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Operating and assembly instructions

Technical information

Water boiler with manual feed

type:

"ŻarKo"

Boiler thermal power … kW
Serial No. .....
Year of construction .....

Original instructions

The boiler bears the "CE" marking

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Issue 01

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1. Introduction - general information

The heating appliance purchased is a latest-generation central heating water boiler for solid fuel - eco-coal peas, with manual loading, meeting the requirements of directives, regulations of standards and the EU at the highest European level.

The latest European and national regulations set very high requirements in terms of emissions, boiler efficiency and eco-design and thus in terms of environmental protection and anti-smog policy.

Attention should also be paid to the high and consistent efficiency of approximately 90 %. The high efficiency of the boilers provides an alternative to boilers for other types of fuel.

'ŻarKo' boilers with manual feed are designed to operate at nominal power and require the connection of an accumulation tank.

1.1. Certificates

All kinds of additional information such as certificates, attestations and other documents are successively completed, verified and posted on our website www.kotlospaw.pl under "download".

1.2. Safety considerations and requirements

For your own safety, the user should request confirmation from the installer of the boiler's open circuit protection, i.e. according to PN-91/B-02413.

- If the boiler is not properly protected, there is a risk of serious damage to the boiler and a safety risk to the user.
- The boiler manufacturer is not responsible for the technical condition and execution of all required installations and the use of chimneys not suitable for low flue gas temperatures.
- *The use of flue pipes selected by a flue gas installation specialist and made of materials resistant to harmful chemicals including acids is required.*
- Due to continuous technical progress, the manufacturer introduces minor design changes to the boilers on an ongoing basis to improve their operation, but these do not affect the thermal and emission parameters. The delivered boilers may differ in minor details from those presented in the manual or in the offer.
- The operator must carefully read and understand these operating instructions and the equipment (draught dampers etc.).
- Display the conditions for safe operation of the boilers in a prominent place in the boiler room**.**
- For correct, fault-free, safe and long-lasting operation of the boiler, it is recommended that the manufacturer performs a service at least once a year before the heating season.
- Boiler installation and servicing should be carried out by a firm or a person authorised for this type of work and having technical knowledge in this field, familiar with the requirements of the

standards and technical specifications given in the manual.

- Equip the boiler room with a fire extinguisher, a flue gas and smoke detector and display the conditions for safe operation in a prominent position. Ensure that the operating manual is always available to the boiler operator.

2. Technical and operational features

Boilers of the type: ***"ŻarKo"*** are a new generation of boilers of high European standard with manual fuel input. The introduction of new design solutions in the combustion chamber and heat exchanger system results in effective and *ecological* combustion in accordance with the requirements of the *highest 5th class of the EN 303-5* standard *and ecodesign.* Certificates can be downloaded from our website www.kotlospaw.pl under the "download" tab.
Operating the boiler requires cyclical firing and refuelling and ash removal.

"ŻarKo" type boilers:

Are low-temperature boilers of the open system and are not subject to conditions of technical supervision.

To be secured *only according to PN-91/B-02413.* Heating and heat engineering. Protection of open-system water heating installations. Requirements.

The standard equipment (without cooling devices and safety valves) is not suitable for closed circuit protection with diaphragm expansion vessels. For details, see separate operating instructions for closed systems.

Meet requirements:

EU product safety *directives* confirmed by a declaration of conformity and *marked with the "CE" mark.*

Commission Regulation (EU) 2015/1189 of 28. 04. 015 implementing Directive *2009/125/EC of the* European Parliament and of the Council with regard to ecodesign requirements for solid fuel boilers.

Commission Delegated Regulation (EU) 2015/1187 of 27. 04. 2015.
supplementing Directive *2010/30/EU of the* European Parliament and of the Council *with* regard to energy labelling of solid fuel boilers.

Regulation of the Minister of Development and Finance of 01.08.2017 *on the requirements for solid fuel boilers* Journal of Laws item 1690) as amended (Journal of Laws 2019 item 363, Journal of Laws 2019 item 2549)

2.1. Operating instructions

The IOIM operating manual, also known as *technical and operating documentation,* is intended for users of central heating water boilers. ***"ŻarKo" boilers*** adapted for solid fuel - eco-coal peas, with manual loading. Careful reading of the IOIM, which contains information on the design, installation and use of the boilers, is essential for their correct and safe operation and for achieving thermal and emission

parameters that meet the requirements of the latest European standards and regulations.

As an integral part of these operating instructions, the operating instructions and declarations of conformity of the boiler accessories (draught dampers, fittings) give detailed information on the method of use, installation, adjustment, etc.

Before installing the boiler and operating it:

- Check the completeness of the delivery, compare the data on the rating plate with the guarantee card,
- check that the boiler has not been damaged during transport,
- detailed familiarisation by the user with the boiler IOIM and the equipment before starting operation,

2.2. Storage of records

Keep the operation and installation manual for the boiler and other documentation for other appliances working with the boiler in a visible place for the operators of the boiler.

The user is obliged to keep the instructions carefully and to make them available if necessary

2.3. Identification and marking of the boiler

The boiler is fitted with a nameplate located in a prominent position which contains the following information:

- name and address, manufacturer's company logo,
- the trademark and type of boiler,
- serial number and year of manufacture,
- nominal heat output,
- boiler class,
- maximum permissible operating pressure in bar,
- max. operating temperature in °C,
- water volume in litres,
- information on protection in the open system in accordance with PN-91/B-02413.

Confirmation that the energy efficiency has been met is provided by a label on the boiler casing.

The boiler is covered by a guarantee. Detailed warranty conditions are specified in this manual and the enclosed warranty card.

The boiler is a heating appliance in which there is always a potential danger of burns and fire, despite numerous technical safeguards and recommendations and information on safe use , so operators are required to observe basic safety rules and exercise extreme caution

before taking any action.

3. General rules of use

ŻarKo" boilers are designed to be installed in rooms which are covered and adapted for this purpose, i.e. boiler rooms.

ŻarKo boilers must only be used for the purpose for which they are intended. Any other use is considered inappropriate and consequently dangerous.

Uses contrary to the IOIM are prohibited!

Boilers should only be used, operated and repaired by persons of legal age, while *boilers above 50 kW* should *only be operated by persons holding a valid licence to operate heating boilers. (Regulation of the Minister of Economy, Labour and Social Policy of 28 April 2003. Journal of Laws of 2003, No. 89, item 828*) The operating and safety responsibilities lie with the user, who should meet all the requirements stated in the IOIM.

To start up the boiler, carefully read the instructions for the components in order to understand their specific operation and strictly adhere to the stated rules of use.

Accident prevention regulations and all basic health and safety regulations must be complied with at all times.

3.1. Warranty conditions

The boiler is covered by a guarantee. Detailed warranty conditions are specified in this manual and the enclosed warranty card.

Disturbances and malfunctions in the operation of the boiler caused by ignorance of the IOIM are not subject to complaint. In particular:

- incorrect sizing of the boiler for the building or facility to be heated,
- inadequate boiler connection and installation of the central heating system,
- use of the wrong fuel (type, granulation, calorific value),
- boiler protection not in accordance with PN-91/B-02413,
- use of a chimney which does not comply with the requirements for low flue gas temperatures,
- failure to clean and maintain the boiler ,
- mechanical damage,
- inadequate ventilation of the boiler room.
- no boiler return protection (low temperature protection low-temperature protection)

3.2. Delivery specification

The boiler is delivered in an assembled condition together with the furnace door, ash pan, cleanout door and thermal insulation made of mineral wool covered with a protective jacket of steel sheet. An integral part of the boiler is the control device - draught metering device, swirlers, ceramic fittings and tools for operation and IOIM of the boiler and equipment and guarantee cards.

The completeness of the standard delivery consists of:

- boiler body - heat exchanger with insulation,
- draught regulator,
- drawer - ash container,
- handling tools,
- instructions for use of the boiler and equipment.

3.3. Transport

The boiler is transported whole. When transporting the boiler, it must be secured against shifting and tilting on the vehicle platform using straps, wedges and wooden blocks attached to the vehicle platform. The boiler should be transported in an upright position preferably on a pallet. The lifting and lowering of the boiler should be done using mechanical jacks. The boiler should only be stored and stored in roofed and ventilated areas.

4. Purpose and selection of the boiler

Solid fuel water boilers with manual charging ***"ŻarKo"*** are designed for supplying central heating systems of various rooms and facilities and preparing hot water. They are mainly used in heating installations in residential buildings, commercial pavilions, workshops, farms, etc. As standard, they can only be installed in open-system installations secured in accordance with PN-91/B-02413. They must operate with an accumulator tank in a pumped system with a so-called gravity bypass - a differential valve connected in parallel to the pump which, in the event of pump failure or lack of electricity, will allow water to flow.

4.1. Selection of boilers for the heating system.

In order to correctly select a boiler, the calculated heat demand due to heat loss by penetration, as well as heat for ventilation and domestic hot water needs to be taken into account. The heat balance of the building should be drawn up by the designer in accordance with the applicable standards.

*The manufacturer is not responsible for incorrect boiler selection**.***

4.2. Indices of specific heat demand for residential buildings.

For a rough initial determination of the heat demand for heating a residential building, estimated values for heat demand indices can be taken. For moderately insulated buildings, q=100 W/m^2 , for well-insulated buildings, q=75 W/m^2 .

5. Fuel and its preparation

Primary fuel
The fuel used in ***'ŻarKo'*** boilers is as standard:
eco-pea coal - Table 1.

Table 1

Boiler type		**ŻARKO**
		ŻARKO 12, ŻARKO 16, ŻARKO 20 ŻARKO 24, ŻARKO 28
Type of fuel		hard coal - peas
Calorific value	kJ/kg	24060
Moisture	%	12,6
Ash content	%	8,5
sulfur content	%	0,4

Compliance with the declared boiler operating parameters is conditional on the use of only the correct fuel. The use of substitute fuels is not permissible and the user of the boiler is solely responsible for their use, which results in a reduction of thermal and technical parameters which do not meet the 5th class and ecodesign requirements, with combustion difficulties and premature destruction of the boiler.

The use of unsuitable fuels exposes the user to sanctions under the new stringent environmental and smog policy requirements for the operation of this type of boiler.

The boiler is not designed for combustion:

Coniferous wood, chipboard, plastics and other waste.

5.1. Fuel storage

The fuel storage area should be protected from the weather. Fuel should not be stored outside. When there is no other possibility, a special box, shelter or roof should be made so that the fuel is not exposed to precipitation.

