



**Informations about fireplaces with water jacket  
and their installation.**

## 1. FIREPLACE WITH A WATER JACKET

While deciding on the fireplace at your house, you have to decide, first of all, on the function that it is to perform. If the fireplace is only going to serve as decoration where you burn wood once in a blue moon and its main function is to decorate the living room, there are a lot of options to choose from. You do not have to worry about the typical insert selection criteria as it is in the case of fireplaces that you want to use to heat the house. If, however, you want to decide on a fireplace that will serve as the source of heat, there are a few factors to be considered.

First of all, you should remember that the fireplace insert should be installed in accordance with the standards existing in a given country. The first decision that you have to make is whether the fireplace will only be used to heat the air or whether you are going to combine it with the central heating system in order for it to heat, for example, also the water circulating in the radiators.

Thanks to the hot air distribution system, forced air fireplaces can heat all the rooms in the house to which the pipes or tunnels distributing the heat are supplied. This solution is easier to install in new buildings. However, you have to start considering it at the early stage of the house construction process. If the forced air distribution system is not designed early enough, you can encounter problems with planning and designing it later on. In the case of existing buildings with no hot air distribution system, installing this solution will be very difficult as it is connected with serious reconstruction. The opponents of hot air distribution systems claim that air heating makes the wall in which the vents are installed dirty. This results in the need to often paint the rooms. However, this is not entirely true. It is a fact that using vent strips or diffusers leads to more active accumulation of dust. It is visible especially when the exit vents are located close to the floor. The best solution to this problem is using air filters at the outlets of the tunnels. This does not eliminate the problem completely but it can reduce it considerably provided that you clean the filters regularly.

A certain advantage of fireplaces with a water jacket is the option of connecting them with the existing central heating installation or with floor heating. In their case, there is no additional dust accumulation and it is not necessary to install an additional heat distribution system. The best results are achieved when the fireplace is used regularly, not occasionally. Then, you can really make considerable savings in comparison to other methods of heating.

It is obvious that both solutions have their pros and cons and that is why it is important to select the one that will best fulfill the expectations of the client. Thanks to the option of connecting the fireplace with the central heating installation, more and more people decide to heat their houses by means of fireplace inserts with water jackets. This is caused, among others, by the growing prices of gas, oil, and electricity. Apart from that, the appearance of an installed insert with a water jacket practically does not differ in any way from a typical forced air insert. The real difference lies in the material and in the construction of the device.

## 1.1. THE CRITERIA OF CHOOSING FIREPLACE INSERTS WITH WATER JACKETS

A fireplace with a water jacket can support or even totally replace the main source of central heating without any problem. Such a solution is more advantageous in comparison to heating the house with gas, oil, coal, as it can turn out that the costs of heating are even twice as low. More and more people decide to heat their houses by means of fireplace inserts with water jackets. This is caused by the growing costs of fuel as well as the esthetic features of fireplace inserts. The heat produced from burning wood is transferred to water as the heating medium and radiated through the glass to the room in which the insert is placed.

While installing a fireplace with a water jacket, we do not have to construct a separate system, an independent installation. We use the existing central heating installation. The appearance of the insert itself together with the water jacket does not differ from the traditional forced air insert. The fumes in the fireplace heat the water circulating in the walls of the insert.

The nominal power of inserts with water jackets is between 8 and 30 kW (8, 9, 10, 12, 14, 15, 16, 17, 18, 19, 22, 24, 30 kW). This is average power and that is why you should bear in mind that it is not constant and that it depends on the amount of fuel and on its burning phase. We can assume that in the appropriate conditions you can obtain  $\sim 3$  kW of power per 1 kg of wood with the moisture content of  $< 20\%$ .

The simplest method of selecting a fireplace insert is **the apartment area (m<sup>2</sup>)**, considering the demand for heat. The heaters should be selected on the basis of the operating temperature of the central heating installation 55°C - 65°C.

The calculations for the Oliwia 22 kW insert are as follows:

22 kW insert can heat an apartment with the area of about 220 m<sup>2</sup> (22 kW  $\times$  10 m<sup>2</sup> = 220 m<sup>2</sup>).

By analogy, we can perform similar calculations for the nominal power of other inserts.

Another, more precise method is determining the power of the system based on the **heat emitters (kW)**. A traditional solution in family houses is using single- and double-panel radiators. The length and the height of the radiator depend on the demand for the heat needed to heat the room. Calculations of the number and the size of the radiators (their total power) are provided in most standard house designs and they are usually not available in individual designs. If no calculations are provided, you can use a considerably simplified method – calculating the power of the radiators on the basis of the area to be heated.

Example 1:

200 m<sup>2</sup> house, good insulation, heat demand - 60 W/m<sup>2</sup>

60 W/m<sup>2</sup>  $\times$  200 m<sup>2</sup> = 12000 W = 12 kW (total power of the radiators)

Example 2:

200 m<sup>2</sup> house, average insulation, heat demand - 90 W/m<sup>2</sup>

90 W/m<sup>2</sup>  $\times$  200 m<sup>2</sup> = 18000 W = 18 kW (total power of the radiators)

Example 3:

200 m<sup>2</sup> house, poor insulation, heat demand - 140 W/m<sup>2</sup>

140 W/m<sup>2</sup>  $\times$  200 m<sup>2</sup> = 28000 W = 28 kW (total power of the radiators)

The power of the emitters should be adequate (or higher) to the power of the fireplace insert or a different source of heat.

Heat demand depends on the size and type of the building as well as on its insulation.

As an example, we will perform the calculations for a bungalow with the floor area of 200 m<sup>2</sup>.

The heat demand ( $Q_s$ ) of the building is calculated according to the following formula:

$$Q_s [W] = V \times G \times (t_w - t_z)$$

Heat demand per 1 m<sup>2</sup> of floor area ( $Q_{SA}$ ) is calculated according to the following formula:

$$Q_{SA} [W/m^2] = Q_s / A$$

where:

$A$  - house area

$h$  - the height of the rooms

$V$  - the cubic capacity of the room ( $A \times h$ )

$t_w$  - temperature in the room

$t_z$  - temperature outside

$G$  - average heat transfer coefficient

values used in the calculations:

200 m<sup>2</sup>

2,60 m

520 m<sup>3</sup>

+ 20°C

- 20°C

$G = 0,75$  building with good insulation

$G = 0,9$  building with average insulation

$G = 1,2$  building with poor insulation

The values obtained as a result of the calculations performed are presented in the table below:

Heat demand $Q_{SA}$ [W/m <sup>2</sup> ] of the building	one-story house with a loft	bungalow
building with good insulation	50 - 60 W/m <sup>2</sup>	60 - 70 W/m <sup>2</sup>
building with average insulation	80 - 90 W/m <sup>2</sup>	90 - 100 W/m <sup>2</sup>
building with poor insulation	130 - 140 W/m <sup>2</sup>	140 - 200 W/m <sup>2</sup>

The selection of the fireplace insert based on the **heat demand of the building**.

Insert power is calculated in accordance with the following formula:

$$\text{Fireplace insert power [kW]} = \frac{\text{Total power of heat emitters [kW]}}{\text{(radiators, floor heating, cointainer)}} \times G (0,75 \text{ to } 1,2)$$

Example 1: (building with good insulation) the total power of heat emitters calculated on the basis of the heat demand of the building: 14-16 kW

$$Q_s = 520 \times 0,75 \times (20 - (-20)) = 15600 \text{ W} = 15,6 \text{ kW}$$

$$Q_{SA} = 15600 \text{ W} : 200 \text{ m}^2 = 78 \text{ W/m}^2$$

$$16 \text{ kW} \times 0,75 = 12 \text{ kW}$$

An insert with the power of 10-12 kW will be appropriate for the building (this pertains to a well-insulated house where the heat emitters have low water capacity, the heat demand of the building itself is low, and the radiators were selected with the assumption of 78 W/m<sup>2</sup>).

Example 2: (building with average insulation) the total power of heat emitters calculated on the basis of the heat demand of the building: 16-19 kW

$$Q_s = 520 \times 0,9 \times (20 - (-20)) = 18700 \text{ W} = 16-19 \text{ kW}$$

$$Q_{SA} = 18700 \text{ W} : 200 \text{ m}^2 = 93 \text{ W/m}^2$$

$$18 \text{ kW} \times 0,9 \text{ kW} = 16,2 \text{ kW}$$

An insert with the power of 15-17 kW will be appropriate for the building (this pertains to a house with average insulation with an installation with high water capacity and with high heat demand where the radiators were selected with the assumption of 90 W/m<sup>2</sup>).

Example 3: (building with poor insulation) the total power of heat emitters calculated on the basis of the heat demand of the building: 22-25 kW

$$Q_s = 520 \times 1,2 \times (20 - (-20)) = 24900 \text{ W} = 25 \text{ kW}$$

$$Q_{SA} = 24900 \text{ W} : 200 \text{ m}^2 = 124 \text{ W/m}^2$$

$$25 \text{ kW} \times 1,2 = 30 \text{ kW}$$

An insert with the power of 30 kW will be appropriate for the building (this pertains to houses without insulation with an installation with high water capacity and with high heat demand where the radiators were selected with the assumption of 120 W/m<sup>2</sup>).

### **Floor heating**

The amount of heat emitted by the floor is limited and usually amounts to 70-80 W/ m<sup>2</sup>. This value depends on the acceptable floor temperature. Such an amount of heat is adequate to heat warm modern houses. However, if the windows are not tight, if there are many thermal bridges or if the rooms are high or if they have glazed walls, floor heating must be supplemented with radiators. Usually mixed systems (radiators plus floor heating) are used in family houses.

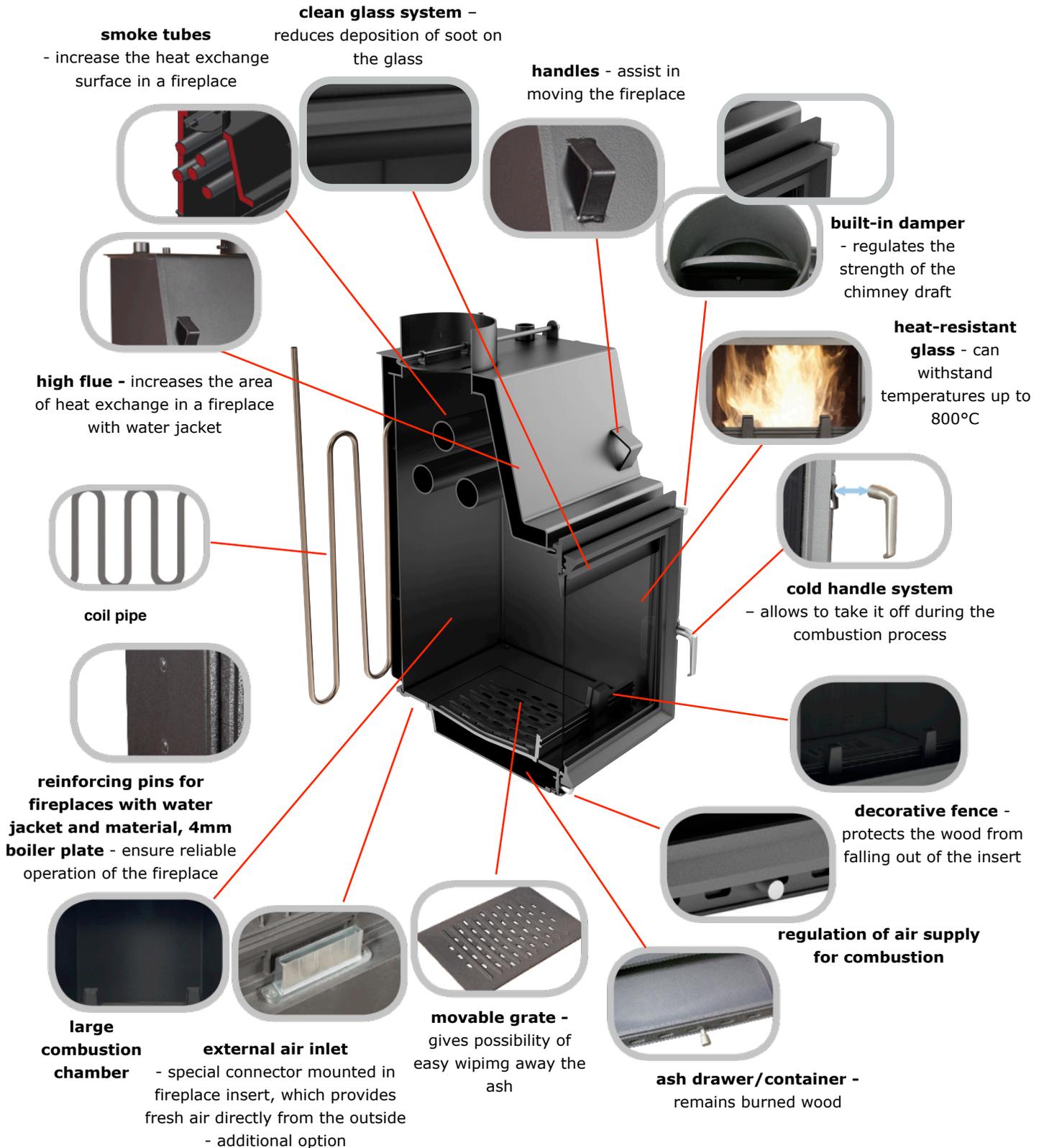
$$70 \text{ W/m}^2 \times 160 \text{ m}^2 \text{ of floor heating} = 11200 \text{ W, thus fireplace insert power} = 12 \text{ kW}$$

### **Water heater**

If the stove is to heat the hot water heater then conversion factor should be indicated by the manufacturer of the tray. Avarage shall be 1 kW = 50 - 100 l.

