EN

KALVIS

MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001
OHSAS 18001

CENTRAL HEATING SOLID FUEL BOILER

KALVIS - 2 - 30
KALVIS - 2 - 40

TECHNICAL CERTIFICATE, INSTALLATION AND MAINTENANCE MANUAL

CE

LST EN 303-5

Made in Lithuania

CONTENTS

DEAR BUYER

We are very pleased that you have purchased our manufactured central heating boiler. This versatile product is designed for space heating. For combustion you can use a variety of solid lump well dried fuel. If desired, the boiler is easy to adapt for stoking in mechanized way, with pellets. The boiler is manufactured using modern materials and technologies.

We believe that if you carefully read this guide, properly install and operate the boiler, it will cause no troubles in handling, and serve you reliably, safely for a long time.

We wish you a warm and comfortable life!

1. Recommendations

In order the boiler served long and without troubles and you did not loose the right for guarantee service; please observe the following main rules:

Attention: <u>It is strictly prohibited to start up the boiler having no prior filled boiler with thermal water.</u>

1. *Boiler installation, adjustment, operator training can be performed by a firm, attested for such jobs and having qualified specialists or by representative authorized by manufacturer.*
2. *It is necessary to install the boiler into such heating system, which* ***is able to maintain the return water temperature not less than 60 ºC.***

Attention: <u>If you fail to meet this requirement, corrosion will occur due to condensate which will significantly reduce service life of the body and ceramic tiles.</u>

3. *Optimum operation of the boiler is achieved at close to nominal power.*
4. *If boiler power is too high and it has to be operated at lower than nominal power,* ***we recommend to install the boiler with accumulation tank.***
5. *Use fuel no damper than 25 %.* ***In the case of higher fuel dampness, boiler power drops, fuel consumption rises.***
6. ***Having the heat demand lower than boiler nominal power, in order to avoid the permanent loaded fuel smoldering (the resins may start accumulating inside the boiler), do not load the furnace in full. We recommend to load only one thirds of furnace.***

Note. *This operation manual is compiled following the requirements provided for in LST EN 12171 Building Heating Systems. Operation, Maintenance and Use Document Preparation Procedures. Heating Systems Needing no Trained Operator.*

2. Intended use

Solid fuel water heating boiler ***Kalvis-2-30***, ***Kalvis-2-40*** (hereinafter referred to as the boiler) is used for heating of various premises where central heating system is installed with forced circulation and closed or open expansion system.

The boiler operates most efficiently under nominal taken thermal power, if operating with lower power, the accumulation capacity is recommended to use *6 (*see page 5*).

3. Main technical data

Boiler model		***Kalvis-2-30***	***Kalvis-2-40***
Nominal power (Q_N), kW *[1]		30	40
Release to heating system, kW		28	37,5
Release to premises, kW *[2]		2	2,5
Heated area, m²	class B buildings *[3]	275…672	344…840
	class C buildings *[3]	147…352	184…440
Fuel consumed *		logs *[4]	
Size of logs L x Ø, up to, cm		40 x 15	45 x 15
Position of logs in furnace		lengthwise or crosswise	crosswise
Fuel loading openings size, mm:	in front	280 x 405	280 x 565
	on top	315 x 405	310 x 565
Furnace volume, dm³ (l)		155	200
Fuel charge combustion duration (Q_N), h. *[5]		4 … 5	
Efficiency rate during operation at nominal power, no less than, %		82	
Boiler class under LST EN 303-5		3	
Boiler water capacity, l		103	80
Min volume of accumulation vessel, l *[6]		800	960
Water pressure in boiler no more than, bar (MPa)		1,5 (0,15)	
Max permissible water temperature, ºC	for opened heating system	95	
	for closed heating system *[6]	80	
Min return water temperature during operation, ºC		60	
Hydraulic resistance, mbar		8	8,3
Operating ambient temperature, ºC		3 ... 40	
Temperature regulator adjustment range, ºC		70 ... 80	
Parameters of cold water used for excess heat dissipation:	pressure, bar	≥ 2,0	
	temperature, ºC	≤ 15	
Chimney draught, Pa	no less than	18	20
	no more than	23	25
Applied smoke exhauster's unit type *[7]		***DM-01N***	
Exhausted flue temperature at nominal output, up to, ºC		210	225
Exhausted flue quantity at nominal output, kg/s		0,03	0,038
Connection sockets dimensions:	flue channel, mm heating system, in drainage, in	Ø180 G2-B G½-B	Ø180 G2-B G½-B
Overall dimensions (netto/brutto), not bigger than:	height, mm width, mm length, mm	1450 / 1610 770 / 800 1340 / 1390	1360 / 1520 930 / 950 1290 / 1480
Mass (netto/brutto), no more than (±10%), kg		532 / 552	550 / 570

*[1] *Firing with 18 – 20 % damp birch firewood. It is not recommended to fire with firewood damper than 25 %.*

*[2] *It is recommended to avoid radiators installation in boiler room, because heat from boiler is transmitted by air. If there is possibility, additional heat (from boiler room) should be transferred into rooms next to it, by natural convection method.*

*[3] *According to STR 2.01.02:2016 Energy Performance Projecting And Certification Of Buildings requirements calculated amount of energy expressed for class B and C energy performance buildings.*

*[4] *As alternative fuel may be used coal, lump wood waste, chip or peat briquettes.*

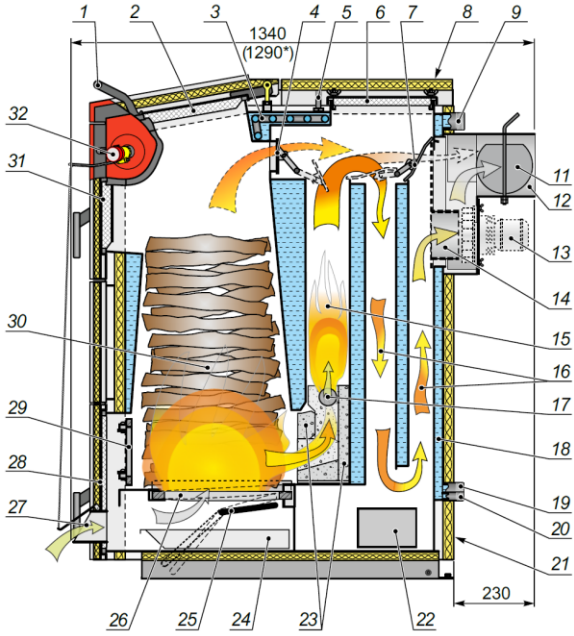
*[5] *Fuel charge combustion duration depends on fuel type, moisture, outdoor temperature and other factors.*

