space heating (for stoves)	kW	12	12	12	12
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3.8	3.8	3.8	3.8
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-	-	-
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.555 x 1.165 x 0.505	0.555 x 1.165 x 0.505	0.555 x 1.165 x 0.505	0.555 x 1.165 x 0.505
Net combustion system weight	kg	152	155	152	155
Heating surfaces	m^2	0.48	0.48	0.48	0.48
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	Manual

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger	Auger	Auger
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	Yes
Integrated Hopper / Silo Capacity	kg	33	33	25	25
Typical fuel consumption	kg/h	0.8-2.4	0.8-2.4	0.8-2.4	0.8-2.4
Time between refueling (for intermittent use. stoves)	min / h	13-41 h	13-41 h	10-31 h	10-31 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner	Fixed burner	Fixed burner
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated	Insulated	Insulated

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	Primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan	Controlled fan	Controlled fan
Deashing system	manual / automatic	Manual	Automatic	Manual	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%	85%	85%	85%	85%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	0.080-0.150	0.080-0.150	0.080-0.150	0.080-0.150
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-
Hydraulics connections	inches	-	-	-	-
Maximum operation pressure	bar	-	-	-	-

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Tested pressure	bar	-	-	-	-
Water volume	l	-	-	-	-
Minimum return temperature	^oC	-	-	-	-
Maximum operation temperature	^oC	-	-	-	-
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	80
Flue gas temperature	^oC	209	209	209	209
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor	Electrical resistor	Electrical resistor
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	No	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days	Every 2-3 days	Every 2-3 days

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Other information					
Cost data					
Price range (VAT included)	€	1.980	2.140	2.260	2.430
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Erta
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Stove				
Fuel type	Erta Basic / Erta FLOW: high quality wood pellets (ENplus A1 / DINplus). Erta EVO/ Erta EVO FLOW: high and low quality pellets. crushed husks. olive stone and others.				
Boiler Model Name	**Units / Characteristics**	**Erta Basic**	**Erta EVO**	**Erta FLOW**	**Erta EVO FLOW**
Basic design parameters and geometry					
Nominal thermal output	kW	10.4	10.4	10.4	10.4
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-
Thermal output for space heating (for stoves)	kW	10.4	10.4	10.4	10.4
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3.7	3.7	3.7	3.7
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-	-	-
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.535 x 1.070 x 0.505	0.535 x 1.070 x 0.515	0.535 x 1.070 x 0.505	0.535 x 1.070 x 0.515
Net combustion system weight	kg	122	125	122	125
Heating surfaces	m^2	0.44	0.44	0.44	0.44
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	Manual

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger	Auger	Auger
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	Yes
Integrated Hopper / Silo Capacity	kg	24	24	16	16
Typical fuel consumption	kg/h	0.8-2.1	0.8-2.1	0.8-2.1	0.8-2.1
Time between refueling (for intermittent use. stoves)	min / h	12-30 h	12-30 h	8-20 h	8-20 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner	Fixed burner	Fixed burner
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated	Insulated	Insulated

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	Primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan	Controlled fan	Controlled fan
Deashing system	manual / automatic	Manual	Automatic	Manual	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%	85%	85%	85%	85%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	0.080-0.150	0.080-0.150	0.080-0.150	0.080-0.150
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-
Hydraulics connections	inches	-	-	-	-
Maximum operation pressure	bar	-	-	-	-

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Tested pressure	bar	-	-	-	-
Water volume	l	-	-	-	-
Minimum return temperature	°C	-	-	-	-
Maximum operation temperature	°C	-	-	-	-
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	80
Flue gas temperature	°C	203	203	203	203
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	0.02-0.03 % vol. 13% O_2	0.02-0.03 % vol. 13% O_2	0.02-0.03 % vol. 13% O_2	0.02-0.03 % vol. 13% O_2
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor	Electrical resistor	Electrical resistor
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	No	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days	Every 2-3 days	Every 2-3 days

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Other information					
Cost data					
Price range (VAT included)	€	1.735	1.895	2.015	2.185
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Fuji
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Stove				
Fuel type	Fuji Basic / Fuji FLOW: high quality wood pellets (ENplus A1 / DINplus). Fuji EVO/ Fuji EVO FLOW: high and low quality pellets. crushed husks. olive stone and others.				
Boiler Model Name	**Units / Characteristics**	**Fuji Basic**	**Fuji EVO**	**Fuji FLOW**	**Fuji EVO FLOW**
Basic design parameters and geometry					
Nominal thermal output	kW	10.4	10.4	10.4	10.4
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-
Thermal output for space heating (for stoves)	kW	10.4	10.4	10.4	10.4
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3.7	3.7	3.7	3.7
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-	-	-
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.570 x 1.110 x 0.515	0.570 x 1.110 x 0.515	0.570 x 1.110 x 0.515	0.570 x 1.110 x 0.515
Net combustion system weight	kg	141	144	141	144
Heating surfaces	m^2	0.44	0.44	0.44	0.44
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	Manual

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger	Auger	Auger
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	Yes
Integrated Hopper / Silo Capacity	kg	24	24	16	16
Typical fuel consumption	kg/h	0.8-2.1	0.8-2.1	0.8-2.1	0.8-2.1
Time between refueling (for intermittent use. stoves)	min / h	12-30 h	12-30 h	8-20 h	8-20 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner	Fixed burner	Fixed burner
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated	Insulated	Insulated

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	Primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan	Controlled fan	Controlled fan
Deashing system	manual / automatic	Manual	Automatic	Manual	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%	85%	85%	85%	85%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	0.080-0.150	0.080-0.150	0.080-0.150	0.080-0.150
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-
Hydraulics connections	inches	-	-	-	-
Maximum operation pressure	bar	-	-	-	-

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Tested pressure	bar	-	-	-	-
Water volume	l	-	-	-	-
Minimum return temperature	°C	-	-	-	-
Maximum operation temperature	°C	-	-	-	-
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	80
Flue gas temperature	°C	203	203	203	203
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	0.02-0.03 % vol. 13% O_2	0.02-0.03 % vol. 13% O_2	0.02-0.03 % vol. 13% O_2	0.02-0.03 % vol. 13% O_2
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor	Electrical resistor	Electrical resistor
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	No	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days	Every 2-3 days	Every 2-3 days

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Other information					
Cost data					
Price range (VAT included)	€	2.315	2.475	2.595	2.765
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A

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Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Musa
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Stove				
Fuel type	Musa Basic / Musa FLOW: high quality wood pellets (ENplus A1 / DINplus). Musa EVO/ Musa EVO FLOW: high and low quality pellets. crushed husks. olive stone and others.				
Boiler Model Name	**Units / Characteristics**	**Musa Basic**	**Musa EVO**	**Musa FLOW**	**Musa EVO FLOW**
Basic design parameters and geometry					
Nominal thermal output	kW	12	12	12	12
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-
Thermal output for space heating (for stoves)	kW	12	12	12	12
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3.8	3.8	3.8	3.8
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-	-	-
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.555 x 1.165 x 0.505	0.555 x 1.165 x 0.505	0.555 x 1.165 x 0.505	0.555 x 1.165 x 0.505
Net combustion system weight	kg	165	168	165	168
Heating surfaces	m^2	0.48	0.48	0.48	0.48
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	Manual

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger	Auger	Auger
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	Yes
Integrated Hopper / Silo Capacity	kg	33	33	25	25
Typical fuel consumption	kg/h	0.8-2.4	0.8-2.4	0.8-2.4	0.8-2.4
Time between refueling (for intermittent use. stoves)	min / h	13-41 h	13-41 h	10-31 h	10-31 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner	Fixed burner	Fixed burner
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated	Insulated	Insulated

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	Primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan	Controlled fan	Controlled fan
Deashing system	manual / automatic	Manual	Automatic	Manual	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%	85%	85%	85%	85%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	0.080-0.150	0.080-0.150	0.080-0.150	0.080-0.150
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-
Hydraulics connections	inches	-	-	-	-
Maximum operation pressure	bar	-	-	-	-

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Tested pressure	bar	-	-	-	-
Water volume	l	-	-	-	-
Minimum return temperature	°C	-	-	-	-
Maximum operation temperature	°C	-	-	-	-
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	80
Flue gas temperature	°C	209	209	209	209
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor	Electrical resistor	Electrical resistor
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	No	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days	Every 2-3 days	Every 2-3 days

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Other information					
Cost data					
Price range (VAT included)	€	2.200	2.360	2.480	2.650
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Nila
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Stove				
Fuel type	Nila Basic: high quality wood pellets (ENplus A1 / DINplus). Nila EVO: high and low quality pellets. crushed husks. olive stone and others.				
Boiler Model Name	**Units / Characteristics**	**Nila Basic**	**Nila EVO**		
Basic design parameters and geometry					
Nominal thermal output	kW	10.4	10.4		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-		
Thermal output for space heating (for stoves)	kW	10.4	10.4		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3.7	3.7		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.104 x 1.113 x 0.310	1.104 x 1.113 x 0.310		
Net combustion system weight	kg	130	133		
Heating surfaces	m^2	0.44	0.44		
Cleaning of heating surfaces	automated / manual	Manual	Manual		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger		
Operation	continuous / intermittent	Intermittent	Intermittent		
Integrated Hopper / Silo	yes / no	Yes	Yes		
Integrated Hopper / Silo Capacity	kg	21	21		
Typical fuel consumption	kg/h	0.8-2.1	0.8-2.1		
Time between refueling (for intermittent use. stoves)	min / h	10-26 h	10-26 h		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated	Automated		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above		
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner		
Combustion chamber volume	l	N/A	N/A		
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A		
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan		
Deashing system	manual / automatic	Manual	Automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%	85%	85%		
Combustion efficiency (related to fuel burnout)	%	N/A	N/A		
Electricity consumption	Wel/kW of boiler output	0.080-0.150	0.080-0.150		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-		
Hydraulics / Water circuit					
Number of tubes	#	-	-		
Hydraulics connections	inches	-	-		
Maximum operation pressure	bar	-	-		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Tested pressure	bar	-	-		
Water volume	l	-	-		
Minimum return temperature	^oC	-	-		
Maximum operation temperature	^oC	-	-		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80		
Flue gas temperature	^oC	203	203		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	0.02-0.03 % vol. 13% O_2	0.02-0.03 % vol. 13% O_2		
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor		
Visual inspection of combustion chamber	yes / no	Yes	Yes		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275		
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Other information					
Cost data					
Price range (VAT included)	€	2.250	2.410		
Maintenance cost (typical)	€ / year	N/A	N/A		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	LASIAN Tecnología del calor. S.L. Polígono Industrial Las Norias. parcela 7. 50450 Muel (Zaragoza. Spain). Tel. 0034 976 140 600. Fax. 0034 976 140 522. http://www.lasian.es . Email: info@lasian.es
Series name	Teon
Photos / schematics	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion system type	Stove				
Fuel type	Teon Basic / Teon FLOW: high quality wood pellets (ENplus A1 / DINplus). Teon EVO/ Teon EVO FLOW: high and low quality Pellets. crushed husks. olive stone and others.				
Boiler Model Name	**Units / Characteristics**	**Teon Basic**	**Teon EVO**	**Teon FLOW**	**Teon EVO FLOW**
Basic design parameters and geometry					
Nominal thermal output	kW	12	12	12	12
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-
Thermal output for space heating (for stoves)	kW	12	12	12	12
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3.8	3.8	3.8	3.8
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-	-	-
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0.560 x 1.170 x 0.505	0.560 x 1.170 x 0.505	0.560 x 1.170 x 0.505	0.560 x 1.170 x 0.505
Net combustion system weight	kg	171	174	171	174
Heating surfaces	m^2	0.48	0.48	0.48	0.48
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	Manual

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Auger	Auger	Auger	Auger
Operation	continuous / intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Integrated Hopper / Silo	yes / no	Yes	Yes	Yes	Yes
Integrated Hopper / Silo Capacity	kg	33	33	25	25
Typical fuel consumption	kg/h	0.8-2.4	0.8-2.4	0.8-2.4	0.8-2.4
Time between refueling (for intermittent use. stoves)	min / h	13-41 h	13-41 h	10-31 h	10-31 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No	No	No
Stoker technology	Manual / automated (screw)	Automated	Automated	Automated	Automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Fixed burner	Fixed burner	Fixed burner	Fixed burner
Combustion chamber volume	l	N/A	N/A	N/A	N/A
Combustion chamber dimensions (Width x Height x Length)	m	N/A	N/A	N/A	N/A
Combustion chamber cooling concept	water cooled / air cooled /	Insulated	Insulated	Insulated	Insulated

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	Primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber
Air supply control	flaps / controlled fans	Controlled fan	Controlled fan	Controlled fan	Controlled fan
Deashing system	manual / automatic	Manual	Automatic	Manual	Automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe	Automatic Temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%	85%	85%	85%	85%
Combustion efficiency (related to fuel burnout)	%	N/A	N/A	N/A	N/A
Electricity consumption	Wel/kW of boiler output	0.080-0.150	0.080-0.150	0.080-0.150	0.080-0.150
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Hydraulics / Water circuit					
Number of tubes	#	-	-	--	-
Hydraulics connections	inches	--	-	-	-
Maximum operation pressure	bar	-	-	-	-

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Tested pressure	bar	-	-	-	-
Water volume	l	-	-	-	-
Minimum return temperature	ºC	-	-	-	-
Maximum operation temperature	ºC	-	-	-	-
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	80
Flue gas temperature	ºC	209	209	209	209
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct	Flue gas duct	Flue gas duct
CO	mg / Nm^3 (and/or) mg/MJ	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2	0.05-0.04 % vol. 13% O_2
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A	N/A	N/A
Other characteristics					
Ignition	spark / kindling / other	Electrical resistor	Electrical resistor	Electrical resistor	Electrical resistor
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	No	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275	0.139 x 0.107 x 0.275
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days	Every 2-3 days	Every 2-3 days

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Other information					
Cost data					
Price range (VAT included)	€	2.530	2.690	2.810	2.980
Maintenance cost (typical)	€ / year	N/A	N/A	N/A	N/A

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2.8. NATURAL FIRE

Manufacturer	NATURAL FIRE S.L. Av. De la Paz. 208. 30510 Yecla (Murcia. Spain) Tel. 0034 968 011 503. www.naturalfire.es. E-mail: info@naturalfire.es
Series name	NF-250
Photos / schematics	

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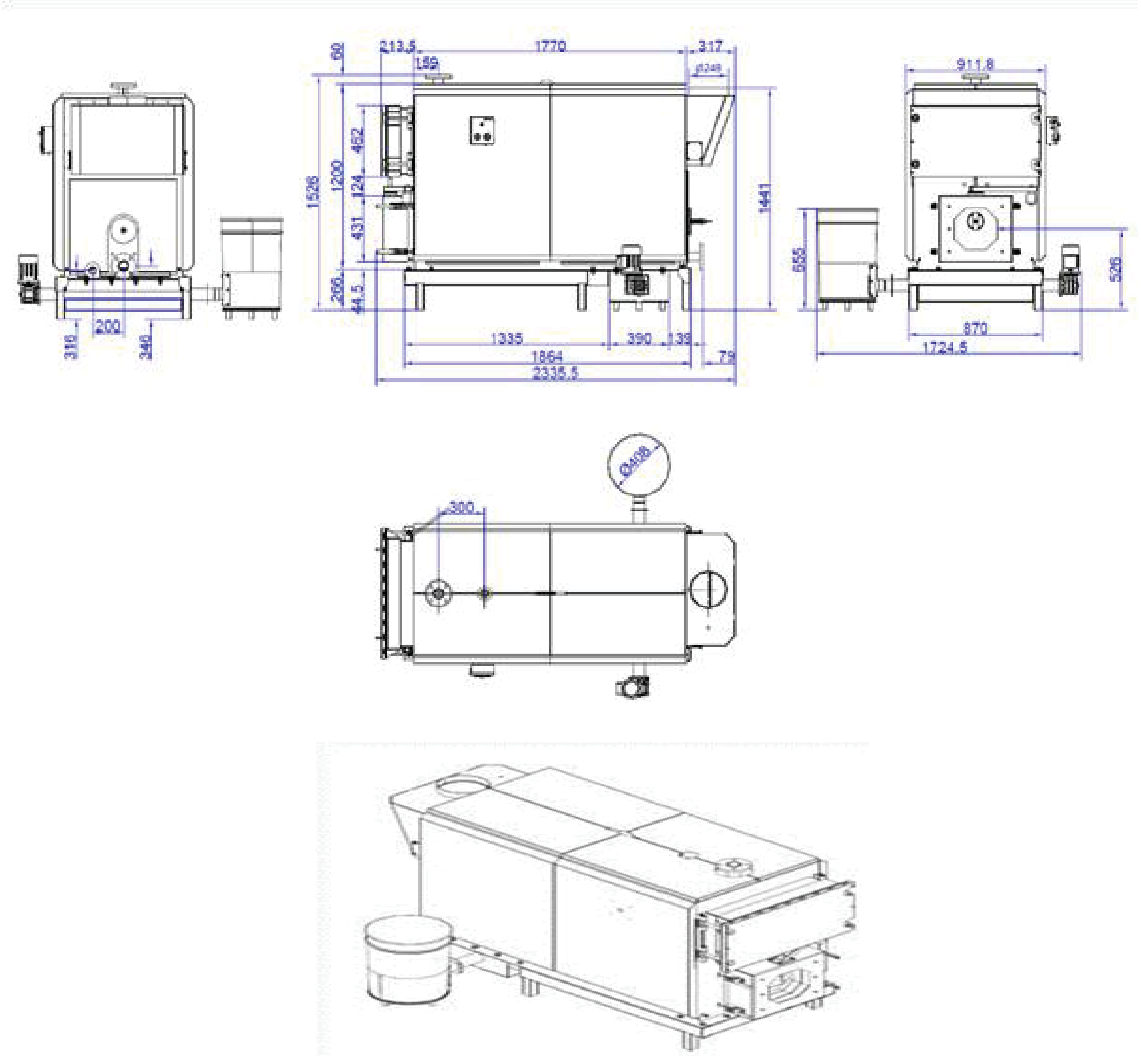

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Combustion system type	Boiler				
Fuel type	Pellet. olive stones. almond shells				
Boiler Model Name	**Units / Characteristics**	**NF-250**			
Basic design parameters and geometry					
Nominal thermal output	kW	250			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	250			
Thermal output for space heating (for stoves)	kW	-			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	25 (10%)			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.870 x 1.526 x 2.335			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	Variable			
Net combustion system weight	kg	1400			
Heating surfaces	m^2	N/A			
Cleaning of heating surfaces	automated / manual	Semi-auto			
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger /	Auger			

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	manual / other				
Operation	continuous / intermittent	Intermittent			
Integrated Hopper / Silo	yes / no	No			
Integrated Hopper / Silo Capacity	kg	N/A			
Typical fuel consumption	kg/h	5 – 50			
Time between refueling (for intermittent use. stoves)	min / h	-			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	Only primary zone			
Stoker technology	Manual / automated (screw)	Automated			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above			
Grate technology	fixed grate / moving grate / others	Fixed or moving grate depending on the burner			
Combustion chamber volume	l	515			
Combustion chamber dimensions (Width x Height x Length)	m	0.62 x 0.52 x 1.6			
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled			
Combustion air streams	primary air /	Primary air			

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	secondary air / others				
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans			
Air supply control	flaps / controlled fans	Controlled fans			
Deashing system	manual / automatic	N/A			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic Temperature control			
Efficiency and Class					
Boiler / Stove Efficiency	%	> 85%			
Combustion efficiency (related to fuel burnout)	%	95%			
Electricity consumption	Wel/kW of boiler output	N/A			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A			
Hydraulics / Water circuit					
Number of tubes	#	28			
Hydraulics connections	inches	DN50 Brida DIN 2576			
Maximum operation pressure	bar	3			
Tested pressure	bar	N/A			

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Water volume	l	590			
Minimum return temperature	^oC	N/A			
Maximum operation temperature	^oC	87			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	248			
Flue gas temperature	^oC	<200^oC			
Draught	forced / natural	Forced			
Location of flue gas fan (for forced draught systems)		Flue gas duct			
CO	mg / Nm^3 (and/or) mg/MJ	N/A			
OGC	mg / Nm^3 (and/or) mg/MJ	N/A			
Dust	mg / Nm^3 (and/or) mg/MJ	N/A			
NOx	mg / Nm^3 (and/or) mg/MJ	N/A			
Other characteristics					
Ignition	spark / kindling / other	Other			
Visual inspection of combustion chamber	yes / no	No			
Ash compaction	yes / no	No			
Ash chamber dimensions (Width x Height x Length)	m	0.408 m diam. x 0.65 m height			
Typical ash cleaning frequency	times per week / month / other	Twice a month			
Other information					

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Cost data					
Price range (VAT included)	€	N/A			
Maintenance cost (typical)	€ / year	N/A			

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2.9. TUBOCAS

Manufacturer	TUBOCAS S.L.Ctra. Castril Km 3,5, 18830 Huéscar (Granada, Spain) .Tel.0034 958 104 000. www.tubocas.net. Email: info@tubocas.net
Series name	BIOTUCAL

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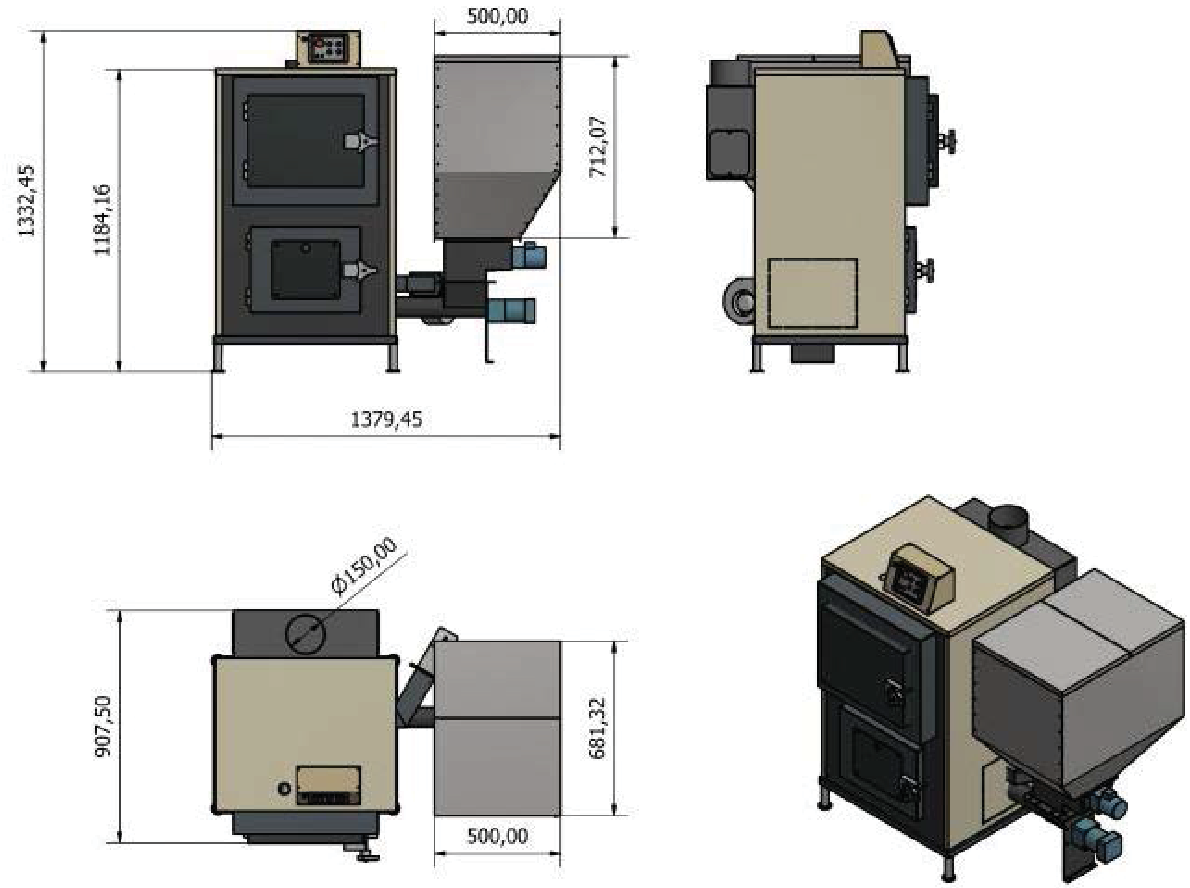
Photos / schematics	 Biotucal 25