## 2. REVIEW OF THE FIREPLACE INSERTS WITH WATER JACKET

### 2.1. FIREPLACE INSERTS WITH WATER JACKET FOR CONTINUOUS BURNING





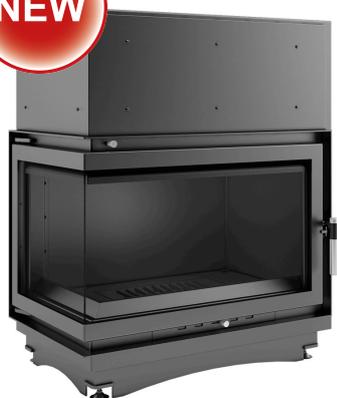
front glass



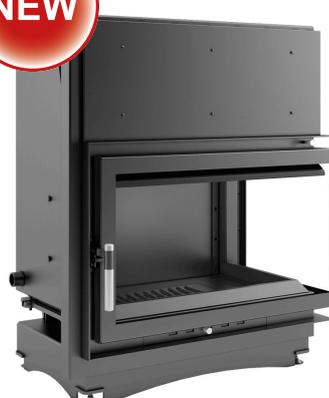
panoramic glass



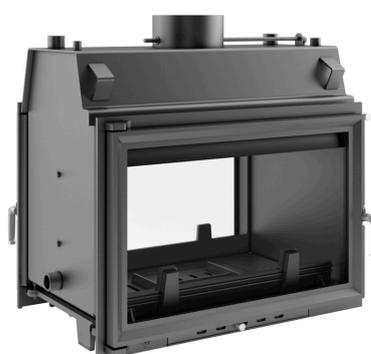
prismatic glass



left BS



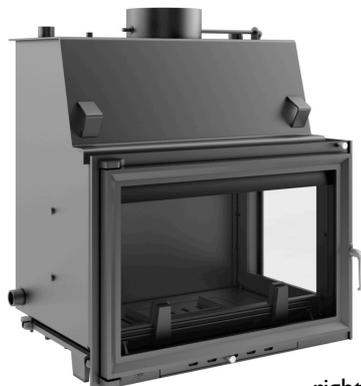
right BS



tunnel



left

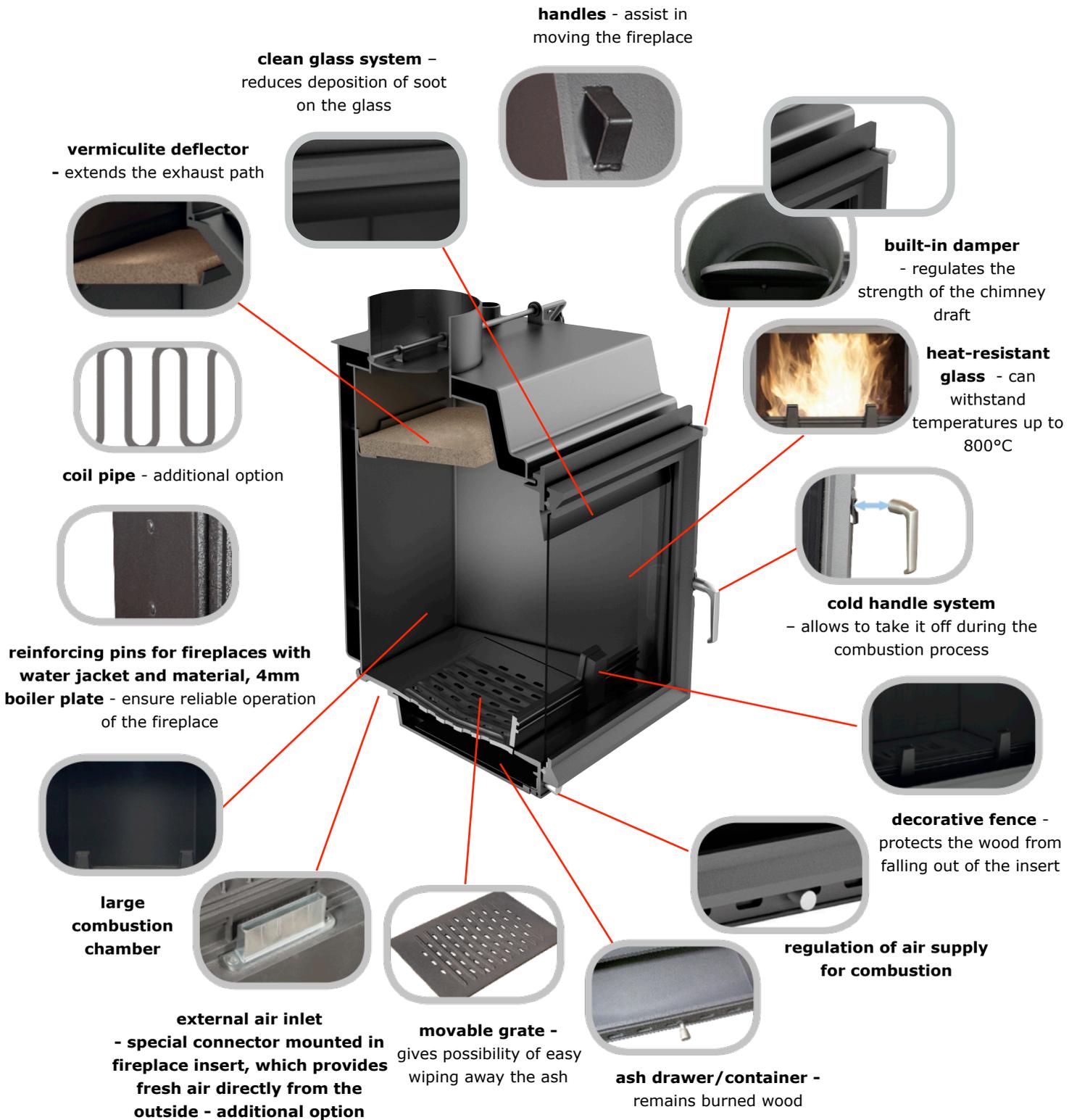


right



lift up system

## 2.2. FIREPLACE INSERTS WITH WATER JACKET WITH TRAPEZE-TYPE FOUNDATION FOR CONTINUOUS BURNING





front glass



lift up system



panoramic glass

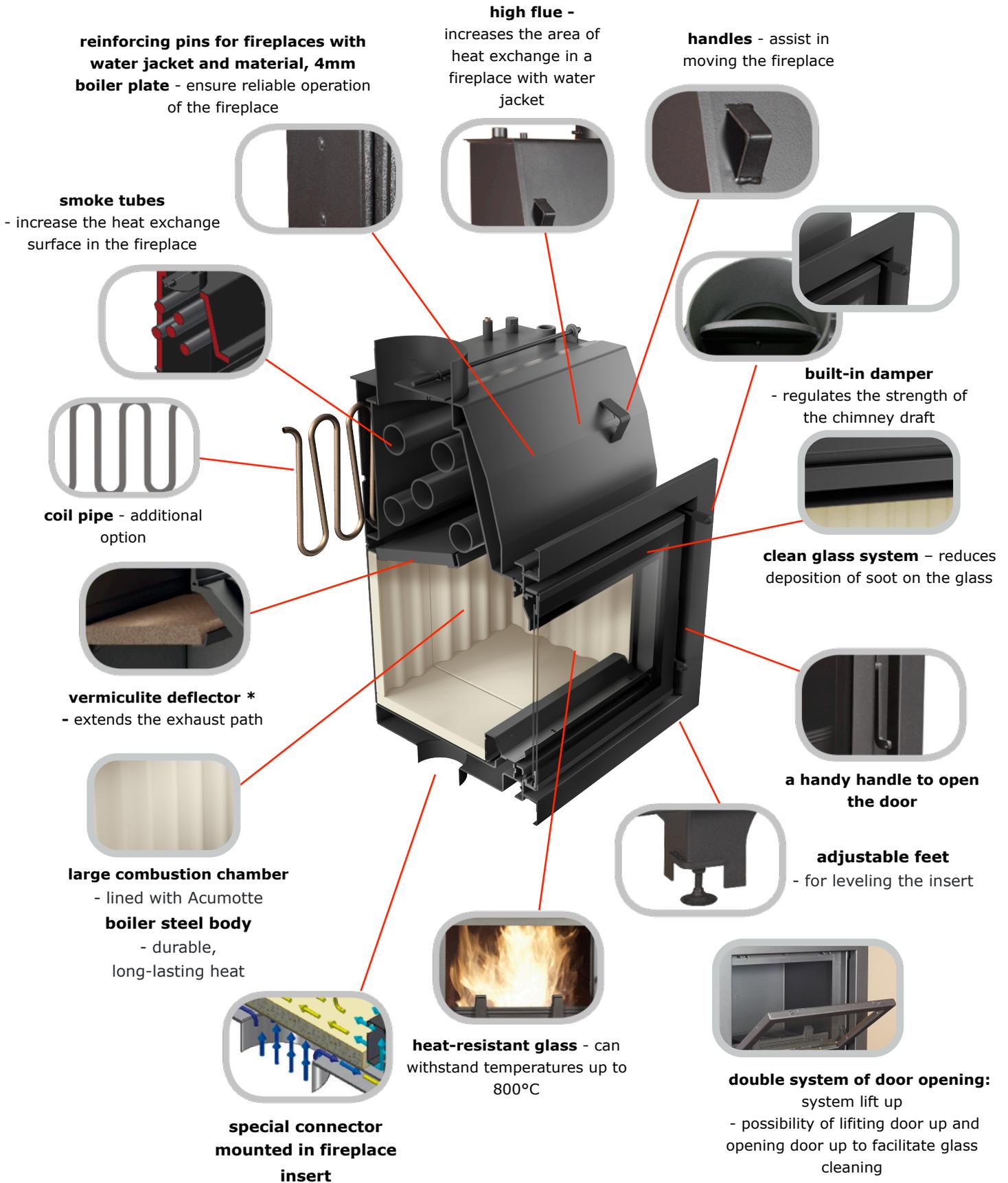


prismatic glass

## 2.3. GUILLOTINE-TYPE FIREPLACE INSERTS WITH WATER JACKET FOR CONTINUOUS BURNING



## 2.4. STEEL FIREPLACE INSERTS WITH WATER JACKETS FOR CONTINUOUS BURNING



\* Mila-type fireplace inserts only



Mila/PW 24 kW



Mila/PW 24 kW glass

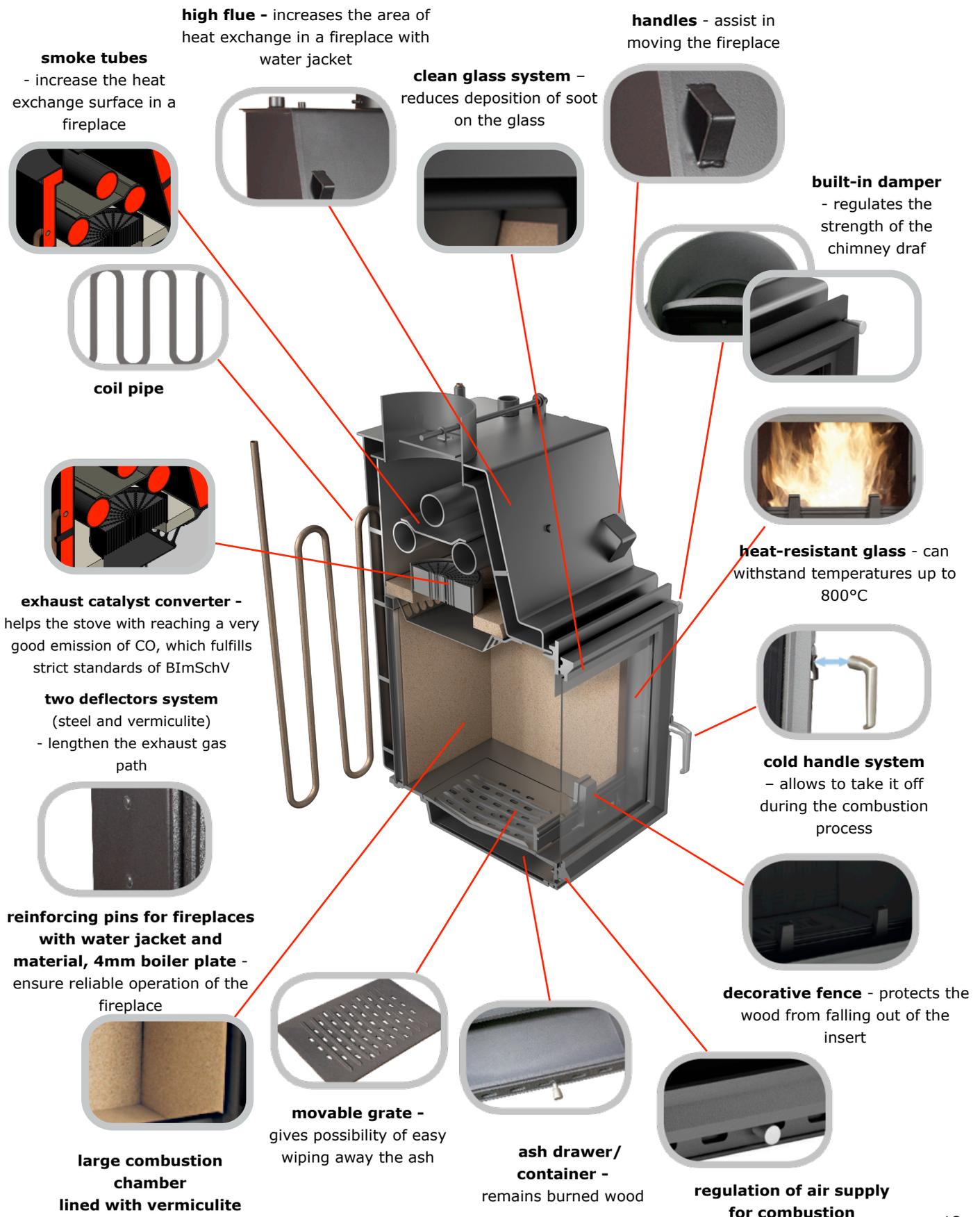


Mila/PW/G 24 kW



Natala/PW 14 kW

## 2.5. FIREPLACE INSERT WITH WATER JACKET ZUZIA DIN 15 W IN RANGE FOR CONTINUOUS BURNING





Zuzia/PW DIN 15 kW



Zuzia/PW DIN 15 kW glass



Zuzia/PW/R DIN 15 kW



Zuzia/PW/PR DIN 15 kW



Zuzia/PW/BL DIN 15 kW

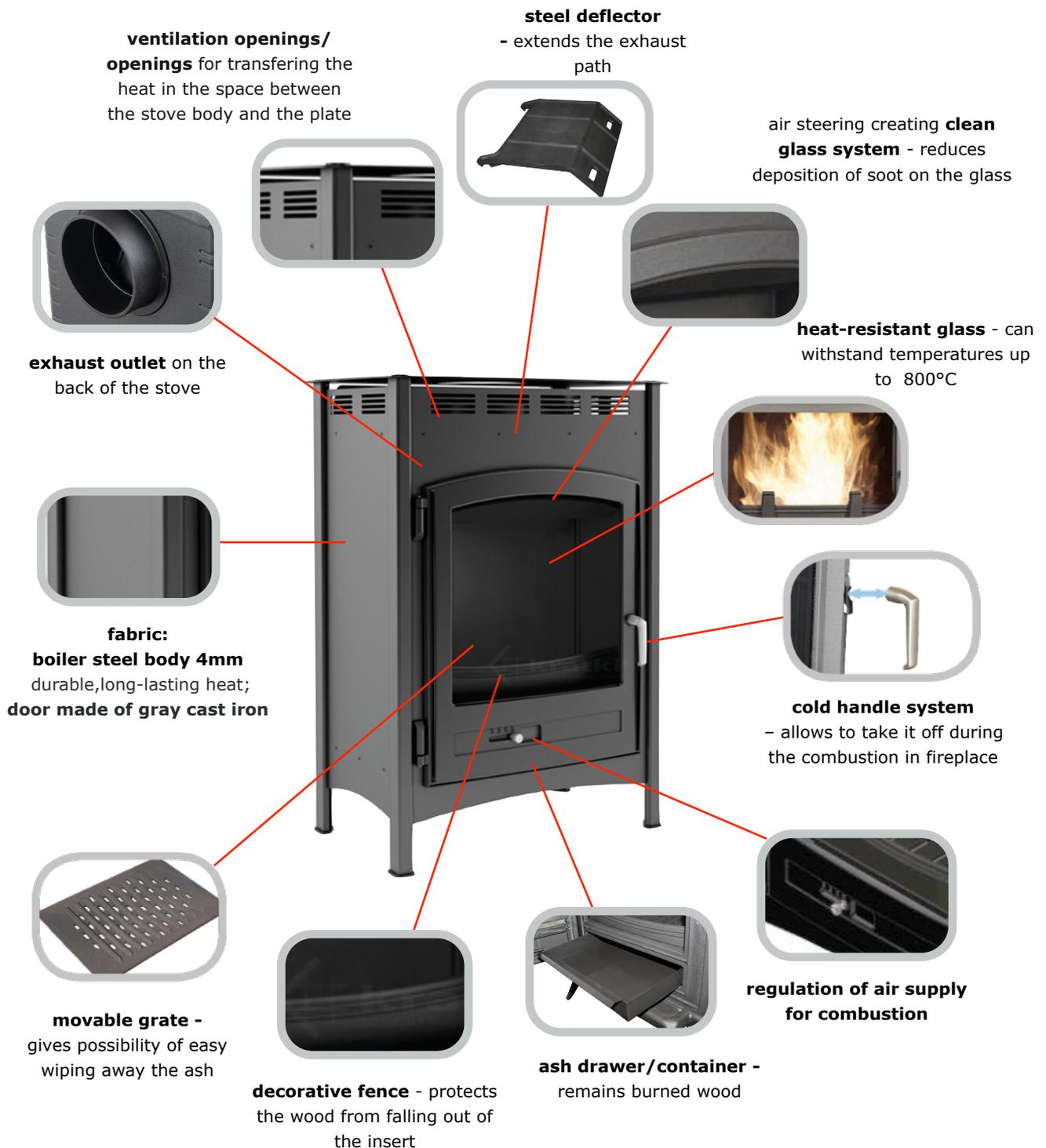


Zuzia/PW/BP DIN 15 kW



Zuzia/PW/G DIN 15 kW

## 2.7. FREE-STANDING STOVE WITH WATER JACKET ALICJA 15 KW FOR CONTINUOUS BURNING



## 2.8. BASIC SPECIFICATIONS FOR FIREPLACE INSERTS WITH WATER JACKET

	ANTEK 8	ERYK 10	MAJA 12	WIKTOR 12	FELIX 14	ALICJA 15	ZUZIA 15	ZUZIA 19	ZUZIA NP 24
Nominal power (kW)	8	10	12	12	13	15	15	19	24
Average power of the water (kW)	7	9	10	10	11	12	13	15	21
Power range (kW)	7-10	9-11	10-14	10-14	11-15	12-17	13-17	15-21	21-26
Dimensions W x S x G (mm)	677x600x380	701x652x421	677x600x416	703x738x421	792x750x421	991x662x438	869x652x496	869x652x496	1138x652x496
Diameter of the flue (mm)	180	180	180	200	200	180	200	200	200
Thermal efficiency (%) ~	~72	~72	~70	~71	~71	~79	~73	~81	~81
Emissions of CO (with 13% O <sub>2</sub> ) ≤	0,69%	0,69%	0,35%	0,69%	0,31%	0,17%	0,80%	0,32%	0,30%
Emission of pollen C (DUST) *	116	116	98,9	116	116	93	51	79,8	95
Flue gas temperature (C°)	240	240	330	240	322	239	278	234	227
Weight (kg)	96	112	115	122	130	136	156	161	217
Water capacity (l)	17	17	18	17	17	33	38	40,5	95
Heating surface (m <sup>2</sup> )**	80-100	80-100	90-120	100-120	120-140	110-130	120-150	150-190	190-240
The flow of the exhaust gases (g/s)	8,86	8,86	10,56	8,86	14,2	12,6	15,3	13,95	17,44
Length of log (mm)	330	450	330	450	450	350	500	500	500
Pressure (bar)	1,5	1,5	2,5	1,5	1,5	1,5	2,5	2,5	2,5
Fabric	boiler steel, gray cast iron class 200								
Type of fuel	seasoned hardwood, (wetness max 20%), brown coal briquettes								

\* mg/m<sup>3</sup>

\*\* depends on insulation of the building

	ZUZIA TUNEL	OLIWIĄ 17	OLIWIĄ 22	OLIWIĄ TUNEL	AMELIA 24	AMELIA 30	NATALA 14	MILA 24***
Nominal power (kW)	19	17	22	22	24	30	14	24
The average power of the water (kW)	15	14	18	18	20	25	13	19
Power range (kW)	15-21	14-19	18-24	18-24	20-26	25-32	13-16	19-26
Dimensions W x S x G (mm)	742x652x606	868x738x496	868x738x496	742x738x606	960x750x496	960x750x496	1118x764x499	1034x1132x448
Diameter of the flue (mm)	180	200	200	180	220	220	180	200
Thermal efficiency (%) ~	~65	~65	~66	~69	~72	~66	~76	~67
Emissions of CO (with 13% O <sub>2</sub> ) ≤	0,36%	0,30%	0,36%	0,36%	0,31%	0,23%	0,56%	0,38%
Emission of pollen C (DUST)*	97	44,2	60,9	65	98,4	105	84,7	53,2
Flue gas temperature (C°)	276	325	328	298	301	315	274	334
Weighth (kg)	163	171	181	176	187	200	156	220
Water capacity (l)	25,5	35	46,5	57	57	60	40	72
Heater surface (m <sup>2</sup> )**	100-140	140-170	180-220	150-190	190-240	250-300	120-140	190-240
The flow of the exhaust gases (g/s)	15,76	18,89	22,9	18,51	33,35	47,43	10,42	22,65
Length of log (mm)	500	500	500	500	500	500	500	700
Pressure (bar)	2,5	2,5	2,5	2,5	2,5	2,5	1,5	1,5
Fabric	boiler steel, gray cast iron class 200							
Type of fuel	seasoned hardwood, (wetness max 20%), brown coal briquettes							

\* mg/m<sup>3</sup>  
\*\* depends on insulation of the building  
\*\*\* combustion chamber lined with vermiculite

## 2.9. EKO AQUA INSERTS



Eko Aqua fireplace inserts represent a new solution for fireplace inserts with a water jacket in which the technologies and materials used create an efficient, economical, and green insert with high energy conversion efficiency (about 85%) and low CO emission coefficient. Thanks to those features, the fireplace parameters meet the requirements of strict German standards BImSchV 1 and BImSchV 2 which are one of the strictest standards in Europe. Inserts of the Eko Aqua series are made of boiler steel which guarantees reliability, thermal resistance, and long service life. They are designed to work in central heating systems with the operating pressure of up to 2 bar. The standard set includes a heating coil which serves as thermal protection of the device. Additionally, the body of the water jacket is strengthened with pins. Optionally, the insert can be equipped with an additional glass pane, the so-called glass system which, thanks to its decorative design, constitutes modern ornamentation of the fireplace. The insert combustion chamber is lined with vermiculite. It's a special material that improves burning efficiency. Eko Aqua inserts are designed to work with central heating installations, heat pumps, solar batteries with domestic hot water tanks and buffers.

*Solutions used in the inserts:*

### *a. SAFETY*

Standard Eko Aqua insert sets include a heating coil which serves as thermal protection of the device; additionally, the body of the water jacket is strengthened with pins.

*Heating coil use and function:*

The heating coil used in Eko Aqua inserts is a copper pipe with the diameter of ½ inch built into the insert which protects the water jacket from overheating. In other words, it serves as the cooler for the insert which cooperates with the thermal safety valve.

In the upper part of the water jacket, the set is equipped with permanently fixed connection pipes which supply water from the waterworks to the heating coil. The connection pipes with ½ inch external thread are placed at the ends of the heating coil. Connectors with ½ inch inner thread should be connected to a thermal sensor of the safety valve which controls the water flow through the heating coil. If the value of the heat emitted by the central heating installation is lower than the power produced, the temperature of the water in the water jacket can increase to a dangerous level. In such a case, when the temperature of 97°C is exceeded, the thermal valve opens the inflow of cold water from the waterworks to the heating coil which cools the water in the water jacket.



### *b. ECOLOGY*

*Double adjustment of combustion chamber aeration:*

- Adjustment of primary air inflow through the ash pit to the combustion chamber makes it possible to dose the air necessary to appropriately support the burning process.
- Adjustment of secondary air inflow through the back wall which is responsible for fume burning thanks to which emission of polluting substances to the environment is reduced and the efficiency of the insert is improved.

Thanks to the application of this solution, the inserts have very good CO emission parameters.

#### *Deflector system:*

- Two deflectors used – steel and vermiculite – referred to as the smoke shelf, are placed in the upper part of the fireplace insert. Their location extends the fume disposal route.

#### *Damper system:*

- Double damper adjustment of the fume outlet – the lower damper and the upper damper.
- The lower damper constitutes an integral part of the fireplace insert. It is located above the furnace chamber and constitutes an extension of the steel deflector along its whole length. Opening it in the initial phase of the burning process shortens the route of the fumes to the chimney which automatically leads to creating a better draught. Closing it, on the other hand, directs the fumes between the two deflectors and the vertical stove. Thanks to that, fuel particles that have not been burned earlier in the furnace chamber are burned out in the space created between the deflectors and above the steel deflector. Additional heat generated in this way is transferred to the fire-tubes of the vertical stove and to the water jacket (water circuit). This has direct effect on achieving very good energy conversion efficiency of the inserts (from 82% to 87%).
- The second (upper) rotating damper fitted in the insert flue makes it possible to control the draught in the chimney.



#### *c. PARAMETERS*

Lining the combustion chamber with vermiculite increases the temperature in it, which improves the burning parameters. Additionally, a system of holes in the back wall provides good aeration of the combustion chamber – secondary air.

Secondary air inflow through the back wall makes it possible to burn the fumes thanks to which the emission of polluting substances to the environment is reduced and the efficiency of the insert is increased. Thanks to the application of this solution, the inserts have very good CO emission parameters.

#### *Power and efficiency*

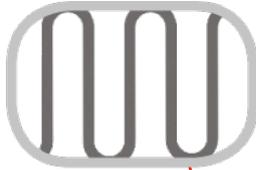
*The special construction* of the water jacket makes it possible to generate a large amount of heat from the and transfer it to the heating system thanks to which it is possible to obtain high energy conversion efficiency which reaches about 85%.

Heat exchange takes place in the upper part of the insert, in the water jacket and in the vertical water stove. A system of vertical tubes located in the stove, the so-called fire-tubes, that increase the area of contact between the water and the heating medium, that is – the fumes, is responsible for recovering the thermal energy in the fumes produced in the combustion chamber of the fireplace insert. Hot fumes flow through the fire-tubes of the stove heating the water around them. Warm water is transported through the connection pipe placed in the side wall of the fireplace to the central heating system.





**coil pipe** - protection from overheating



**reinforcing pins for fireplaces with water jacket and material, 4mm boiler plate** - ensure reliable operation of the fireplace



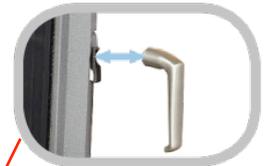
**handles** - assist in moving the fireplace



**vertical heater** - vertical pipe system increasing the contact area of water with the heating medium, or fumes



**double-damper regulation of gas**



**two deflectors system** (steel and vermiculite) - lengthen the exhaust gas path



**cold handle system** - allows to take it off during the combustion in fireplace



**large combustion chamber** - lined with Acumotte (system of holes in the back wall is in charge of the aeration of the combustion chamber)

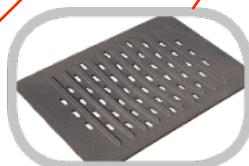


**heat-resistant glass** - can withstand temperatures up to 800°C



**external air inlet** - special connector mounted in fireplace insert, which provides fresh air directly from outside - additional option

**movable grate** - gives possibility of easy wiping away the ash



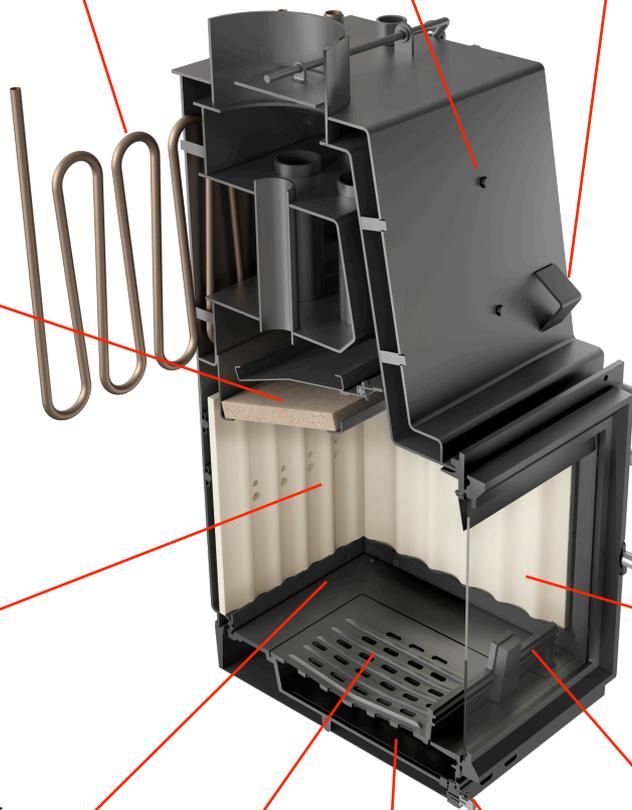
**double regulation of air supply for combustion**



