



INSTRUCTIONS FOR OPERATION, HANDLING AND  
MAINTENANCE OF BOILERS TYPE  
**ŠUKOPLAM K 20-50 kW**



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## PROPER OPERATION AND DURABILITY

3) Wood or coal, in order to become a good fuel, needs 2 years of drying in a natural environment to obtain fuel with 20% humidity. In our conditions, wood that has been dried for a year or less is most often used, and which at best has 35% humidity. Such fuel looks dry enough to be burned, but it is not. If you burn wood that has 20% humidity in a boiler, the boiler must invest a certain amount of energy in order to completely dry it, and it is known that water does not burn. What do you think, then, how much heat energy should be spent to dry wood with 35% humidity? The wetter the fuel, the slower the boiler will reach the operating temperature of 80/60 °C, and until it reaches that temperature, the boiler will condense. Imagine if your boiler is oversized, how much condensation will form in it due to poor fuel.

Since water does not burn, you must create conditions in the boiler as soon as possible to achieve an operating mode of 80/60 °C and for the water from the fuel to turn into water vapor and escape into the atmosphere through the chimney via flue gases. Otherwise, if you fire the boiler in a low-temperature mode, that water will turn into water vapor since the temperature in the firebox itself is around 500 °C where the fuel burns, but in contact with the water that returns to the boiler and is below 57 °C, most of that water vapor will turn back into water and your boiler will condense. This way of working can contribute to your boiler leaking very quickly due to the appearance of sulfuric acid that corrodes the boiler. Sulfur is an element that is an integral part of wood and coal, when burned it also turns into a gaseous state, in contact with oxygen it oxidizes and as such in contact with water from the boiler sulfuric acid is formed, which is one of the strongest acids and is very corrosive. the greater the condensation in the boiler, the stronger its concentration.

*How to prevent condensation in solid fuel boilers?*

The solution is to install a 4-way manual mixing valve, which installers call a slang and mouse valve. This valve serves to protect the boiler from condensation by ensuring that not all the hot water from the boiler is sent to the heating installation, but that a part of the hot water from the boiler is mixed with the water coming from the installation and as such returns to the boiler with a temperature of 60 °C, while the other part of the hot water from the boiler is sent to the installation and in this way the temperature in the room is regulated. In order for this valve to have its function, the boiler must be fired in the lowest water temperature mode of 80/60 °C. In order to know what the temperature of the water in the boiler return line is, it is recommended to install a thermostat on the return line. You can see an illustration of how this valve works in the picture. To protect the boiler from condensation, there are thermostatic mixing valves, which are factory-set for the appropriate temperature regimes of the boiler's operation. If your boiler is significantly oversized, then your problem may not be solved even with a 4-way manual mixing valve. In that case, the only solution is to install an accumulation tank.

*Does the boiler consume more fuel in the 80/60 °C water temperature mode?*

The answer is no. If we consider that the entire system is well-designed, when the boiler reaches its operating temperature, the draft regulator closes the primary air supply and then the boiler only maintains the set temperature and remains in standby mode (fuel consumption is reduced).

### REMARK:

*By operating and maintaining your boiler yourself, you shorten and extend the service life of your boiler.*

## PROPER OPERATION AND DURABILITY

What is needed for the proper operation of a solid fuel hot water boiler?

1) The boiler must have the appropriate heat output to heat the desired space, which means that the boiler power must be correctly calculated for the specific space. The boiler power must not be too high, but not too low. The boiler must always be fired in a water temperature regime of at least 80/60 °C (80 °C flow water temperature, 60 °C return water temperature).

If the boiler is oversized and has a higher heat output than is needed to heat the desired space and the user fires it in the 80/60 °C mode, such a boiler will always provide more heat energy than is needed at a given moment. If the user does not have built-in regulating mixing valves for the heating system or on the radiators to set the desired temperature, the temperature in the room will be too high and he will feel uncomfortable. In order to reduce the temperature in the room, the user will try to fire the boiler at a reduced intensity and will bring the boiler into a low-temperature operating mode, e.g. 70/50 °C or 60/40 °C, depending on the current needs for the desired temperature in the room. Every time the return water temperature in the boiler drops below 57 °C, condensation will occur in the boiler, i.e. The water will change from a vapor state to a liquid state, and as such, mixing with the soot will create deposits of tar and rust, and depending on the intensity of the condensation, it will lead to premature deterioration of the boiler sheet metal due to corrosion. Deposits of soot and tar also lead to a reduction in the boiler's thermal power.

Deposits of just 1 mm reduce the power by 5%. For example, if you have a 50 kW boiler with deposits on the boiler walls of 2 mm, that boiler no longer has a thermal output of 50 kW, but has a thermal output of 40 kW. This also applies to a boiler that operates in the correct operating mode of 80/60 °C, but which is not cleaned regularly. Ash is known to be a poor heat transfer agent and deposits caused by condensation or lack of cleaning lead to reduced heat transfer from the boiler combustion chamber to the water in the boiler itself.

