JASPI®

HEATING

HIGH EFFICIENCY SOLID FUEL BOILER

ecOnature40

INSTALLATION AND OPERATION MANUAL

NORTHMAN

WWW.JASPI.CO.UK

JASPI – HEATING PROFESSIONAL

Contents

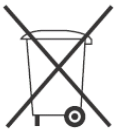
UK TECHNICAL HELPLINE 01392 247 343

Environmental instructions

Packing

Packing is made of 100 % waste materials. Dispose of packing in accordance with local waste disposal requirements.

Removal from Service



The boiler should be delivered to a waste disposal point for electric and electronic components.

Operating Principle

ECONATURE-40 is a solid-fuel water-heating boiler operating on a rotating combustion principle designed for heating systems in private houses. The rotating combustion technique used in ECONATURE-40 is even 30 % more energy saving than the conservative upper burning technique.

Firewood Burning Phases

DRYING: Dehumidification of firewood.

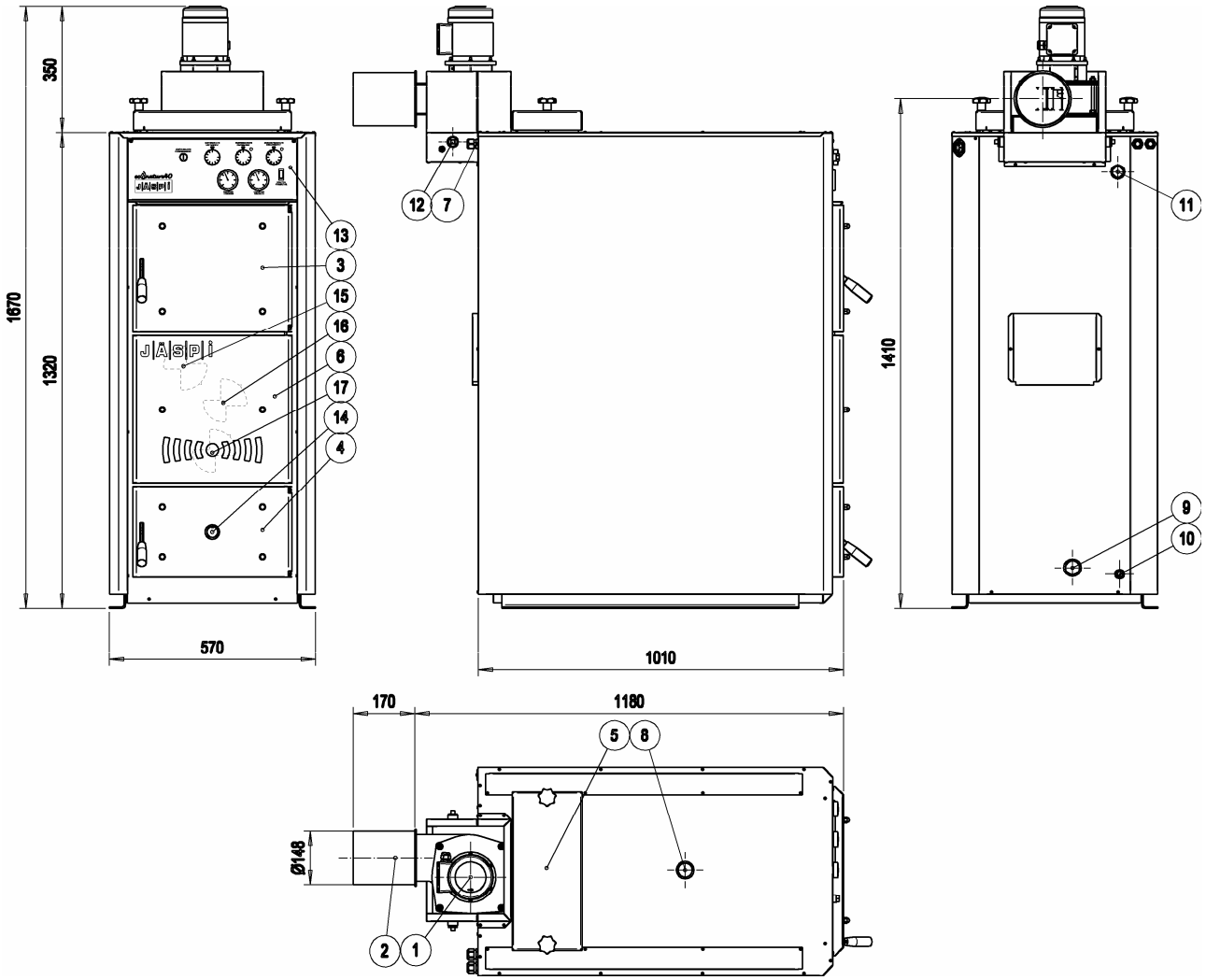
PYROLYTIC DECOMPOSITION: Wood starts to break apart and change to coal and gas. Pyrolytic decomposition begins at a temperature above 100 ºC; when the temperature exceeds 280ºC the resulting reaction causes heat release. Secondary combustion (the reaction between pyrolytic gases and oxygen) begins at a temperature over 600 ºC.