Fuel storage should be located in a separate technical room close to the boiler. It is possible to store fuel in a boiler room for boilers with a maximum thermal output of up to 25kW, provided that a minimum distance of 0.5m is maintained from equipment and installations whose external surfaces may heat up to a temperature exceeding 100°C (Journal of Laws No. 109, item 719 of 2010).

6. Description of boiler construction

The body is made in the shape of a box and consists of a lower combustion part and an upper convection part (heat exchanger), as well as manholes closed with sealed doors allowing front access to each part. There is a flue at the back of the boiler. *The boiler operates with negative pressure in the combustion chamber.*

The convection part of the boiler consists of one vertical and horizontal water and flue gas ducts. In the upper part of the boiler there are feeding and measuring water stubs and at the bottom at the back there is a return water and drain stub. The boiler body and door have thermal insulation. The design of the boiler allows periodic cleaning of the heat transfer surfaces through hatches. The superstructure and dimensions of the boiler are shown in Fig. 1.

Furnace

Made in the shape of a chamber into which eco-coal is loaded. There is a water grate made of pipes at the

bottom and a water channel at the back and top. Behind the firebox is a vertical flue duct connected to the combustion chamber by an aperture (gap) directly above the grate. There is an ash pan under the grate. The furnace is equipped with an ash door and a feeding door. Under the feeding door there is a steel baffle whose function is to feed the fuel as it burns.

Convection section

It is a system of vertical and horizontal ducts. There is one vertical flue behind the firebox and horizontal water and flue ducts alternating above the firebox. The last combustion ducts are connected to the flue. In the flue gas ducts, flue gas turbolisers are placed on shelves. The construction and extended surface of the heat exchanger, the turbolisers used, and the labyrinthine flow of the flue gases cause changes in their speed and turbulence in the flow, resulting in intensification of the heat exchange and precipitation of coarse volatile fractions (dust).

The upper part of the heat exchanger (horizontal channels) is separated from the furnace by a flue gas bypass cover, which allows flue gases to flow through the afterburning chamber and the vertical channel during boiler operation. The cover is opened during boiler firing and results in shortened flue gas circulation only through the horizontal channels of the exchanger.

Ashtray

It is located under the grate and occupies the lower part of the firebox where the ash accumulates It is equipped with a drawer which makes it easy to remove the ash by removing it through the ash hatch at the front of the boiler.

Grid

Made of pipes and built into the water jacket, located between the furnace and the ash pan. In the gaps between the pipes are movable ribs (steel plates) connected to a lever on the side of the boiler, which allows the ribs to be moved and the grate to be ashed.

Afterburning duct

It constitutes a chamber in the flue gas flow zone from the furnace above the grate to the vertical duct. The chamber is lined with ceramic fittings. Above the chamber, on the sides of the boiler in the vertical flue duct, additional secondary air is supplied via a spigot with an adjustable aperture. The use of ceramics and the air supply results in postcombustion of the flue gases (reduced CO emissions).

Furnace and ash hatch

It is a common hatch located at the bottom of the boiler in the grate and ash pan area. It is used for firing up and operating the boiler and for removing ash and other debris left after combustion and cleaning the boiler.

Manhole cover

Located at the top of the firebox at the front of the boiler. It is used to load the fuel and operate the boiler. It also allows access to the horizontal channels of the heat exchanger and cleaning of the internal surfaces of the furnace.

Top cleanout hatch

The boiler has a cleanout hatch is located at the top at the front of the boiler in the heat exchanger area. It is used for cleaning the removal of dirt from the horizontal channels. It also allows access to the flue gas bypass cover and flue gas turbolators and their removal for cleaning.

Doors and manhole covers

All hatches are closed with thermally insulated doors or covers. The ash and combustion manhole have air inlets with a hinged adjustable flap. The hatches are fitted with an openwork spacer plate (bumper) to

prevent embers from falling out and protect the door from excessive heat.

Flue

It is the connecting element between the last flue of the boiler and the chimney. It is led out of the body in the rear upper part of the boiler. The flue stub is circular in shape.

Installation and measurement taps

The boiler is equipped with threaded connectors for flow and return water, drainage and measuring sleeves for thermometer (thermo-pressure gauge), thermostat, draught measurer and additional (safety valve - as an option). At the top of the boiler there are supply and measuring water connections and at the bottom at the rear there are return water connections and a drain connection at the side.
The boiler has no other measurement openings.

Thermal insulation

It is made of mineral wool placed in steel sheet cassettes, coated or painted on both sides, ensuring a safe external surface temperature.

Temperature regulator - draught excluder

The draught metering device mechanically regulates the amount of air that enters the combustion chamber through an adjustable - hinged - slot in the primary air inlet duct of the boiler in the combustion and ash door. It consists of a thermostat built into a brass sleeve with an external thread, a knob and a metal arm with a chain. The knob of the temperature controller has a scale on which the boiler's desired temperature is set. The mechanism, by opening or closing the air inlet flap, maintains the required temperature on the boiler using the action of the thermostatic head, which reacts to changes in the temperature of water in the heating circuit. The thermostatic head is mounted to the regulator stub on top of the boiler, while the regulator lever is connected by a linkage to the opening flap.
Detailed information on the installation and operation of the draught excluder is given in its operating manual, which is an integral part of this manual.

6.1. Types of boiler protection

The boiler has protection against temperature and pressure rise and a device for dissipating excess heat.

- Open system protection system according to PN-91/B-02413
- Temperature regulator - draught excluder
- Storage tank - buffer

6.2. Technical and operational parameters

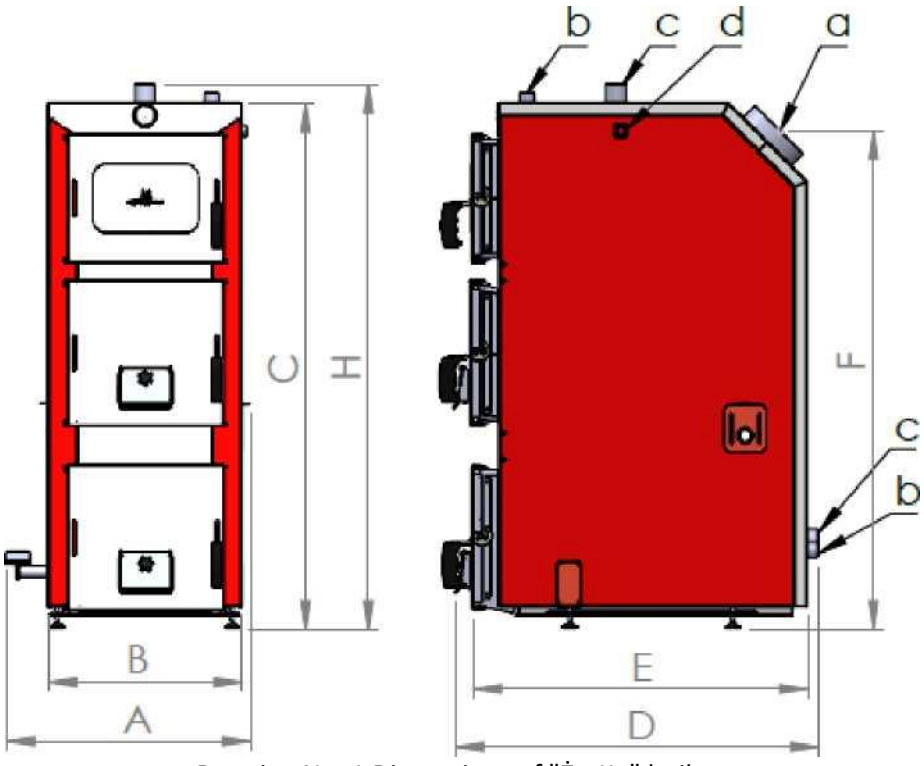
The basic data of the ***"ŻarKo"*** boiler series in terms of technical and operational parameters and overall dimensions are presented in Table 2.

Table 2

Boiler type **"ŻarKo"**			**ŻarKo 12**	**ŻarKo 16**	**ŻarKo 20**	**ŻarKo 24**	**ŻarKo 28**
Rated thermal output		kW	12	16	20	24	28
Nominal flue gas volume		g/s	9,39	10,3	11,22	14,26	17,3
Nominal flue gas temperature		°C	138	142	146	158	170
Water flow resistance At=20		mbar	0,15	0,25	0,4	0,55	0,75
Water flow resistance At=10		mbar	0,6	1,0	1,6	2,2	3,0
Heated area	Thermal insulation 100 W/m2	up to 120	Do 100	100 -160	160 -210	210 -240	240 - 280
	Thermal insulation 75 W/m2	up to 160	Do 160	160 - 210	210 - 260	260 - 320	320 - 370
Water capacity		l	73	81	81	90	90
Fuel consumption-max		kg/h	2,14	2,61	3,07	3,79	4,50
Chimney draught		mbar	0,2	0,25	0,295	0,295	0,295
Boiler mass		kg	340	370	370	408	408
Utility efficiency at rated heat output		%	89,0	89,4	89,7	89,3	88,8
Operating pressure		bar	2	2	2	2	2
Water test pressure		bar	4	4	4	4	4
Mass of fuel in the combustion chamber		kg	22	24	26	28	30
Sustainability		h	4	4	4	4	4
Max. operating temperature		°C	85	85	85	85	85
Min. return temperature		°C	55	55	55	55	55
Min. boiler water temp.		°C	10	10	10	10	10
Minimum recommended storage tank capacity *		l	504	672	840	1008	1176

The area of the heated building-room applies to insulated buildings (heat loss coefficient of 75 and 100 W/m2) at the rated output of the boiler.
The value in the table is indicative and does not take into account the specifics of a particular building or facility.

*- recommended tank capacity, final size to be determined in accordance with the requirements of para. 7.1.1.