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	 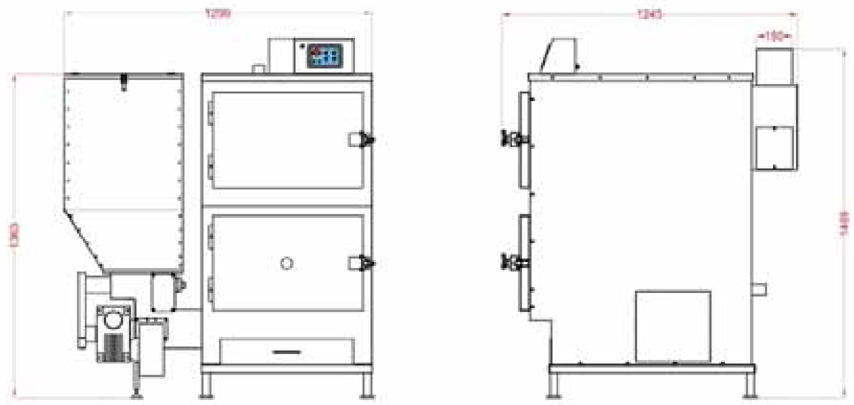 Biotucal 45
Combustion system type	Boiler
Fuel type	Multifuel: wood pellet, olive stones, almond/hazelnut/pine nut/walnut shells, chopped stones (peach, apricot, or similar), wood logs (only manually)

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Boiler Model Name	Units / Characteristics	BIOTUCAL 25	BIOTUCAL 45		
Basic design parameters and geometry					
Nominal thermal output	kW	25	46		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	N/A	N/A		
Thermal output for space heating (for stoves)	kW	-	-		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	15	15		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.76 x 1.33 x 0.907	0.725 x 1.469 x 1.245		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.379 x 1.333 x 0.907	1.299 x 1.469 x 1.245		
Net combustion system weight	kg	325	360		
Heating surfaces	m^2	2.6	0.95		
Cleaning of heating surfaces	automated / manual	Manual	Manual		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Manual	Manual		
Operation	continuous / intermittent	Intermittent	Intermittent		
Integrated Hopper / Silo	yes / no	No	No		

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Integrated Hopper / Silo Capacity	kg	125	145		
Typical fuel consumption	kg/h	1.6 -5.7	9.5 (maximum)		
Time between refueling (for intermittent use, stoves)	min / h	-	-		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No	No		
Stoker technology	Manual / automated (screw)	Automated (double screw)	Automated (double screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From below	From below		
Grate technology	fixed grate / moving grate / others	Fixed grate	Fixed grate		
Combustion chamber volume	l	0.09 m3	0.21 m3		
Combustion chamber dimensions (Width x Height x Length)	m	0.560 x 0.426 x 0.456	0.813 x 0.623 x 0.456		
Combustion chamber cooling concept	water cooled / air cooled / insulated	Water cooled	Water cooled		
Combustion air streams	primary air / secondary air / others	Primary air	Primary air		
Combustion air supply	separate air fans / suction due to	Separate air fans	Separate air fans		

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	underpressure in the combustion chamber				
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans		
Deashing system	manual / automatic	Manual	Manual		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Manual	Manual		
Efficiency and Class					
Boiler / Stove Efficiency	%	87	89		
Combustion efficiency (related to fuel burnout)	%	96	96		
Electricity consumption	Wel/kW of boiler output	0.185	0.185		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	N/A	N/A		
Hydraulics / Water circuit					
Number of tubes	#	N/A	N/A		
Hydraulics connections	inches	DN 32 - 1¼” DN 10 – 3/8”	DN 32 - 1¼” DN 10 – 3/8”		
Maximum operation pressure	bar	1.8	1.8		
Tested pressure	bar	1.5	1.5		
Water volume	l	120	140		
Minimum return temperature	^oC	45	45		
Maximum operation temperature	^oC	85	85		

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Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	150		
Flue gas temperature	^{o}C	180	180		
Draught	forced / natural	Forced	Forced		
Location of flue gas fan (for forced draught systems)		Flue gas duct	Flue gas duct		
CO	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
OGC	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
Dust	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
NOx	mg / Nm^3 (and/or) mg/MJ	N/A	N/A		
Other characteristics					
Ignition	spark / kindling / other	Manual	Manual		
Visual inspection of combustion chamber	yes / no	No	No		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	0.540 x 0.120 x 0.8	0.520 x 0.120 x 0.540		
Typical ash cleaning frequency	times per week / month / other	Once a week	Once a week		
Other information					
Cost data					
Price range (VAT included)	€	4000-4235	3500-3848		

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Maintenance cost (typical)	€ / year	50	50		

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3. Italy

3.1. CS Thermos

Manufacturer	**CS Thermos (Italian biomass stoves and boilers manufacture) www.csthermos.it**				
Series name	Thelma120/Luise120/Notabene120/Trendy120/Cippatina120				
Photos / schematics	http://www.csthermos.it/prd/stufa-pellet-pelletbiomassa-cippato/cippatina/				
Combustion system type	Stove (EN 14785:2006)				
Fuel type	**Wood pellet (ISO 17225-2, A1); Calibrated wood chips: P16A; M10 (acc. ISO 17225-4)**				
Boiler Model Name	**Units / Characteristics**	**1**	**2**	**3**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	9,04			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW				
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	65,7%			
System dimensions (excluding daily fuel storage container)	m				

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(Width x Height x Length)					
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	65x132x53			
Net combustion system weight	kg	50			
Heating surfaces	m^2	1,4			
Cleaning of heating surfaces	automated / manual	manual			
Fuel feeding	pneumatic / auger / manual / other	Auger			
Operation	continuous / intermittent	continuous			
Integrated Hopper / Silo	yes / no	yes			
Integrated Hopper / Silo Capacity	kg	28 – pellet 14 - chips			
Typical fuel consumption	kg/h	1,8 – pellet 2 - chips			
Time between refueling (for intermittent use, stoves)	min / h				

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Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes			
Stoker technology	Manual / automated (screw)	automated (screw)			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above			
Grate technology	fixed grate / moving grate / others	Rotative self-cleaning multi-fuel burner (patented by CS Thermos)			
Combustion chamber volume	l	25			
Combustion chamber dimensions (Width x Height x Length)	m	0,15 x 0,5 x 0,3			
Combustion chamber cooling concept	water cooled / air cooled / insulated	Air cooled			
Combustion air streams	primary air / secondary air / others	primary air and separated secondary air			
Combustion air supply	separate air fans / suction due to	suction due to underpressure in			

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	underpressure in the combustion chamber	the combustion chamber with dedicated flue gas fan			
Air supply control	flaps / controlled fans	controlled flue gas fan			
Deashing system	manual / automatic	manual			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	temperature fumes probe			
Efficiency and Class					
Boiler / Stove Efficiency	%	90,26			
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output	72			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				

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Maximum operation pressure	bar				
Tested pressure	bar				
Water volume	l				
Minimum return temperature	°C				
Maximum operation temperature	°C				
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80			
Flue gas temperature	°C	150			
Draught	forced / natural	forced			
Location of flue gas fan (for forced draught systems)		in the combustion chamber downstream			
CO	mg / Nm^3 (and/or) mg/MJ	190			
OGC	mg / Nm^3 (and/or) mg/MJ	9,99			
Dust	mg / Nm^3 (and/or) mg/MJ	21,20			
NOx	mg / Nm^3 (and/or) mg/MJ				

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Other characteristics					
Ignition	spark / kindling / other	Electrical resistance			
Visual inspection of combustion chamber	yes / no	yes			
Ash compaction	yes / no	no			
Ash chamber dimensions (Width x Height x Length)	m	0,28 x 0.16 x 0,18			
Typical ash cleaning frequency	times per week / month / other				
Other information		In function of the fuel utilized there are different times of cleaning from chamber combustion surfaces or burner			
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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Manufacturer	**CS Thermos (Italian biomass stoves and boilers manufacture) www.csthermos.it**				
Series name	**VENEXIA (15/18/21/25)**				
Photos / schematics	http://www.csthermos.it/prodotti/#				
Combustion system type	Stove with water jacket (EN 14785:2006)				
Fuel type	**almond shells, hazelnut shell, and other shells in general; olive stones**				
Boiler Model Name	**Units / Characteristics**	**1**	**2**	**3**	**4**
Basic design parameters and geometry					
Nominal thermal output	kW	15,4	17,0	20,1	22,9
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	13,6	15,3	15,6	17,6
Thermal output for space heating (for stoves)	kW	1,7	1,7	4,5	5,2
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	48,7%	44,1%	50%	43,6
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container)	m	62 x 121 x 56	62 x 121 x 56	63 x 130 x 56	63 x 130 x 62

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(Width x Height x Length)					
Net combustion system weight	kg	75	75	110	110
Heating surfaces	m^2	1,8	1,8	2,2	2,2
Cleaning of heating surfaces	automated / manual	automated	automated	automated	automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	manual
Operation	continuous / intermittent	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	kg	21	21	32	32
Typical fuel consumption	kg/h	3,38	3,77	4,10	5,09
Time between refueling (for intermittent use, stoves)	min / h				
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes	yes	yes
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)	automated (screw)	automated (screw)
Fuel feeding to the fuel bed	from above / from the side /	From above	From above	From above	From above

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	from below = underfeed stoker				
Grate technology	fixed grate / moving grate / others	Rotative self-cleaning multi-fuel burner (patented by CS Thermos) http://www.csthermos.it/en/plus/the-cs-thermos-patent/			
Combustion chamber volume	l	36	36	62	62
Combustion chamber dimensions (Width x Height x Length)	m	12.5 x 32 x 90	12.5 x 32 x 90	19.5 x 32 x 99	19.5 x 32 x 99
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	water cooled
Combustion air streams	primary air / secondary air / others	Primary air and separated secondary air	Primary air and separated secondary air	Primary air and separated secondary air	Primary air and separated secondary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber with dedicated flue gas fan	suction due to underpressure in the combustion chamber with dedicated flue gas fan	suction due to underpressure in the combustion chamber with dedicated flue gas fan	suction due to underpressure in the combustion chamber with dedicated flue gas fan
Air supply control	flaps / controlled fans	Controlled flue gas fan	Controlled flue gas fan	Controlled flue gas fan	Controlled flue gas fan
Deashing system	manual / automatic	manual	manual	manual	manual

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Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Temperature fumes probe	Temperature fumes probe	Temperature fumes probe	Temperature fumes probe
Efficiency and Class					
Stove Efficiency	%	93,3	92,5	93,4	93,3
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output	42	38	32	28
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#	4	4	6	6
Hydraulics connections	inches	¾”	¾”	¾”	¾”
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	8	8	8	8
Water volume	l				
Minimum return temperature	^oC	50	50	50	50
Maximum operation temperature	^oC	80	80	80	80

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Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	80
Flue gas temperature	^oC	90,4	98,6	100,5	100,5
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		In the combustion chamber downstream	In the combustion chamber downstream	In the combustion chamber downstream	In the combustion chamber downstream
CO	mg / Nm^3 (and/or) mg/MJ	167/269 mg / Nm^3	143/179 mg / Nm^3	155/360 mg / Nm^3	196/360 mg / Nm^3
OGC	mg / Nm^3 (and/or) mg/MJ	1,3/0,5 mg / Nm^3	1,3/0,5 mg / Nm^3	4/7 mg / Nm^3	3/7 mg / Nm^3
Dust	mg / Nm^3 (and/or) mg/MJ	12,2/13,0 mg / Nm^3	11,8/12,6 mg / Nm^3	19,9/20,5 mg / Nm^3	23,9/20,5 mg / Nm^3
NOx	mg / Nm^3 (and/or) mg/MJ	121/117 mg / Nm^3	124/117 mg / Nm^3	149/136 mg / Nm^3	155/136 mg / Nm^3
Other characteristics					
Ignition	spark / kindling / other	Electrical resistance	Electrical resistance	Electrical resistance	Electrical resistance
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	No	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	0,2 x 0,31 x 0,16	0,2 x 0,31 x 0,16	0,2 x 0,31 x 0,22	0,2 x 0,31 x 0,22

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Typical ash cleaning frequency	times per week / month / other				
Other information		In function of the fuel utilized there are different times of cleaning from chamber combustion or burner	In function of the fuel utilized there are different times of cleaning from chamber combustion or burner	In function of the fuel utilized there are different times of cleaning from chamber combustion or burner	In function of the fuel utilized there are different times of cleaning from chamber combustion or burner
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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3.2. D'Alessandro Termomeccanica

Manufacturer	**D'Alessandro Termomeccanica (Italian biomass boilers manufacturer)** **www.caldaiedalessandro.it**				
Series name	CS 30-100 kW				
Photos / schematics	http://www.caldaiedalessandro.it/prodotti-caldaia-cs/				
Combustion system type	Boiler EN 303-5				
Fuel type	**Wood pellets, almond shells, hazelnut shell, and other shells in general; olive stones and olive cake**				
Boiler Model Name	**Units / Characteristics**	**1**	**2**	**3**	**4**
Basic design parameters and geometry					
Nominal thermal output	kW	30	45	60	80
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW				
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	30	30	30	30
System dimensions (excluding daily fuel storage container)	m	1000x1255x525	1000x1255x625	1000x1255x725	1000x1255x925

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(Width x Height x Length)					
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1700x1255x525	1700x1255x625	1700x1255x725	1700x1255x925
Net combustion system weight	kg	430	480	600	680
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual				
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	manual
Operation	continuous / intermittent				
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	dm^3	190	190	190	190
Typical fuel consumption	kg/h	6,9	10,4	13,8	18,4
Time between refueling (for intermittent use, stoves)	min / h				
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not				

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Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)	automated (screw)	automated (screw)
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker				
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	95	115	135	175
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others				
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber				
Air supply control	flaps / controlled fans				
Deashing system	manual / automatic	automatic	automatic	automatic	automatic

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Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	automatic
Efficiency and Class					
Boiler / Stove Efficiency	%	88,1	88,2	88,5	88,6
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output	9	6,7	5	3,75
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	Class 3 acc. EN 303-5:1999	Class 3 acc. EN 303-5:1999	Class 3 acc. EN 303-5:1999	Class 3 acc. EN 303-5:1999
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	DN	40	40	40	40
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	4,5	4,5	4,5	4,5
Water volume	l	130	150	170	215
Minimum return temperature	°C				
Maximum operation temperature	°C				

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Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm				
Flue gas temperature	^{o}C	180	180	180	180
Draught	forced / natural				
Location of flue gas fan (for forced draught systems)					
CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other				
Visual inspection of combustion chamber	yes / no				
Ash compaction	yes / no				
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				

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Other information					
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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3.3. Pasqualicchio

Manufacturer	**Pasqualicchio (Italian biomass stoves and boilers manufacture) www.ctpasqualicchio.it**				
Series name	CS MARINA				
Photos / schematics	http://www.ctpasqualicchio.it/index.php?option=com_virtuemart&view=productdetails&virtuemart_product_id=595&Itemid=485				
Combustion system type	Boiler (EN 303-5)				
Fuel type	**Wood pellets; olive stones; olive cake**				
Boiler Model Name	**Units / Characteristics**	**1**	**2**	**3**	**4**
Basic design parameters and geometry					
Nominal thermal output	kW	29	46	69	92
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW				
Output range (min. % of nominal load that can be achieved in continuous	kW	30	30	30	30

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operation)					
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	630x1060x390	630x1060x540	630x1060x740	630x1060x940
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1420x1060x730	1420x1060x930	1420x1060x1130	1420x1060x1330
Net combustion system weight	kg	460	460	535	580
Heating surfaces	m^2	3	3	4.9	6.4
Cleaning of heating surfaces	automated / manual	Automated (optional) / manual	Automated (optional) / manual	Automated (optional) / manual	Automated (optional) / manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	*Manual wood* *Auger other*	*Manual wood* *Auger other*	*Manual wood* *Auger other*	*Manual wood* *Auger other*
Operation	continuous / intermittent	Continuous (optional) / intermittent	Continuous (optional) / intermittent	Continuous (optional) / intermittent	Continuous (optional) / intermittent
Integrated Hopper / Silo	yes / no	Yes	Yes	yes	yes

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Integrated Hopper / Silo Capacity	kg	*130*	*130*	*130*	*130*
Typical fuel consumption	kg/h	1,3-6,8	1,3-10,8	1,3-16	2-21
Time between refueling (for intermittent use, stoves)	min / h	*Programmable*	*Programmable*	*Programmable*	*programmable*
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	*Not / Yes (optional)*	*Not / Yes (optional)*	*Not / Yes (optional)*	*Not / Yes (optional)*
Stoker technology	Manual / automated (screw)	*automated (screw)*	*automated (screw)*	*automated (screw)*	*automated (screw)*
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	underfeed stoker	underfeed stoker	underfeed stoker	underfeed stoker
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	83	83	116	150
Combustion chamber dimensions (Width x Height x	mm	475x350x500	475x350x500	475x350x700	475x350x900

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Length)					
Combustion chamber cooling concept	water cooled / air cooled / insulated	*water cooled / insulated (optional)*	*water cooled / insulated (optional)*	*water cooled / insulated (optional)*	*water cooled / insulated (optional)*
Combustion air streams	primary air / secondary air / others	Primary air / secondary air (optional)	Primary air / secondary air (optional)	Primary air / secondary air (optional)	Primary air / secondary air (optional)
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans
Deashing system	manual / automatic	Manual / automatic (optional)	Manual / automatic (optional)	Manual / automatic (optional)	Manual / automatic (optional)
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic	Automatic	automatic	Automatic
Efficiency and Class					
Boiler / Stove Efficiency	%	85.6	87.1	86.3	85.4

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Combustion efficiency (related to fuel burnout)	%	89.7	91.2	91.3	90.7
Electricity consumption	Wel/kW of boiler output	16,8	10,77	7,18	5,39
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	DN	40	40	40	40
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	5	5	5	5
Water volume	l	115	115	152	195
Minimum return temperature	°C	50	50	50	50
Maximum operation temperature	°C	85	85	85	85
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	*200*	*200*	*200*	*200*
Flue gas temperature	°C	*150*	*150*	*150*	*150*
Draught	forced / natural	*natural*	*natural*	*natural*	*natural*

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Location of flue gas fan (for forced draught systems)		--------	--------	--------	--------
CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	*phon*	*phon*	*Phon*	*phon*
Visual inspection of combustion chamber	yes / no	*yes*	*yes*	*yes*	*yes*
Ash compaction	yes / no	*Yes (optional)*	*Yes (optional)*	*Yes (optional)*	*Yes (optional)*
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month	*t.p.w.*	*t.p.w.*	*t.p.w.*	*t.p.w.*

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	/ other				
Other information					
Cost data					
Price range (VAT included)	€	6154	6154	6795	7436
Maintenance cost (typical)	€ / year				

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Manufacturer	**CT Pasqualicchio (Italian biomass stoves and boilers manufacture) www.ctpasqualicchio.it**				
Series name	CSB MARINA				
Photos / schematics	http://www.ctpasqualicchio.it/index.php?option=com_virtuemart&view=productdetails&virtuemart_product_id=108&Itemid=318				
Combustion system type	Boiler (EN 303-5)				
Fuel type	**Wood pellets; Wood chips; olive stones; olive cake**				
Boiler Model Name	**Units / Characteristics**	**1**	**2**	**3**	**4**
Basic design parameters and geometry					
Nominal thermal output	kW	29	46	69	92
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW				
Output range (min. % of nominal load that can be achieved in continuous	kW	30	30	30	30

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operation)					
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	mm	630x1060x390	630x1060x540	630x1060x740	630x1060x940
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	2100x1060x1190	2100x1060x1190	2100x1060x1230	2100x1060x1330
Net combustion system weight	kg	460	460	535	580
Heating surfaces	m^2	3	3	4.9	6.4
Cleaning of heating surfaces	automated / manual	Automated (optional) / manual	Automated (optional) / manual	Automated (optional) / manual	Automated (optional) / manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	*Manual wood* *Auger other*	*Manual wood* *Auger other*	*Manual wood* *Auger other*	*Manual wood* *Auger other*
Operation	continuous / intermittent	Continuous (optional) / intermittent	Continuous (optional) / intermittent	Continuous (optional) / intermittent	Continuous (optional) / intermittent
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes

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Integrated Hopper / Silo Capacity	kg	370	370	370	370
Typical fuel consumption	kg/h	1,3-6,8	1,3-10,8	1,3-16	2-21
Time between refueling (for intermittent use, stoves)	min / h	*Programmable*	*Programmable*	*Programmable*	*programmable*
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	*Not / Yes (optional)*	*Not / Yes (optional)*	*Not / Yes (optional)*	*Not / Yes (optional)*
Stoker technology	Manual / automated (screw)	*automated (screw)*	*automated (screw)*	*automated (screw)*	*automated (screw)*
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	underfeed stoker	underfeed stoker	underfeed stoker	underfeed stoker
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	83	83	116	150
Combustion chamber dimensions (Width x Height x	mm	475x350x500	475x350x500	475x350x700	475x350x900

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Length)					
Combustion chamber cooling concept	water cooled / air cooled / insulated	*water cooled / insulated (optional)*	*water cooled / insulated (optional)*	*water cooled / insulated (optional)*	*water cooled / insulated (optional)*
Combustion air streams	primary air / secondary air / others	Primary air / secondary air (optional)	Primary air / secondary air (optional)	Primary air / secondary air (optional)	Primary air / secondary air (optional)
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans	Controlled fans	Controlled fans
Deashing system	manual / automatic	Manual / automatic (optional)	Manual / automatic (optional)	Manual / automatic (optional)	Manual / automatic (optional)
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	automatic
Efficiency and Class					
Boiler / Stove Efficiency	%	84.3	85.9	85.2	85.1

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Combustion efficiency (related to fuel burnout)	%	88.2	89.7	90.5	90.2
Electricity consumption	Wel/kW of boiler output	48,32	31,03	20,7	15,5
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	DN	40	40	40	40
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	5	5	5	5
Water volume	l	115	115	152	195
Minimum return temperature	°C	50	50	50	50
Maximum operation temperature	°C	85	85	85	85
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	*200*	*200*	*200*	*200*
Flue gas temperature	°C	*150*	*150*	*150*	*150*
Draught	forced / natural	*natural*	*natural*	*natural*	*natural*

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Location of flue gas fan (for forced draught systems)		--------	--------	--------	--------
CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	*phon*	*phon*	*Phon*	*phon*
Visual inspection of combustion chamber	yes / no	*yes*	*yes*	*yes*	*yes*
Ash compaction	yes / no	*Yes (optional)*	*Yes (optional)*	*Yes (optional)*	*Yes (optional)*
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month	*t.p.w.*	*t.p.w.*	*t.p.w.*	*t.p.w.*

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	/ other				
Other information					
Cost data					
Price range (VAT included)	€	9359	9359	10385	11410
Maintenance cost (typical)	€ / year				

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4. Turkey

4.1. Aral Makine

Manufacturer	Aral Makine Organize Sanayi Bölgesi 8. Cadde No:16 Kayseri aral@aralmakina.com.tr daiwa.com.tr
Series name	List series commercial name
Photos / schematics	 
Combustion system type	Boiler & Stove
Fuel type	Pellets

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Boiler Model Name	**Units / Characteristics**	**DP-10**	**DP-12**		
Basic design parameters and geometry					
Nominal thermal output	kW	12	19,5		
Thermal output for Domestic Heating Water (D.H.W.)	kW	-	-		
Thermal output for space heating	kW	-	-		
Output range	kW	-	-		
System dimensions (Width x Height x Length)	m	0,585X1,1X0,55	0,585X1,1X0,55		
Net combustion system weight	kg	120	150		
Heating surfaces	m^2	-	-		
Cleaning of heating surfaces	automated / manual	manual	manual		
Air supply adjustment	manual / automatic / lamda sensor / temperature probe / CO sensor	automatic	automatic		
Fuel capacity and feeding					

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Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m	0,55x0,535X0,585	0,55x0,535X0,585		
Integral fuel capacity	kg	20	20		
Fuel feeding	pneumatic / auger / manual / other	pneumatic	pneumatic		
Integrated Hopper /Silo	yes / no	no	no		
Silo Capacity	kg	-	-		
EN 303-5 Class / Efficiency					
Class	3 / 4 / 5 / not specified / not applicable	-	-		
Efficiency	%	-	-		
Combustion efficiency	%	92	82		
Electricity consumption	W	100	100		
Hydraulics / Water circuit					
Number of tubes	#	-	-		
Hydraulics connections	inches	-	1		
Maximum operation pressure	bar	-	-		

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Tested pressure	bar	-	-		
Water volume	l	-	30		
Minimum return temperature	°C	-	-		
Maximum operation temperature	°C	-	-		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80		
Flue gas temperature	°C	-	-		
Draught	Forced / Natural	-	-		
Location of flue gas fan (for forced draught systems)		-	-		
CO	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-		
OGC	mg / Nm3 (@ 6% O2) (and/or) mg/MJ	-	-		
Dust	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-		
NOx	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-		
Other characteristics					
Ignition	Spark / kindling / other	spark	spark		

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Visual inspection of combustion chamber	yes / no	yes	yes		
Ash compaction	yes / no	No	no		
Ash chamber dimensions (Width x Height x Length)	m	-	-		
Typical ash cleaning frequency	Times per week / month / other	-	-		
Other information		-	-		
Cost data					
Price range (VAT included)	€	1327	1610		
Maintenance cost (typical)	€ / year				