REMAINING COAL BURNING: Remaining coal burns after pyrolytic gases are removed.

After firewood starts to burn the temperature must rise quickly since secondary burning will not be efficient until the combustion temperature is high enough. Efficient and clean combustion implies full control over the burning process throughout its phases. The rotating combustion technique uses secondary firewood burning efficiently where flue gases provide additional burning in a separate firing throat and obtain the hottest and cleanest flame possible simultaneously reducing hazardous flue gas emissions notably. During the secondary burning process, the flame temperature exceeds 1000 ºC making combustion efficient and clean.

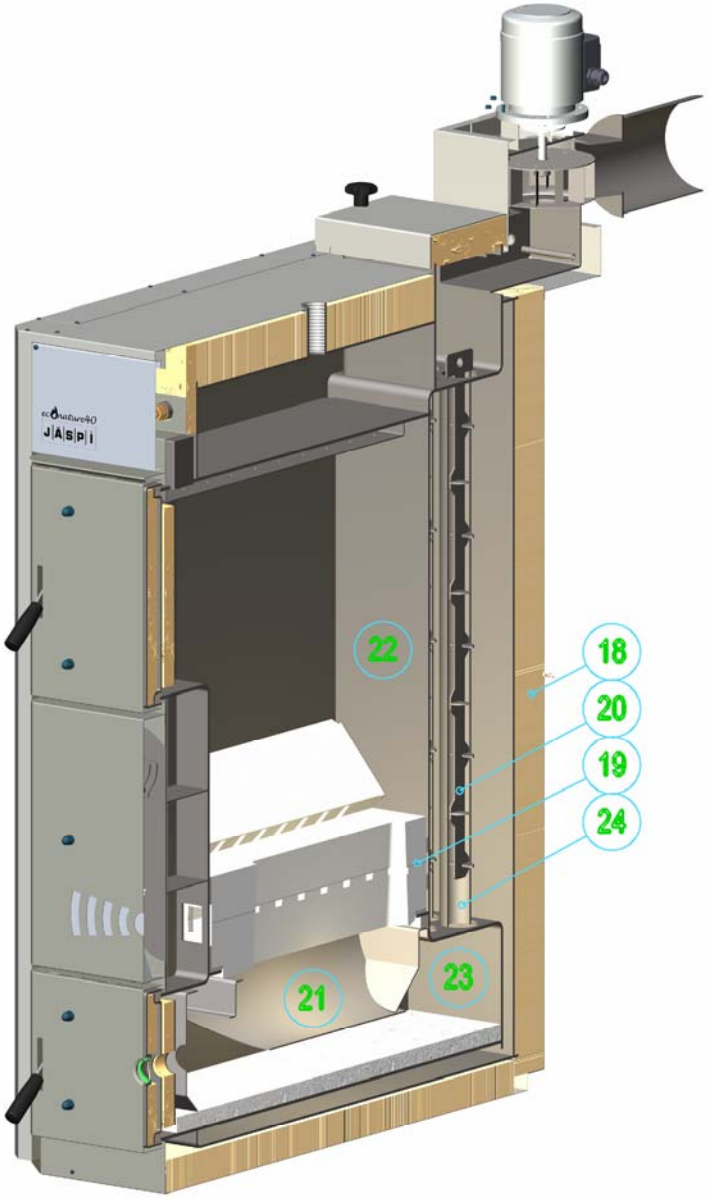
Technical Data

Power: 40-45kW
Weight: 450 kg
Volume: 120 l
Max. temperature: 110 ºC
Min. temperature: 0 ºC
Max. pressure: 3.0 bar
Standard pressure: 1.5-1.8bar
Proof-test pressure: 4.0 bar
Power consumption: 0.12 kW
Voltage: 230 V
Frequency: 50 Hz
Body protection: IP 2X
Furnace dimensions: height 600 mm, width 350 mm, and depth 550 mm