**decorative fence** - protects the wood from falling out of the insert



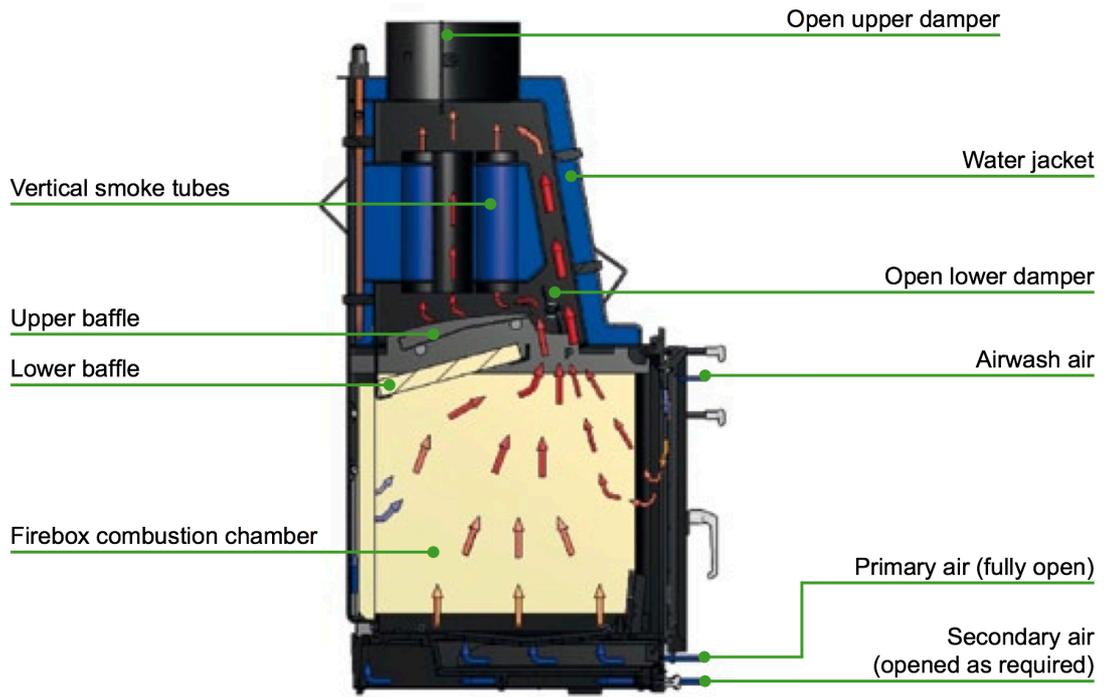
**ash drawer** - remains burned wood



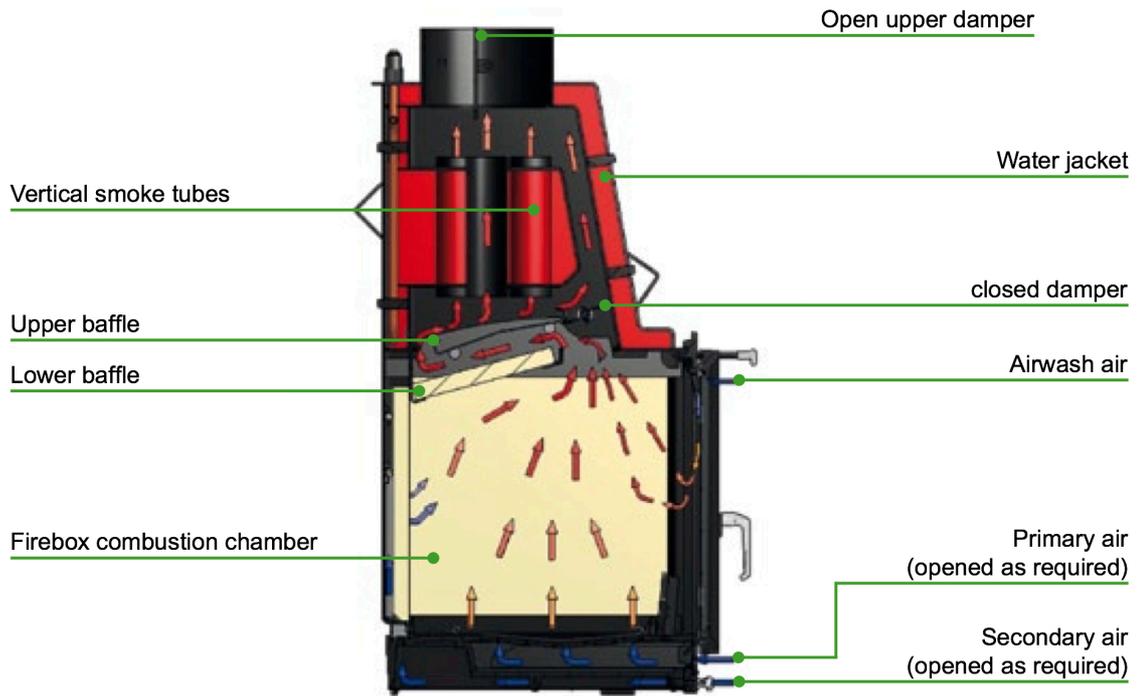
## BASIC SPECIFICATIONS FOR EKO AQUA FIREPLACE INSERTS

	<b>Maja EKO AQUA 8</b>	<b>Maja EKO AQUA 12</b>	<b>Zuzia EKO AQUA 10</b>	<b>Zuzia EKO AQUA 14</b>	<b>Oliwia EKO AQUA 12</b>	<b>Oliwia EKO AQUA 16</b>	<b>Amelia EKO AQUA 14</b>	<b>Amelia EKO AQUA 18</b>
Nominal power (kW)	8 kW	12 kW	9 kW	12 kW	12 kW	16 kW	14 kW	18 kW
Average power obtained from water	5,5 kW	8 kW	7 kW	10,6 kW	8,4 kW	10,8 kW	9,8 kW	12,5 kW
Average power obtained from the air	4 kW	4,2 kW	3,7 kW	3,5 kW	3,9 kW	5,3 kW	4,5 kW	5,5 kW
Power range	5-10 kW	8-14 kW	5-11 kW	7-14 kW	8-16 kW	8-16 kW	8-16 kW	10-18 kW
CO emission	0,10%	0,09%	0,10%	0,08%	0,08%	0,10%	0,08%	0,07%
Energy efficiency	82%	87%	83%	86%	83,10%	84,40%	84,30%	86,50%
Dust emission	38 mg/m <sup>3</sup>	31 mg/m <sup>3</sup>	36 mg/m <sup>3</sup>	35 mg/m <sup>3</sup>	34 mg/m <sup>3</sup>	37 mg/m <sup>3</sup>	30 mg/m <sup>3</sup>	26 mg/m <sup>3</sup>
NOx	138 mg/m <sup>3</sup>	133 mg/m <sup>3</sup>	104 mg/m <sup>3</sup>	150 mg/m <sup>3</sup>	106 mg/m <sup>3</sup>	106 mg/m <sup>3</sup>	87 mg/m <sup>3</sup>	77 mg/m <sup>3</sup>
Flue diameter	180 mm	180 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm
Fume temperature	227 C°	198 C°	221 C°	250 C°	186 C°	204 C°	220 C°	207 C°
Fume mass flow rate	9,52 g/s	9,55 g/s	9,46 g/s	11,5 g/s	12,5 g/s	14,9 g/s	12,4 g/s	13,6 g/s
Weight	148 kg	159 kg	197 kg	249 kg	221 kg	241 kg	223 kg	253 kg
Pressure	12 Pa							
Operating pressure	2 bar							
Fuel type	seasoned deciduous wood, lignite coal briquette							
Manufacturing material	grey cast iron, boiler steel, Acumotte							
Log length	330 mm				500 mm			

# COMBUSTION & GAS CIRCULATION:



KINDLING STAGE



WORKING STAGE

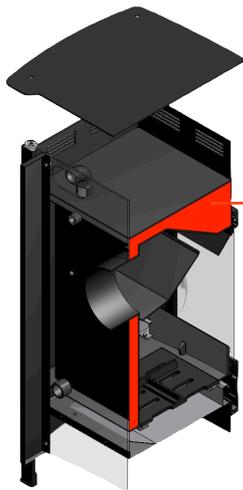
### 3. CROSS-SECTIONS (ILLUSTRATIONS) OF FIREPLACES WITH A WATER JACKET

As it was already mentioned, a built-in fireplace insert with a water jacket looks the same as a fireplace with a standard air insert although its efficiency is considerably higher and most often exceeds 78%, reaching up to 87% in the case of certain models. The nominal (average) power of those devices which depends on the amount of fuel and the phase of the burning process is important. In the case of fireplaces with a water jacket, the power of the device is distributed between two media: water and air.

The basic difference between forced air inserts and water inserts lies in the construction and in the material of which the furnace is manufactured. The body of an insert with a water jacket is made of high-quality boiler steel. The base and the front of the insert can be made of cast iron or boiler steel. However, the very name of this type of inserts originates from the system of double walls surrounding the combustion chamber between which water circulates.

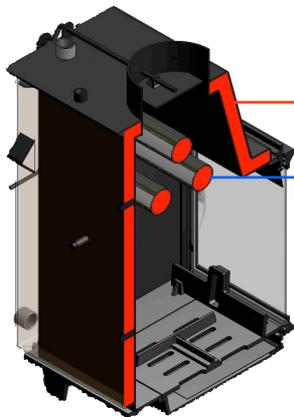
The liquid collects the heat from the furnace and then it transmits it to the central heating installation – to the heat emitters in the form of wall radiators, floor heating, the buffer, etc.

### 3.1. CROSS-SECTIONS OF INSERTS WITH A WATER JACKET BUT WITHOUT A HEATING COIL

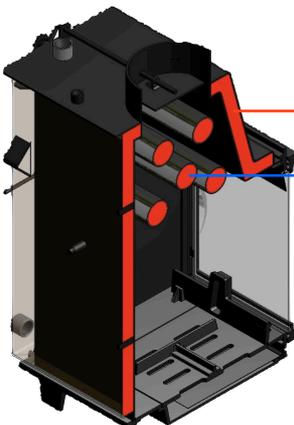


Water jacket – double wall system surrounding the combustion chamber between which water circulates

Cross-section of the insert construction:  
- KOZA ALICJA/PW 15 kW

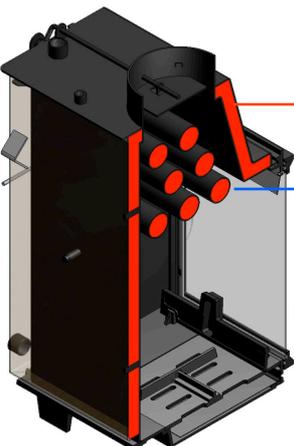


Cross-section of the insert construction:  
- MAJA/PW 12 kW  
- ZUZIA/PW 15 kW  
- OLIWIA/PW 17 kW

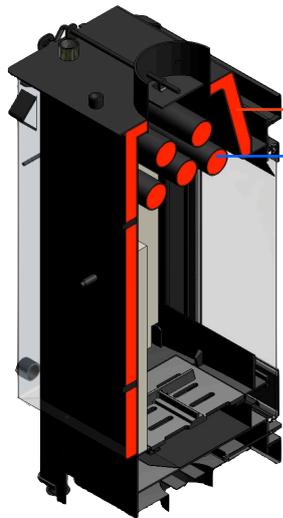


Fire-tubes – water flows through them in the fireplaces of the female series, the power of the insert depends on their number

Cross-section of the insert construction:  
- ZUZIA/PW 19 kW  
- OLIWIA/PW 22 kW  
- AMELIA/PW 24 kW



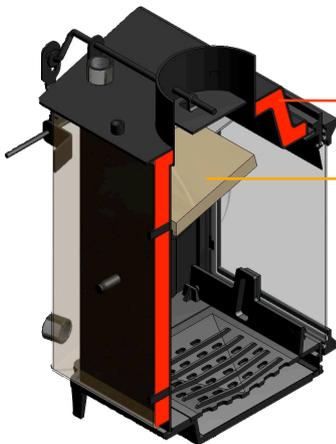
Cross-section of the insert construction:  
- AMELIA/PW 30 kW



Fire-tubes – water flows through them in the fireplaces of the female series, the power of the insert depends on their number

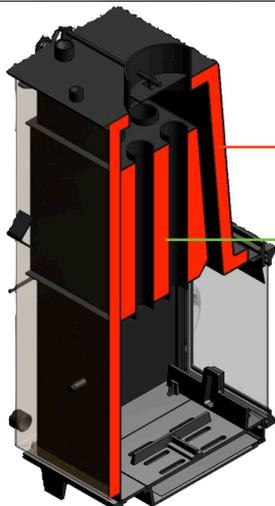
Water jacket – a system of double walls surrounding the combustion chamber between which water circulates

Cross-section of the insert construction:  
- NATALA/PW 14 kW



Vermiculite deflector  
- lengthen the exhaust gas path

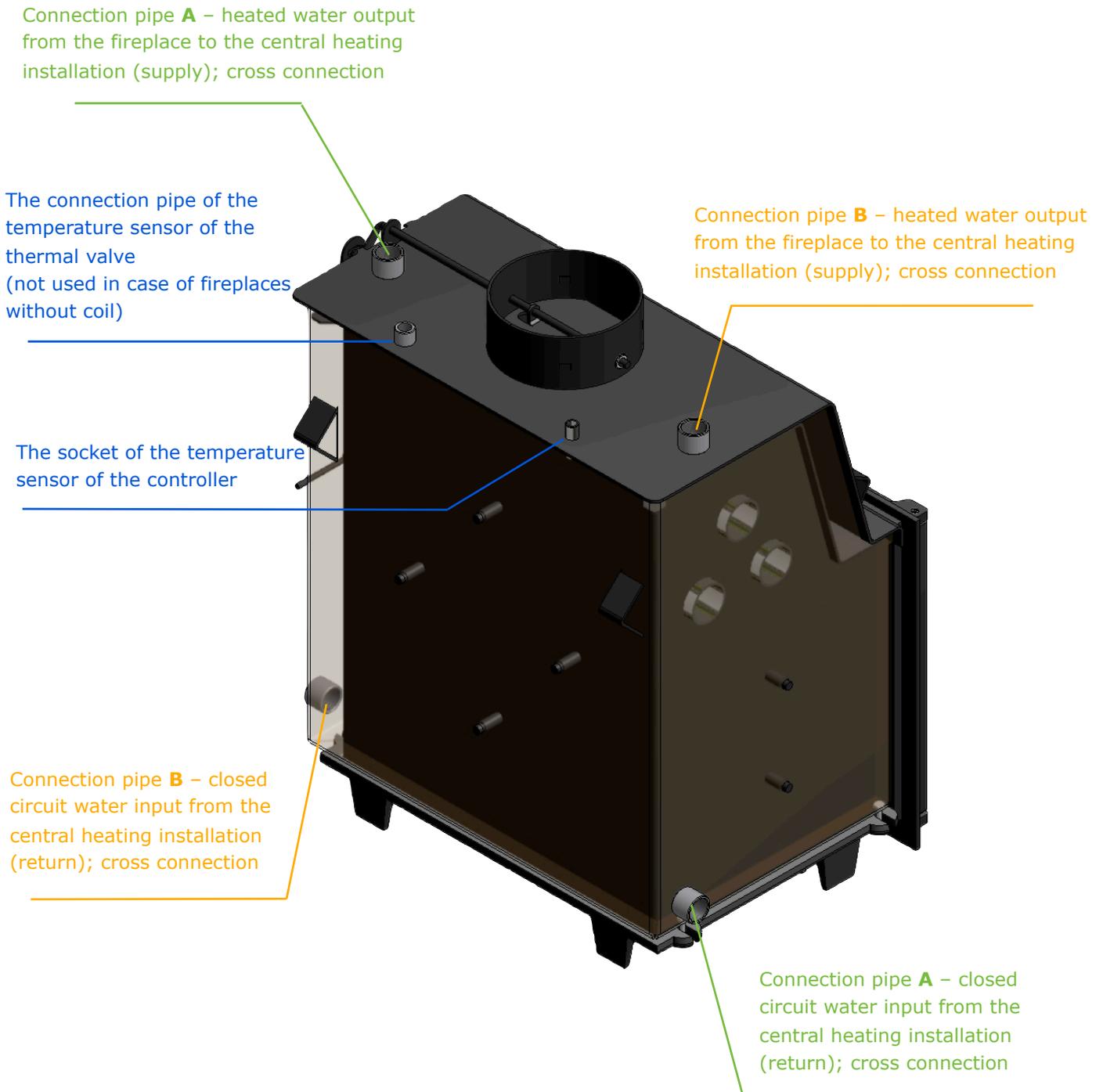
Cross-section of the insert construction:  
- ANTEK/PW 8 kW  
- ERYK/PW 10 kW  
- WIKTOR/PW 12 kW  
- FELIX/PW 14 kW



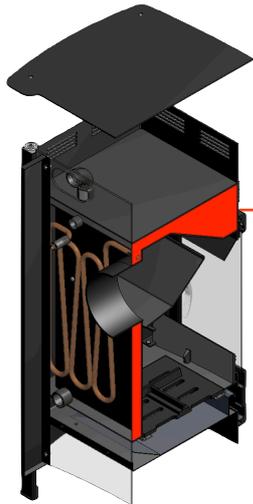
Vertical heater - vertical pipe system increasing the contact area of water with the heating medium, or fumes

Cross-section of the insert construction:  
- ZUZIA/NP 24 kW

## DESCRIPTION OF CONNECTORS IN FIREPLACE INSERTS WITH WATER JACKET WITHOUT COIL

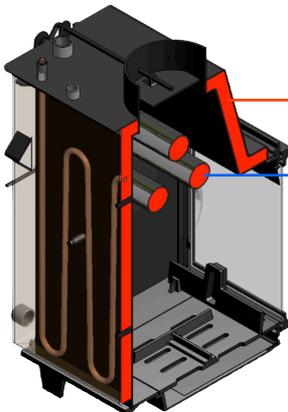


### 3.2. CROSS-SECTION OF FIREPLACE INSERTS WITH WATER JACKET AND COIL

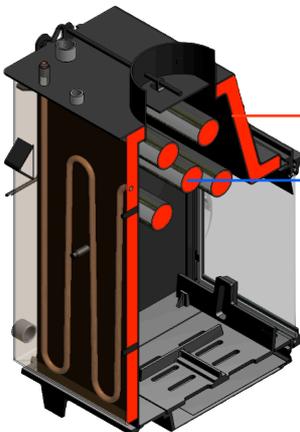


Water jacket – a system of double walls surrounding the combustion chamber between which water circulates

Cross-section of the insert construction:  
- KOZA ALICJA/PW 15 kW

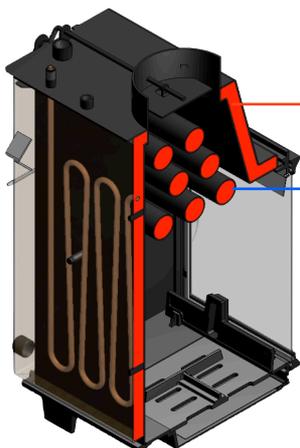


Cross-section of the insert construction:  
- MAJA/PW 12 kW  
- ZUZIA/PW 15 kW  
- OLIWIA/PW 17 kW



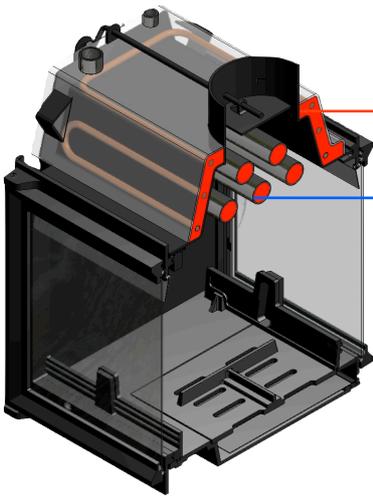
Fire-tubes – water flows through them in the fireplaces of the female series, the power of the insert depends on their number

Cross-section of the insert construction:  
- ZUZIA/PW 19 kW  
- OLIWIA/PW 22 kW  
- AMELIA/PW 24 kW



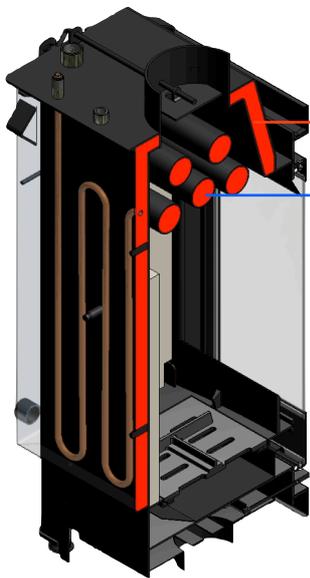
Cross-section of the insert construction:  
- AMELIA/PW 30 kW

Water jacket – a system of double walls surrounding the combustion chamber between which water circulates



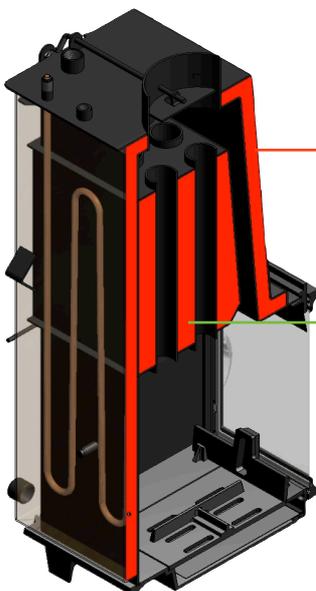
Cross-section of the insert construction:  
- ZUZIA/PW TUNEL 19 kW  
- OLIWIA/PW TUNEL 22 kW

Fire-tubes – water flows through them in the fireplaces of the female series, the power of the insert depends on their number



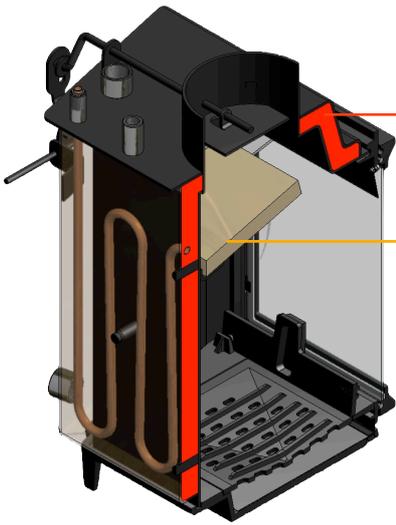
Cross-section of the insert construction:  
- NATALA/PW 14 kW

Vertical heater - vertical pipe system increasing the contact area of water with the heating medium, or fumes



Cross-section of the insert construction:  
- ZUZIA/NP 24 kW

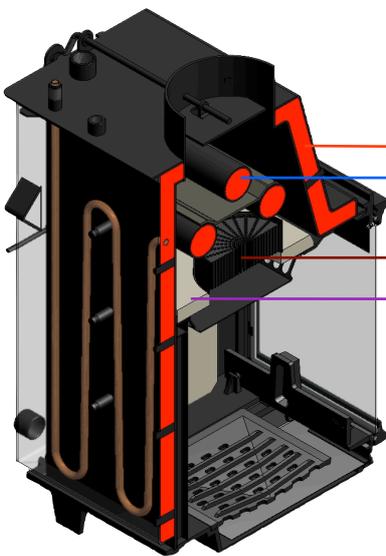
Water jacket – a system of double walls surrounding the combustion chamber between which water circulates



Vermiculite deflector  
- lengthen the exhaust gas path

- Cross-section of the insert construction:
- ANTEK/PW 8 kW
  - ERYK/PW 10 kW
  - WIKTOR/PW 12 kW
  - FELIX/PW 14 kW

Fire-tubes – water flows through them in the fireplaces of the female series, the power of the insert depends on their number

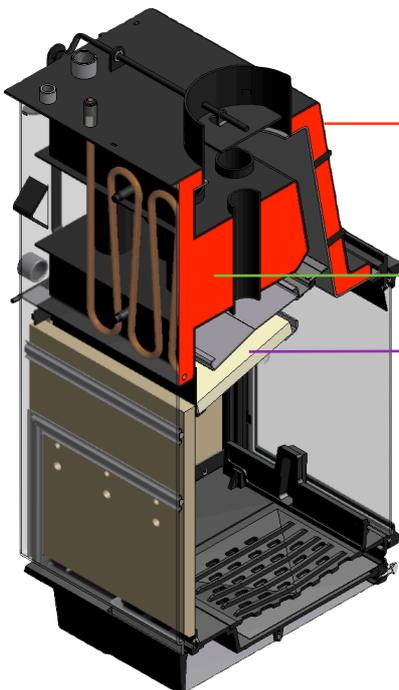


Catalytic converter - helps stove with reaching very good emission parameters of CO

- Cross-section of the insert construction:
- ZUZIA DIN 15 kW

Two deflectors system (steel and vermiculite)  
- lengthen the exhaust gas path

Vertical heater - vertical pipe system increasing the contact area of water with the heatin medium, or fumes



- Cross-section of the insert construction:
- MAJA EKO AQUA 8
  - MAJA EKO AQUA 12
  - ZUZIA EKO AQUA 10
  - ZUZIA EKO AQUA 14
  - OLIWIA EKO AQUA 12
  - OLIWIA EKO AQUA 16
  - AMELIA EKO AQUA 14
  - AMELIA EKO AQUA 18

DESCRIPTION OF CONNECTORS IN FIREPLACE INSERTS WITH WATER JACKET AND COIL -  
TRADITIONAL: MALE, FEMALE AND ZUZIA NP, ZUZIA DIN

Connection pipe **A** – heated water output from the fireplace to the central heating installation (supply); cross connection