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4.2. Desan Makina

Manufacturer	Desan Makina 1430 sokak no:25 Doğanlar,Bornova-İzmir www.peletsoba.com pelet@peletsoba.com
Series name	DSP
Photos / schematics	   
Combustion system type	Boiler & Stove
Fuel type	pellets (6-8 mm)

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Boiler Model Name	Units / Characteristics	DSP01	DSP02	DSP06 Hidromax	DSP04
Basic design parameters and geometry					
Nominal thermal output	kW	8-10	10-14	10-20	16-18
Thermal output for Domestic Heating Water (D.H.W.)	kW	-	-	-	-
Thermal output for space heating	kW	-	-	-	-
Output range	kW	-	-	-	-
System dimensions (Width x Height x Length)	m	-	-	-	-
Net combustion system weight	kg	95	80	130	90
Heating surfaces	m^2	-			
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Air supply adjustment	manual / automatic / lamda sensor / temperature probe / CO sensor	temperature probe	temperature probe	temperature probe	temperature probe
Fuel capacity and feeding					

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Combustion chamber volume	l	-	-	-	-
Combustion chamber dimensions (Width x Height x Length)	m	-	-	-	-
Integral fuel capacity	kg	14	22	22	22
Fuel feeding	pneumatic / auger / manual / other	pneumatic	pneumatic	pneumatic	pneumatic
Integrated Hopper /Silo	yes / no	no	no	no	no
Silo Capacity	kg	-	-	-	-
EN 303-5 Class / Efficiency					
Class	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Efficiency	%	87	87	87	87
Combustion efficiency	%	-	-	-	-
Electricity consumption	W	60	60	60	60
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-

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Hydraulics connections	inches	-	-	-	-
Maximum operation pressure	bar	-	-	-	-
Tested pressure	bar	-	-	-	-
Water volume	l	-	-	-	-
Minimum return temperature	°C	-	-	-	-
Maximum operation temperature	°C	-	-	-	-
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80-130	80-130	80-130	80-130
Flue gas temperature	°C	-	-	-	-
Draught	Forced / Natural	-	-	-	-
Location of flue gas fan (for forced draught systems)		-	-	-	-
CO	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
OGC	mg / Nm3 (@ 6% O2) (and/or) mg/MJ	-	-	-	-

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Dust	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
NOx	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
Other characteristics					
Ignition	Spark / kindling / other	Auto ignition	Auto ignition	Auto ignition	Auto ignition
Visual inspection of combustion chamber	yes / no	yes	Yes	Yes	Yes
Ash compaction	yes / no	no	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-
Typical ash cleaning frequency	Times per week / month / other	-	-	-	-
Other information		-	-	-	-
Cost data					
Price range (VAT included)	€	1000	1022	1700	1300
Maintenance cost (typical)	€ / year	-	-		

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4.3. Felluce ısı , Konya

Manufacturer	Felluce ısı , Konya aral@aralmakina.com.tr daiwa.com.tr				
Series name	FLC-PST-KC,FLC-STK,FLC-PST				
Photos / schematics					
Combustion system type	Boiler				
Fuel type	pellets ,hazelnut shell, apricot kernel, peach kernel, pine cone and olive pomace				
Boiler Model Name	**Units / Characteristics**	FLC-PST-KC 30	FLC-PST-KC 90	FLC-STK-40	FLC-PST-60
Basic design parameters and geometry					
Nominal thermal output	kW	34	104	46	69

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Thermal output for Domestic Heating Water (D.H.W.)	kW	-	-	-	-
Thermal output for space heating	kW	-	-	-	-
Output range	kW	-	-	-	-
System dimensions (Width x Height x Length)	m	0,52X1,52X1,84	0,585X1,1X0,55	0,52X1,75X0,91	0,52X1,67X1,87
Net combustion system weight	kg	450	760	480	615
Heating surfaces	m^2	-	-	-	-
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Air supply adjustment	manual / automatic / lamda sensor / temperature probe / CO sensor	automatic	automatic	automatic	automatic
Fuel capacity and feeding					
Combustion chamber volume	l	-	-	-	-
Combustion chamber dimensions (Width x Height x Length)	m	-	-	-	-
Integral fuel capacity	kg	-	-	-	-
Fuel feeding	pneumatic / auger / manual / other	pneumatic	pneumatic	pneumatic	pneumatic
Integrated Hopper /Silo	yes / no	yes	yes	yes	yes

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Silo Capacity	kg	150-175	150-175	150-175	150-175
EN 303-5 Class / Efficiency					
Class	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Efficiency	%	-	-	-	-
Combustion efficiency	%	98	98	98	98
Electricity consumption	W	90	90	90	90
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-
Hydraulics connections	inches	1 ¼ &3/4	1 ½& 3/4	1 ¼ &3/4	1 ¼ &3/4
Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	4,5	4,5	4,5	4,5
Water volume	l	110	180	135	150
Minimum return temperature	^{o}C	35	35	35	35
Maximum operation temperature	^{o}C	90	90	90	90
Flue gases / Emissions					

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Chimney / Flue gas connection diameter	mm	127	140	127	127
Flue gas temperature	^oC	-	-	-	-
Draught	Forced / Natural	-	-	-	-
Location of flue gas fan (for forced draught systems)		-	-	-	-
CO	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
OGC	mg / Nm3 (@ 6% O2) (and/or) mg/MJ	-	-	-	-
Dust	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
NOx	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
Other characteristics					
Ignition	Spark / kindling / other	Spark	spark	spark	spark
Visual inspection of combustion chamber	yes / no	Yes	yes	yes	yes
Ash compaction	yes / no	No	no	no	no
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-
Typical ash cleaning frequency	Times per week / month / other	-	-	-	-
Other information		-	-	-	-

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Cost data					
Price range (VAT included)	€	2500	5000	2600	3500
Maintenance cost (typical)	€ / year				

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4.4. Hoşseven Isı ve Yalıtım A.Ş.

Manufacturer	Hoşseven Isı ve Yalıtım A.Ş. Ankara Yolu 18. Km -Bursa www.hosseven.com.tr hosseven@hosseven.com.tr				
Series name	Peletli Isıtıcılar				
Photos / schematics					
Combustion system type	Stove				
Fuel type	pellets / woods				
Boiler Model Name	**Units /**	**Violet**	**Lily**	**Camelia**	**Vera Heater**

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	Characteristics				
Basic design parameters and geometry					
Nominal thermal output	kW	2,2-6,5	3-20	3-16	24
Thermal output for Domestic Heating Water (D.H.W.)	kW	-	-	-	-
Thermal output for space heating	kW	-	-	-	-
Output range	kW	-	-	-	-
System dimensions (Width x Height x Length)	m	0,485x0,485x0,87	0,64x0,58x1,3	0,4x0,875x1,13	0,624x0,544x1,095
Net combustion system weight	kg	82	210	198	177
Heating surfaces	m^2	0,8	1,65	1,65	1,7
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	Manual
Air supply adjustment	manual / automatic / lamda sensor / temperature probe / CO sensor	Automatic	Automatic	Automatic	Automatic
Fuel capacity and feeding					

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Combustion chamber volume	l		0,046	0,046	
Combustion chamber dimensions (Width x Height x Length)	m	-	0,307*0,670*0,226	0,307*0,670*0,226	-
Integral fuel capacity	kg	33	33	33	33
Fuel feeding	pneumatic / auger / manual / other	Automatic	Automatic	Automatic	Automatic
Integrated Hopper /Silo	yes / no	No	No	No	No
Silo Capacity	kg	-	-	-	-
EN 303-5 Class / Efficiency					
Class	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Efficiency	%	88,5-92	90-93	92-94,8	-
Combustion efficiency	%	-	-	-	-
Electricity consumption	W	-	-	-	-
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-
Hydraulics connections	inches	-	1	1	1

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Maximum operation pressure	bar	-	1,5	1,5	1,5
Tested pressure	bar	-	4,5	4,5	4,5
Water volume	l	-	-	-	30
Minimum return temperature	^oC	-	60	60	60
Maximum operation temperature	^oC	-	85	85	85
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm		130	130	130
Flue gas temperature	^oC	-	-	-	-
Draught	Forced / Natural	-	-	-	-
Location of flue gas fan (for forced draught systems)		-	-	-	-
CO	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	490	163	163	163
OGC	mg / Nm3 (@ 6% O2) (and/or) mg/MJ	-	-	-	-
Dust	mg / Nm^3 (@ 6% O_2)	-	-	-	-

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	(and/or) mg/MJ				
NOx	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	116	125	125	140
Other characteristics					
Ignition	Spark / kindling / other	Spark	Spark	Spark	Spark
Visual inspection of combustion chamber	yes / no	Yes	Yes	Yes	Yes
Ash compaction	yes / no	No	No	No	No
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-
Typical ash cleaning frequency	Times per week / month / other	Week	Week	Week	week
Other information		-	-	-	-
Cost data					
Price range (VAT included)	€	975	1811	1733	913
Maintenance cost (typical)	€ / year	-	-	-	-

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4.5. İFYIL

Manufacturer	İFYIL Hançerli Mah. 100. Yıl Bulvarı No: 37/A-SAMSUN http://www.ifyil.com.tr info@ifyil.com.tr
Series name	
Photos / schematics	   
Combustion system type	Boiler & Stove
Fuel type	pellets

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Boiler Model Name	Units / Characteristics	Truva	Abant	Efes	Gediz
Basic design parameters and geometry					
Nominal thermal output	kW	4-22	4-16	2-10	2-6
Thermal output for Domestic Heating Water (D.H.W.)	kW				
Thermal output for space heating	kW				
Output range	kW	-	-	-	-
System dimensions (Width x Height x Length)	m	0,67x1,11x0,62	0,67x1x0,62	0,59x1x0,49	-
Net combustion system weight	kg	230	220	120	-
Heating surfaces	m^2	-	-	-	-
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	Manual
Air supply adjustment	manual / automatic / lamda sensor / temperature probe / CO sensor	Automatic	Automatic	Automatic	Automatic
Fuel capacity and feeding					

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Combustion chamber volume	l	-	-	-	-
Combustion chamber dimensions (Width x Height x Length)	m	-	-	-	-
Integral fuel capacity	kg	22	18	17	15
Fuel feeding	pneumatic / auger / manual / other	Pneumatic	Pneumatic	Pneumatic	Pneumatic
Integrated Hopper /Silo	yes / no	No	No	No	No
Silo Capacity	kg	-	-	-	-
EN 303-5 Class / Efficiency					
Class	3 / 4 / 5 / not specified / not applicable	-	-	-	-
Efficiency	%	90-95	90-95	90	90
Combustion efficiency	%	-	-	-	-
Electricity consumption	W	60	60	60	60
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-
Hydraulics connections	inches	1	1	-	-
Maximum operation pressure	bar	2	2	-	-

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Tested pressure	bar	3	3	-	-
Water volume	l	-	-	-	-
Minimum return temperature	°C	-	-	-	-
Maximum operation temperature	°C	-	-	-	-
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	80
Flue gas temperature	°C	-	-	-	-
Draught	Forced / Natural	-	-	-	-
Location of flue gas fan (for forced draught systems)		-	-	-	-
CO	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
OGC	mg / Nm3 (@ 6% O2) (and/or) mg/MJ	-	-	-	-
Dust	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
NOx	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
Other characteristics					
Ignition	Spark / kindling / other	spark	spark	spark	spark

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Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-
Typical ash cleaning frequency	Times per week / month / other	daily	daily	daily	daily
Other information		-	-	-	-
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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4.6. Kozlusan,Manisa

Manufacturer	Kozlusan,Manisa, http://www.kozlusan.com kozlusan@kozlusan.com				
Series name	-				
Photos / schematics					
Combustion system type	Stove				
Fuel type	Logs / pellets				
Boiler Model Name	**Units / Characteristics**	**Hydro Wood Pellet Stove**	**Slimpel-40**	**PEL-100**	**Prestige-25**
Basic design parameters and geometry					

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Nominal thermal output	kW	3-17	40	116	25
Thermal output for Domestic Heating Water (D.H.W.)	kW	-	-	-	-
Thermal output for space heating	kW	-	-	-	-
Output range	kW	-	-	-	-
System dimensions (Width x Height x Length)	m	0,87x0,510x1,1150	1,05x0,76x1,85	0,8x1,8x1,6	0,82x1,08x1,5
Net combustion system weight	kg	145	380	710	330
Heating surfaces	m^2	1,218			
Cleaning of heating surfaces	automated / manual	Manual	Manual	automated	automated
Air supply adjustment	manual / automatic / lamda sensor / temperature probe / CO sensor	Lamda sensor - CO sensor	Lamda sensor- CO sensor	Automatic	Automatic
Fuel capacity and feeding					
Combustion chamber volume	l	-	-	-	-
Combustion chamber dimensions (Width x Height x Length)	m	-	-	-	-
Integral fuel capacity	kg	-	180	205	75
Fuel feeding	pneumatic / auger / manual / other	pneumatic	pneumatic	pneumatic	pneumatic

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Integrated Hopper /Silo	yes / no	no	no	no	no
Silo Capacity	kg	-	-	-	-
EN 303-5 Class / Efficiency					
Class	3 / 4 / 5 / not specified / not applicable	-	4	-	-
Efficiency	%	-	-	-	-
Combustion efficiency	%	-	-	-	-
Electricity consumption	W	-	-	240+180	100
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	-
Hydraulics connections	inches	1	1	2	1
Maximum operation pressure	bar	1,5	3	3	1,5
Tested pressure	bar	2,5	4,3	4,3	2,5
Water volume	l	35	90	210	55
Minimum return temperature	°C	-	35	35	35
Maximum operation temperature	°C	85	85	85	85

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Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	128	200	128
Flue gas temperature	^oC	-	-	-	-
Draught	Forced / Natural	-	-	-	-
Location of flue gas fan (for forced draught systems)		-	-	-	-
CO	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
OGC	mg / Nm3 (@ 6% O2) (and/or) mg/MJ	-	-	-	-
Dust	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
NOx	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	-
Other characteristics					
Ignition	Spark / kindling / other	spark	Auto ignition	Auto ignition	Auto ignition
Visual inspection of combustion chamber	yes / no	yes	no	No	No
Ash compaction	yes / no	no	no	No	No
Ash chamber dimensions (Width x Height x Length)	m	-	-	50 L	15L
Typical ash cleaning frequency	Times per week / month / other	-	Per week	-	-

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Other information		-	-	Auto ash cleaning	-
Cost data					
Price range (VAT included)	€	1700	2168	5000	4600
Maintenance cost (typical)	€ / year	-	-	-	-

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4.7. Rodos ısı ve enerji , İzmir

Manufacturer	Rodos ısı ve enerji , İzmir http://www.kovalikombi.com/				
Series name	RODOS				
Photos / schematics					
Combustion system type	Stove				
Fuel type	Logs /pellets				
Boiler Model Name	**Units / Characteristics**	**KK-25**	**Rodos-20**	**Rodos-36**	**...**

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Basic design parameters and geometry					
Nominal thermal output	kW	6	4,8	8,2	
Thermal output for Domestic Heating Water (D.H.W.)	kW				
Thermal output for space heating	kW				
Output range	kW				
System dimensions (Width x Height x Length)	m	0,46x0,69x0,69	0,46x0,80x0,69	0,46x0,68x0,69	
Net combustion system weight	kg	130	110	170	
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	Manual	Manual	Manual	
Air supply adjustment	manual / automatic / lamda sensor / temperature probe / CO sensor	Manual	Manual	manual	
Fuel capacity and feeding					
Combustion chamber volume	l	-	-	-	
Combustion chamber dimensions (Width x Height x Length)	m	-	-	-	

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Integral fuel capacity	kg	-	-	-	
Fuel feeding	pneumatic / auger / manual / other	-	-	-	
Integrated Hopper /Silo	yes / no	-	-	-	
Silo Capacity	kg	-	-	-	
EN 303-5 Class / Efficiency					
Class	3 / 4 / 5 / not specified / not applicable	-	-	-	
Efficiency	%	-	-	-	
Combustion efficiency	%	85	60	85	
Electricity consumption	W	50	50	50	
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	
Hydraulics connections	inches	1	1	1	
Maximum operation pressure	bar	-	-	-	
Tested pressure	bar	-	-	-	
Water volume	l	75-90	30	70	

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Minimum return temperature	°C	-	-	-	
Maximum operation temperature	°C	-	-	-	
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	130	130	130	
Flue gas temperature	°C	-	-	-	
Draught	Forced / Natural	-	-	-	
Location of flue gas fan (for forced draught systems)		-	-	-	
CO	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	
OGC	mg / Nm3 (@ 6% O2) (and/or) mg/MJ	-	-	-	
Dust	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	
NOx	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	
Other characteristics					
Ignition	Spark / kindling / other	Spark	Spark	Spark	

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Visual inspection of combustion chamber	yes / no	No	No	no	
Ash compaction	yes / no	No	No	No	
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	
Typical ash cleaning frequency	Times per week / month / other	Daily	Daily	daily	
Other information					
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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4.8. Yakar Soba , İstanbul

Manufacturer	Yakar Soba , İstanbul info@yakarsoba.com yakarsoba.com
Series name	Pelet Stoves
Photos / schematics	 
Combustion system type	Stove&boiler
Fuel type	Logs /pellets

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Boiler Model Name	**Units / Characteristics**	**LOGPEL-25**	**LOGPEL-40**	**PRESTIGE-25**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	5-23	5-30	25	
Thermal output for Domestic Heating Water (D.H.W.)	kW				
Thermal output for space heating	kW				
Output range	kW				
System dimensions (Width x Height x Length)	m	1,1x1,6x1,55	1,2x1,6x1,65	0,82x1,5x1,08	
Net combustion system weight	kg	400	520	330	
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated	automated	
Air supply adjustment	manual / automatic / lamda sensor / temperature probe / CO sensor	Lamda sensor	Lamda sensor	Lamda sensor	

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Fuel capacity and feeding					
Combustion chamber volume	l	-	-	-	
Combustion chamber dimensions (Width x Height x Length)	m	-	-	-	
Integral fuel capacity	kg	250	250	75	
Fuel feeding	pneumatic / auger / manual / other	Pneumatic	pneumatic	pneumatic	
Integrated Hopper /Silo	yes / no	-	-	-	
Silo Capacity	kg	-	-	-	
EN 303-5 Class / Efficiency					
Class	3 / 4 / 5 / not specified / not applicable	-	-	-	
Efficiency	%	-	-	-	
Combustion efficiency	%	-	-	-	
Electricity consumption	W	100	100	100	
Hydraulics / Water circuit					
Number of tubes	#	-	-	-	
Hydraulics connections	inches	1	1	1	

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Maximum operation pressure	bar	3	3	3	
Tested pressure	bar	4,3	4,3	4,3	
Water volume	l	60	105	55	
Minimum return temperature	°C	35	35	35	
Maximum operation temperature	°C	90	90	90	
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	350	168	130	
Flue gas temperature	°C	-	-	-	
Draught	Forced / Natural	-	-	-	
Location of flue gas fan (for forced draught systems)		-	-	-	
CO	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	
OGC	mg / Nm3 (@ 6% O2) (and/or) mg/MJ	-	-	-	
Dust	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	

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NOx	mg / Nm^3 (@ 6% O_2) (and/or) mg/MJ	-	-	-	
Other characteristics					
Ignition	Spark / kindling / other	Spark	Spark	Spark	
Visual inspection of combustion chamber	yes / no	No	No	no	
Ash compaction	yes / no	No	No	No	
Ash chamber dimensions (Width x Height x Length)	m	-	-	15 lt	
Typical ash cleaning frequency	Times per week / month / other	Weekly	weekly	weekly	
Other information					
Cost data					
Price range (VAT included)	€	3562	3872	5480	
Maintenance cost (typical)	€ / year				

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5. Portugal

5.1. SOLZAIMA

Manufacturer	**SOLZAIMA**, Rua dos Outarelos 111, 3750-362 Belazaima do Chão, Águeda – Portugal. http://www.solzaima.pt/, Tel: (+351) 234 650, Email: mail@solzaima.co.uk
Series name	AUTOMATIC BOILER
Photos / schematics	 
Combustion system type	Boiler

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Fuel type	Pellets and olive stones				
Boiler Model Name	**Units / Characteristics**	SZM A 18	SZM A 24	SZM A 30	
Basic design parameters and geometry					
Nominal thermal output	kW	18	24	30	
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	18,7	24	30	
Thermal output for space heating (for stoves)	kW	18	24	30	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	n.a	n.a	n.a	
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,677x1,355x1,109	0,677x1,355x1,109	0,677x1,355x1,109	
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	(optional silo) 0,539x1,335x0,79	(optional silo) 0,539x1,335x0,79	0,539x1,335x0,79 (optional silo)	
Net combustion system weight	kg	350	350	350	
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated	automated	

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Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	
Operation	continuous / intermittent	intermittent	intermittent	intermittent	
Integrated Hopper / Silo	yes / no	yes	yes	yes	
Integrated Hopper / Silo Capacity	kg	45	45	45	
Typical fuel consumption[6] (pellets)	kg/h	2,3-4,4	2,9-5,6	3,7-7	
Time between refueling (for intermittent use, stoves)	min / h	n.a	n.a.	n.a.	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not				
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)	automated (screw)	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	
Grate technology	fixed grate / moving grate / others				

[6] At nominal load and minimum load for continuous use (Biomasud Plus fuels).

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled / air cooled	water cooled / air cooled	water cooled / air cooled	
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber				
Air supply control	flaps / controlled fans				
Deashing system	manual / automatic	automatic	automatic	automatic	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	
Efficiency and Class					
Boiler / Stove Efficiency	%	90	90	90,4	
Combustion efficiency (related to fuel burnout)	%				

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				
Maximum operation pressure	bar				
Tested pressure	bar				
Water volume	l	60	60	60	
Minimum return temperature	°C				
Maximum operation temperature	°C				
Flue gases / Emissions[7]					
Chimney / Flue gas connection diameter	mm	100	100	100	
Flue gas temperature	°C	86,8-102	93-112,7	100,6-124,8	
Draught	forced / natural				

[7] At nominal load and minimum load; according to type testing if available for Biomasud-fuels.

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Location of flue gas fan (for forced draught systems)					
CO[8]	mg / Nm^3 (and/or) mg/MJ				
OGC[2]	mg / Nm^3 (and/or) mg/MJ				
Dust[2]	mg / Nm^3 (and/or) mg/MJ				
NOx[2]	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other				
Visual inspection of combustion chamber	yes / no				
Ash compaction	yes / no				
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information[9]					
Cost data					

[8] O_2 level for emission value should be 10% for boilers (EN 303-5:2012) and 13% for stoves (EN 13240:2001 & EN 14785:2006). For different values, please specify.
[9] Indicate any other appropriate characteristics of the combustion system.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Price range (VAT included)	€	n.a.	n.a.	n.a.	
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour	Depending on the annual utilization and the user behaviour	Depending on the annual utilization and the user behaviour	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	**SOLZAIMA**, Rua dos Outarelos 111, 3750-362 Belazaima do Chão, Águeda – Portugal. http://www.solzaima.pt/, Tel: (+351) 234 650, Email: mail@solzaima.co.uk
Series name	COMPACT BOILER
Photos / schematics	 
Combustion system type	Boiler
Fuel type	Pellets

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Boiler Model Name	**Units / Characteristics**	SZM C 18	SZM C 24		
Basic design parameters and geometry					
Nominal thermal output	kW	18	24		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	18,1	23,8		
Thermal output for space heating (for stoves)	kW				
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	n.a	n.a		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,666x1,305x0,751	0,666x1,305x0,751		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m				
Net combustion system weight	kg	225	225		
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated		
Fuel feeding	pneumatic / auger / manual / other	auger	auger		

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Operation	continuous / intermittent	intermittent	intermittent		
Integrated Hopper / Silo	yes / no	yes	yes		
Integrated Hopper / Silo Capacity	kg	60	60		
Typical fuel consumption[10] (pellets)	kg/h	1,8-4,4	2,2-5,9		
Time between refueling (for intermittent use, stoves)	min / h	n.a	n.a.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not				
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above		
Grate technology	fixed grate / moving grate / others				
Combustion chamber volume	l				

[10] At nominal load and minimum load for continuous use (Biomasud Plus fuels).

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Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled / air cooled	water cooled / air cooled		
Combustion air streams	primary air / secondary air / others	primary air	primary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber				
Air supply control	flaps / controlled fans				
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic		
Efficiency and Class					
Boiler / Stove Efficiency	%	88	88		
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output				

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Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	EN 14785 certification standard	EN 14785 certification standard		
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				
Maximum operation pressure	bar				
Tested pressure	bar				
Water volume	l	22	22		
Minimum return temperature	°C				
Maximum operation temperature	°C				
Flue gases / Emissions[11]					
Chimney / Flue gas connection diameter	mm	100	100		
Flue gas temperature	°C	77-133	86-162		
Draught	forced / natural				

[11] At nominal load and minimum load; according to type testing if available for Biomasud-fuels.

