

ATTENTION!

**Please read this manual thoroughly before installing and using the boiler.
This will help you to install the boiler correctly and use it in the most efficient way.**

1. Technical data

Solid fuel water heating boiler "*Kalvis-3-50(W)*" ("*Alcon-3-50(W)*"), (hereinafter referred to as the boiler) is intended for heating various premises where central heating system with natural or forced circulation is installed.

Electric heating devices (3x1.5...3x2kW) with temperature control and emergency thermostats may be installed by removing the socket cover.

Main technical data (equal for all types):

Table 1.

Parameter name	Parameter value
Nominal output* / minimal output*, kW	50 / 25
Area heated when thermal resistance quotient is 2.5, m ²	300 ... 550
Fuel used	Fire wood, waste wood, peat and sawdust briquettes, coal
Fire wood size L x Ø, up to, cm	57 x 40
Combustion chamber volume, dm ³ (l)	120
Fuel* combustion duration, h:	- at nominal output - at minimal output
	2,9 5,5
Amount of fuel* used per season, m ³	26 - 40
Efficiency at nominal output, not less than, %	77
Boiler class according to LST EN 303-5	3
Boiler water volume, l	186
Water pressure in boiler, not greater than, MPa (kgf/cm ²)	0,15 (1,5)
Maximum allowed water temperature in the boiler, °C	100
Minimal return water temperature during operation, °C	57
Ambient temperature range, °C	3 - 60
Temperature adjuster control range, °C	65 - 90
Cold water used for excessive heat dissipation parameters **: - pressure, bar	≥ 2,0
	- temperature, °C
	≤ 15
Minimal chimney draught, Pa	25
Exhaust smoke (fume) tmeperature*, °C:	- at nominal output - at minimal output
	211 162
Fuel loading hole dimensions, mm:	240 x 550
Boiler exhaust channel dimension, mm	Ø200
System connection tubes dimension	G2-B (2")
Overall dimensions, not greater than: height x depth x length, mm	1248 x 941 x 1200
Mass (netto/brutto), no more than, kg	639 / 664

* 18-20 % moist content firewoods.

Firing wood with moist content exceeding 30% is not recommended

** For boiler with emergency cooling system (*K-3-50W*).

2. Design description

As the design of the boiler is being constantly improved, non essential deviations form this manual are possible.

KALVIS[®]

**CENTRAL HEATING
SOLID FUEL BOILER**

**KALVIS-3-50, KALVIS-3-50W
(Alcon-3-50, Alcon-3-50W)**



**USER'S MANUAL,
INSTALLATION AND MAINTENANCE
MANUAL**



LST EN 303-5 GOCT 9817-95
IST 144948958.13:2004

Available types with hole(s) for the burner on the side (table 2).

Table 2

Type	Description
<i>Kalvis-3-50e (Alcon-3-50e)</i>	Base model
<i>Kalvis-3-50eD (Alcon-3-50eR)</i>	With hole on the right
<i>Kalvis-3-50eK (Alcon-3-50eL)</i>	With hole on the left
<i>Kalvis-3-50eDK (Alcon-3-50eRL)</i>	With holes on the right and left and with one hole cover

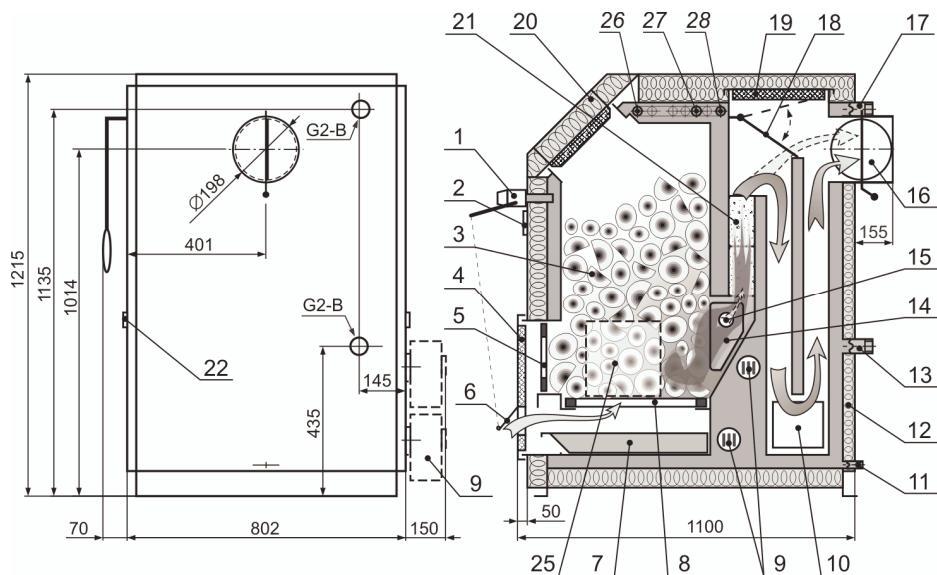


Fig. 1

1. Draught adjuster. 2. Thermomanometer. 3. Fuel load. 4. Door. 5. Door. 6. Air damper. 7. Ash tray. 8. Fire grate. 9. El. Heating device place. 10. Deashing holes. 11. Water drain tube. 12. Insulation shields. 13. Return (cooled) water tube. 14. Cast iron catalyst plate. 15. Secondary air tube. 16. Draught damper. 17. Hot water tube. 18. Ignition and exhaust damper. 19. Service cover. 20. Fuel loading door. 21. Chamotte (fire) brick. 22. Secondary air valve. 23. Ignition and exhaust damper handle. 24. Fuel loading cover handle. 25. Burner mounting hole. 26. Cooling water outlet tube*. 27. Temperature sensor socket*. 28. Cooling water inlet tube.*

* Cooling system is only available on "Kalvis-3-50W" type boilers.