Drawing No. 1 Dimensions of "ŻarKo" boilers

ŻarKo	I.M.	12 kW	16 kW	20 kW	24 kW	28 kW
A	mm	577	577	577	642	642
B	mm	455	455	455	520	520
C	mm	1162	1240	1240	1240	1240
D	mm	858	858	858	858	858
E	mm	790	790	790	790	790
F	mm	1100	1194	1194	1194	1194
H	mm	1206	1284	1284	1284	1284
a	mm	ϕ 160	ϕ 160	ϕ 160	ϕ160	ϕ160
b	mm	DN 20 (G3/4)	DN 20 (G3/4)	DN 20 (G3/4)	DN 20 (G3/4)	DN 20 (G3/4)
c	mm	DN 40 (G1,5)	DN 40 (G1,5)	DN 40 (G1.5)	DN 40 (G1,5)	DN 40 (G1,5)
d	mm	DN 15 (G1⁄2)	DN 15 (G1⁄2)	DN 15 (G1/2)	DN 15 (G1⁄2)	DN 15 (G1⁄2)

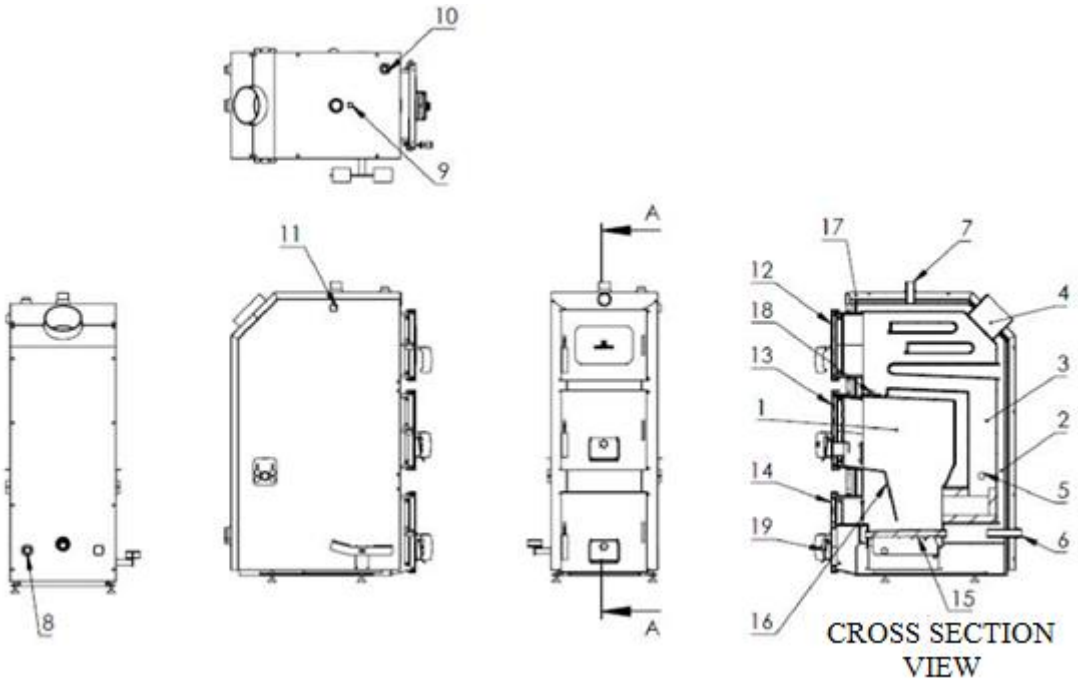


Figure No. 2: Construction of the "ŻarKo" boilers

1. Firebox
2. Water body
3. Exhaust duct
4. Flue
5. Secondary air duct
6. Return spigot
7. Supply spigot
8. Drain coupler
9. Temperature sensors
10. Draught metering device
11. Safety valve (optional)
12. Clearance doors
13. Feed doors
14. Ash door
15. Water grate with scraper
16. Chute baffle
17. Thermal insulation
18. Flue gas bypass cover
19. Flap for flue gas control

7. Installation of the boiler in the plant.

No special tools are required to assemble the boiler. Typical locksmith and plumbing tools are sufficient.
Before installing the boiler, it is advisable to carry out a pressure test for boiler leakage.
The water test pressure values are given in Table 3.
Before connecting the boiler to the heating system, carefully Read the operating manual and check that all components are in working order and that the boiler is fully equipped and in compliance with the delivery note.
"ŻarKo" type boilers should be installed in accordance with the boiler IOIM, boiler plant design,

ventilation and flue gas discharge requirements and boiler feed water quality.

An accumulation tank should be installed in the boiler installation

For safety reasons, all boiler installations should be carried out with particular care using the current state of the art in accordance with recognised engineering practice. The boiler should only be protected in accordance with DIN EN-91/B-02413.

7.1. Storage tank

In accordance with the eco-design requirements (Commission Regulation (EU) 2015/1189), boilers with manual fuel charging should be operated with a water heat accumulator tank with a capacity depending on the heat output.

The purpose of accumulation tanks is to store periodic energy surpluses in situations of fluctuating heat demand for heating purposes. the use of an accumulation tank results in full utilisation of the heat generated by the combustion process and a reduction in fuel consumption compared to a system without a tank. a boiler operating at nominal output achieves the highest efficiency while keeping emissions below the legal limit values.

The energy generated in the boiler during fuel combustion is gradually transferred via the heating medium to the insulated storage tank. This can be used at a later stage as the heating demand for the central heating and hot water system increases. After burning all the fuel, the energy stored in the tank can still be used by the system for several hours.

7.1.1 Storage tank volume

The required volume of the accumulation tank has been determined in accordance with the requirements of EN 303-5 and EU Parliamentary Decree 2015/1189. According to the aforementioned requirements, the volume of the accumulation tank must not be less than 300 litres.
The capacity shown in Table 2 has been calculated on the assumption that the heat load of the building and the minimum heat output are equal to the nominal output of the boiler.

If the heat load of the building is different from the nominal boiler output, the capacity must be verified and adopted according to the actual boiler operating conditions.
It is advisable to enlist the help of a designer

7.2. Transport to destination

To make transportation of the boilers easier and more efficient, they are usually delivered assembled on a pallet. The transportation of the boiler to its destination, due to its dimensions and weight, should be done with special care. Pipes laid on the floor or ground can be used to move the boiler.

The operation should be managed by one responsible person, preferably an experienced fitter who will be installing the boiler. This person should be responsible for selecting the method and organisation of moving and positioning the boiler.

The manner in which the boiler is moved and positioned must be adapted to suit the conditions of the premises, the condition of the pavement, obstacles, slopes, etc. *Particular attention must be paid to leg and arm safety and the possibility of tipping over the boiler.*

7.2.1 Positioning the boiler in the boiler room.

It is recommended that the boiler rests on a foundation approximately 5^10 cm above the floor. It is permissible to place it directly on a floor (subfloor) made of non-combustible materials. The boiler should be accurately levelled and the strength of the floor and the ground on which it is set should be sufficient due to the weight of the boiler including water.

There should be easy access to the boiler from all sides, especially from the front of the boiler, so that objects surrounding the boiler or the walls of the building do not obstruct the filling of the fuel , the cleaning of the burner, the furnace, the ash pan, the convection channels and the removal of deposits.

7.3. Ventilation in the boiler room

One of the conditions for good boiler operation is an adequate supply of fresh air to the boiler room. Ventilation of the boiler room is responsible for supplying the right amount of oxygen needed to burn the fuel in the boilers, as well as replacing the air in the room. This relates to safety issues - the removal of flue gases, including harmful gases and vapours that can cause danger to the occupants or ignition, resulting in an explosion or fire.

A carbon monoxide (CO) detector and a smoke detector should be placed in the boiler room

The rooms intended for the installation of solid fuel boilers and the rooms in which the fuel is stored and the boiler room should meet the provisions of the Regulation of the Minister of Infrastructure of 12.04.2002, Journal of Laws No. 75, item 690, as amended, on technical conditions to be met by buildings and their location, as well as the requirements set out in the Polish Standard for built-in solid fuel boiler rooms - PN-87/B- 02411.

With a view to safety and proper operation of the boiler, it is recommended that a ventilation plan be drawn up by an authorised person, taking into account the specifics of the building and current requirements. requirements

7.3.1 Basic ventilation requirements for boiler plants up to 25 kW

Supply ventilation - should be by means of a non-closable opening with a minimum cross-section of 200 cm2.

Exhaust ventilation - should be realised with an exhaust duct made of non-flammable material with a minimum free cross-section of 14 x 14 cm with an inlet opening under the ceiling of the boiler room. The exhaust duct should be routed above the roof and located near the chimney. Closing devices should not be located on the exhaust duct and the cross-section of the chimney should not be smaller than 20 x 20 cm.

7.3.2. Basic ventilation requirements for boiler plants up to an output of more than 25 kW

Inlet ducts -should have a cross-section not less than 50% of the chimney cross-section, but not less than 20x20 cm and its outlet opening should not be higher than 1m from the floor surface.

Exhaust duct - should have a cross section not less than 25% of the cross section of the chimney but not

less than 14x14 cm with an inlet opening under the ceiling of the boiler room. The exhaust duct should be routed above the roof and located close to the chimney and have no closing device.

Mechanical exhaust ventilation is prohibited in boiler rooms!

7.4. Flue gas installation

Due to the high thermal efficiency and low flue gas temperature, it is inadvisable to connect the boiler to traditional and standard brick and steel chimneys without protection against the effects of low flue gas temperatures.

Due to the operation of boilers at lower flue gas temperatures, there is the possibility of condensation and the formation of dangerous and aggressive chemical compounds in the chimney, which can damage the chimneys and the walls of the rooms adjacent to the chimney, which is why it is advisable to install chimneys or liners made of special grades of steel.

The boiler manufacturer is not liable for damage and all consequences and effects associated with the use of non-compliant flues.
It is the responsibility of the user to apply suitable measures and solutions!

The boiler flue should be connected to the chimney by means of an additional upward-facing steel connection with a cross-section not smaller than that of the flue. The length of the connection should be as short as possible (max. up to 400 mm). The connection to the flue must be airtight and have tightly closing cleaning holes to enable cleaning of the flue and the connection.

If a flue extension or other cleaning configuration is required, an additional cleaning hole must be provided in the connecting piece.
It is not recommended to connect two or more boilers to a common manifold.

The boiler operates with negative flue gas pressure at the boiler outlet, so the flue gas installation must provide the required flue gas draught shown in Table 3.

The dimensions of the chimney are very important for the correct operation of the boiler. The height and section should ensure the required chimney draught, which has a particular impact on the correct operation of the boiler. *Incorrect dimensions of the flue pipe height and cross section of the flue opening are the cause of insufficient draught, which may lead to faulty operation of the boiler.* The height of the chimney should take into account the conditions of the location of the boiler room in relation to other buildings. In the case of an uninsulated steel chimney, its cross-sectional area should be increased by 20%. The chimney should be routed min. 150 cm above the highest roof edge. The flue pipe should be free of other connections. The walls of the flue pipe should be smooth, airtight and without constrictions or kinks. To ensure good draught, the chimney and boiler must be thoroughly heated and dried before starting to heat (or after a break in burning).
For an approximate estimate of the size of the chimney, the formula can be used:

$$F = \frac{0{,}003 \times Q \times 0{,}86}{\sqrt{h}} (m^2)$$

Where:

Q - represents the thermal output of the boilers connected to the flue [kW],

h - height of the chimney measured from the level of the grate to the outlet [m].

