121009 THL no.: ----- rev0
SMOKELESS HEAT

Installation and maintenance

Vedolux 650



VÄRMEBARONEN

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To be completed when the Vedolux 650 is installed

Serial number: .....

Installation date: .....

Plumber: .....

Phone: .....

Electrician: .....

Phone: .....

Other: .....

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Checklist

To be completed by installation engineer:

- ☐ **Boiler installed according to these instructions.**
- ☐ **Chimney tested for leaks and approved for wood firing, and meets the requirements of the boiler.**
- ☐ **Installed so that the fan and boiler can be easily cleaned.**
- ☐ **Flue pipe is connected to the chimney so that there are no gas and dust leaks.**
- ☐ **Thermal valve (STW) has been fitted.**
- ☐ **Expansion tank volume correctly dimensioned. Pay attention to prepressurisation in a closed tank.**
- ☐ **System has been filled with water, vented and checked for leaks. Pay attention to system pressure.**
- ☐ **Safety valve has been tested and its drainage pipe has been laid to a drain.**
- ☐ **Boiler connected to mains power.**
- ☐ **Aggregate test performed, O_2 probe calibrated and boiler correctly programmed. See 'Starting the boiler'.**
- ☐ **User has been informed about how the system is operated and how it works.**

Congratulations on making a good choice!

Wood boiler with reversed combustion and lambda control for large properties

Vedolux 650

- is a wood-fired boiler with a suction fan, designed for heating properties.
- must be fired in combination with an accumulator.
- has environmental approval.
- is designed for half-metre wood.
- is designed for connection to an external water heater suitably located in the accumulator.
- has an output of 221.8 kBTU/h.

Ceramic combustion chamber

The combustion chamber is designed for reversed combustion. The depth of the combustion chamber is 550 mm.

How it works

Vedolux 650 uses so-called reversed combustion. The suction flue gas fan causes the flames to move downwards through the grate. The gases remaining are combusted in the ceramics.

The hot flue gases then continue through the boiler's tubular pipe, where the heat is absorbed, and then up through the chimney.

Sweeping

All flues in the boiler are swept from the same hatch on the front of the boiler. As the flues are round, it is not possible to miss any inaccessible corners when sweeping.

Chimney

Vedolux 650 has a suction fan which means that the boiler has low requirements for the chimney conditions.

Accumulator tank

To achieve the best combustion and efficiency, and to meet the environmental requirements for wood firing, the boiler must be fired in combination with an accumulator tank.

Lambda control

Vedolux 650 is fitted with lambda control, which guarantees optimum combustion. The result is high efficiency with minimum environmental impact.

Included in the delivery

- Sweeping tool
- Power cables for mains and charging pump
- Turbulators
- LPG ignition
- Flue pipe to rear

Accessories

• Flue pipe upwards	art. no.: 71 12 94
• Accumulator control 6	art. no.: 2914

Safety and handling

Read these instructions carefully before installation and ignition.
Keep the instructions close to the boiler.

- Correct installation in combination with correct adjustment and continuous service will produce high operational reliability and good heating economy.
- Contact a chimney sweep before changing fuel type.
- Contact the public authorities regarding restrictions on burning solid fuel in a densely built-up area.
- Only authorised persons may work on the boiler.
- Switch off the operating switch before any service/repair
- Never carry out maintenance work/ service on pressure-bearing parts when they are pressurised.
- The boiler must not be modified, changed or converted in any way.
- The boiler may not be used by children or people with physical or mental impairments. Nor by children/people who lack knowledge about the boiler. Children may not play with the boiler and connect accessories.
- Never place any combustible material on the boiler or flue pipe.
- Risk of crushing! Never touch the lambda dampers when the boiler is switched on.
- The hatch lock prevents the boiler's hatches from being opened unintentionally.
- Be careful if you need to open the boiler's hatches during operation. If the hatch is opened too fast, flames may shoot out.
- Always contact your installation engineer for service.
- The type and serial number of the boiler must always be specified when contacting Värmebaronen. See the boiler's design plate.
- Värmebaronen AB reserves the right to change the specification, in accordance with its policy of continuous improvement and development, without prior notice.

The following icons are used in these instructions to indicate important information:

Information that is important for optimum operation.

Tells you what you should or should not do to avoid personal injury.

Tells you what you should or should not do to avoid a component, the boiler, a process or the environment being damaged or destroyed.

- Subject to amendments and printing and proofreading errors

Operation

Combustion control

The combustion in Vedolux 650 is set automatically via the O_2 value for optimum combustion

Power reduction

A high boiler temperature produces a high charging capacity but increases the risk of an over temperature situation. To minimise this risk, reduce the boiler's power by approximately 20% if the boiler temperature exceeds the desired boiler temperature by more than 35°F. The power is reduced by closing the primary air damper so that the flue gas temperature falls.

Switching off the boiler

The boiler can be switched off automatically or manually. When the wood has been burned up, the boiler is switched off via the O_2 value (there is also an option to do this via the flue gas temperature). The boiler is switched off when it has been in operation for at least 45 minutes and when the O_2 value has subsequently been over 14% for 15 minutes. After the boiler has been switched off, the flue gas fan is stopped and the primary air damper closed. The secondary air damper is open 25% until the flue gas temperature is lower than 210°F. This position should be standard as it reduces the cooling of the boiler via the chimney. The remaining embers make the next firing easier and result in the minimum possible emissions during firing.

If the boiler is set to be switched off via the flue gas temperature, it is switched off 15 minutes after the flue gas temperature is less than 25% of the nominal value. This option should only be used if the wood is bulky or damp.

Residual heat

If the boiler's temperature rises to 192°F after the wood has burned up, the charging pump starts in order to withdraw the remaining heat from the boiler. The charging pump is in operation for at least three minutes.

Frost protection

If the boiler temperature falls to 45°F, the charging pump starts. This reduces the risk of freezing on account of the flowing water. When the boiler temperature rises to 46°F, the charging pump is switched off.

Restart after power cut

When the power returns, the secondary air damper is opened fully for 30 seconds so that the chimney is ventilated. The operating status is then restored to the status before the power cut.

Hatch lock

The boiler's hatches are locked to prevent unintentional opening.

Safety functions

If the boiler has not been fired for seven days, the flue gas fan starts for two minutes and ventilates the boiler with fresh air to keep it dry. The charging pump operates at the same time for ten seconds.

Over temperature in the boiler

When the accumulator tank is fully charged because too much wood has been inserted, the boiler temperature rises to over 194°F and an over temperature situation arises. In this case, the flue gas fan is stopped and the primary air damper is closed, while the secondary air damper is opened to 25%. ⚠ indication flashes and the display shows:



Max. temperature thermal relay, STB

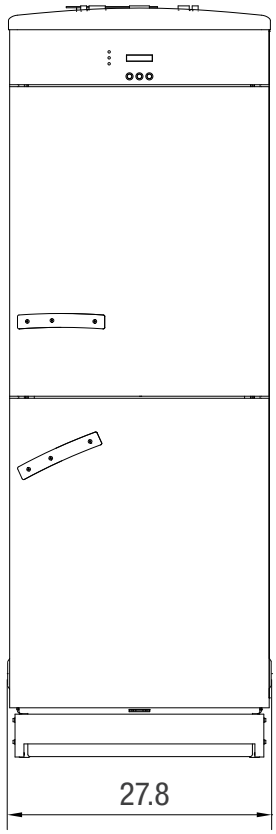
If the boiler temperature rises over 203°F, the max. temperature thermal relay is triggered. The reason may be too much wood or a fault in the heat removal, charging pump or charging valve. The flue gas fan and charging pump are stopped and the primary air damper is closed, while the secondary air damper is opened 25%. ⚠ indication lights up and the display shows:

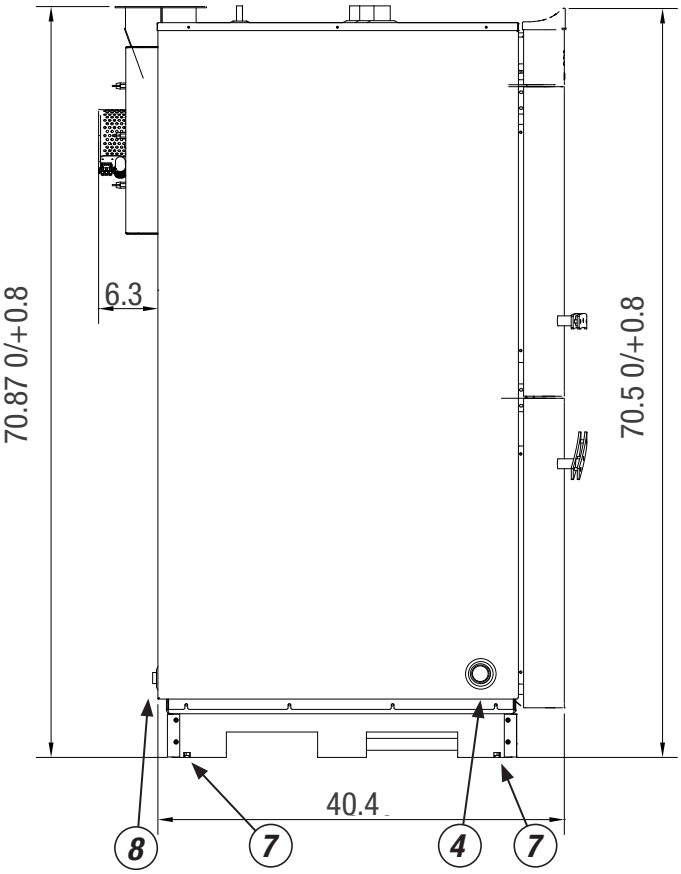


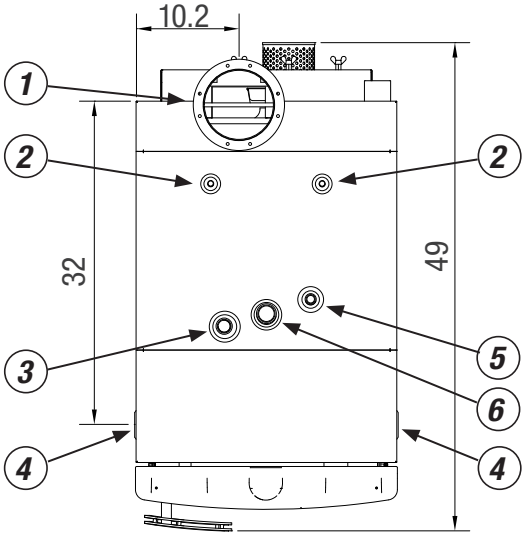
Technical data

Weight	empty	1609	lb
	full of water	2050	lb
Water volume		52.8	gal
Fuel		wood	
	length	19.7	in
	moisture content	16 ±8	%
Wood store	volume	52.8	gal
	depth:	550	mm
Filling hatch	w x h	15.8 x 16.5	in
Burn time	full wood load	≈3.6	h
Power	nominal	221.8	kBTU/h
Pressure	design	36.26	psi
	test	62.37	psi
Temperature	max.	230	°F
Chimney requirements	height	≥ 16.4	ft
	draught during operation	- 15	Pa
	diameter	7.1	in
Flue gas temperature	nominal output	266	°F
Flue gas flow rate		1.3	oz/s
Operation, natural ventilation/fan		with flue gas fan	
Condensing/non-condensing		non-condensing	
Positive/negative pressure at flue gas outlet		negative pressure	
Pressure drop, water side	q = 1320 gal/h, Δt = 50°F	17	psi
	q = 660 gal/h, Δt = 68°F	0,04	psi
Return temperature	min.	≥ 122	°F
Temperature range		167 – 185	°F
Accumulator volume	min.	770	gal
Cooling coil, incoming cold water	connection pressure	≥ 29	psi
	temperature	< 60	°F
	minimum cooling water volume	≥ 8.8	gal
Boiler class in accordance with EN 303-5		Class 5	
Voltage		115 V~ ±10%, 60 Hz	
Current consumption	max.	1	A
Power consumption	operation, max.	230	W
(without any additional appliances connected)	standby	8	W
IP class		IPX1	
Max. temperature thermal relay (STB)	breaking temperature	212 +0/-41	°C
Ambient temperature	during operation	0 – 86	°F
Noise level during operation		50	dB
Manufactured to		PED 97/23/EC article 3.3	
Standards Tested To:		UL 391, ETLM 78-1, ASTM E1509, CSA B-366.1 Certified by Guardien Fire Test Labs	

Dimensions

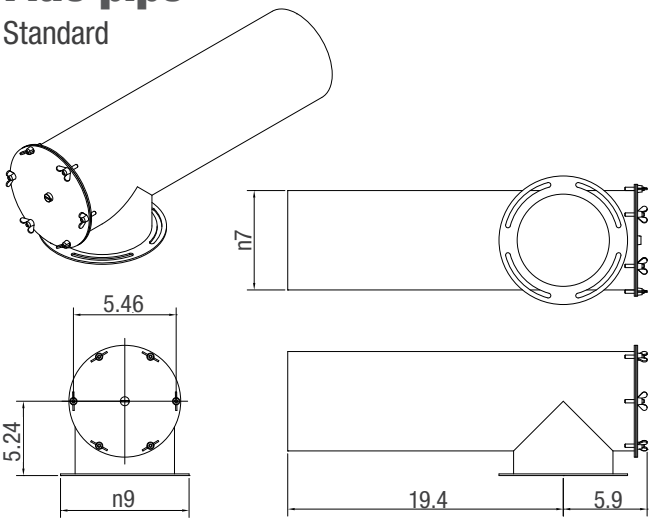




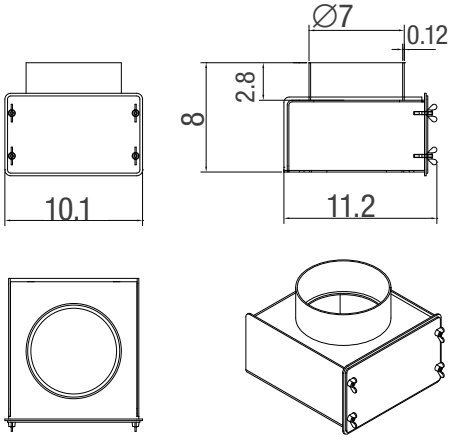


Flue pipe

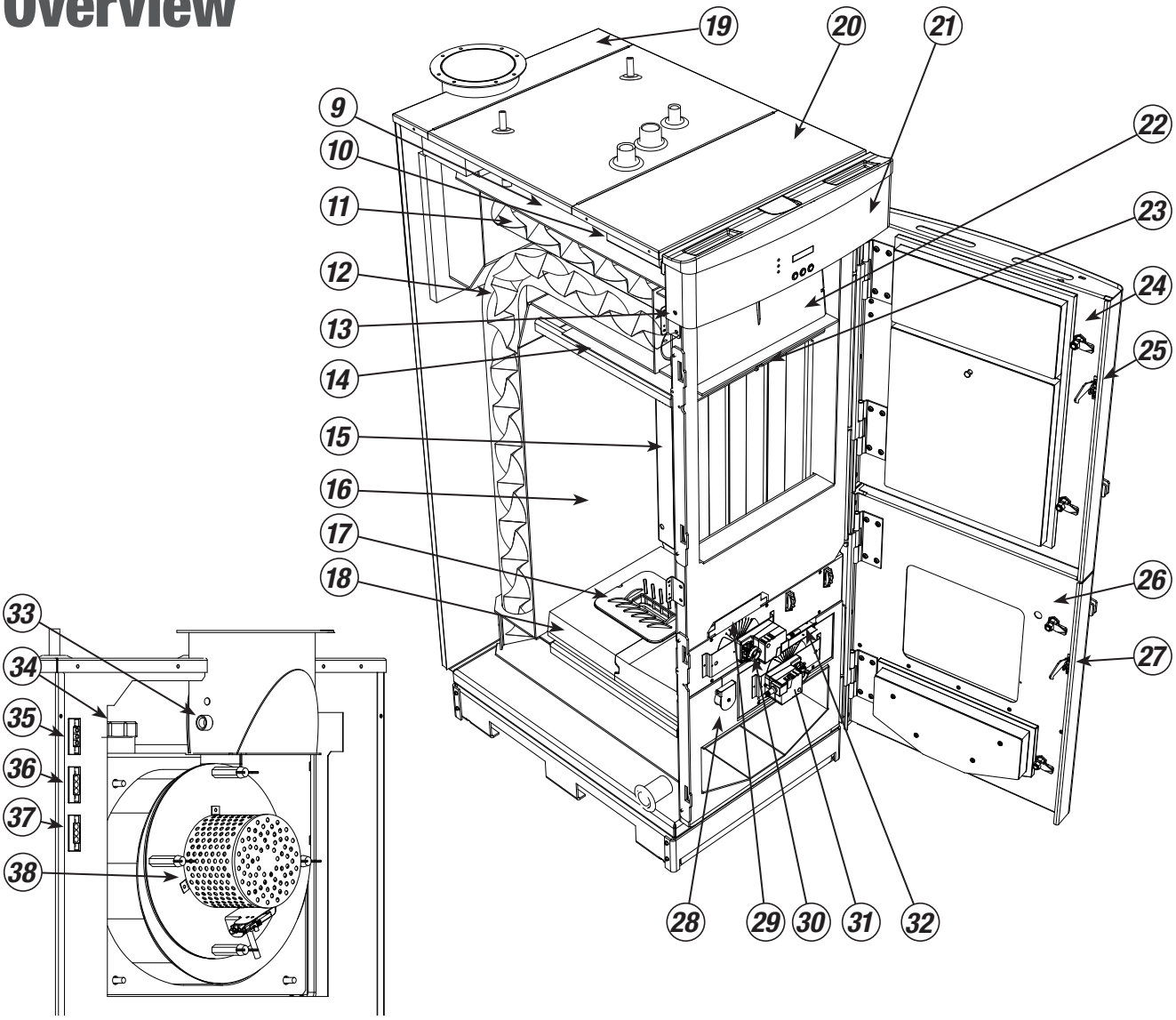
Standard



Flue pipe upwards, accessory



Overview



1. Flue pipe connection.
2. Cooling coil, DN 15.
3. Expansion connection/safety valve/Rp 1”/NPT G25.
4. Return from accumulator tank/drain, Rp 1 1/4”/ NPT G32.
5. Connection, sensor thermal valve, Rp 1/2”/ NPT G15.
6. Flow line to accumulator tank, Rp 1 1/4”/NPT G32. Can be used as lifting sleeve.
7. Adjustable foot bolts.
8. Drain, Rp 1/2”/NPT G15.
9. Boiler temperature sensor (inside electronics box).
10. Box with boiler’s electronics.
11. Upper flue gas tubes, 4, with turbulators.
12. Lower flue gas tubes, 4, with turbulators.
13. Resetting the max. temperature thermal relay (STB).
14. Bypass plate.
15. Air plates, detachable.
16. Wood store.
17. Grate.
18. Ceramics.
19. Rear cover plate, detachable.
20. Front cover plate, detachable.
21. Display/control panel.
22. Soot hatch.
23. Bypass damper.
24. Wood filling/soot hatch.
25. Latch, wood filling hatch.
26. Ash hatch.
27. Latch, ash hatch.
28. Opening for LPG ignition.
29. Back-pressure damper, primary.
30. Motor/damper, primary air.
31. Motor/damper, secondary air.
32. Back-pressure damper, secondary.
33. Flue gas temperature sensor.
34. O_2 probe.
35. Mains connection, 230 V~.
36. Supply, 230 V~, flue gas fan.
37. Supply, 230 V~, charging pump.
38. Fan.

Installation



Installation must take place according to existing regulations and standards.

- The boiler must be placed indoors in a boiler room designed to meet the existing standard.

- The installation site must withstand the weight of the boiler, the accumulator tank and any chimney.
  The boiler may be loaded with maximum 100 kg of the chimney's weight vertically downwards.

- There must be a fresh air intake, > Ø180 mm.
  Any mechanical ventilation in the room must not create any negative pressure that disturbs the operation of the boiler.

- The existing standards for minimum distance to combustible material must be met.
  The minimum distance for removing the flue gas fan = minimum 100 mm free space behind the flue gas fan.
  Ensure that the provisions for sweeping meet the existing regulations.

- Adjust the foot bolts so that the boiler is horizontal.

- The flue pipe must be connected according to existing standards.
  It is important for all connection points and flues not to leak dust and gas.
  If the boiler is connected higher up the chimney than a previous boiler was connected, the lower, inactive part must be filled.

- The boiler must be connected to an open or closed expansion system.

- The boiler must be connected to an accumulator system. The installation must have accumulator control.

- A temperature limiter, thermal valve (STW), must be fitted.