Boiler frame is welded from steel plates with water gaps for water heating (see fig. 1). Frame's external walls are 4 and internal walls are 6mm thick. Boiler's exterior is covered with insulation shields. On the front part of the boiler there is a draught adjuster (p.1) that controls the air damper (p.6), thermomanometer (p.2), door (p.4), už

beyond which there is a service door (p.5) and an ashtray (p.7). Combustion chamber is closed with the cover (p.20).

Inside the boiler frame there are: ignition and exhaust damper(p.18), fire grate (p.8), stainless secondary air tube (p.15) with 7 catalyst segments (p.14). Between the second and third water chambers there are three rows of fire bricks (p.21). Under the top insulation cover there is a service cover (p. 19) used for maintenance of boiler's internal surfaces. Damper (p.18) opens a direct way for exhaust smoke into the chimney and is used when igniting or adding fuel.

When firing coal it is recommended to remove catalyst segments, secondary air tube should remain in place.

Side walls of the boiler have deashing covers (p.10) for removing the ash and the secondary air dampers (p.22).

On the rear side of the boiler there is a water drain tube (p.11), return (p.13) and hot (p.17) water tubes with a two inch thread also an exhaust tube with the draught damper (p.16).

Tubes on the side wall of *Kalvis-3-50W* boiler are needed for a cooling system: a bushing with the temperature sensor is mounted watertightly into the socket (p.27), water (pressure ≥ 2 bar) is connected to the tube (p.28), (p.26) is the outlet of heated cooling water.

2 electric heating devices, sold separately, will automatically turn on electric heating when the boiler runs out of fuel and the temperature in the boiler drops to the required standby operation mode.

Changing of construction of the boiler is prohibited.

3. Transportation and Storage

Boilers shall be stored and transported fastened on wooden pallet and wrapped into a polythene film if nothing else is agreed for in the supply agreement.

Boilers can be transported exclusively in an upright position by any kind of closed vehicle. If weather is dry, open vehicle can be used. Extra protection measures are to be used to protect boilers from overturn, scratching each other. It is forbidden to knock, overturn, throw the boilers during loading, unloading and transportation.

Boilers should be stored in dry premises without presence of chemically active vapours.

Note. After having unpacked the boiler, use its wooden pallet as fuel for the boiler and dispose polythene film to household waste dump.

4. Boiler Installation

Boiler is to be installed in the premises meeting the requirements of RSN-159-95 and RPST-01-97 as well as in accordance with "Rules for Installation of Solid Fuel Heating Furnaces in the Buildings" ST 8860273.02:1998.

It is recommended to install fume extraction hood above the boiler. Boiler is to be positioned upright or declined to front by no more than 1°.

When installing the boiler outside Lithuania, please observe all local regulations based upon EU and national standards.

Before connecting the boiler to heating system and chimney, take into consideration the fact that the boiler will have to be maintained (cleaned, adjusted etc.).

Minimum distances between the boiler and walls necessary for its maintenance are shown in fig. 2.

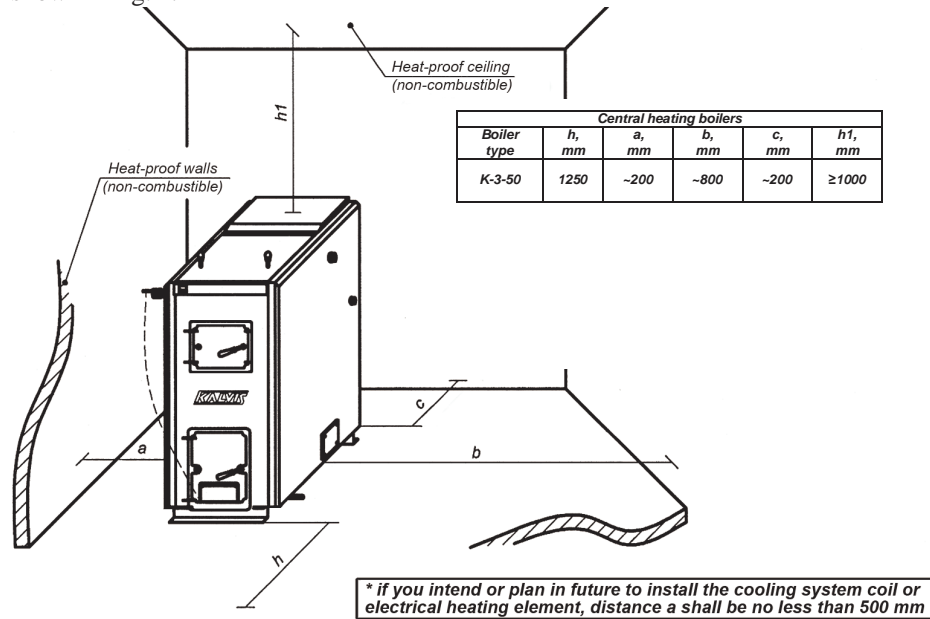


Fig. 2. Recommended distances to fire-proof partitions

4.1. Fire-prevention Requirements:

- Put boiler on fire-resistant base.
- Metal tubes are used to connect boiler to chimney, these tubes have to be made of metal sheet no thinner than 1.5 mm and covered with heat insulating material.

