

Operating Instructions
Firewood boiler S1 Turbo



Translation of the original German operating instructions for the operator

Read and follow the instructions and safety information!

Technical changes, typographical errors and omissions reserved!

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1 General

Thank you for choosing a quality product from Fröling. The product features a state-of-the-art design and conforms to all currently applicable standards and testing guidelines.

Please read and observe the documentation provided and always keep it close to the system for reference. Observing the requirements and safety information in the documentation makes a significant contribution to safe, appropriate, environmentally friendly and economical operation of the system.

The constant further development of our products means that there may be minor differences from the pictures and content. If you discover any errors, please let us know: doku@froeling.com.

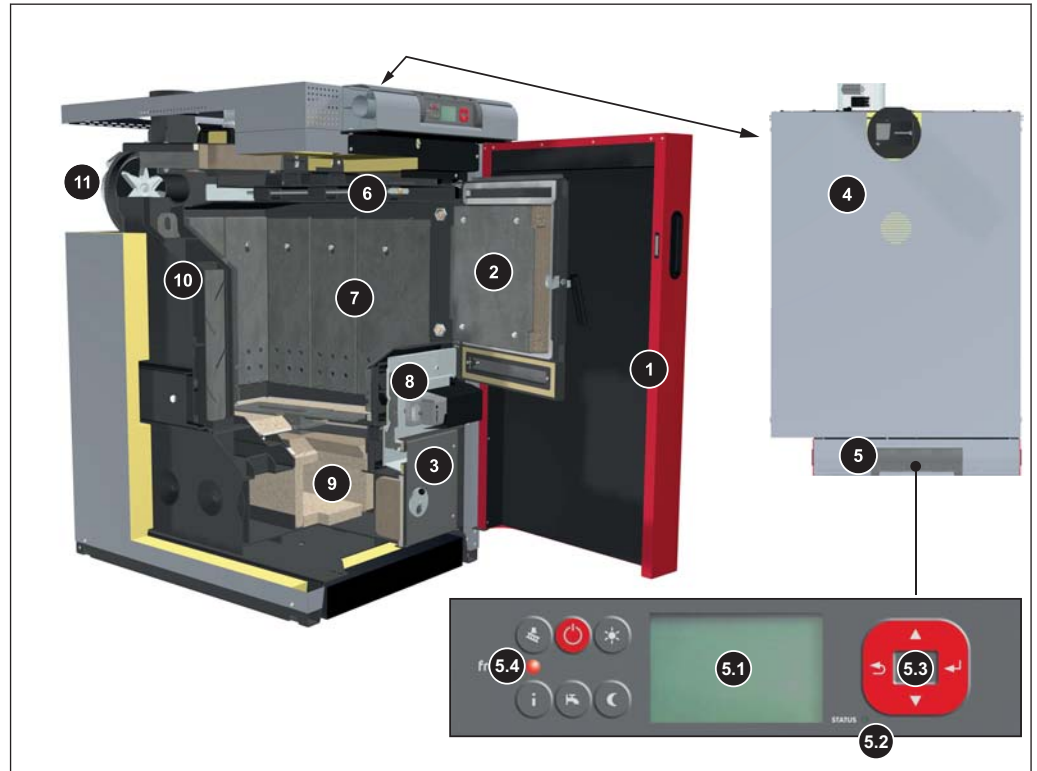
Subject to technical change.

Guarantee conditions

Our sale and delivery conditions generally apply. These conditions have been made available to customers, and customers have been made aware of them at the time of order completion.

You can also find the guarantee conditions on the enclosed guarantee certificate.

1.1 S1 Turbo Product Overview



1	Insulated door	3	Combustion chamber door with inspection glass
2	Fuel loading door	4	Controller cover
5	Lambdatronic S 3200 S1 boiler controller		
5.1	Visual display showing operating statuses and parameters		
5.2	Status LED to display the operating status: - GREEN constant: BOILER ACTIVE (heating up/heating) - GREEN flashing (interval: 5 sec OFF, 1 sec ON): OFF - ORANGE flashing: WARNING - RED flashing: FAULT		
5.3	Navigation keys to move around in the menus and to change the parameter values		
5.4	Function keys to call up individual boiler functions directly NOTICE! For key layout see operating instructions for boiler controller		
6	Carbonisation gas duct flap	9	Combustion chamber
7	Cladding plates	10	WOS (Efficiency Optimisation System)
8	Servo-motor/manual adjuster	11	Induced draught fan

Under the insulating cover (4):



12 Main switch

13 High-limit thermostat (STL)

14 Service interface (RS232)

2 Safety

2.1 Hazard levels of warnings

This documentation uses warnings with the following hazard levels to indicate direct hazards and important safety instructions:

DANGER

The dangerous situation is imminent and if measures are not observed it will lead to serious injury or death. You must follow the instructions!