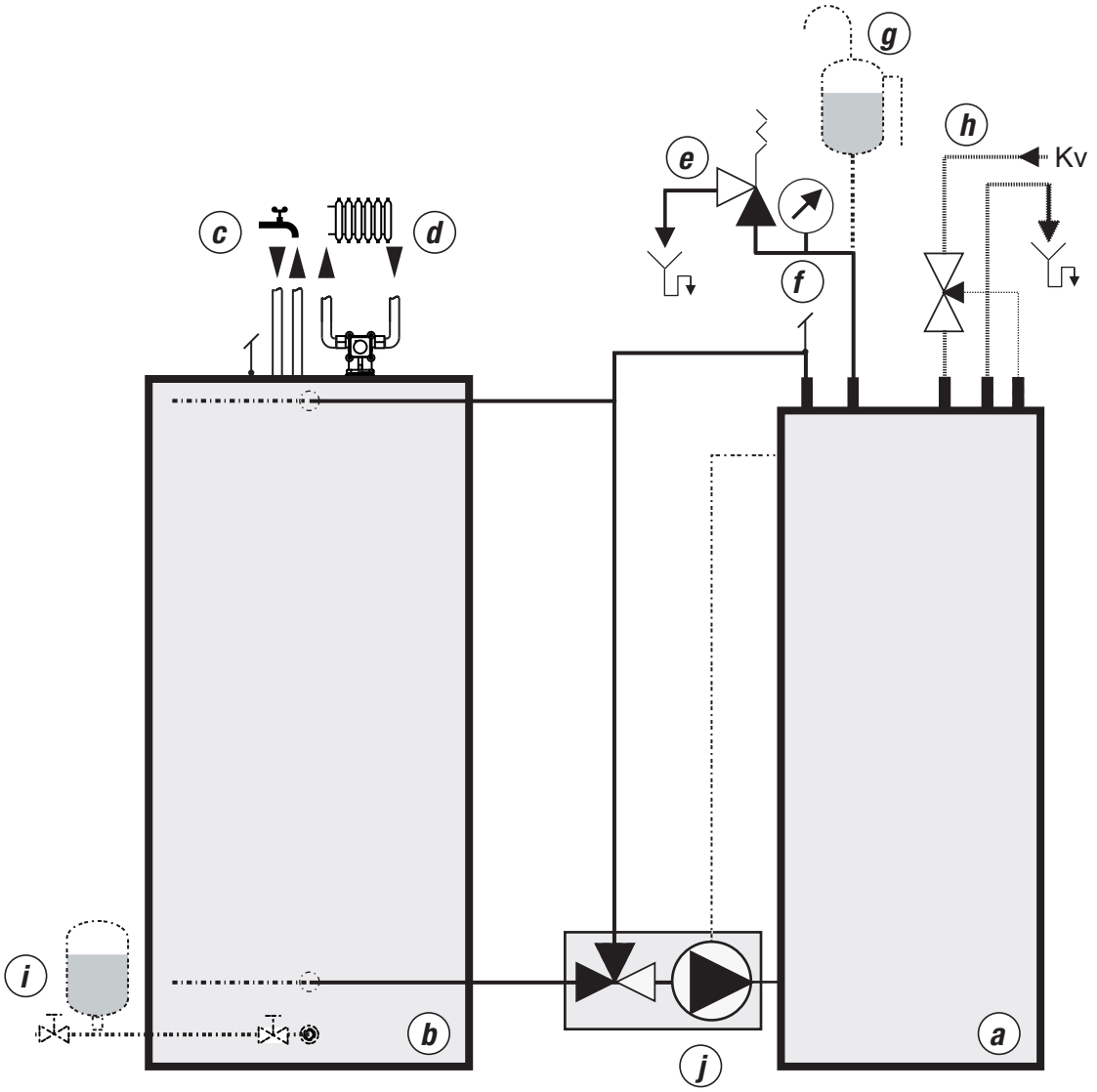
- No work must take place on the boiler's cover plates as it can damage the boiler's electrical equipment.

- The boiler is not designed for oxygenated water.
  Hard, calcareous water is not suitable in a plumbing and heating context.
  If you have your own well, the water quality must be checked so that it does not cause damage. Copper in the pipes must not be subjected to abnormally aggressive water. A water analysis will give you the necessary information. If the water quality is poor, a water filter must be installed.

- The turbulators and the draught damper can be used to adjust the flue gas temperature if there is a risk of condensation in the chimney.

System in principle

This is a system in principle. The actual system must be installed according to existing rules and the instructions provided by each manufacturer for its product.

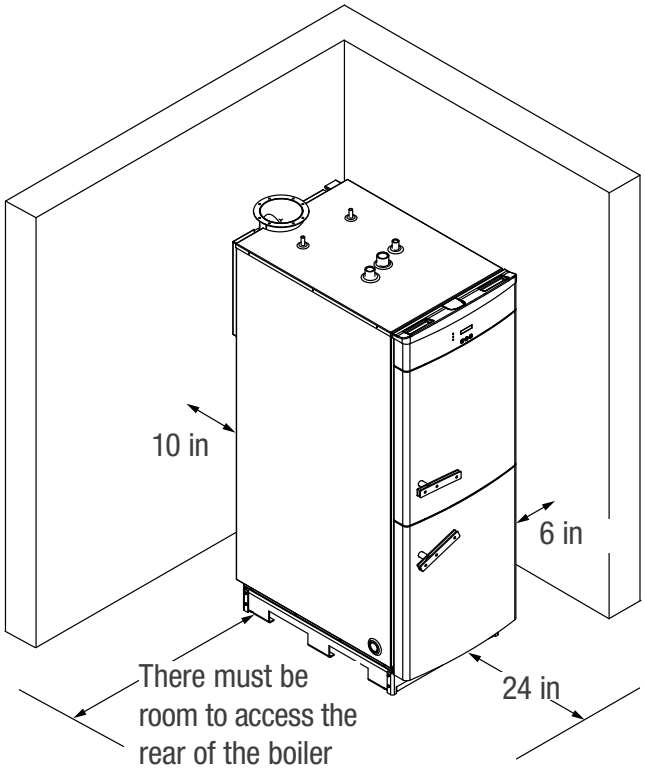


a. Vedolux 650
b. Accumulator system
c. Hot tap water
d. Heating circuit
e. Safety valve
f. Manometer
g. Open expansion tank
h. Thermal valve, STW
i. Closed expansion tank
j. Accumulator control

Pipe installation

Installation must take place according to existing regulations and standards.

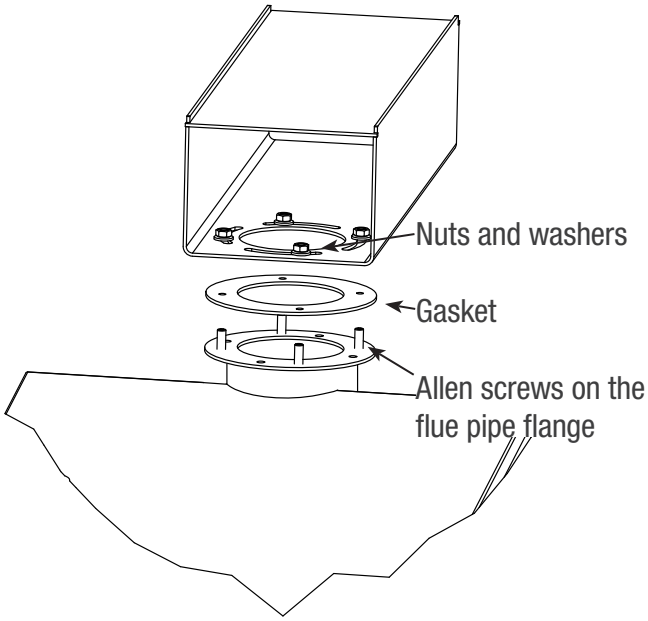
Minimum distance



Flue pipe

The flue pipe can be fitted at various angles.
Take into account:

- Minimum possible distance between boiler and chimney.
- Access for sweeping.
- Leakproof connections.



Accumulator system - accumulator control

The boiler must be connected to an accumulator system with accumulator control.

The accumulator control prevents the return temperature to the boiler being too low, which minimises the risk of condensation in the combustion chamber. The accumulator system's charging pump is controlled by the boiler's control equipment.

Pipe connections

The pipes to the accumulator system must be as short as possible, with as few bends as possible. The pipes must be laid to eliminate air pockets and to achieve self-circulation.

The minimum recommended pipe dimensions are 1.1 in.

Expansion system

The volume of the expansion tank is dimensioned according to the prevailing conditions. The recommended values for this are that the volume, for an open system, must be approximately 5% of the system's total volume or approximately 15% for a closed system.

To avoid oxygenation of an open expansion system, the distance between the highest point of the heating system and the expansion tank must not be less than 98.5 in.

The expansion tank is connected in an unisolatable, uninterruptible rise from the boiler's expansion connection.

To avoid damage in the event of any blockage in the expansion system, the boiler should be fitted with a safety valve.

In a closed system, the boiler must be fitted with a vent valve and an approved safety valve, connected in an uninterruptible connection from the connection on the top of the boiler. The waste pipe of the safety valve must be laid to the floor drain with the mouth visible.

The opening pressure of the safety valve is determined by the component in the system that tolerates the lowest pressure.

A closed expansion tank is best connected in the manner shown in the system in principle.

Pipe installation

Thermal relay

A thermal valve, STW, must be connected to the boiler's cooling coil. The function of the valve is to limit the boiler temperature if the boiler has no power or if the flow, the cooling, ceases. The valve admits cold water, which cools the heat so that the temperature of the boiler does not exceed 230°F.

An adequate volume of cooling water must be present (see the data for the cooling coil) regardless of whether the water supply is your own or municipal.

The valve's opening temperature must be 203 – 207°F and it must be fully open at 230°F.

The valve's drainage pipe must be laid to a floor drain. Follow the instructions of the valve manufacturer and the existing standards and regulations.

Filling/draining

The boiler must be fitted with one or more valves for filling and draining. The boiler is best filled with a fixed filling line.

Venting

The installation must be such that air is automatically vented via the expansion line and/or via bleed valves.

Electrical connection

The installation must be carried out according to existing rules and standards under the supervision of a qualified electrician.

The boiler must be preceded by an all-pole main breaker.

The boiler is protected with a maximum 10 A fuse.

The boiler is connected to the mains power and a charging pump is connected to the boiler. Necessary connections are made with connectors on the rear of the boiler.