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Location of flue gas fan (for forced draught systems)					
CO[12]	mg / Nm^3 (and/or) mg/MJ				
OGC[2]	mg / Nm^3 (and/or) mg/MJ				
Dust[2]	mg / Nm^3 (and/or) mg/MJ				
NOx[2]	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other				
Visual inspection of combustion chamber	yes / no				
Ash compaction	yes / no				
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information[13]					
Cost data					

[12] O_2 level for emission value should be 10% for boilers (EN 303-5:2012) and 13% for stoves (EN 13240:2001 & EN 14785:2006). For different values, please specify.
[13] Indicate any other appropriate characteristics of the combustion system.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Price range (VAT included)	€	n.a.	n.a.		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour	Depending on the annual utilization and the user behaviour		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	**SOLZAIMA**, Rua dos Outarelos 111, 3750-362 Belazaima do Chão, Águeda – Portugal. http://www.solzaima.pt/, Tel: (+351) 234 650, Email: mail@solzaima.co.uk				
Series name	WOOD BOILER				
Photos / schematics					
Combustion system type	Boiler				
Fuel type	wood				
Boiler Model Name	**Units /**	SZM WI 42 (Inverted flame	SZM W 35		

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	Characteristics	wood boiler)	(WOOD BOILER)		
Basic design parameters and geometry					
Nominal thermal output	kW	42	35		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	42	32		
Thermal output for space heating (for stoves)	kW				
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	n.a	n.a		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,566x1,687x1,036	0,604x1,280x0,950		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m				
Net combustion system weight	kg	610	300		
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual				
Fuel feeding	pneumatic / auger / manual / other	other	otherr		

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Operation	continuous / intermittent	intermittent	intermittent		
Integrated Hopper / Silo	yes / no	n.a	n.a		
Integrated Hopper / Silo Capacity	kg	n.a	n.a		
Typical fuel consumption[14] (wood)	kg/h	10,5	10,5		
Time between refueling (for intermittent use, stoves)	min / h	n.a	n.a.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	Inverted flame wood boiler			
Stoker technology	Manual / automated (screw)				
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker				
Grate technology	fixed grate / moving grate / others				
Combustion chamber volume	l				

[14] At nominal load and minimum load for continuous use (Biomasud Plus fuels).

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Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled / air cooled	water cooled / air cooled		
Combustion air streams	primary air / secondary air / others				
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber				
Air supply control	flaps / controlled fans				
Deashing system	manual / automatic				
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor				
Efficiency and Class					
Boiler / Stove Efficiency	%	85	77		
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output				

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Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	EN 303-5:2012 (not specified)	EN 12809 certification standard		
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				
Maximum operation pressure	bar				
Tested pressure	bar				
Water volume	l	120	80		
Minimum return temperature	°C				
Maximum operation temperature	°C				
Flue gases / Emissions[15]					
Chimney / Flue gas connection diameter	mm	125	140		
Flue gas temperature	°C	260	257		
Draught	forced / natural				

[15] At nominal load and minimum load; according to type testing if available for Biomasud-fuels.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Location of flue gas fan (for forced draught systems)					
CO[16]	mg / Nm^3 (and/or) mg/MJ				
OGC[2]	mg / Nm^3 (and/or) mg/MJ				
Dust[2]	mg / Nm^3 (and/or) mg/MJ				
NOx[2]	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other				
Visual inspection of combustion chamber	yes / no				
Ash compaction	yes / no				
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information[17]					
Cost data					

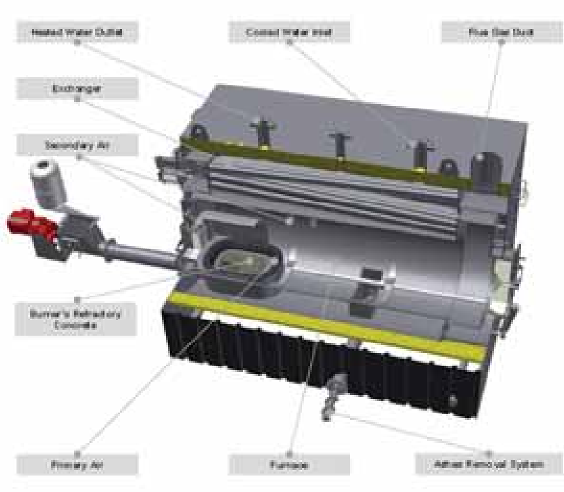
[16] O_2 level for emission value should be 10% for boilers (EN 303-5:2012) and 13% for stoves (EN 13240:2001 & EN 14785:2006). For different values, please specify.
[17] Indicate any other appropriate characteristics of the combustion system.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Price range (VAT included)	€	n.a.	n.a.		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour	Depending on the annual utilization and the user behaviour		

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

6.1. TORBEL

Manufacturer	**TORBEL**, S.A. - Zona Industrial das Ervosas, Apartado 14, 3834-909 Ílhavo, Portugal. http://www.torbel-systems.com/, Tel: (+351) 234 325 011, Fax: (+351) 234 325 012, Email geral@torbel.pt				
Series name	BIOMASS BOILER – HORIZONTAL **Cal H TB**				
Photos / schematics	 				
Combustion system type	Boiler				
Fuel type	wood, wood chips, sawdust, nutshells, pine bark, pinecone, marc and olive stone or pellets				
Boiler Model Name	**Units / Characteristics**	**Cal H TB 125**	**Cal H TB 250**	**Cal H TB 500**	**Cal H TB >500**

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Basic design parameters and geometry					
Nominal thermal output	kW	145	290	580	On Request
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	145	290	580	
Thermal output for space heating (for stoves)	kW	n.a	n.a	n.a	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	n.a	n.a	n.a	
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,95x1,44x1.49	1,487x1,814x2.683	1,630x1,980x3,1	
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	n.a	n.a	n.a	
Net combustion system weight	kg	1.300	1.750	2.500	
Heating surfaces	m^2	n.a	n.a	n.a	
Cleaning of heating surfaces	automated / manual	automated / manual	automated / manual	automated / manual	
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	
Operation	continuous / intermittent	continuous	continuous	continuous	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Integrated Hopper / Silo	yes / no	Hopper coupled to the boiler feeding stocker screw , linked to the silo stocker screw through an hose/ Silo with a mixer coupled to the dosage stocker screw , that links to the bolier feeding stocker screw	Hopper coupled to the boiler feeding stocker screw , linked to the silo stocker screw through an hose/ Silo with a mixer coupled to the dosage stocker screw , that links to the bolier feeding stocker screw	Hopper coupled to the boiler feeding stocker screw , linked to the silo stocker screw through an hose/ Silo with a mixer coupled to the dosage stocker screw , that links to the bolier feeding stocker screwo	
Integrated Hopper / Silo Capacity	kg	n.r.	n.r	n.r	
Typical fuel consumption[18]	kg/h	53 (For a fuel 15.900 KJ/Kg)	105 (For a fuel 15.900 KJ/Kg	175 (For a fuel 15.900 KJ/Kg	
Time between refueling (for intermittent use, stoves)	min / h				
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes	yes	

[18] At nominal load and minimum load for continuous use (Biomasud Plus fuels).

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)	automated (screw)
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker			
Grate technology	fixed grate / moving grate / others	fixed grate or moving grate (according to the type of fuel)	fixed grate or moving grate (according to the type of fuel)	fixed grate or moving grate (according to the type of fuel)
Combustion chamber volume	l			
Combustion chamber dimensions (Width x Height x Length)	m			
Combustion chamber cooling concept	water cooled / air cooled / insulated			
Combustion air streams	primary air / secondary air / others	primary air / secondary air	primary air / secondary air	primary air / secondary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber			
Air supply control	flaps / controlled fans			

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Deashing system	manual / automatic	manual / automatic	manual / automatic	manual / automatic	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				
Maximum operation pressure	bar				
Tested pressure	bar				
Water volume	l				
Minimum return temperature	^oC				

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Maximum operation temperature	°C	110	110	110	
Flue gases / Emissions[19]					
Chimney / Flue gas connection diameter	mm				
Flue gas temperature	°C				
Draught	forced / natural				
Location of flue gas fan (for forced draught systems)					
CO[20]	mg / Nm^3 (and/or) mg/MJ				
OGC[2]	mg / Nm^3 (and/or) mg/MJ				
Dust[2]	mg / Nm^3 (and/or) mg/MJ				
NOx[2]	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other				
Visual inspection of combustion chamber	yes / no				

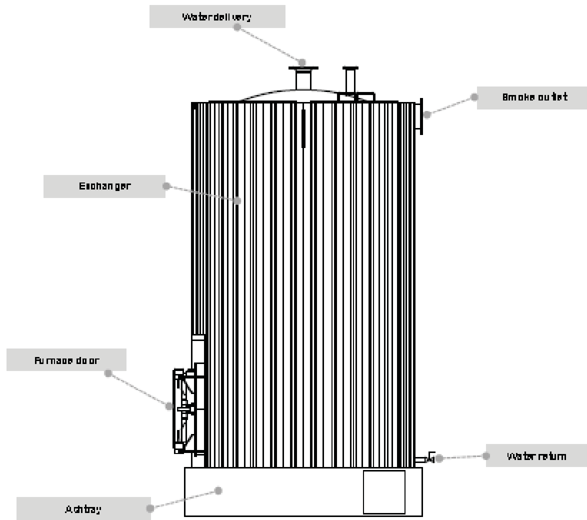
[19] At nominal load and minimum load; according to type testing if available for Biomasud-fuels.
[20] O_2 level for emission value should be 10% for boilers (EN 303-5:2012) and 13% for stoves (EN 13240:2001 & EN 14785:2006). For different values, please specify.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Ash compaction	yes / no				
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information[21]					
Cost data					
Price range (VAT included)	€	Depending on the options chosen	Depending on the options chosen	Depending on the options chosen	
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour	Depending on the annual utilization and the user behaviour	Depending on the annual utilization and the user behaviour	

[21] Indicate any other appropriate characteristics of the combustion system.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

<table>
<tr><td>Manufacturer</td><td colspan="5">TORBEL, S.A. - Zona Industrial das Ervosas, Apartado 14, 3834-909 Ílhavo, Portugal. http://www.torbel-systems.com/, Tel: (+351) 234 325 011, Fax: (+351) 234 325 012, Email geral@torbel.pt</td></tr>
<tr><td>Series name</td><td colspan="5">BIOMASS BOILER – VERTICAL Cal V TB</td></tr>
<tr><td>Photos / schematics</td><td colspan="5"> 
</td></tr>
<tr><td>Combustion system type</td><td colspan="5">Boiler</td></tr>
<tr><td>Fuel type</td><td colspan="5">bark, wood chips, sawdust, pellets or briquettes, bagasse and olive pit</td></tr>
<tr><td>Boiler Model Name</td><td>Units / Characteristics</td><td>Cal V TB 125</td><td>Cal V TB 250</td><td>Cal V TB 500</td><td>Cal V TB 1000-4000</td></tr>
</table>

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Basic design parameters and geometry					
Nominal thermal output	kW	350	580	870	
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	350	580	870	
Thermal output for space heating (for stoves)	kW	n.a	n.a	n.a	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	n.a	n.a	n.a	
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	2,09x3,41x2,09	2,09x3,91x2,09	2,09x3,91x2,09	
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	n.a	n.a	n.a	
Net combustion system weight	kg	3000	3850	4200	
Heating surfaces	m^2	n.a	n.a	n.a	
Cleaning of heating surfaces	automated / manual	automated / manual	automated / manual	automated / manual	
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	
Operation	continuous / intermittent	continuous	continuous	continuous	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Integrated Hopper / Silo	yes / no				
Integrated Hopper / Silo Capacity	kg	n.r.	n.r	n.r	
Typical fuel consumption[22]	kg/h	105 (For a fuel 15.900 KJ/Kg)	175 (For a fuel 15.900 KJ/Kg)	260 (For a fuel 15.900 KJ/Kg	
Time between refueling (for intermittent use, stoves)	min / h				
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes	yes	
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)	automated (screw)	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker				
Grate technology	fixed grate / moving grate / others	fixed grate or moving grate (according to the type of fuel)	fixed grate or moving grate (according to the type of fuel)	fixed grate or moving grate (according to the type of fuel)	

[22] At nominal load and minimum load for continuous use (Biomasud Plus fuels).

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others	primary air / secondary air	primary air / secondary air	primary air / secondary air	
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber				
Air supply control	flaps / controlled fans				
Deashing system	manual / automatic	manual / automatic	manual / automatic	manual / automatic	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%				

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Electricity consumption	Wel/kW of boiler output			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable			
Hydraulics / Water circuit				
Number of tubes	#			
Hydraulics connections	inches			
Maximum operation pressure	bar			
Tested pressure	bar			
Water volume	l	2500	2900	2800
Minimum return temperature	^oC			
Maximum operation temperature	^oC	110	110	110
Flue gases / Emissions[23]				
Chimney / Flue gas connection diameter	mm			
Flue gas temperature	^oC			
Draught	forced / natural			

[23] At nominal load and minimum load; according to type testing if available for Biomasud-fuels.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Location of flue gas fan (for forced draught systems)					
CO[24]	mg / Nm^3 (and/or) mg/MJ				
OGC[2]	mg / Nm^3 (and/or) mg/MJ				
Dust[2]	mg / Nm^3 (and/or) mg/MJ				
NOx[2]	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other				
Visual inspection of combustion chamber	yes / no				
Ash compaction	yes / no				
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information[25]					
Cost data					
Price range (VAT included)	€	Depending on the	Depending on the	Depending on the	

[24] O_2 level for emission value should be 10% for boilers (EN 303-5:2012) and 13% for stoves (EN 13240:2001 & EN 14785:2006). For different values, please specify.
[25] Indicate any other appropriate characteristics of the combustion system.

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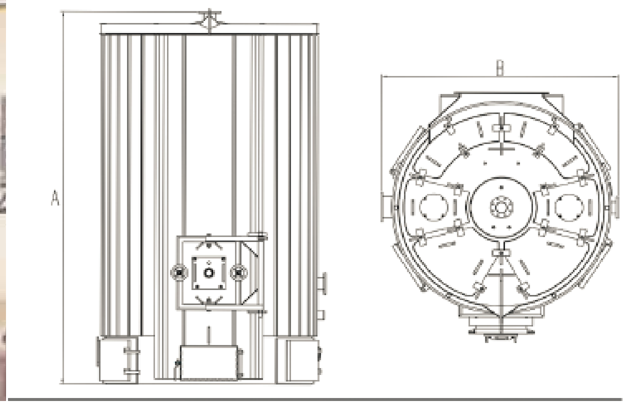
		options chosen	options chosen	options chosen	
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour	Depending on the annual utilization and the user behaviour	Depending on the annual utilization and the user behaviour	

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

7.1. VENTIL

Manufacturer	**VENTIL** - Engenharia do Ambiente, Lda. Z.I. das Ervosas PO Box 27, 3834-909 Ílhavo, Portugal. http://ventil.pt/en/, Tel: (+351) 234 325 085, Fax: (+351) 234 325 086, Email ventil@ventil.pt				
Series name	CVT-SModel				
Photos / schematics	 				
Combustion system type	Boiler				
Fuel type	Wood chips, pellets, olive pits , nut shells (almond , pine nuts), forest residues and waste from the wood industry				
Boiler Model Name	**Units / Characteristics**	**CVT-SMODEL 300**	**CVT-SMODEL 500**	**CVT-SMODEL 750**	**CVT-SMODEL 1000**

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Basic design parameters and geometry					
Nominal thermal output	kW	350	580	870	1160
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	350	580	870	1160
Thermal output for space heating (for stoves)	kW	n.a	n.a	n.a	n.a
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	n.a	n.a	n.a	n.a
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.4x2.6x1.4	2.0x2.9x2.0	2.1x3.2x2.1	2.3x3.8x2.3
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	n.a	n.a	n.a	n.a
Net combustion system weight	kg	2.500	4.200	4.800	8.100
Heating surfaces	m^2	16	24	35	52
Cleaning of heating surfaces	automated / manual	automated	automated	automated	automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger
Operation	continuous / intermittent	continuous	continuous	continuous	continuous

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Integrated Hopper / Silo	yes / no	no	no	no	no
Integrated Hopper / Silo Capacity	kg	n.r.	n.r	n.r	n.r
Typical fuel consumption[26] (pellets)	kg/h	83-87	138-144	207-216	276-288
Time between refueling (for intermittent use, stoves)	min / h				
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes	yes	yes
Stoker technology	Manual / automated (screw)				
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from below	from below	from below	from below
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				

[26] At nominal load and minimum load for continuous use (Biomasud Plus fuels).

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Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others				
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber				
Air supply control	flaps / controlled fans				
Deashing system	manual / automatic	automatic	automatic	automatic	automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	automatic
Efficiency and Class					
Boiler / Stove Efficiency	%	85,9 – 89,8	85,9 – 89,8	85,9 – 89,8	85,9 – 89,8
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				

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Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				
Maximum operation pressure	bar				
Tested pressure	bar				
Water volume	l	1350	2200	2450	4900
Minimum return temperature	°C				
Maximum operation temperature	°C	109	109	109	109
Flue gases / Emissions[27]					
Chimney / Flue gas connection diameter	mm				
Flue gas temperature	°C				
Draught	forced / natural				
Location of flue gas fan (for forced draught systems)					

[27] At nominal load and minimum load; according to type testing if available for Biomasud-fuels.

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CO[28]	mg / Nm^3 (and/or) mg/MJ				
OGC[2]	mg / Nm^3 (and/or) mg/MJ				
Dust[2]	mg / Nm^3 (and/or) mg/MJ				
NOx[2]	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other				
Visual inspection of combustion chamber	yes / no				
Ash compaction	yes / no				
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information[29]					
Cost data					
Price range (VAT included)	€	n.a.	n.a.	n.a.	n.a.
Maintenance cost (typical)	€ / year	Depending on the	Depending on the	Depending on the	Depending on the

[28] O_2 level for emission value should be 10% for boilers (EN 303-5:2012) and 13% for stoves (EN 13240:2001 & EN 14785:2006). For different values, please specify.
[29] Indicate any other appropriate characteristics of the combustion system.

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		annual utilization and the user behaviour	annual utilization and the user behaviour	annual utilization and the user behaviour	annual utilization and the user behaviour

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9. Slovenia

9.1. Petrič d.o.o

Manufacturer	Petrič d.o.o., Goriška 57, SI-5270 Ajdovščina, Slovenija tel.: +386 5 365 90 00 fax.: +386 5 36 590 22 e-mail: petric@petric.si website: http://www.petric.si
Series name	MADE By Petrič
Photos / schematics	

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	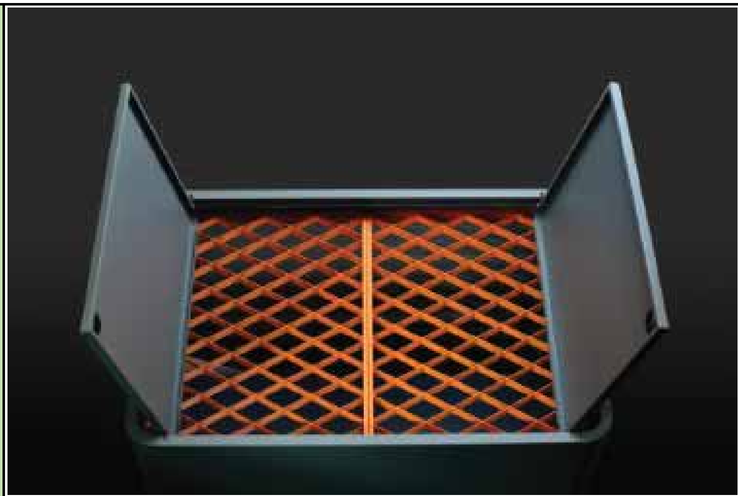				
Combustion system type	Boiler				
Fuel type	Wood pellets				
Boiler Model Name	**Units / Characteristics**	**PP 27A**			
Basic design parameters and geometry					
Nominal thermal output	kW	32,97			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..			

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Output range (min. % of nominal load that can be achieved in continuous operation)	kW	9,15 – 32,97			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0,771 x 1,51 x 1,00			
Net combustion system weight	kg	315			
Heating surfaces	m^2	80 - 400			
Cleaning of heating surfaces	automated / manual	automated			
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger			
Operation	continuous / intermittent	continuous			
Integrated Hopper / Silo	yes / no	yes			
Integrated Hopper / Silo Capacity	kg	180			
Typical fuel consumption	kg/h	min: 2,1 max: 7,45			

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Time between refueling (for intermittent use, stoves)	min / h	..			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not				
Stoker technology	Manual / automated (screw)	automated			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above			
Grate technology	fixed grate / moving grate / others	moving grate			
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled			
Combustion air streams	primary air / secondary air / others	primary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	underpressure in the combustion chamber			

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Air supply control	flaps / controlled fans	controlled fans			
Deashing system	manual / automatic	automatic			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / temperature probe			
Efficiency and Class					
Boiler / Stove Efficiency	%	92,5 % – (nominal heat output) 91,5 % – (reduced heat output)			
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5			
Hydraulics / Water circuit					
Number of tubes	#	40			
Hydraulics connections	inches	1			
Maximum operation pressure	bar	2			
Tested pressure	bar	4			

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Water volume	l	85			
Minimum return temperature	^oC	55			
Maximum operation temperature	^oC	80			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	100			
Flue gas temperature	^oC	126,1			
Draught	forced / natural	forced			
Location of flue gas fan (for forced draught systems)		back			
CO	mg / Nm^3	72 mg / Nm^3 – nominal heat output			
OGC	mg / Nm^3 (and/or) mg/MJ	3 mg / Nm^3 -– nominal heat output			
Dust	mg / Nm^3 (and/or) mg/MJ	26,4 mg / Nm^3 – nominal heat output			
NOx	mg / Nm^3 (and/or) mg/MJ	194 mg / Nm^3 – nominal heat			

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		output			
Other characteristics					
Ignition	spark / kindling / other	spark			
Visual inspection of combustion chamber	yes / no	yes			
Ash compaction	yes / no	yes			
Ash chamber dimensions (Width x Height x Length)	m	0,31 x 0,13 x 0,38			
Typical ash cleaning frequency	times per week / month / other	Cleaning of combustion vessel (depending on the pellet quality) – at least once per every hopper worth of pellets burned. The ash container needs to be emptied once per every 3 hoppers worth of pellets burned (depending on the pellet quality).			

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Other information					
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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9.2. Ogrevanje Sedeljšak d.o.o.

Manufacturer	Ogrevanje Sedeljšak d.o.o. Prapreče 25, 3305 VRANSKO, Slovenija tel.: +386 3 703 84 90 fax.: +386 3 703 84 95 GSM: +386 41 694 332 e-mail: prodaja@sedeljsak.si website: http://www.sedeljsak.si				
Series name	BIOLIN				
Photos / schematics					
Combustion system type	Boiler				
Fuel type	Logs				
Boiler Model Name	**Units / Characteristics**	**BIOLIN 20**	**BIOLIN 30**	**BIOLIN 40**	**BIOLIN 60**
Basic design parameters and geometry					

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Nominal thermal output	kW	20	30	40	60
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..	..	..	..
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,6 x 1,44 x 1,1	0,66 x 1,6 x 1,1	0,66 x 1,6 x 1,1	0,66 x 1,7 x 1,2
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0,6 x 1,44 x 1,1	0,66 x 1,6 x 1,1	0,66 x 1,6 x 1,1	0,66 x 1,7 x 1,2
Net combustion system weight	kg	480	515	520	580
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	manual
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent
Integrated Hopper / Silo	yes / no	no	no	no	no

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Integrated Hopper / Silo Capacity	kg	..	..	..	..
Typical fuel consumption	kg/h				
Time between refueling (for intermittent use, stoves)	min / h				
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	separated primary and secondary combustion zone	separated primary and secondary combustion zone	separated primary and secondary combustion zone	separated primary and secondary combustion zone
Stoker technology	Manual / automated (screw)	Manual	Manual	Manual	Manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	from above
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	120	167	167	187
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air /	secondary air	secondary air	secondary air	secondary air

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	others				
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	lambda sensor	lambda sensor	lambda sensor	lambda sensor
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				

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Maximum operation pressure	bar	3	3	3	3
Tested pressure	bar	5	5	5	5
Water volume	l	115	130	130	180
Minimum return temperature	^oC	65	65	65	65
Maximum operation temperature	^oC	90	90	90	90
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	160	160	160	160
Flue gas temperature	^oC				
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		back	back	back	back
CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					

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Ignition	spark / kindling / other	kindling	kindling	kindling	kindling
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information					
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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Manufacturer	Ogrevanje Sedeljšak d.o.o. Prapreče 25, 3305 VRANSKO, Slovenija tel.: +386 3 703 84 90 fax.: +386 3 703 84 95 GSM: +386 41 694 332 e-mail: prodaja@sedeljsak.si website: http://www.sedeljsak.si				
Series name	BIOMAC				
Photos / schematics	 				
Combustion system type	Boiler				
Fuel type	Wood chips, wood scrapings, sawdust (automatic feeding); logs and wood chunks (manual feeding)				
Boiler Model Name	**Units / Characteristics**	**BIOMAC 30**	**BIOMAC 50**	**BIOMAC 75**	**BIOMAC 100**
Basic design parameters and geometry					
Nominal thermal output	kW	30	50	75	100

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..	..	..	..
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m				
Net combustion system weight	kg				
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated	automated	automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger
Operation	continuous / intermittent	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	no	no	no	no
Integrated Hopper / Silo Capacity	kg	..	..	..	..