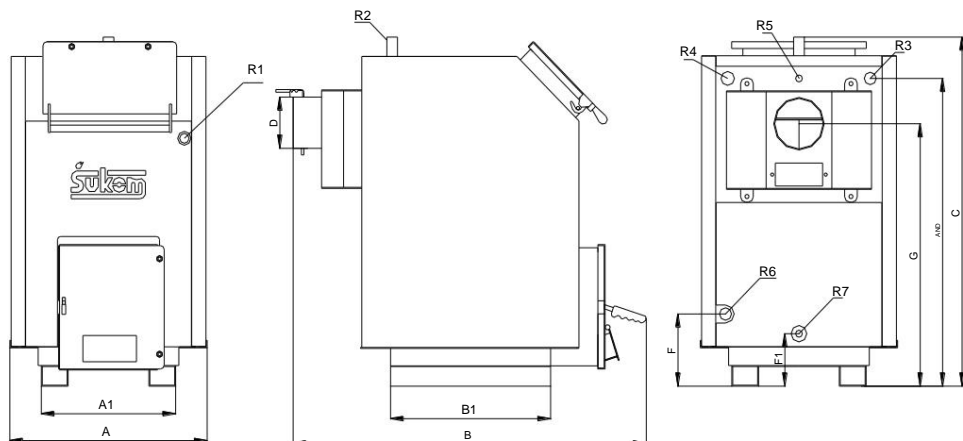
2) A chimney of the appropriate diameter and height that has the appropriate negative pressure (draft) to be able to extract all the flue gases from the boiler. The chimney must also be correctly calculated according to the boiler that is connected to it. If you have a chimney that has a higher negative pressure than your boiler needs, such a chimney will extract a certain part of the thermal energy from the boiler and will waste it uselessly into the environment, if you have a chimney that does not have sufficient negative pressure (draft), such a chimney will cause problems with combustion in the boiler, it will not be able to extract all the flue gases from the boiler, the concentration of carbon monoxide in the boiler will be increased and the concentration of oxygen required for combustion will be reduced. The boiler will be in a situation where it cannot achieve the operating mode of the water temperature in the boiler of 80/60 °C, which will also cause condensation to form in the boiler. If you have a chimney with insufficient negative pressure, the flue gases from the boiler will most likely escape into the boiler room. The chimney must be thermally insulated from the outside. If it is not thermally insulated, the flue gases containing water vapor may suddenly cool down, which can lead to condensation in the chimney and the boiler itself.

## SPECIFICATIONS

TYPE OF BOILER		K20	K 25	K 30 K 40	K 50	
Nominal boiler power Qn (kW)		20	25	30	40	50
Minimum boiler power Qmin (kW)		18	20	24	32	40
Boiler dimensions (mm)	A1 (mm)	385	426	426	500	550
	B1 (mm)	480	508	508	575	615
	A (mm)	575	626	626	700	775
	B (mm)	1090	1120	1150	1146	1240
	C (mm)	1046	1046	1046	1146	1246
	E (mm)	938	938	938	1015	1115
	F/F1 (mm)	160	160	160	160	160
G (mm)	797	797	797	875	975	
Water content (l)		78	90	103	125	145
Boiler weight (kg)		195	230	255	295	340
Required draft (mbar)		0,2	0,3	0,32	0,34	0,37
Flue gas mass flow rate at Qn (kg/s)		0,21	0,028	0,041	0,059	0,068
Flue gas mass flow rate at Qm(kg/s)		0,017	0,0237	0,029	0,039	0,049
Fuel type wood (150x150xL) coal 20-60mm		L (mm)				
		400	450	450	450	500
Average burning time (h)		3	4,4	4,5	4,1	4,2
Dimensions of the combustion chamber (mm)		305X240 342x240 342x240 392x240 365x305				
Pressure and temperature of the safety heat exchanger		4-6 bar, 10-14 °C				
Connections	Hot/cold water connection M5/4"		M5/4"	M5/4"	M5/4"	M5/4"
	Safety line connection	M1"	M1"	M1"	M1"	M1"
	Charging and discharging	F1/2"	F1/2"	F1/2"	F1/2"	F1/2"
	Safety exchanger	F5/4"	F5/4"	F5/4"	F5/4"	F5/4"
	Thermal valve sensor	F1/2"	F1/2"	F1/2"	F1/2"	F1/2"
	Chimney diameter D (mm)	150	160	160	180	180
	Draft regulator connection	F3/4"	F3/4"	F3/4"	F3/4"	F3/4"

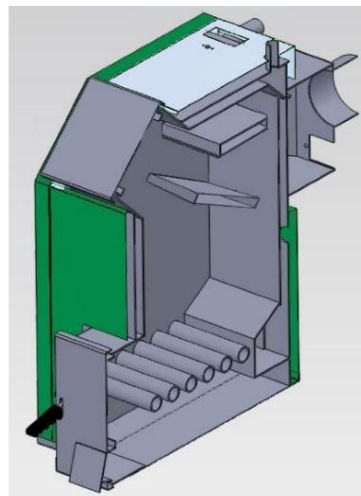
\*The manufacturer reserves the right to change dimensions.

## BOILER DIMENSIONS ŠUKOPLAM K 25-50kW



## Legend:

- R1 - Regulator pormaje
- R2 - Safety group connection
- R3 - Hot water drain
- R4 - Safety exchanger
- R5 - Thermal protection valve probe connection
- R6 - Cold water inlet
- R7 - Charging and discharging



## PROPER OPERATION AND DURABILITY

When choosing the power of a heating boiler, the insulation of the building (house) plays a very important role in calculating the heating area.

This force must be carried out by an appropriate professional to prevent improper operation and a short life of the boiler.

The following table shows the recommended heating areas based on boiler power and insulation.