Warning! In the case draught in the chimney is too strong and if wood chips, sawdust, chaff or another powdery materials are used as fuel, smouldering unburnt fuel particles (sparks) can come out of the chimney during fuel loading or after fuel has burnt and having shaken remaining fuel.

If roof or its constructions are made of easily flammable materials or there are similar constructions, building materials, fuel etc. found closer than 20 m from the chimney, it is strictly prohibited to use the mentioned powdery materials.!

4.2. Requirements for Chimney:

Chimney construction and boiler connection to chimney options are shown on fig. 3a, 3b, 3c.

Requirements:

- Chimney draught shall be no less than it is specified in the table on page 3.
- Hole of the chimney shall have cross-section no less than 120 x 270 mm.
- Boiler needs separate chimney hole. Nothing else should be connected to the same hole.

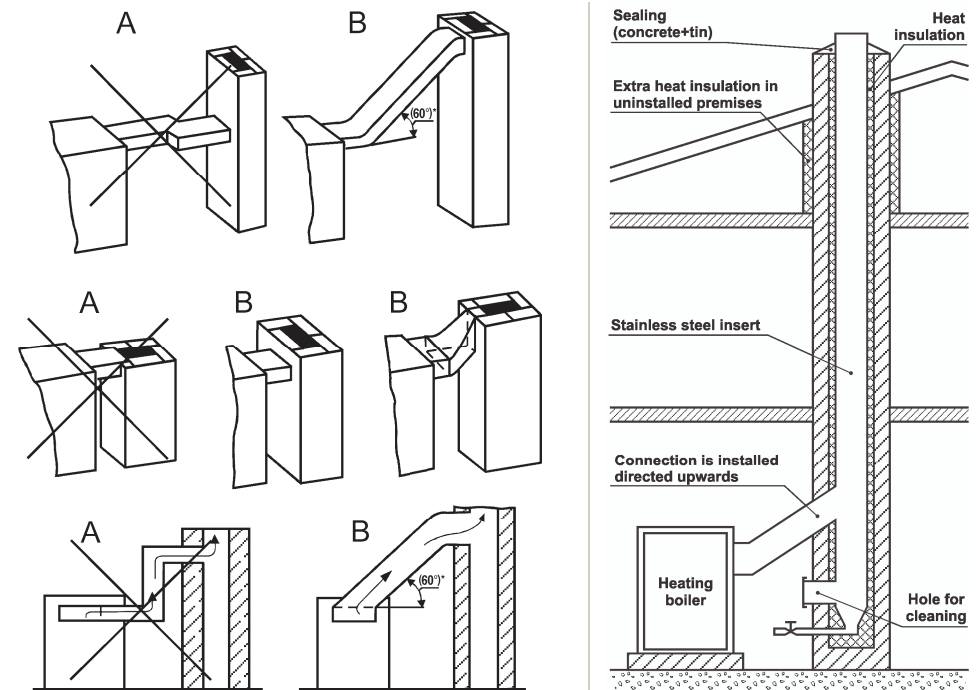


Fig. 3a
Boiler connection through elbows to the chimney.
* no less than 60° A - incorrect B - correct

Fig. 3b
Installation of chimney insert

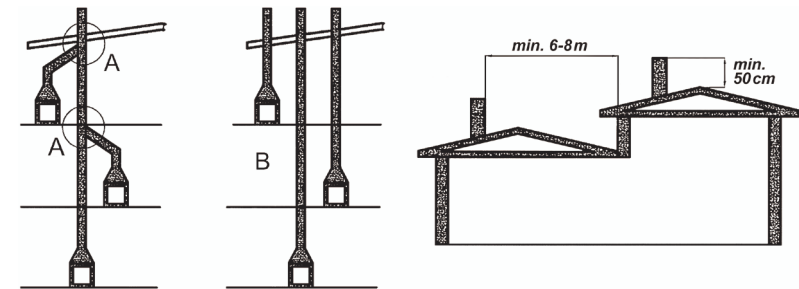


Fig. 3c

- If chimney is connected with extra elbow, its cross-section cannot be less than the cross-section of fume escape from boiler hole with bending radii no less than 100 mm;
- Tube between boiler flue and chimney shall be no longer than 1,5 m it must be rising towards the chimney.
- Seal the gaps at connection and chimney entrance places.
- Clean the chimney regularly.

Note that:

- Fume, which gets from the boiler through flue to the chimney, is cooling, vapour contained in the fume, condenses on the chimney walls, especially in unheated loft and external part of the chimney.

- Acids contained in the condensate along with heat-cold erosion can destroy chimney within several years.
- Unremoved soot can ignite in some time and, if chimney is unmaintained or roofing is easily flammable, cause fire.