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Typical fuel consumption	kg/h				
Time between refueling (for intermittent use, stoves)	min / h				
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	separated combustion zone	separated combustion zone	separated combustion zone	separated combustion zone
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side	from the side	from the side
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air
Combustion air supply	separate air fans / suction due to	separate air fans	separate air fans	separate air fans	separate air fans

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	underpressure in the combustion chamber				
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	automatic	automatic	automatic	automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	lambda sensor	lambda sensor	lambda sensor	lambda sensor
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%				
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				
Maximum operation pressure	bar				
Tested pressure	bar				

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Water volume	l				
Minimum return temperature	^oC				
Maximum operation temperature	^oC				
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm				
Flue gas temperature	^oC				
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		back	back	back	back
CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	Hot air blow-dryer	Hot air blow-dryer	Hot air blow-dryer	Hot air blow-dryer
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes

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Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	1 times per month	1 times per month	1 times per month	1 times per month
Other information					
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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9.3. STROJ

Manufacturer	STROJ - energijska tehnika d.o.o. Dvorska vas 31c, SI - 4275 Begunje, Slovenija tel.: +386 4 53 33 070 fax.: +386 4 53 07 070 GSM: +386 51 680 265 e-mail: info@stroj-si.com website: http://www.stroj-si.com				
Series name	OPTE, SOPTE, SOPE				
Photos / schematics					
Combustion system type	Boiler				
Fuel type	Wood pellets				
Boiler Model Name	**Units / Characteristics**	**OPTE10-40**	**SOPTE 10-30**	**SOPE 10 - 30**	**SOPE 30 - 50**

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Basic design parameters and geometry					
Nominal thermal output	kW	27,2	29	29	50
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..	..	..	..
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	9 – 29	10 - 30	10 - 30	30 - 50
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	ø0,4 x 2	ø0,7 x 2	ø0,7 x 2	ø0,95 x 2,2
Net combustion system weight	kg				
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated	automated	automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger
Operation	continuous / intermittent	continuous	continuous	continuous	continuous

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Integrated Hopper / Silo	yes / no	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	kg				
Typical fuel consumption	kg/h				
Time between refueling (for intermittent use, stoves)	min / h	..	..	..	..
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	not separated	not separated	not separated	not separated
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side	from the side	from the side
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				

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Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	automatic	automatic	automatic	automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor	automatic / lambda sensor	automatic / lambda sensor
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%	91,6	91,4	91,4	91,4
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	5
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				

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Maximum operation pressure	bar				
Tested pressure	bar				
Water volume	l		150 - 250	150 - 250	400 - 700
Minimum return temperature	^oC				
Maximum operation temperature	^oC				
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm				
Flue gas temperature	^oC				
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		back	back	back	back
CO	mg / Nm^3	170	161,9		
OGC	mg / Nm^3				
Dust	mg / Nm^3	37	32		
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					

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Ignition	spark / kindling / other	kindling	kindling	kindling	kindling
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	1 times per week	1 times per week	1 times per week	1 times per week
Other information					
Cost data					
Price range (VAT included)	€				
Maintenance cost (typical)	€ / year				

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Manufacturer	STROJ - energijska tehnika d.o.o. Dvorska vas 31c, SI - 4275 Begunje, Slovenija tel.: +386 4 53 33 070 fax.: +386 4 53 07 070 GSM: +386 51 680 265 e-mail: info@stroj-si.com website: http://www.stroj-si.com				
Series name	LAMBDA – UP 20				
Photos / schematics					
Combustion system type	Boiler				
Fuel type	Logs				
Boiler Model Name	**Units / Characteristics**	**UP 20**			

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Basic design parameters and geometry					
Nominal thermal output	kW	20			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..	..	..	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW				
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	ø0,4× 2			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m				
Net combustion system weight	kg				
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated			
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	manual			
Operation	continuous / intermittent	intermittent			

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Integrated Hopper / Silo	yes / no	no			
Integrated Hopper / Silo Capacity	kg				
Typical fuel consumption	kg/h				
Time between refueling (for intermittent use, stoves)	min / h	..	..	..	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	separated combustion zone			
Stoker technology	Manual / automated (screw)	manual			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side			
Grate technology	fixed grate / moving grate / others	fixed grate			
Combustion chamber volume	l	130			
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				

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Combustion air streams	primary air / secondary air / others	secondary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber			
Air supply control	flaps / controlled fans	controlled fans			
Deashing system	manual / automatic	automatic			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor			
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%	93,2			
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	
Hydraulics / Water circuit					
Number of tubes	#				

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Hydraulics connections	inches				
Maximum operation pressure	bar				
Tested pressure	bar				
Water volume	l				
Minimum return temperature	^{o}C				
Maximum operation temperature	^{o}C				
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm				
Flue gas temperature	^{o}C				
Draught	forced / natural	forced			
Location of flue gas fan (for forced draught systems)		back			
CO	mg / Nm^3	80			
OGC	mg / Nm^3				
Dust	mg / Nm^3	19,8			
NOx	mg / Nm^3 (and/or) mg/MJ				

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Other characteristics					
Ignition	spark / kindling / other	Kindling or auto			
Visual inspection of combustion chamber	yes / no	yes			
Ash compaction	yes / no	no	no	no	
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	1 times per week	1 times per week	1 times per week	
Other information					
Cost data					
Price range (VAT included)	€	4400	5500		
Maintenance cost (typical)	€ / year				

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9.4. VALHER ogrevalna tehnika d.o.o.

Manufacturer	VALHER ogrevalna tehnika d.o.o. Spodnji Boč 32c, 2352 Selnica ob Dravi, Slovenija tel.: +386 2 67 40 290 fax.: +386 2 67 40 291 GSM: +386 51 680 265 e-mail: info@valher.si website: http://www.valher.si				
Series name	PK				
Photos / schematics	 				
Combustion system type	Boiler				
Fuel type	Wood pellets				
Boiler Model Name	**Units / Characteristics**	**20**	**30 - 220**	**30-280**	**50**
Basic design parameters and geometry					
Nominal thermal output	kW	20	30	30	50

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..	..	..	..
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	6 - 20	9 – 30	9 – 30	15 – 50
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1,15 x 1,37 x 1,108	1,15 x 1,37 x 1,108	1,321 x 1,37 x 1,108	1,425 x 1,475 x 1,2
Net combustion system weight	kg				
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger
Operation	continuous / intermittent	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	kg	220	220	280	355

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Typical fuel consumption	kg/h				2 - 6
Time between refueling (for intermittent use, stoves)	min / h	..	..	..	..
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	not separated combustion zone	not separated combustion zone	not separated combustion zone	not separated combustion zone
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	from above
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others	secondary air	secondary air	secondary air	secondary air
Combustion air supply	separate air fans / suction due to	separate air fans	separate air fans	separate air fans	separate air fans

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	underpressure in the combustion chamber				
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	automatic	automatic	automatic	automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / temperature probe	automatic / temperature probe	automatic / temperature probe	automatic / temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%	93	93	93	91,3
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	5
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				
Maximum operation pressure	bar	2,5	2,5	2,5	2,5
Tested pressure	bar		4	4	

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Water volume	l	100	100	100	100
Minimum return temperature	^oC	50	50	50	50
Maximum operation temperature	^oC	80	80	80	80
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	130	130	130	150
Flue gas temperature	^oC		117,8	117,8	
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		back	back	back	back
CO	mg / Nm^3		76,7	76,7	
OGC	mg / Nm^3		13,3	13,3	
Dust	mg / Nm^3		14	14	
NOx	mg / Nm^3 (and/or) mg/MJ		136	136	
Other characteristics					
Ignition	spark / kindling / other	spark	spark	spark	spark
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes

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Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	1 times per week	1 times per week	1 times per week	1 times per week
Other information					
Cost data					
Price range (VAT included)	€		3600	3800	
Maintenance cost (typical)	€ / year				

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Manufacturer	VALHER ogrevalna tehnika d.o.o. Spodnji Boč 32c, 2352 Selnica ob Dravi, Slovenija tel.: +386 2 67 40 290 fax.: +386 2 67 40 291 GSM: +386 51 680 265 e-mail: info@valher.si website: http://www.valher.si				
Series name	UPX				
Photos / schematics	  				
Combustion system type	Boiler				
Fuel type	Logs				
Boiler Model Name	**Units / Characteristics**	**1**	**3**	**5**	
Basic design parameters and geometry					
Nominal thermal output	kW	20	30	50	

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..	..	..	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	10 - 18	20 – 27	30 - 44	
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0,61 x 1,46 x 1,195	0,67 x 1,6 x 1,195	0,67 x 1,795 x 1,195	
Net combustion system weight	kg		806	920	
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated	automated	
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	
Operation	continuous / intermittent	intermittent	intermittent	intermittent	
Integrated Hopper / Silo	yes / no	no	no	no	
Integrated Hopper / Silo Capacity	kg				

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Typical fuel consumption	kg/h				
Time between refueling (for intermittent use, stoves)	min / h	..	..	..	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	separated combustion zone	separated combustion zone	separated combustion zone	
Stoker technology	Manual / automated (screw)	manual	manual	manual	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	
Combustion chamber volume	l		145		
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others	secondary air	secondary air	secondary air	
Combustion air supply	separate air fans / suction due to	suction due to underpressure in	suction due to underpressure in	suction due to underpressure in	

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	underpressure in the combustion chamber	the combustion chamber	the combustion chamber	the combustion chamber	
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	
Deashing system	manual / automatic	manual	manual	manual	
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor	automatic / lambda sensor	
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%	91	91,3	92,3	
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				
Maximum operation pressure	bar				
Tested pressure	bar				

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Water volume	l				
Minimum return temperature	°C				
Maximum operation temperature	°C				
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm		150		
Flue gas temperature	°C				
Draught	forced / natural	forced	forced	forced	
Location of flue gas fan (for forced draught systems)		back	back	back	
CO	mg / Nm^3				
OGC	mg / Nm^3				
Dust	mg / Nm^3				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	kindling	kindling	kindling	
Visual inspection of combustion chamber	yes / no	yes	yes	yes	

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Ash compaction	yes / no	no	no	no	
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	1 times per week	1 times per week	1 times per week	
Other information					
Cost data					
Price range (VAT included)	€	4400	5500		
Maintenance cost (typical)	€ / year				

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9.5. Valtis Ogrevanje d.o.o

Manufacturer	Valtis Ogrevanje d.o.o, Cesta k Tamu 61, SI-2000 Maribor, Slovenija tel.: +386 2 460 08 01 fax.: +386 2 460 08 03 GSM: +386 51 680 265 e-mail: info@valtis.si website: http://www.ogrevanje-kotli.si				
Series name	PELETKA				
Photos / schematics					
Combustion system type	Boiler				
Fuel type	Wood pellets				
Boiler Model Name	**Units / Characteristics**	**PELETKA 25**			
Basic design parameters and geometry					

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Nominal thermal output	kW	26,47			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..	..	..	..
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	6,92 – 26,47			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0,91 x 1,37 x 0,75			
Net combustion system weight	kg	238			
Heating surfaces	m^2	80 - 300			
Cleaning of heating surfaces	automated / manual	manual			
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger			
Operation	continuous / intermittent	continuous			

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Integrated Hopper / Silo	yes / no	yes			
Integrated Hopper / Silo Capacity	kg	180			
Typical fuel consumption	kg/h	min: 1,7 max: 6,7			
Time between refueling (for intermittent use, stoves)	min / h	..			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	not separated combustion zone			
Stoker technology	Manual / automated (screw)	automated			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above			
Grate technology	fixed grate / moving grate / others	fixed grate			
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				

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Combustion air streams	primary air / secondary air / others	secondary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans			
Air supply control	flaps / controlled fans	controlled fans			
Deashing system	manual / automatic	automatic			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / temperature probe			
Efficiency and Class					
Boiler / Stove Efficiency	%				
Combustion efficiency (related to fuel burnout)	%	91,96			
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5			
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches	DN25			

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Maximum operation pressure	bar	2			
Tested pressure	bar	5			
Water volume	l	74			
Minimum return temperature	^{o}C	50			
Maximum operation temperature	^{o}C	80			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80			
Flue gas temperature	^{o}C	130 - 200			
Draught	forced / natural	forced			
Location of flue gas fan (for forced draught systems)		back			
CO	mg / Nm^3 (and/or) mg/MJ	228/104			
OGC	mg / Nm^3 (and/or) mg/MJ	2,6/1,2			
Dust	mg / Nm^3 (and/or) mg/MJ	34,43/15,64			
NOx	mg/MJ	77			
Other characteristics					

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Ignition	spark / kindling / other	spark			
Visual inspection of combustion chamber	yes / no	yes			
Ash compaction	yes / no	no			
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	2 times per week			
Other information					
Cost data					
Price range (VAT included)	€	3900			
Maintenance cost (typical)	€ / year				

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Manufacturer	Valtis Ogrevanje d.o.o, Cesta k Tamu 61, SI-2000 Maribor, Slovenija tel.: +386 2 460 08 01 fax.: +386 2 460 08 03 GSM: +386 51 680 265 e-mail: info@valtis.si website: http://www.ogrevanje-kotli.si				
Series name	PELLSON				
Photos / schematics	 X1 X3 X5 X7				
Combustion system type	Boiler				
Fuel type	Wood pellets				
Boiler Model Name	**Units / Characteristics**	**X1**	**X3**	**X5**	**X7**
Basic design parameters and geometry					
Nominal thermal output	kW	10	25	48	70
Thermal output for Domestic Heating Water (D.H.W.) and warm	kW				

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water supply					
Thermal output for space heating (for stoves)	kW	..	..	..	..
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3 - 10	7,5 – 25	20 – 48	21 – 70
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0,67 x 1,34 x 1,04	0,93 x 1,53 x 1,09	1,05 x 1,35 x 1,34	1,422 x 1,611 x 1,349
Net combustion system weight	kg	230	350	486	670
Heating surfaces	m^2	50 - 160	80 - 400	300-700	600 - 3000
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger
Operation	continuous / intermittent	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	kg	105	180	75 (+1000)	50

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Typical fuel consumption	kg/h	min: 0,7 max: 2,4	min: 1,8 max: 6,2	min: 3,8 max: 12,5	min: 5,1 max: 16,9
Time between refueling (for intermittent use, stoves)	min / h	..	..	..	..
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	not separated combustion zone	not separated combustion zone	not separated combustion zone	not separated combustion zone
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side	from the side	from the side
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others	secondary air	secondary air	secondary air	secondary air
Combustion air supply	separate air fans / suction due to	separate air fans	separate air fans	separate air fans	separate air fans

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	underpressure in the combustion chamber				
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	automatic	automatic	automatic	automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / temperature probe	automatic / temperature probe	automatic / temperature probe	automatic / temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%	94,8	93,7	92	92,5
Combustion efficiency (related to fuel burnout)	%	90,2	91,7	91,5	90,9
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches	DN25	DN25	DN25	1,5
Maximum operation pressure	bar	2	2	2	2
Tested pressure	bar				

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Water volume	l	61	123	146	258
Minimum return temperature	°C	80	80	80	90
Maximum operation temperature	°C	55	55	50	50
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	100	100	100	150
Flue gas temperature	°C				
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		back	back	back	back
CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	spark	spark	spark	spark
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes

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Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	2 times per month	2 times per month	3 times per month	2 times per month
Other information					
Cost data					
Price range (VAT included)	€	4700	5300	9300	14500
Maintenance cost (typical)	€ / year				

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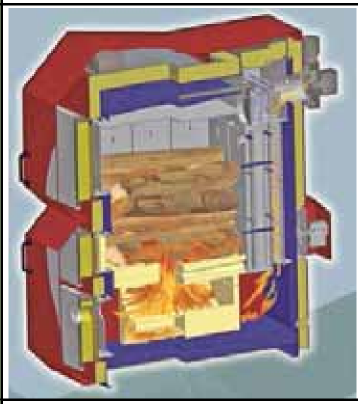
Manufacturer	Valtis Ogrevanje d.o.o, Cesta k Tamu 61, SI-2000 Maribor, Slovenija tel.: +386 2 460 08 01 fax.: +386 2 460 08 03 GSM: +386 51 680 265 e-mail: info@valtis.si website: http://www.ogrevanje-kotli.si				
Series name	VIVA EXTREME				
Photos / schematics	  				
Combustion system type	Boiler				
Fuel type	Logs				
Boiler Model Name	**Units / Characteristics**	**19**	**25**	**25LS**	**32LS**
Basic design parameters and geometry					
Nominal thermal output	kW	19	25	25	32

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW				
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	12 – 20	16 - 25	16 - 25	18 - 32
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0,57 × 1,333 × 1,27	0,57× 1,333 × 1,27	0,57×1,333×1,27	0,57 × 1,417 × 1,27
Net combustion system weight	kg	493	505	505	530
Heating surfaces	m^2	50 - 200	75 - 270	75 - 270	150 - 380
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	manual
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent
Integrated Hopper / Silo	yes / no	No	No	No	No
Integrated Hopper / Silo Capacity	kg	..	..	..	..

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Typical fuel consumption	kg/h	7,5	8	8	8,5
Time between refueling (for intermittent use, stoves)	min / h	4,5 - 10,5 h	4,5 - 9,5 h	4,5 - 9,5 h	3,5 - 8,5 h
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	separated primary and secondary combustion zone	separated primary and secondary combustion zone	separated primary and secondary combustion zone	separated primary and secondary combustion zone
Stoker technology	Manual / automated (screw)	manual	manual	manual	manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	from above
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	103	110	110	110
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others	secondary air	secondary air	secondary air	secondary air
Combustion air supply	separate air fans /	suction due to	suction due to	suction due to	suction due to

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	suction due to underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	temperature probe	temperature probe	lambda sensor	lambda sensor
Efficiency and Class					
Boiler / Stove Efficiency	%	93,5	92	92	93,5
Combustion efficiency (related to fuel burnout)	%	91,2	90,2	90,2	91,2
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches				DN25
Maximum operation pressure	bar				2,5

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Tested pressure	bar				
Water volume	l	173	189	189	192
Minimum return temperature	°C				80
Maximum operation temperature	°C				50
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	80	80	80	80
Flue gas temperature	°C				
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		back	back	back	back
CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling

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Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	1 times per week	1 times per week	1 times per week	1 times per week
Other information					
Cost data					
Price range (VAT included)	€	3600	3700	4500	4600
Maintenance cost (typical)	€ / year				

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9.6. WVTERM, d.o.o

Manufacturer	WVTERM, d.o.o., Preradovičeva 22, SI-2000 Maribor, Slovenija tel.: +386 2 42 92 810 fax.: -- GSM: +386 41 77 18 60 e-mail: wvterm@wvterm.si website: http://www.wvterm.si				
Series name	PELET STAR, STADLER C 28 PELET,				
Photos / schematics	   PELET STAR STADLER C 28 PELET STADLER EKO PELET				
Combustion system type	Boiler				
Fuel type	Wood pellets				
Boiler Model Name	**Units / Characteristics**	**PELET STAR 20**	**PELET STAR 40**	**STADLER C 28 PELET**	**STADLER EKO PELET**
Basic design parameters and geometry					
Nominal thermal output	kW	20	40	25	20

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW	..	..	..	..
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	8 - 20	25 – 40	10 – 25	15 – 20
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m			1,09 x 1,07 x 0,66	0,96 x 1,09 x 0,755
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1,02 x 1,43 x 1,35	1,02 x 1,43 x 1,35		
Net combustion system weight	kg	280	290	370	
Heating surfaces	m^2	70 - 220	250 - 380	140 - 260	140 - 220
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger
Operation	continuous / intermittent	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	yes	yes	no	no
Integrated Hopper / Silo Capacity	kg	250	250		

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Typical fuel consumption	kg/h				
Time between refueling (for intermittent use, stoves)	min / h	..	..	..	..
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	not separated combustion zone	not separated combustion zone	not separated combustion zone	not separated combustion zone
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from below	from below	from the side	from below
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air
Combustion air supply	separate air fans / suction due to	separate air fans	separate air fans	separate air fans	separate air fans

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	underpressure in the combustion chamber				
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / temperature probe	automatic / temperature probe	automatic / temperature probe	automatic / temperature probe
Efficiency and Class					
Boiler / Stove Efficiency	%	90,1-91	90,3-91	90,12	91,5
Combustion efficiency (related to fuel burnout)	%	91,9-92,4	90,9-91,3		
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches	DN25	DN25	DN25	
Maximum operation pressure	bar	3	3	3	
Tested pressure	bar				

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Water volume	l	126	140	70	126
Minimum return temperature	^oC	95	95	95	95
Maximum operation temperature	^oC				60
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	130	130	130	
Flue gas temperature	^oC				
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		back	back	back	back
CO	mg / Nm^3 (and/or) mg/MJ	9,3		22,9	69
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ	19,8		22	29,2
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	spark	spark	spark	spark
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes

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Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	2 times per month	2 times per month	3 times per month	2 times per month
Other information					
Cost data					
Price range (VAT included)	€	5200	6100	3800	4100
Maintenance cost (typical)	€ / year				

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Manufacturer	WVTERM, d.o.o., Preradovičeva 22, SI-2000 Maribor, Slovenija tel.: +386 2 42 92 810 fax.: -- GSM: +386 41 77 18 60 e-mail: wvterm@wvterm.si website: http://www.wvterm.si				
Series name	GT, LT, TR				
Photos / schematics					
Combustion system type	Boiler				
Fuel type	Logs				
Boiler Model Name	**Units / Characteristics**	**GT30**	**LT20**	**LT30**	**TR30**
Basic design parameters and geometry					
Nominal thermal output	kW	30	20	30	30

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW				
Thermal output for space heating (for stoves)	kW				
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	15 – 30	10 - 20	20 - 30	15 - 30
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m				
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	0,638 × 1,356 × 1,36	0,66× 1,385 × 1,2	0,66×1,385×1,2	0,695 × 1,48 × 1,2
Net combustion system weight	kg	600	554	559	735
Heating surfaces	m^2	230 - 330	140 - 220	230 - 330	230 - 330
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	manual	manual	manual	manual
Operation	continuous / intermittent	intermittent	intermittent	intermittent	intermittent
Integrated Hopper / Silo	yes / no	No	No	No	No
Integrated Hopper / Silo Capacity	kg	..	..	..	..