WARNING

The dangerous situation may occur and if measures are not observed it will lead to serious injury or death. Work with extreme care.

CAUTION

The dangerous situation may occur and if measures are not observed it will lead to minor injuries or damage to property.

2.2 Pictograms used

The following symbols are used in the documentation and/or on the boiler to show what is required and forbidden and to give warnings.

In accordance with the Machinery Directive, signs fitted directly within the danger area of the boiler indicate immediate hazards or safety procedures. These stickers must not be removed or covered.

	Refer to the operating instructions		Wear safety shoes
	Wear protective gloves		Turn off the main switch
	Keep the doors closed		
	Unauthorised access prohibited		
	Warning - hot surface		Warning - hazardous electrical voltage
	Warning - hazardous or irritant materials		Warning - automatic boiler start-up
	Warning of injury to fingers or hands, automatic fan		

2.3 General safety information

DANGER



If the device is used incorrectly:

Incorrect use of the system can cause severe injury and damage.

When operating the system:

- Observe the instructions and information in the manuals
- Observe the details on procedures for operation, maintenance and cleaning, as well as troubleshooting in the individual manuals.
- Any work above and beyond this should be carried out by authorised heating engineers or by Froling customer services.

WARNING



External influences:

Negative external influences, such as insufficient combustion air or non-standard fuel, can cause serious faults in combustion (e.g. spontaneous combustion of carbonisation gases or flash fires) which can in turn cause serious accidents!

When operating the boiler, please note the following:

- Instructions and information regarding versions and minimum values, as well as standards and guidelines for heating components in the instructions must be observed.

WARNING

Severe injuries and damage can be caused by an inadequate flue gas system.

Problems with the flue gas system, such as poor cleaning of the flue pipe or insufficient chimney draught, can cause serious faults in combustion (such as spontaneous combustion of carbonisation gases or flash fires).

Take the following precautions:

- Optimum boiler performance can only be guaranteed if the flue gas system is functioning correctly.

2.4 Permitted uses

The Froling Firewood boiler S1 Turbo is designed solely for heating domestic water. Only use fuels specified in the "Permitted fuels" section.

⇒ See "Permitted fuels" [page 10]

The unit should only be operated when it is in full working order. It should be operated in accordance with the instructions, observing safety precautions, and you should ensure you are aware of the potential hazards. The inspection and cleaning intervals in the operating instructions should be observed. Ensure that any faults which might impair safety are rectified immediately.

The manufacturer or supplier is not liable for any damage resulting from non-permitted uses.

2.4.1 The Clean Air Act 1993 and Smoke Control Areas

Under the Clean Air Act local authorities may declare the whole or part of the district of the authority to be a smoke control area. It is an offence to emit smoke from a chimney of a building, from a furnace or from any fixed boiler if located in a designated smoke control area. It is also an offence to acquire an „unauthorised fuel“ for use within a smoke control area unless it is used in an „exempt“ appliance („exempted“ from the controls which generally apply in the smoke control area). The Secretary of State for Environment, Food and Rural Affairs has powers under the Act to authorise smokeless fuels or exempt appliances for use in smoke control areas in England. In Scotland and Wales this power rests with Ministers in the devolved administrations for those countries. Separate legislation, the Clean Air (Northern Ireland) Order 1981, applies in Northern Ireland. Therefore it is a requirement that fuels burnt or obtained for use in smoke control areas have been „authorised“ in Regulations and that appliances used to burn solid fuel in those areas (other than „authorised“ fuels) have been exempted by an Order made and signed by the Secretary of State or Minister in the devolved administrations.

Further information on the requirements of the Clean Air Act can be found here: <http://smokecontrol.defra.gov.uk>

Your local authority is responsible for implementing the Clean Air Act 1993 including designation and supervision of smoke control areas and you can contact them for details of Clean Air Act requirements.