For the location of the components, see 'Overview'.

The boiler temperature sensor and the max. temperature sensor's bulb are located inside the electronics box. The electronics box and the sensors are accessible when the front cover plate has been removed. The O_2 probe and the flue gas temperature sensor are accessible when the boiler's rear cover plate has been removed.

If the boiler is connected to an emergency power unit, this must produce a pure sine wave. Otherwise, the boiler's electrical components may be damaged.

a. O_2 probe

Terminal 1: O_2 probe -, grey.
Terminal 2: O_2 probe +, black.
Terminals 3 – 4: probe heating, white.
Heating element output: 12 V~ / 16 VA.

b. Temperature sensor

Terminals 1 – 2: flue gas temperature sensor.
Terminals 3 – 4: boiler temperature sensor.
Sensor type: Pt100.
Measurement range: flue gas temperature sensor, -4..+930°F.
boiler temperature sensor, -4..+930°F.

R/T values:

°F	32	50	150	200	300	400
Ω	100.0	103.9	125.4	136	156.9	177.5

The temperature sensors are not polarised.

c. Air control actuator

Terminal 3: power supply, 24 V~, black.
Terminal 4: power supply, 24 V~, red.
Terminal 5: secondary control signal, Y+, white.
Terminal 6: primary control signal, Y+, white.
Control signal output: 2 – 10 V= / max. 3 mA.

d. Charging pump

Connections with connectors on the rear of the boiler.
Charging pump output: 115 V~ / max. 2.5 A.
On circuit board: Terminal 12: L, phase connection.
Terminal 13: N, neutral connection.
Terminal 14: PE, protective earth connection.

e. Flue gas fan

Terminal 15: L, phase connection.
Terminal 16: N, neutral connection.
Terminal 18: PE, protective earth connection.
Fan output: 115 V~ / max. 2.5 A.
The fan is connected through a transformer 115/230V.

f. Mains connection

Connections with connectors on the rear of the boiler.
Voltage: 115 V~, 60 Hz.
On circuit board: L1: phase connection.
PE: protective earth connection.
N: neutral connection.

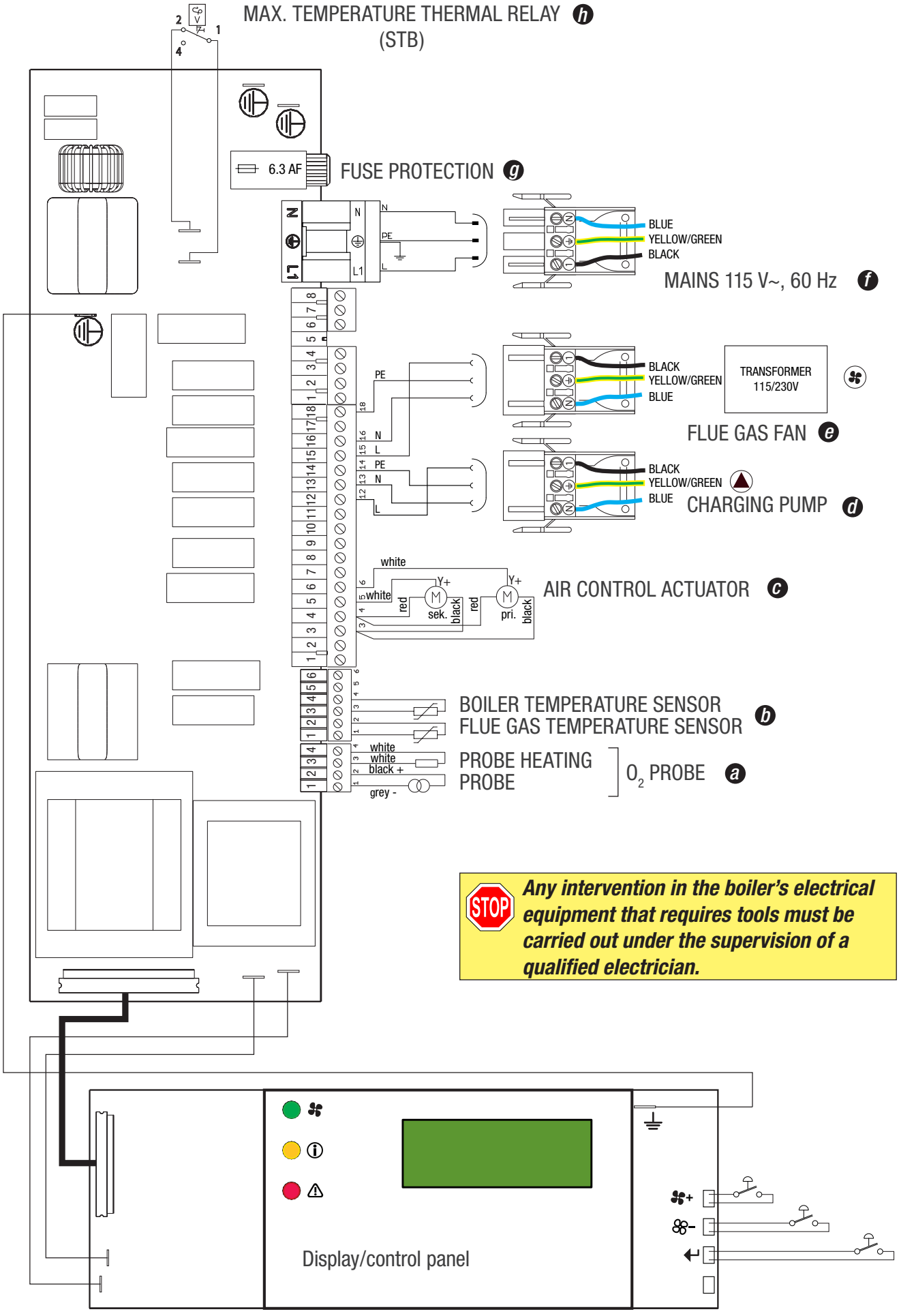
g. Fuse

Glass tube fuse: 5 x 20 mm / 6.3 AF.

h. Max. temperature thermal relay

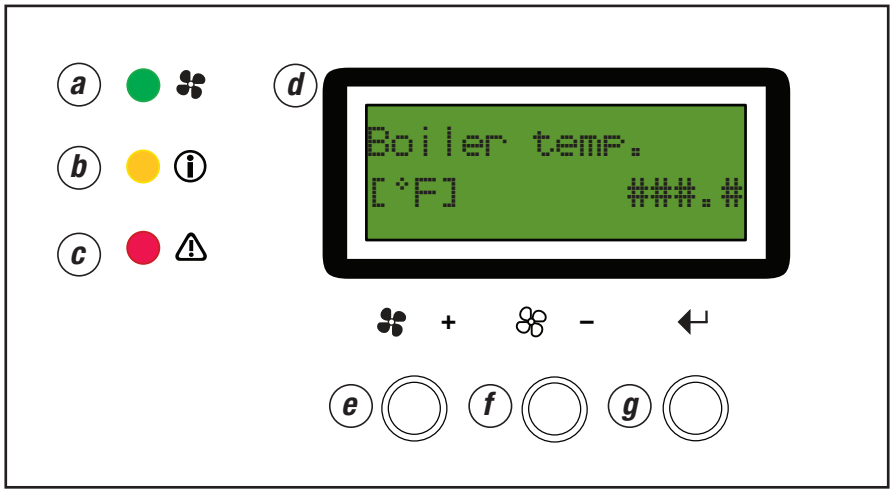
Max. temperature thermal relay (STB): 212 +0/-41°F.

Electrical connection



STOP ***Any intervention in the boiler's electrical equipment that requires tools must be carried out under the supervision of a qualified electrician.***

Control panel



This is how the control panel works:

All settings are set on the panel. It also displays information on temperature and operation.

Get into the habit of always paying attention to what the display shows in connection with all activities relating to the boiler.

Press a key once to light up the display. Press twice to use the key's function.

Description

a. ✤ : Green indication, lights up when the boiler is started with the + key.
Goes out when the boiler is switched off because the wood has been burned up or with the - key.

b. ⓘ : Yellow indication, lights up for a warning.

c. ⚠ : Red indication, lights up for an alarm. No boiler operation possible. Flashes when no correct boiler operation is possible.

d. Display, shows operating data and settings.
When the boiler is switched off, the illumination goes out after 15 minutes.

e. +: Used primarily to:
- start firing.
Used also for settings.

f. -: Used for emergency shutdown of the boiler, for example when there is no water in the heating system and if the O_2 probe or flue gas temperature sensor is defective.
Used also for settings.

g. ↵: Used to access menus and confirm a selection in a menu.

Aggregate test

See ‘Menu system’ for procedure.

The test is available only when the boiler is not in operation.

There must be no fire or embers in the boiler when calibrating the O_2 probe.

Press [+] and [-] at the same time to end the test.

Information		
Aggregate test	O2 calibration + Test end [+/-]	[+]: Calibrate, takes 10 minutes → Calibration [sek] ### [↵]: No calibration, on to next test step.
Safety test		
Settings		
E N D		
	Exhaust fan +- Test end [+/-]	[+]: fan started. [-]: fan stopped. [↵]: next test step.
	Load pump +- Test end [+/-]	[+]: charging pump started. [-]: charging pump stopped. [↵]: next test step.
	Primary motor +- Test end [+/-]	[+]: primary air damper opened [-]: primary air damper closed. [↵]: next test step.
	Second.motor +- Test end [+/-]	[+]: secondary air damper opened. [-]: secondary air damper closed. [↵]: next test step.
	C/O contact +- Test end [+/-]	Not used! [↵]: next test step.
	Door opener +- Test end [+/-]	Not used! [↵]: next test step.
	Lighting +- Test end [+/-]	[+]: display illumination on. [-]: display illumination off. [↵]: next test step.
	Display 1 +- Test end [+/-]	[+]: ✽ indication on. [-]: ✽ indication off. [↵]: next test step.
	Display 2 +- Test end [+/-]	[+]: ⓘ indication on. [-]: ⓘ indication off. [↵]: next test step.
	Display 3 +- Test end [+/-]	[+]: ⚠ indication on. [-]: ⚠ indication off. [↵]: to 'display when boiler is not in operation'.