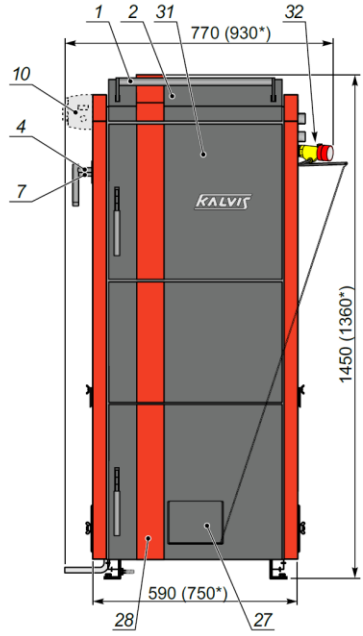
*[6] *It is not recommended in the opened heating system to mount boiler with accumulation tank. Intensive boiler stoking at 80 ºC will cause the water inside of the boiler boiling, will appear the stranger noises.*

*[7] *Available for installation having purchased separately (manufacturer UAB "Kalvis").*

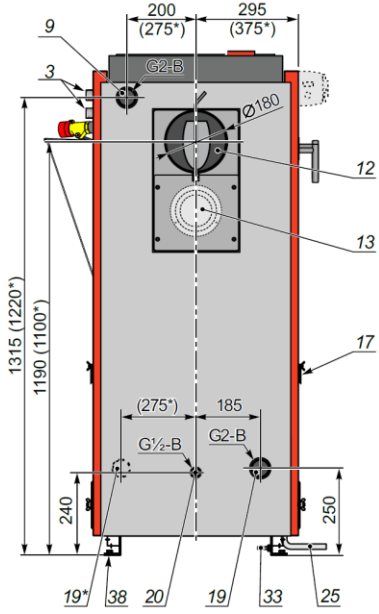
4. Design description

Note: *Since boiler construction is under constant improvement, non-essential deviations from this manual are possible.*

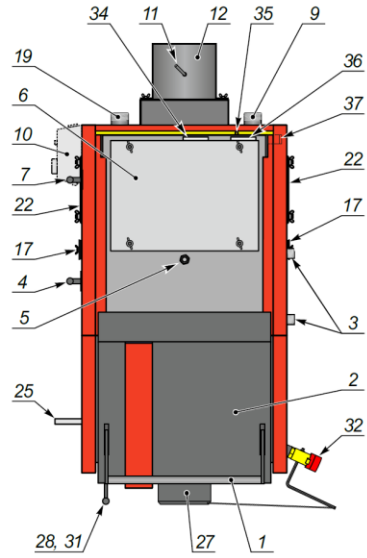




View from front



View from back



View from above
(with taken upper cover 8)

Picture 1. Boiler design.

*1. Handle the upper fuel loading cover. 2. Upper fuel loading cover. 3. Cooling coil. 4. Smoke exhaust damper. 5. Boiler lifting loop. 6. Service cover. 7. Ignition damper. 8. Upper cover. 9. Flow out (hot) water socket. 10. Smoke exhauster's control panel *. 11. Smoke exhaust damper. 12. Flue duct. 13. Smoke exhauster *. 14. Additional insert for smoke exhauster **. 15. Secondary burning chamber. 16. Heat exchanger. 17. Secondary air openings with dampers. 18. Boiler housing. 19. Return (cold) water socket. 20. Water drainage socket. 21. Decorative thermo insulation shields. 22. Soot cleaning covers. 23. Refractory bricks. 24. Ash tray. 25. Fare grates lifting (shaking) pedal. 26. Moving fire grates. 27. Air supply damper. 28. Furnace door. 29. Cast iron door. 30. Furnace. 31. Fuel loading door. 32. Air draught regulator. 33. Earthing bolt. 34. Emergency thermostat sensor's socket for smoke exhauster. 35. Additional socket for temperature sensor. 36. Additional socket for temperature sensor. 37. Cooling system temperature sensor socket. 38. Welded-on nuts for boiler fastening to the pallet and height adjustment at installation.*

* *Could be mounted as option.*

** *Installs together with mounting smoke exhauster (13).*

Boiler housing (*18*) (*see picture 1*), is welded of the steel plates, has the water cavities, where the water is heating. Housing's internal part walls are of 6 mm. thick. Housing is covered by thermo insulation decorative shields (*21*).

In the front part of the boiler there are the air draught regulator (*32*), which controls the air supply damper (*27*), furnace door (*28*), behind which there is a cast iron door (*29*).

The fuel loading chamber is covering by door (*31*). Inside of the housing there are mounted the ignition (*7*) and smoke exhaust (*4*) dampers, which are opening the path for smoke flow straight to the chimney, and using for firing start up or refueling.

On the top there are the fuel loading chamber cover (*2*) and, under to the removable decorative shield (*8*) – the service cover (*6*), used for the boiler's heat exchanger surfaces cleaning. At boiler sides there are the secondary air supply regulate dampers (*17*); and underneath - the covers (*22*) used for the soot cleaning.

The air, needed for combustion, supplies over to the fire grates (*26*) and secondary air openings (*17*). Due to the life coal does not plug the air openings of the fire grates (*26*) and ash will falls into the ash tray (*24*), there is mounted the mechanism (pedal) (*25*), used for fire grates shaking.

At the bottom part of the burning chamber (*15*) there are mounted the refractory bricks (*23*) which maintain the high temperature inside of the chamber and ensures the complete flue gas combustion and therefore is reduces the emissions of the pollution.

At the rear part of the housing there is a heat exchanger partition (*16*), which, in order to better heat transferring, creates the longer path for the smoke, till the smoke reaches the smoke outlet (*12*).