Parts

1. Flue gas extractor fan
2. 90º flue swiveling joint
3. Filling port
4. Maintenance hatch
5. Cleanout
6. Air chamber hatch
7. Electric leads
8. R32 FH (female threaded) outlet to accumulator
9. R32 FH return from accumulator
10. R15 FH drain connection
11. R25 FH expansion connection
12. R15 FH flue gas sensor / analyzer connection
13. Sensor panel
14. Flame monitor glass
15. Upper primary air adjusting damper
16. Lower primary air adjusting damper
17. Secondary air adjusting damper
18. Mineral wool insulation 75 mm
19. Ceramic fire bar
20. Turbulent components
21. Firing throat
22. Storage furnace
23. Furnace
24. Convection ducting



Installation

When installing follow the requirements below.

The boiler should be installed upright on a safe level support/surface. There are four adjustable legs supplied with the boiler.

Boiler Room

Leave free space of at least 1000 mm in front of filling and maintenance hatches of the boiler, at least 600 mm front the cleanout hatch, and 400 mm on one side of the boiler.

Combustion air required for the boiler is supplied from outside and the duct or valve area should be at least the same size as the flue area.

Flue Stack

The stack should be round, Ø 150 mm, steel or brick.

The minimum required boiler draft is 10 Pa.

The flue should be high enough to prevent flue gases from polluting environment nearby.

Installation

The boiler must be connected to a 1500-3000 liter energy accumulator.

We recommend to install three thermometers into the battery: bottom, middle, and top.

The system should be fitted with shutoff valves in order to ensure easy filling and emptying of the boiler, accumulator, and heating system.

The boiler should contain at least one 2.5 bar safety relief valve with a blowoff capacity of at least 150 kg/h if the maximum boiler power is 60 kW. The blowoff capacity can be distributed among two or three (maximum) valves if necessary. To confirm functionality, at least two safety relief valves are recommended to be used at all times, each having the required blowoff capacity. The blowoff line of the safety valve should be laid to the floor drain to ensure that the drain can be noticed and escaping vapor cannot constitute a hazard for people or property.

The volume of the membrane expansion tank should be at least 7 % of the entire water volume in the system.

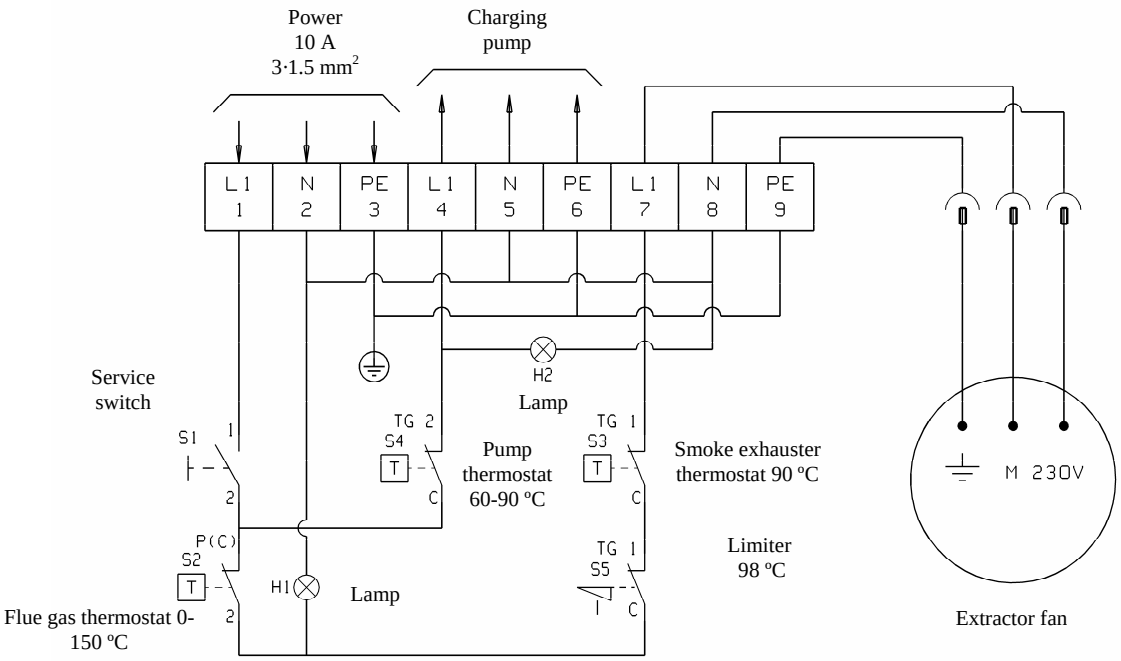
Pipework should be installed to ensure that boiler operation, maintenance, and cleaning are unobstructed.