Heating coil connection pipes

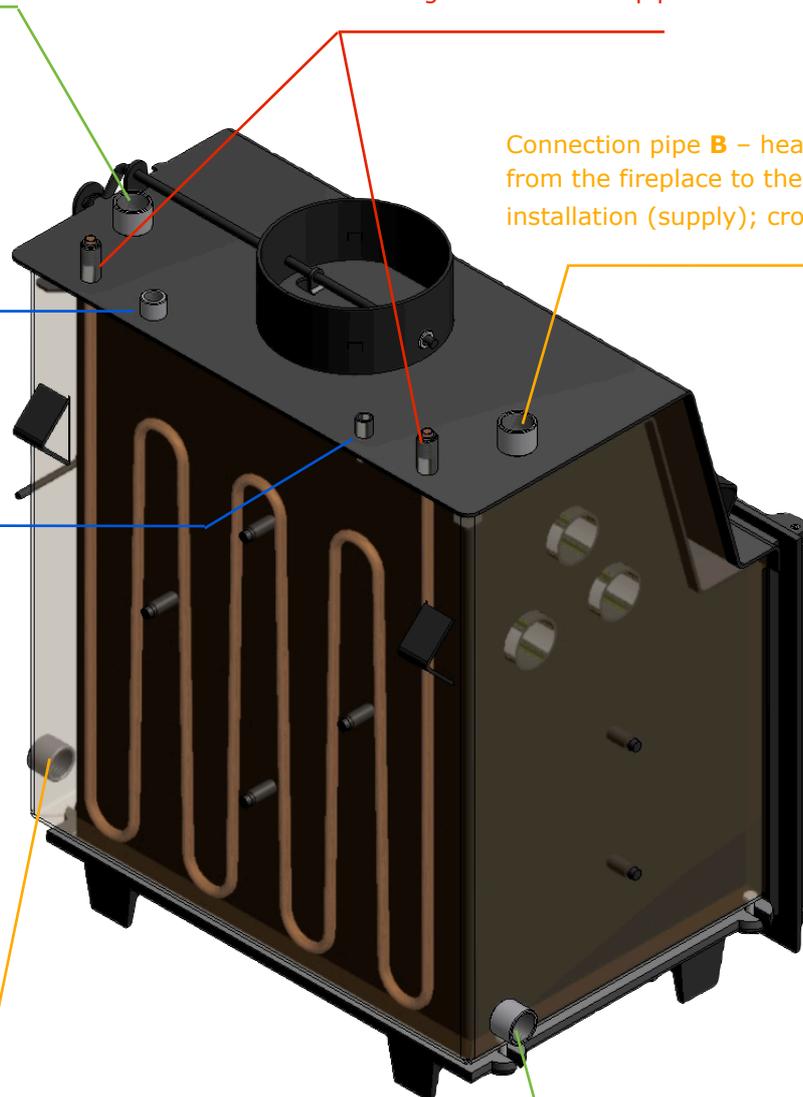
Connection pipe **B** – heated water output from the fireplace to the central heating installation (supply); cross connection

The connection pipe of the temperature sensor of the thermal valve

The socket of the temperature sensor of the controller

Connection pipe **B** – closed circuit water input from the central heating installation (return); cross connection

Connection pipe **A** – closed circuit water input from the central heating installation (return); cross connection



DESCRIPTION OF THE CONNECTION PIPES IN INSERTS WITH A WATER JACKET EQUIPPED WITH A HEATING COIL - ZUZIA TUNEL, OLIWIA TUNEL

Connection pipe **A** – heated water output from the fireplace to the central heating installation (supply); cross connection

The connection pipe of the temperature sensor of the thermal valve

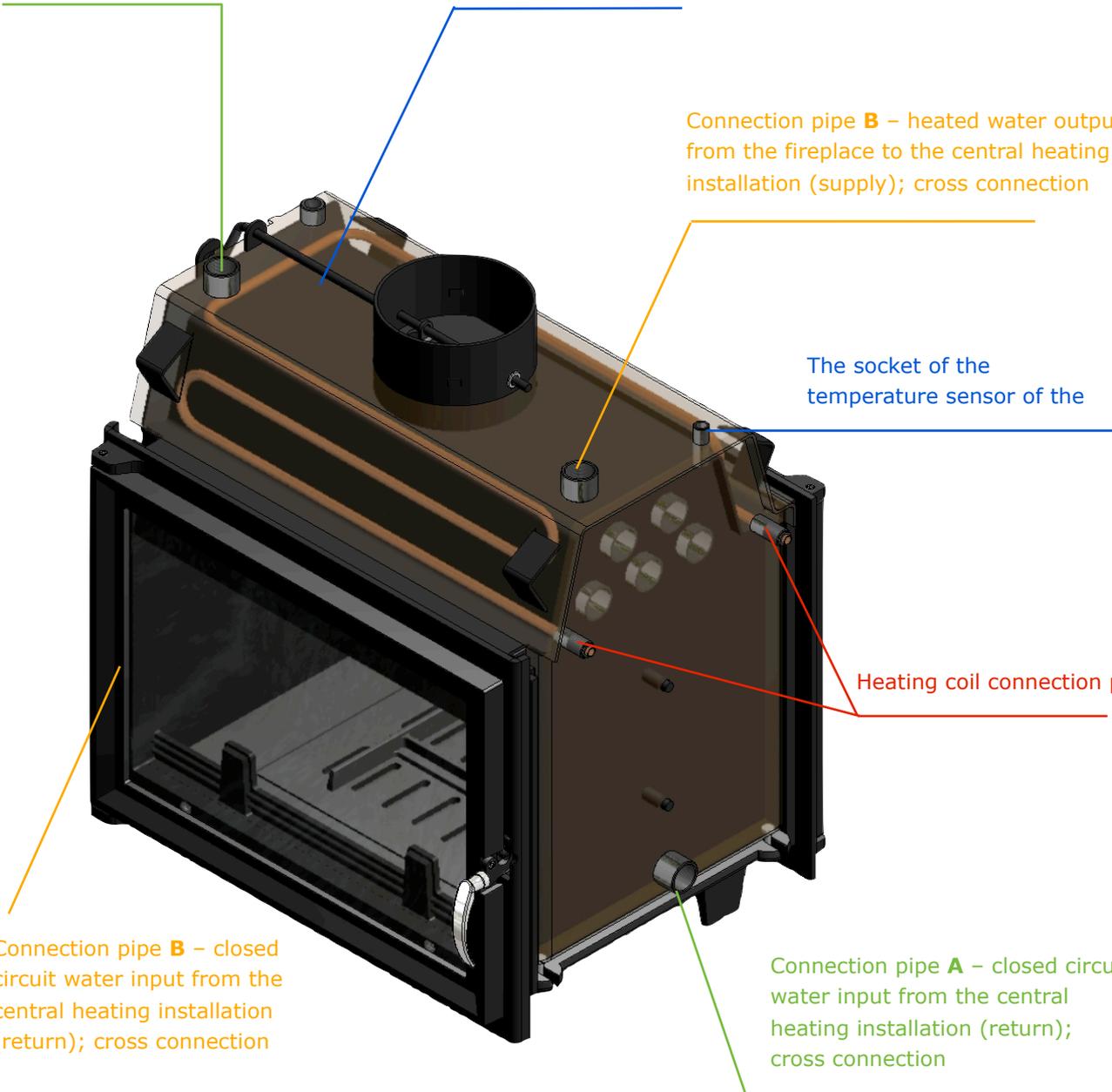
Connection pipe **B** – heated water output from the fireplace to the central heating installation (supply); cross connection

The socket of the temperature sensor of the

Heating coil connection pipes

Connection pipe **B** – closed circuit water input from the central heating installation (return); cross connection

Connection pipe **A** – closed circuit water input from the central heating installation (return); cross connection



DESCRIPTION OF THE CONNECTION PIPES IN INSERTS WITH A WATER JACKET EQUIPPED WITH A HEATING COIL - EKO AQUA: MAJA, ZUZIA, OLIWIA, AMELIA

Connection pipe **A** – heated water output from the fireplace to the central heating installation (supply); cross connection

Heating coil connection pipes

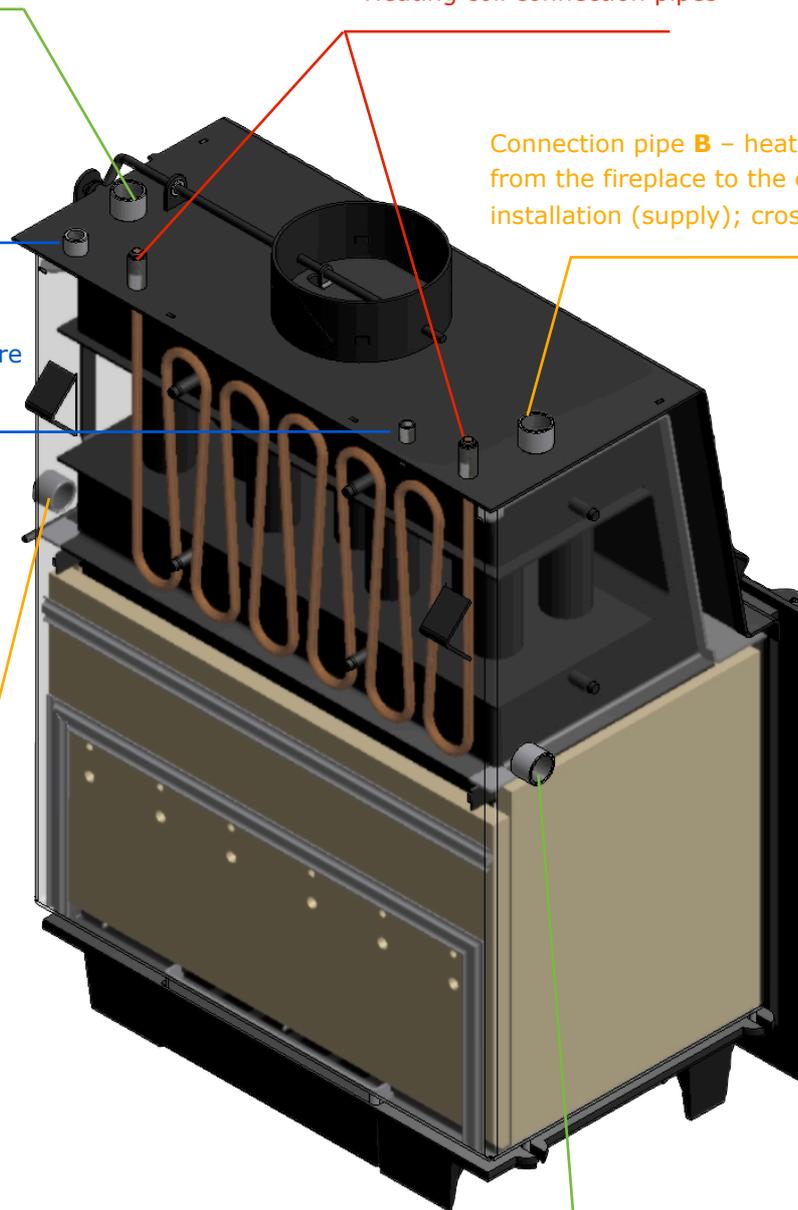
The connection pipe of the temperature sensor of the thermal valve

Connection pipe **B** – heated water output from the fireplace to the central heating installation (supply); cross connection

The socket of the temperature sensor of the controller

Connection pipe **B** – closed circuit water input from the central heating installation (return); cross connection

Connection pipe **A** – closed circuit water input from the central heating installation (return); cross connection



DESCRIPTION OF CONNECTORS IN FREE-STANDING STOVE WITH WATER JACKET AND COIL -  
KOZA ALICJA

Connection pipe **A** – heated water output from the fireplace to the central heating installation (supply); cross connection

Connection pipe **B** – heated water output from the fireplace to the central heating installation (supply); cross connection

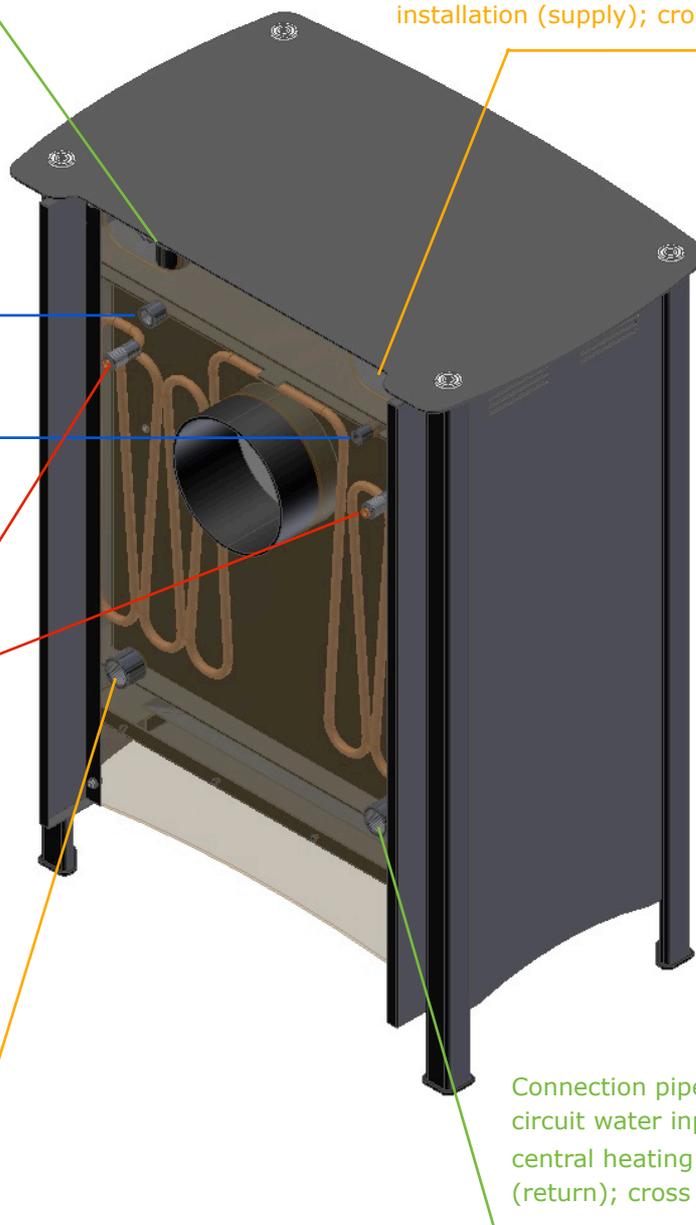
The connection pipe of the temperature sensor of the thermal valve

The socket of the temperature sensor of the controller

Heating coil connection pipes

Connection pipe **B** – closed circuit water input from the central heating installation (return); cross connection

Connection pipe **A** – closed circuit water input from the central heating installation (return); cross connection

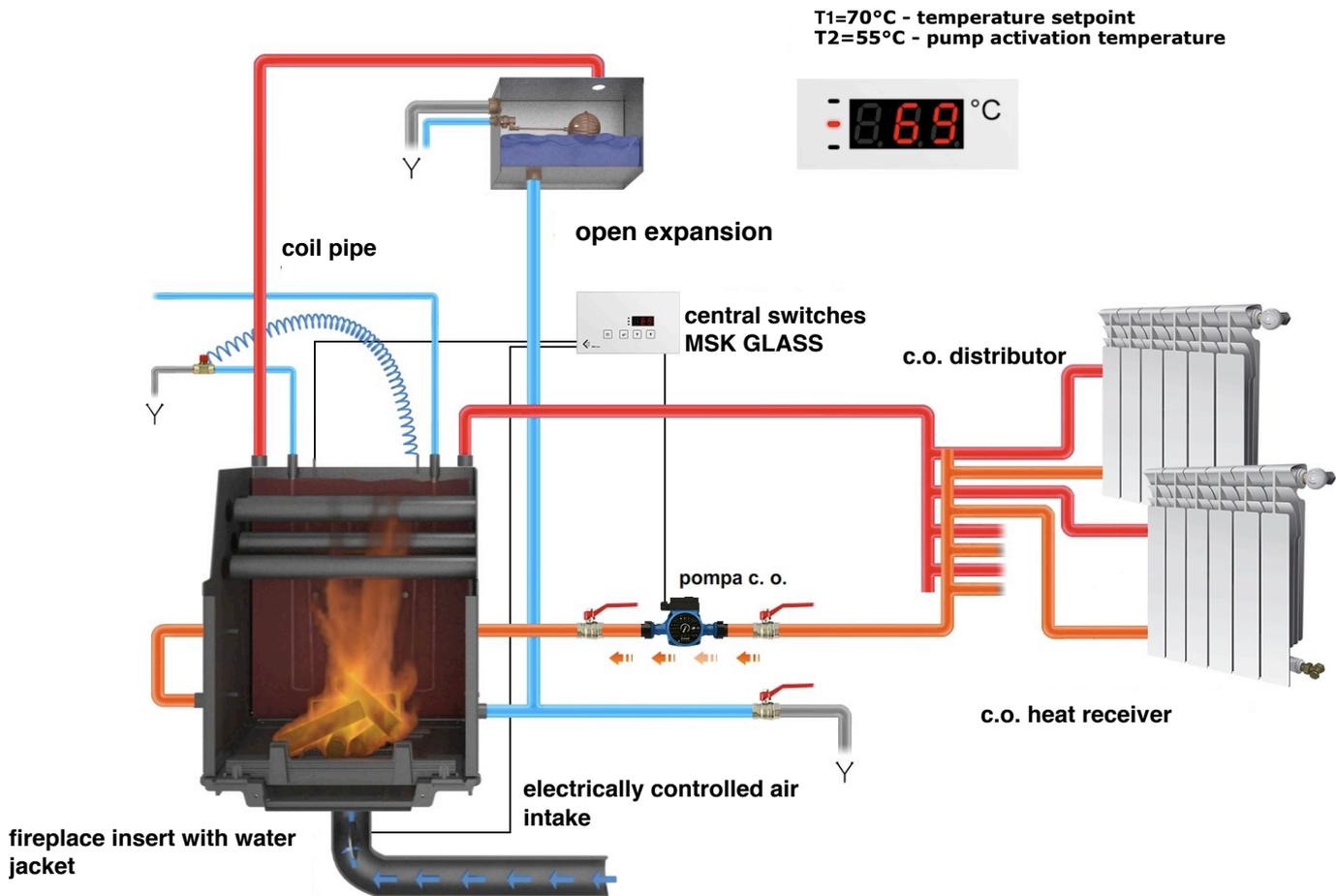


## 4. OPEN AND CLOSED SYSTEM

### 4.1. OPEN SYSTEM

Open system - non-pressure hydraulic system with an open expansion vessel

### CONNECTION DIAGRAM FIREPLACE WITH WATER JACKET IN OPEN SYSTEM



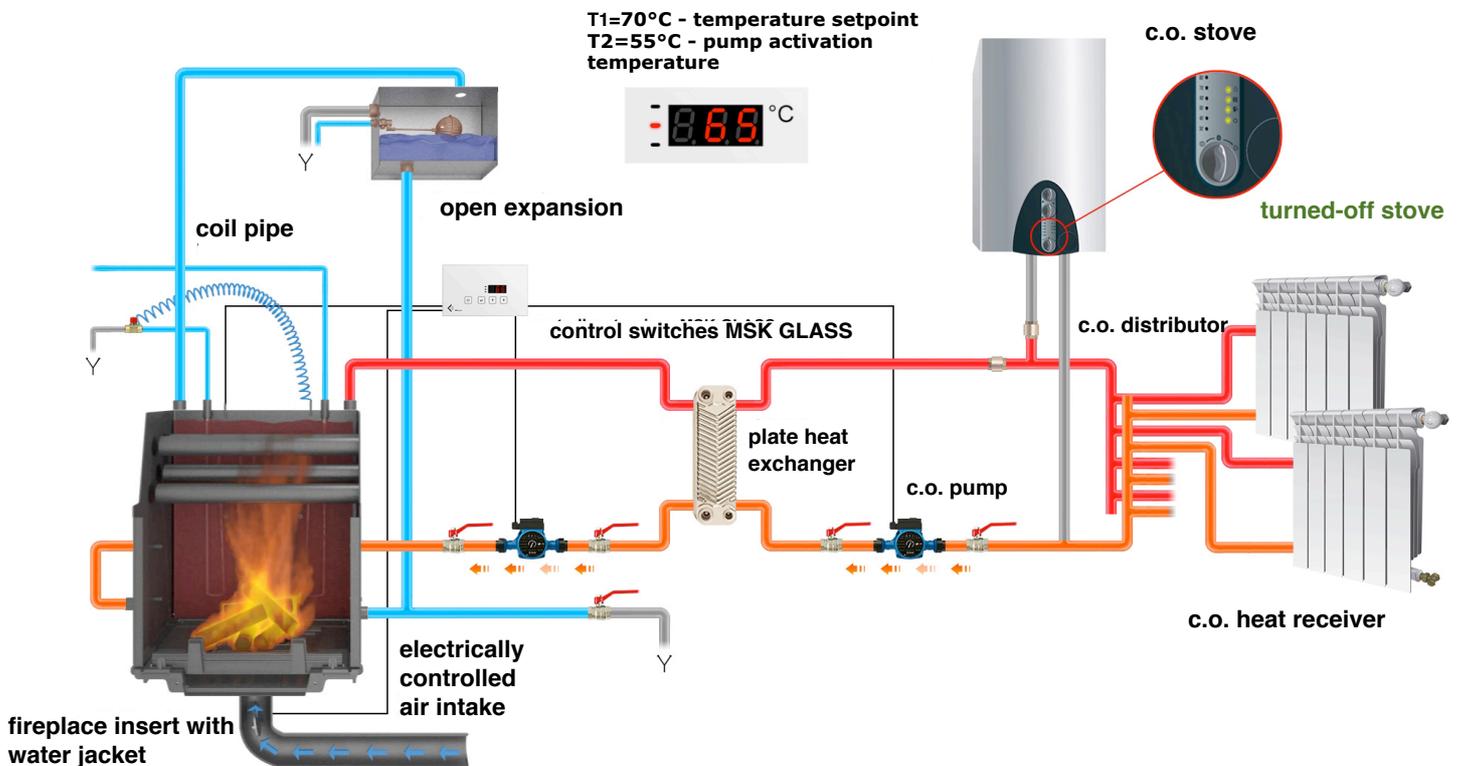
ELEMENTS NECESSARY FOR THE INSTALLATION OF THE INSERT:

- EXPANSION VESSEL
- CIRCULATION PUMP
- CONTROLLER: MSP, MSK with a throttling valve or EKO LINE
- INSULATION
- ANTI-CONDENSATION FLANGE

ADDITIONAL ELEMENTS:

- HEATING COIL
- BVTS THERMAL SAFETY VALVE
- EKOBAL
- EMERGENCY POWER SUPPLY

## CONNECTION DIAGRAM FOR THE FIREPLACE WITH A WATER JACKET WITH A GAS BOILER



### ELEMENTS NECESSARY FOR THE INSTALLATION OF THE INSERT:

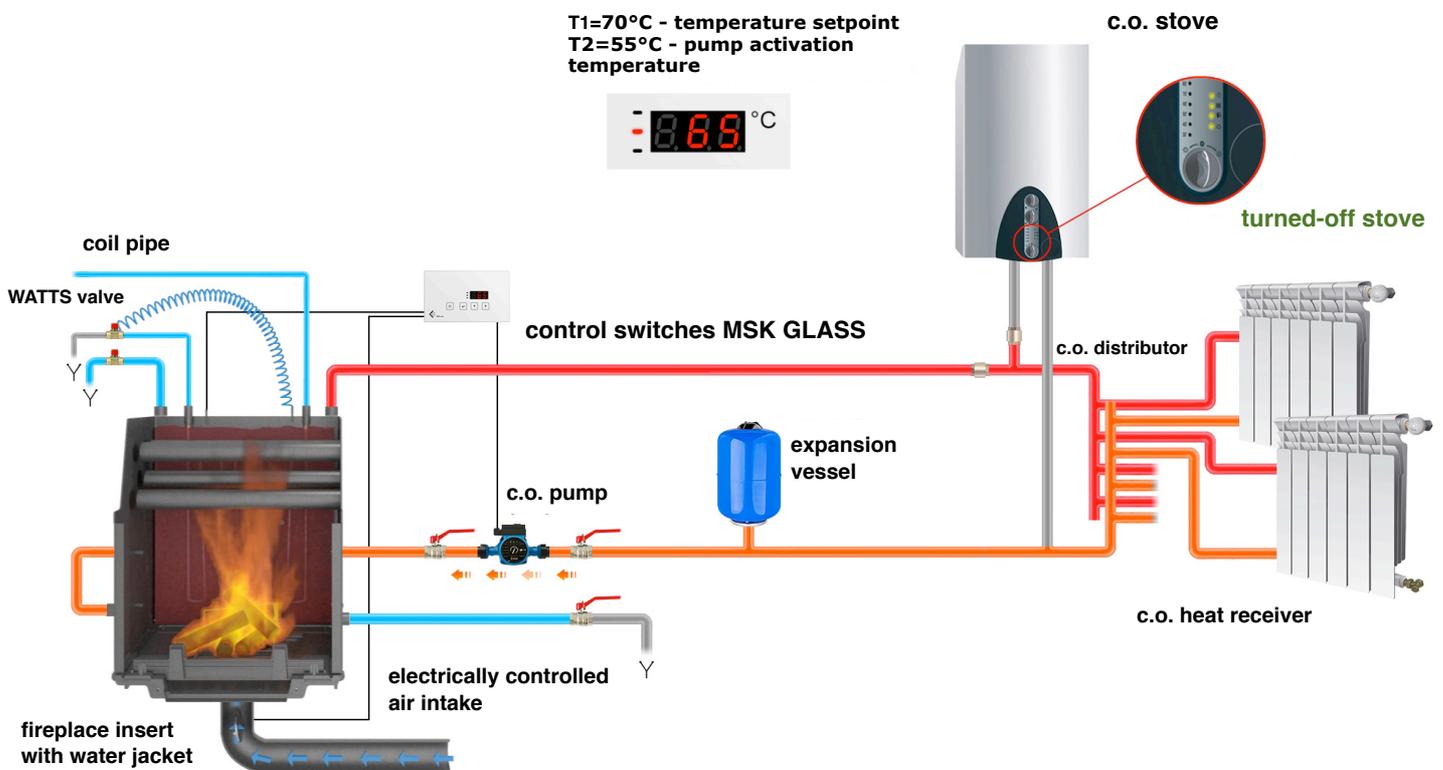
- EXPANSION VESSEL
- PLATE EXCHANGER AND CIRCULATION PUMP (2 pieces) or SEALED BRASS HEAT EXCHANGER AND PUMP SET
- CONTROLLER: MSK with a throttling valve or EKO LINE
- INSULATION
- ANTI-CONDENSATION FLANGE

### ADDITIONAL ELEMENTS:

- HEATING COIL as an additional security
- BVTS THERMAL SAFETY VALVE
- EKOBAL
- EMERGENCY POWER SUPPLY

## 4.2. CLOSED SYSTEM

Closed system - Hydraulic pressure with the diaphragm expansion vessel; installation powered by: solid-fuel stoves, gas boilers, electrical, oil or heat pump. Heating water in the system is at 1.4 - 2 bars pressure



ELEMENTS NECESSARY FOR THE INSTALLATION OF THE INSERT:

- HEATING COIL
- BVTS THERMAL SAFETY VALVE
- MEMBRANE SAFETY VALVE 2,5 BAR
- CIRCULATION PUMP
- CONTROLLER: MSP, MSK with a throttling valve or EKO LINE
- INSULATION
- ANTI-CONDENSATION FLANGE

ADDITIONAL ELEMENTS:

- THROTTLING VALVE WITH A LANYARD
- EKOBAL
- EMERGENCY POWER SUPPLY

## 5. CHARACTERISTICS OF THE ELEMENTS NECESSARY TO PERFORM THE INSTALLATION AND OF OPTIONAL ELEMENTS

### 5.1. ELEMENTS NECESSARY TO PERFORM THE INSTALLATION

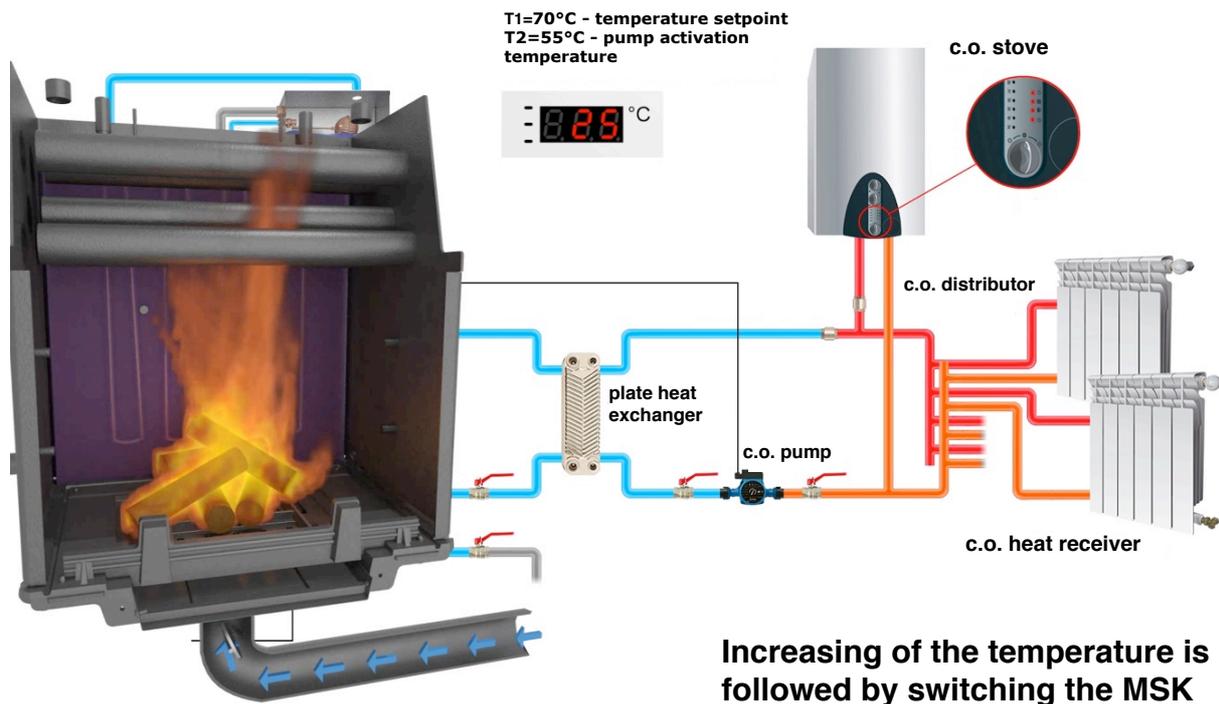
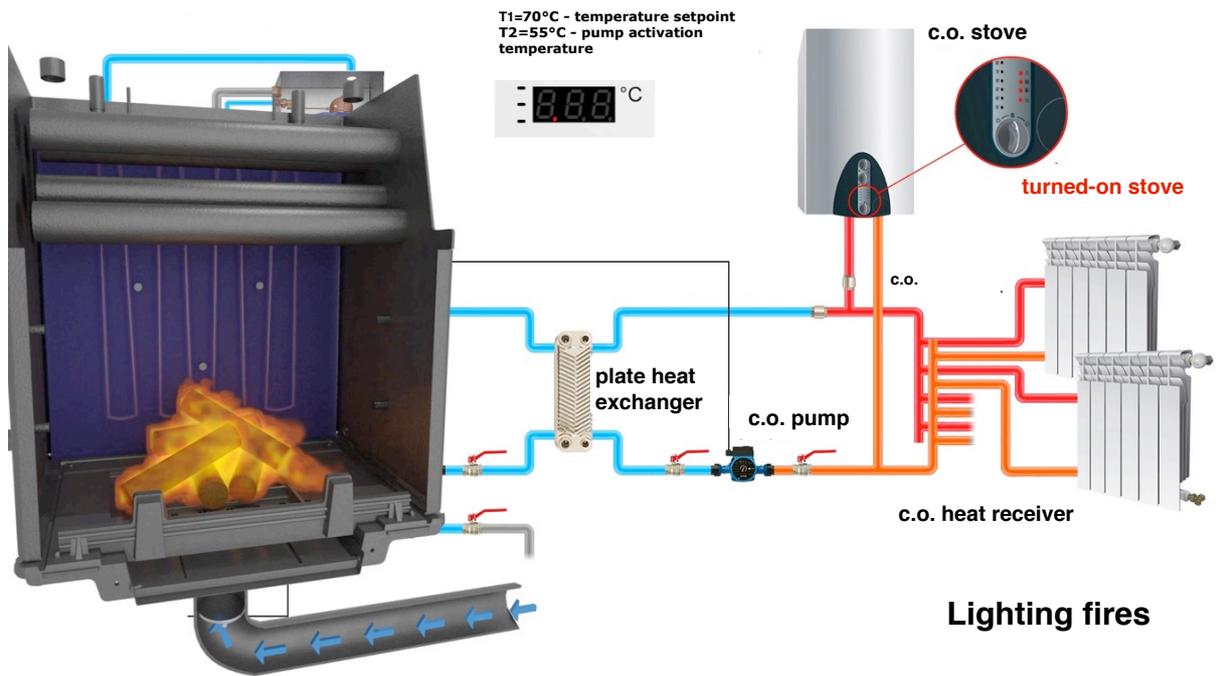
#### 5.1.1. HEATING COIL | COIL PIPE

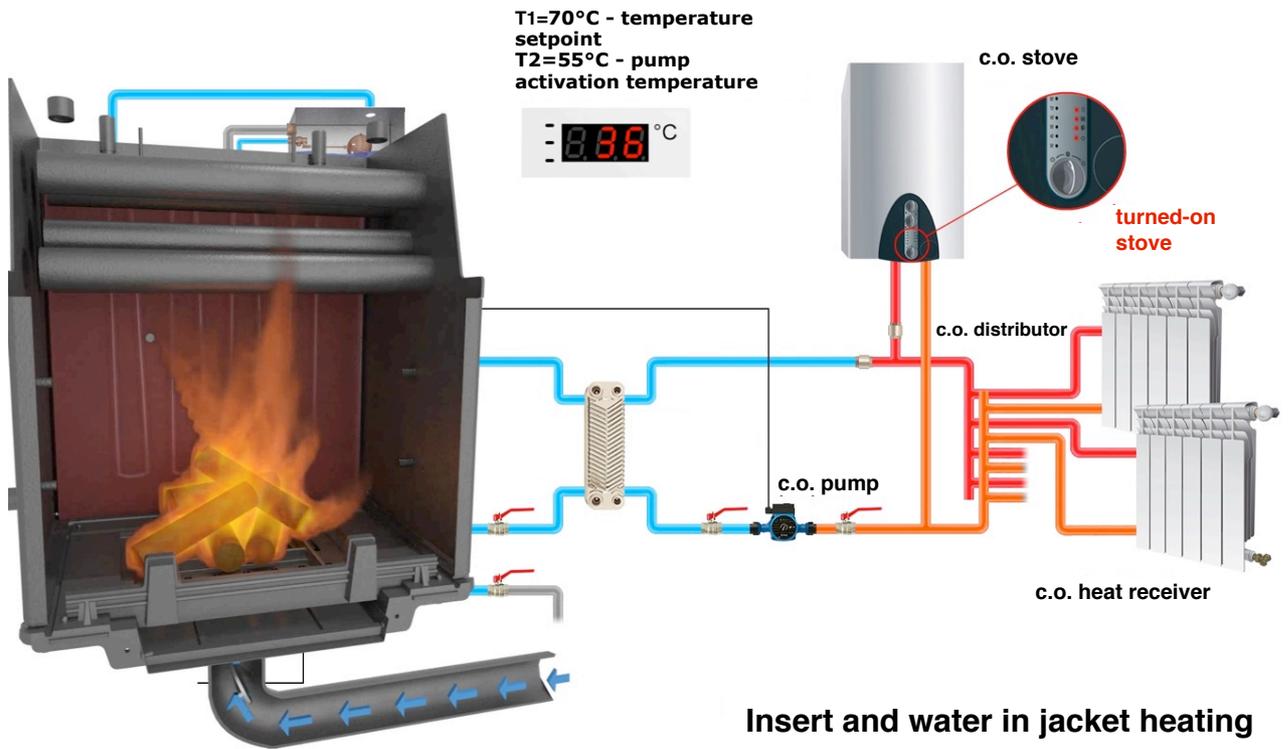
*The heating coil* is a copper pipe with the diameter of  $\frac{1}{2}$  inch built into the fireplace insert and protecting the device against overheating. It serves as the cooler for the fireplace and its length depends on the power of the insert. It is assumed that 0,12 m of heating coil per 1 kW of insert power should be used. It cooperates directly with the BVTS thermal safety valve (look at page 38).

Using a heating coil in inserts with a water jacket is necessary for fireplaces operating in a closed circuit.

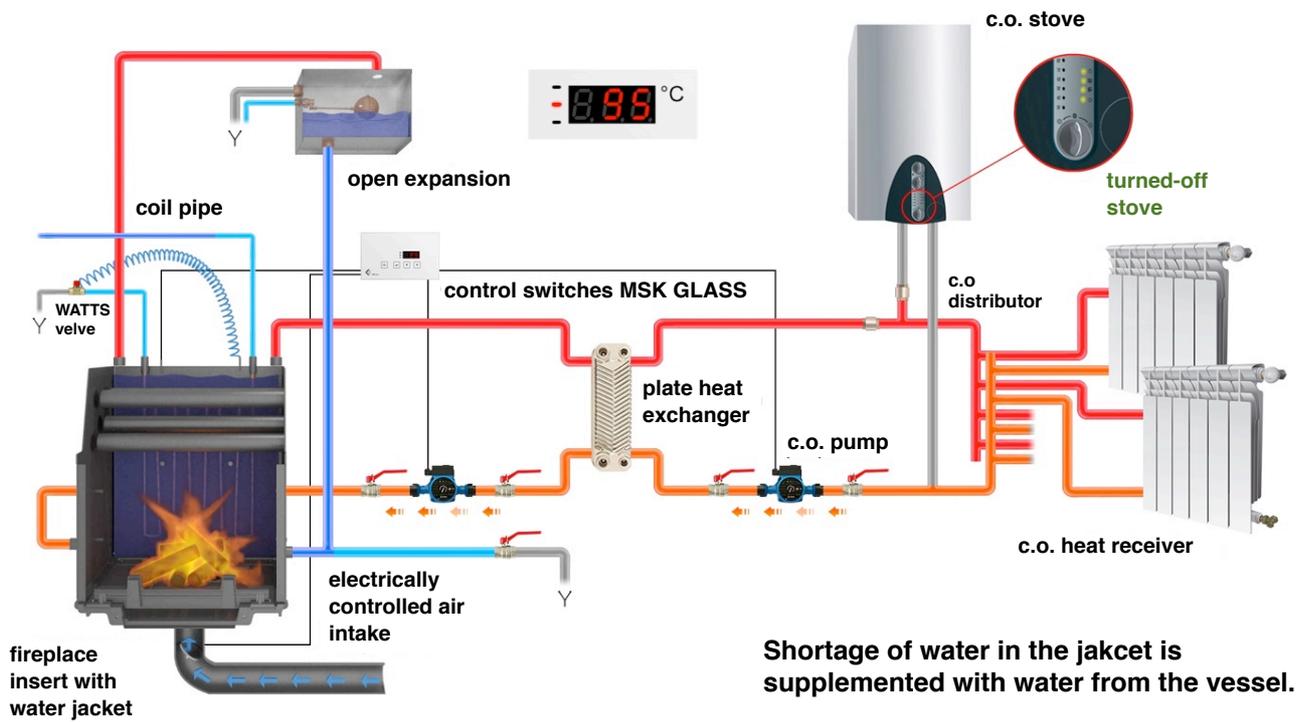


# THE WAY OF COIL PIPE WORK IN FIREPLACE WITH WATER JACKET

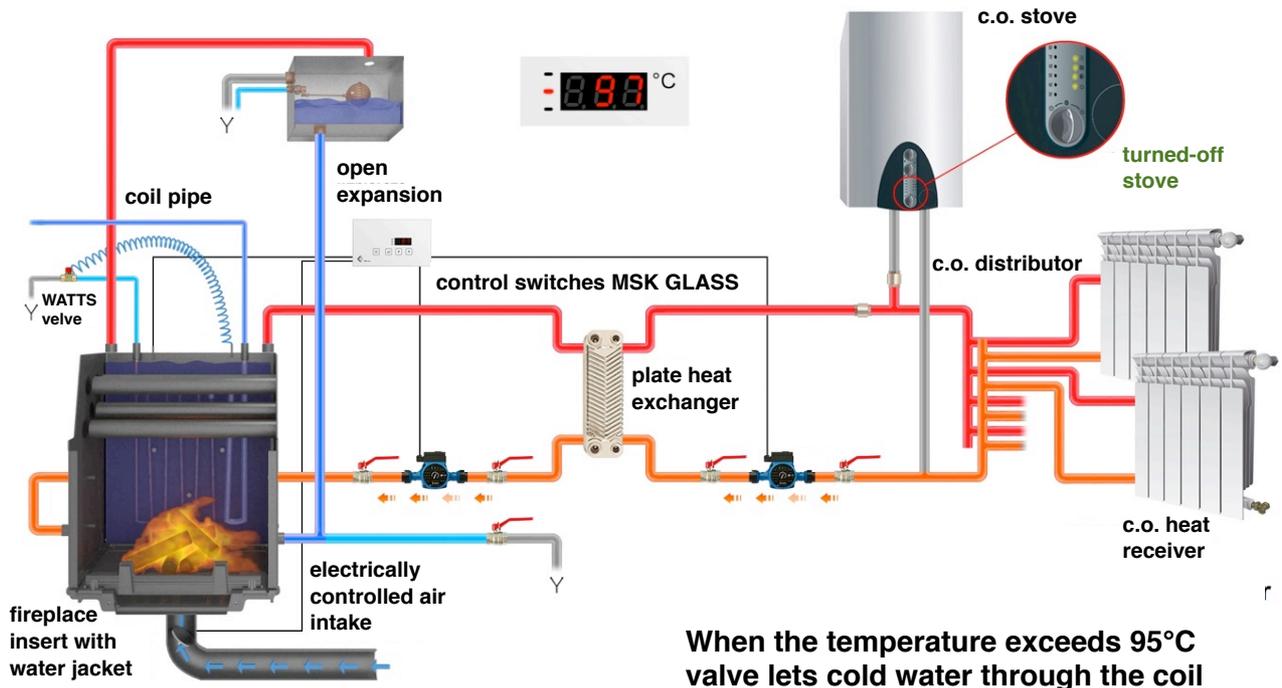




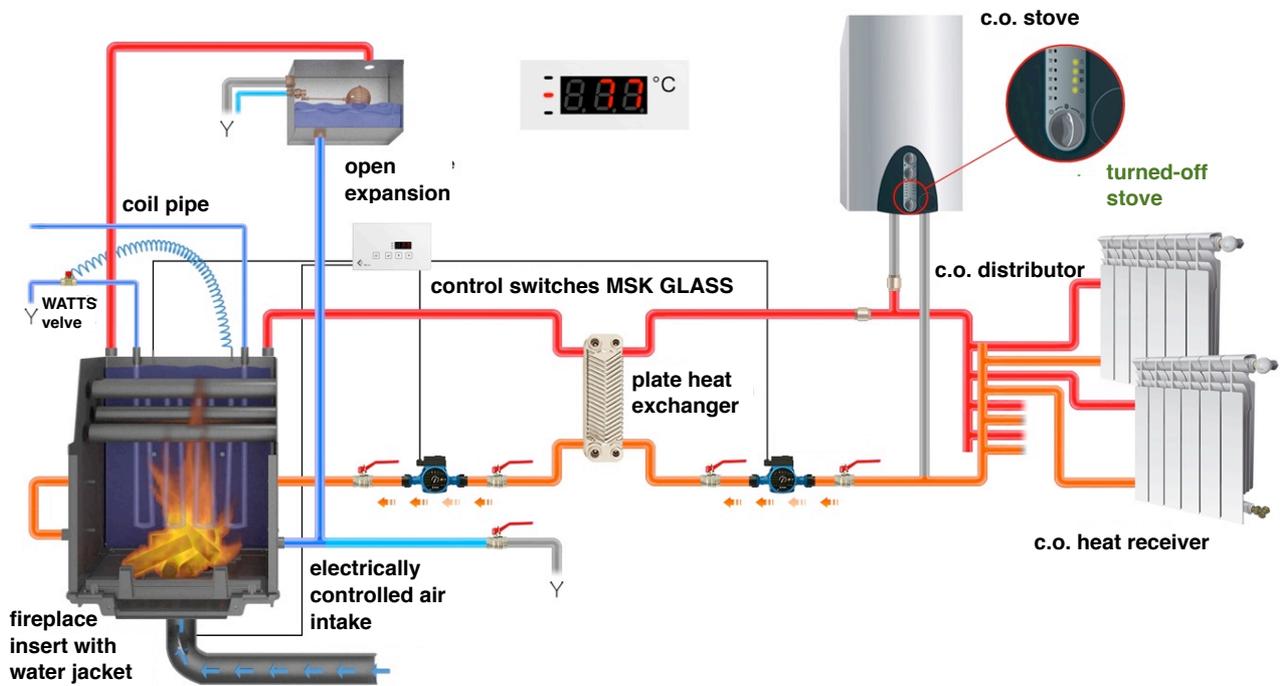
Insert and water in jacket heating



Shortage of water in the jaket is supplemented with water from the vessel.



When the temperature exceeds 95°C valve lets cold water through the coil which cools water in the jacket.