In the rear wall, below the smoke outlet (*12*) and mounted in the smoke draught damper (*11*), there is the optional smoke exhauster's ***DM-01N***, fastening place (*13*). It is necessary to use it in case, if the chimney natural draught is not sufficient. The smoke exhauster's control panel (*10*) is to be fastened at the left side of the boiler. In case of operating boiler with smoke exhauster it is necessary to install the additional insert (*14*). If the boiler is operating without smoke exhauster, the additional insert must be removed.

Hot water goes into the heating system over to the top socket (*9*), mounted at the rear part of the boiler, and, cooled down, returns over to underneath socket

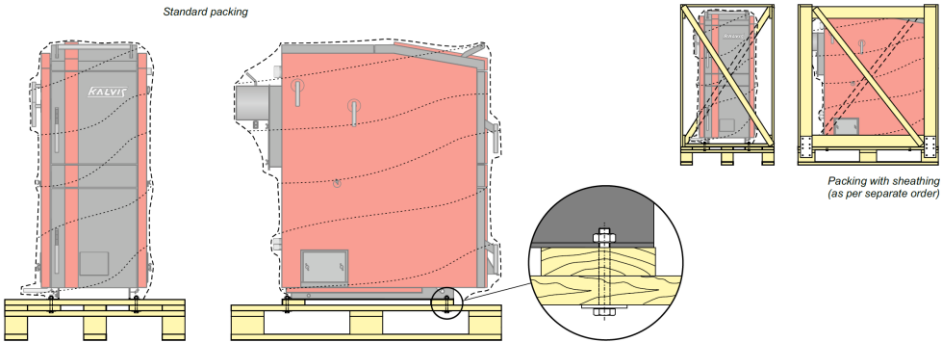
(*19*). Underneath also there is welded the socket (*20*) used for the water drainage from the boiler and whole the heating system.

In the right wall there are the two sockets (*3*) intended use for cooling system connection and, at the rear part, behind the decorative shield, there is the temperature sensor's socket (*37*).

It is prohibited to change boiler construction without permission.

5. Transportation and storage

Boilers are stored and transported fastened onto wooden pallet and twisted with polythene film, if nothing else is agreed in the supply agreement (*see picture 2*).



Picture 2. Boiler packing for transportation.

Boilers are allowed to transport exclusively in vertical position with any kind of covered transport. If weather is dry, open transport is allowed. Extra measures have to be taken to protect boilers from falling down, scratching against each other. During loading/unloading/transportation it is prohibited to beat, turn, throw the boilers.

Boilers are stored in dry premises, without presence of chemically active substance gases.

Note. *Product packing (wooden pallet and polythene film) disposal actions shall meet the environmental requirements and rules of the user's country. In the extreme case wooden pallet can be used as fuel for the boiler.*

6. Boiler installation

Boiler is to be installed in the premises meeting the relevant requirements of the country where boiler has to be installed.

Boiler firing requires much air, therefore is necessary to ensure the sufficient fresh air intake in the boiler operate premise.

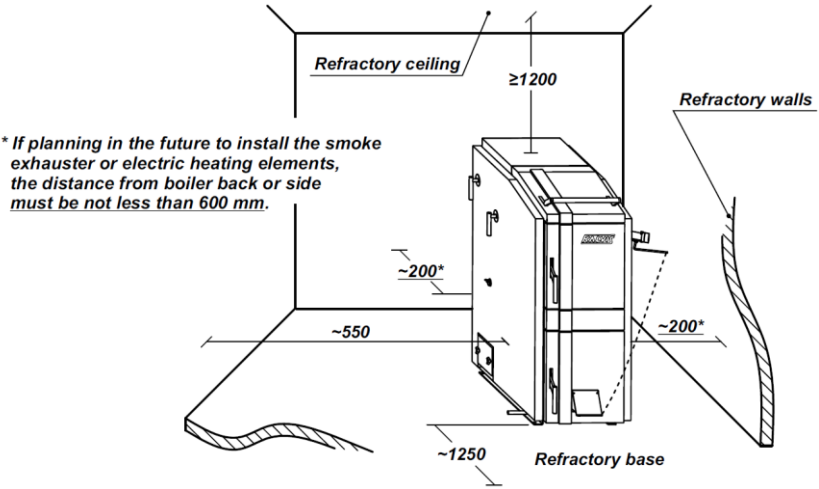
Boiler is to be positioned upright or declined to front by no more than 1º. Premise floor must be even, not flammable and capable to withstand the load

up to 0,8 t/m². Boiler installation height (horizontality) can be adjusted with the boiler-to-pallet fastening bolts (*38*).

It is prohibited to install boiler in the living rooms or corridors.

It is recommended to install fume extraction hood above the boiler.

Prior connecting the boiler to heating system and chimney, take into consideration the fact that the boiler will has to be maintained (cleaned, adjusted etc.). Minimum distances between the boiler and walls necessary for its maintenance and fire precaution are shown in *picture 3*.