Area for heating (m <sup>2</sup> )	Tip kotla				
	K 20	K 25	K 30	K 40	K 50
A	100	125	150	200	250
B	135	168	200	270	335
C	180	250	300	400	500

## REMARK:

- A - poorly insulated buildings, room height up to 3m
- B - well-insulated buildings, room height up to 3m (insulation 5cm)
- C - extremely well insulated buildings, room height up to 3m (insulation 10cm)

**BOILER THERMAL PROTECTION**

The temperature valve is controlled by a temperature probe that must be screwed into the ½" socket provided on the back of the boiler. When the water temperature in the boiler reaches high values, the probe registers this and opens the temperature valve. The temperature valve opens both the cold water inlet and the hot water outlet at the same time. Cold water enters the boiler, mixes with the hot water in the boiler and reduces its temperature, and hot water leaves the boiler and goes directly into the safety drain (channel) or sewer. When the water temperature in the boiler drops, the valve closes and cuts off the cold water supply.

In general, when it comes to boiler thermal protection, you need to take into account 2 things:

1. The water pressure in the water supply must be higher than the water pressure in the boiler.
2. The source of water pressure (e.g. water pump) must not depend on electricity (power outages), so thermal protection is connected exclusively to the water supply.

**NOTE: After**

*installation, the position of the thermal valve MUST be as shown in the pictures.*

IF THE THERMOSTAT ON THE BOILER IS USED ACCORDING TO THE INSTRUCTIONS PROVIDED FOR CONTROLLING THE OPERATION OF THE BOILER CIRCULATION PUMP, IT IS MANDATORY TO CHECK THE CORRECT OPERATION OF THE THERMOSTAT DURING A HOT TEST OF THE BOILER.

1. IF THE THERMOSTAT TURNS ON THE BOILER CIRCULATION PUMP **AT** THE SET TEMPERATURE , RETURN TO NORMAL BOILER OPERATION.

2. IF FOR SOME REASON THE THERMOSTAT **DOES NOT TURN ON** THE PUMP AT THE SET TEMPERATURE OR A FAILURE IS NOTICED ON THE THERMOSTAT AFTER USE, PLEASE CONTACT US IMMEDIATELY TO FIND THE BEST SOLUTION FOR THE UNINTERRUPTED OPERATION OF THE BOILER AND THE ENTIRE INSTALLATION

**TECHNICAL DESCRIPTION OF THE BOILER****1. Technical description of boilers**

ŠUKOPLAM K boilers are solid fuel boilers:

- coal
- wood

They are produced for a temperature regime of 90/70°C. The boilers are made of sheet metal and pipes according to the requirements of the current Serbian SRPS and European standards EN 303-5.

The installed material is accompanied by a seller's warranty upon purchase.

**2. Boiler construction**

Heat exchange (draft) is carried out by radiation and convection methods in the firebox and water-cooled boiler partitions.

This construction enables intensive heat exchange between water and combustion products, so the boilers operate with a high degree of efficiency.

The boiler's firebox is dimensioned in such a way that it can accommodate the fuel needed for a minimum of 4 hours of boiler operation at full power, while at the same time having enough free surface area required for heat exchange by radiation.

The spacious firebox and large fire door allow for the storage of large quantities of solid fuel and large pieces of wood and coal.

The doors are lined with refractory concrete that returns radiant heat back to the firebox and are insulated to prevent burns.

When using solid fuel, combustion air is supplied through a damper on the lower door, the opening and closing of which regulates the amount of combustion air, and therefore the temperature of the water in the boiler.

The damper opening is regulated using a draft regulator that is screwed into the sleeve on the upper part of the boiler and connected to the regulating damper with a chain.

Due to the size of the damper and its weight, the choice of draft regulator must be such that the force in the chain must not be less than 10N.

## COMPLETENESS OF DELIVERY

## 3. Boiler operating mode

The standard design of solid fuel boilers is designed for operating modes:

- 90/70°C . The boiler is protected by a safety valve set at 3 bar.
- 110/90°C . The boiler is protected by a safety valve set at 3.5 bar.

Boilers are tested at a test pressure of 3.6 or 4.3 bar (working pressure multiplied by a coefficient of 1.43) as required by applicable Serbian and European standards.

## 4. Completeness of boiler delivery

Standard boiler delivery includes delivery of the boiler body with connections for all accompanying equipment.

Standard delivery includes:

- Boiler body
- 80mm thick thermal insulation
- Outer sheath with terminal block for connection and power distribution
- Cleaning accessories: ash and ember scraper
  
- Thermometer

The boiler is delivered from the factory sheathed and insulated, or insulation and sheathing is performed after transport and installation, depending on the agreement with the customer.

Note: The costs of payment to the buyer are charged subsequently.

The accompanying equipment installed on the boiler body includes:

- safety valve
- safety heat exchanger
- thermal safety valve
- draft regulator

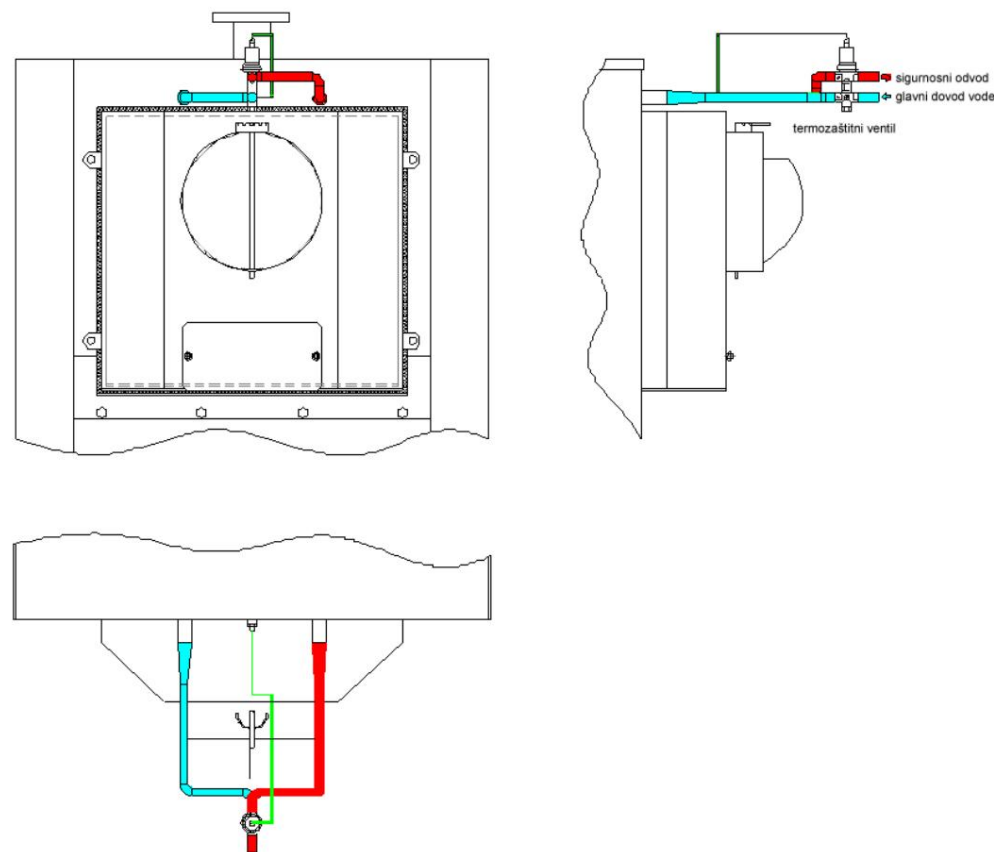
The customer orders the accompanying equipment separately or buys it himself and installs it after connecting the boiler in the boiler room.

**NOTE: Only a boiler that has complete supporting equipment installed guarantees safe and secure operation of the boiler as well as its longevity.**

## BOILER THERMAL PROTECTION

The temperature (thermal) valve is connected to the main water supply (3) on one side and to the cold water pipe on the heat exchanger (1) on the other side via connection (4). The hot water leaving the exchanger (2) goes directly into the safety drain (channel) or sewer.

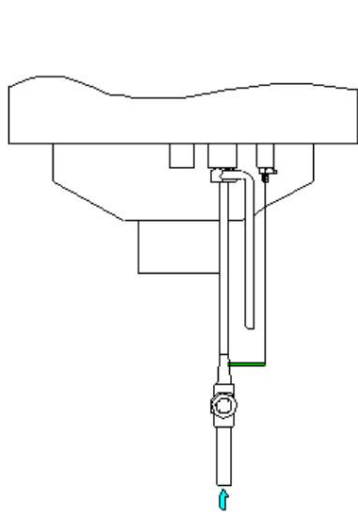
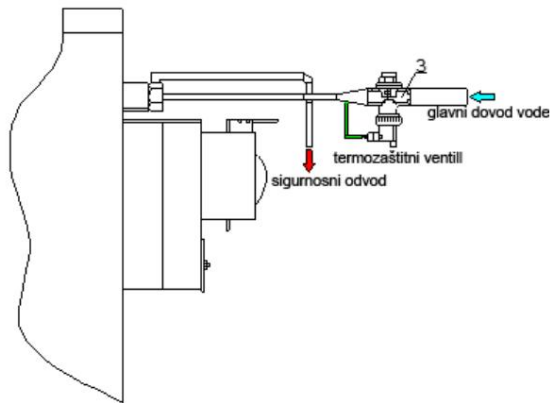
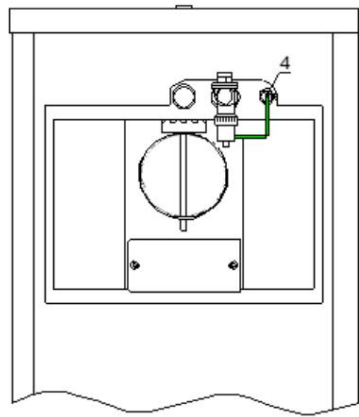
The temperature valve is controlled by a temperature probe that must be screwed into the provided ½" (5) socket on the back of the boiler. When the temperature probe registers high temperature values (100°C), it opens the temperature valve, cold water enters the heat exchanger and starts to cool the boiler. When the temperature in the boiler drops, the probe automatically closes the temperature valve.



The picture shows the thermal protection of the boiler through direct mixing of cold and hot water inside the boiler. Water flow control and therefore thermal control (protection) can be performed via a Caleffi type 544 temperature valve or a similar device.

Also, due to the direct mixing of fluids under different pressures, it is necessary to install an automatic boiler refilling unit with a non-return valve and pressure reducer in the installation.

## BOILER THERMAL PROTECTION



## Legenda:

1. Ulaz hladne vode
2. Izlaz tople vode
3. Termozaštitni ventil
4. Sonda

The picture shows the thermal protection of the boiler via a non-separable safety heat exchanger. The detachable heat exchanger is screwed into the 5/4" socket on the back of the boiler, while the non-separable heat exchanger is already welded into place in the boiler. Regardless of whether the heat exchanger is detachable or non-separable, it must be connected to the main water supply as shown in the picture. Water flow control and therefore thermal control (protection) can be carried out via a Caleffi type 543 temperature valve or a similar device.