Electric Wiring

The boiler power supply is 230 V / 50 Hz.

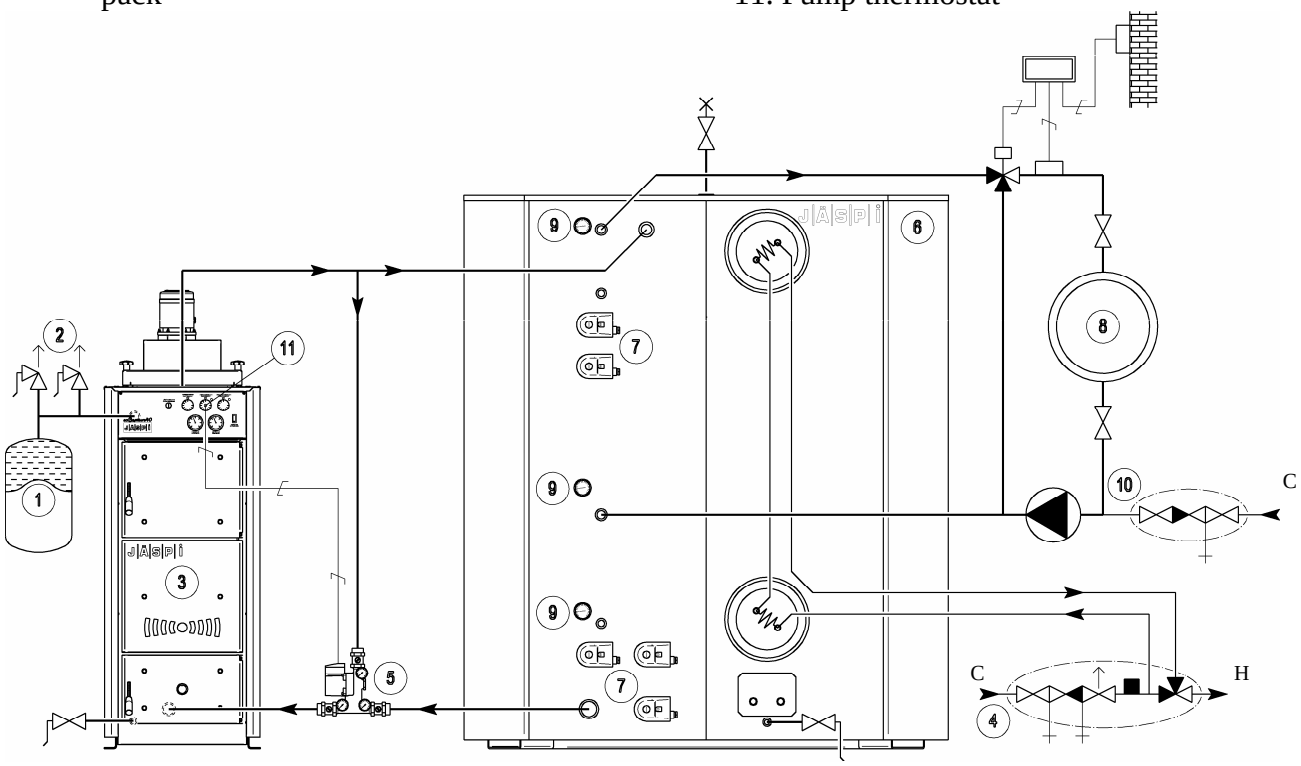
The wiring should be connected to the terminal block located behind the openable sensor panel.