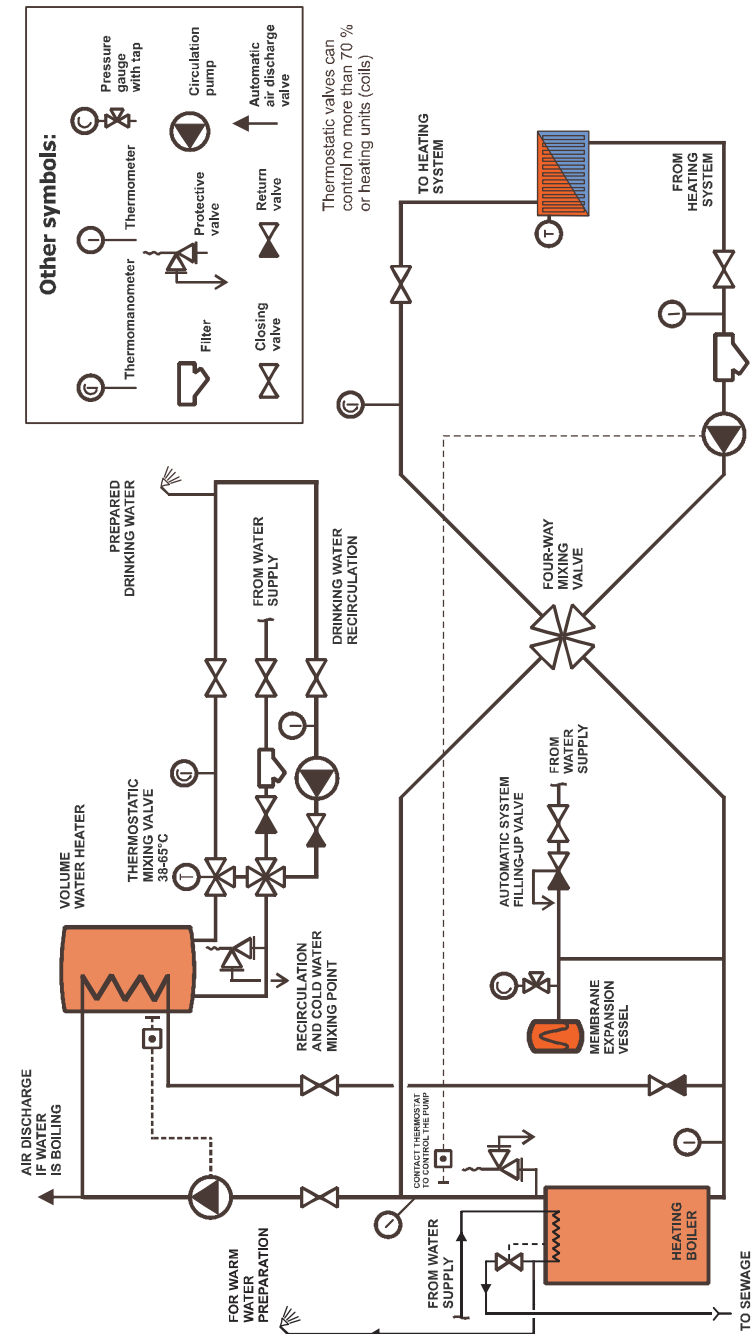
It is recommended:

- To install stainless steel insert inside the chimney. Correctly installed insert protects chimney from condensate impact and improves draught.
- Insert shall not reduce cross-section of the chimney hole significantly.
- Joints between the parts of the insert have to be sealed together (not by soldering).
- Condensate collector has to be installed in the bottom.
- Fill the gap between insert and chimney walls, at least where chimney is outside the building, with fireproof heat insulation material. Plaster the gap on the top and cover with tin at a gradient.
- Winterize chimney with fireproof heat insulation material in a cold loft.
- If fire is set out inside the chimney, close air feeding to the chimney and call firemen.
- Make holes in the chimney joint in a suitable place, for periodical cleaning of soot (once a month).
- It is recommended to have the chimney examined by qualified chimney supervision specialist.