2.4.2 Permitted fuels

Firewood

Firewood up to max. 55 cm long.

Water content

Water content (w) greater than 15% (equivalent to wood moisture $u > 17\%$)
Water content (w) less than 25% (equivalent to wood moisture $u < 33\%$)

Note on standards

EU: Fuel acc. to EN 14961 - Part 5: Firewood class A2 / D15 L50

Germany also: Fuel class 4 (§3 of the First Federal Emissions Protection Ordinance (BimSchV) in the last amended version)

Tips for storing wood

- Values in practice:
 - Hardwood: 2 years in dry storage
 - Soft wood: 1 year in dry storage
- Store stacks of split wood sheltered from the rain
- Create a dry underlay, where possible with air access (line with round timber, pallets, etc.)
- Use wind-exposed areas where possible for storage (e.g. store at edge of forest instead of in forest)
- Walls of buildings facing the sun are ideal
- If possible, stock fuel for the day in a warm place (e.g. in boiler room) (pre-heats the fuel!)

NOTICE! Use fuels that are consistent in size and water content.

NOTICE! Burning extremely dry fuels (w < 15%) may require repairs by qualified staff. Please contact Froling customer services or your installer.

2.4.3 Fuels permitted under certain conditions

Wood briquettes

Wood briquettes for non-industrial use with a diameter of 5-10 cm and 5-50 cm long.

Note on standards

EU:	Fuel acc. to 14961 - Part 3: Wood briquettes class B / D100 L500 Form 1 - 3
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Additional for Germany:	Fuel class 5a (§3 of the First Federal Emissions Protection Ordinance (BimSchV) in the last amended version)
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Notes on use

- When burning wood briquettes use the settings for extremely dry fuel
- Wood briquettes must be heated up with firewood as per EN 14961-5 (at least two layers of firewood under the wood briquettes)
- The fuel loading chamber must not be filled more than 3/4 full, as the wood briquettes expand during combustion
- Even when using the settings for dry fuel, burning wood briquettes can cause combustion problems. In such cases, repairs must be carried out by qualified staff. Please contact Froling customer services or your installer.

2.4.4 Non-permitted fuels

The use of fuels not defined in the "Permitted fuels" section, and particularly the burning of refuse, is not permitted.

CAUTION

In case of use of non-permitted fuels:

Burning non-permitted fuels increases the cleaning requirements and leads to a build-up of aggressive sedimentation and condensation, which can damage the boiler and also invalidates the guarantee. Using non-standard fuels can also lead to serious problems with combustion.

For this reason, when operating the boiler:

- Only use permitted fuels

2.5 Qualification of operating staff

CAUTION



If unauthorised persons enter the installation room / boiler room:

Risk of personal injury and damage to property

- The operator is responsible for keeping unauthorised persons, in particular children, away from the system.

Only trained operators are permitted to operate the unit. The operator must also have read and understood the instructions in the documentation.

2.6 Protective equipment for operating staff

You must ensure that staff have the protective equipment specified by accident prevention regulations.



- For operation, inspection and cleaning:
 - suitable work wear
 - protective gloves
 - sturdy shoes

2.7 Design information

It is forbidden to carry out modifications to the boiler or to change or deactivate safety equipment.

Always comply with all fire, building, and electrical regulations when installing or operating the boiler system, and follow the operating instructions and mandatory regulations that apply in the country in which the boiler is operated.

2.7.1 Installation and approval of the heating system

The boiler should be operated in a closed heating system. The following standards govern the installation:

Note on standards

ÖNORM / DIN EN 12828 Heating Systems in Buildings

NOTICE! Each heating system must be officially approved.

The appropriate supervisory authority (inspection agency) must always be informed when installing or modifying a heating system, and authorisation must be obtained from the building authorities:

Austria: Inform the civic/municipal building authorities.

Germany: Notify an approved chimney sweep and the building authorities.