Picture 3. Recommended distances from not flammable partitions

6.1. Fire precaution

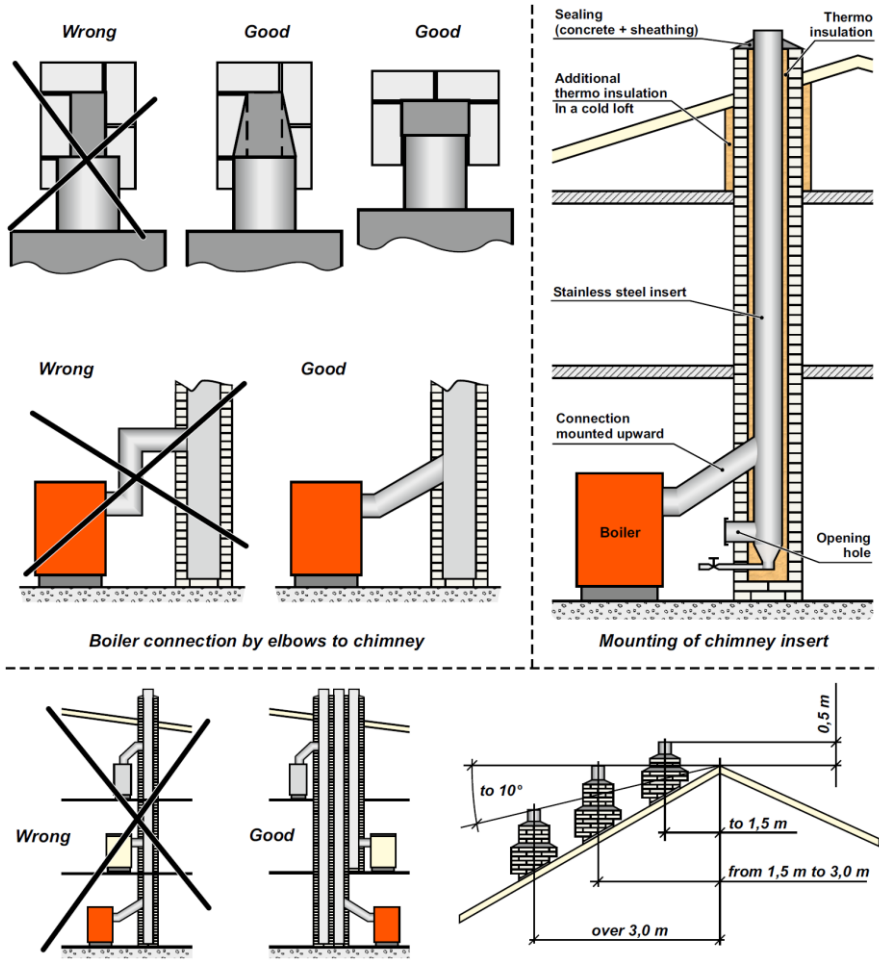
- Put the boiler on the refractory base;
- Metal tubes are used to connect boiler to chimney, these tubes have to be made of metal sheet no thinner than 1,5 mm and covered with heat insulating material.

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, smoldering unburned 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!

6.2. Requirements for chimney

Chimney construction and boiler connection to chimney options *see picture 4*.



Picture 4.

Requirements:

- chimney draught shall be no less than it is specified *in the main technical data table (see page 5)*;
- hole of the chimney shall have cross-section no less than boiler's flue cross-section;
- boiler needs the separate chimney hole. Nothing else should be connected to the same hole;
- if the chimney is connected with extra elbow, its cross-section cannot be less than the cross-section of fume escape from boiler hole with bending radius no less than 100 mm;
- tube between the boiler flue and chimney shall be no longer than 1,5 m, it must be rising towards the chimney, providing the possibility for its cleaning;
- seal the gaps at connection and chimney entrance places.

Note that:

- smoke, after getting into the chimney from the boiler flue pipe, continues cooling, vapor, contained in the smoke, condenses by settling on the chimney walls, especially in unheated loft and external part of the chimney;
- acids of the condensate and heat-cold erosion can disintegrate chimney in a couple of years;
- not cleaned soot can ignite in some time and, if the chimney is unmaintained or roofing is easily flammable, it may cause the fire.

We recommend:

- to install stainless steel insert inside the chimney. Correctly installed insert protects chimney from condensate impact and improves draught;
- the 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);
- the 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 the chimney with the fireproof heat insulation material in a cold loft.
- if the fire is set out inside of the chimney, close the air feeding to the chimney and call firemen;
- make the openings in the chimney joint in a suitable place, for periodical cleaning of soot (once a month).
- it is recommended to have boiler examined by qualified chimney expert once a year.

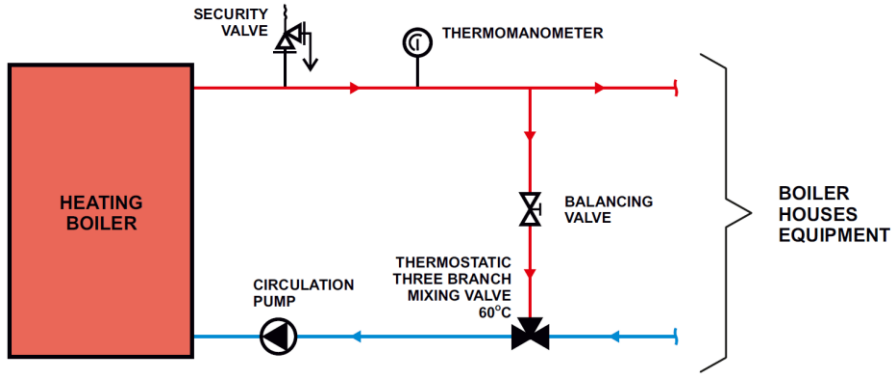
6.3. Connection to the heating system

The many of heat consumer's boiler houses connection diagrams are becoming increasingly complexes. There are connected a few of alternative heat generators - the solid fuel or gas boiler, extra pellet burner, electric heating system, thermal pumps, solar collectors and etc. For the premises heating there are used a several of radiators, heating floor or air heating, there are mounted the accumulation tanks, various equipment of the water preparation.

Therefore the proper setting of the boiler and formation of the boiler connection diagram according to the customer requirements is allowed only for the qualified engineers and experienced installers. The *picture 5* is showing only the part of the recommended boiler's connection to the heating system diagram, which ensures the return water temperature not lower than 60 ºC. Diagram not contained the auxiliary technological equipment (valves, expansion vessel and other).

Requirements for the connection:

- The valves, disconnecting the boiler from heating system installed in the system tubes, must be fully opened. In order to avoid accident through negligence, take off the grips of the valves after having opened them;



Picture 5.
The part of recommended boiler installation diagram, performing which, ensures the long service life of the boiler, not allows to form the condensate. There are not shown the auxiliary technological equipment of the boiler house (expansion vessel, valves and other).

- In order to avoid the condensate formation, which can significantly reduce service life of the boiler, there should be installed the such heating system, which enables maintaining the return water temperature of no less than 60 ºC;
- ***It is necessary into the heating system, as much closer to boiler, to install the protective valve (G½B), preventing the boiler housing against to pressure bigger than 1,5 bar (0,15 MPa). In between the boiler and protective valve there is not allowed to install any shut-off fittings***;

Notice. *If the system pipes contained the shut-off valves, which disconnects boiler from the heating system, they should be fully opened. In order to avoid any accidents caused by inattention, it is expedient to take away the valves grips, having the valves fully opened.*

- Boiler can be connected into a heating system with membrane expansion reservoir, vessel's permissible operation pressure could be up to 10 bar, air pressure should be equal to the system pressure, for example 0,6 bar. Prepares the opened type heating system, instead of membrane expansion vessel, there could be used the expansion vessel of opened type.