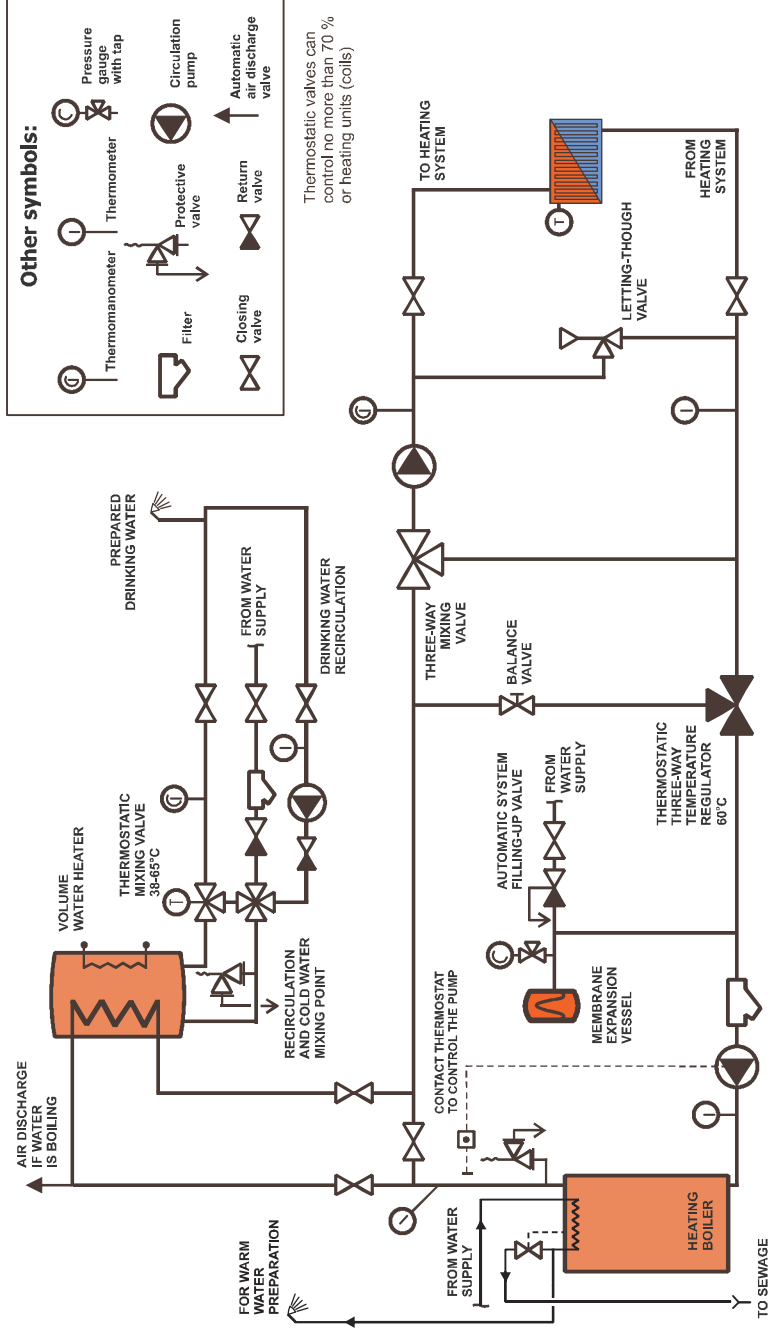
4.3. Connection to Heating System

Requirements for connection

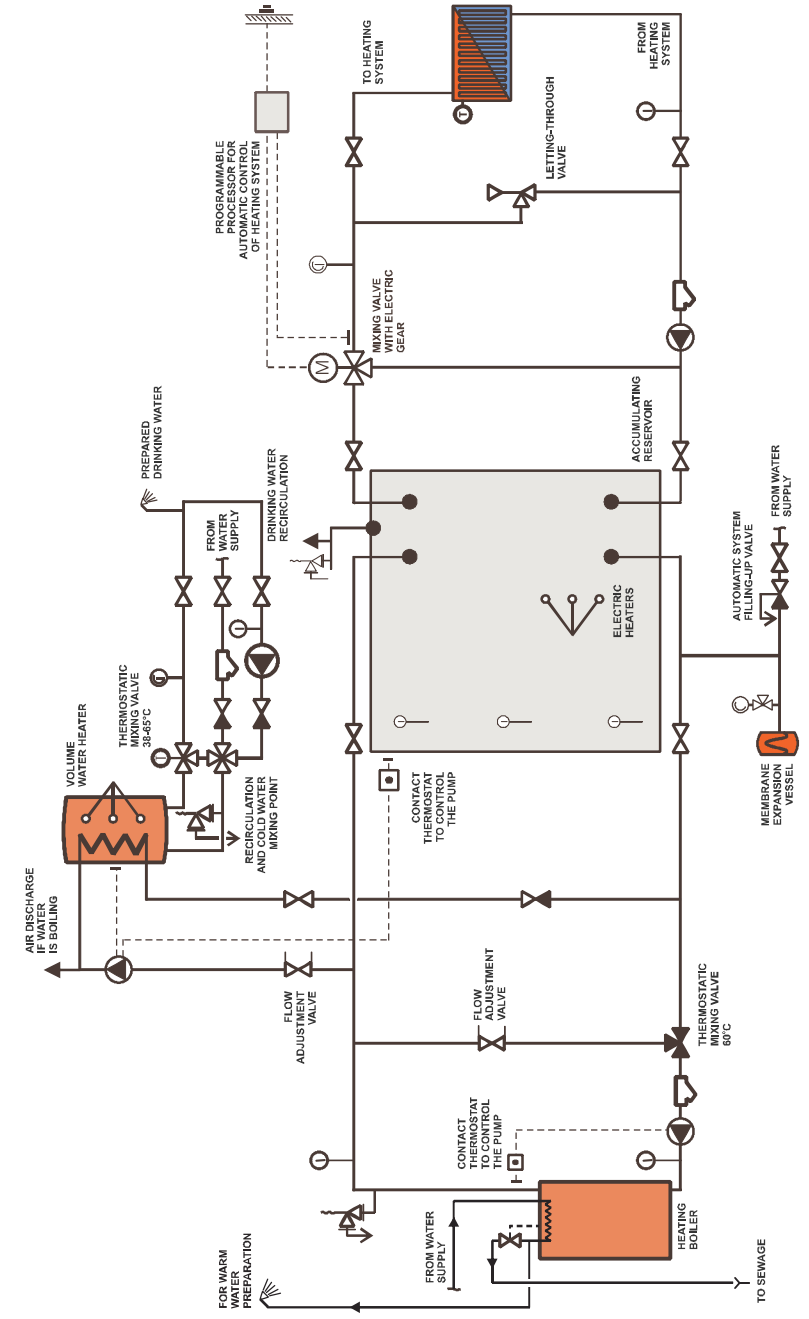
- Connect chimney to the heating system in accordance with a project prepared by heat engineering specialists or the works can be done independently by a top-qualified plumber – welder, who is experienced and knows boiler construction and this description well;
- If there are valves, disconnecting the boiler from heating system installed in the system tubes, they have to be fully open. In order to avoid accident through negligence, take off handles of the valves after opening them.
- Heating system can also be open-type. In this case expansion reservoir can be duly installed instead of the pressure expansion vessel.
- In order to avoid condensate formation, which can significantly reduce service life of the boiler, install a four-way mixing valve or thermostatic valve in the heating system (see recommended connection diagrams), which enables maintaining return water temperature of no less than 57°C.
- Install protective valve into the system, preventing working pressure from exceeding 0,15 MPa (1,5 kgf/cm²) in the heating system. Check operation of the valve every time the boiler is fired, by turning valve handle.
- Boiler can be connected into a heating system (with expansion reservoir which also serves as extra overpressure protection unit), with operation pressure not exceeding 0,15 MPa (1,5 kgf/cm²).
- It is recommended to have boiler examined by qualified chimney expert once a year.