Starting the boiler

Before firing the boiler for the first time:

- **All safety requirements must have been met.**
- **An electrician must have confirmed that the boiler is safe and operating properly.**
- **A plumbing and heating installation engineer must have confirmed that the boiler is safe and operating properly.**
- **The O_2 probe must have been calibrated and an aggregate test and safety test carried out.**
  See the 'Aggregate test' and 'Safety test' menus.
- **The boiler's operating parameters must have been checked/adjusted.**
  As a rule, no changes need to be made to the boiler's factory settings.
  See the 'Settings' menu.
- **The user must have been informed about how the system is operated and how it works.**

First firing

When the boiler is fired for the first time, it must be fired carefully. This is so that any moisture in the ceramics is evaporated slowly to avoid damage to the ceramics and so that the condensation formed by firing in a cold boiler is evaporated rapidly and ventilated out through the chimney.

The boiler must be fired:

- with a small fire, roughly ten pieces of wood.
- without turbulators.

When the ceramics are dry, the boiler can be fired normally. Check then at the outlet of the flue that the smoke is white and there is no odour.

Turbulators

The boiler is supplied with turbulators. Their task is to make the flue gases turbulate to extract more heat from the flue gases and thus increase efficiency.

Flue gas temperature

During combustion, water vapour is formed. This accompanies the flue gases out in the chimney and can condense to form water there, which can have a harmful effect on the chimney.
A low flue gas temperature results in better efficiency but this must be weighed up against the risk of condensation.

Measures to minimise the risk of condensation:

- fit a draught damper.
- insulate the flue pipe between the boiler and the chimney.
- insulate the chimney in cold rooms.
- remove/shorten the turbulators.

In each case, check the flue gas temperature so that condensation does not form in the chimney.

Firing - Operation

After installation, check with the installation engineer that the system is in perfect condition.
Ask the installation engineer to demonstrate the control and functions so that you know how the system works and must be maintained.

Fire carefully the first time or when the boiler has not been fired for a while. This is so that any moisture in the ceramics is evaporated slowly and so that the condensation formed by firing in a cold boiler is evaporated rapidly and goes out with the flue gases.

Under these circumstances, the boiler must be fired:

- **with a fire of roughly ten pieces of wood.**
- **without turbulators.**

When the ceramics are dry, the boiler can be fired normally.

Settings

The basic settings for the lambda control must be set by the installation engineer during installation. We recommend that these settings be used.

One setting that must be set by the user is 'Desired flue gas temperature', see 03:TRG setpoint in the 'Settings' menu. During the first few weeks in which the boiler is used, check and note, each time it is fired, the flue gas temperature it reaches when the boiler temperature is 160 – 170°F and it is burning properly. Add 50°F to the maximum temperature reached. Then set this value as the 'Desired flue gas temperature'.

Opening the hatches

The boiler's wood filling hatch and ash hatch are locked by a latch, so they cannot be opened fully until the latch has been released. See the adjacent diagram.

Open the hatch with the handle on the front of the hatch. Wait 5 – 10 seconds before raising the latch while opening the hatch.

Wood filling - ignition

The combustion chamber can be completely filled but the quantity of wood must be adapted to heating requirements.
Use half-metre wood of a size that allows three pieces to fit side by side. Lay the pieces of wood parallel to each other in the combustion chamber.
Level out the bed of burned wood from the previous firing before inserting sticks and/or wood.
The wood must be inserted not thrown in. Otherwise there is a risk of the ceramic parts being damaged.

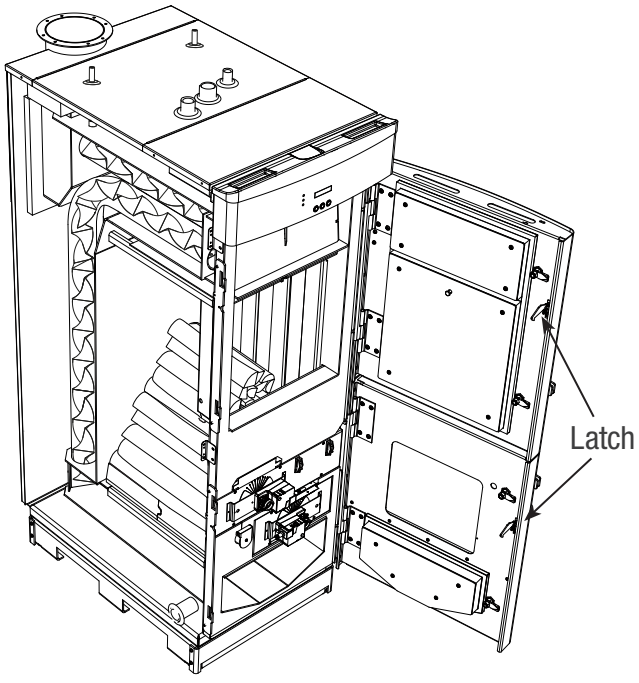
Two ways of lighting the boiler

1. With LPG ignition

- Open the wood filling hatch and insert sticks in the base and then logs.
- Have the wood filling hatch slightly open.
  Open the ash hatch.
  Light the wood by inserting the enclosed LPG ignition device in the opening for LPG ignition. The ignition process takes about two minutes.
- Close the hatches when the fire is established.

2. With a paper fuse

- Open the wood filling hatch.
  Layer newspaper and sticks in the base. Then twist the paper fuse up to the wood insertion point.
  Cover with pieces of wood.
- Light the paper fuse.
- Close the hatch when the fire is established.



Firing - Operation

Starting firing

The boiler must only be fired or filled when heating requirements and the temperature of the accumulator permit.

Preferably only add wood when the boiler is switched off, ✤ indication off.

Pay attention to the pressure in the heating system (water level) before firing.

Have wood to hand near the boiler.

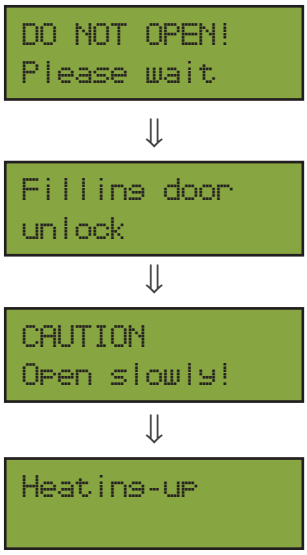
STOP ***RISK OF BURN INJURIES!***
Always follow the instructions in the display. Do not open the hatch if the fan is idle and you suspect there may be fire in the boiler. There is a risk of flames shooting out. Be very careful!

Press [✤ +] to start a firing phase.

When [✤ +] has been pressed, a process starts with the following steps:

- ✤ indication on
- flue fan starts
- charging pump starts
- firing programme starts

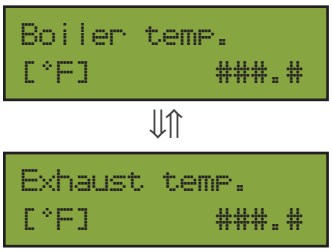
The display shows the following in sequence, with different times between each display:



Add wood to the boiler and set fire to it. Close the hatches when the wood has been ignited.



The growing bar shows the difference between the flue gas and boiler temperatures, TAD.
When the total of the boiler temperature and TAD exceeds the flue gas temperature or 15 minutes have passed, the display switches to alternately showing:



STOP ***RISK OF BURN INJURIES!***
Open the hatch carefully. Wait 5 – 10 s with the hatch open but locked by the latch.

If the ignition fails, the boiler and fan are switched off after a further 30 minutes. The cause may be:

- the fire went out when the hatches were closed because there was too little kindling or the wood used was too damp.
- 'TAD start' is set to a temperature that is too high. See '03:TAD start' in the 'Settings' menu.

The burn time for a full combustion chamber is just over 3.5 hours.

When the wood has been burned up, the ✤ indication goes out and the boiler is switched off.

Firing - Operation

Filling when the boiler is in operation

Press .

The wood must be added fast and the wood insertion hatch must then be closed immediately. Otherwise the control and operation are as described in 'Starting firing'.

RISK OF BURN INJURIES!
Always follow the instructions in the display. Open the hatch carefully. There is a risk of flames shooting out. Be very careful! Leave the hatch locked by the latch for 5 – 10 s before opening it.

Display when the boiler is switched off

When the wood has been burned up, the boiler is switched off and the display shows:

```
Boiler temp.
[°F]        ###.#
```

Flue gas temperature too high

If the flue gas temperature exceeds 572°F, the display shows:

```
Exhaust temp.
[°F]        ###.#
```

For safety reasons, the flue gas fan is switched off if the flue gas temperature reaches 662°F. When the temperature has fallen below 572°F, the fan starts again. This prevents damage to the fan and the flue gas temperature sensor.

RISK OF BURN INJURIES!
Do not open the boiler's hatches.

Safety functions

When the boiler has not been fired for seven days, the flue gas fan starts and is in operation for two minutes to ventilate the boiler so that it is kept dry. At the same time, the charging pump is activated for 10 seconds. During this process, the display shows:

```
Protect. func.
Please wait
```

When the function has been completed, the display switches to the display for when the boiler is switched off.

Over temperature in the boiler

When the accumulator tank is fully charged because too much wood has been inserted, the boiler temperature rises to over 194°F and an over temperature situation arises. In this case, the flue gas fan is switched off. ⚠ indication flashes and the display shows:

```
Over temp.
DO NOT OPEN!
```

If the boiler's temperature falls below 191.3°F, the secondary air damper is opened fully for 30 seconds, the chimney is ventilated and the primary air damper then controls according to the flue gas temperature's requirements and the secondary air damper controls according to the O_2 value.

RISK OF BURN INJURIES!
Do not open the boiler's hatches.

Handling wood

Wood

Hardwood generally has a higher energy content than softwood.

The wood must have a moisture content of 16 ±8%. If the wood is damp, a large part of its energy is used to dry it, combustion is impaired and the risk of tar coating increases.

Oak must be well dried, for more than three years, or mixed with other species of wood to avoid the negative factors of the acid content.

The pieces of wood must be adapted to the combustion chamber. The length should be approximately 50 cm and the thickness such that three to six pieces have room on the width of the grate.

Storage

After cutting, the wood must be split. The more it is split, the faster and more easily it dries. For pieces of wood that are hard to split, the bark can be peeled off to allow them to dry faster. Fresh wood is easiest to split.