Electrical Diagram



Heat Connection Diagram

1. Membrane expansion tank
2. 2.5 bar safety relief valve 2 ea.
3. ECONATURE–40 boiler
4. Hot water mixing valve
5. TERMOVAR DN32 / 72 ºC charging pack
6. OVAL-1800 energy accumulator
7. JÄSPI tubular electric heater max. 5 ea.
8. Heating loop pump
9. Accumulator thermometer 3 ea.
10. Boiler water filling valve
11. Pump thermostat



Boiler Operation and Maintenance

Fuel

Use dry firewood for burning. Using wet firewood will absorb energy during evaporation and remove most of it through the stack as unburnt flue gases, thus uselessly loosing part of energy and resulting in soot formation in the stack.

Firewood is considered dry when the moisture content is 20 %. Such wood is lighter in weight and smashing logs against each other produces a clearer sound.

ECONATURE-40 is mainly designed for birch firewood which has a length of 50 cm, a diameter of 12 cm, and a weight of 1.5 to 1.9 kg.

Other foliferous and coniferous woods are also suitable for combustion but coniferous woods cause more contamination to the boiler. Different woods burn differently. Lighter woods with a smaller wood diameter will burn better.

Start-up

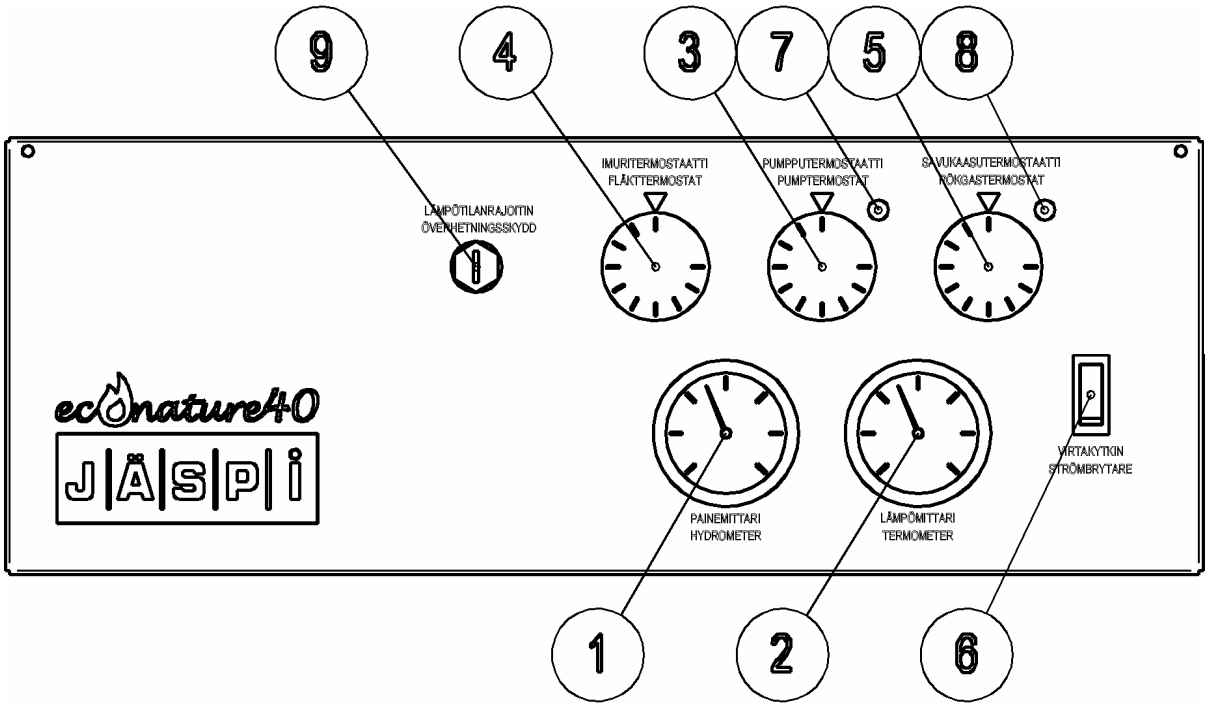
Check that:

- The flue is open and there is no installation or other waste at its base.
- The boiler and the heating system are filled with water and circulation is working.
- Piping connections are tight.
- The system is under pressure.
- The safety relief valve is working, i.e. water runs from the drain line during valve testing.

Use a small amount of firewood for the first burning to avoid bar splitting by boiling water that could soak in the ceramic fire bar.

If the system is filled for the first time the air dissolved in water will penetrate into the system but will be removed from the boiler water when the temperature exceeds 90 ºC. When used for the first time, the system should be deaerated.