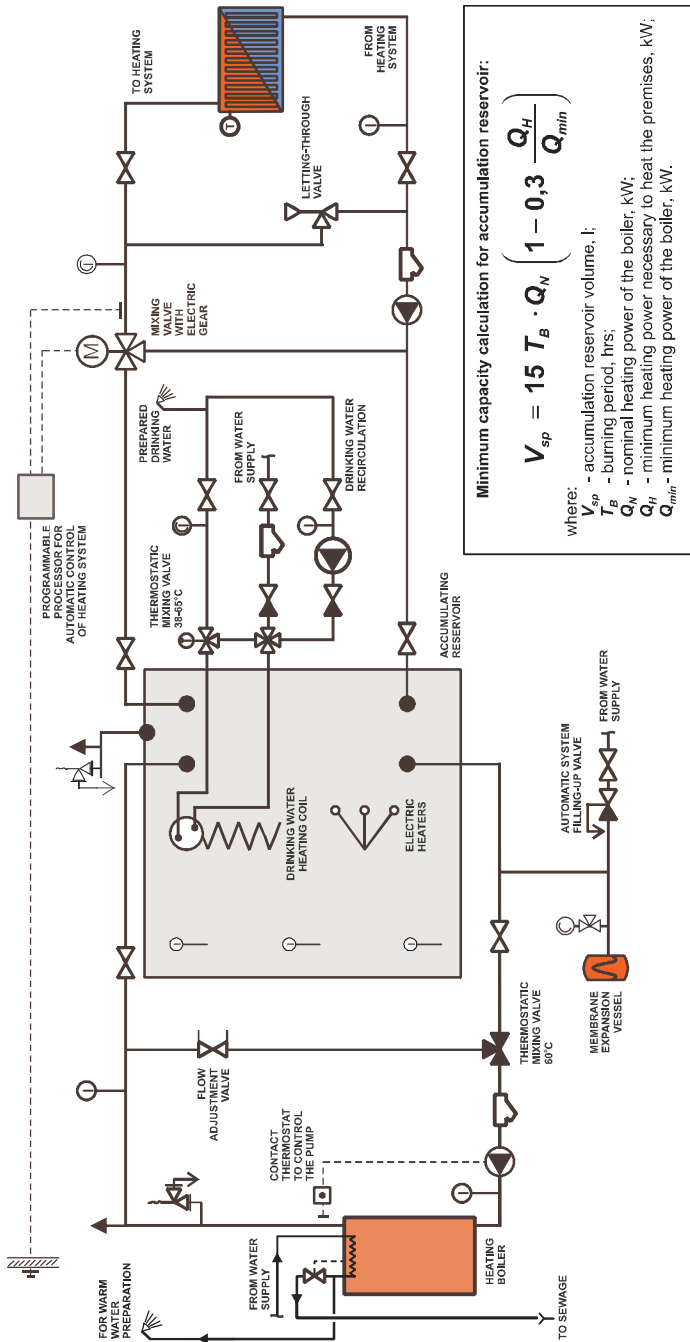
4a fig. Recommended local heating system schema with the four way valve.



4b fig. Recommended local heating system schema with the 3 way valve.



4c fig. Recommended local heating system schema with the 3 way valve and accumulation tank.



4d fig.
Recommended local heating system schema with the 3 way valve and accumulation tank.

- Water discharge tube is used to drain water from the system and boiler in the case there is system freezing risk.

Recommended boiler connection option diagrams fig. 4a – 4d.

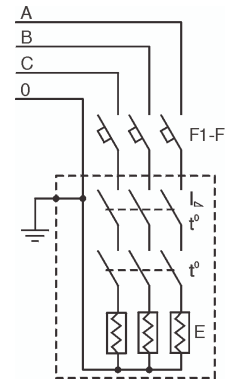
If boiler is operated at the power lower than the nominal power as per the technical specification table, boiler's efficiency is reduced, its environmental indices deteriorate. Therefore it is recommended to apply boiler connection diagrams with accumulation reservoirs (see fig. 4c, 4d). Minimum capacity of accumulation reservoir shall be calculated using the equation given at fig. 4d.

4.5. Requirements for Connection of Electric Part

If electric heating elements are installed in the boiler:

- Electric heating elements are recommended to install into the boiler in the case when boiler is connected to the heating system in accordance with the connection diagram as per fig. 4a.
- Electric part of the boiler can be connected only by a person having electrician's qualification and permission-licence for execution of installation works.
- Installation works shall be performed in line with prepared project (taking into consideration existing total inlet capacity).

Recommended diagram for connection of electric heating elements, see fig.5.



Pos.	Description	Q-ty	
F1-F3	Automatic switch	3	16A
E	Heating element (connection thread G2B L=400)	1	3x1,5 kW 3x2 kW

Fig 5

Recommended diagram for connection of electric heating elements

5. Operation of the Boiler

Adult persons, familiar with the boiler construction and this technical manual can operate the boiler.

Warning! When boiler is powered with wet fuel or sawdust, condensate forms, it combines with flammable gases forming acids, which significantly reduce service life of the boiler.

It is forbidden to fire the boiler with fine wood waste (dust), because there is explosion risk or fine unburnt particles can escape through chimney.

5.1. System Preparation for heating

Fill in the system with soft or desalinated water and drain air out. Check valves disconnecting the system from boiler for full opening and take their handles away.