Attention ! Within boiler installation, onto the outgoing water pipe, at visible place, it is necessary, for the thermo manometer mounting, to weld the coupling with thread G½B.

If boiler operates at the power less than the nominal power specified in the technical specifications, the efficiency of the boiler reduces, environmental indices become worse. Therefore it is recommended to use the boiler connection diagrams with accumulation tank.

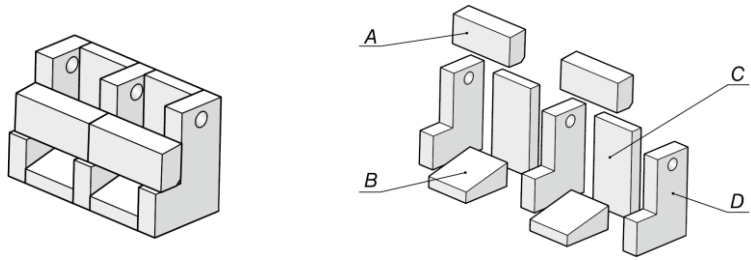
Notice. *We not recommend to install the boiler with accumulation tank having the opened type heating system. The boiler intensive firing, when temperature is rising close to 80 ºC, may cause the water boiling inside of boiler, may appear as well the extraneous noise.*

Attention! *Having a risk of freezing or within the boiler repair, the water from the system is drained over to drain socket (20) (see picture 1).*

6.4. Burning chamber assembly

Boilers are supplied fully assembled, but after completion of all boiler installation works it is necessary to check whether refractory bricks are put in correctly in the burning chamber. If the bricks are out of their original positions, return them back to correct places. If the bricks are supplied separately or if you want to replace the worn bricks, do this in the following sequence:

Through front door (*28* and *29*) into secondary combustion chamber (*15*) insert the side and the central bricks (*D*) (*see picture 6*). Place the rear bricks (*C*) and bottom bricks (*B*) into the spaces. Lastly, put frontal bricks *(A)* onto the side and the central brick edges (recess down, towards combustion chamber).



Picture 6. Refractory bricks combustion chamber construction.

6.5. Air draught regulator installation

The air draught regulator (*32*) (*see picture 1*) (*hereinafter referred to as regulator*) is screwed in, for sealing using oakum or sealing tape.

Connect the chain with primary air supply damper (*27*) (*see also chapter 7.3*).

6.6. Connection of the boiler cooling system

This system intended use for the heat excess dissemination (to prevent boiler against to emergency overheating), if the normal heat removal inside of the heating system would be break down.

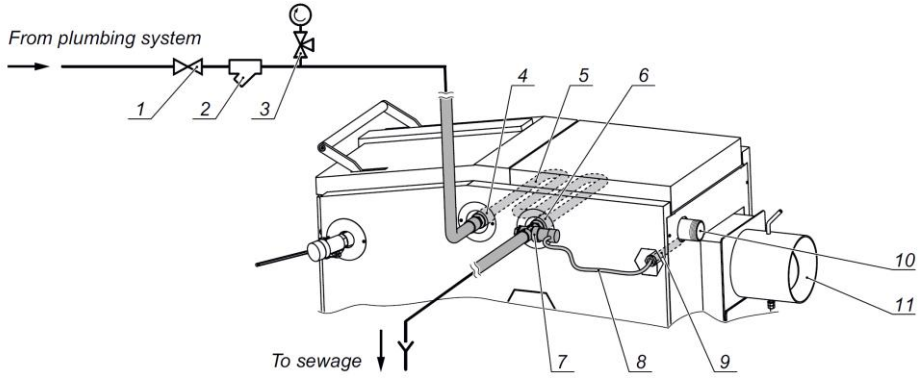
Notice. *It is not necessary to install into the boilers the equipment used for the overheat dispersing, if the boilers are installed into the opened type heating system, because the overheat is dispenser in the form of steam over to the opened type expansion vessel proper installed.*

For this purpose into the boiler housing there is mounted the stainless steel coil (*3, see pictures 1 and 7*). When the boiler's water heats over 95 °C, opens the temperature valve and cold water, flowing through the cooling coil, cools the boiler. The passed water then is directed to the sewage through pipes no thinner than those installed on exit from the coil (water has to flow freely to the sewage).

At the cooling coil is connecting the temperature valve (*see recommended boiler house connection schemas*). Temperature valve to be connected using not

thinner than ¾ inches pipes, the sensor of the temperature valve to be mounted into the socket (*9*) (*see picture 1*) which is located under the cover, at the rear part of the decorative thermo insulation shield.

Notice. *When connecting the pipes and temperature valve, try not to move sealing of coil connection pipe sleeve. If it is moved and leaks, tighten the sleeves carefully. If it still leaks, remove the sleeves, change paranite gaskets and pack anew.*



Picture 7. Emergency cooling system.

1. Shut-off damper. 2. Water filter. 3. Manometer with faucet. 4. Socket of cooling water supply (G ¾). 5. Cooling coil (3, see picture 1a). 6. Socket of the cooling water exit (G ¾)*. 7. Emergency cooling valve. 8. Capillary. 9. Socket of the temperature sensor (G ½) (37, see picture 1). 10. Outgoing (hot) water socket (9, see picture 1), 11. Flue duct (12, see picture 1).*

** the connections 4 and 6 can be replaced*

Attention ! *Work carefully - the edges of the decorative shield's opening may become sharp, do not injures.*

The temperature valve used shall has the following parameters:

Min water temperature	10 ºC;
Opening temperature	95 ºC;
Max water temperature	110 ºC;
Max water debit	6,5 m³/h;
Max water pressure	10 bar.

If the electric power supply is interrupted in the house equipped with the local water supply system (water is supplied by hydrophore) than may occur the boiler overheat (stopped heating system circulation pumps), therefore it is necessary to have the extra water supply to the cooling system.

Attention ! ***Emergency cooling coil cannot be used for hot water preparation.***

6.7. Exhauster connection

More detailed information regarding to exhauster ***DM-01N*** connection to the boiler see "*Smoke exhauster mounting and maintenance manual*".