The calculations according to the above formula are not the basis for the correct selection of the chimney.

The amount of draught required for the individual boilers is given in Table 2. The provision of the required draught should be supported by the designer by calculations and selection of the chimney flue parameters (section and height), taking into account climatic zones and terrain conditions. The use of a draught regulator is recommended.

The chimney installation should meet the requirements of current regulations and standards for safe flue gas discharge. A chimney sweep should assess the technical condition of the chimney and confirm the draught required for the boiler. and chimney parameters, should be carried out by a chimney sweep. During normal operation and use of the boiler at rated output, there is a very high probability of flue gas condensation due to the high efficiency of the boiler and the low flue gas temperature.

The flue pipes should be made of materials resistant to harmful chemical compounds including acids. In chimneys that have already been built, use stainless steel flue liners and chimney cowls..

7.4.1. Basic requirements for chimneys

Above all, the chimney must be safe and therefore certain essential requirements of the *Building Act* must be met:

- security of construction,
- fire safety ,
- safety in use ,
- appropriate hygiene and health conditions and environmental protection,
- energy savings.

The chimney must be built to meet these requirements:

- by a person with the required building qualifications,
- of materials with the required approvals for chimney construction,

The chimney must meet the chimney draught requirements. It must be inspected and approved by an authorised master chimney sweep before it is put into service. The chimney must meet the requirements for operation at low flue gas temperatures; it *is advisable to seek specialist advice on this issue.*

7.5. Central heating installation.

Once the boiler has been set up and connected to the chimney, the boiler must be connected to the central heating system. To do this, carry out the following steps:

- connect the boiler supply connection to the central heating system at the location intended for this purpose,

- connect the boiler return stub as described above,
- connect safety system pipes in accordance with **PN-91/B-02413**,
- fill the central heating system with water until there is a continuous overflow from the signal tube,
- connect the control unit and check that the electrical installation has been carried out correctly.

The most important requirements for safety devices are:

- an open-system expansion vessel of the capacity calculated in accordance with point 2.5.1 of PN-91/B-02413,
- a safety tube with a diameter depending on the heat output of the boiler according to Table 1,
- the expansion, signal, overflow and vent pipe, as well as the circulation pipe, allowing the vessel to maintain an adequate temperature and protected against freezing. *Valves and gate valves are not permitted on the safety pipe. This pipe should be free of constrictions and sharp bends along its entire length,*
- if it is not possible to route the safety pipes to the vessel in the shortest and simplest way possible, their routing and diameter should be in accordance with *PN-91/B-02413.*

The heating system should be properly designed with regard to the heat output of the radiators, the cross-section of the pipe. Venting in accordance with the requirements in this respect. *It is recommended that the installation be designed by a qualified designer.*

The manufacturer is not responsible for incorrect boiler operation caused by faulty and non-compliant central heating installation.

In the case of installation into an existing central heating system, the technical condition must be checked (e.g. check for leaks, flush, replace fittings, etc.).
The connection of the boiler to the central heating system must be made by a duly authorised company and the fact of a correct connection must be confirmed in writing by the heating engineer on the page: *Confirmation of installation and securing of the boiler according to PN-91/B- 02413-* attached to this manual. *The signed confirmation is a condition of the boiler warranty!*

A circulation pump is recommended for the central heating system. In the event of a power failure or pump failure, the water circulation in the system will stop and the heat will not be absorbed, which can result in a rapid increase in the boiler temperature. Therefore, a so-called 'gravity bypass' should be implemented by using a differential valve that will allow water to flow through the system in the event of power failure.

Topping up the water in the installation can only be caused by evaporation losses. Frequent topping up is a sign of a leaky system and is not permitted. This poses the risk of scale formation, which can lead to permanent boiler damage.

7.6. Electrical installation

The electrical installation with a mains voltage of 230 V / 50 Hz intended to supply the circulation pump (circulating pump) or other electrical appliances should be equipped with a protective or protective-neutral conductor with a plug socket fitted with a protective pin. The plug socket should be located at a safe distance from the heat emission source (boiler). It is *recommended that a separate electrical circuit is laid out to supply the boiler.*

7.7. Filling with water

Before starting the fire in the boiler, the heating system including the boiler must be filled with water. Filling must be carried out in accordance with the instructions of the installation contractor. To check whether the system has been filled correctly, open the valve on the signal tube for several seconds - the continuous flow of water from the signal tube indicates that the water is filling the expansion vessel at the highest point of the system and not just the signal tube. Top up the water in the boiler and the system during a break in operation when the boiler is cold. When the temperature is high, the water should be cooled by switching off the boiler and then topped up very slowly, preferably with heated water. It is recommended to use softened water. *After filling, check the boiler and system for leaks*.
The drain from the overflow and signal pipe should be placed in the boiler room and directed to the waste water system, e.g. to a washbasin, drain grating. The *pipe outlet to the drain should be free and protected from hot water splashing.*

7.7.1 Boiler water quality requirements.

The composition of boiler water depends on the parameters of the water intake and the treatment methods. In principle, each installation should be treated individually with regard to the appropriate treatment of the installation water. The water should be treated in such a way that it does not cause boiler scale formation and is not corrosive to the equipment with which it is in contact, as well as having a reduced amount of oxygen, which accelerates corrosion. The quality of water in heating systems is defined by the standard: *PN-C-04607:1993 Water in heating systems. Requirements and tests for water quality.*

Demineralised and salt-free water (desalinated) should be used for water boilers. Water that does not meet the manufacturer's or normative requirements should be subjected to treatment processes, it is recommended to use corrosion inhibitors - chemicals applied to the heating system intentionally to deactivate aggressive substances that cause corrosion and limescale.

7.8. Low-temperature corrosion.

The boiler should be operated with a supply and return temperature difference in the range of 20-15°C and a return temperature of not less than 50°C. The requirement to use an accumulation tank in the heating system and to operate the boiler at nominal output, as well as to protect the boiler return (drawing No. 4), result in compliance with this condition.
Other solutions can also be used - boiler circuit pumps directly between the supply and return and the use of mixing systems equipped with four- or three-way mixing valves.

The technical solutions described above have the effect of reducing internal corrosion of the boiler and thus prolonging its service life.

The use of temperature protection is required and a prerequisite for the boiler supplier to honour the warranty conditions.

Table 3 below shows the nominal and external diameters of the safety and expansion pipes, depending on the heat output of the central heating boiler. *Examples of open system protection schemes according to PN-91/B-02413 are shown in Fig. 3.*

Table 3

Size of boiler protection **tubes** in open circuit according to PN-91'B-02413

Boiler thermal output /kWj		safety fleece /mm		Expansion pipe [mm]	
from	To	Nominal diameter	internal diameter	Nominal diameter	Internal diameter
0	40	25	27.5	25	27,2
40	85	32	35.9		
85	140	40	41,8		

7.9 Protection diagrams for the open system according to PN-91/B-02413 and installation of the accumulation tank.

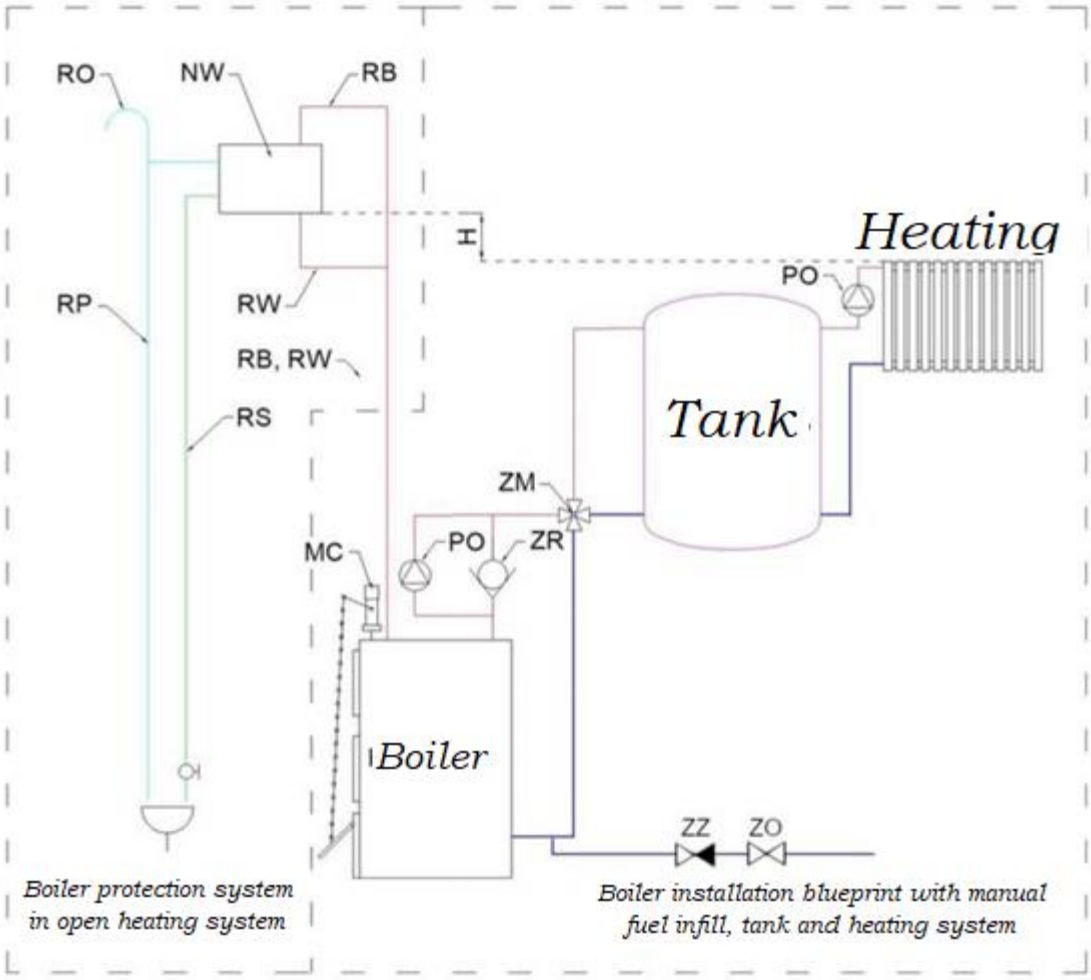


Figure 3
Diagram of protection and installation of the boiler in an open loop system

RB- safety pipe
RW- expansion pipe
RP- overflow pipe
RS- signal tube
RO- vent pipe
PO - circulating pump
ZM - mixing valve
ZR - differential valve
MC - thrust throttle
ZO - shut-off valve
ZZ - non-return valve

For gravity and pumped water heating systems with feed-mounted circulation pumps.