5.2. Firing boiler (fig. 1)

Before firing the boiler, open the draught damper (p.16), ignition damper (p.18). Place some fine dry firewood or chips (if fire wood is to be fired) through the door (p.5) on the fire grate and ignite. Secondary air damper (p.22) must be closed.

When fuel is well lit, combustion chamber may be filled with fuel (firewood or coal). Ignition damper (p.18) should now be closed. Finer chopped firewood increases boiler output. Boiler draught is adjusted with damper (p.16).

Place firewood loosely into the combustion chamber so it could sag down to the bottom of the chamber freely.

If coal is to be used, take 5-10 kg of firewood and pour 10 cm of coal on the top.

Pour coal in layers several times, depending on the fuel quality and required heat amount.

To add fuel into the boiler:

- Open ignition damper (p.18);
- Open door (p.4) and check if the ash does not block air channels in the fire grate. If needed stir the bottom fuel layer with rake and close the door after 15...20 seconds;
- Remove draught adjuster's (p.1) chain from the door damper (p.6), to allow it to close fully;
- Carefully open the fuel loading door (p.20) a little bit, in 5...10 seconds slowly open the door completely and fill the chamber with fuel;
- Tightly close the fuel loading door and dampers;
- Attach draught adjuster's chain to the door damper.

Secondary air valves (p.22) are opened when temperature in the boiler reaches 60°C. Position of the damper is adjusted depending on the combustion intensity and fuel type.

The control of the combustion process may be performed by monitoring the color of the smoke. When combustion is good, smoke should be light coloured and thin. If there is a lot of smoke and it is dark, it means that the combustion is incomplete and there is not enough of secondary air. In such case open the secondary air valve fully.

Fuel combusts into ash, which covers the grate, resulting in reduced combustion intensity and lost efficiency of the boiler. This is why fuel is to be raked. Rake coal through inner door gaps. If there is too much ash, it prevents primary air from passing, so remove ash in due time.

Opening fuel loading door (p. 20) without necessity is not recommended

Boiler stocking needs much air, so sufficient amount of air has to get into the premises with the boiler installed.

Recommended moisture for the fuel to be used is no more than 15-22 %.

Note. In the beginning of boiler operation, during firing, before a soot layer forms on the internal walls of the boiler, water condensate is formed when firewood is burning, creating an impression that the boiler is leaky. Water vapour condensate

disappears after water temperature in the boiler rises up to 70-80 °C with the help of four-way distributor. It is recommended to maintain as high temperature in the boiler as possible. If return water temperature is lower than 57°, water vapour condenses on the internal walls of the boiler, it mixes with combustion products and forms chemically aggressive acids, leading to significantly reduced lifespan of the boiler.

In order to make sure that the boiler is leak proof, stock it intensely for several hours, then stop stocking and look for increase in the condensate volume. If condensate volume remains the same, boiler is leak proof.

5.3. Draught Adjuster Installation and Adjustment

Swedish ESBE draught adjuster (hereinafter referred to as regulator) C20/25 with or without boiler overheat protection are used. Screw the regulator in using oakum bundle or sealing tape, connect the chain with air delivery valves (1) (see fig. 1).

After the boiler heats up to 70 °C, set regulator knob with positions marked (1; 2; 3; 4; 5; 6) to position "4" and shorten the chain so that when it is strained air delivery valve (1) was closed. Set the desirable temperature by turning the regulator knob to relevant position. Position "6" means 90°C. Difference of the temperatures between the positions is 10 °C.

5.4. Cleaning the Boiler

Ash, accumulated under the grate, can prevent air from getting into the combustion chamber. Therefore, no rarely than every next firing (every next day) remove ash from the ash box as well as from the ashtray.

In order to assure more efficient operation of the boiler, clean regularly soot from internal surfaces of the boiler. Cleaning frequency depends on the fuel quality (especially moisture), stocking intensity, chimney draught and other factors. It is recommended to clean heat exchanger and combustion chamber of the boiler when soot layer is up to 3 mm, but not less than 2-3 times per month. Remove service cover (p.19), take out the damper (p.18) and clean internal surfaces of the boiler thoroughly with scraper and brush.

Use chemical cleaners to remove hardened deposits (Swedish "Fauch 300" or similar).

Chimney should be cleaned at least once a year and before starting the heating season as a must.

Note. At first firing of the boiler or if it was unused for a longer period, fume can be blocked in the chimney. If this is so, during firing, open chimney or boiler chimney connection cleaning door and carefully insert burning creasy paper. When the paper completes burning, close the door. Draught should have improved.

5.5. Risk analysis and Elimination

Boiler is protected from adverse impact of overpressure by protective valve or expansion vessel installed in the system.

What is wrong	Possible causes	What to do
Boiler overheats	Combustion is too intense. Power failure (systems with forced circulation).	Close air supply, observe water temperature in the boiler. After temperature falls down, return to normal stocking mode.
Power failure		Call qualified specialist. In winter, if power failure lasts longer and there is risk of freezing, discharge water from the system.
Boiler fails to reach nominal efficiency	Bad/damp fuel. Poor draught.	Use drier fuel, open firing valve. Check chimney draught.
Boiler sweats	Bad fuel. Too low temperature of returning water (>57°C !). Poor draught.	Use dry fuel. Adjust mixing valve.
Overpressure forms in the boiler	Boiler overheats. Protective valve fails. Expansion vessel fails in a closed system.	Close air supply, observe water temperature in the boiler. Check and if necessary replace the protective valve. Check expansion vessel.