Control Panel



1. **Pressure gauge.** Measures pressure in the boiler.
2. **Thermometer.** Measures water temperature in the boiler.
3. **Pump thermostat 60-90 ºC.** Activates the charging pump when the boiler water achieves the setpoint. The setpoint should be at least 85 ºC under normal operating conditions.
4. **Smoke exhauster thermostat 90 ºC.** Deactivates the smoke exhauster if the boiler water achieves the setpoint of 90 ºC.
5. **Flue gas thermostat 0-150 ºC.** Deactivates the smoke exhauster when the flue gas temperature drops to the setpoint.
6. **Power switch.** The power switch of the smoke exhauster and the charging pump.
7. **Pump thermostat indicator lamp.** On when the pump is on.
8. **Flue gas thermostat indicator lamp.** On when the smoke exhauster is on.
9. **Temperature limiter.** Deactivates the smoke exhauster and the charging pump if the boiler water temperature exceeds 98 ºC. The limiter will not actuate unless the instrumentation is improperly used or until it fails. Acknowledgement is provided by opening the protective cap and pressing the limiter. Note that the boiler water should cool down before acknowledgement.

Firewood burning

- Position the power switch (6) to ON.
- Put about eight 50 cm long pieces of wood evenly onto the fire bar, altogether weighing about 6 kg, and insert paper or birch bark in between to ensure ignition.
- Fire the wood and start the smoke exhauster by rotating the thermostat to position 0. The filling hatch is kept slightly open during ignition.
- Wait 15-20 minutes to allow about a 10 cm layer of live coals to form on the bar.
- Charge blocks (about 18-20 birch logs altogether weighing about 32 kg) evenly and closely, bark upward, onto the bar so that the blocks touch the rear wall of the furnace.
- Set the smoke exhauster thermostat to the setpoint which is about 90 ºC. The setpoint is correct if the smoke exhauster stops when there is a small amount of coals left in the boiler.
- Put new blocks onto the remaining coals.

One firewood charge will burn about 2.5 hours producing about 100 kW heat, i.e. a 1800 liter energy accumulator will be heated to approximately 50 ºC.

If the boiler has not been used for a long while, use a small amount of firewood for the first burning to avoid bar splitting by boiling water that could soak in the ceramic fire bar.

Charge the firewood on the fire bar so that it does not block the firing hole located in the middle of the bar.