7. Boiler operate

Attention! *The dampers of smoke exhausting (4) and ignition (7) (see picture 1) within the boiler firing* ***must be fully closed !***

Boiler can be operated by adult persons well familiarized with boiler construction and this technical certificate.

The recommended fuel moisture should not exceed 25 %.

Attention! *When boiler is fired with damp fuel (firewood or chips), formed condensate combines with combustible gases resulting in acids, which reduce service life of the boiler significantly. Besides that, this is inefficient, because given efficiency rate cannot be reached, so much more firewood is consumed.*

If damp fuel is used for stoking, the specified efficiency factor cannot be reached, so much more firewood is needed.

Notice. *User is allowed at its discretion to use other solid fuel, but requirements of chapter 6.1 should be not violated and with meaningless claims to the manufacturer on the output.*

Notice*. If in the room, where the boiler is operated, there are more air using equipment, than the sufficient fresh air intake into the room must be ensured for all equipment.*

It is prohibited! To fire the boiler with:

- ***small fraction (dust) of waste wood, because is a risk of explosion or sparks emission from the chimney;***
- ***rubbish (household waste);***
- ***with opened smoke exhausting (4) and ignition (7) dampers.***

Attention! *In order to prevent the smoke entering in the room, the upper fuel loading cover (2), furnace's and fuel loading doors (28, 3) and service covers (6, 22) has to be tightly closed, except in cases of boiler ignition, refueling or boiler cleaning.*

Attention! *The flue duct (12), and other boiler surfaces not covered by the thermo insulation shields (21)* ***becomes very hot during operation. Do not touch them.***

Attention! Don't overheat (boil) water in the boiler.

7.1. System preparation for heating

Prior to boiler start firing make sure does the system is filled with thermal water and de aerated. We recommend to apply the de salted, soft, or at least rainwater. If there will be used the prepared "soft" water, than the boiler housing will serve for the longer time. As well it is necessary to make sure does the valves, which are disconnecting the boiler from the system, are not closed.

7.2. Boiler start up firing

Prior to boiler start up firing, open the ignition (*7*) as well smoke draught (*11*) dampers (*see picture 1*), through the doors (*28* and *29*) onto the fire grates (*26*) put the chopped dray logs or chips and ignite. The secondary air dampers (*16*) has to be closed. The dampers to be adjusted, when the temperature inside of the boiler rises up to 60 ºC.

After having the fuel burns up well, refuel the loading chamber (furnace) (*30*) (*refueling instruction see below*). Close the ignition damper (*7*), smoke exhaust damper (*11*) adjust for needed draught from the boiler.

The more fine chopped logs burns more effective and increases the boiler output.

Place firewood loosely into the combustion chamber (furnace) (*30*) so it could sag down to the bottom of the chamber freely.

If coal is to be used, take 5 - 10 kg firewood and top with 10 cm coal. Coal is to be poured layer by layer in a number of times, depending on fuel quality and desirable heat volume.

Attention! *When firing the boiler for the first time, also after the long period of non-operation (after summer season), it is necessary to heat up the refractory concrete parts for the moisture contained inside, converting into the steam, did not disintegrate such parts. For this purpose there to be ignited not big amount of the fuel. Fuel volume must be such that it will burned within 20 – 30 min. After 2 hours the boiler is ready for normal operation.*

7.3. Air draught regulator adjustment

After the boiler reaches desirable temperature (70 ÷ 90 ºC), comparing with the readings of thermal pressure gauge, installed in the outgoing (hot) water pipe, set the air draught regulator (*32*) for the similar temperature.

Note. *Regulator's dial misalignment with readings of thermal pressure gauge is possible.*

Shorten the chain so, that the primary air supply valves (*27*) would be closed or the gap would be not bigger than 2 mm. Set the desired temperature by turning regulator knob to relevant position. If the smoke exhauster (*13*) there is used, to avoid the temperature rising, set its speed regulator for the same temperature as for the air draught regulator (*32*).

As well the boiler may be supplied with different regulator, which has different temperature's range marking.

7.4. Boiler firing

For the boiler refueling operate as follow:

- open the smoke exhaust (*4*) and ignition (*7*) dampers (*see picture 1*);
- turn the air regulator grip (*32*) and close the primary air supply damper (*27*);
- pre open the fuel loading door (*31*), after 15...20 seconds -door (monitor till the smoke will be completely exhausted from the furnace);
- open the door fully and refuel;

- tightly close the fuel loading door (*31*);
- tightly close the ignition (*7*) and smoke exhausting (*4*) dampers;
- according to the chosen temperature, via draught regulator (*32*), open the air damper (*27*).

Notice. *We recommend to refuel only having completely burned previous fuel load. Otherwise refuel only in urgent cases if there is no other option.*

Secondary air

The combustion process control not having the measuring devices could be done by monitoring the color of the smoke going out of the chimney. The combustion quality to be checked at water temperature ≥ 80 ºC. If the combustion process is good, smoke than is thin, grey. If the smoke is thick and dark, means that fuel is not fully burn, secondary air supply is insufficient. In such case open more the secondary air valves. Using the birch logs moisture contain 25 %, the smoke ecological pollution is the lowest (the carbon monoxide (CO) emission) when the secondary air supply valves is opened fully. Using other type of fuel for the secondary air supply valve adjustment we recommend call to specialist, which have the gas analyzer. It is appropriate to do so having the big quantity of homogeneous high-quality fuel.

Firing efficiency

During combustion remains the ash, which covers the fire grates. Accordingly drops the burning intensity and boiler output. Therefore the fuel need to be poked. The burning coal to be pocked via poker through the gaps of the inner door, or shaking the fire grates via pedal (*25*). Large volume of generated ash prevents primary air from entering, so ash (*24*) has to be removed timely.

Do not open the fuel loading door (*2)* and door (*31)* during the intense combustion.

Boiler combustion needs much air, so enough volume of air has to enter into the premises where boiler is installed.