## BOILER INSTALLATION

## 5. Boiler installation

The boiler is installed in an appropriate location in the boiler room, which **MUST** meet the technical regulations for a boiler of the appropriate power, according to the project. This location mainly depends on the location of the chimney. In any case, when installing the boiler, the following should be taken into account:

- The boiler should be raised 5-10 cm from the boiler room floor to prevent water from the floor from coming into contact with the boiler body.
- To the left or right of the boiler, there should be a channel that will collect water from boiler sludge removal, water that occurs during condensation, etc. A pipe for draining water from the safety valve in the event of its opening is also introduced into the same channel.
- The floor of the boiler room should be made of non-combustible material (concrete or similar).
- The space for the liquid fuel reserve should be separated at least by a partition wall from boiler and ash removal transport route.

The boiler room **MUST** have good ventilation. An opening for the introduction of fresh air The air intake is sized according to the boiler power and must be protected by a grille or mesh.

$$A = 6.02 \times Q \text{ (cm}^2\text{)} \quad A - \text{opening area} \quad Q - \text{boiler power (kW)}$$

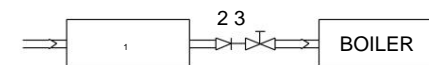
Q (kW)	20	25	30	40	50
A (cm <sup>2</sup> )	120	150	180	240	301

**NOTE:** The fresh air intake opening must **NEVER** be closed.

## 6. Boiler connection

## 6.1. Connecting the boiler to the feed water - filling and emptying the boiler -

Filling and emptying of the boiler is done via the boiler tap which is screwed into the 1/2" socket on the back that of the boiler. This connection can be temporary (rubber hose) or permanent. In the case of a permanent connection, a classic valve and a pressure reducer to 3 bar must be installed between the boiler and the feed line so that in the event of a classic valve failure, the pressure does not equalize between the feed water and the water in the boiler. It is desirable that the feed water is passed through a water softener before being introduced into the boiler.



- 1 - Water softener
- 2 - Pressure reducer
- 3 - 1/2" ventil

**BOILER CONNECTION**

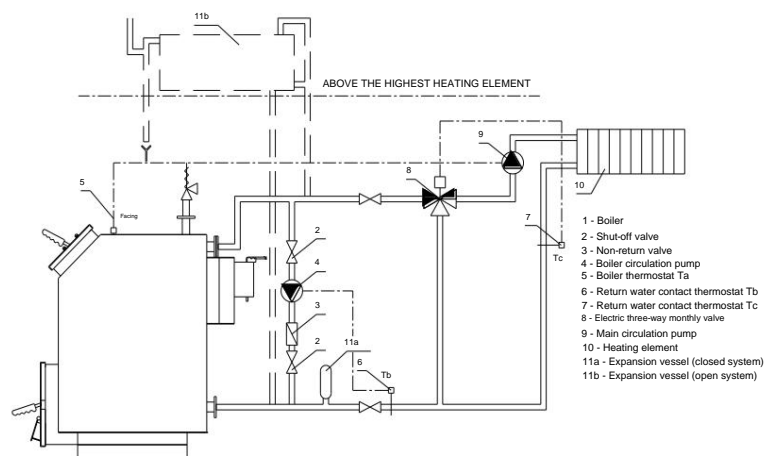
Venting is done via an automatic vent valve installed on the discharge pipes and preferably at the highest point, but always above the boiler.

When draining water from the boiler (intervention, sludge removal), the water should be drained using a hose lead to a channel in the boiler room or outside the boiler room.

**6.2. Connection to the heating installation**

The boiler is connected to the heating installation via the discharge pipe (on the upper part of the rear side of the boiler) and the return pipe (on the lower part of the rear side of the boiler) via the provided 5/4" connections for 20-50kW boilers.

The following figures show how to connect the boiler to a heating installation with cold end protection via a boiler circulation pump or an electric three-way mixing valve in a closed and open heating system.



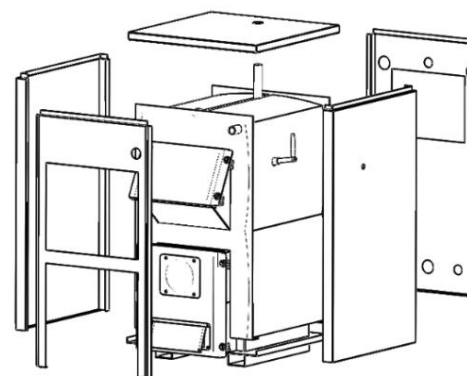
The figure shows the connection of the boiler to a closed or open heating system with one consumer and cold end protection via a boiler circulation pump and/or a three-way mixing valve.

**APPLICATION:** Installations with a higher water content. The boiler receives a portion of the hot water supply until the temperature reaches the desired Tb temperature. The rest of the hot water supply goes into the installation.

**BOILER THERMAL PROTECTION**

Boilers that are at or above the radiator level must have a built-in heat exchanger that is connected via a solenoid valve to the main water supply from the water installation. The solenoid valve is normally closed and opens only in the event of a power failure. This heat exchanger cools the water in the boiler in the event of a power failure. For boilers installed in this way, it is best to immediately start extinguishing the fire in the boiler either with a fire extinguisher or by dismantling the boiler.

In case the safety valve has opened and water has flowed out of the boiler, you must pump an additional amount of water into the boiler because: **THE BOILER MUST NOT BE LEFT WITHOUT WATER.**

**12. Cladding scheme****13. Boiler thermal protection**

In accordance with the European standard EN303-5, ŠUKOM installs thermal protection plants, especially boilers, from overheating water.