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Typical fuel consumption	kg/h				
Time between refueling (for intermittent use, stoves)	min / h				
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	separated primary and secondary combustion zone	separated primary and secondary combustion zone	separated primary and secondary combustion zone	separated primary and secondary combustion zone
Stoker technology	Manual / automated (screw)	manual	manual	manual	manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	from above
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	102	125	125	150
Combustion chamber dimensions (Width x Height x Length)	m				
Combustion chamber cooling concept	water cooled / air cooled / insulated				
Combustion air streams	primary air / secondary air / others	secondary air	secondary air	secondary air	secondary air
Combustion air supply	separate air fans /	suction due to	suction due to	suction due to	suction due to

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	suction due to underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	lambda sensor	lambda sensor	lambda sensor	lambda sensor
Efficiency and Class					
Boiler / Stove Efficiency	%	91	90,1-91	90,3-91,2	90-92
Combustion efficiency (related to fuel burnout)	%	93	92,1-93,1	93,3-94,5	93,1-95,5
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable		5	5	5
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches	5/4	5/4	5/4	5/4
Maximum operation pressure	bar	3	3	3	3

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Tested pressure	bar				
Water volume	l	125	117	110	193
Minimum return temperature	^oC	95	95	95	95
Maximum operation temperature	^oC				
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	150	150	150
Flue gas temperature	^oC				
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		back	back	back	back
CO	mg / Nm^3 (and/or) mg/MJ	49	28,2	100,6	32
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ	12	36	17	4
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	kindling	kindling	kindling	kindling

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Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other	1 times per week	1 times per week	1 times per week	1 times per week
Other information					
Cost data					
Price range (VAT included)	€	3400	4000	4500	6000
Maintenance cost (typical)	€ / year				

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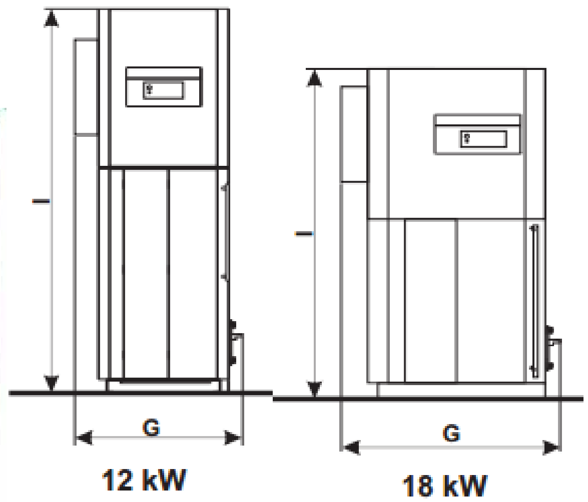
10. Croatia

10.1. Centrometal d.o.o

Manufacturer	Centrometal d.o.o, Glavna 12, 40306 Macinec, http://www.centrometal.hr/, tehnicki.ured@centrometal.hr
Series name	PelTec
Photos / schematics	 

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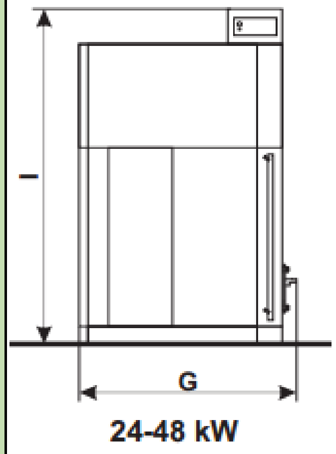

Combustion system type	Boiler					
Fuel type	Wooden pellets					
Boiler Model Name	**Units / Characteristics**	**12**	**18**	**24**	**36**	**48**
Basic design parameters and geometry						
Nominal thermal output	kW	12	18	24	36	48
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-	-
Thermal output for space heating (for stoves)	kW	-	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous	kW	3,6 kW	5,4	7,2	10,8	14,4

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operation)						
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	-	-	-	-	-
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.2x1.56x1.105	1,42x1,56x1,105	1,4x1,56x1,08	1,485x1,56x1,16	1,485x1,56x1,175
Net combustion system weight	kg	328	349	402	455	478
Heating surfaces	m^2	0	0	0	0	0
Cleaning of heating surfaces	automated / manual	automated	automated	automated	automated	automated
Fuel capacity and feeding						
Fuel feeding	pneumatic / auger / manual / other	pneumatic	pneumatic	pneumatic	pneumatic	pneumatic
Operation	continuous / intermittent	continuous	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	kg	340 L	340 L	340 L	340 L	340 L
Typical fuel consumption	kg/h	-	-	-	-	-
Time between refueling (for intermittent use, stoves)	min / h	-	-	-	-	-
Combustion technology						

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Combustion concept	separated primary and secondary combustion zone or not	Not separated	Not separated	Not separated	Not separated	Not separated
Stoker technology	Manual / automated (screw)	Manual	Manual	Manual	Manual	Manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	Drop shaft burner grate	Drop shaft burner grate	Drop shaft burner grate	Drop shaft burner grate	Drop shaft burner grate
Combustion chamber volume	l	0,942	1,59	1,59	2,56	2,56
Combustion chamber dimensions (Width x Height x Length)	m	0,465x0,3x,0,3	0,65x0,3x0,3	0,65x0,3x0,3	0,62x0,385x0,385	',77x0,385x0,385
Combustion chamber cooling concept	water cooled / air cooled / insulated	Air cooled	Air cooled	Air cooled	Air cooled	Air cooled
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air	primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans

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Deashing system	manual / automatic	automatic	automatic	automatic	automatic	automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	Automatic lambda sensor	Automatic lambda sensor	Automatic lambda sensor	Automatic lambda sensor	Automatic lambda sensor
Efficiency and Class						
Boiler / Stove Efficiency	%	-	-	-	-	-
Combustion efficiency (related to fuel burnout)	%	-	-	-	-	-
Electricity consumption	Wel/kW of boiler output	1.050	1.050	1.050	1.050	1.050
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5	5	5	5
Hydraulics / Water circuit						
Number of tubes	#	2	2	2	2	2
Hydraulics connections	inches	0,5	0,5	0,5	0,5	0,5
Maximum operation pressure	bar	2.5				
Tested pressure	bar	5				
Water volume	l	78	76	100	108	135
Minimum return temperature	°C	> 0°C				

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Maximum operation temperature	°C	90	90	90	90	90
Flue gases / Emissions						
Chimney / Flue gas connection diameter	mm	130	130	130	150	150
Flue gas temperature	°C	120 at nominal heating output	120 at nominal heating output	120 at nominal heating output	120 at nominal heating output	120 at nominal heating output
Draught	forced / natural	natural	natural	natural	natural	natural
Location of flue gas fan (for forced draught systems)		-	-	-	-	-
CO	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
OGC	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
Dust	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
NOx	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
Other characteristics						
Ignition	spark / kindling / other	-	-	-	-	-
Visual inspection of combustion chamber	yes / no	no	no	no	no	no
Ash compaction	yes / no	yes	yes	yes	yes	yes

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Ash chamber dimensions (Width x Height x Length)	m	9.9 l	16,4 l	19,8 l	29,3 l	32,6 l
Typical ash cleaning frequency	times per week / month / other	Ash removal after approximately 3 spent pellet tanks (approximately 600 kg)				
Other information						
Cost data						
Price range (VAT included)	€	3000	3200	3400	3700	3900
Maintenance cost (typical)	€ / year	-	-	-	-	-

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Manufacturer	Centrometal d.o.o, Glavna 12, 40306 Macinec, http://www.centrometal.hr/, tehnicki.ured@centrometal.hr					
Series name	Cm Pelet set					
Photos / schematics						
Combustion system type	Boiler					
Fuel type	Wooden pellets					
Boiler Model Name	**Units / Characteristics**	**EKO-CK P 14**	**EKO-CK P 20**	**EKO-CK P 25**	**EKO-CK P 30**	**EKO-CK P 35**
Basic design parameters and geometry						
Nominal thermal output	kW	14	20	25	30	35

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-	-
Thermal output for space heating (for stoves)	kW	-	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	9	10	10	10	10
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,47x1,395x0,73	0,526x1,395x0,73	0,526x1,395x0,73	0,576x1,395x0,73	0,626x1,395x0,73
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1,09x1,545x0,73	1,151x1,545x0,73	1,151x1,545x0,73	1,204x1,545x0,73	1,251x1,395x0,73
Net combustion system weight	kg	220	227	234	255	266
Heating surfaces	m^2	-	-	-	-	-
Cleaning of heating surfaces	automated / manual	automated	automated	automated	automated	automated
Fuel capacity and feeding						
Fuel feeding	pneumatic / auger / manual / other	pneumatic	pneumatic	pneumatic	pneumatic	pneumatic
Operation	continuous / intermittent	continous	continous	continous	continous	continous
Integrated Hopper / Silo	yes / no	no	no	no	no	no
Integrated Hopper / Silo Capacity	kg	-	-	-	-	-

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Typical fuel consumption	kg/h	-	-	-	-	-
Time between refueling (for intermittent use, stoves)	min / h	-	-	-	-	-
Combustion technology						
Combustion concept	separated primary and secondary combustion zone or not	Not separated	Not separated	Not separated	Not separated	Not separated
Stoker technology	Manual / automated (screw)	manual	manual	manual	manual	manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side	from the side	from the side	from the side
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	89,3	89,3	95,5	110,3	125,2
Combustion chamber dimensions (Width x Height x Length)	m	321x506 x550	321x506 x550	321x541x 550	371x541x 550	21x541x 550
Combustion chamber cooling concept	water cooled / air cooled / insulated	Air cooled	Air cooled	Air cooled	Air cooled	Air cooled
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	Primary air	Primary air
Combustion air supply	separate air fans / suction due to	separate air	separate air fans	separate air fans	separate air fans	separate air fans

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	underpressure in the combustion chamber	fans				
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	manual	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	automatic	automatic
Efficiency and Class						
Boiler / Stove Efficiency	%	-	-	-	-	-
Combustion efficiency (related to fuel burnout)	%	-	-	-	-	-
Electricity consumption	Wel/kW of boiler output	0,25	0,25	0,25	0,25	0,25
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3
Hydraulics / Water circuit						
Number of tubes	#	2	2	2	2	2
Hydraulics connections	inches	0,5	0,5	0,5	0,5	0,5
Maximum operation pressure	bar	2.5				
Tested pressure	bar	5,5				

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Water volume	l	59	60	64	67	76
Minimum return temperature	°C	> 0°C				
Maximum operation temperature	°C	90	90	90	90	90
Flue gases / Emissions						
Chimney / Flue gas connection diameter	mm	150	150	150	160	160
Flue gas temperature	°C	160	160	160	160	160
Draught	forced / natural	natural	natural	natural	natural	natural
Location of flue gas fan (for forced draught systems)		-	-	-	-	-
CO	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
OGC	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
Dust	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
NOx	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
Other characteristics						
Ignition	spark / kindling / other	Electric igniter	Electric igniter	Electric igniter	Electric igniter	Electric igniter

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Visual inspection of combustion chamber	yes / no	no	no	no	no	no
Ash compaction	yes / no	-	-	-	-	-
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-	-
Typical ash cleaning frequency	times per week / month / other	-	-	-	-	-
Other information		-	-	-	-	-
Cost data						
Price range (VAT included)	€	1900	2000	2050	2150	2250
Maintenance cost (typical)	€ / year	-	-	-	-	-

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 691763

Manufacturer	Centrometal d.o.o, Glavna 12, 40306 Macinec, http://www.centrometal.hr/, tehnicki.ured@centrometal.hr					
Series name	Cm Pelet set					
Photos / schematics						
Combustion system type	Boiler					
Fuel type	Wooden pellets					
Boiler Model Name	**Units / Characteristics**	**EKO-CK P 40**	**EKO-CK P 50**	**EKO-CK P 60**	**EKO-CK P 70**	**EKO-CK P 90**
Basic design parameters and geometry						
Nominal thermal output	kW	40	50	60	70	90

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-	-
Thermal output for space heating (for stoves)	kW	-	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	12	15	15	21	27
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,62x1,395x0,6	0,62x1,395x0,69	0,62x1,395x0,725	0,64x1,395x0,815	0,69x1,395x0,915
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	Depending on the storage container - 3 options	Depending on the storage container - 3 options	Depending on the storage container - 3 options	Depending on the storage container - 3 options	Depending on the storage container - 3 options
Net combustion system weight	kg	293	337	355	429	455
Heating surfaces	m^2	-	-	-	-	-
Cleaning of heating surfaces	automated / manual	automated	automated	automated	automated	automated
Fuel capacity and feeding						
Fuel feeding	pneumatic / auger / manual / other	pneumatic	pneumatic	pneumatic	pneumatic	pneumatic
Operation	continuous / intermittent	continuous	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	no	no	no	no	no

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Integrated Hopper / Silo Capacity	kg	-	-	-	-	-
Typical fuel consumption	kg/h	-	-	-	-	-
Time between refueling (for intermittent use, stoves)	min / h	-	-	-	-	-
Combustion technology						
Combustion concept	separated primary and secondary combustion zone or not	Not separated	Not separated	Not separated	Not separated	Not separated
Stoker technology	Manual / automated (screw)	Manual	Manual	Manual	Manual	Manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side	from the side	from the side	from the side
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	140	172	203,2	280	310
Combustion chamber dimensions (Width x Height x Length)	m	0,471x0,541x 0,550	0,471x0,664x 0,550	0,471x0,664x 0,650	0,471x0,742x0,804	0,521x0,742x0,804
Combustion chamber cooling concept	water cooled / air cooled / insulated	air cooled	air cooled	air cooled	air cooled	air cooled
Combustion air streams	primary air / secondary air /	primary air	primary air	primary air	primary air	primary air

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	others					
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	separate air fans	separate air fans	separate air fans	separate air fans	separate air fans
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	manual	manual	manual	manual	manual
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	automatic	automatic
Efficiency and Class						
Boiler / Stove Efficiency	%	-	-	-	-	-
Combustion efficiency (related to fuel burnout)	%	-	-	-	-	-
Electricity consumption	Wel/kW of boiler output	0,25	0,25	0,25	0,25	0,25
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	3	3
Hydraulics / Water circuit						
Number of tubes	#	2	2	2	3	3
Hydraulics connections	inches	0,5	0,5	0,5	1	1
Maximum operation pressure	bar	2.5				

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Tested pressure	bar	5,5				
Water volume	l	78	96	118	135	140
Minimum return temperature	°C	> 0°C				
Maximum operation temperature	°C	90	90	90	90	90
Flue gases / Emissions						
Chimney / Flue gas connection diameter	mm	180	180	180	200	200
Flue gas temperature	°C	160	160	160	190	200
Draught	forced / natural	natural	natural	natural	natural	natural
Location of flue gas fan (for forced draught systems)	-	-	-	-	-	-
CO	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
OGC	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
Dust	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
NOx	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
Other characteristics						
Ignition	spark / kindling / other	Electric igniter	Electric igniter	Electric igniter	Electric igniter	Electric igniter

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Visual inspection of combustion chamber	yes / no	-	-	-	-	-
Ash compaction	yes / no	-	-	-	-	-
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-	-
Typical ash cleaning frequency	times per week / month / other	-	-	-	-	-
Other information		-	-	-	-	-
Cost data						
Price range (VAT included)	€	2400	2500	2650	3300	3450
Maintenance cost (typical)	€ / year	-	-	-	-	-

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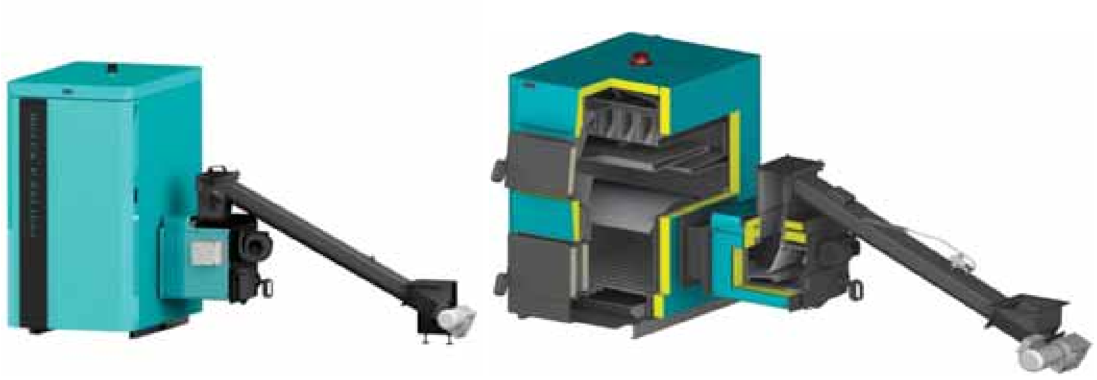
Manufacturer	Centrometal d.o.o, Glavna 12, 40306 Macinec, http://www.centrometal.hr/, tehnicki.ured@centrometal.hr				
Series name	BIO-CK P Unit (25 – 100 kW)				
Photos / schematics					
Combustion system type	Boiler				
Fuel type	Wood chips, wood shavings, olive pits left after olive processing (olive cake) or solid fuel				
Boiler Model Name	**Units / Characteristics**	**20**	**40**	**60**	**100**
Basic design parameters and geometry					
Nominal thermal output	kW	7,5-25	12-40	18-60	30-100

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	-	-
Thermal output for space heating (for stoves)	kW	-	-	-	-
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	7,5	12	18	30
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,670x1,255x1,055	0,670x1,355x1,250	0,730x1,435x1,250	0,830x1,615x1,345
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	-	-	-	-
Net combustion system weight	kg	293	355	450	-
Heating surfaces	m^2	-	-	-	-
Cleaning of heating surfaces	automated / manual	-	-	-	-
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	Feed screw, an electric motor with gearbox and a rotating plate with springs for wood chip collection	Feed screw, an electric motor with gearbox and a rotating plate with springs for wood chip collection	Feed screw, an electric motor with gearbox and a rotating plate with springs for wood chip collection	Feed screw, an electric motor with gearbox and a rotating plate with springs for wood chip collection
Operation	continuous /	Continuous if using	Continuous if	Continuous if using	Continuous if using

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	intermittent	wood chips	using wood chips	wood chips	wood chips
Integrated Hopper / Silo	yes / no	No	No	No	No
Integrated Hopper / Silo Capacity	kg	-	-	-	-
Typical fuel consumption	kg/h	-	-	-	-
Time between refueling (for intermittent use, stoves)	min / h	-	-	-	-
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	Not separated	Not separated	Not separated	Not separated
Stoker technology	Manual / automated (screw)	automated	automated	automated	automated
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side	from the side	from the side
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	89,3	140	203,2	370

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Combustion chamber dimensions (Width x Height x Length)	m	0,321x,506x0,55	0,471x0,541x0,55	0,471x0,664x0,65	0,521x0,804x0,883
Combustion chamber cooling concept	water cooled / air cooled / insulated	air cooled	air cooled	air cooled	air cooled
Combustion air streams	primary air / secondary air / others	primary air	primary air	primary air	primary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber	underpressure in the combustion chamber
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	-	-	-	-
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	automatic
Efficiency and Class					
Boiler / Stove Efficiency	%	-	-	-	-
Combustion efficiency (related to fuel burnout)	%	-	-	-	-
Electricity consumption	Wel/kW of boiler output	-	-	-	-

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Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	EN 303-5 and ISO 9001:2008			
Hydraulics / Water circuit					
Number of tubes	#	3	3	3	3
Hydraulics connections	inches	-	-	-	-
Maximum operation pressure	bar	2,5	2,5	2,5	2,5
Tested pressure	bar	5	5	5	5
Water volume	l	78	118	140	227
Minimum return temperature	°C	-	-	-	-
Maximum operation temperature	°C	90	90	90	90
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	930	1025	1085	1215
Flue gas temperature	°C	133	175	175	162
Draught	forced / natural	Forced	Forced	Forced	Forced
Location of flue gas fan (for forced draught systems)		Boiler outlet	Boiler outlet	Boiler outlet	Boiler outlet
CO	mg / Nm^3 (and/or) mg/MJ	-	-	-	-

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OGC	mg / Nm^3 (and/or) mg/MJ	-	-	-	-
Dust	mg / Nm^3 (and/or) mg/MJ	-	-	-	-
NOx	mg / Nm^3 (and/or) mg/MJ	-	-	-	-
Other characteristics					
Ignition	spark / kindling / other	Electric heater	Electric heater	Electric heater	Electric heater
Visual inspection of combustion chamber	yes / no	no	no	no	no
Ash compaction	yes / no	-	-	-	-
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-
Typical ash cleaning frequency	times per week / month / other	-	-	-	-
Other information		-	-	-	-
Cost data					
Price range (VAT included)	€	4500	5100	6000	7500
Maintenance cost (typical)	€ / year	-	-	-	-

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10.2. Senko d.o.o

Manufacturer	Senko d.o.o, Štefanec, Vladimira Nazora 22, 4000 Čakovec, info@senko.hr
Series name	Pellet stoves
Photos / schematics	 

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Combustion system type	Stoves					
Fuel type	Wooden pellets					
Boiler Model Name	**Units / Characteristics**	E 2402 P7 AIR	E2403 P 10 AIR	E 2404 P 12 WATER+AIR	E 2406 P 12 SLIM WATER+AIR	E 2405 P 20 WATER+AIR
Basic design parameters and geometry						
Nominal thermal output	kW	7	10	13	13	19

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Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	-	-	11,5	11,1	16,7
Thermal output for space heating (for stoves)	kW	3,1	4,4	1,7	1,7	1,9
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3,1	4,4	6,9	7	8,8
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0,510x1,010x 0,580	0,510x1,090x 0,580	0,600x1,135x 0,680	0,950x1,155x 0,400	0,660x1,260x 0,680
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	-	-	-	-	-
Net combustion system weight	kg	120	125	213	186	257
Heating surfaces	m^2	-	-	-	-	-
Cleaning of heating surfaces	automated / manual	manual	manual	manual	manual	manual
Fuel capacity and feeding						
Fuel feeding	pneumatic / auger / manual / other	-	-	-	-	-
Operation	continuous / intermittent	continuous	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	yes	yes	yes	yes	yes
Integrated Hopper / Silo Capacity	kg	21	25	34	24	54

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Typical fuel consumption	kg/h	1,6	2,3	2,8	2,8	4,2
Time between refueling (for intermittent use, stoves)	min / h	-	-	-	-	-
Combustion technology						
Combustion concept	separated primary and secondary combustion zone or not	-	-	-	-	-
Stoker technology	Manual / automated (screw)	Manual	Manual	Manual	Manual	Manual
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	From above	From above	From above	From above	From above
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate	fixed grate	fixed grate	fixed grate
Combustion chamber volume	l	-	-	-	-	-
Combustion chamber dimensions (Width x Height x Length)	m	255 × 395x150	255 × 395x150	295×460×205	310 × 460× 180	355×455×205
Combustion chamber cooling concept	water cooled / air cooled / insulated	air cooled	air cooled	air cooled	air cooled	air cooled
Combustion air streams	primary air / secondary air / others	Primary air	Primary air	Primary air	Primary air	Primary air
Combustion air supply	separate air fans / suction due to	separate air	separate air	separate air	separate air fans	separate air

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	underpressure in the combustion chamber	fans	fans	fans		fans
Air supply control	flaps / controlled fans	controlled fans	controlled fans	controlled fans	controlled fans	controlled fans
Deashing system	manual / automatic	automatic	automatic	automatic	automatic	automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic	automatic	automatic	automatic	automatic
Efficiency and Class						
Boiler / Stove Efficiency	%	91,3	91,3	95	94,2	94,5
Combustion efficiency (related to fuel burnout)	%	-	-	-	-	-
Electricity consumption	Wel/kW of boiler output	0,07	0,075	0,13	0,13	0,16
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	-	-	-	-	-
Hydraulics / Water circuit						
Number of tubes	#	-	-	-	-	-
Hydraulics connections	inches	-	-	-	-	-
Maximum operation pressure	bar	-	-	2,5	2,5	2,5
Tested pressure	bar	-	-	-	-	-

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Water volume	l	-	-	30,5	28	35
Minimum return temperature	°C	-	-	-	-	-
Maximum operation temperature	°C	-	-	80	80	80
Flue gases / Emissions						
Chimney / Flue gas connection diameter	mm	Ø 80	Ø 80	Ø 80	Ø 80	Ø 80
Flue gas temperature	°C	144	133	77	92	93
Draught	forced / natural	–	–	–	–	–
Location of flue gas fan (for forced draught systems)		-	-	-	-	-
CO	mg / Nm^3 (and/or) mg/MJ	-	-	-	-	-
OGC	mg / Nm^3 (and/or) mg/MJ	8	5	3	1	7
Dust	mg / Nm^3 (and/or) mg/MJ	10	13	12	9	11
NOx	mg / Nm^3 (and/or) mg/MJ	119	110	124	128	129
Other characteristics						
Ignition	spark / kindling / other	Electric igniter	Electric igniter	Electric igniter	Electric igniter	Electric igniter
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes	yes

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Ash compaction	yes / no	-	-	-	-	-
Ash chamber dimensions (Width x Height x Length)	m	-	-	-	-	-
Typical ash cleaning frequency	times per week / month / other	Every 2-3 days	Every 2-3 days	Every 2-3 days	Every 2-3 days	Every 2-3 days
Other information						
Cost data						
Price range (VAT included)	€	-	-	-	-	-
Maintenance cost (typical)	€ / year	-	-	-	-	-

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11. Other manufacturers

11.1. KWB Kraft und Wärme aus Biomasse GmbH

Manufacturer	**KWB - Kraft und Wärme aus Biomasse GmbH** Industriestraße 235 A-8321 St.Margarethen/Raab Tel. : +43 3115 6116, Fax : +43 3115 6116-4, M : office@kwb.at
Series name	KWB Multifire Available in 8 models with ratings of 20, 30, 40, 50, 60, 80, 100 and 120 kW. In the following the lowest and highest capacity boilers are presented.
Photos / schematics	

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Combustion system type	Boiler				
Fuel type	pellets / wood chips / olive stones / miscanthus /short rotation coppice				
Boiler Model Name	**Units / Characteristics**	**MF2 20**	**MF 2 120**		
Basic design parameters and geometry					
Nominal thermal output	kW	20	120		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	20	120		
Thermal output for space heating (for stoves)	kW	n.r.	n.r.		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	6 - 20	36 - 120		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.24x1.59x2.12	1.35x1.59x2.46		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.24x1.59x2.52	1.35x1.59x2.86		
Net combustion system weight	kg	920	1200		
Heating surfaces	m^2	2.61	7.56		

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Cleaning of heating surfaces	automated / manual	automated	automated		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger		
Operation	continuous / intermittent	continuous	continuous		
Integrated Hopper / Silo	yes / no	no	no		
Integrated Hopper / Silo Capacity	kg	n.r.	n.r.		
Typical fuel consumption	kg/h	4.5 – 5 at nominal load (olive stones)	27 – 30 at nominal load (olive stones)		
Time between refueling (for intermittent use, stoves)	min / h	n.r.	n.r.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes		
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side		
Grate technology	fixed grate / moving grate /	rotary grate	rotary grate		