### 5.1.2. BVTS THERMAL SAFETY VALVE

The *BVTS thermal safety valve* is used only in fireplaces with a water jacket and with the heating coil. It protects the water in the water jacket of the fireplace insert against boiling, e.g. in the case of a power failure when the circulation pumps stop working.

When the water in the water jacket of the fireplace reaches the temperature of 95°C, the thermostatic valve is opened and cold water which cools down the water jacket starts running through the heating coil. After passing through the heating coil, the water is drained to the sewage system. Thanks to this, it prevents the temperature in the water jacket of the fireplace from increasing above 100°C.

The valve does not require any power supply – it works automatically (independently), that is – without any external power supply, e.g. electricity or compressed air.

The temperature sensor of the valve can be installed in any position. You must make sure that the sensor is in contact with the measurement area at all times. The pointer fitted on the body of the valve indicates the direction of water flow. The capillary is fitted in the connection pipe of the thermal valve.

Before fitting the valve, you have to flush the installation in order to make sure that there are no residues or other foreign materials in the system that could deposit on the socket of the valve causing its failure. You must also remember to install a filter prior to fitting the valve.



### 5.1.3. 2,5 BAR MEMBRANE SAFETY VALVE - 1"

The *SVH25 membrane safety valve* is used in fireplaces with a water jacket and with a heating coil in closed circuit central heating systems. It is used to protect central heating installations in which a liquid with the temperature not higher than 120°C is used against excessive pressure increase.

The valve activation pressure for SVH25 is 2,5 bar. The values are set in the factory and they cannot be modified by the user.

The valve should be fitted vertically on an unused input connection pipe to the central heating system.

The inflow pipe should be as short as possible and no water stop fittings should be used in it. It is recommended to fit outflow pipes. The diameter of the inflow and outflow pipes should not be smaller than the diameter of the valve connections used. If necessary, at maximum two changes in the direction of the outflow pipe (max. 2 knee pipes) can be fitted. The outlet must be placed in such a way so that it would not pose a threat to the persons present in its vicinity. If the pipe ends with an outlet funnel, the cross-section of the funnel outlet should be twice the size of the cross-section of the safety valve outlet.

The body of the valve is made of MS 58 brass, the knob is made of a material resistant to impact and temperature, the spring is made of chromium-nickel steel, and the membrane and the seal are made of a material resistant to high temperatures and aging.



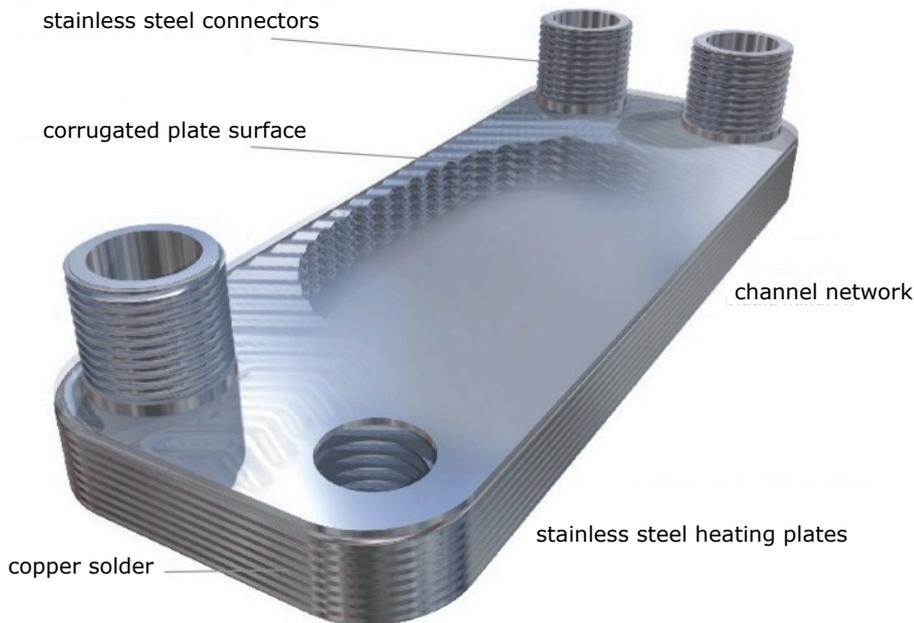
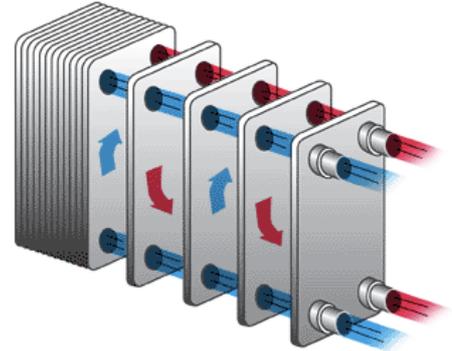
### 5.1.4. PLATE EXCHANGER

The plate exchanger (10, 15, 20, 30 plates) – its task is to separate two independent systems – the open circuit system in which, for example, the fireplace with a water jacket operates, and the closed circuit system in which the central heating installation operates. It is used to connect two systems with different operating pressure values.

Plate heat exchangers are liquid-flow and contra-flow devices. The corrugated stainless steel plates connected into a block by means of copper or nickel solder constitute the heat exchange area. The flow of the liquids exchanging heat is directed into every second channel created by the corrugated heating plates.

The selection of the appropriate heat exchanger depends on the power of the fireplace insert selected. If no heat exchanger corresponding with the power of the insert is available, an exchanger with more plates should be selected.

Example: 15 kW fireplace insert – 15-plate heat exchanger.



### 5.1.5. CENTRAL HEATING CIRCULATION PUMP

The purpose of the water central heating installation is to supply heating water prepared in the boiler room to every radiator. This is achieved chiefly thanks to the operation of an appropriate circulation pump. The goal of every pump is to transform mechanical energy into the kinetic energy of the liquid. This means that the moving element of the pump transmits its energy to the liquid pumped thanks to which it can circulate in the system. The circulation pump of the heating system moves the heating water and keeps its pressure at the level that is high enough for the water to reach the most distant radiator. To put it simply, the circulation pump of the central heating system is responsible for assuring circulation of the water flowing between the fireplace and the radiators thanks to the pressure difference created by the pump.

The pump should be used only to force clean, treated water in small, average central heating installations, especially in family houses and to pump non-aggressive, non-explosive liquids with low viscosity that do not contain any solids, fibers, mineral oils.

The circulation pump is described by means of two parameters:

a. *Head* - the pressure that the pump is capable of producing in the liquid forced.

The value is provided in water column meters (conventionally the value is provided in meters). The head value is also influenced by the height difference between the boiler (heat source) and the highest radiator as well as by the difference in the temperature of the water at the return and supply points. Because the so-called gravitational pressure difference resulting from it is relatively small, the value can be neglected in most calculations (particularly in the case of lower buildings).

b. *Capacity* [ $m^3/h$ ] - it is connected with the amount of water that the pump must force into the heating system, and thus – with the volumetric flow rate for the whole installation.

The pump should be fitted on a straight section of the piping between two stop valves, considering the following factors:

- the pressure in the system does not exceed the acceptable operating pressure of the pump, that is 10 MPa,
- the pump should be easy to access for the purpose of de-aeration,
- a filter whose permeability is periodically verified is fitted before the pump,
- water is treated and the network is free of mud,
- the system is filled with the liquid and de-aerated,
- the axis of the pump engine is positioned horizontally.

At January 1st 2013 into force have entered european rules under Directive 2005/32/EC on establishing requirements for energy-related products (ErP). They allow on the market only high-efficiency circulation pump. (Energy Efficiency Index EEI <0,27).

According to this regulation we supply products with high efficiency, which means energy-saving pump WITA Delta HE.



### 5.1.6. SEALED BRASS HEAT EXCHANGER AND PUMP SET

Instead of using separate elements of the system (an exchanger or a circulation pump), it is also possible to purchase a ready-made solution in the form of a heat exchanger and pump set.

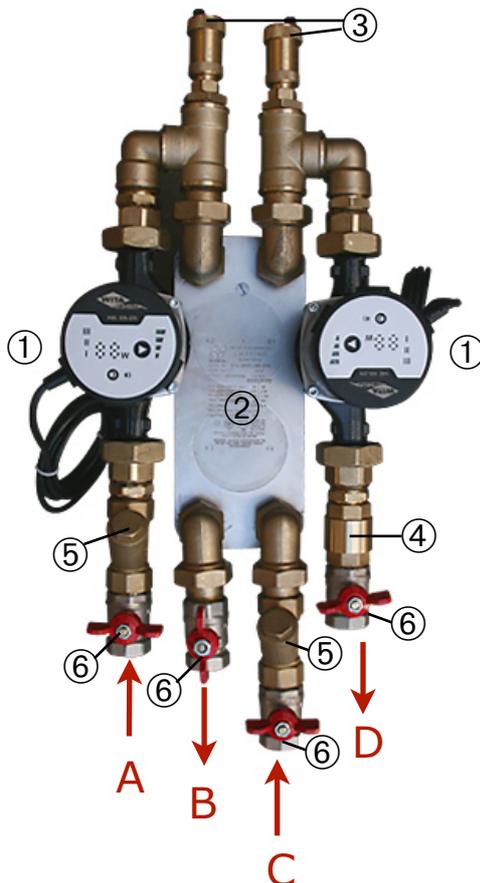
A sealed heat exchanger and pump set is a complex, professionally mounted heat transfer station, that is – a set of devices necessary to assure circulation of the warm water produced by the fireplace functioning in an open circuit system with the existing central heating installation which operates in a closed circuit system. Combining those systems is possible thanks to the plate exchanger. It makes it possible to transfer energy from one system to the other in a way that does not compromise the characteristics of any of the systems.



*The set is comprised of:* a plate exchanger with the appropriate number of plates (selected depending on the power of the fireplace insert), two circulation pumps, two filters, two deaeration valves, a check valve (on the central heating system), stop ball valves. Additionally, the set also includes brass fittings for connecting particular elements.

The set should be fitted in such a way so that the heat exchanger is positioned vertically and the axes of pump rotors are positioned horizontally. While fitting the set, you should also bear in mind the necessity to perform basic maintenance activities and control over the device. After the set is mounted, it is required to check the tightness of all the connections. Before starting the device, make sure that the whole set is filled with water and that the pumps are deaerated. The correct direction of the flow of the media through the set is presented on figure.

The speed with which the media flow through the set must be selected in such a way so that the temperature fluctuation at the inlet to the fireplace insert and the outlet is round 5°C. A situation in which only one of the pumps is operational is not permitted.



- 1. circulation pump**
- 2. plate exchanger**
- 3. automatic deaeration valve**
- 4. check valve**
- 5. filter**
- 6. stop valve**

- A. supply from the fireplace**
- B. return to the fireplace**
- C. return from the central heating system**
- D. supply to the central heating system**

### 5.1.7. EXPANSION VESSEL

The *expansion vessel with an auto-stop valve* constitutes hydraulic protection of a fireplace insert with a water jacket operating in an open circuit. It is an open vessel which stores the excess of water in the system caused by the increase in its volume as a result of the temperature increase. It protects the system when there is no electricity and the circulation pumps forcing the water in the system do not work.

An open expansion vessel with a float valve must be mounted above the fireplace. The vessel should be placed along a vertical line over the source of heat. Such devices should be placed in heated rooms or in rooms with the temperature greater than 0°C. Otherwise, it is necessary to provide thermal insulation of the expansion vessel.

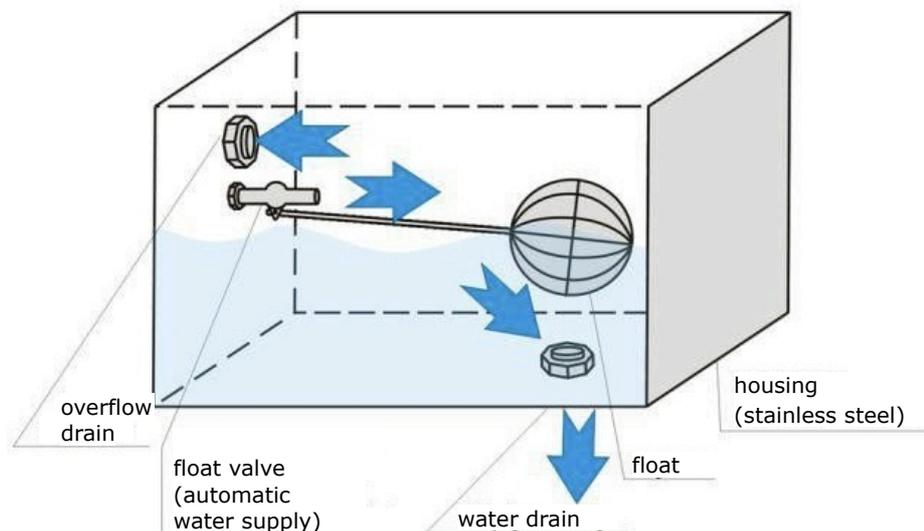
The expansion vessel is made of stainless steel.

*It is comprised of:*

- a valve with a float made of copper which assures automatic provision of water in the system supplied by the fireplace with a water jacket,
- brass connection joints that guarantee tightness of the connection with the overflow and expansion pipes.

A fireplace insert with a water jacket is connected with the open part of the expansion vessel through an overflow safety pipe. The safety pipe is connected to the unused upper inlet connection pipe or connected to the installation between the insert and the valve closest to it. The task of the overflow safety pipe is to prevent pressure increase in the boiler, e.g. as a result of closing the stop valve separating the boiler from the system while the fuel is still burning. No valves can be fitted on the safety pipe. With the exception of vertical sections, the pipe must be fitted at the proper pitch so as to assure proper water flow and prevent the air from accumulating in the pipe.

Increase in the temperature of the water circulating in the system leads to an increase of its volume. This, in turns, causes the water to flow through the safety pipe to the extension vessel which lowers the water level in the vessel. The copper float lowers automatically and lets the water from the waterworks run into the vessel, lowering the temperature and balancing the water level in the vessel. The overflow drain connected to the waterworks installation prevents the water in the vessel from exceeding the maximum level (it works similarly to the overflow drain in a bathtub).



### 5.1.8. MSP CONTROLLER

The *microprocessor pump controller* is a device which constantly monitors the temperature in the water jacket of the fireplace insert and controls two outlets to which the maximum of 2 central heating circulation pumps (1 outlet) and, for example, a valve (2 outlet) are connected by default on the basis of the parameters set.



Apart from its basic functions, the controller also informs about the fact that the alarm temperature has been exceeded, protects the installation against freezing by automatically switching off the central heating pump if the temperature measured falls below 4°C and against self-activated switching from the stand-by mode after detecting an increase in the temperature of the liquid in the installation.

### 5.1.9. MSK CONTROLLER / MSK GLASS

*The MSK or MSK GLASS set with a throttle with the diameter of 100, 125, 150 mm*

MSK is an innovative microprocessor controller of the fireplace insert for all forced-air inserts as well as for inserts with a water jacket. Its task is to manage both the burning process in the insert and to operate the devices constituting the insert so that the heating is as efficient as possible.

*The MSK controller enables:*

- controlling two central heating pumps and one other independently set device,
- controlling the chimney turbine in the Air option,
- precise air dosing during the burning process in a way that assures its maximum efficiency.

The controller protects the system against overheating through stopping the flow of air in the case of a power failure. Additionally, it protects the installation against freezing by automatically switching off the central heating pump if the temperature measured falls below 4°C. Thanks to its application, you can save up to 30% of wood and recoup your investment after 2 months of its use.



MSK  
(microprocessor fireplace controller)  
with a throttle



MSK GLASS  
(microprocessor fireplace controller)  
with a throttle

### 5.1.10. MSK PLUS CONTROLLER



*MSK PLUS set with z throttle fi 100, 125, 150 mm*

*MSK PLUS* is an innovative microprocessor controller of the fireplace inserts. It can be used for every traditional inserts as well as those with water jacket. Controlled size is heated by insert air temperature or air temperature in water jacket. It enables you to control temperature in 3 different points of installation. It also allows you to control independently 4 devices like: pump, fans or solenoids. Its job is to dispend cold air (for burning) with electronic throttle. The air comes from outside the building into the combustion chamber in such way that it could be more efficient while maintaining the set of temperature control.

Thanks to its use we can save even up to 30% of the wood and after only two months of using the money for this purchase will return.

*Functions of the controller:*

- independent control of four devices, eg. pumps c.o., fans or solenoid
- precise combustion of air for burning
- protection against overheating
- cutting off the air supply in case of a power failure.
- acoustic warning
- antifreeze function of circulating water.
- funktion of postseason run of circulation pumps when they are not used out of season.

Similarly to the MSK controller, the *EKO LINE controller* is responsible for optimizing the burning process in the fireplace. It fulfills the requirements for handling modern central heating installations. The controller can be used for fireplace inserts with a water jacket. It is possible to set three controller operation modes thanks to which you can assure proper operation of many different installations used to provide central heating and domestic hot water.



Control starts automatically after the wood is placed in the insert, set on fire, and the door of the stove is closed. The supply of air to the burning chamber is controlled by means of the throttle which guarantees ideal burning of the wood which, thanks to optimum efficiency, makes it possible to reduce the amount of wood consumed, that is – money.

The controller also plays a verification function; thanks to the throttle and the fact that it reads the temperature measured by the temperature sensor, it can optimize the amount of air needed to support the burning process which will have an effect on economical burning of wood fuel.

The device makes it possible to use a combination of central heating supply from different energy sources, including a fireplace with a water jacket, solar energy, electric energy, a gas boiler. The controller protects the central heating installation against hazardous phenomena, such as: water boiling or freezing, pump stiffening if they are not used for a longer period of time. Controlling the knob of the domestic hot water tank considering electricity price rates provides savings of up to a few dozen percent outside of the heating season. The possibility of switching off the gas boiler or another source of heat after the fire is started in the fireplace considerably facilitates the management of the whole system.

#### *Characteristics:*

- modern design,
- glass front panel with the dimensions of 175×175 mm
- installation in a flush-mounting box with the dimensions of 150×150×60 mm
- OLED display with the dimensions of 62×31 mm and resolution of 128×64 mm
- 4 touch fields serving as pushbuttons.

Thanks to the touch panel of the display and the icons displayed on it, you will be informed about the processes that have been programmed, e.g. ignition, pump operation, turbine capacity modification, throttle positioning, etc. The functions are clear and easy to use, the helpful icons on the display make the operation of the controller easy even for the least experienced users.

It provides considerably more configuration controller adjustment options for a particular installation. It is equipped with more input and output sockets (RS module, fire protection switchgear, door closing sensor, main heat source disconnection).

### 5.1.12. THERMAL INSULATION OF THE INSERT WITH A WATER JACKET

Thermal insulation of the insert with a water jacket makes it possible to considerably reduce heat loss in the water heated and directly influences an increase in the efficiency of the fireplace insert even by 10%. It also protects the fireplace housing against heating and prevents vapor condensation on the elements located both inside as well as outside of the fireplace insert. Thanks to that, the maximum amount of heat is supplied to the heating system.

Additional application of the insulation also reduces the amount of wood burned, and, thus, guarantees more economical burning. This means that when you use it, you need less wood to obtain the same temperature. Thermal insulation of the fireplace insert with a water jacket is made of zinc coated metal sheets and insulation wool protected with aluminum foil.



### 5.1.13. ANTI-CONDENSATION FLANGE

The *anti-condensation flange for steel pipes* has a two-layer structure and seals the outlet from the fireplace flue to the chimney. Thanks to that, the condensate produced as a result of temperature fluctuations in the chimney falls into the fireplace where it is heated and turned into vapor. The water which falls from the chimney does not escape out of the chimney system and it does not cause corrosion and the appearance that fireplace welding is not tight. The flange is only suitable for 2 mm black steel pipes.

Installation: fitting the flange on the fume outlet.



## 5.2. THE CHARACTERISTICS OF ADDITIONAL ELEMENTS NEEDED TO PERFORM THE INSTALLATION

### 5.2.1. EKOBAL

The *EKOBAL concentrate* is a liquid used in cooling and heating installations.

*The benefits of using the concentrate:*

1. It lowers the temperature of the heating medium in heating installations thanks to which it protects the system against exploding during planned or random breaks in the operation of the system. The most frequent reasons for breaks in the operation of heating systems that result in their explosion in frosty weather:
  - long-term break in the supply of electricity, gas,
  - defective operation of the start-up automation system of the fireplace insert after a short break in the supply of electricity,
  - a failure of the circulation pump.

Building cooling to a level that results in explosions of the radiators, the fireplace insert, or, potentially, flooding the rooms is relatively rare but the costs of purchasing the concentrate will prove incomparably low in relation to the potential damages.

2. It protects the installation against corrosion (also electrolyte corrosion of copper / aluminum installations).
3. It prevents limescale accumulation.
4. It prevents local overheating of the heating medium thanks to which it assures quiet fireplace operation.
5. Thanks to the features listed above, the meantime between failures of the heating installation is considerably extended.

The concentrate can be used in installations made of all the types of commonly used construction materials: cast iron, aluminum, copper, plastics. A new heating system to be filled with EKOBAL cannot include any zinc galvanized elements (internally) – zinc is dissolved by propylene glycol. The concentrate should be protected against access of halogenated compounds. In a newly constructed installation in which solder connections are used, halogens can be present in the fluxes – that is why it is recommended to initially rinse the installation before it is filled with the concentrate. The most preferable option is for the connections to be made of silver or copper solder. Following the instructions provided above will considerably prolong the anti-corrosion protection provided by the concentrate and preserve the installation intact for many years.

#### *Filling and maintenance*

The concentrate should be pumped into the system from below. To fill the installation, you can use a pump made on the basis of a commonly available garden sprinkler. In the case of any potential leaks of the concentrate from the installation, you can use the same pump to refill the installation with EKOBAL and create the pressure required. Gravitational heating systems should be filled with a solution of the concentrate prepared in advance. In the systems with forced circulation, it can be mixed with water in the installation itself. A filter – a sedimentation basin must be installed at the lowest point in the installation. A deaeration valve must be installed at the highest point in the installation. Before using the concentrate, all the dirt must be rinsed off from the installation. Sediments in the installation accumulated over the period of its earlier exploitation should be flushed with the use of special preparations in accordance with



the recommendations of their producers. For final filling, water free from any mechanical contamination – filtered if necessary – should be used.

After final rinsing, the installation should be filled with an EKOBAL solution to prevent its corrosion even if the system is to be started later. After the concentrate is applied, the system should be deaerated. After about two weeks since the system is started, the filter must be inspected (and cleaned if necessary). The amount of water missing as a result of its evaporation should be refilled. The losses resulting from leaks should be refilled with the concentrate solution.

#### Note

The standard heating installation is connected to the waterworks system and separated from it with a stop valve. The pressure in the installation can fall for various reasons and that is why the valve opens from time to time for a moment to refill the water in the installation (increase the pressure). The concentrate circulating in the system could partially penetrate into the waterworks, and thus – to drinking water, if the valve is opened when there is no pressure in the waterworks system. Check valves that make it possible for the liquid to flow only in one direction can serve as protection against such a risk. It is, however, assumed, that, according to Murphy's law, all the valves will fail in a critical moment and that is why the system should be completely separated from the waterworks installation. The concentrate cannot have any direct contact with useful water in a normally operating installation in working order. The heat is transferred to the water diaphragmatically (in the exchangers).