The term boiler overheating means that the water in the heating system reaches 90/70°C. temperature of 100°C

Thermal protection of the boiler can be done in 2 ways:

1. By installing a safety heat exchanger and thermal valve
2. Direct mixing of cold and hot water inside the boiler with an adequate thermal valve.

## HAZARDS WHEN HANDLING THE BOILER

The boilers are equipped with a safety heat exchanger that cools the water in the boiler if it reaches high values. If, for some reason, this safety measure fails, the water temperature rises above 100 °C, the pressure increases and the water is discharged from the system through the safety valve. The water that flows out of the safety valve is very hot and turns into steam at atmospheric pressure and can cause severe burns. The safety valve must be turned so that the water and steam go into the wall, or through a special pipe into the sewer.

If the upper part of the boiler is left without water when draining the system, it will overheat. When the water pressure in the system drops and if water returns to the heated pipes, the water turns directly into steam and a strong explosion occurs, which leads to collapse, serious injuries and deaths. In such cases, no safety valves will help. This danger is most common during a power outage, especially if the boiler is level with the radiators, because the pump stops working.

## THAT'S WHY:

**A.** If the pump has not stopped working (there is power), and you notice that the temperature is rising excessively:

Disconnect the damper from the draft regulator chain and cut off the air supply to the boiler.

Increase the pump speed to maximum and open all consumers (radiators)

Just in case, if you do not have a regulated drain, place a cloth or towel over the safety valve to prevent you from being burned by the jet of hot water or steam.

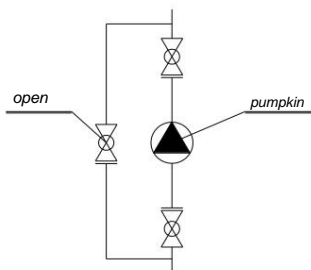
With the cessation of air supply, in most cases the temperature begins to drop.

If this does not happen, you must extinguish the fire in the boiler. You can do this either with a powder extinguisher or by dismantling the boiler. To dismantle it, bring a large container of water next to the boiler and place the embers and unburned pieces in it. There is no other way to extinguish the fire in the boiler.

**REMEMBER:** You should never pour water into the boiler's firebox. If water gets into the firebox, it will cause a sudden formation of hot steam that will cause burns and even lead to an explosion.

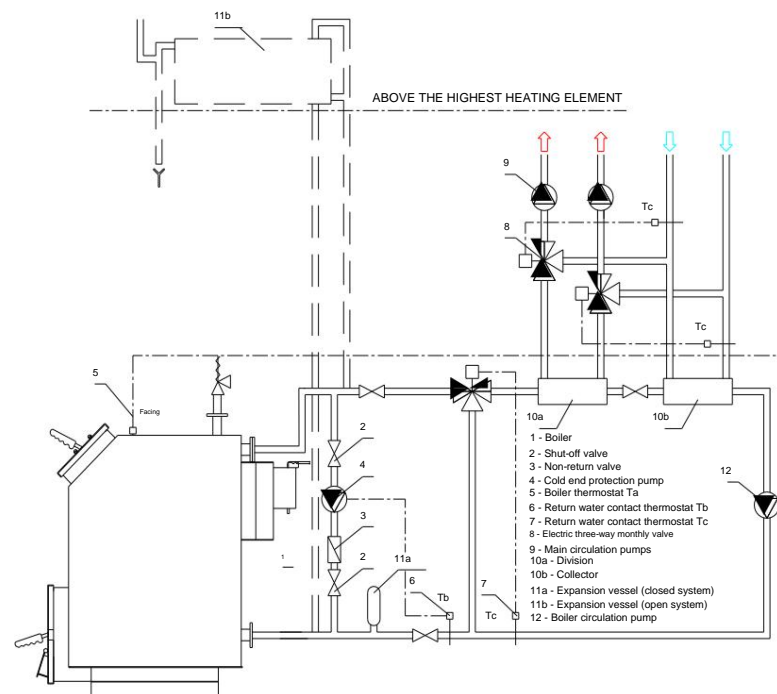
**B.** If the heating pump has stopped working (most often - no power), the procedure is similar to the previous one with the following additional steps:

If the boiler is below the radiator level, open the bypass valves around the pump. So you will get water flow in the system by gravity.



## BOILER CONNECTION

**NOTE:** The maximum capacity of the boiler circulation pump is calculated based on the expected lowest return water temperature from the installation and the adopted heating system, as well as the desired return water temperature to the boiler. For the most commonly used hot water boiler temperatures  $t_{max}=110$  °C and a heating system of 90 / 70 °C, the capacity of this pump is about 25% of the main circulation pump.



The picture shows the connection of the boiler to a closed or open heating system with multiple consumer and cold end protection via the boiler circulation pump and control valve.

**APPLICATION:** Installations in which the boiler is unique for several separate substations - district heating.

The reason for installing a recirculation pump or a three-way mixing valve or both is to increase the temperature of the return water above the condensation temperature of water vapor that is formed by the evaporation of water from the fuel (especially when burning wood). This temperature ranges from 40-50 °C. The condensed water from the fuel combines with the combustion products, forming sulfuric and sulfurous acids when burning coal and acetic, formic and phenolic acids when burning wood. Moisture with ash provides a base. All these acids and bases corrode the steel sheet inside the firebox and shorten its service life.