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	others				
Combustion chamber volume	l	140	275		
Combustion chamber dimensions (Width x Height x Length)	m	Not applicable due to the complex geometry	Not applicable due to the complex geometry		
Combustion chamber cooling concept	water cooled / air cooled / insulated	Parts are water cooled and parts are insulated	Parts are water cooled and parts are insulated		
Combustion air streams	primary air / secondary air / others	Primary air and secondary air	Primary air and secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans		
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans		
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor / temperature probe	automatic / lambda sensor / temperature probe		
Efficiency and Class					

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Boiler / Stove Efficiency	%	chips: 93 pellets: 93.6	chips: 94,4 pellets: 94.1		
Combustion efficiency (related to fuel burnout)	%	> 99	> 99		
Electricity consumption	Wel/kW of boiler output	7	2.5		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#	24	36		
Hydraulics connections	inches	5/4	2		
Maximum operation pressure	bar	3.5	3.5		
Tested pressure	bar	6	6		
Water volume	l	155	195		
Minimum return temperature	^oC	55	55		
Maximum operation temperature	^oC	110	110		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	200		
Flue gas temperature	^oC full load/part. load	140/100	140/100		

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Draught	forced / natural	forced	forced		
Location of flue gas fan (for forced draught systems)		after boiler	after boiler		
CO at full load/part. load	mg / Nm^3; mg/MJ	chips: 16/102;8/50 pellets: 13/65;7/32	chips: 3/19;2/9 pellets: <4/40;<2/20		
OGC at full load/part. load	mg / Nm^3; mg/MJ	chips: <3/4;<2/2 pellets:<3/5;<2/3	chips: <3/<3;<2/<2 pellets:<3/<3;<1/<2		
Dust at full load/part. load	mg / Nm^3; mg/MJ	chips: 15/11;7/5 pellets:12/9;7/5	chips: 19/14;9/7 pellets:18/14;9/7		
NOx at full load/part. load	mg / Nm^3; mg/MJ	chips: 132/109;66/54 pellets:120/117;59/58	chips: 126/83;62/41 pellets:134/102;66/50		
Other characteristics					
Ignition	spark / kindling / other	ceramic ignition element	ceramic ignition element		
Visual inspection of combustion chamber	yes / no	no	no		
Ash compaction	yes / no	no	no		
Ash chamber dimensions (Width x Height x Length)	m	70l	70l		
Typical ash cleaning frequency	times per week / month / other	About once every 2 weeks at full load	2 to 3 times per week at full load		
Other information					
Cost data					
Price range (VAT included)	€	No data due to the	No data due to the		

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		varying distribution models (direct sales, sales via plumbers etc.) used	varying distribution models (direct sales, sales via plumbers etc.) used		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given		

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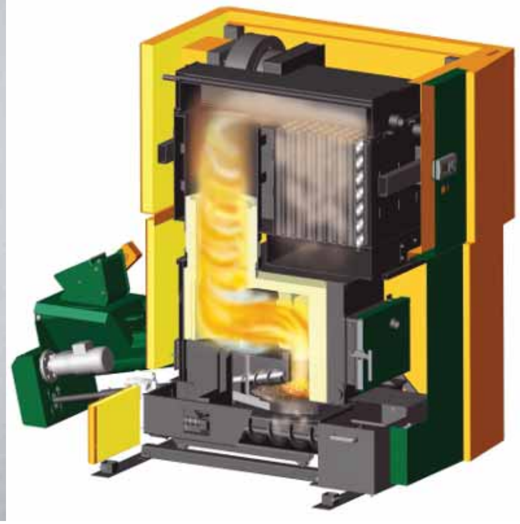
Manufacturer	**KWB - Kraft und Wärme aus Biomasse GmbH** Industriestraße 235 A-8321 St.Margarethen/Raab Tel. : +43 3115 6116, Fax : +43 3115 6116-4, M : office@kwb.at
Series name	KWB Powerfire Available in the following ratings: 150, 200 (only available in the UK), 240 and 300 kW. In the following, the characteristics of the boilers with the lowest and highest capacities are presented.
Photos / schematics	 
Combustion system type	Boiler
Fuel type	pellets / wood chips / olive stones

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Boiler Model Name	**Units / Characteristics**	**TDS 130**	**TDS 300**	**3**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	130	300		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	130	1300		
Thermal output for space heating (for stoves)	kW	n.a.	n.a.		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	39-130	73.5-300		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.64x2.08x1.49	2.02x2.24x1.65		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	n.r.	n.a.		
Net combustion system weight	kg	1634	2858		
Heating surfaces	m^2	9.68	14.23		
Cleaning of heating surfaces	automated / manual	automated	automated		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger		

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Operation	continuous / intermittent	continuous	continuous		
Integrated Hopper / Silo	yes / no	no	no		
Integrated Hopper / Silo Capacity	kg	n.r.	n.r.		
Typical fuel consumption	kg/h	30 - 35	70 - 75		
Time between refueling (for intermittent use, stoves)	min / h	n.r.	n.r.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes		
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side		
Grate technology	fixed grate / moving grate / others	rotating grate	rotating grate		
Combustion chamber volume	l	309	754		
Combustion chamber dimensions (Width x Height x Length)	m	Not applicable due to the complex	Not applicable due to the complex		

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		geometry	geometry		
Combustion chamber cooling concept	water cooled / air cooled / insulated	Parts are water cooled and parts are insulated	Parts are water cooled and parts are insulated		
Combustion air streams	primary air / secondary air / others	Primary air and secondary air	Primary air and secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans		
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans		
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor		
Efficiency and Class					
Boiler / Stove Efficiency	%	chips: 91 pellets: 91.9	chips: 92.9 pellets: 94.4		
Combustion efficiency (related to fuel burnout)	%	> 99	> 99		
Electricity consumption	Wel/kW of boiler output	2 – 3.1 at nominal load;	1.44 – 1.93 at nominal load;		

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		3.5 – 5.0 at minimal partial load	4.1 – 5.39 at minimal partial load		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#	108	150		
Hydraulics connections	inches	DN50	DN80		
Maximum operation pressure	bar	3.5	3.5		
Tested pressure	bar	6	6		
Water volume	l	295	610		
Minimum return temperature	^oC	55	55		
Maximum operation temperature	^oC	95	95		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	250	300		
Flue gas temperature	^oC full load/part. load	160/80	160/80		
Draught	forced / natural	forced	forced		

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Location of flue gas fan (for forced draught systems)		after boiler	after boiler		
CO at 11 % O_2 with wood chips	mg / Nm^3	Full load: 10; part. load 448	Full load: 45; part. load 337		
OGC at 11 % O_2 with wood chips	mg / Nm^3	Full load: < 2; part. load 2	Full load: < 2; part. load 2		
Dust at 11 % O_2 with wood chips	mg / Nm^3	Full load: 55; part. load 40	Full load: 53; part. load 21		
NOx at 11 % O_2 with wood chips	mg / Nm^3	Full load: 230; part. load 138	Full load: 124; part. load 147		
Other characteristics					
Ignition	spark / kindling / other	Electric ignition	Electric ignition		
Visual inspection of combustion chamber	yes / no	no	no		
Ash compaction	yes / no	no	No		
Ash chamber dimensions (Width x Height x Length)	m	66 l (bottom ash box); 23 l (fly ash box)	66 l (bottom ash box); 23 l (fly ash box)		
Typical ash cleaning frequency	times per week / month / other	Up to 3 times a week at full load	Once every day at full load		
Other information					
Cost data					
Price range (VAT included)	€	No data due to the varying distribution	No data due to the varying distribution		

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		models (direct sales, sales via plumbers etc.) used	models (direct sales, sales via plumbers etc.) used		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given		

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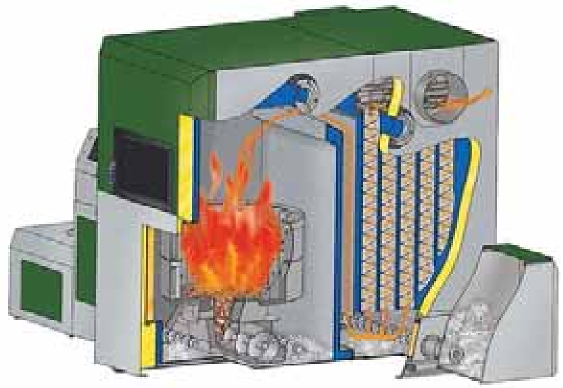
11.2. Herz Energietechnik

Manufacturer	Herz Energietechnik, Herzstraße 1, 7423 Pinkafeld Phone: +43 (0)3357 / 42840 - 0 Fax: +43 (0)3357 / 42840 - 190 Email: office-energie@herz.eu
Series name	BioMatic BioControl Only the lowest / highest capacity models of the series are presented below.
Photos / schematics	 
Combustion system type	Boiler

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Fuel type	Wood chips, pellets, olive stones				
Boiler Model Name	**Units / Characteristics**	**BioMatic BioControl 220**	**BioMatic BioControl 500**	**3**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	220	450		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	220	450		
Thermal output for space heating (for stoves)	kW	n.a.	n.a.		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	54-220	79-450		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	Storage container is part of the feeding system	Storage container is part of the feeding system		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.95x1.80x3.04	2.57x1,97x3,16		
Net combustion system weight	kg	2600	3500		
Heating surfaces	m^2	11.8	26.6		
Cleaning of heating surfaces	automated / manual	automated	automated		

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Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger		
Operation	continuous / intermittent	continuous	continuous		
Integrated Hopper / Silo	yes / no	Only a small hopper before the stoker unit	Only a small hopper before the stoker unit		
Integrated Hopper / Silo Capacity	kg	No data	No data		
Typical fuel consumption	kg/h	45 – 50 at full load	95 – 100 at full load		
Time between refueling (for intermittent use, stoves)	min / h	n.a.	n.a.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes		
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from below	from below		
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate		

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Combustion chamber volume	l	123	148		
Surface of combustion chamber	m^2	0.332	0.442		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled		
Combustion air streams	primary air / secondary air / others	Primary air and secondary air	Primary air and secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans	Separate air fans		
Air supply control	flaps / controlled fans	Controlled fans	Controlled fans		
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor		
Efficiency and Class					
Boiler / Stove Efficiency	%	> 90	> 90		
Combustion efficiency (related to fuel burnout)	%	> 99	> 99		

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Electricity consumption	Wel/kW of boiler output	No data available	No data available		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#	30	63		
Hydraulics connections	inches	DN 80	DN 100		
Maximum operation pressure	bar	5	5		
Tested pressure	bar	7.5	7.5		
Water volume	l	500	940		
Minimum return temperature	°C	60	60		
Maximum operation temperature	°C	90	90		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	250	300		
Flue gas temperature	°C full load/part. load	140/100	120/100		
Draught	forced / natural	forced	forced		
Location of flue gas fan (for forced draught systems)		after boiler	after boiler		

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CO at 13 % O_2 with wood chips	mg / Nm^3 and mg/MJ	Full load: 11 / 7.3 part. load: 38 /25	Full load: 79 / 54 part. load: 119 / 81		
OGC at 13 % O_2 with wood chips	mg / Nm^3 and mg/MJ	Full load: <1 / <1 part. load: <1 / <1	Full load: 9 / 6 part. load: 2 / 1		
Dust at 13 % O_2 with wood chips	mg / Nm^3 and mg/MJ	Full load: 31 / 20 part. load: 8 /5	Full load: 18 / 11 part. load: 29 /20		
NOx at 13 % O_2 with wood chips	mg / Nm^3 and mg/MJ	Full load: 80 / 52 part. load: 57 / 37	Full load: 126 / 85 part. load: 99 / 68		
Other characteristics					
Ignition	spark / kindling / other	hot air	hot air		
Visual inspection of combustion chamber	yes / no	no	no		
Ash compaction	yes / no	no	no		
Ash chamber dimensions (Width x Height x Length)	m	2 x 30 x 70 x 40	2 x 30 x 70 x 40		
Typical ash cleaning frequency	times per week / month / other	2 to 3 times a week at full load	3 times a week at full load		
Other information					
Cost data					
Price range (VAT included)	€	No data due to the varying distribution	No data due to the varying distribution		

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		models (direct sales, sales via plumbers etc.) used	models (direct sales, sales via plumbers etc.) used		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given		

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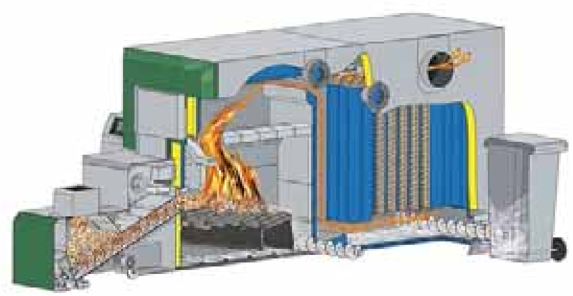
Manufacturer	Herz Energietechnik, Herzstraße 1, 7423 Pinkafeld Phone: +43 (0)3357 / 42840 - 0 Fax: +43 (0)3357 / 42840 - 190 Email: office-energie@herz.eu				
Series name	BioFire (the series covers a nominal output range from 500 to 1500 kW; below, only the lowest capacity boiler of this series is presented, since higher capacities are intended for non-residential markets)				
Photos / schematics	 				
Combustion system type	Boiler				
Fuel type	wood chips, pellets, olive stones				
Boiler Model Name	**Units / Characteristics**	**BioFire 500**			

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Basic design parameters and geometry					
Nominal thermal output	kW	500			
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	500			
Thermal output for space heating (for stoves)	kW	n.r.			
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	150-500			
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	A small storage container is part of the feeding system			
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	4.49x1.98x2.49			
Net combustion system weight	kg	5331			
Heating surfaces	m^2	24			
Cleaning of heating surfaces	automated / manual	automated			
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger			
Operation	continuous / intermittent	continuous			

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Integrated Hopper / Silo	yes / no	Only a small hopper before the stoker unit			
Integrated Hopper / Silo Capacity	kg	no data			
Typical fuel consumption	kg/h	120 – 125 at full load			
Time between refueling (for intermittent use, stoves)	min / h	n.r.			
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes			
Stoker technology	Manual / automated (screw)	automated (screw)			
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side			
Grate technology	fixed grate / moving grate / others	moving grate			
Combustion chamber volume	l	1000			
Combustion chamber dimensions (Width x Height x Length)	m	Not applicable due to the complex			

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		geometry			
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled			
Combustion air streams	primary air / secondary air / others	Primary air and secondary air			
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fans			
Air supply control	flaps / controlled fans	Controlled fans			
Deashing system	manual / automatic	automatic			
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor			
Efficiency and Class					
Boiler / Stove Efficiency	%	93.1			
Combustion efficiency (related to fuel burnout)	%	> 99			
Electricity consumption	Wel/kW of boiler output	3.6			

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Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5			
Hydraulics / Water circuit					
Number of tubes	#	63			
Hydraulics connections	inches	DN 100			
Maximum operation pressure	bar	5			
Tested pressure	bar	7.5			
Water volume	l	1146			
Minimum return temperature	°C	60			
Maximum operation temperature	°C	102			
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	300			
Flue gas temperature	°C	full load 160 / part. load 90			
Draught	forced / natural	forced			
Location of flue gas fan (for forced draught systems)		after boiler			

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CO at 13 % O_2 with wood chips	mg / Nm^3 (and/or) mg/MJ	Full load: 27 /18 part. load: 41 / 27			
OGC at 13 % O_2 with wood chips	mg / Nm^3 (and/or) mg/MJ	n.a.			
Dust at 13 % O_2 with wood chips	mg / Nm^3 (and/or) mg/MJ	Full load: 43 /29 part. load: 24 / 16			
NOx at 13 % O_2 with wood chips	mg / Nm^3 (and/or) mg/MJ	Full load: 133 /88 part. load: 116 / 77			
Other characteristics					
Ignition	spark / kindling / other	hot air			
Visual inspection of combustion chamber	yes / no	no			
Ash compaction	yes / no	no			
Ash chamber dimensions (Width x Height x Length)	m	2 x 240 l (one for bottom ash and one for boiler fly ash)			
Typical ash cleaning frequency	times per week / month / other	Up to 2 times a week at full load			
Other information					

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Price range (VAT included)	€	No data due to the varying distribution models (direct sales, sales via plumbers etc.) used			
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given			

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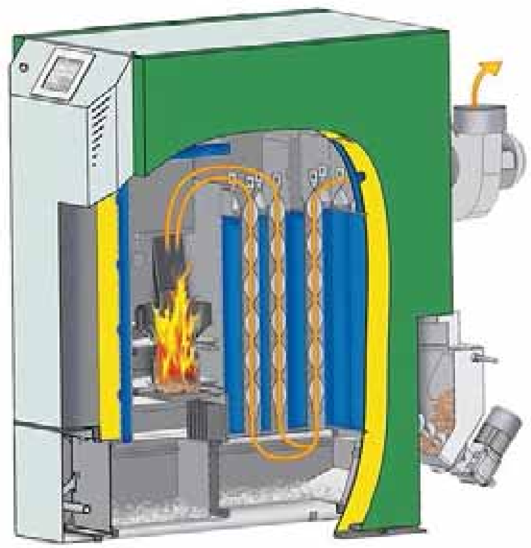
Manufacturer	Herz Energietechnik, Herzstraße 1, 7423 Pinkafeld Phone: +43 (0)3357 / 42840 - 0 Fax: +43 (0)3357 / 42840 - 190 Email: office-energie@herz.eu
Series name	Pelletstar The series includes models with the following nominal thermal outputs: 10, 20, 30, 45 and 60 kW. In the following, the Pelletstar 10 and 60 models of the series are presented.
Photos / schematics	 
Combustion system type	Boiler

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Fuel type	pellets				
Boiler Model Name	**Units / Characteristics**	**Pelletstar 10**	**Pelletstar 60**		
Basic design parameters and geometry					
Nominal thermal output	kW	12	60		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	12	60		
Thermal output for space heating (for stoves)	kW	n.r.	n.r.		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3,5-12	13-60		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.59x1.13x1.4	0.75x1.48x1.62		
System dimensions (including daily fuel storage container) (Width x Height x Length) (min)	m	1.03x1.35x1.4	1.19x1.60x1.62		
System dimensions (including daily fuel storage container) (Width x Height x Length) (max)	m	1.21x1.13x1.75	1.37x1.48x1.97		
Net combustion system weight	kg	261	518		
Heating surfaces	m^2	0.81	2.82		

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Cleaning of heating surfaces	automated / manual	automated	automated		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger		
Operation	continuous / intermittent	continuous	continuous		
Integrated Hopper / Silo	yes / no	yes	yes		
Integrated Hopper / Silo Capacity	kg min/max	56/260	71/310		
Typical fuel consumption	kg/h	3	15		
Time between refueling (for intermittent use, stoves)	min / h	n.r.	n.a.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	Separated primary and secondary combustion zone	Separated primary and secondary combustion zone		
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above		
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate		

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Combustion chamber volume	l	20	72		
Combustion chamber dimensions (Width x Height x Length)	m	Not applicable due to the complex geometry	Not applicable due to the complex geometry		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled		
Combustion air streams	primary air / secondary air / others	Primary air and secondary air	Primary air and secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Flaps and frequency controlled ID fan	Flaps and frequency controlled ID fan		
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor		
Efficiency and Class					
Boiler / Stove Efficiency	%	> 93	> 93		

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Combustion efficiency (related to fuel burnout)	%	> 99	> 99		
Electricity consumption	Wel/kW of boiler output	8.2	1.9		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#	9	20		
Hydraulics connections	inches	1	6/4		
Maximum operation pressure	bar	3	3		
Tested pressure	bar	4.5	4.5		
Water volume	l	55	178		
Minimum return temperature	^oC	60	60		
Maximum operation temperature	^oC	95	95		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	130	150		
Flue gas temperature	^oC	full load 160 / part. load 90	full load 160 / part. load 90		

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Draught	forced / natural	forced	forced		
Location of flue gas fan (for forced draught systems)		after boiler	after boiler		
CO at 13 % O_2 with pellets	mg / Nm^3 (and/or) mg/MJ	Full load: 169 / 110 part. load: 272 /178	Full load: 13 / 8 part. load: 124 / 81		
OGC at 13 % O_2 with pellets	mg / Nm^3 (and/or) mg/MJ	n.a.	n.a.		
Dust at 13 % O_2 with pellets	mg / Nm^3 (and/or) mg/MJ	Full load: 35 / 23	Full load: 23 / 15 part. load: 23 / 15		
NOx at 13 % O_2 with pellets	mg / Nm^3 (and/or) mg/MJ	Full load: 123 / 80	Full load: 113 / 93 part. load: 98 / 64		
Other characteristics					
Ignition	spark / kindling / other	hot air	hot air		
Visual inspection of combustion chamber	yes / no	No	no		
Ash compaction	yes / no	No	No		
Ash chamber dimensions (Width x Height x Length)	m	14 (bottom ash)+ 11 (fly ash)	35 (bottom ash)+ 23 (fly ash)		
Typical ash cleaning frequency	times per week / month / other	Once a month	Once a month		
Other information					

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Cost data					
Price range (VAT included)	€	9,300.00 (packaging, transport, installation etc. excluded)	14,800.00 (packaging, transport, installation etc. excluded)		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given		

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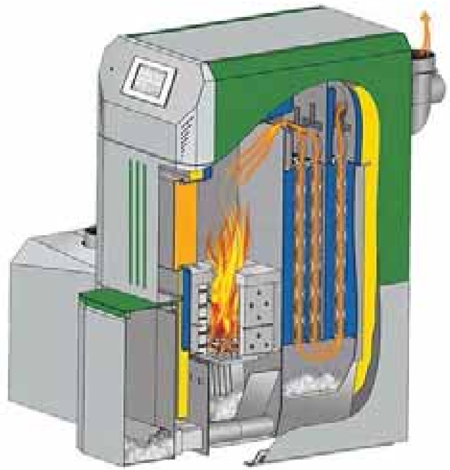
Manufacturer	Herz Energietechnik, Herzstraße 1, 7423 Pinkafeld Phone: +43 (0)3357 / 42840 - 0 Fax: +43 (0)3357 / 42840 - 190 Email: office-energie@herz.eu
Series name	Firematic The Firematic series procudes models in the following capacity ranges: 20 – 60 kW (4 models), 80 – 301 kW (13 models) and 349 – 499 kW (5 models). In the following the Firematic 20 and Firematic 499 models of the series are presented.
Photos / schematics	Firematic 20 

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	Firematic 499 				
Combustion system type	Boiler				
Fuel type	wood chips, pellets, olive stones				
Boiler Model Name	**Units / Characteristics**	**firematic 20**	**firematic 499**	**3**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW (pellets/wood chips)	-/20	499/499		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	20	499		

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Thermal output for space heating (for stoves)	kW	n.r.	n.a.		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	6-20	103.9-499/104/499		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	A small storage container is part of the feeding system	A small storage container is part of the feeding system		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.39x1.49x1.30	3.02x2.19x2.66		
Net combustion system weight	kg	517	4393		
Heating surfaces	m^2	1.74	25.58		
Cleaning of heating surfaces	automated / manual	automated	automated		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger		
Operation	continuous / intermittent	continuous	continuous		
Integrated Hopper / Silo	yes / no	Only a small hopper before the stoker unit	Only a small hopper before the stoker unit		
Integrated Hopper / Silo Capacity	kg	n.a.	n.a.		