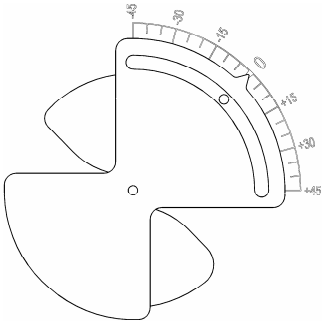
Combustion Air Control

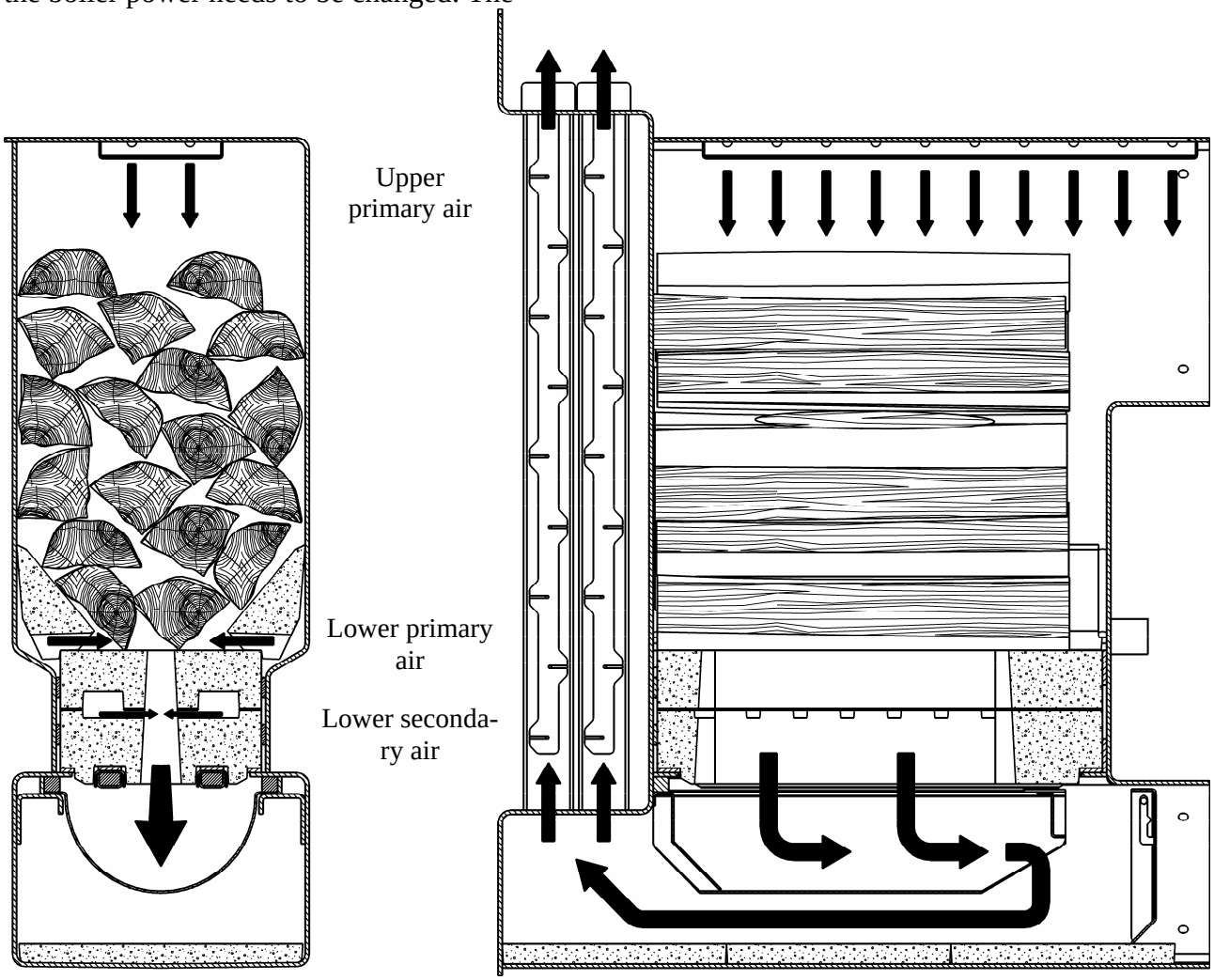
For clean boiler convection surfaces, the flue gas temperature should be approximately 170 ºC. Raising temperature by increasing power will reduce the boiler efficiency. Too low power should not be used either as this will drop the flue gas temperature below 150 ºC due to corrosion hazard.

The required air quantity and ratio for burning varies depending on the wood to be burnt. Primary and secondary air is factory adjusted for birch firewood.

Upper primary air does not have to be adjusted under normal operating conditions. Lower primary air should be adjusted when the boiler power needs to be changed. The boiler power grows in correlation with the flame length.

Secondary air can be adjusted when the boiler water temperature has been unchanged for 45 minutes after the beginning of combustion.





SECONDARY AIR ADJUSTMENT		
FLAME	**CAUSE**	**ADJUSTMENT**
Red flame with black swirling.	Secondary air is not enough for burning. The stack discharges black or dark smoke.	Add secondary air.
Yellow white flame.	Good air distribution. The stack discharges light grey smoke.	No need to adjust burning.
Dazzling white flame.	Too much secondary air. The stack discharges white smoke.	Reduce the amount of secondary air.

Maintenance

- Regularly check that the system is filled with water; if you have to add water constantly, then the system is leaking. Constantly adding fresh water causes corrosion to the heating system since fresh water contains air (oxygen).
- The hot system pressure should be lower than 1.5 bar and the cold system pressure higher than 0.5 bar (1.5 bar safety relief). The water volume varies as the temperature, i.e. the higher the temperature, the higher the volume and the pressure. The expansion tank serves to smooth such volume variations.
- Check the pre-pressure of the expansion tank at several years' intervals.
- Check the safety relief valves at least twice a year by rotating the knob/lever in order to prevent sticking. Add water to the system after the check.
- While burning firewood take care to ensure that the boiler water temperature is always higher than the flue gas due point i.e. at least 70 ºC and the flue gas temperature is at least 150 ºC in order to prevent corrosion.
- Remove ashes from the furnace and the firing throat as required.