2.7.2 General information for installation room (boiler room)

Boiler room characteristics

- There must not be a potentially explosive atmosphere in the boiler room as the boiler is not suitable for use in potentially explosive environments.
- The boiler room must be frost-free.
- The boiler does not provide any light, so the customer must provide sufficient lighting in the boiler room in accordance with national workplace design regulations.
- When using the boiler over 2000 metres above sea level you should consult the manufacturer.
- Danger of fire due to flammable materials.
No flammable materials should be stored near the boiler. Flammable objects (e.g. clothing) must not be put on the boiler to dry.
- Damage due to impurities in combustion air.
Do not use any solvents or cleaning agents containing chlorine in the room where the boiler is installed.
- Keep the air suction opening of the boiler free from dust.

Ventilation of the boiler room

Ventilation air for the boiler room should be taken from and expelled directly outside, and the openings and air ducts should be designed to prevent weather conditions (foliage, snowdrifts, etc.) from obstructing the air flow.

Unless otherwise specified in the applicable building regulations for the boiler room, the following standards apply to the design and dimensions of the air ducts:

Note on standards

ÖNORM H 5170 - Construction and fire protection requirements

2.7.3 Requirements for central heating water

The following standards and guidelines apply:

Note on standards

Austria:	ÖNORM H 5195-1
Germany:	VDI 2035
Switzerland:	SWKI 97-1
Italy:	D.P.R. no. 412

NOTICE! Note on filling with make-up water: Always bleed the filling hose before connecting, in order to prevent air from entering the system.

Observe the standards and also follow the recommendations below:

- Max. cumulative value for alkaline earth: 1.0 mmol/l or 100 mg/l (corresponds to 5.6 dH)
- Use softened water as the make-up water
- Avoid leaks and use a closed heating system to maintain water quality during operation

2.7.4 Notes for using pressure maintenance systems

Pressure maintenance systems in hot-water heating systems keep the required pressure within predefined limits and balance out volume variations caused by changes in the hot-water temperature. Two main systems are used:

Compressor-controlled pressure maintenance

In compressor-controlled pressure maintenance units, a variable air cushion in the expansion tank is responsible for volume compensation and pressure maintenance. If the pressure is too low, the compressor pumps air into the tank. If the pressure is too high, air is released by means of a solenoid valve. The systems are built solely with closed-diaphragm expansion tanks to prevent the damaging introduction of oxygen into the domestic hot water.

Pump-controlled pressure maintenance

A pump-controlled pressure maintenance unit essentially consists of a pressure-maintenance pump, relief valve and an unpressurised receiving tank. The valve releases hot water into the receiving tank if the pressure is too high. If the pressure drops below a preset value, the pump draws water from the receiving tank and feeds it back into the heating system. Pump-controlled pressure maintenance systems with **open expansion tanks** (e.g. without a diaphragm) introduce ambient oxygen via the surface of the

water, exposing the connected system components to the risk of corrosion. These systems offer no oxygen removal for the purposes of corrosion control as required by VDI 2035 and **in the interests of corrosion protection should not be used.**

2.7.5 Return lift

If the hot water return is below the minimum return temperature, some of the hot water outfeed will be mixed in.

CAUTION

Risk of dropping below dew point/condensation formation if operated without return temperature control.

Condensation water forms an aggressive condensate when combined with combustion residue, leading to damage to the boiler.

Take the following precautions:

- Regulations stipulate the use of a return temperature control.
 - ➔ The minimum return temperature is 60 °C. We recommend fitting some sort of control device (e.g. thermometer).

2.7.6 Combination with storage tank

You can find more detailed information about storage tank design in the boiler assembly instructions.

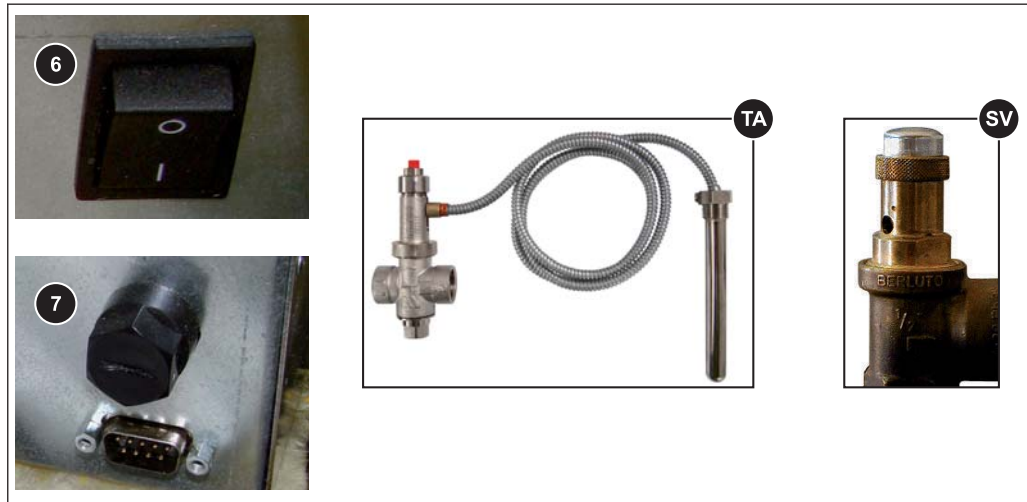
NOTICE! See "Design Information" section in the assembly instructions S1 Turbo