### 5.2.2. EMERGENCY POWER SUPPLY

The device is useful when there is a power failure. The emergency power system is designed to provide the recipients with alternate current with the nominal voltage of 230 VAC and the wattage of 300W, 400W and to charge batteries with the nominal voltage of 12 VDC. Note: every emergency power supply unit should be equipped with an appropriate VRLA battery; next, the power consumption by the pumps and any other potential devices that are necessary to assure proper operation of the fireplace installation should be verified.



### 5.2.3. A THROTTLING VALVE WITH A LANYARD

A throttling valve with a lanyard makes it possible to control the inlet of fresh air from the outside to the combustion chamber in the fireplace. The throttling valve is equipped with a rod and with a special seal that guarantees complete disconnection of the airflow. Material: zinc coated metal sheet.



## 6. CONTROL DEVICES FOR FIREPLACE INSERTS WITH A WATER JACKET – MSP, MSK, AND EKO LINE

The burning process is controlled by a control unit which, depending on the temperature of water in the water jacket, controls the operation of the throttling valve. When the temperature in the water jacket reaches the value set, the throttle shuts up providing less air to the combustion chamber. The controller also manages the operation of the central heating circulation pump(s). Our offer includes a few kinds of control units.

### 6.1. MSP PARAMETER SETTINGS (MICROPROCESSOR PUMP CONTROLLER)

Parameter	Parameter description	Exemplary parameter settings
<b>t1</b>	The temperature of activation / deactivation of the central heating pump, considering H1 hysteresis.	55°C
<b>H1</b>	Hysteresis (temperature) – the point of activation / deactivation of the central heating pump. The pumps are activated when the temperature of the fireplace is higher than $t1 + H1$ . The pumps are deactivated when the temperature of the fireplace is lower than $t1 - H1$ and after the time P1 passes (pump overrun).	5°C
<b>P1</b>	Pump overrun time, that is the time after which the pump is switched off till the temperature falls to the value of $t1 - H1$ .	5 min
<b>t2</b>	The temperature of activation / deactivation of output 2 (a valve or a different device, e.g. another central heating circulation pump). The devices are activated when the temperature of the fireplace is higher than $t2 + H2$ . The devices are deactivated when the temperature of the fireplace is lower than $t2 - H2$ and after the time P2 passes (pump overrun).	Example: If the controller serves central heating pump 2; 55°C
<b>H2</b>	Hysteresis (temperature) – the point of activation / deactivation of output 2.	5°C
<b>P2</b>	Overrun time, that is the time after which output 2 is switched off till the temperature falls to the value of $t2 - H2$ .	5 min
<b>tAl</b>	Alarm temperature. The temperature value above which the alarm is activated and remains activated until the temperature drops below the alarm value set (max. 95°C).	95°C
<b>n2</b>	A parameter set for the second output from the controller. If the device connected to this output is to operate when the fireplace is used (e.g. a second circulation pump), the parameter is set to LOF. If the device connected to this output is to operate when the fireplace is not used (e.g. domestic hot water heater), the parameter is set to LON.  LOF – the parameter set to control the operation of 2 pumps when the fireplace is used so that both pumps could operate in the same parameters. $t2 + H2 <$ pump activation $t2 - H2 >$ pump deactivation  LON – the parameter set to control the operation of output 2 to which a different device (e.g. an electric heater) is connected instead of a pump and which is activated after the fireplace is put out. $t2 - H2 <$ additional device activation $t2 + H2 >$ additional device deactivation	Depending on the device connected.

All the parameters are selected individually.

## 6.2. MSK / MSK GLASS PARAMETER SETTINGS (MICROPROCESSOR FIREPLACE CONTROLLER)

Parameter	Parameter description	Exemplary parameter settings
<b>t1</b>	The temperature set for the fireplace (the water in the water jacket) that the controller will try to maintain.	65°C
<b>t2</b>	The temperature of activation of the central heating circulation pump(s).	55°C
<b>t3</b>	The temperature of a different device that is connected to socket J7 (not applicable if no device is connected).	If no device is connected to socket J7, the value is set to 90°C so that the control diode is not activated unnecessarily.
<b>tAl</b>	The alarm temperature value above which the alarm is activated and remains activated until the temperature drops below the alarm value set (max. 95°C).	95°C
<b>p1</b>	The position of the throttling valve after switching to the stand-by mode. After the temperature falls and the pumps are deactivated, the controller switches to the stand-by mode. The throttling valve is then closed to the level defined by the user so as not to cool down the fireplace.	1 (10%)
<b>p2</b>	Pump deactivation hysteresis. The pump is deactivated when the temperature falls below the set temperature value t2 of t2 - p2.	5°C
<b>p3</b>	The time after which the pump will be deactivated after the temperature falls to the value of t2 - p2.	5 min
<b>p4</b>	The time period from the moment when the pumps are deactivated till the moment when the controller switches into the stand-by mode.	30 min 1 - activation 0 - deactivation
<b>r1</b>	Temperature controller integration time (the time needed to verify the parameters set). The reaction rate of the throttling valve to changes in the temperature of the fireplace (range from 0 to 240 s) depends on the value of this parameter.	30 s
<b>Ar</b>	Activation / deactivation of automatic throttling valve position adjustment.	1 - activation 0 - deactivation It is recommended to set this parameter to 0 while the fire is started in the fireplace.

*In the models with firmware V 33 and above the parameters are set by default (as stated in the table above).*

### 6.3. EKO LINE CONTROLLER PARAMETER SETTINGS

Example:

Setting – a fireplace with a water jacket, open circuit with a heat exchanger, control of an electronic throttling valve and two circulation pumps.

Parameter	Parameter description	Exemplary parameter settings
MENU	Controller menu: item number 1. The temperature set that the controller tries to maintain by adjusting the position of the throttling valve appropriately. The arrow pointing up on the left side of the temperature value means an increase in the temperature of the fireplace.	65°C
SUB-MENU 6.3	Sub-menu: A sub-menu containing the parameters responsible for the controller operation modes and for controlling the throttling valve.	
SUB-MENU 6.3.1	Alarm temperature: the fireplace temperature value above which the temperature indication lamp starts flashing and a sound signal is emitted.	95°C
6.3.2	Throttling valve position in the put out mode.	0%
6.3.3	Throttling valve position in the fire lighting mode.	100%
6.3.4	When the controller is in the put out mode, temperature increase read by sensor T1 by the value set in parameter „6.3.4 Fire lighting increase“ over the period of time set in „6.3.5 Fire lighting time“ will make the controller switch to the fire lighting mode.	4°C
6.3.5	The time needed to start the fire.	4 min
6.3.6	The time period after which the controller switches to the stand-by mode if the temperature value set in parameter „6.3.7“ is not reached.	15 min
6.3.7	The temperature of the fireplace above which the controller switches from the fire lighting mode to full wood burning mode.	40°C
6.3.8 6.3.9	Hysteresis of throttling valve opening. The throttling valve is fully opened (100%) when the temperature falls below the value set in parameter „6.3.8“ after the time period set in parameter „6.3.9 Extinguishing period“.	10°C 60 s
6.3.10	The temperature at which all the fuel in the fireplace is burned and the throttling valve is shut.	30°C
6.3.11 6.3.12 6.3.13	The parameters responsible for the operation of the PI-D controller. The PI-D controller is responsible for maintaining constant temperature in the fireplace by means of appropriate adjustment of the throttling valve.	6.3.13 Kd should be set to 0%; The values of parameters 6.3.11 Kp and 6.3.12 Ki should be determined empirically, according to the description in the user's guide
6.3.14	Minimum opening of the throttling valve while the PI-D controller is operational. The parameter should be selected in such a way so that the fire is not over-suppressed, e.g. when the temperature set decreases.	5%
6.3.15	Activation / deactivation of continuous throttling valve control. Constant active control leads to quick wear of the throttling valve and it should be used only during the adjustment of the PI-D controller. Continuous control should be automatically deactivated after the put out mode is activated.	T - activated N - recommended deactivated
6.3.16	Throttling valve control time when continuous control is deactivated.	1 s

6.3.17	Minimum change of the optimal throttling valve position after which it will be adjusted when continuous control is deactivated. Adjustment range 1-25%.	5%
6.3.18	Minimum time interval between subsequent throttling valve adjustments when continuous control is deactivated.	20 s
6.3.19	Maximum time interval between subsequent throttling valve adjustments when continuous control is deactivated.	300 s
6.3.20	The level of the control signal (electric impulse) that is responsible for complete shutting of the throttling valve manufactured by Kratki.pl.	4%
6.3.21	The level of the control signal (electric impulse) that is responsible for complete opening of the throttling valve manufactured by Kratki.pl.	54%

#### 6.4. COMPARISON OF MSP, MSK, AND EKO LINE CONTROLLERS

CONTROLLER	MSP	MSK / MSK GLASS	MSK PLUS	EKO LINE
control of fireplaces with a water jacket in an open circuit	+	+ / +	+	+
control of fireplaces with a water jacket in a closed circuit	+	+ / +	+	+
control of forced-air fireplaces with DGP	-	+ / + (Air option)	+	+
controlling an electronic throttling valve with a servomechanism	-	+ / + (throttling valve with the diameter of 100, 125, or 150 mm in the set)	+ / + (throttling valve with the diameter of 100, 125, or 150 mm in the set)	+ / + (no throttling valve in the set)
air turbine control	-	+ / + (Air option)	+	+
electric hot domestic water heater control (considering electricity price rates)	-	-	-	+
circulation pump	+	+ / +	+	+
temperature sensor	+	+ / +	+	+
	(1 PT 100 1 mb sensor included in the set)	(1 PT 100 1 mb sensor included in the set)	(3 PT 100 1 mb sensor included in the set)	(4 PT 100 1 mb sensor included in the set)
fuel signaling	-	-	+	+
<b>EXTERNAL APPEARANCE</b>				
glass panel	-	- / +	-	+
installation in a flush-mounting box	+	+	+	+
graphical display	7-segment LED 4 numbers	7-segment LED 4 numbers	Alphanumeric LCD 2x8 signs	Graphic OLED 128x64
tactile sensors – instead of pushbuttons	-	- / +	-	+
<b>SAFETY</b>				
overheating protection (acoustic warning)	+	+ / +	+	+
emergency throttling valve shutting	-	+ / +	+	+

anti-freezing pump protection	+	+ / +	+	+
off-season pumps run	-	- / -	+	+

## 7. ADDITIONAL ELEMENTS FOR FIREPLACE INSERTS WITH A WATER JACKET

### 7.1. COLD AIR INTAKE

Cold air intake is a special aluminum tapping fixed to every fireplace insert with a cast iron base that we manufacture. Its purpose is to supply fresh air to the combustion chamber.

In order to work properly, every fireplace needs the adequate amount of air. Its shortage often becomes one of the main problems of insert malfunctions. For a problem-free use of the fireplace, about 8-10 m<sup>3</sup>/h of air per 1 kg of wood must be supplied to it. If no other route is available, it draws the air from the room in which it is installed. As it is most frequently placed in the living room, which means a place where we stay very often, it actually "takes the air from us" in an indirect way.

The best way to make sure that the appropriate amount of air is supplied to the fireplace is supplying it through a special intake tunnel directly from the outside of the building. Pipes, tunnels made of zinc coated steel sheets, aluminum or PCV are used to construct the tunnel. The tunnel is placed under the subfloor or on it. Before the subfloor is poured, it must be thermally insulated; otherwise, the air flowing through it will cool down the floor. In a house with a basement, the intake tunnel is usually constructed under the basement ceiling. A throttling valve that makes it possible to stop the inflow of air is fitted on the section of the tunnel that conveys the air so as not to cool down the rooms when the fireplace is not used. The end of the pipe on the outside (the intake air box) is fitted on the wall of the building or led out above the surface of the ground.

A PDR connection (a transition between the intake tunnel and a pipe with the diameter of 100, 125, or 150 mm) which makes it possible to connect the tapping with a pipe of the FLEX type should be used to connect the intake tunnel to the installation.

### 7.2. DECORATIVE VERMICULITE INSERT

A decorative insert is made of vermiculite plates and angles. Its dimensions are adjusted to particular types of fireplace inserts.

Vermiculite is a natural organic material used to inlay the combustion chamber in fireplace inserts. It is characterized by low density and high resistance to high temperatures as well as by great insulation properties. Vermiculite increases the temperature in the combustion chamber by which it improves the parameters of burning poisonous gases and additionally reduces the accumulation of soot on the fireplace pane. It is particularly recommended for inserts with a water jacket.



The cracks that can occur in vermiculite plates are natural for this type of material and they do not influence its usage features.

Technical data:

Plate thickness: 25 mm

Density: 600 kg/m<sup>3</sup> (± 10%)

Maximum working temperature: 1100°C

Linear thermal expansion coefficient (20-700°C): 0,9

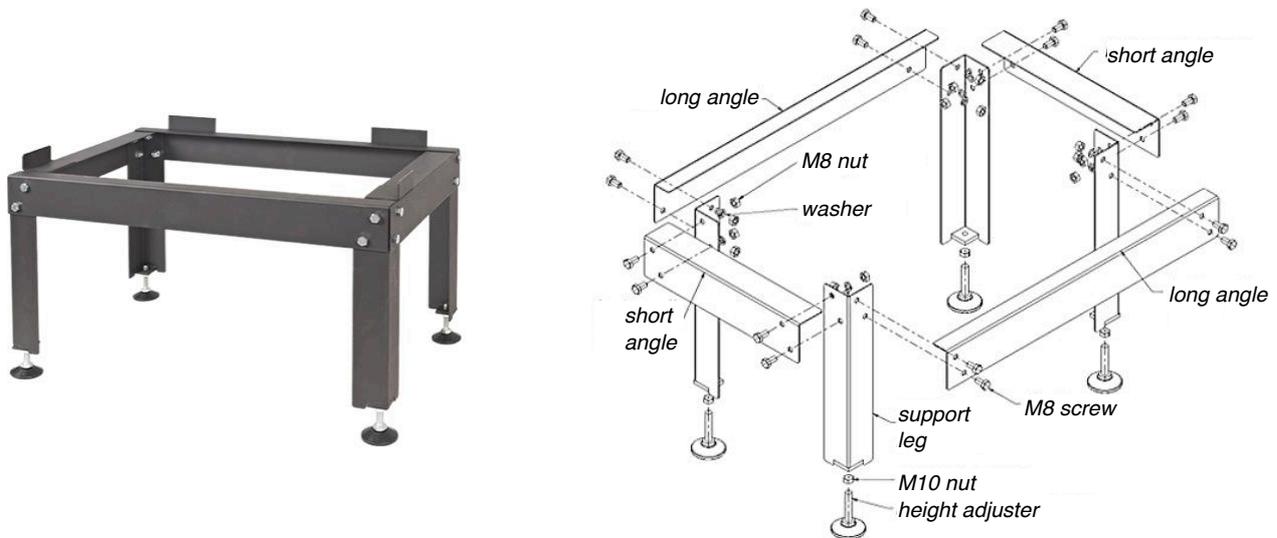


### 7.3. FIREPLACE INSERT SUPPORT FRAME

The support frame of the insert is designed to make the insert higher and to adjust its height to the desired level. Thanks to the legs moveable up to 5 cm, you can safely place the fireplace insert even on a considerably uneven surface.

#### *Assembly instructions:*

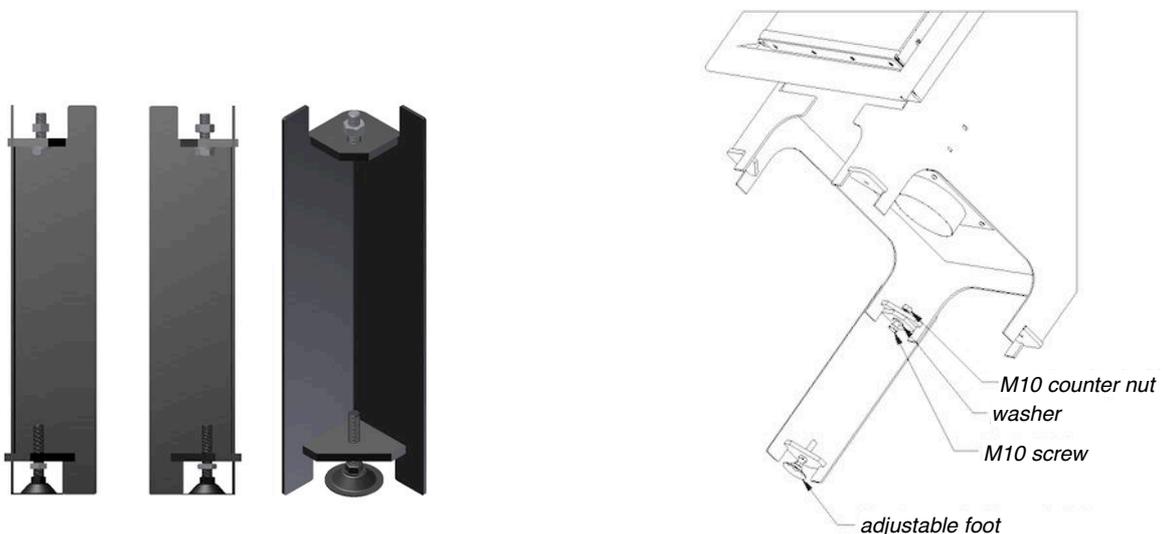
Start assembling the support with screwing the support legs with the left and right side angles; then screw the front and the back angle. Screw the height adjusters together with the nuts into the frame legs. After assembly, adjust the height of the support frame by using the height adjusters and securing them with the nuts. The maximum support frame load is 750 kg.



#### **Mila insert legs - Legs for Mila, Basia and BS-type inserts**

#### **Assembly instructions:**

Start assembling the support (the leg) with unscrewing the height regulators with the foot from the insert. Screw the height regulator together with the counter nut into the leg base. Next, screw the legs to the insert by means of the appropriate screws with washers and tighten the nut. After the legs are screwed to the insert, adjust the height and level the insert by means of the height adjusters and securing them with the nuts. The maximum support frame load is 750 kg. The adjustable foot is not included in the set, it should be unscrewed from the fireplace insert.



## 7.4. GLASS SYSTEM

The *glass system* is an additional glass pane fitted to the front of the fireplace insert door and painted by means of the screen coating technique (with special ceramic paint resistant to high temperatures). It gives the fireplace insert a smart and modern appearance. The external glass pane is protected against overheating thanks to which it reduces (but not eliminates) the risk of burns. The air that has been initially heated between the two glass panes considerably increases the temperature in the insert thanks to which the efficiency of the burning process is improved.

An insert with the glass system fits perfectly into modern fireplace housings made, for example, of acid resistant steel sheets.



## 7.5. PYROLYTIC GLASS

The purpose of fireplace ceramics with pyrolytic coating is to reduce the amount of thermal energy emitted outside of the fireplace. Thanks to its innovative construction, the glass can direct up to 35% of thermal radiation back to the combustion chamber.

Its main feature is keeping a certain amount of thermal energy inside the stove thanks to which:

- the temperature inside the insert is higher,
- the fuel is burned more efficiently and completely,
- the amount of fumes is reduced,
- the water in the water jacket heats up more quickly (in the case of fireplace inserts with a water jacket),
- complete burning reduces the amount of dirt accumulating on the pane.

Pyrolytic glass is also referred to as self-cleaning glass. The name comes from the chemical reaction that involves a decomposition of chemical compounds that occurs in high temperatures. The process takes place thanks to a special thin layer of a metal oxide with which the glass is coated on one side. It can be observed when you look at the insert against the light. The colored, anti-reflective coating also increases the temperature to the level at which the thermal decomposition of the impurities accumulating on the glass plane can occur, at the same time protecting the pane against overheating.

To clean heat-resistant pyrolytic glass ceramics, it is recommended to use only standard cleaning agents for window panes. It is not allowed to use any caustic agents. Temperature resistance: up to do 650°C.

## 8. TOP-MOUNT WATER EXCHANGER

The purpose of top-mount water exchangers is to recover the heat from the fumes flowing from the fireplace to the flue. They make it possible to considerably recover the heat from the fumes which would be irrecoverably lost otherwise. The heat is then transmitted to the water circulating in the cover and distributed to the heat emitters, e.g. the radiators, the domestic hot water tank. It is a very economical source of heat as it does not require any additional use of fuel. The same principles that are used while mounting fireplace inserts with a water jacket apply also while fitting and using top-mount water exchangers. Top-mount water exchangers constitute an ideal alternative for people who have installed a forced-air fireplace insert and who cannot replace it with a fireplace insert with a water jacket but who would like to use the opportunity to utilize the additional portion of energy at the same time.

Top-mount water exchangers should operate in an open circuit. The system must be equipped with an extension vessel that accommodates the increase in the volume of water in the system resulting from the increase of its temperature, preventing any increase of its pressure. In order to connect the exchanger to the central heating installation, you should use copper or steel pipes. It is not recommended, on the other hand, to use pipes made of plastic whose thermal resistance is lower than 95°C. The exchanger should be connected into the system in such a way so that it can be separated from it by means of cast iron or brass reducing connectors. It is forbidden to use stop valves or any devices that reduce the inner cross-section of the safety pipe, the extension pipe, and the overflow pipe. The connections between the fireplace (the stove) and the exchanger should be sealed with a fireplace sealing material resistant to high temperatures.

The exchangers are made of 4 mm thick boiler steel, the same as the steel used to manufacture fireplace inserts with a water jacket. The material is suitable for use in central heating systems and it guarantees high reliability of the device, high thermal resistance and long service life.

The exchangers are used in all types of central heating installations. They can cooperate with radiators, floor heating, as well as with the domestic hot water tank.

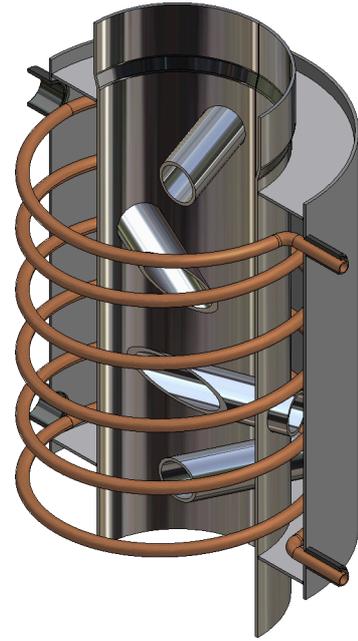
### 8.1. WATER TURBO SMOKE

Water turbo smoke is a top-mount exchanger intended to be fitted on the fume outlet from a forced-air fireplace insert. Its purpose is to recover part of the thermal energy in the fumes flowing from the combustion chamber of the fireplace insert. The heat is transmitted to domestic hot water or to the radiators located in the rooms through the central heating system. Hot fumes flow through the turbo smoke pipe heating up the water in the water jacket of the exchanger. The central element of the device is the internal chamber in which an additional system of pipes through which water circulates is located. They increase the contact area between the water and the heating medium, that is – the fumes. Warm water is transported to the central heating system through a connection pipe placed on the side wall of the exchanger.