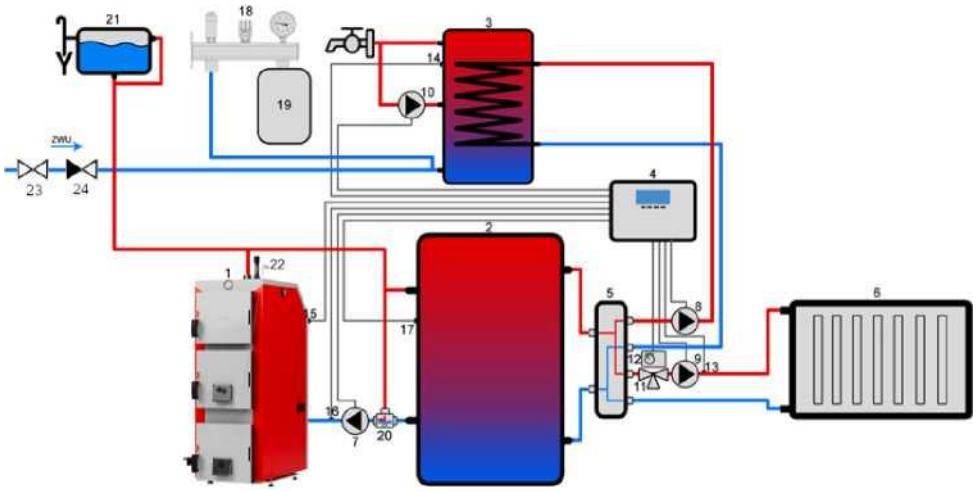
$H \geq 0{,}3m$

For gravity fed pumped water heating systems with circulation pumps of head Hp [m] installed in the return flow.

$$H \geq 0{,}7 * Hp$$

The boiler installation diagram is illustrative and does not include fittings and apparatus of the heating system equipment.

It is recommended to prepare a technological design of the boiler room.



1. Boiler
2. Buffer
3. DHW storage tank
4. Installation controller
5. Hydraulic distributor (no clutch!)
6. Radiator heating
7. Return flow/short circuit protection pump
8. DHW tank charging pump
9. CH pump

W. DHW circulation pump

11, 3-way rotary valve
12, Valve actuator
13, Valve temperature sensor
14, DHW temperature sensor
15, Boiler temperature sensor
16, Return temperature sensor
17, Buffer temperature sensor

16, DHW safety group

19. DHW diaphragm vessel
20. Return protection valve

21. **Overflow receptacle**
22. **Draught metering device**
23. Shut-off valve
24. Non-return valve

Figure 4
Heating installation diagram recommended by the manufacturer

8. Commissioning and operation of the boiler.

Before starting the ***'ŻarKo'*** boiler for the first time, it is necessary to check the correct connection of the accumulation tank and the central heating, flue gas, electrical and ventilation systems.
and tightness of the boiler in the water and flue gas system. Particular attention should be paid to the protection of the installation in an open system according to *PN-91/B-02413.* Before starting up the boiler, check that the heating system is correctly filled with water and that the water in the system and in the boiler is not frozen.
The user or his/her representative is responsible for the inspection and technical acceptance of the boiler after installation and should draw up an acceptance protocol in consultation with the designer, installer or other representative in the field of heating installations.

When firing up a cold boiler, there can be a phenomenon of condensation on the boiler walls, known as sweating, giving the illusion that the boiler is leaking. This is a natural phenomenon which disappears when the boiler warms up.

8.1. Firing up the boiler

To fire the boiler, the following steps must be taken as standard:

- Open the "short-circuit" flap through the top clean-out door when firing up. Check that the lid is

not hot before opening.

- Open the airflow flap in the ash door. Adjust the amount of air during firing with the adjustment screw.

- Place pieces of paper and a small amount of fine wood in the firebox on the grate and light it. Kindling should be done slowly until the chimney has warmed up and the flue draught is adequate, a prerequisite for proper combustion.

- Once an adequate draught has been created in the chimney, the "short circuit" flap should be closed in order to direct the flue gases towards the correct circuit (via the lower duct and the afterburning zone) to start the combustion process.

- A small amount of eco-coal should be thrown in through the filling door in order to create a layer of embers approx. 10-15 cm above the level of the grate.

- Adjust the secondary air supply by appropriately positioning the dampers in the side openings at the rear of the boiler.

- In the event of smoke from the boiler, the secondary air openings should then be closed and then, after some time (further heating of the chimney), the openings should be gradually opened with a flap until this is the case. After the boiler and flue pipe have warmed up, the above-mentioned disadvantage should disappear.

- When firing up after adding a portion of eco-coal, it is necessary to monitor the combustion process to ensure that the boiler does not go out, as different fuel qualities (kindling wood, eco-coal) can affect this.

- If the fire in the boiler goes out during firing-up, clean the furnace, ventilate the boiler ducts and repeat the firing-up process.

- When firing up, the boiler should be monitored until embers appear and the feed water temperature reaches approx. 45- 50°C, you can proceed with the firing process.

8.2. Burning in the boiler

Boiler firing is the continuation of the boiler operation after the correct firing process. The following should then be carried out:

- Close the air dosing flap located in the ash door

- Open the filling door and top up the amount of eco-coal in the firebox up to the height of the door to achieve the required steadiness.

- After fuel feeding, the boiler is regulated by the primary air supply through a flap in the combustion door.

- The air quantity is controlled by a pull rod and a draft damping device to ensure that the boiler does not exceed the maximum permissible operating temperature.

- During normal boiler operation, the combustion process consists of periodically sweeping the furnace by moving the lever of the moving grate mechanism.

- Once the fuel load has burned out, the grate should be raked, leaving a layer of embers and the fuel reloaded.

- After several firings, the boiler should be extinguished as necessary, the furnace and grate cleaned and the boiler re-fired.

8.3. Boiler operation - maintenance

During the combustion process in the boiler, the function of the regulator is performed by the draught regulator according to the settings which the user sets on the regulator following the user's manual for the regulator. Ash and cinders from burnt fuel gradually fall into a container in the ash pan. In addition, successive actuation of the lever makes it easier to clean the grate. If pieces of slag hang up, remove them to the ash pan with a rake or hook.

The flame must be observed by opening the damper flap of the hopper door. *Opening the feed door for this purpose is prohibited.*

8.4. Refuelling

Maintaining the continuity of the burning process requires periodic topping up of the combustion chamber with fuel. The frequency of topping up depends on the intensity of the burning process and the temperature of the water in the accumulation tank. Due to varying weather conditions during the heating season, the topping up frequency should be determined by experiment. On average, topping up occurs every few hours. *Lack of fuel results in a permanent stop of the combustion process and requires re-firing of the boiler.*

The fuel should be homogeneous and free of contaminants such as stones, rubble, concrete, dust, plastics, waste etc. Contaminated fuel interferes with the combustion process and can cause damage to the grate cleaning mechanism.

In order to prevent this and to avoid breakdowns and downtime, the contamination condition must be visually assessed and unnecessary and dangerous items removed from the fuel and the sorted fuel must be fed into the boiler.

Loading fuel is possible after the previous fuel load in the firebox has burned out, when there is a small layer of glowing fuel on the grate to allow ignition of the new load. Before loading the stove, make sure (by looking through the peephole) that the stove is clean.

flap) that the fuel has burned out sufficiently and needs to be refilled. Then clean the grate by moving the lever and carefully open the door while standing on the side of the boiler. After ensuring that there is no smoke or flames coming out of the boiler, level the layer of embers (if necessary) and close the combustion and ash door. Then load the fuel through the loading door.

Topping up the fuel is possible if the combustion conditions allow, i.e. the grate is cleaned of ash and the fuel has an adequate ignition layer. Otherwise, the boiler must be extinguished and re-fired. Do not top up the fuel and continue firing if the accumulation tank has reached the required temperature of approx. 80° C.

8.5. Power control

In order to regulate the output, the ***"ŻarKo"*** boiler is equipped with a temperature regulator - draught measurer, which enables operation with the appropriate output as required.
The draught meter controls the operation of the boiler by supplying the correct amount of air depending on the boiler water temperature.
Detailed information regarding the method of use, installation, settings, adjustment, etc., is given in the operating manual for the draught dampers used with the boiler, *which is an integral part of this manual.*

8.6. Operational safety

After initial start-up and prior to commissioning, the person who is qualified to carry out this type of installation and who is responsible for the installation and commissioning of the boiler (service technician) is obliged to provide the user with verbal training in the basic operating and safety rules.

After the firing-up stage, the boiler does not require permanent attendance consisting of direct observation of the combustion process; however, successive control and supervision by trained personnel is required to ensure that the boiler does not go out, to check the set temperature and to ash the grate.

Careful cleaning has a fundamental effect on the correct operation, maintenance of good draught and boiler efficiency, economical fuel consumption and the service life of the boiler. Cleaning is not difficult if carried out systematically. Failure to clean results in:

- difficult-to-remove contaminants - sinters, carbon deposits,
- interference with the stable combustion process,
- Significantly increased fuel consumption, reduced boiler efficiency,
- the escape of smoke through possible leaks.

Protecting the boiler and flue gas system from low water and flue gas temperatures by using an accumulation tank and special chimneys.

Poor fuel quality, low calorific value, high ash content, moisture content and the presence of non-combustible compounds cause, in addition to a reduction in thermal and emission parameters, rapid contamination of the grate with slag, ash and makes burning difficult and impossible.
Lack of ventilation and dampness in the boiler room, especially the floors, significantly shorten the life of the boiler.

Failure to properly secure the boiler may result in serious boiler damage and danger to the user!

It is forbidden to open the door when the boiler is in operation and to use it for permanent observation

of the combustion and for slagging off the burner and the furnace.

Failure to do so may result in burns and fire.

For your own safety, the user should request confirmation from the installer of the safety of the boiler in the open system in accordance with PN-91/B-02413.

The manufacturer of the boiler is not responsible for the technical condition and workmanship of the central heating system.