Notice. *In case of lower heat demand then boiler nominal output, in order to avoid the permanent loaded fuel smoldering (inside of boiler may accumulates the resin, do not load with fuel full furnace. We recommend to load one third of furnace.*

Attention! *Make sure does the dampers of smoke exhausting (7) and ignition (4) within the boiler firing are closed fully.*

Note. *When boiler is started to operate, during firing, on the internal boiler walls, when there is no sooth layer yet, when firewood burns, water condensate forms, which can look like the boiler is not tight and leaks water. Water steam condensate disappears when the water temperature in the boiler raises up to 70 – 80 ºC with the help of 4-way mixing valve. It is recommended to maintain water temperature in the boiler as high as possible. If return water temperature is less than 60 ºC, water steam condenses on internal surfaces of the boiler, which combine with combustion products and form chemically aggressive acids, under effect of which boiler service life can be reduced significantly. In order to ensure whether the boiler is tight, stoke it intensely for 1 – 2 h with dry logs, then observe for growing condensate volume. If condensate does not grow in volume, boiler is tight.*

Attention! *If boiler is operated incorrectly, fuel is unsuitable, low chimney draught, the dampers installed in the boiler can get stuck, so during the heating season move the dampers: open and close several times all the valves installed in the boiler.*

7.5. Smoke exhauster control

Smoke exhauster ***DM-01N*** control see at „*Smoke exhauster control instruction*".

7.6. Boiler extinguishing

During usual operation, boiler is self-extinguishing when fuel charge completely burns out. If boiler has to be extinguished in the forced way, firstly, remove fuel from the furnace (*30*). Throw burning fuel into a vessel with water – this will reduce smoke in the premises. During forced extinguishing, open roods or windows to assure good ventilation of the premises.

Attention! *It is prohibited to pour the water onto burning fuel in the furnace.*

7.7. Boiler cleaning

Ash, accumulated under the fire grate (*26*) (*see picture 1*), may prevent air supply to the furnace (*30*). So, no rarely than before each second firing, remove the ash from the ash tray (*24*) and scoop remaining ash.

Attention ! It is allowed to clean the boiler, remove the ash tray and scoop up the remaining ash, having only the boiler fully extinguished and cooled down.

In order to assure the efficient boiler operation, it is necessary to clean periodically the sooth from the internal surfaces of the boiler. Intervals between cleanings depend on fuel quality (especially moisture), burning intensity, chimney draught and other circumstances. It is recommended to clean boiler heat exchanger and combustion chamber when sooth layer is up to 3 mm thick, but no rarely than 2 – 3 times per month. For the cleaning take of the service covers (*6, 22*) and thoroughly, with the help of scraper and brush, clean internal surfaces of the boiler.

In order to remove the hardened scale, it is recommended to use the chemical cleaners.

It is recommended to clean the chimney no rarely than every year and necessarily before start of the heating season.

Attention! *During the boiler cleaning we recommend to remove the smoke exhauster, in order of more easier cleaning of the smoke ducts and exhauster's impeller.*

Notice. *Is recommended to have a annual inspection of the boiler carried out by qualified specialist of boilers supervision.*

7.8. Frequently Asked Questions

I. What may happen when electricity breaks down during boiler's working process?

If there's no forced circulation, then water might get boiled, threat of the overheat of the boiler, there's threat of explosion of boiler or pipes, threat of being scalded.

a) Lower intensity of burning process: close primary air valve; close fume valve as much as you can, avoiding fume access to the premises;

b) In case of emergency, extinguish the boiler by removing fuel out of the boilers burning chamber (put burning fuel to the utensil with water to get as little fume as possible accessing the premises; open windows and doors). Do not pour water into burning chamber; water can damage the boiler completely.

c) At winter time, if electricity failure lasts and there's threat of getting frozen, let out the water from heating system and pipes.

II. Why during combustion process there's outsider noises (boiling water noise), external decorations and flue changes their color?

Boiler is working above the nominal power; circulation pump is out of the order.

a) Check if smoke cessation and ignition valves are closed.

b) Check if air draft regulator is set properly and it's not set for too high temperature.

c) Check if chimneys thrust are not to strong, half-shut fume thrust valve.

d) Maybe there's no water circulation: check if circulation pump is in working order; check water pressure (level) in the system; check if systems is vented properly; check for close system valve; check if water filters are not blocked.

e) Check out for worn out of door or lid sealing parts, replace them if needed.

III. Why boiler weeps, the fire goes out, smoke penetrates out of the boiler?

Boilers operating power is set to low or there's not enough draught from chimney, that's why condensate accumulates.

a) In case of lower demand of heat, put less fuel to make sure that fuel is burning not smoldering.

b) Use proper fuel - dry logs.

c) Check if inbound waters temperature is not too low as has to be, adjust mixing valve in order to assure inbound water temperature not lower than 60 °C.

d) Check chimneys draught, clean chimney, flue channels and the boiler itself; check for ash level under the fire grades and clean.

e) Check out of door or lid sealing parts, replace them if needed.

IV. <u>Why after boiler is lighted water pressure increase?</u>

When boiler is heated up to nominal power water pressure exceeds permissible limits.

a) There's possibility that extension vessel is not working or it's too small.
b) Maybe there's no water circulation: check if circulation pump is working correctly; check water pressure (level) in the system; check if systems is vented properly; check for close system valve; check if water filters are not blocked.
c) There's possibility that during fill up of the system permissible pressure limits were exceeded, lower the pressure.

8. Boiler disposal

Dispose the boiler after expiration of its service life or if it is uninstalled due to other reasons. Boiler is constructed from various materials, so:

- Bring electric appliances, if present, to electric appliances recycling organization;
- Metal parts go to metal scrap;
- Remaining materials go to landfill or waste storage sites.

Note. *Disposal actions shall be in line with laws and rules of user's country.*

9. Safety requirements

The following is prohibited:

- To operate boiler without having filled heating system with water. Water in the heating system has to be protected from freezing;
- To connect boiler into closed system without safety valve, which prevents the system from exceeding pressure by more than 1,5 bar (0,15 MPa);
- To close supply or return water line valves when boiler is in operation;
- To dry fuel or other easily combustible materials near or on the boiler;
- To fire the boiler with the help of easily combustible fluids (petrol, kerosene etc.);
- To operate boiler with open doors or covers;
- To pour non-extinguished coal and ash near living or auxiliary buildings;
- To entrust boiler maintenance to minors or non-trained persons;
- To operate boiler without grounding the case;
- To touch electric installation of the boiler.