2.7.7 Chimney connection/chimney system

EN 303-5 specifies that the entire flue gas system must be designed to prevent, wherever possible, damage caused by seepage, insufficient feed pressure and condensation. Please note in this respect that flue gas temperatures lower than 160K above room temperature can occur in the permitted operating range of the boiler.

NOTICE! Please see the technical data contained in the assembly instructions for further information about standards and regulations as well as the flue gas temperatures when clean and the other flue gas values!

2.8 Safety devices

**6 MAIN SWITCH** (*switches off the power supply*)

Before cleaning work in/on the boiler:

- Turn off the main switch
 - The power to all components is switched off.
 - **WARNING!** Only switch off the boiler when the fuel has burnt down and the boiler has cooled off.

7 HIGH-LIMIT THERMOSTAT (STL) (*protection against overheating*)

The STL switches off the combustion system when the boiler reaches approx. 105°C. The pumps continue to run. Once the temperature falls below approx. 75°C, the STL can be reset mechanically.

TA THERMAL DISCHARGE VALVE (TA) (*protection against overheating*)

The thermal discharge valve opens at approx. 100°C and feeds cold water to the safety heat exchanger to lower the boiler temperature

SV SAFETY VALVE (*protection against overheating/excess pressure*)

When the boiler pressure reaches a maximum of 3 bar, the safety valve opens and the heated water is blown off in the form of steam.

2.9 Residual risks

WARNING

When the main switch is switched off in heating mode:

The boiler is not controlled. Any resulting boiler malfunctions can cause serious injury and damage.

Take the following precautions:

- Allow the fire to burn out completely and let the boiler cool
 - ID fan switches off when "Off" status has been reached (flue gas temperature < 80°C, boiler temperature < 65°C)
- Only then is it safe to switch off the main switch

WARNING

When touching hot surfaces:

Severe burns are possible on hot surfaces and the flue gas pipe!

When work is carried out on the boiler:

- Shut down the boiler in a controlled way (operating status "Off") and allow it to cool down
- Protective gloves must generally be worn for work on the boiler, and it should only be operated using the handles provided
- Insulate the flue pipes or simply avoid touching them during operation.



WARNING

When inspecting and cleaning the boiler with the main switch on:

Serious injuries possible due to boiler/individual components starting up automatically (induced draught)!

Before inspection and cleaning work in/on the boiler:

- Allow the fuel in the boiler to burn off
- Allow boiler to cool off and switch off main switch



WARNING

If non-permitted fuel types are used:

Non-standard fuels can cause serious faults in combustion (e.g. spontaneous combustion of carbonisation gases / flash fires) which can lead to serious accidents!

Take the following precautions:

- Only use fuels specified in the "Permitted fuels" section of these operating instructions.

2.10 Emergency procedure

2.10.1 Overheating of the system

If the system overheats and the safety devices fail, proceed as follows:

NOTICE! Do not under any circumstances switch off the main switch or disconnect the power supply.

- Keep all the doors on the boiler closed
- Open all mixing valve taps, switch on all pumps.
 - ➔ The Froling heating circuit control performs this function in automatic operation.
- Leave the boiler room and close the door
- Open any available radiator thermostat valves

If the temperature does not drop:

- Contact the installer or Froling customer services
 - ⇒ See "Addresses" [page 44]

2.10.2 Smell of flue gas

DANGER



If you smell flue gas in the boiler room:

Inhaling toxic flue gas can be fatal!