8.7. Boiler malfunctions - malfunctions

The causes of boiler malfunctions and inefficiencies are:

1. poor fuel quality,
2. wrong type of chimney and insufficient draught,
3. fouling of the boiler, especially of the convection ducts,
4. lack of ventilation in the boiler room,
5. no air supply to the boiler,
6. failure of the draught excluder,

Infirmities	***Reason for poor performance***	***Modalities***
Boiler does not reach nominal output	- wrong fuel	- use IOIM-compliant fuel
	- incorrect boiler control	- check the throttle setting
	- insufficient chimney draught	- check the patency of the flue and

		flue pipe
	- fouled boiler	- clean the boiler and the heat exchanger (flue gas ducts)
	- insufficient or no air supply in the boiler room	- check or make the air supply to the boiler room
	- low water level in the system, aerated system	- top up water (overflow from expansion vessel), bleed the system.
	- defective or improperly placed thermostat sensor in measuring nipple	- check the sensor and its installation
Fuel does not burn completely	- inadequate flue draught	- check throttle position
	- non-compliant fuel	- use the correct fuel
Uncontrolled shutdown of the boiler	- low temperature settings of the draught excluder	- check - increase settings
	- failure of the draught excluder	- notify the manufacturer's service department - Replace the proportionator
Exhaust fumes from the boiler - smoking	- open doors, boiler clean-out openings	- check that the door or lid is closed
	- damaged boiler door seal	- check the closure and tightness of the door
	- no or insufficient exhaust ventilation in the boiler room	- check the effectiveness of the extraction ventilation and, if not, carry out a
	- no inspection and cleaning of the boiler	- take care of the technical condition - cleaning,

		inspections, maintenance
	- incorrect position of the boiler door or tank lid	- adjust hinges, handles, clips - correct door alignment
	- insufficient chimney draught	- check flue, call chimney sweep, clean chimney
Water leakage from the boiler	- the phenomenon of "boiler sweating" has occurred	- set the boiler operating temperature above 50°C
	- leakage of the water part of the boiler body	- notify the manufacturer's service
Chimney destruction	- incorrectly selected chimney due to low flue gas temperature	- contact a flue gas installation specialist, upgrade chimney, use flue liner

In the event of other and unusual problems with the operation of the boiler, contact the service department of the boiler manufacturer.

Detailed types and causes of malfunctions of the throttle controller and how to rectify them are given in its operating instructions (IOIM).
All major repairs and overhauls of the boiler should be carried out by a suitably qualified heating engineer. On the other hand, repairs and maintenance of the boiler accessories are carried out by the manufacturers of these accessories or the boiler manufacturer's service department.

9. Cleaning maintenance of the boiler

The boiler requires periodic cleaning and maintenance. Systematic cleaning of the boiler, especially of the flue and the flue pipe is particularly important for proper operation and combustion efficiency. Thorough cleaning of the boiler should be carried out as necessary (estimated every few days) depending on the degree of fouling of the boiler surface.
Use only or battery torches during cleaning.

Careful cleaning has a fundamental effect on correct operation, maintenance of good draught and efficiency, economical fuel consumption and the service life of the boiler.

The thickness of the layer of dirt (dust, ash, soot) on the horizontal ducts should not exceed approx. 2 mm. To remove them, unscrew or open the cover-door.

all manholes. For cleaning and maintenance, remove the turbolift and ceramic fittings and plates. *Allow some time for them to cool down before removing.*

If ceramic components remain in the boiler, take particular care when cleaning so as not to damage them. Also allow some time for the fittings to cool down before cleaning.
Start cleaning the boiler from the duct exchanger. Clean the horizontal convection ducts with a rake from lower and lower levels and surfaces through the upper cleaning hatch, and the vertical duct through the upper cleaning hatch with a flexible wire brush. Then clean the firebox and ash pan. Remove soot and fly ash deposits outside the boiler through the cleanout and manhole openings.

After cleaning the turbochargers, insert the ceramic plates into the boiler in the correct place.

Do not drain the boiler after the end of the heating season, but thoroughly clean the furnace and exchanger flue ducts. Perform technical inspection of the whole boiler. If defects are found, repair or replace damaged parts with new ones (doors, covers, ceramic fittings, gaskets, handles, etc.). If the boiler is operated correctly, only minor defects may have to be repaired after the heating season.

In the case of small boilers, typical cleaning and maintenance operations of the combustion chamber associated with the operation process do not require access to the inside of the boiler, to the boiler or to dangerous heights. The maintenance operations associated with the operation and cleaning of the boilers should be carried out standing on the floor using tools (graca, hook, squeegee, brush, etc.).

If the overall dimensions of larger boilers are large or the boiler stands on a high foundation and it is necessary to climb to a dangerous height for servicing, cleaning, maintenance or repair, the *work* area must be *equipped with gangways and platforms with suitable barriers as required for work at a dangerous height. Operators must be suitably qualified and equipped with safety belts, harnesses and equipment for this type of work.*

Before carrying out any cleaning and maintenance work on the boiler , take the boiler out of operation, cool it down and ventilate the firebox.

It is advisable to test the concentration of carbon monoxide using a specialised meter and to ensure that the concentration does not endanger the life and health of the operator.
Clean the flue pipe through the upper cleaner, discharging the impurities into the chimney, and then remove them through the lower cleaner. *In the case of extended stubs or other configurations, an additional cleanout opening must be provided for cleaning*.

All service operations for adjustment, maintenance, repair, cleaning, etc. must be carried out with the appliance switched off during standstill and the boiler cooled down to safe temperature. Use personal protective equipment for handling - protective gloves, goggles, headgear, etc.

9.1 Daily review

As part of the daily inspection, check that:

- The boiler water temperature controller (draught measurer) is functioning correctly.
- The set temperature values on the draught measurer are realised.
- The ash pan is not overfilled

If a fault or damage to any assembly is noticed during the inspection, the faulty part or assembly must be repaired or replaced as a matter of urgency.

10. Fire safety conditions.

- The boiler is made of non-combustible materials,
- storage of other flammable materials (paints, solvents, oils, etc.) is prohibited in the room (boiler room),
- do not store fuel in the immediate vicinity of the boiler - it is advisable to store the fuel in a separate or enclosed room with the required safety distances and non-combustible materials,
- it is recommended that a fire extinguisher, a chad detector and a smoke detector be placed in the boiler room,
- have the flue pipe cleaned by a chimney sweep before the start of the heating season and successively during the season to remove soot and eliminate the risk of ignition.

It is strictly forbidden to operate the boiler with the door open.

11. Boiler emergency stop

In the event of emergency conditions, such as exceeding 100°C, pressure increase, discovery of a sudden large leakage of water in the boiler or central heating system, burst pipes, radiators, associated fittings (valves, gate valves, pumps), flue gas or water escaping from the chimney and other hazards, it is necessary:

- turn off the regulator and remove the embers from the firebox in a safe manner, preferably into a drawer or other non-flammable container,
- determine the cause of the fault and, once the fault has been corrected and the boiler and system are technically sound, proceed to restart the boiler,
- If you have any other additional problems, contact the manufacturer's service department.

• 1.1 Handling fire hazards

A potential fire hazard may occur in the event of possible embers falling into the boiler room or other unforeseeable situations. In such a case you should:

Use short residence times in the boiler room. Take care not to burn or succumb to asphyxiation and open doors, windows, vents.

Use a fire extinguisher in place of the source. It is permissible to cover embers with dry sand to quickly extinguish the fire

Once the effects of the fire have been removed and the boiler and system are technically sound, proceed to restart the boiler. In the event of damage to the boiler or its equipment, repair or replace with new.

In special cases, if the smoke in the boiler room does not allow the embers to be removed efficiently and or in other circumstances which threaten the spread of the

fire, call the fire brigade - telephone 112, 998.

12. Putting the boiler out of operation

At the end of the heating season or in other cases of planned shutdown of the boiler, the boiler must be thoroughly cleaned, paying particular attention to the combustion chamber, ash pan, convection exchanger.
Do not drain the central heating system during the shutdown period, unless repair or installation work requires it. In order to prolong the life of the boiler, it is advisable to leave the boiler in an open position for the duration of the shutdown, allowing air to flow freely through the interior of the boiler and consequently drying it.
Boiler maintenance should be carried out after the heating season.

13. Boiler equipment specification

The boiler is equipped with accessories as per Table 5.

Table 5

Boiler type	ŻarKo				
	ŻarKo 12	**ŻarKo 16**	**ŻarKo 20**	**ŻarKo 24**	**ŻarKo 28**
Temperature controller	Draught meter - Regulus RT4 3/4				

13.1 Spare parts specifications

Temperature regulator - draught excluder
Ceramic fittings
Hinges, handles
Sealing cord, gaskets
Others as agreed with the manufacturer, if required

14. Concluding remarks

For your own safety, the user should request confirmation from the installer of the boiler's open circuit protection, i.e. according to PN-91/B-02413.

If the boiler is not properly protected, there is a risk of serious damage to the boiler and a safety risk for the user.

The boiler manufacturer is not responsible for the technical condition and workmanship of the systems required or for the use of chimneys which are not suitable for low flue gas temperatures.

The use of flue pipes selected by a flue gas installation specialist, made of materials resistant to harmful chemicals including acids, is required.

Due to continuous technical progress, the manufacturer introduces ongoing structural changes to the boilers which do not affect the thermal and emission parameters, but improve their operation. The delivered boilers may differ in minor details from those presented in the manual or in the offer..

The user must carefully read and understand these operating instructions (IOIM) and the equipment.

Display the conditions for
safe operation of the boilers in a prominent place in the boiler room.

15. Environmental protection

The boiler is made of environmentally neutral materials. After the boiler has been used up and worn out, it must be dismantled and disposed of. The disassembly of the individual boiler components does not require any special description due to the simplicity of its design. Used metal parts should be

scrapped. Dispose of the remaining parts in accordance with the requirements for disposal.

15.1. Noise

Due to the intended use and specific operation of boilers with manual fuel feeding and the absence of powered mechanical components, the boiler does not emit noise and does not pose any danger as a result.

16. Residual risk

Although the manufacturer takes responsibility for the design and labelling of the boiler in order to eliminate hazards during operation as well as during operation and maintenance, certain elements of risk are unavoidable.

Residual risks arise from erroneous or inappropriate behaviour on the part of the operator of the boiler, which is why basic safety principles and rational behaviour must be applied in all situations.

In assessing and presenting the residual risk, the boiler is treated as a device that, up to the point of production, has been designed and manufactured according to the current state of the art in accordance with recognised engineering practice.

In order to draw the attention of the user and operator, the boiler has been marked with the appropriate symbols, signs, notes in the IOIM about the dangers involved and the prohibited use, which the user should strictly observe.

16.1 Causes of residual risk and ways to address them

A residual risk exists in the event of failure to comply with the specified recommendations and instructions given in the IOIM of the boiler and its equipment.