Cleaning

Keeping a daily watch on the burning process in the boiler and making necessary adjustments make the cleaning process a problem free and infrequent job. Good burning forms a thin grey or coffee colored layer on the firing surfaces of the boiler, which falls off itself. Poor burning forms a dirty layer of soot, ashes, and tar on the firing surfaces and inside the flue. This prevents thermal energy from transferring to water thus increasing the flue gas temperature and lowering the efficiency.

Cleaning should be performed as follows:

1. Remove ashes from the fire bar and furnace.
2. Remove turbulators from the convection ducts.
3. Clean the convection ducts with a metal brush.
4. Clean the firing surfaces with a metal brush.

To control contamination of the boiler check the flue gas temperature. When the temperature rises 30 …50 ºC higher as compared with the clean boiler, it means that the boiler needs to be cleaned.
Note that tar can stick to the walls of the storage furnace, which is normal so you do not have to clean the walls.
When cleaning the stack check also the smoke exhauster blades.

Troubleshooting

The boiler water temperature does not rise to the desired level

- Ensure that the primary and secondary air ratio and access are correct.
- Ensure that the firewood is dry.
- If there is a cooling coil in the boiler
- Make sure that the mixing valve functions properly.

The boiler boils and sputters

- Ensure that there is enough water in the system and the pressure is between 1 and 1.5 bar. If there is no water in the system stop the heating process immediately by extinguishing fire. Do not add water to the boiler but let it cool down by driving cold air through it. When the boiler is cool, you can fill the system with water and restart heating.
- Check that the pump and the mixing valve are working and check the circulation through the pump and piping. The air present in the system can inhibit water circulation.
- Ensure that the furnace bottom bricks are in place and in good condition.

The flue gas temperature is too high

- Clean the boiler. Soot, ashes, and tar contaminate the firing surface and act as thermal insulation.
- The flue gas temperature should not exceed 350 ºC as the boiler can break down and the flues cannot withstand high temperatures. Ensure that the primary and secondary air ratio and volume are correct.
- Ensure that turbulators are in place and in good condition.
- Ensure that the firing throat seal is in good order.

The flue gas temperature is too low

- Ensure that the primary and secondary air ratio and volume are correct.
- Ensure that the firewood is dry.
- Shorten the turbulators if necessary by removing the lower plate from each element in order to increase the flue gas temperature.

The extractor fan won't work

- Ensure that the boiler water temperature is below 90 ºC and that the thermostat indicator lamp is on since the set value of the extractor thermostat is 90 ºC.
- Check the set value of the flue gas thermostat.
- Check that the temperature limiter has not tripped. For acknowledgement, open the protective cap and press the limiter. However, let the boiler temperature cool down before acknowledgement. Find out why the temperature limiter tripped.
- If the extractor fan produces abnormal sound when working the trouble can be caused by a motor bearing or a blade.
- If the extractor power has dropped then the blades have to be cleaned.

Installation record

Boiler serial number / year	
Boiler type	
Installer / company	
Date	

Wiring installer / company	
Date	

System tuning / training	
Installer / company	
Date	

	Factory setting	Date						
Flue gas temperature	170 ºC							
Reduced flue pressure								
Pump speed								
Pump speed								
Upper primary air	0							
Lower primary air	0							
Secondary air	0							
Expansion tank pre-pressure								
Signature								

Warranty

The warranty is confirmed to be two years for the boiler and one year for the components. The warranty is effective provided that installation, start-up, and maintenance are done or approved by an authorized agent/dealer in accordance with this manual.

EY Assurance Certificate

KAUKORA OY

JÄSPI HEATING

certifies that its solid-fuel heating boiler

complies with the pressure vessels requirements according to
the Ministry of Finance and Industry's Decision 938/1999 and Directive 97/23/EY

ecOnature40

Modules B1

Quality audit agency

inspecta

Declared agency 0424

Inspecta EY inspection certificate for the development of RS 419-07

Testing has been conducted to EN 303-5, test agency

SP

SP Sveriges Tekniska Forskningsinstitut, declared agency 1002

Inspection report P7 00360-02

Applicable compliance standards:

EN 303-5

Applicable directives:

PED Directive (97/23/EY § 3.3)
EMC Directive (89/336/EEC, 92/31/EEC, and 93/68/EEC)
LVD Directive (73/23/EEC and 93/68/EEC)

Raisio 30.01.09

Kimmo Virtanen

QUALITY JÄSPI CONTROLLER