If you smell flue gas in the room where the boiler is installed:

- Keep all the doors on the boiler closed
- Shut down the boiler according to procedure
- Ventilate the room where the boiler is installed
- Close the fire door and doors to living areas

2.10.3 Fire in the system

DANGER



In case of fire in the system:

Risk of death by fire and poisonous gases

Emergency procedure in case of fire:

- Leave the boiler room
- Close the doors
- Inform the fire department

3 Operating the System

3.1 Assembly and initial startup

Assembly, installation and initial startup of the boiler must only be carried out by qualified staff, and these procedures are described in the accompanying assembly instructions.

NOTICE! See assembly instructions for the S1 Turbo

NOTICE

Optimum efficiency and efficient, low-emission operation can only be guaranteed if the system is set up by trained professionals and the standard factory settings are observed.

Take the following precautions:

- Initial startup should be carried out with an authorised installer or with Froling customer services

The individual steps for initial start-up are explained in the operating instructions for the controller

NOTICE! See operating instructions for the Lambdatronic S 3200 S1

The customer is responsible for ensuring the following prior to initial start-up of the system by Froling customer services:

- Electrical installation
 - Installation of water pipes
 - Flue gas connection including all insulation work
 - Work must comply with local fire protection regulations
-
- It is essential that the electrician who has carried out the installation work is available when starting up the system for the first time to make any changes to the wiring which may become necessary.
 - During initial start-up, operating staff are shown how to use the boiler. It is imperative for proper handover of the product that those involved are present as this is a one-off opportunity.

NOTICE

If condensation escapes during the initial heat-up phase, this does not indicate a fault.

- Tip: If this occurs, clean up using a cleaning rag.

3.2 Heating the boiler

3.2.1 Switching on the power supply



- Turn on the main switch
 - There is voltage at all of the boiler's components
 - When the control has completed the system start, the boiler is ready for operation

3.2.2 Switching on the boiler



- Press the standby key
 - Automatic mode is active
 - The heating system is controlled via the controller according to the selected mode in automatic mode
- For other modes press the relevant function key
 - Information on function keys in the relevant operating instructions for the "Lambdatronic S 3200 S1" boiler controller
- Switch the boiler on by tapping "Boiler ON"
 - Automatic mode is active
 - The heating system is controlled via the controller according to the selected mode in automatic mode
- For other modes press the relevant function key
 - Information on function keys in the relevant operating instructions for the "Lambdatronic S 3200" boiler controller

NOTICE! The storage tank can be loaded in all operating modes to ensure constant heat consumption.

3.2.3 Before heating up the boiler

Reloading intervals when operating with storage tank

Reloading intervals and amounts should be determined exclusively according to the storage tank for efficient and environmentally-friendly heating.

- Check the store load status on the display

Load status	Procedure
	No bars or one bar in the store load status means that the storage tank needs to be heated up by approx. 35°C. ⇒ See "Determining the right amount of fuel" [page 21]
	Two bars in the store load status mean that the storage tank needs to be heated up by approx. 20°C. ⇒ See "Determining the right amount of fuel" [page 21]
	Three or four bars in the store load status mean that the storage tank cannot take any more heat, or only a small amount. In this case do not add fuel!

Determining the right amount of fuel

The amount of fuel added should allow the storage tank to be constantly heated to the max. storage tank temperature (= boiler target temperature). Please note that the amount to reload also depends on the type of fuel.

Example: Heat a 2000 litre storage tank by 30°C

The calculation below only takes into account the storage tank. It does not take into account the boiler efficiency, pipe losses and the energy required to heat the boiler and heating system.

Assumption: The storage tank currently has a temperature of 50°C and should be heated to 80°C. The calculation below shows how much fuel is required for heating. First we calculate the energy required:

As the medium to be heated is water and the mass is roughly the same as the volume (2000 litres = 2000 kg), we can use the simplified formula $Q = m \times c \times \Delta t$.

Q = energy required

m = mass of the medium to be heated

c = heat capacity of the medium to be heated (constant for water)

Δt = temperature difference between start and end temperature¹⁾

Mass (m) x heat capacity (c) x temperature difference (Δt) = energy (Q)

2000 kg x 1.163 Wh/kgK x 30 K = 69 780 Wh

69 780 Wh = **69.8 kWh**

Heating a 2000 litre storage tank from 50°C to 80°C requires approx. 69.8 kWh of energy.