The greatest danger is in carrying out prohibited activities:

1. Using the boiler for purposes other than those described in the IOIM

    - *careful reading and reading by the operators of the IOIM of the boiler and the instructions of the equipment,*
    - *Correct and safe operation of the boiler and achievement of the declared parameters is only possible if all requirements, recommendations and warnings, orders and prohibitions are complied with.*

2. Failure to meet requirements for open layout and security systems

    - *Boiler protection only as per DIN-91/b-02413 and its confirmation by the installer,*
    - *use of a temperature controller*

3. Operation by minors as well as by persons not acquainted with the IOIM with the instructions for use of the equipment and not trained in occupational health and safety

- *comply with all service-related prohibitions stated in the IOIM,*
- *It is strictly forbidden to operate the boilers (above 50kW) by persons without a valid licence and by minors, not under the influence of alcohol or other intoxicants.*

4. Leaving the boiler unattended and unattended during operation

   - *carry out successive checks on the combustion process*
   - *equip the boiler room with a chad and smoke detector.*

5. Unauthorised modifications of any kind

   - *prohibition of interference with the design of the boiler and the equipment and system safeguards,*
   - *the heating installation and security system can only be carried out by a specialist installer,*

6. Lack of required care and distraction during handling

   - *no boiler operation without protective equipment (gloves, goggles, headgear),*
   - *it is prohibited to operate the boiler with the doors or covers of the openings open and manholes.*

7. Failure to meet chimney specific requirements

   - *making flue and chimney installations suitable for boiler operation at low flue gas temperatures.*

17. Conditions for safe operation of boilers

A basic prerequisite for the safe operation of boilers is the installation of a safety system in accordance with PN-91/B-02413.

In addition, the following rules must be observed:

1. It is forbidden to operate the boiler when the water level in the system falls below the level specified in the boiler plant operating instructions.

2. During operation, it is forbidden to put hands in dangerous places (furnace, ash pan, etc.). Use gloves, safety goggles and headgear when operating the boilers.

3. Do not open the door while the boiler is in operation.

4. Keep the boiler room tidy, where there should be no objects unrelated to the operation of the boilers.

5. Use only rechargeable torches when operating the boiler for cleaning and maintenance.

6. Ensure that the boiler and its accessories are in good working order and that all the necessary installations are in place for proper operation.

7. During the winter period, heating interruptions that could cause the water in the system or parts of it to freeze should not be used, which is particularly dangerous as firing up the boiler with an obstructed central heating system can lead to serious damage.

8. Filling and commissioning of the installation during the winter period must be carried out with care. Filling of the system during this period must be carried out with hot water so that the water in the system does not freeze during filling.

9. It is not permitted to light the boiler using flammable and explosive agents such as petrol, paraffin, etc.

10. Take into account the specific requirements for chimneys.

11. Do not cover ventilation openings

12. Call the fire brigade in justified cases of fire risk to the facility (e.g. ignition of soot in the chimney).

13. Any faults with the boiler must be rectified immediately.

14. Pay attention to residual risks.

15. Ensure that the operating conditions of the boiler and the safety system are such that the temperature of the boiler water does not fall below 10°C. *In case of any suspicion of possible water freezing in the central heating system and especially in the boiler safety system, check the patency of the system.*

If there is no patency, firing up the boiler is prohibited.
It is prohibited to allow cold water to enter the hot boiler and flood the furnace.

18. Hazards arising from improper use of the boiler

Cause of danger	*Anticipated possible effect*	*Method of prevention*
Boiler protection not compliant	Bursts - destruction of the boiler, explosion	Boiler protection in open circuit according to PN-91/B 02413 and IOIM
Freezing of the water in the boiler including the central	Bursts - destruction of the boiler, explosion	Properly insulate the central heating system and the
Storage of flammable and explosive materials, e.g.: solvents, paints, etc., in the vicinity of the boiler.	Fire, explosion	Removal of all substances, flammable materials from the danger area
Leaving doors, lids or hatches, cleaning openings open	Uncontrolled boiler operation - no controllability, boiling water, smoke	Check and close all doors and covers of the boiler, tank
Rapid and unreasonable opening of doors	Exhaust fumes, embers, flames to the outside	Use the sight glass in the hopper door to observe the flame.
Boiler leakage-no water in boiler and central heating system.	Burnout - destruction of the boiler, fire	Check the water level in the central heating system by checking the overflow from the expansion vessel of the open-system installation
Lack of ventilation in the boiler room	Smoke in the boiler room if the flue gas escapes outside the boiler	Perform supply ventilation of the boiler room - follow boiler IOIM
No boiler operation and maintenance	Flue gas leakage outside the boiler, accelerated wear, corrosion of the boiler	Carry out maintenance and cleaning of the boiler in accordance with the IOIM
Topping up the central heating system with cold water during boiler operation	Possible destruction of the boiler - rupture, water leakage from the boiler	Top up the central heating system of the cooled boiler during standstill, preferably with
No chimney suitable for low flue gas temperatures	Destruction of the chimney, the wall of the building façade - large repair costs.	Use of the correct chimney - specialist company recommended

The possible final and tragic consequences of the above-mentioned hazards resulting from improper use of the boiler can be burns, poisoning, disability and, in extreme cases, even death.

19 Additional information

Any additional information, such as certificates, attestations and other documents, will be successively supplemented and verified and added to this operating manual as appendices and will form an integral part of it.

1. **Appendices:**

- Confirmation of installation and securing of the boiler according to PN-91/B-02413

- Declaration of conformity
- Warranty card

2. Annexes - file

- Ecodesign requirement sheet for "ŻarKo " solid fuel boilers in accordance with EU Regulation 2015/1189 Annex II point. 2a
- Product fiche in accordance with EU Regulation 2015/1187 Supplementing Directive 2009/125/EC of the European Parliament and of the Council

Confirmation of installation and securing of the boiler according to PN-91/B-02413

Boiler type: ŻarKo .....

Factory no: .....

Year of construction:.....

Installer:

Company name: .....

Name of installer: .....

User:

Name:.....

Address/telephone: .....

I, the undersigned, declare with full responsibility that the above-mentioned boiler has been installed in a correctly constructed central heating system and protected in an open system in accordance with the PN-91/B-02413 standard "Protection of open-system water-heating systems" and has been fitted with basic protection elements:

- an open expansion vessel of the required capacity protected against freezing,
- protection tubes and overflow and vent pipes with diameters according to power the thermal efficiency of the boiler(s) without shut-off fittings and ducting.

Signature and stamp of the installer

KOTŁOSPAW Sp. z o.o. DECLARATION OF CONFORMITY

Person authorised to issue technical documentation: ***Przemysław Wroński*** By signing this document we declare with full responsibility that the low-temperature central heating water boiler manufactured by our company. ***"ŻarKo"*** for solid fuel with manual feeding.

Boiler type: ŻarKo Power…kW
Serial No.....
Year of construction.

to which this declaration and the declaration of conformity of the equipment relates complies with the requirements of the following EU directives, acts, regulations and standards and recognised engineering practice to ensure safety:

DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 17 May 2006 on machinery (OJ L.152/43 of 09.06.2006) amending Directive 95/16/EC (recast)
DIRECTIVE 2014/68/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 15 May 2014 on the harmonisation of the laws of the Member States relating to making pressure equipment available on the market (Article 4(3)) (OJ L.189/164 of 27.06.2014) ***REGULATION (EU) 2017/1369 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL***
of 4 July 2017 establishing a framework for energy labelling and repealing Directive 2010/30/EU (OJ L-198/1 of 28.07.2017)
DIRECTIVE 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL *of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285/10 of 31.10.2009).*
COMMISSION DELEGATED REGULATION (EU) 2015/1187
of 27 April 2015 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of solid fuel boilers and kits comprising a solid fuel boiler, additional heaters, temperature controllers and solar thermal equipment (OJ L.193/43 of 21.07.2015)
COMMISSION REGULATION (EU) 2015/1189
of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel boilers (OJ L.193/100 of 21.07.2015)
Regulation of the Minister of Development and Finance on requirements for solid fuel boilers Dz.U. 2017 item 1690 as amended ***Dz.U. 2019 pos. 363, Dz.U. 2019 item 2549*** based on the following standards and technical specifications adopted for evaluation:

- ***EN 303-5. Solid fuel heating boilers with manual and automatic fuel feed up to 500 kW nominal output. Definitions, requirements, tests and markings.***
- ***PN-91/B-02413*****. district heating*****. Protection of open-system water heating installations. Requirements***.
- ***EN ISO 12100 Safety of machinery. General principles for design. Risk assessment and risk reduction***
- ***WUDT-UC. Conditions of the Office of Technical Inspection - pressure equipment*** **The boiler has:**
- EU design examination certificate module B No - Certificates and test certificates for ecodesign and EN 303-5 requirements

The boiler bears the "CE" marking

Company owner

Place, date

Signature of authorised person

WARRANTY CARD

1. Name of the central heating boiler: steel water boiler, coal gasification.

Type: ŻarKo

Power .....[kW]

Factory number .....

2. The guarantee is given from the date of purchase on

Boiler	24 months
boiler with return protection*	60 months
thrust gauge	24 months

3. Complaints should be submitted to the address of the retailer or manufacturer.

Date, stamp and signature of manufacturer

Date, stamp and signature of seller

4. I conclude that the boiler as mentioned above

1. has been installed in accordance with the operating and installation instructions
2. a leak test has been carried out at a pressure of 4 bar for at least 10 minutes

Date, stamp, legible signature of the representative of the company that installed the boiler

*register at www.kotlospaw.pl and receive a return e-mail with the extended warranty

Ecodesign requirement sheet for solid fuel boilers in accordance with EU Regulation 2015/1189 Annex II point. 2a

Name and address of the equipment supplier	KOTŁOSPAW Sp. z o.o. 63-300 Pleszew ul. Szenica 38						
Model ID:	**ŻarKo 12**						
Fuel delivery method:	Manual loading						
Condensing boiler: **no**	Solid fuel CHP boiler:		**not**	Multifunctional boiler:			**not**
Fuel:	Recommended fuel	Other suitable fuel:	ηs %	Emissions related to seasonal space heating			
				PM	OGC	CO	NOx
				mg/m^3			
Logs, moisture content ≤ 25 %		none					
Woodchips, moisture content 15-35		none					
Woodchips, moisture content > 35 %		none					
Pressed wood in the form of pellets or briquettes		none					
Sawdust, moisture content ≤ 50 %		none					
Other woody biomass		none					
Non-wood biomass		none					
Hard coal	yes		82	17	19	682	304
Lignite (including briquettes)		none					
Coke		none					
Anthracite		none					
Mixed fossil fuel briquettes		none					
Other fossil fuel		none					
Briquettes made from a mixture (30-70 %) of biomass and fossil fuel		none					
A different mix of biomass and fossil fuel		none					

Properties when operated using only the recommended fuel.