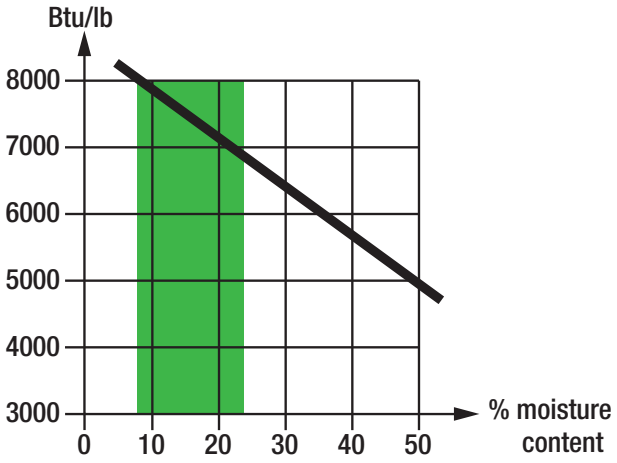
The wood must not lie directly on the ground as it will then absorb moisture instead of drying. It should preferably be stored under a roof but so that the sun and wind are able to dry it. Finally, it should be dried in the boiler room two to three weeks before it is used. After this, the moisture content is approximately 20%.

Heat content

Heat content means the quantity of heat that the boiler can make use of and transfer to the boiler water. Do not confuse this with energy content, which is higher the bigger the piece of wood is. The heat content is higher the drier the piece of wood is, as it does not use as much heat for the drying process.

Freshly felled wood has a moisture content of approximately 55%. Wood that has been dried according to our instructions has a moisture content of approximately 20%.

The diagram shows the differences in heat content.



Sweeping - ash removal

In a well-swept boiler, less heat accompanies the flue gases out. Check the flue gas temperature. Sweeping to keep costs down is a good idea when the temperature has risen by approximately 80°F compared to a well-swept boiler.

The Swedish Rescue Services Act specifies how frequently the system must be swept and the time interval between sweeping. When the system is swept by a chimney sweep, all flue gas ducts are swept. Sweeping to keep costs down should take place at shorter intervals. It is done by cleaning the flues with a flue brush.
Tar that forms on the walls of the combustion chamber does not normally need to be removed.
A good aid for emptying the boiler of ash is an ash trap, which is connected to a vacuum cleaner.

Sweeping

RISK OF BURN INJURIES!
Before sweeping:
- Let the boiler cool down.
- No fire or embers in the boiler.

Sweeping is carried out from the front of the boiler.

- Press and open the hatches.
- Fold down and insert the soot hatch so it covers the opening of the bypass damper.
- Pull out the turbulators.
  Check the turbulators each time you sweep.
  Damaged turbulators must be replaced.
- Sweep the flues with the flue brush.
  Be careful when sweeping the upper flues so that the flue brush does not pass through the protective grating and damage the fan. The flue brush must not be inserted further in than the end of the flue. You will know it is there because less force is required to move it.
- Refit the turbulators.
- Remove and empty the soot hatch and remove any soot that has been deposited on the bypass damper's sealing surfaces. Refit and close the soot hatch.
- Pull out the bypass plate and empty it in the combustion chamber. Refit it.
- Leave an ash layer of a few centimetres to protect the ceramics. Pieces of charred wood can remain. Rake surplus ash down through the grate.
  Check, after lifting out the grate, that no ash or pieces of charred wood are blocking the secondary air ducts in the ceramics.
- Rake away the ash in the ceramic duct. Leave a layer of a few centimetres here too.
- Clean around and in front of the lower ceramics.
- Close the hatches.

The ash may contain residual embers for a long time after firing. Therefore, keep it in a non-combustible container with a lid. Place the container on a non-combustible base.

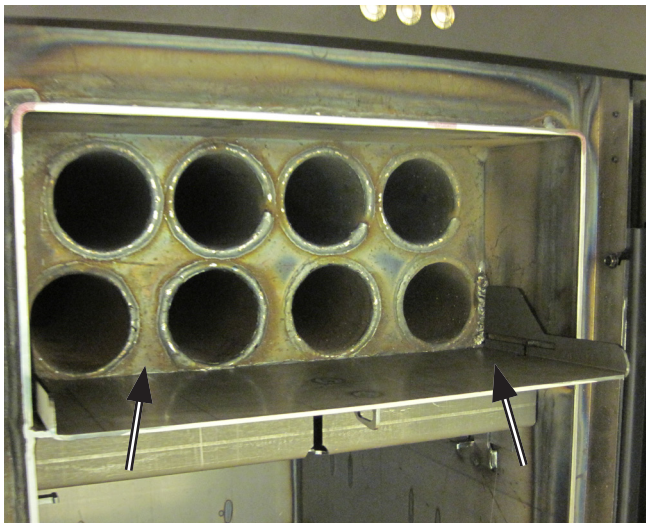
Sweeping the chimney

After sweeping the chimney, loosen the wing nuts on the front of the flue pipe and remove the cover so that soot and ash can be removed.
Remove any ash that has fallen down on the fan and in the collection chamber before the boiler is started again.

Cleaning the fan

When required, remove the fan and clean it. Handle it with care.

- Detach the fan's electrical connector and loosen the nuts that hold the fan in place.
- Clean the fan blades carefully with a brush.
- Refit the fan. Do not forget to connect the power cable.



Soot hatch folded down and inserted Bypass plate

Maintenance

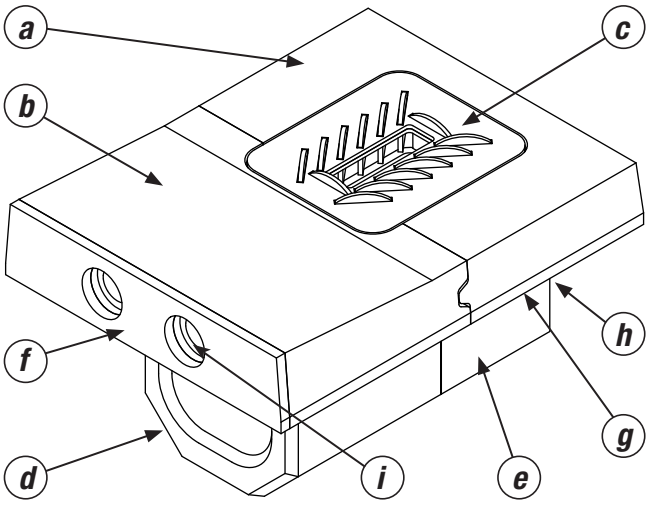
Check regularly that the heating system is in good condition, that there is sufficient water in the system and that there are no leaks.

Ceramics - grate

The boiler's ceramic parts and grate are wearing parts that need replacement as required.
Wearing parts are not covered by any warranty.
Small cracks in the ceramics are normal and require no action.

To increase the service life, remember the following:

- Do not remove the ceramics when cleaning the combustion chamber.
- Leave an ash layer of a few centimetres to protect the ceramics. Pieces of charred wood can remain. Rake surplus ash down through the grate.
- Scrape the ceramics carefully when removing ash.
- Fire only with real wood, not plastic, processed timber, refuse or similar.
- The wood must be inserted in the boiler, not thrown.
- If the boiler/ceramics is/are new or has/have not been used for a while, the ceramics must be warmed with a small fire.



a. Ceramics, upper rear.
b. Ceramics, upper front.
c. Grate.
d. Ceramics, lower front.
e. Ceramics, lower rear.
f. Gasket.
g. Sealing cord between upper ceramics and combustion chamber wall.
h. Sealing cord between lower and upper ceramics.
i. Secondary air ducts

Venting/filling

Check regularly that there is sufficient water in the heating system.

Air may be left in the heating system for a while after installation, for which reason it should be vented a few more times. Check the pressure after venting and add water if necessary.

Water changes its volume with temperature, which affects the pressure in the heating system. Higher temperature produces higher volume and pressure. The expansion tank absorbs the volume changes in the system.

The pressure in a heating system varies with the temperature. Do not add water unnecessarily.

Safety valves

Safety valves must be activated regularly to maintain the safety function.
Open the valve manually and check that water flows out and that the valve subsequently closes tight.

Closed expansion system

The prepressurisation of a closed expansion system should be checked every year or two. The tank may then not be subject to any pressure from the heating system.

Max. temperature thermal relay, STB

The max. temperature thermal relay reset is behind the control panel. When it is reset, the boiler temperature must be lower than 185°C.

Call an installation engineer if the max. temperature thermal relay trips repeatedly.

Maintenance

Action in the event of a risk of freezing

When it is extremely cold, no part of the heating system must be switched off as there is a risk of bursting.

Never fire if you suspect that any part of the heating system may be frozen. Call an installation engineer.

Heating system switched off

If the heating system is to be switched off for an extended period of time, the water should be drained. Alternatively, anti-freeze can be added to the system water.

Ensure that the anti-freeze contains a suitable quantity of a corrosion-inhibiting additive.

Draining the boiler

The boiler must not be in operation when it is drained.

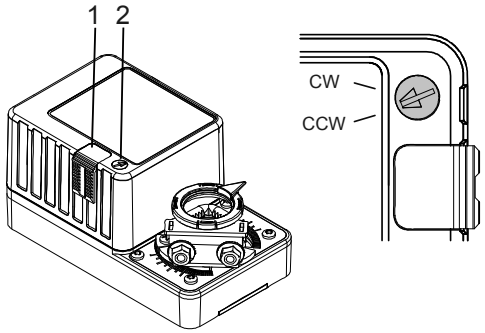
Close the valves for the heating system.

Drain the water to a floor drain via a hose connected to the boiler's drain valve.

Create air supply by opening the boiler's safety valve.

Always cut the power to the boiler before the boiler water is drained.