6. Accident Prevention Requirements

It is forbidden:

- To operate the boiler without filling the heating system with water. Do not allow water to freeze in the heating system and boiler.
- To connect the boiler into closed system without protective valve, which prevents the system from exceeding pressure by more than 0,15 MPa (1,5 kgf/cm²).
- To close supply or return line valves when boiler is in operation.
- To dry fuel or other combustibles near or on the boiler.
- To assist firing with combustible liquids (petrol, kerosene etc.).
- To operate boiler with opened doors and covers.
- To discharge live coal and ash near living and auxiliary structures.
- To let children to maintain the boiler.
- To operate boiler with heating elements without adequate grounding.

It is necessary:

To check condition of grounding regularly

7. Consumables

Door and other sealing ropes from glass fibre, cast iron grate and doors, heat-resistant concrete parts can wear, burn out or crack during operation.

These spare parts can be purchased in the shop or from the manufacturer.

Use exclusively the manufacturer's spare parts.

8. Sorts of Fuel and their Properties

Combustion heat of absolutely dry wood practically is unrelated with the wood species and equals to 4510 kcal/kg. Therefore, when ranking various sorts of

firewood, its specific gravity should be taken into consideration. Weight of various wood species per cubic metre is as follows:

- Oak firewood - 500 kg;
- Birch firewood - 450 kg;
- Spruce firewood - 330 kg;
- Asp firewood - 330 kg.

The damper is the firewood the less is its calorific content. Reduction in the calorific content of wet firewood compared with dry firewood (~20 % humidity) is as follows:

- 30 % humidity - 10 ÷ 15 %;
- 50 % humidity - 35 ÷ 40 %.

Fresh cut wood has 35 ÷ 60 % of water. Least volume of water is contained in the tree cut in winter. Hardwood contains less water.

Wood to be used as firewood has to be cut and split. After one year spent under shelter firewood contains 20 ÷ 25 % humidity. After two years it contains 13 ÷ 17 %, which means that much less fuel will be needed for heating than with wet firewood.

Firewood and peat volumes of equal weight give similar quantities of heat.

1 kg of coal gives 2 ÷ 3 times more heat than 1 kg of firewood.

To burn 1 kg of firewood needs 4 ÷ 5 m³ of air, coal needs - 10 m³.

The worse is fuel quality the larger amount of ash remains.

Energy emission by burning 1 dm³ of 20 % of firewood:

Wood species	kcal	kWh	Compared in % with oak
Oak, maple	2520	2,93	100 %
Ash	2460	2,86	98 %
Birch	2270	2,64	90 %
Black alder	1900	2,21	75 %
Pine	1850	2,15	73 %
Asp	1810	2,10	72 %
Poplar	1680	1,95	67 %
Spruce	1610	1,87	64 %

Burning 1 kg of average calorific content coal, ca. 6500 kcal (7,56 kWh) is emitted.

9. Acceptance certificate

Solid Fuel Central Heating Boiler "*Kalvis-3-50*" plant Nr. _____ meets drawings, requirements as per IST 144948958.13:2004 and LST EN 303-5 and is suitable for use.

Boiler underwent test with pressure 0,4 MPa applied.

Date of manufacture _____

Q/A inspector _____

10. Complement.

- 1. Boiler "*Kalvis-3-50* ___" ("*Alcon-3-50* ___") - 1 pcs.
- 2. Draught adjuster C20/25 - 1 pcs.
- 3. Scraper - 1 pcs.
- 4. Ash Scoop - 1 pcs.
- 5. Rake - 1 pcs.
- 6. Boiler user's manual - 1 pcs.

Electrical heating blocks, cooling coil and temperature valve are not included.

11. Warrantee

- Manufacturer guarantees that the boiler meets the requirements set forth in the technical documents as well as in IST 144948958.13:2004.
- Guarantee servicing period is 12 months after selling the boiler to the customer. 24 months guarantee is applied to the frame of the boiler.

During this period manufacturer will eliminate the faults caused by his fault if customer has not violated transportation, storage, connection and operation requirements.

- In the case of fault in the boiler, fill the last page of this manual, cut it away and send by registered mail to the address of manufacturer or the firm which provides guarantee repairs. In an urgent case call them and deliver the filled request to the representatives who come.

Note. If the boiler was connected and used without observing the requirements of chapter 4, buyer loses the right to guarantee service.

I am acquainted with boiler installation and operation as well as guarantee service conditions. I know that if the boiler was installed and operated without observing the requirements of this manual, I lose the right to guarantee service.

Buyer: _____
(name, surname, signature)

Sold by:

Company _____
Date of sale: _____
Address _____
Tel. _____

Installed by:

Company _____
Address _____
Tel. _____
Master _____
(name, surname, signature)

In the case of damage call:

Company _____
Address _____
Tel. _____

Manufacturer

UAB "Kalvis"
Pramonės 15, LT-78137 Šiauliai, Lithuania
Tel.: (+370 41) 540556, 540558, 540565
E-mail: prekyba@kalvis.lt



To _____

Guarantee servicing request

Having acquainted with fireplace's "Kalvis _____" user's manual (Products No. _____) and having installed it as required I have following claims:

I. _____

I consider it a manufacturing error and I ask you to send your representatives to inspect the fireplace, determine the defects and remove them.

If the aforementioned defects are due to wrong installation and operation of the fireplace I shall cover the arrival costs of your representatives (_____) and the time spent for travel and on site at ____/hour for each representative including the driver.

My address _____ Phone number. _____

Name

Signature

Notice: Request should be sent by a registered mail to the address specified in this passport, in case of emergency call specified phone number.