The following is necessary:

- Periodically (twice a year) check if grounding is working properly;
- Before cleaning the boiler disconnect it from electric power.

10. Wearing parts

Sealing parts from glass fiber; cast iron fire grates (*26*) and door (*29*); refractory concrete bricks (*23*) can become worn, burn out, disintegrate while in use.

These parts are available for purchase at boiler manufacturer or its agents.

Note. *It is advisable to use only manufacturer's original spare parts.*

11. Fuel types and their properties

Combustion heat of absolutely dry wood actually doesn't depend on wood spice and is equal about 4500 kcal/kg. So, as to assess different wood species, one should take into consideration their comparative weight. Weight per cubic meter of various firewood species is as follows:

- oak firewood - 500 kg;
- birch firewood - 450 kg;
- fir firewood - 330 kg;
- aspen firewood - 330 kg.

The damper is firewood the less is its caloric content. Wet firewood caloricity reduction, compared with dry firewood (dampness ~20 %) is as follows:

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

Just cut tree contains 35 ÷ 60 % water. Tree cut in the beginning of winter contains least quantity of water. Hardwood contains less water.

Wood has to be cut and split to make firewood. Firewood, after one year spent in garret is of 20 ÷ 25 % moisture.

After two years it is 13 ÷ 17 %, and this means that after drying less fuel is needed than combustion with damp firewood.

Equal weight of firewood and peat give similar heat quantity.

1 kg of coal gives 2 ÷ 3 times more heat than 1 kg of firewood, due to this reason, coal change into hearth should not exceed 10 kg.

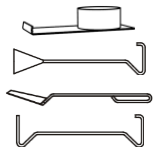
Volume of air needed to combust 1 kg of firewood is 4 ÷ 5 m^3, for coal –10 m^3.

The poorer quality is fuel, the more ash it generates.

Combustion of 1 kg average caloricity coal gives about 6500 kcal (7,56 kWh).

12. Scope of delivery

1. Boiler "***Kalvis-2-____***" - 1 pcs.
2. Air draught regulator - 1 pcs.
3. Thermo manometer - 1 pcs.
4. Extra insert for smoke exhauster - 1 pcs. *
5. Scraper - 1 pcs.
6. Ash removal scoop - 1 pcs.
7. Poker - 1 pcs.
8. Boiler technical passport - 1 pcs.
9. Wooden pallet for transportation - 1 pcs.



Notice. *Smoke exhauster (10, 13) (see picture 1), temperature valve of cooling coil (7) (see picture 7) are not included into the scope of delivery - to be purchased separately.*

* *Extra insert for smoke exhauster is mounting in case only, if there is mounted, extra purchased, the smoke exhauster unit. The description of insert installation is given at "Smoke exhauster control instruction"*

13. Acceptance certificate

Solid fuel heating boiler "***Kalvis-2-_____***" meets drawings, *LST EN 303-5* standard requirements and is fit for use.

Boiler was tested with 4 bar (0,4 MPa) pressure.

Factory No. _____

Manufacturing date _____

Supervisor _____

14. Warranty and guarantee service conditions

Manufacturer guarantees that product is in line with technical documentation requirements.

- ***If you correctly will install and operate the boiler in accordance with these instructions, the following guarantee service period will be applied from the date of purchase:***
  - ***for boiler case - 48 months.***
  - ***for completing parts - 12 months.***
  - ***for wearing parts (see chapter 10) - 6 months.***
- ***Manufacturer obliges to eliminate failures occurring due to its fault during the mentioned period for free.***
- ***Manufacturer takes no obligation for boiler operation and related consequences, grants no warrant if the boiler is inadequately selected, poorly installed (see chapter 6) or operated (see chapter 7) and this is found out during the visit at user. In this case user shall pay for technicians' arrival and repairs!***
- ***No rarely than once a year perform revision of the boiler and its control elements with the help of adequately qualify specialists.***
- ***Keep purchase receipt or invoice throughout the warrant period.***
- ***For warrant repairs apply to this service providing company, specified by seller.***
- ***In the case of boiler failure, apply to the specified service.***
- ***We ask user to take care for after warrant repairs service employee made relevant record in this certificate "Notes about warrant and non-warrant repairs" and filled warrant repairs report***

I familiarized with warrant repairs conditions. I am informed that in the case boiler is installed and operated without observing the requirements given in this manual otherwise I loose the right for warrant repairs.

Buyer: _____

(name, surname, signature)

SALES MARK

Boiler was sold by:

Company: _____

Sales date: _____

Address: _____

Telephone: _____

In the case of failure please call:

Company: _____

Address: _____

Telephone: _____

Manufacturer	***UAB "Kalvis"*** ***Televizorių 3, LT-78137 Šiauliai, Lietuva (Lithuania)*** ***Telephone: +370-671-88891*** ***E-mail: prekyba@kalvis.lt***
Warranty service	***Provided by a partner you bought a product***

NOTES ON WARRANT AND NON-WARRANT REPAIRS PERFORMED

Company: _____ Address: _____

Experts: _____ Telephone: _____

Failure, works carried out: _____

_____

_____

_____

_____

_____

_____

Repairs date: _____ Expert's signature: _____

Company: _____ Address: _____

Expert: _____ Telephone: _____

Failure, works carried out: _____

_____

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_____

Repairs date: _____ Expert's signature: _____

Company: _____ Address: _____

Expert: _____ Telephone: _____

Failure, works carried out: _____

_____

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_____

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_____

Repairs date: _____ Expert's signature: _____

Product fiche

Delegated Regulation (EU) 2015/1186

Supplier name or trademark	**UAB "Kalvis"**	
Model identifier	**Kalvis-2-30**	**Kalvis-2-40**
Energy Efficiency Class	**A+**	**A+**
Direct heat output	**2,0 kW**	**3,0 kW**
Indirect heat output	**28,0 kW**	**37,0 kW**
Energy Efficiency Index	**107**	**107**
Useful Energy Efficiency (at nominal heat output)	**82,0 %**	**82,0 %**
Useful Energy Efficiency (at minimum load)	**– %**	**– %**
Specific precautions	**–**	
QR code	**1592083**	**1592093**

Product barcode sticking place