Air control actuator

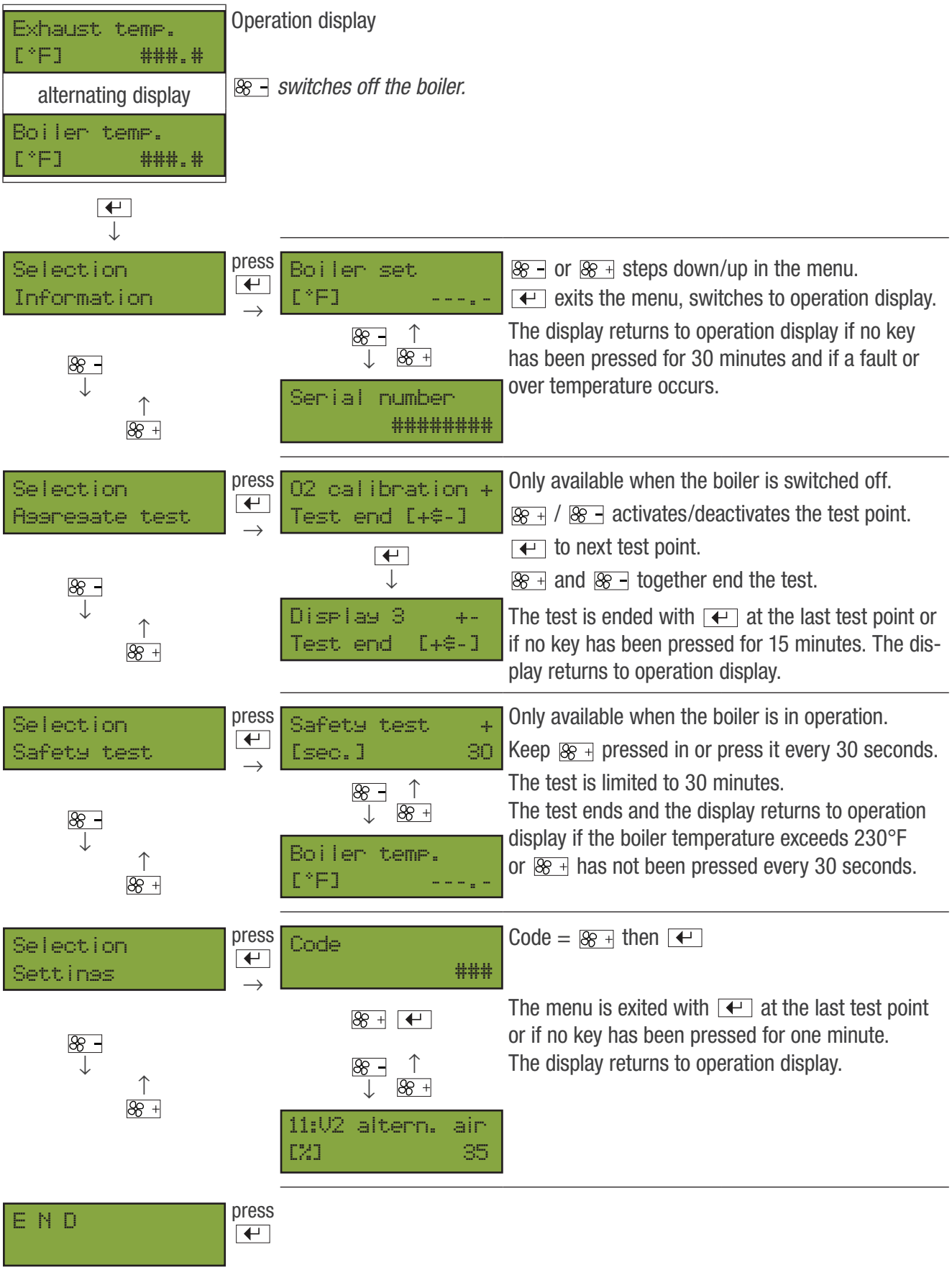


1. Button for manual adjustment.
2. Choice of direction of rotation. Must be in position 'CCW'.

Cleaning the boiler

Keep the boiler clean and tidy. Alkaline cleaning agents are a good way of removing soot smudges. Do not use strong solvents.

Menu system


Exhaust temp.
[°F] ###.#
alternating display
Boiler temp.
[°F] ###.#
Operation display
– switches off the boiler.
Selection
Information
press
Boiler set
[°F] ---.-
Serial number
#########
– or + steps down/up in the menu.
exits the menu, switches to operation display.
The display returns to operation display if no key has been pressed for 30 minutes and if a fault or over temperature occurs.
Selection
Aggregate test
press
O2 calibration +
Test end [+⇳-]
Display 3 +-
Test end [+⇳-]
Only available when the boiler is switched off.
+ / – activates/deactivates the test point.
to next test point.
+ and – together end the test.
The test is ended with at the last test point or if no key has been pressed for 15 minutes. The display returns to operation display.
Selection
Safety test
press
Safety test +
[sec.] 30
Boiler temp.
[°F] ---.-
Only available when the boiler is in operation.
Keep + pressed in or press it every 30 seconds.
The test is limited to 30 minutes.
The test ends and the display returns to operation display if the boiler temperature exceeds 230°F or + has not been pressed every 30 seconds.
Selection
Settings
press
Code
###
11:V2 altern. air
[%] 35
Code = + then
The menu is exited with at the last test point or if no key has been pressed for one minute.
The display returns to operation display.
E N D
press

Information - Current operating status

Exit the menu with ↵. The display switches to the operation display. This also happens if no key is pressed for 30 min.

The menu is exited if a fault or over temperature occurs.

Information Aggregate test Safety test Settings E N D	Boiler set [°F] ---.-	Setpoint for boiler temperature.
	Boiler temp. [°F] ---.-	Current boiler temperature.
	Exhaust set [°F] ---.-	Setpoint for flue gas temperature.
	Exhaust temp. [°F] ---.-	Current flue gas temperature.
	O2 set [%] --.-	Setpoint for oxygen content in flue gases.
	O2 [%] --.-	Current oxygen content in flue gases.
	CO2 set [%] --.-	Setpoint for carbon dioxide content in flue gases. (Calculated from O_2 setpoint)
	CO2 [%] --.-	Current carbon dioxide content in flue gases. Based on CO_{2max} for wood being 20.3%.
	Exhaust fan ON/OFF	Operating status, flue gas fan.
	Load pump ON/OFF	Operating status, charging pump.
	Primary motor [%] --.-	Current opening position for primary air damper.
	Second. motor [%] --.-	Current opening position for secondary air damper.

Information - Current operating status

Lambda --.-	Lambda value = excess oxygen value, a measure of how efficient the combustion is. Based on CO_{2max} for wood being 20.3%. Lambda = $\frac{CO_{2max}}{CO_2}$ Lambda value for good combustion: 1.5 – 1.7.
Efficiency ETA-F[%] --.-	Current combustion efficiency (not to be confused with boiler efficiency). The calculation is based on a combustion air temperature of 95°F.
Over temp. total [%] ---.-	Shows the proportion of over temperature incidents in relation to the total number of operating hours.
0-10 burn-off [%] ---.-	Shows the proportion of over temperature incidents (too much wood has been added) in the past 10 firings. ***If the value is > 0%, the quantity of wood added must be reduced.***
Operating hours [h] #####	Shows how many hours the boiler has been fired for. After 60,000 hours, the counter is zeroed.
Software ##.##	Software version number.
Serial number ########	The regulator's serial/production number.

Aggregate test

The test is available only when the boiler is not in operation.

When the test is carried out, there must not be any risk of the boiler being overheated.

There must be no fire or embers in the boiler when calibrating the O_2 probe.

The O_2 probe is calibrated automatically when the boiler has not been fired for 48 hours and the probe has been in operation for more than 200 hours since the previous calibration.

Press [+] and [-] at the same time to end the test.

Information	
Aggregate test	O2 calibration + Test end [+$-] → Calibrate, takes 10 minutes → Calibration [sek] ### [↵] No calibration, on to next test step.
Safety test	
Settings	
E N D	
	Exhaust fan +- Test end [+$-] [+]: fan started. [-]: fan stopped. [↵]: next test step.
	Load pump +- Test end [+$-] [+]: charging pump started. [-]: charging pump stopped. [↵]: next test step.
	Primary motor +- Test end [+$-] [+]: primary air damper opened [-]: primary air damper closed. [↵]: next test step.
	Second.motor +- Test end [+$-] [+]: secondary air damper opened. [-]: secondary air damper closed. [↵]: next test step.
	C/O contact +- Test end [+$-] Not used! [↵]: next test step.
	Door opener - Test end [+$-] Not used! [↵]: next test step.
	Lighting +- Test end [+$-] [+]: display illumination on. [-]: display illumination off. [↵]: next test step.
	Display 1 +- Test end [+$-] [+]: ✽ indication on. [-]: ✽ indication off. [↵]: next test step.
	Display 2 +- Test end [+$-] [+]: ⓘ indication on. [-]: ⓘ indication off. [↵]: next test step.
	Display 3 +- Test end [+$-] [+]: ⚠ indication on. [-]: ⚠ indication off. [↵]: to 'display when boiler is not in operation'.

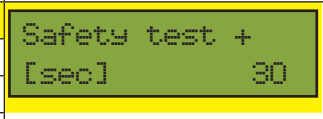
Safety test

The test can only be selected when the boiler is in operation.

Before the test, the boiler must have been in operation long enough that its power corresponds to normal operation.

During the test, [fan +] must be kept pressed in or be pressed every 30 seconds.

The test is limited to maximum 30 minutes.

Information Aggregate test Safety test Settings E N D	 

When the boiler temperature has risen to 203 – 212°F, the max. temperature thermal relay, STB, will be tripped and the fan will stop: This is displayed after a few seconds with 'STB tripped'. The test has been completed with a positive result.

Testing the thermal valve, if one is fitted:

If you press [fan +] after STB has been tripped, the charging pump is switched off until the boiler reaches 230°F so that the thermal valve, STW, can be tested. STW should now keep the boiler's temperature below 230°F. If it does, the test of the thermal safety valve has been completed with a positive result.

Settings

Before the boiler is started for the first time, the requirements for testing or operation must be met. The following settings must also be set.

Settings must only be set by a person with knowledge about the functions.

After these settings have been set, an aggregate test and a safety test must be carried out.

Information Aggregate test Safety test Settings E N D	
Code ###	A random number is displayed. Press [+] and confirm with [↵].
01: Language English [GB]	Language selection. Step with [+] or [-] until the desired language is displayed. Confirm with [↵].
02: Boiler set [°F] 185	To reduce the risk of an over temperature situation, the boiler power is reduced by approximately 20% if the boiler temperature exceeds the setpoint by more than 34.7°F. Factory setting: 185°F Setting range: 167 – 185°F
03: Exhaust set [°F] 356	Desired flue gas temperature, TRG. Factory setting: 356°F Setting range: 239 – 464°F
04: O2 set [%] 6.0	Desired O_2 value during firing, affected by the moisture content of the wood. Moisture content: Low ⟺ Normal 16 ±8% ⟺ High O_2 value: 4.0 6.0 8.0 Factory setting: 6.0% Setting range: 4.0 – 8.0%
05: TAD start [K] 104	Function that checks the fire in the boiler during ignition. If the fire is sufficient, combustion control is connected. If not, the boiler is switched off. Factory setting: 104°F Setting range: 77 – 257°F TAD = difference between flue gas and boiler temperatures.
06: Switch-off O2/TAG	When the wood has been burned up, the boiler is switched off via the O_2 value or the flue gas temperature. O_2: **should be standard**. Produces easier firing and a larger quantity of charred wood residue. TAG: recommended only if the wood is bulky or very damp. Produces a minimum quantity of charred wood residue. Factory setting: O_2 Settings: O_2 / TAG
10:V1 altern.air [%] 45	If the flue gas temperature sensor or O_2 probe is defective, the primary air is set to this value. ***Only for emergency operation.*** Factory setting: 45% Setting range: 0 – 100%
11:V2 altern.air [%] 35	If the flue gas temperature sensor or O_2 probe is defective, the secondary air is set to this value. ***Only for emergency operation.*** Factory setting: 35% Setting range: 0 – 100%

Warnings and alarms

The emergency program is intended only for short-term operation. Longer operation can damage the system.