## BOILER CONNECTION

**REMEMBER:**

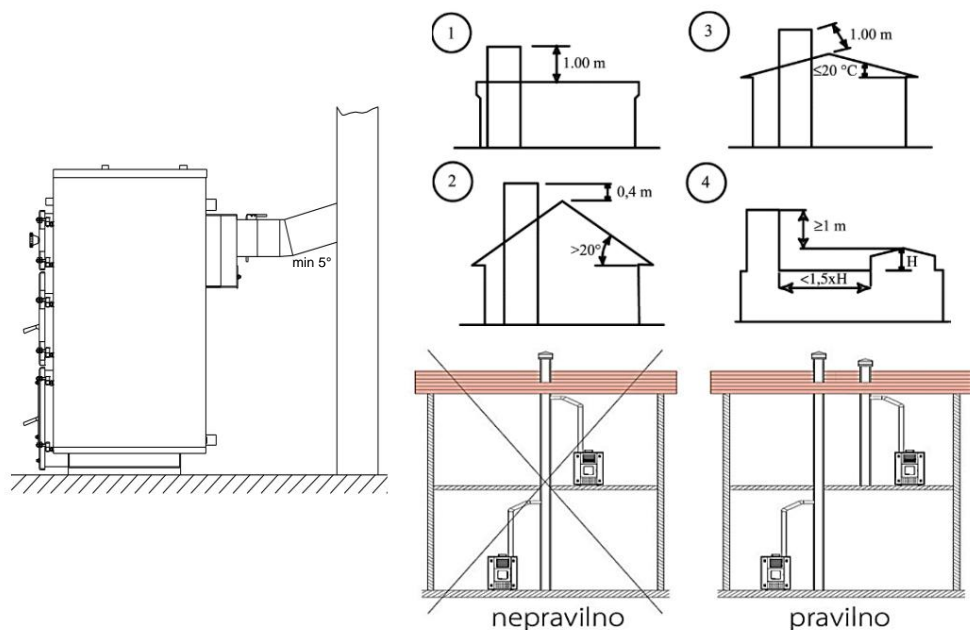
A mixing valve or recirculation pump is a prerequisite for the longevity of the boiler.

The 5-year warranty period is only valid if they are installed.

## 6.3. Connection to the chimney

The draft of the boiler and the quality of fuel combustion depend on a well-chosen and installed chimney. A poorly made and selected chimney causes smoke in the boiler room, poor combustion with increased fuel consumption and resin leakage both in the boiler and on the chimney.

Attached are recommendations for choosing the chimney diameter and its height depending on the power, as well as sketches for proper chimney installation.



Tip kotla	K 20	K 25	K 30	K 40	K 50
ÿ (mm)	160	160	160	160/180	180/200
Name (m)	6	7	8	9 (7)	10 (8)

These are just recommendations. Since the configuration of the soil and surrounding objects (buildings, forests, etc.) and the wind rose are different at each location and facility, it is advisable to consult an expert in this field. External chimneys (chimneys attached to a building or free-standing chimneys) must be insulated to prevent condensation of combustion products and leakage down the chimney.

## HAZARDS WHEN HANDLING THE BOILER

The boiler is connected to the chimney with pipes and elbows using the largest possible route. The inside diameter of the pipe is slightly larger than the outside diameter of the chimney. There must be a minimum slope of 5° from the boiler chimney to the chimney inlet.

## 11. Dangers that may occur when handling the boiler

A seemingly harmless boiler can cause various problems. Dangers that may occur when using the boiler are as follows:

1. Danger of burns
2. Fire hazard. 3. Explosion hazard.

**1. RISK OF BURNS:**

Burns can occur from flashback from the firebox and from hot water that may escape from the safety valve.

**Therefore:**

1. Do not put closed plastic bottles, lighters - full and empty, batteries, items soaked in gasoline or oil, sanding dust from wood and plastic, or other flammable and explosive materials into the boiler's firebox.
2. When draining water through the safety valve or if the valve opens on its own due to increased pressure, the hot water drain during boiler room installation must be designed so that hot water cannot burn the user, i.e. designed according to technical regulations - **never extinguish the embers in the boiler with water.**

**2. FIRE HAZARD:**

Fires in the boiler room can occur due to backfire or due to embers falling out of the boiler during firing or cleaning. The area around the boiler must be made of non-flammable material and cleaned of fuel residues. Fuel must be properly stored and kept away from the boiler.

In addition to fires in the boiler room, fires can also occur in the chimney. Chimney self-ignition occurs if the chimney is not cleaned regularly and the exhaust gases have very high temperatures (600 - 800 °C).

**Therefore:** 1. Keep the chimney clean.

2. Do not burn flammable materials that are not considered solid fuels.
3. Do not use liquid flammable materials for heating (gasoline, oil, etc.)
4. Make sure your draft regulator works well and seals well.
5. The boiler door must be tightly closed.

**3. EXPLOSION HAZARD:**

In certain cases, a boiler explosion may occur. This occurs when the water temperature in the boiler cannot be controlled by the draft regulator (regulator faulty or damper disconnected from the chain and door open or left open).

**BOILER CLEANING AND MAINTENANCE****10. Boiler cleaning and maintenance**

Cleaning and maintaining the boiler is a basic prerequisite for the economical operation of the boiler and its long service life.

The impact of boiler cleaning stems from the fact that ash, soot and resin are heat insulators and as such reduce the conduction of heat through the sheet metal and water-cooled baffles.

The service life is shortened due to the connection between dirt and moisture from condensation.

**REMEMBER: The warranty does not apply to boilers that are not properly cleaned and maintained.**

How and when to clean the boiler:

Clean the boiler firebox and the space under the grate daily from ash, solid unburned materials and slag.