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Typical fuel consumption	kg/h	4.5 - 5	120 - 125		
Time between refueling (for intermittent use, stoves)	min / h	n.r.	n.r.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes		
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side		
Grate technology	fixed grate / moving grate / others	fixed grate	moving grate		
Combustion chamber volume	l	69	1390		
Combustion chamber dimensions (Width x Height x Length)	m	Not applicable due to the complex geometry	Not applicable due to the complex geometry		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled, partly insulated	water cooled		
Combustion air streams	primary air / secondary air /	Primary air and	Primary air and		

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	others	secondary air	secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber	Suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Flaps and frequency controlled ID fan	Flaps and frequency controlled ID fan		
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor		
Efficiency and Class					
Boiler / Stove Efficiency	%	>94	>93		
Combustion efficiency (related to fuel burnout)	%	> 99	> 99		
Electricity consumption	Wel/kW of boiler output	10.7	1.9		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#	12	176		

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Hydraulics connections	inches	1	DN 100		
Maximum operation pressure	bar	3	5		
Tested pressure	bar	4.5	7.5		
Water volume	l	80	1130		
Minimum return temperature	^oC	60	60		
Maximum operation temperature	^oC	95	95		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	250		
Flue gas temperature	^oC	Full load 110 / part. load 85	Full load 150 / part. load 90		
Draught	forced / natural	forced	forced		
Location of flue gas fan (for forced draught systems)		after boiler	after boiler		
CO at 13 % O_2 with wood chips	mg / Nm^3 (and/or) mg/MJ	Full load: 30 / 20 part. load: 160 / 107	Full load: 17 / 11 part. load: 49 / 34		
OGC at 13 % O_2 with wood chips	mg / Nm^3 (and/or) mg/MJ	No data	No data		
Dust at 13 % O_2 with wood chips	mg / Nm^3	Full load: 35 / 24	Full load: 12 / 8		

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	(and/or) mg/MJ	part. load: 24 / 16	part. load: 14 / 10		
NOx at 13 % O_2 with wood chips	mg / Nm^3 (and/or) mg/MJ	Full load: 143 / 97 part. load: 112 / 75	Full load: 107 / 71 part. load: 78 / 52		
Other characteristics					
Ignition	spark / kindling / other	hot air	hot air		
Visual inspection of combustion chamber	yes / no	No	No		
Ash compaction	yes / no	No	no		
Ash chamber dimensions (Width x Height x Length)	m	20 x 60 x 45	240 l		
Typical ash cleaning frequency	times per week / month / other	Once every 2 weeks at full load	Every two days at full load		
Other information					
Cost data					
Price range (VAT included)	€	12,350.00 (packaging, transport, installation etc. excluded)	No data due to the varying distribution models (direct sales, sales via plumbers etc.) used		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user	Depending on the annual utilization and the user		

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		behaviour; therefore, no typical numbers can be given	behaviour; therefore, no typical numbers can be given		

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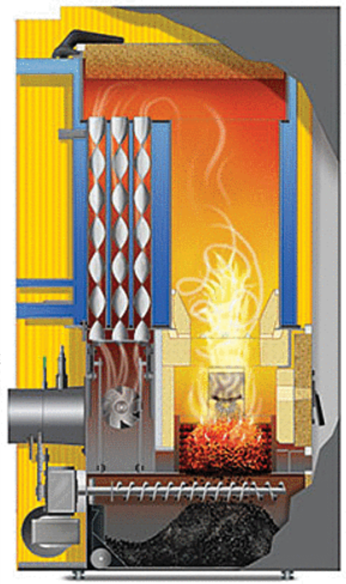
11.3. Guntamatic Heiztechnik GmbH

Manufacturer	GUNTAMATIC Heiztechnik GmbH Bruck 7 4722 Peuerbach Austria Tel: +43 (0) 7276 / 2441 0 office(at)guntamatic.com
Series name	Powerchip Available in the following nominal capacity ranges: 20/30/40/50kW, 75/100kW and 100 – 400 kW. In the following the characteristics of the Powerchip 20/30 and Powerchip 100 models are presented.
Photos / schematics	  

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Combustion system type	Boiler / Stove				
Fuel type	wood chips, pellets, miscanthus, energy corn				
Boiler Model Name	**Units / Characteristics**	**POWERCHIP 20/30**	**POWERCHIP 100**	**3**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	30	99		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	30	99		
Thermal output for space heating (for stoves)	kW	n.r.	n.r.		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	7-30	22-99		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.98x1.67x1.57	0.98x1.85x1.88		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m				
Net combustion system weight	kg	550	865		
Heating surfaces	m^2				

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Cleaning of heating surfaces	automated / manual	automated	automated		
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger		
Operation	continuous / intermittent	continuous	continuous		
Integrated Hopper / Silo	yes / no	no	no		
Integrated Hopper / Silo Capacity	kg	-	-		
Typical fuel consumption	kg/h	7 – 8 at full load	25 at full load		
Time between refueling (for intermittent use, stoves)	min / h	-	-		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes		
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side		
Grate technology	fixed grate / moving grate / others	moving grate	moving grate		

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Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m	Not applicable due to the complex geometry	Not applicable due to the complex geometry		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled, partly insulated	water cooled, partly insulated		
Combustion air streams	primary air / secondary air / others	Primary and secondary air	Primary and secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Flaps and frequency controlled ID fan	Flaps and frequency controlled ID fan		
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor		
Efficiency and Class					
Boiler / Stove Efficiency	%	94	94		

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Combustion efficiency (related to fuel burnout)	%	> 99	> 99		
Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches	5/4	2		
Maximum operation pressure	bar	3	3		
Tested pressure	bar	4.5	4.5		
Water volume	l	128	256		
Minimum return temperature	°C	55	55		
Maximum operation temperature	°C	60-80	60-80		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	180		
Flue gas temperature	°C	Full load180 part. load 130	Full load 195 part. load 150		

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Draught	forced / natural	forced	forced		
Location of flue gas fan (for forced draught systems)		after boiler	after boiler		
CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust with wood chips	mg/MJ	Full load 9 part. load 12	Full load 10		
NOx with wood chips	mg/MJ	Full load 88 part. load 72	Full load 102 part. load 43		
Other characteristics					
Ignition	spark / kindling / other	Hot air	Hot air		
Visual inspection of combustion chamber	yes / no	no	No		
Ash compaction	yes / no	no	No		
Ash chamber dimensions (volume)	l	60 (bottom ash)+ 12 (boiler fly ash)	80 (bottom ash)+ 12 (boiler fly ash)		
Typical ash cleaning frequency	times per week / month / other	Once every two weeks at full load	Up to twice a week at full load		
Other information					

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Cost data					
Price range (VAT included)	€	No data due to the varying distribution models (direct sales, sales via plumbers etc.) used	No data due to the varying distribution models (direct sales, sales via plumbers etc.) used		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given		

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11.4. Fröling Heizkessel- und Behälterbau Ges.m.b.H.

Manufacturer	Fröling Heizkessel- und Behälterbau Ges.m.b.H. Industriestraße 12 A - 4710 Grieskirchen Phone: 0043 (0)7248 / 606 - 0 Fax: 0043 (0)7248 / 606 - 600 E-Mail: info@froeling.com; verkauf@froeling.com; kundendienst@froeling.com
Series name	P4 Pellet The series produces models in the following nominal capacity ranges: 8/15/20/25 kW, 32 / 38 kW and 48/60/80/100/105 kW. In the following, the P4 15, 38 and 105 models of the series are presented.
Photos / schematics	

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Combustion system type	Boiler				
Fuel type	olive stones, pellets				
Boiler Model Name	**Units / Characteristics**	**P4 15**	**P4 38**	**P4 105**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	14.9	38	105	
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	14.9	38	105	
Thermal output for space heating (for stoves)	kW	n.r.	n.r.	n.r.	
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	3.1-14.9	8.9-38	24-105	
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	0.6x1.35x0.86	0.86x1.35x0.94	1.34x1.79x1.07	
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	1.43x1.40x0.94	-	-	
System dimensions (including suction cyclone) (Width x Height x Length)	m	1.19x1.66x0.86	1.45x1.90x0.94	2.09x1.90x1.07	
Net combustion system weight	kg	355	535	1110	

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Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated	automated	
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	
Operation	continuous / intermittent	continuous	continuous	continuous	
Integrated Hopper / Silo	yes / no	optional	no	no	
Integrated Hopper / Silo Capacity	kg	235 l	-	-	
Typical fuel consumption	kg/h	3.5 - 4	9 - 10	24 - 26	
Time between refueling (for intermittent use, stoves)	min / h	n.r.	n.r.	n.r.	
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes	yes	
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)	automated (screw)	
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from above	from above	from above	

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Grate technology	fixed grate / moving grate / others	fixed grate (special grate for olive pits)	fixed grate (special grate for olive pits)	fixed grate (special grate for olive pits)	
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m	Not applicable due to the complex geometry	Not applicable due to the complex geometry	Not applicable due to the complex geometry	
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled	water cooled	water cooled	
Combustion air streams	primary air / secondary air / others	Primary and secondary air	Primary and secondary air	Primary and secondary air	
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber	
Air supply control	flaps / controlled fans	Flaps and frequency controlled ID fan	Flaps and frequency controlled ID fan	Flaps and frequency controlled ID fan	
Deashing system	manual / automatic	manual	automatic	automatic	
Combustion and load control	manual / automatic / lambda sensor / temperature probe	automatic / lambda sensor	automatic / lambda sensor	automatic / lambda sensor	

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	/ CO sensor				
Efficiency and Class					
Boiler / Stove Efficiency	%	90.9	92.6	94.3	
Combustion efficiency (related to fuel burnout)	%	> 99	> 99	> 99	
Electricity consumption	Wel/kW of boiler output	3.6	2.9	1.1	
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	3	3	3	
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches	1	6/4	2	
Maximum operation pressure	bar	3	3	3	
Tested pressure	bar	4.5	4.5	4.5	
Water volume	l	70	125	280	
Minimum return temperature	^{o}C	No limit since the boiler features an internal preheating system	No limit since the boiler features an internal preheating system	No limit since the boiler features an internal preheating system	
Maximum operation temperature	^{o}C	80	80	80	

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Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	130	150	200	
Flue gas temperature	°C	150	160	170	
Draught	forced / natural	forced	forced	forced	
Location of flue gas fan (for forced draught systems)		after boiler	after boiler	after boiler	
CO for pellets	mg/MJ	Full load 39 part. load 77	Full load 45 part. load 61	Full load 6 part. load 29	
OGC for pellets	mg/MJ	Full load 0.6 part. load 1.4	Full load 1.0 part. load 1.0	Full load < 1 part. load < 1	
Dust for pellets	mg/MJ	Full load 12 part. load 11	Full load 9 part. load 10	Full load 13 part. load 10	
NOx for pellets	mg/MJ	Full load 74 part. load 69	Full load 77 part. load 75	Full load 83 part. load 62	
Other characteristics					
Ignition	spark / kindling / other	hot air	hot air	hot air	
Visual inspection of combustion chamber	yes / no	no	no	No	
Ash compaction	yes / no	no	no	No	

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Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information					
Cost data					
Price range (VAT included)	€	No data due to the varying distribution models (direct sales, sales via plumbers etc.) used	No data due to the varying distribution models (direct sales, sales via plumbers etc.) used	No data due to the varying distribution models (direct sales, sales via plumbers etc.) used	
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	

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Manufacturer	Fröling Heizkessel- und Behälterbau Ges.m.b.H. Industriestraße 12 A - 4710 Grieskirchen Phone: 0043 (0)7248 / 606 - 0 Fax: 0043 (0)7248 / 606 - 600 E-Mail: info@froeling.com; verkauf@froeling.com; kundendienst@froeling.com
Series name	T4 Available in the following rated heat outputs: 24, 30, 40, 50, 60, 75, 90, 100, 110, 130 and 150 kW. In the following, the 24 and 150 kW models of the series are presented.
Photos / schematics	
Combustion system type	Boiler

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Fuel type	olive pits (depending on the size), nut shells, grape vine, olive cuts (<35% moisture)				
Boiler Model Name	**Units / Characteristics**	**T4 24**	**T4 150**	**3**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	24	150		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	24	150		
Thermal output for space heating (for stoves)	kW	n.r.	n.r.		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	7.2-24	45-150		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.36x1.44x1.43	1.64x1.77x2.30		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	-	-		
Net combustion system weight	kg	620	1750		
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated		
Fuel capacity and feeding					

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Fuel feeding	pneumatic / auger / manual / other	auger	auger		
Operation	continuous / intermittent	continuous	continuous		
Integrated Hopper / Silo	yes / no	no	no		
Integrated Hopper / Silo Capacity	kg	-	-		
Typical fuel consumption	kg/h	5 - 6	35 - 37		
Time between refueling (for intermittent use, stoves)	min / h	n.r.	n.r.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	no	no		
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side		
Grate technology	fixed grate / moving grate / others	fixed grate	fixed grate		
Combustion chamber volume	l				
Combustion chamber dimensions	m	Not applicable due	Not applicable due		

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(Width x Height x Length)		to the complex geometry	to the complex geometry		
Combustion chamber cooling concept	water cooled / air cooled / insulated	water cooled, partly insulated	water cooled, partly insulated		
Combustion air streams	primary air / secondary air / others	Primary and secondary air	Primary and secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber	suction due to underpressure in the combustion chamber		
Air supply control	flaps / controlled fans	Flaps and frequency controlled ID fan	Flaps and frequency controlled ID fan		
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor		
Efficiency and Class					
Boiler / Stove Efficiency	%	92.3	93		
Combustion efficiency (related to fuel burnout)	%	> 99	> 99		

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Electricity consumption	Wel/kW of boiler output pellets/wood chips	3/4.8	1.76/1.75		
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches	6/4	2		
Maximum operation pressure	bar	3	3		
Tested pressure	bar	4.5	4.5		
Water volume	l	105	340		
Minimum return temperature	°C	45	45		
Maximum operation temperature	°C	90	90		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	150	200		
Flue gas temperature	°C	125	150		
Draught	forced / natural	forced	forced		

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Location of flue gas fan (for forced draught systems)		after boiler	after boiler		
CO with wood chips	mg/MJ	Full load: 9 part. load: 28	Full load: 7 part. load: 6		
OGC with wood chips	mg/MJ	Full load: < 1 part. load: 1.4	Full load: < 1 part. load: < 1		
Dust with wood chips	mg/MJ	Full load: 13	Full load: 13 part. load: 10		
NOx with wood chips	mg/MJ	Full load: 70	Full load: 74 part. load: 41		
Other characteristics					
Ignition	spark / kindling / other	hot air	hot air		
Visual inspection of combustion chamber	yes / no	no	No		
Ash compaction	yes / no	no	no		
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information					
Cost data					
Price range (VAT included)	€	No data due to the	No data due to the		

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		varying distribution models (direct sales, sales via plumbers etc.) used	varying distribution models (direct sales, sales via plumbers etc.) used		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given		

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Manufacturer	Fröling Heizkessel- und Behälterbau Ges.m.b.H. Industriestraße 12 A - 4710 Grieskirchen Phone: 0043 (0)7248 / 606 - 0 Fax: 0043 (0)7248 / 606 - 600 E-Mail: info@froeling.com; verkauf@froeling.com; kundendienst@froeling.com
Series name	Turbomat Available in 150/200/250 kW and 300/320/400/500 kW capacities. In the following, the 150 and 500 kW models of the series are presented.
Photos / schematics	 
Combustion system type	Boiler

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Fuel type	olive stones (depending on the size), nut shells, grape vine, olive cuts (<35% moisture)				
Boiler Model Name	**Units / Characteristics**	**TM 150**	**TM 500**	**3**	**...**
Basic design parameters and geometry					
Nominal thermal output	kW	150	499		
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	150	499		
Thermal output for space heating (for stoves)	kW	n.r.	n.r.		
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	45 - 150	160 - 499		
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	2.17x1.94x2.63	2.99x2.66x3.60		
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	-	-		
Net combustion system weight	kg	3300	8400		
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated		
Fuel capacity and feeding					

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Fuel feeding	pneumatic / auger / manual / other	auger	auger		
Operation	continuous / intermittent	continuous	continuous		
Integrated Hopper / Silo	yes / no	no	no		
Integrated Hopper / Silo Capacity	kg	n.r.	n.r.		
Typical fuel consumption	kg/h	35	120 - 122		
Time between refueling (for intermittent use, stoves)	min / h	n.r.	n.r.		
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	yes	yes		
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)		
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side		
Grate technology	fixed grate / moving grate / others	moving grate	moving grate		
Combustion chamber volume	l				
Combustion chamber dimensions	m	Not applicable due	Not applicable due		

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(Width x Height x Length)		to the complex geometry	to the complex geometry		
Combustion chamber cooling concept	water cooled / air cooled / insulated	Insulated, partly water cooled	insulated		
Combustion air streams	primary air / secondary air / others	Primary and secondary air	Primary and secondary air		
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fan	Separate air fan		
Air supply control	flaps / controlled fans	Flaps and frequency controlled combustion air fan	Flaps and frequency controlled combustion air fan		
Deashing system	manual / automatic	automatic	automatic		
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor / temperature probe	automatic / lambda sensor / temperature probe		
Efficiency and Class					
Boiler / Stove Efficiency	%	91.6	94.2		
Combustion efficiency (related to fuel burnout)	%	> 99	> 99		

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Electricity consumption	Wel/kW of boiler output	4.38			
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable	5	5		
Hydraulics / Water circuit					
Number of tubes	#				
Hydraulics connections	inches	2 ½	DN 100		
Maximum operation pressure	bar	3	6		
Tested pressure	bar	4.5	7.5		
Water volume	l	440	750		
Minimum return temperature	°C	65	65		
Maximum operation temperature	°C	90	90		
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	200	350		
Flue gas temperature	°C	150	140		
Draught	forced / natural	forced	forced		
Location of flue gas fan (for forced draught systems)		after boiler	after boiler		

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CO at 13% O_2 with wood chips	mg / Nm^3 and mg/MJ	Full load 2 / 2 part. load 73 / 50			
OGC at 13% O_2 with wood chips	mg / Nm^3 and mg/MJ	Full load <1 / <1 part. load < 2 / < 2			
Dust at 13% O_2 with wood chips	mg / Nm^3 and mg/MJ	Full load 13 / 9 part. load 24 / 17			
NOx at 13% O_2 with wood chips	mg / Nm^3 and mg/MJ	Full load 120 / 82 part. load 116 / 79			
Other characteristics					
Ignition	spark / kindling / other	hot air	hot air		
Visual inspection of combustion chamber	yes / no	no	No		
Ash compaction	yes / no	no	no		
Ash chamber dimensions (Width x Height x Length)	m				
Typical ash cleaning frequency	times per week / month / other				
Other information					
Cost data					
Price range (VAT included)	€	No data due to the varying distribution models (direct	No data due to the varying distribution models (direct sales,		

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		sales, sales via plumbers etc.) used	sales via plumbers etc.) used		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given		

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Manufacturer	Fröling Heizkessel- und Behälterbau Ges.m.b.H. Industriestraße 12 A - 4710 Grieskirchen Phone: 0043 (0)7248 / 606 - 0 Fax: 0043 (0)7248 / 606 - 600 E-Mail: info@froeling.com; verkauf@froeling.com; kundendienst@froeling.com
Series name	Lambdamat The Industry series is available in the following rated heat outputs: 150, 200, 300, 499 and 750 kW. In the following the 150 and 499 kW models of the series are presented. The Communal series is available in the following rated heat outputs: 300, 499, 750 and 999 kW. In the following, the 300 and 499 kW models of the series are presented.

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Photos / schematics	 Lambdamat Industry	Lamdamat Communal

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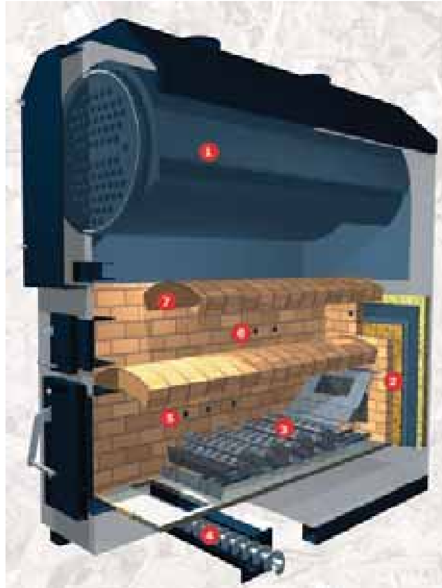

Combustion system type	Boiler				
Fuel type	olive pits (depending on the size), nut shells, grape vine, olive cuts (<35% moisture)				
Boiler Model Name	**Units / Characteristics**	**Lambdamat Industry 150**	**Lambdamat Industry 500**	**Lambdamat Communal 320**	**Lambdamat Communal 500**
Basic design parameters and geometry					
Nominal thermal output	kW	150	500	300	500
Thermal output for Domestic Heating Water (D.H.W.) and warm water supply	kW	150	500	300	500

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Thermal output for space heating (for stoves)	kW	n.r.	n.r.	n.r.	n.r.
Output range (min. % of nominal load that can be achieved in continuous operation)	kW	100 - 150	300 - 500	90 - 300	150 - 500
System dimensions (excluding daily fuel storage container) (Width x Height x Length)	m	1.96x2.03x2.17	2.50x2.93x3.07	1.98x2.80x2.72	2.17x3.22x2.72
System dimensions (including daily fuel storage container) (Width x Height x Length)	m	-	-		
Net combustion system weight	kg	2166	8510	5780	7350
Heating surfaces	m^2				
Cleaning of heating surfaces	automated / manual	automated	automated	automated	automated
Fuel capacity and feeding					
Fuel feeding	pneumatic / auger / manual / other	auger	auger	auger	auger
Operation	continuous / intermittent	continuous	continuous	continuous	continuous
Integrated Hopper / Silo	yes / no	no	no	no	no
Integrated Hopper / Silo Capacity	kg	-	-	-	-
Typical fuel consumption	kg/h (G50/W20)	45	155	100	155

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Time between refueling (for intermittent use, stoves)	min / h	-	-	-	-
Combustion technology					
Combustion concept	separated primary and secondary combustion zone or not	No, primary air underneath the grate and secondary air over the fuel bed	No, primary air underneath the grate and secondary air over the fuel bed	Yes (primary air underneath the grate, secondary air over the fuel bed and tertiary air in the post-combustion chamber	Yes (primary air underneath the grate, secondary air over the fuel bed and tertiary air in the post-combustion chamber
Stoker technology	Manual / automated (screw)	automated (screw)	automated (screw)	automated (screw)	automated (screw)
Fuel feeding to the fuel bed	from above / from the side / from below = underfeed stoker	from the side	from the side	from the side	from the side
Grate technology	fixed grate / moving grate / others	moving grate	moving grate	moving grate	moving grate
Combustion chamber volume	l				
Combustion chamber dimensions (Width x Height x Length)	m	Not applicable due to the complex geometry	Not applicable due to the complex geometry	Not applicable due to the complex geometry	Not applicable due to the complex geometry
Combustion chamber cooling concept	water cooled / air cooled /	insulated	insulated	insulated	insulated

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	insulated				
Combustion air streams	primary air / secondary air / others	Primary and secondary air	Primary and secondary air	Primary, secondary and tertiary air	Primary, secondary and tertiary air
Combustion air supply	separate air fans / suction due to underpressure in the combustion chamber	Separate air fan	Separate air fan	Separate air fan	Separate air fan
Air supply control	flaps / controlled fans	Flaps (for the distribution to the primary and secondary air nozzles) and frequency controlled combustion air fan	Flaps (for the distribution to the primary and secondary air nozzles) and frequency controlled combustion air fan	Flaps (for the distribution to the primary, secondary and tertiary air nozzles) and frequency controlled combustion air fan	Flaps (for the distribution to the primary, secondary and tertiary air nozzles) and frequency controlled combustion air fan
Deashing system	manual / automatic	automatic	automatic	automatic	automatic
Combustion and load control	manual / automatic / lambda sensor / temperature probe / CO sensor	automatic / lambda sensor	automatic / lambda sensor	automatic / lambda sensor	automatic / lambda sensor
Efficiency and Class					
Boiler / Stove Efficiency	%	> 90	> 90	> 90	> 90
Combustion efficiency (related to fuel burnout)	%	> 99	> 99	> 99	> 99

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Electricity consumption	Wel/kW of boiler output				
Class according to EN 303-5:2012 (boilers only)	3 / 4 / 5 / not specified / not applicable				
Hydraulics / Water circuit					
Number of tubes	#	72	72		
Hydraulics connections	inches	DN100	DN100	DN100	DN100
Maximum operation pressure	bar	4	4	4	4
Tested pressure	bar	6	6	6	6
Water volume	l	440	1060	790	1100
Minimum return temperature	°C	65	65	65	65
Maximum operation temperature	°C	95	95	95	95
Flue gases / Emissions					
Chimney / Flue gas connection diameter	mm	200	350	300	350
Flue gas temperature	°C	220	220	220	220
Draught	forced / natural	forced	forced	forced	forced
Location of flue gas fan (for forced draught systems)		after boiler	after boiler	after boiler	after boiler

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CO	mg / Nm^3 (and/or) mg/MJ				
OGC	mg / Nm^3 (and/or) mg/MJ				
Dust	mg / Nm^3 (and/or) mg/MJ				
NOx	mg / Nm^3 (and/or) mg/MJ				
Other characteristics					
Ignition	spark / kindling / other	Hot air or manually (optional)	Hot air or manually (optional)	manually	Hot air or manually (optional)
Visual inspection of combustion chamber	yes / no	yes	yes	yes	yes
Ash compaction	yes / no	no	no	no	no
Ash chamber dimensions (volume)	l	180 / 320 (optional)	180 / 320 (optional)	180 / 320 (optional)	180 / 320 (optional)
Typical ash cleaning frequency	times per week / month / other	Once a week with the 320 l container at full load	Three times a week with the 320 l container at full load	Twice a week with the 320 l container at full load	Three times a week with the 320 l container at full load
Other information					
Cost data					
Price range (VAT included)	€	No data due to the varying distribution models (direct	No data due to the varying distribution models (direct sales,		

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		sales, sales via plumbers etc.) used	sales via plumbers etc.) used		
Maintenance cost (typical)	€ / year	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given	Depending on the annual utilization and the user behaviour; therefore, no typical numbers can be given		

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