The fault must be remedied as soon as possible.

The max. temperature thermal relay has been tripped - no operation possible.

STB triggered Reset!	⚠ indication: On.
alternating display	Cause: Boiler temperature over 203°F on account of too much wood, a power cut or a fault in the heat removal, in the charging pump or in the charging valve.
Boiler temp. [°F] ###.#	Remedy: Add a smaller quantity of wood. Check the heat removal.
	Reset: Unscrew and remove the protective cover on the max. temperature thermal relay, STB, and press in the key below it when the display shows 'Boiler temperature 185°F'. The fault is deleted after a few seconds and the boiler can be started manually.
	Control measures: The flue gas fan and charging pump are switched off. primary air, V1 = 0% secondary air, V2 = min. 25% open.
	STOP ***RISK OF BURN INJURIES!*** ***Do not open the boiler's hatches.***
	Contact an installation engineer if the fault occurs repeatedly.

Incorrect measured values for the boiler temperature - no operation possible.

Boiler temp. measurem. error	⚠ indication: On.
alternating display	Cause: Measured value under -4°F or over 302°F.
Boiler temp. [°F] ###.#	Remedy: Check the contact and cable. Change the sensor if necessary.
	Reset: Automatically when the cause has been remedied.
	Control measures: The flue gas fan and charging pump are switched off. primary air, V1 = 0% secondary air, V2 = min. 25% open.

Flue gas temperature too high - no correct operation possible.

Exhaust temp. too high	⚠ indication: Flashing.
alternating display	Cause: Flue gas temperature over 572°F.
Exhaust temp. [°F] ###	Remedy: Close the hatches as soon as possible or clean the boiler after firing.
	Reset: Automatically at a flue gas temperature under 572°F.
	Control measures: Flue gas temperature over 662°F: The flue gas fan is switched off. Flue gas temperature under 572°F: The flue gas fan starts.
	STOP ***RISK OF BURN INJURIES!*** ***Do not open the boiler's hatches.***

Warnings and alarms

Over temperature - no correct operation possible.

Over temp. DO NOT OPEN!	⚠ indication: Flashing.
alternating display	Cause: - Boiler in operation, boiler temperature ≥ 194°F. - Too much wood or fault in the charging pump or accumulator control.
Boiler temp. [°F] ###.#	Remedy: Add a smaller quantity of wood or remedy another fault.
	Reset: Automatically at a boiler temperature under 194°F.
	Control measures: Boiler temperature over 194°F: The flue gas fan is switched off primary air, V1 = 0% secondary air, V2 = min. 25% open. Boiler temperature under 194°F: The flue gas fan starts V1 and V2 work to the set values.
	STOP ***RISK OF BURN INJURIES!*** ***Do not open the boiler's hatches.***

Incorrect measured values for the flue gas temperature - operation with automatic emergency program.

Exhaust temp. measurem. error	ⓘ indication: On.
alternating display	Cause: Measured value under -4 or over 932°F.
Exhaust temp. [°F] ###	Remedy: Check the contact and cable. Change the sensor if necessary.
	Reset: Automatically when the fault has been remedied.
	Control measures: The regulator works with primary air, V1, and secondary air, V2, replacement air flow rate. After firing, the boiler must be switched off with [fan -]. No bar is displayed when the firing begins.

Frost protection - operation with automatic emergency program.

Frost protection	ⓘ indication: On.
alternating display	Cause: The boiler temperature is lower than 44.6°F when the boiler is switched off.
Boiler temp. [°F] ###.#	Remedy: Fire.
	Reset: Automatically during firing or when the boiler temperature is over 46.4°F.
	Control measures: The charging pump starts. This reduces the risk of freezing on account of the flowing water.
	STOP ***Never fire if you suspect that any part of the heating system may be frozen. Call an installation engineer.***

Incorrect measured values for the O_2 probe - operation with automatic emergency program.

O2 measurem. error	ⓘ indication: On.
alternating display	Cause: The probe heating has been interrupted. Cable fault or short circuit.
Boiler temp. [°F] ###.#	Remedy: Check the contact and cable. Remove and clean the O_2 probe. Replace the probe if necessary.
	Reset: Automatically when the cause has been remedied and the O_2 probe has been calibrated.
	Control measures: The regulator works with V1 and V2 replacement air flow rate. After firing, the boiler must be switched off with [fan -]. Remedy the cause as soon as possible.

Troubleshooting

The boiler burns poorly.	Damp wood.	A ceramic boiler requires a high combustion temperature. To achieve this, the wood must be dry with a moisture content of 16 ±8%.
	The wood is not adapted to the boiler.	Its length should be 19.7 in. Its thickness should be such that three to six pieces of wood have room on the width of the grate.
	Shaped wood, studs.	If evenly shaped pieces of wood are stacked on top of each other, they form a solid lump of wood with little surface for the fire to gain a hold on. Insert the wood so that there is air between the pieces.
	The wood gets stuck.	This occurs when the wood is bent and not adapted to the combustion chamber. Adapt the wood to the boiler.
	The chimney duct continues downwards from the connection to the boiler.	Turbulence may be formed, which takes away part of the draught. Fill the underlying part with sand.
	Insufficient supply air.	The supply air duct for the boiler room must have at least the same area as the flue. Check that the supply air valve is open.
	Incorrect settings. The O_2 probe has not been calibrated.	Check the settings and calibrate the O_2 probe.
Smoke from the boiler is entering the boiler room.	Insufficient supply air.	See above There must be a fresh air intake, > Ø7.1 in.
	Mechanical ventilation.	Any mechanical ventilation in the room must not create any negative pressure that disturbs the operation of the boiler.
	Insufficient basic draught in the chimney.	See chimney requirements.
	Smoke entering the boiler room when wood is inserted.	Check that the bypass damper is working properly.
High flue gas temperature.	Tar and soot in the tubes.	Caused by incorrect combustion. Check the wood, the draught, the supply air and the operation. Sweep the boiler.
Tar and and a lot of soot in the tubes.	Incorrect combustion.	See the item about high flue gas temperature. Too much wood in relation to the heating requirements or damp wood.
	Incorrect connection.	Check.
Heat is not transferred from the boiler to the accumulator.	Circulation pump too small.	The pump must have sufficient capacity so that it can transfer the heat. Replace with a bigger pump.
	Air.	Vent.
	Fault in accumulator control.	Check that the charging package is working properly.
The fan does not start.	Switches in position 0.	Switch the switches to position I.
	Forgot to connect the quick connector.	Connect the quick connector.
	Overheating protection triggered.	Reset the overheating protection.
The safety valve opens when the system becomes hot.	Expansion tank too small.	See the ‘Expansion system’ section.
	Prepressurisation in the expansion tank too high/low.	Check the pressure in the tank.

Summary - faults, functions and control measures

Power cut.	Return to the operating status that existed before the power cut when the power returns.
Over temperature in the boiler.	≥ 194°F: the fan is switched off. ≤ 192°F: the fan starts.
Incorrect measured value for boiler temperature.	The fan and charging pump are switched off. The boiler cannot be started.
Incorrect measured value for flue gas temperature.	The boiler can be started. The regulator works with V1 and V2 replacement air flow rate. The boiler must be switched off manually after firing. The bar is not displayed when firing begins.
Incorrect measured value for O2 probe	The boiler can be started. The regulator works with V1 and V2 replacement air flow rate. The boiler must be switched off manually after firing.
Switch off on flue gas temperature. Not recommended.	The boiler is switched off if the flue gas temperature, after 30 minutes of operation, is lower than 25% of the set flue gas temperature for 15 minutes. (TRG = flue gas temperature)
Frost protection.	Boiler switched off The charging pump starts at a boiler temperature < 45°F. If the temperature exceeds 46°F, the charging pump is switched off.
Protection for flue gas fan and flue gas temperature sensor in connection with over temperature.	Flue gas temperature ≥ 662°F: the flue gas fan is switched off. Flue gas temperature ≤ 570°F: the flue gas fan starts.
Safety test.	Limited to max. 30 minutes and ended or interrupted automatically if: 1) The boiler temperature is ≥ 230°F 2) has not been activated every 30 seconds.
Calibration of O2 probe.	Automatically when the boiler has not been fired for 48 hours and the probe has been in operation for more than 200 hours since the previous calibration.
Safety functions.	If the boiler has not been fired for seven days, the flue gas fan starts for two minutes and ventilates the boiler with fresh air to keep it dry. At the same time, the charging pump is activated for 10 seconds.
TAD start.	If 'TAD start' is set to a temperature that is too high, the control will interpret it as failed ignition and switch the boiler off. See '03:TAD start' in the 'Settings' menu.

Component specification

210026	Lambda control, 115V	1
210198	Boiler temperature sensor	1
210199	Flue gas temperature sensor	1
500015	Fan	1
500040	Rotating damper motor	2
232254	Turbulator, 600 mm	4
232255	Turbulator, 1600 mm	4
440002	Tube cleaner, 89 mm	1
440013	Spring steel shaft, 2000 mm	1
710260	Turbulator tool	1
711396	Ash rake	1
700400	Ceramics without base, rear	1
700401	Ceramic front grate	1
700402	Ceramic rear grate	1
700403	Ceramics without base, front	1
700404	Plane gasket, grate	1
711192	Sealing cord	1
711282	**Slit grate, complete**	**1**
711305	Damper end plate	14
440227	LPG ignition	1
300014	Glass-fibre gasket, 20 x 20 (m)	2
700396	Insulation, front lower	1
700397	Insulation, front upper	1
711308	**Lower hatch, complete**	**1**
300013	Glass-fibre gasket, 15 x 15 (m)	1.2
720371	**Wood filling hatch, complete**	**1**
700468	Gasket, int. silicone	1

For the user

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