**Once a week, with the fire extinguished, open the upper fire on the boiler and clean the smoke ducts and the walls of the combustion chamber using a cleaning tool.**

- Monthly boiler cleaning includes daily and weekly cleaning. In addition, once a month, the chimney opening should be opened at the back of the boiler - the chimney - and the interior of the chimney should be cleaned of dirt.

- Cleaning at the end of the heating season

At the end of the season the boiler must be left in an absolutely clean condition. Otherwise, moisture from the air in contact with the cold surfaces of the boiler will condense and in contact with elements from uncleaned ash and soot will cause corrosion of the boiler. Water from the boiler and the heating system should not be drained.

The heating pump is switched off.

In addition to the boiler, it is advisable to clean the chimney and the pipes connecting the boiler to the chimney.

**REMEMBER:**

1. If you need to increase the draft in the boiler, it is better to increase the height of the chimney rather than the diameter.
2. Do not place any decorations or caps on the top of the chimney as they negatively affect its operation.
3. Leave a pipe up to 1" at the bottom of the chimney next to the cleaning hole to drain condensate and precipitation.
4. The boiler chimney can have only one opening – the chimney opening. Connecting another device (stove, stove, etc.) prevents the boiler from operating normally.

**BOILER START-UP AND USE****7. Boiler commissioning and use**

Before the first firing, the entire installation should be checked for leaks, air released from the installation, the safety valve and expansion tank are working properly.

The fire is lit with dry wood stacked so that it is thinner at the bottom and thicker at the top. Until the water in the boiler is heated, the lower air damper is manually set to the fully open position. The valves on the installation are open, the heating pump is running.

During the first firing, as well as later when the fire is lit and the water in the boiler is cold, moisture condensation occurs on the walls of the firebox, and especially at the flue gas outlet from the boiler under the chimney, so that the impression is that the boiler is leaking. The origin of the moisture is from the fuel and air.

When the water in the system is heated, the condensation is lost.

**REMEMBER:** Whether the water that appears in or behind the boiler is the result of condensation or a leak can be seen on the moment that measures the pressure. If the pressure does not drop, it is condensation. The first firing of the boiler is always done by the installer, who then regulates the draft regulator, adjacent thermostats and mixing valve.

The final stage of the first boiler start-up is to check whether the air damper, which is connected to the draft regulator by a chain, completely closes the air opening at the set temperature and whether the boiler door seals properly.

**8. Fuels in use**

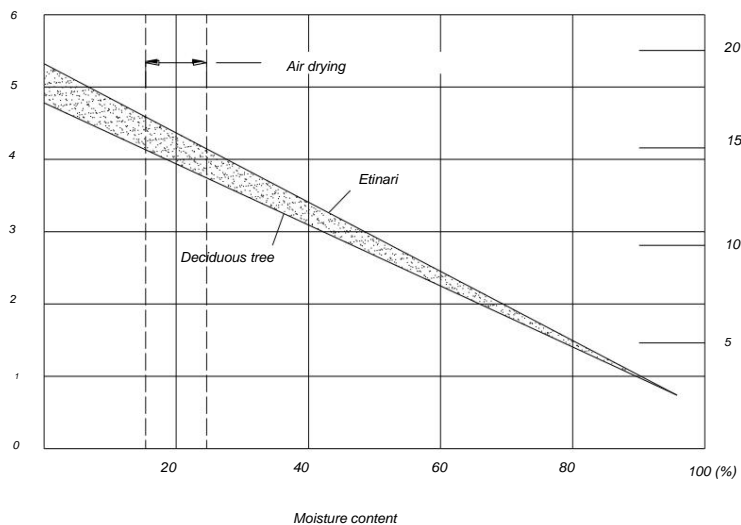
**COAL:** hard coal, brown coal, lignite, peat are ordered by strength from strongest to weakest.

Coal must be stored in a dry room to avoid getting wet. Coal obtained by wet separation - washed coal (Kolubara, Kostolac), lignite, as well as coal obtained by extracting peat from water (Kovin) must be purchased in the spring for the next season so that the water can evaporate and they can dry out. Šukoplam boilers are designed for burning walnut (15-30mm) and cube (30-60mm) coal granulation.

**WOOD:** Oak, beech, pine. Only dry wood is burned.

**BOILER START-UP AND USE**

Attached is a chart of the heat output of wood, depending on its moisture content. In addition to the fact that raw wood will not heat you, moisture shortens the life of your boiler and increases heating costs.



**BRIQUETS:** Since briquettes are made from ground wood mass with a maximum moisture content of 14%, they represent a strong and good fuel. If the briquettes start to decompose during combustion, it means that they contain a lot of moisture and are not suitable for use.

**The manufacturer is in no way responsible for poor boiler performance due to the use of poor quality fuel.**

The heat obtained from the fuel goes into the water of the heating system, through the flue gases into the chimney and through the radiation of the boiler body into the boiler room. The boiler is therefore well insulated.

"ŠUKOM" certification of these boilers was carried out according to the following fuels:

- Wood (15% moisture) 15,400 KJ/kg = 3,600 kcal/kg
- Coal 16,000 KJ/kg = 3,800 kcal/k

**ELECTRICAL CONNECTION****9. Electrical connection**

Šukoplam boilers are equipped with a main circulation pump thermostat built into the boiler casing. The electrical connection is also located on the boiler casing. It is necessary to connect the electrical power to the intended connection and connect the main circulation pump at the designated location.