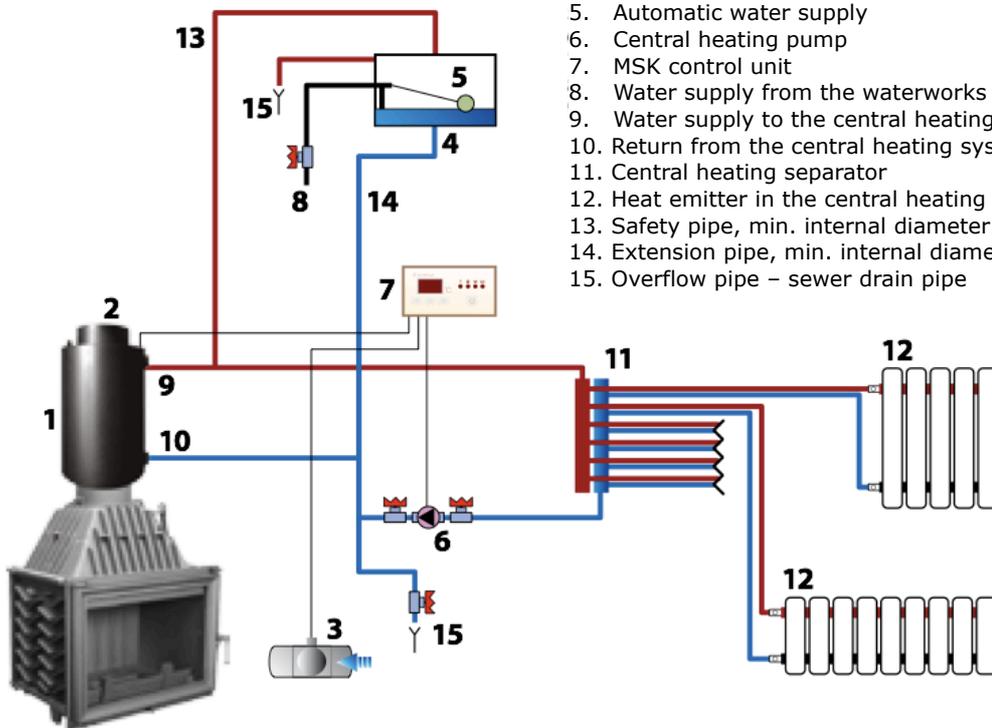


## 8.2. WATER TURBO SMOKE WITH A HEATING COIL

In this option, the water turbo smoke is additionally equipped with a heating coil which constitutes thermal protection of the device and of the whole system against overheating. The heating coil is a copper pipe of the appropriate length which is placed inside the top-mount exchanger during the manufacturing process. Cold water from the waterworks network is supplied to one of the ends through a BVTS thermostatic valve, and an overflow to the sewage system is connected to the other end. When the temperature in the system reaches 95°C, the valve opens and cold water which cools down the system flows through the heating coil and, then, it is drained to the sewage system.



### Installation example Turbo smoke in an open circuit



1. Turbo smoke
2. Fume outlet
3. Electronically controlled air intake
4. Open expansion (OUT OF STOCK)
5. Automatic water supply
6. Central heating pump
7. MSK control unit
8. Water supply from the waterworks system
9. Water supply to the central heating system
10. Return from the central heating system
11. Central heating separator
12. Heat emitter in the central heating system
13. Safety pipe, min. internal diameter 25 mm
14. Extension pipe, min. internal diameter 25 mm
15. Overflow pipe – sewer drain pipe

### 8.3. TOP-MOUNT WCW (HOT WATER EXCHANGER) WITHOUT PIPING

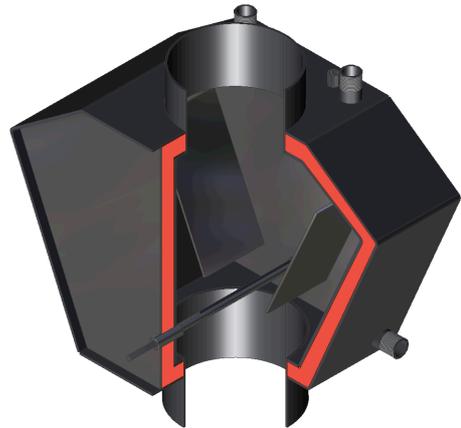
The central part of the WCW is the inner chamber. A movable base plate which guarantees appropriate positioning of the damper is fixed at the inlet to the chamber.

The damper which directs the fume flow is installed in the inner chamber:

1 - vertically - the damper is opened - the fumes flow through the middle of the exchanger directly to the chimney - the exchanger is switched off.

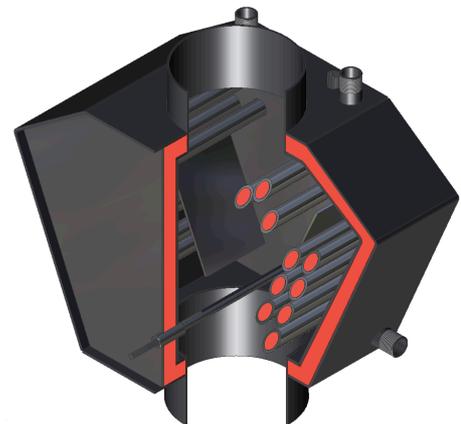
2 - horizontally - the damper is closed - the fumes flow round the water jacket of the exchanger transmitting heat to the water jacket - the exchanger is switched on.

While starting the fire in the fireplace, the damper should be positioned vertically (exchanger switched off). While mounting the exchanger, you should always remember to make sure that you can access the damper in order to adjust its position, e.g. through the inspection door.

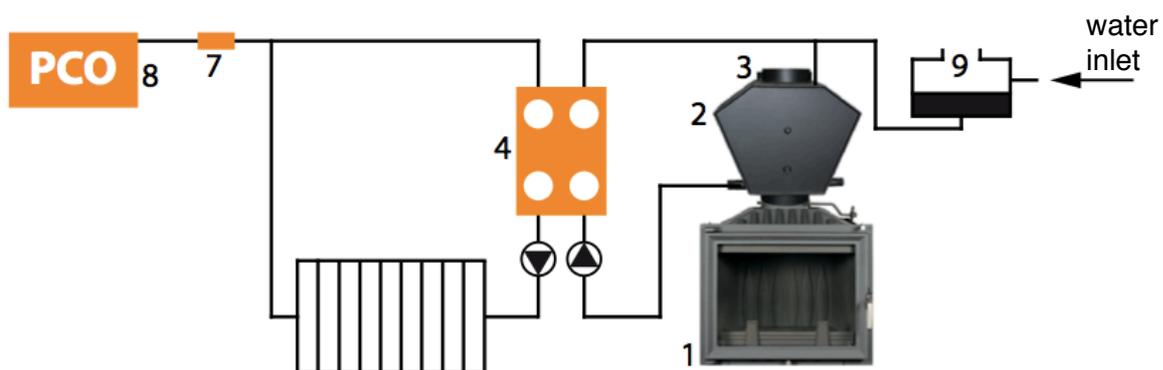


### 8.4. TOP-MOUNT WCW WITH PIPING

The central part of the WCW with piping is the inner chamber in which a system of pipes increasing the heat exchange area is fitted. The fumes heat up the water circulating in the pipes. The water heated in this way is transported to the central heating system.



### AN EXAMPLE OF WCW INSTALLATION IN AN OPEN CIRCUIT



- 1 - fireplace
- 2 - water exchanger
- 3 - temperature sensor
- 4 - plate exchanger
- 5 - pumps
- 6 - radiators
- 7 - stop valve
- 8 - central heating stove
- 9 - extension vessel

## 8.5. WATER TURBO SMOKE WITH A VERTICAL HEATER

Turbo smoke water exchanger with a vertical heater is a top-mount fireplace insert exchanger with internal vertical fire tubes. It is a system of pipes which increase the contact area between the water circulating in the system and the heating medium, that is – the fumes. The fumes flowing through the tubes transmit heat which is recovered by the water jacket of the turbo smoke exchanger in which circulates water. The water heated in this way is transported to the central heating system.



## 8.6. WATER TURBO SMOKE WITH A VERTICAL HEATER AND A HEATING COIL

In this option, the turbo smoke water exchanger with a vertical heater is additionally equipped with a heating coil, that is – a copper pipe which constitutes thermal protection of the device and of the whole system against overheating. Its operation and installation is the same as in the case of a standard turbo smoke exchanger with a heating coil.



## 8.7. TECHNICAL PARAMETERS OF WATER FIREPLACE BASE

WATER BASE						
	Water Turbodym without coil	Water Turbodym with coil	WCW without tubes	WCW with tubes	Water Turbodym with vertical heater	Water Turbodym with vertical heater and coil
Nominal power (kW) *	do 7 kW	do 7 kW	do 7 kW	do 10 kW	do 9 kW	do 9 kW
Thermal efficiency (%) **	do 60 %	do 60 %	do 65 %	do 75 %	do 70 %	do 70 %
Device selection	required exhaust gas temperature at the exit contribution to the proper functioning of the basey; 180°C - 460°C					
Heating surface (m <sup>2</sup> )	Depends on the stove and insulation of the building					
Dimensions wys. x szer. x gł. (mm)	560 x 351	560 x 351	580 x 570 x 310	580 x 570 x 310	535 x 400	535 x 400
Weight (kg)	24,3	25,6	54,00 / 54,20	62,20 / 63,60	49	50
Water capacity (l)	17,5	17,5	16	17,5	26	26
Fabric	boiler steel 4 mm					
Diameter of the flue (mm)	200	200	180 / 200	180 / 200	200	200
Built-in damper	-	-	+	+	-	-
Posibility of connecting with open system	+					
Posibility of connecting with closed system	-					

\* depend on the power of the stove

\*\* depends on the efficiency of the furnace

## 9. CONNECTING A FIREPLACE INSERT WITH A WATER JACKET TO THE EXHAUST PIPE

### Chimney

The basic condition of safe and economical exploitation of a fireplace insert with a water jacket is a fully functional flue which is properly selected with respect to its cross-section. The evaluation of the technical condition of the chimney must be performed by a chimney sweep. The flue should not be connected to any other devices.

The *cross-section of the flue* is determined in accordance with the following formula:

$$F = 0,003 \times \frac{Q}{\sqrt{h}} \text{ [m}^2\text{]}$$

where:

*F* - flue cross-section [m<sup>2</sup>],

*Q* - nominal thermal power of the fireplace insert [kW],

*h* - chimney height [m].

The chimney should be built of inflammable materials that make it possible to maintain constant temperature. Otherwise, the chimney should be inlaid with an insulation material or a double-wall chimney should be installed (in the part that extends above the roof surface). The chimney and the flues should be inspected for tightness; no escapes are allowed. The chimney cross-section can be round or square but it should not be smaller than 25 x 25 cm. The cross - section of the flue should be the same along its height, there should be no abrupt narrowings or changes in the direction of the flow of fumes.

The flue should meet some basic criteria, as follows:

- it must be made of materials of low thermal conductivity;
- for the fireplace insert with the flue diameter of 200 mm, the minimum cross-section must be 4 dm<sup>2</sup>;
- the exhaust pipe cannot have more than two 45° pitches for a 5 m high pipe and 20° for a pipe that is more than 5 m high.

The chimney draught value should be as follows:

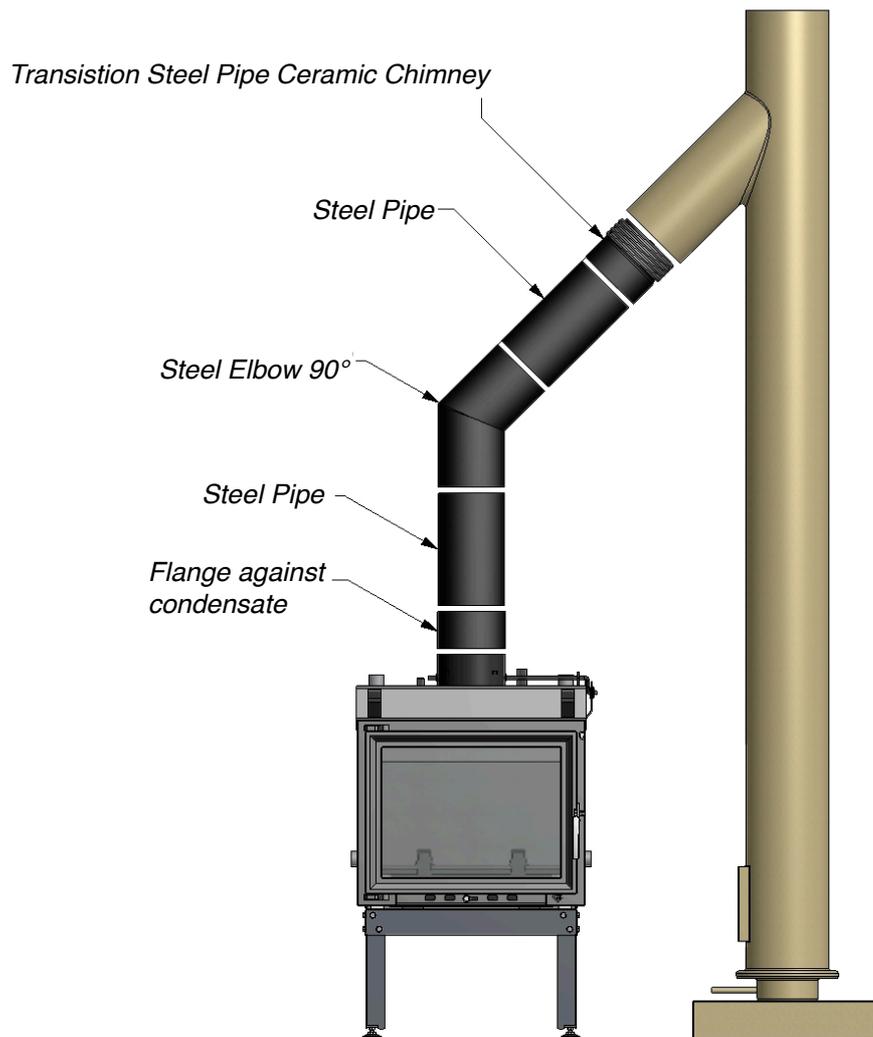
- minimal draught - 6 ± 1 Pa;
- average draught, recommended - 12 ± 2 Pa;
- maximum draught - 15 ± 2 Pa.

### Connection to the chimney

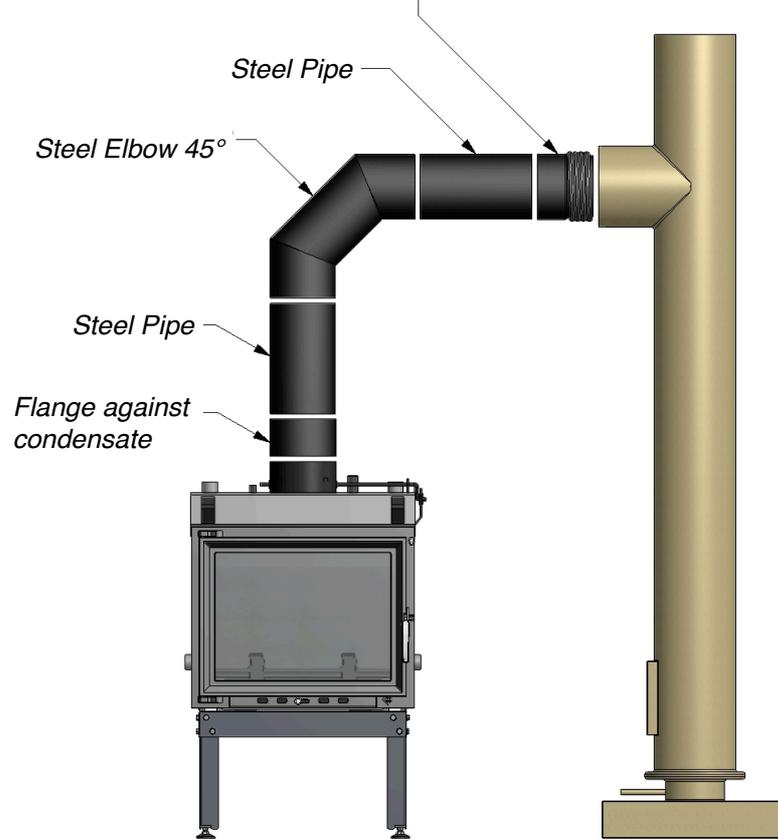
To connect a fireplace insert with a water jacket with the flue, use the following components: an anti-condensation flange, pipes, an adjustable knee pipe and, potentially, a chimney connector (steel pipe – ceramic chimney connector). All those elements should be made of certified materials. The length of the pipes should be suitable for the location of the fireplace. The minimum length of the pipe over the insert flue is 250 mm. The length of the connection pipe (the flue) cannot be greater than ¼ of the height of the chimney, and the pitch should be at least 5% towards the fireplace.

In the case of brick chimneys, an opening should be forged at the appropriate height and a steel pipe should be fitted in it. For this purpose, you can use ready-made materials or heat - resistant cement mixed with sand in accordance with the instructions provided by the manufacturer. If the insert is to be connected with an existing chimney made of ceramic fittings, we have to use a connection pipe with a rope along its external perimeter, that is a connection between the steel pipe and the ceramic chimney. Inappropriate connection with such a chimney can lead to its damage – bursting, flange cracks. In the case of chimneys made of acid or heat resistant steel sheets no connection pipe is required; the insert can be directly connected with the chimney tee. You should pay attention to the connection between the pipe and the flue – fume outlet from the fireplace insert. It must be tight but it must guarantee smooth

operation of the damper at the same time. Special outlets – supports placed on the flue serve as limiters preventing unintentional damper jamming. Using an anti-condensation flange is recommended for connecting a fireplace insert with a water jacket with the chimney. The flange has a double-wall structure and it seals the flue outlet to the chimney. Thanks to that, the condensate produced as a result of temperature fluctuations in the chimney falls into the fireplace where it is heated and turned into vapor. The water which falls from the chimney does not escape out of the chimney system and it does not cause corrosion and the appearance that fireplace welding is not tight. After the pipes are connected and stuck into the flue, the construction comprised of those elements becomes more stable.



*Transition Steel Pipe Ceramic Chimney*



## 10. FREQUENT PROBLEMS, FREQUENTLY ASKED QUESTIONS, SUGGESTED SOLUTIONS

### 10.1. CONDENSATION

The level of condensation tends to be higher in fireplaces operating at a low rate and that are only used periodically (constant breaks in the burning process, fireplace cooled down and then heated up again) as well as fireplaces where the fuel is burned without the required flame, smoldering. In order to prevent this, it is recommended to use the fireplace regularly, which means longer working cycles and longer fire maintenance in the combustion chamber which will burn the fouling accumulated. Alternatively, it is possible to install mixing valves in order to prevent condensation – a three-way valve, or even more preferably – a four-way valve. Valves reduce the risk of low-temperature corrosion more effectively and they guarantee a longer service life of the system which influences the amount of fuel consumed and the efficiency of the heating installation. In the case of excessive fouling accumulation in the combustion chamber, it should be removed mechanically.

What is more, the results of excessive condensation can also include the following:

- condensate leaking down the inner walls of the fireplace, and – in extreme cases – leaking outside of the fireplace,
- smoking, the smoke penetrates into the room,
- intense soiling of the combustion chamber and of the glass pane in particular,
- damper jamming (no possibility to adjust the draught as a result).

If the fireplace is combined with a closed circuit heating system and protected by means of a heat exchanger, its capacity must match the power of the fireplace insert and the conditions in the system (the pressure, the temperature, the flow rate). Exchange operation parameters: primary flow – 75°C (the temperature of the water flowing from the insert to the exchanger), secondary flow – 65°C (the temperature of the water flowing from the exchanger into the central heating system). In relation to the above, the central heating system should be designed to work with the maximum operational temperature of 70°C. In order to analyze the temperature values, and, thus, the flow rate, it is recommended to install thermometers. With the appropriately adjusted flow parameters (the pumps working at comparable rotational speed values), the temperature difference should fluctuate within the range of  $\pm 5^\circ\text{C}$ .

In order to avoid the symptoms mentioned above, it is recommended to follow the instructions provided below:

- set the insert temperature to 70-75°C,
- set the pump activation temperature to 55°C.

Setting the pump activation temperature to the value provided above makes it possible for the system to heat up more quickly. The temperature difference between the operating temperature of the fireplace insert (the set temperature), and the temperature at the return from the central heating system should not exceed 20°C and the condition that the temperature at the return from the central heating system should not be lower than 50°C should be met at the same time. It is connected with the dew point (the value at which water vapor forms on wood surface) which is 48°C for wood with the moisture content of about 20%.

If you decide on a fireplace with a water jacket, you must take care about the chimney and assure that there is adequate draught in it. This parameter is influenced by the diameter of the chimney, its shape, height, and construction. Meeting the combination of all the conditions mentioned earlier will make it possible to reduce the condensation level and it will improve the efficiency of the burning process.

## 10.2. ANOMALIES OCCURRING DURING FIREPLACE INSERT EXPLOITATION

During the exploitation of a fireplace insert, certain anomalies indicating that the stove is not working correctly can occur. They can be caused by incorrect installation of the fireplace insert against the existing legal regulations or for external reasons, e.g. the natural environment.

The most frequent causes of incorrect operation of the insert together with their solutions are presented below.

- a. Smoke coming back into the room when the fireplace door is opened:
  - the door has been opened in an abrupt manner (open the door slowly);
  - closed rotary damper of the exhaust pipe flue (open the rotary damper);
  - insufficient air inflow to the room in which the fireplace insert is fitted (assure sufficient ventilation in the room and supply air into the combustion chamber in accordance with the guidelines provided in the instruction);
  - atmospheric conditions;
  - insufficient draught (perform a chimney sweep inspection of the flue).
- b. Insufficient furnace heating or cooling:
  - insufficient amount of fuel in the furnace (place more fuel in the furnace in accordance with the instruction);
  - too high moisture content of the wood used as fuel (use wood with the moisture content of up to 20%);
  - insufficient draught in the chimney (perform a chimney sweep inspection of the flue).
- c. Insufficient heating despite good fuel burning in the combustion chamber:
  - low-calorie „soft“ wood (use wood in accordance with the recommendations included in the instruction);
  - too high moisture content of the wood used as fuel (use wood with the moisture content of up to 20%);
  - wood logs are too small.
- d. Excessive soiling of the insert glass pane:
  - the intensity of the burning process is low (the fireplace should not be frequently used with a very low flame, only the recommended species of dry wood should be used as fuel);
  - using coniferous resin wood as fuel (use only dry deciduous wood recommended in the insert usage instruction).
- e. Correct operation of the insert can be disturbed due to atmospheric conditions (humidity, fog, wind, atmospheric pressure), and sometimes due to high buildings located in the vicinity. If you experience repeating problems, seek expert advice from a chimney sweep company or use a chimney cap (e.g. of the dragon type).