Parameter	Symbol	Value	unit	Parameter	Symbol	Value	unit
Utility heat generated				***Utility efficiency***			
at rated heat output	*Pn*	12,7	kW	at rated thermal power	ηn	84,6	%
at 30 % of rated thermal output	*Pp*	-	kW	at 30 % of rated thermal power	ηp	-	%
for solid fuel CHP boilers: efficiency Electricity				***Electricity consumption for own use***			
at rated heat output	$\eta_{el,n}$	not applicable	%	at rated thermal power	^{el}max	-	kW
				at 30 % of rated thermal power	^{el}min	-	kW
				secondary abatement equipment, where appropriate			kW
				in standby mode	PBS`B	-	kW

Contact details	KOTŁOSPAW Sp. z o.o. ul. Szenica 38, 63-300 Pleszew tel: Kotlospaw@kotlospaw.pl

Ecodesign requirement sheet for solid fuel boilers in accordance with EU Regulation 2015/1189 Annex II point. 2a

Name and address of the equipment supplier	KOTŁOSPAW Sp. z o.o. 63-300 Pleszew ul. Szenica 38						
Model ID:	**ŻarKo 16**						
Fuel delivery method:	Manual loading						
Condensing boiler: **no**	Solid fuel CHP boiler:		**not**	Multifunctional boiler:			**not**
Fuel:	Recommended fuel	Other suitable fuel:	ηs %	Emissions related to seasonal space heating			
				PM	OGC	CO	NOx
				mg/m^3			
Logs, moisture content ≤ 25 %		none					
Woodchips, moisture content 15-35		none					
Woodchips, moisture content > 35 %		none					
Pressed wood in the form of pellets or briquettes		none					
Sawdust, moisture content ≤ 50 %		none					
Other woody biomass		none					
Non-wood biomass		none					
Hard coal	yes		82	14	20	678	306
Lignite (including briquettes)		none					
Coke		none					
Anthracite		none					
Mixed fossil fuel briquettes		none					
Other fossil fuel		none					
Briquettes made from a mixture (30-70 %) of biomass and fossil fuel		none					
A different mix of biomass and fossil fuel		none					

Properties when operated using only the recommended fuel.

Parameter	Symbol	Value	unit	Parameter	Symbol	Value	unit
Utility heat generated				***Utility efficiency***			
at rated heat output	*Pn*	15,6	kW	at rated thermal power	ηn	84,9	%
at 30 % of rated thermal output	*Pp*	-	kW	at 30 % of rated thermal power	ηp	-	%
for solid fuel CHP boilers: efficiency Electricity				***Electricity consumption for own use***			
at rated heat output	$^{n}el,n$	not applicable	%	at rated heat output	^{el}max	-	kW
				at 30 % of rated thermal output	*elmin*	-	kW
				secondary abatement equipment, if applicable			kW
				in standby mode	*PBSB*	-	kW

Contact details	KOTŁOSPAW Sp. z o.o. ul. Szenica 38, 63-300 Pleszew tel: Kotlospaw@kotlospaw.pl

Ecodesign requirement sheet for solid fuel boilers in accordance with EU Regulation 2015/1189 Annex II point. 2a

Name and address of the equipment supplier		KOTŁOSPAW Sp. z o.o. 63-300 Pleszew ul. Szenica 38						
Model ID:		**ŻarKo 20**						
Fuel delivery method:		Manual loading						
Condensing boiler:	**not**	Solid fuel CHP boiler:		**not**	Multifunctional boiler:			**not**
Fuel:		Recommended fuel	Other suitable fuel:	ηs %	Emissions related to seasonal space heating			
					PM	OGC	CO	NOx
					mg/m3			
Logs, moisture content ≤ 25 %			none					
Woodchips, moisture content 15-35			not					
Woodchips, moisture content > 35 %			not					
Pressed wood in the form of pellets or briquettes			not					
Sawdust, moisture content ≤ 50 %			not					
Other woody biomass			not					
Non-wood biomass			not					
Hard coal		yes		82	11	20	674	308
Lignite (including briquettes)			not					
Coke			not					
Anthracite			not					
Mixed fossil fuel briquettes			not					
Other fossil fuel			not					
Briquettes made from a mixture (30-70 %) of biomass and fossil fuel			not					
A different mix of biomass and fossil fuel			not					

Properties when operated using only the recommended fuel.

Parameter	Symbol	Value	J.m.	Parameter	Symbol	Value	J.m.
Usable heat generated				***Utility efficiency***			
at rated heat output	*Pn*	18,5	kW	at rated heat output	*nn*	85,2	%
at 30 % of rated thermal output	*Pp*	-	kW	at 30 % of rated thermal output	ηp	-	%
for solid fuel CHP boilers: electrical efficiency				***Consumption of electricity for own use***			
at rated heat output	$^{p}el,n$	not applicable	%	at rated heat output	^{el}max	-	kW
				at 30 % of rated thermal output	*elmin*	-	kW
				secondary abatement equipment, if applicable			kW
				in standby mode	*PBSB*	-	kW

Contact details	KOTŁOSPAW Sp. z o.o. ul. Szenica 38, 63-300 Pleszew tel: Kotlospaw@kotlospaw.pl

Ecodesign requirement sheet for solid fuel boilers in accordance with EU Regulation 2015/1189 Annex II point. 2a

Name and address of the equipment supplier		KOTŁOSPAW Sp. z o.o. 63-300 Pleszew ul. Szenica 38					
Model ID:		**ŻarKo 24**					
Fuel delivery method:		Manual loading					
Condensing boiler:	**not**	Solid fuel CHP boiler:	**not**	Multifunctional boiler:			**not**

Fuel:	Recommended fuel	Other suitable fuel:	ηs %	Emissions related to seasonal space heating			
				PM	OGC	CO	NOx
				mg/m^3			
Logs, moisture content ≤ 25 %		none					
Woodchips, moisture content 15-35		not					
Woodchips, moisture content > 35 %		not					
Pressed wood in the form of pellets or briquettes		not					
Sawdust, moisture content ≤ 50 %		not					
Other woody biomass		not					
Non-wood biomass		not					
Hard coal	yes		82	11	23	669	327
Lignite (including briquettes)		not					
Coke		not					
Anthracite		not					
Mixed fossil fuel briquettes		not					
Other fossil fuel		not					
Briquettes made from a mixture (30-70 %) of biomass and fossil fuel		not					
A different mix of biomass and fossil fuel		not					

Properties when operated using only the recommended fuel.

Parameter	Symbol	Value	J.m.	Parameter	Symbol	Value	J.m.
Usable heat generated				***Utility efficiency***			
at rated heat output	*Pn*	22,9	kW	at rated heat output	*nn*	84,7	%
at 30 % of rated thermal output	*Pp*	-	kW	at 30 % of rated thermal output	ηp	-	%
for solid fuel CHP boilers: electrical efficiency				***Consumption of electricity for own use***			
at rated heat output	^{n}*el,n*	not applicable	%	at rated heat output	^{el}*max*	-	kW
				at 30 % of rated thermal output	*elmin*	-	kW
				secondary abatement equipment, if applicable			kW
				in standby mode	*PBSB*	-	kW

Contact details	KOTŁOSPAW Sp. z o.o. ul. Szenica 38, 63-300 Pleszew tel: Kotlospaw@kotlospaw.pl

Ecodesign requirement sheet for solid fuel boilers in accordance with EU Regulation 2015/1189 Annex II point. 2a

Name and address of the equipment supplier		KOTŁOSPAW Sp. z o.o. 63-300 Pleszew ul. Szenica 38					
Model ID:		**ŻarKo 28**					
Fuel delivery method:		Manual loading					
Condensing boiler:	**not**	Solid fuel CHP boiler:	**not**	Multifunctional boiler:			**not**

Fuel:	Recommended fuel	Other suitable fuel:	ηs %	Emissions related to seasonal space heating			
				PM	OGC	CO	NOx
				mg/m3			
Logs, moisture content ≤ 25 %		none					
Woodchips, moisture content 15-35		not					
Woodchips, moisture content > 35 %		not					
Pressed wood in the form of pellets or briquettes		not					
Sawdust, moisture content ≤ 50 %		not					
Other woody biomass		not					
Non-wood biomass		not					
Hard coal	yes		81	11	26	663	346
Lignite (including briquettes)		not					
Coke		not					
Anthracite		not					
Mixed fossil fuel briquettes		not					
Other fossil fuel		not					
Briquettes made from a mixture (30-70 %) of biomass and fossil fuel		not					
A different mix of biomass and fossil fuel		not					

Properties when operated using only the recommended fuel.

Parameter	Symbol	Value	J.m.	Parameter	Symbol	Value	J.m.
Usable heat generated				***Utility efficiency***			
at rated heat output	*Pn*	27,2	kW	at rated heat output	*nn*	84,2	%
at 30 % of rated thermal output	*Pp*	-	kW	at 30 % of rated thermal output	ηp	-	%
for solid fuel CHP boilers: electrical efficiency				***Consumption of electricity for own use***			
at rated heat output	$^{n}el,n$	not applicable	%	at rated heat output	^{el}max	-	kW
				at 30 % of rated thermal output	*elmin*	-	kW
				secondary abatement equipment, if applicable			kW
				in standby mode	*PBSB*	-	kW

Contact details	KOTŁOSPAW Sp. z o.o. ul. Szenica 38, 63-300 Pleszew tel: Kotlospaw@kotlospaw.pl

PRODUCT FICHE IN ACCORDANCE WITH EU REGULATION 2015/1187 SUPPLEMENTING DIRECTIVE 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

KOTŁOSPAW Manufacturer: KOTŁOSPAW Sp. z o.o., ul. Szenica 38,63-300 Pleszew

Device parameters	**Model identifier**				
	ŻarKo				
	12	16	20	24	28
Energy efficiency class	B	B	B	B	C
Rated thermal output	12 kW	16 kW	20 kW	24 kW	28 kW
Energy efficiency index	82,00	82,00	82,00	82,00	81,00
Seasonal energy efficiency of space heating	82%	82%	82%	82%	81%

Observe all assembly, installation, and maintenance requirements contained in the instruction manual supplied with the boiler.

PN-EN 303-5:2021-09