1. Temperature difference in Kelvins (K). As these are not absolute temperatures the value can be entered in degrees Celsius (°C). (30°C equals 30°K)

The amount of fuel can now be calculated from the energy required:

For our sample calculation we used beech with a water content w=20%. The energy content of the fuel varies according to the type of wood and the water content. (⇒ See "Fuel table" [page 22])

Energy required = 69.8 kWh (from calculation above)

Energy content of fuel = 3.8 kWh/kg (beech, w=20%)

Energy required / energy content of fuel = amount of fuel

69.8 kWh / 3.8 kWh/kg = **18.4 kg**

Approx. 18.4 kg beech wood (w=20%) is required to heat a 2000 litre storage tank from 50 °C to 80 °C.

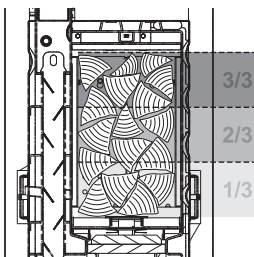
Fuel table

The table below shows a selection of wood types with the corresponding energy content depending on the water content:

Wood type	Energy content with water content [kWh/kg]		
	w = 15%	w = 20%	w = 25%
Spruce	4.3	4.0	3.7
Pine	4.3	4.0	3.7
Beech	4.1	3.8	3.5
Oak	4.1	3.8	3.5

Fill level in boiler

The table below shows the relationship between fill level and weight. It compares beech (example of hardwood) and spruce (example of soft wood) with a water content of approx. 20%. Using our example above with beech, the fill level of an S1 Turbo 15 would, therefore, be approximately two-thirds.



Fill level		Weight at fill level	
		S1 Turbo 15/20	
3/3	Beech	approx. 28 kg	
	Spruce	approx. 17 kg	
2/3	Beech	approx. 19 kg	
	Spruce	approx. 12 kg	
1/3	Beech	approx. 9 kg	
	Spruce	approx. 6 kg	

Reloading intervals when operating without storage tank or if the storage tank is too small**NOTICE****Feed based on output:**

Only replenish the fuel if energy is needed!

- If too much fuel is loaded, the boiler drops below its minimum output limit and goes over to "constant burn" operating status (blower fan switches off)
 - The level of efficiency drops in constant burn mode, the emissions increase and the boiler can tar up (pitch formation!)

3.2.4 Heating up the boiler



- Open the insulated door and the fuel loading door
- Check the ash level in the combustion chamber and clean if necessary
 - Recommendation: Do not remove the ash in the combustion chamber each time you heat up the boiler, only when the middle row of holes in the cladding plates is no longer visible. This protects the combustion chamber and makes the heating-up process more efficient.



- Add one layer of firewood
 - Use firewood with a length of approximately 50 cm and arrange it lengthwise
 - Do not cover the flame slot entirely
- Place some crumched-up paper at the front against the fuel loading door



- Cover the first layer of firewood with cardboard
- Fill the fuel loading chamber in accordance with the output
 - ⇒ See "Determining the right amount of fuel" [page 21]



- Close the carbonisation gas duct flap by pulling out the lever
 - The carbonisation gas duct is closed to provide a better draught during the heating-up process
- Light the paper



If the negative pressure from the induced draught fan is too strong for the firing material to be ignited:

- Press the Down arrow in the navigation keys (6.3) briefly
 - The induced draught fan switches off
- Light the firing material
- Press the Up arrow in the navigation keys (6.3) briefly
 - The induced draught fan switches on
- Leave the fuel loading door open for approximately 5 minutes
 - A bed of embers forms
- Close the fuel loading door
 - The flue gas temperature must be > 130°C

3.2.5 Regulating the boiler

For the necessary steps, and how to display and alter parameters:

NOTICE! See operating instructions for boiler controller!

3.2.6 Reloading firewood

WARNING



When reloading firewood when the boiler is hot:

Risk of injury from handling firewood or of burns from hot surfaces.

By the nature of its operation, the surfaces and operating elements get hot! There is also a risk of injury from splinters when working with firewood.

- When working on the boiler during operation, particularly when reloading fuel, always wear protective gloves.

WARNING



Opening the fuel loading door

can cause injury, damage and smoke!

- Open the fuel loading door slowly and with care
- Close the fuel loading door again immediately after checking/reloading

If additional heat is required by connected heating systems (e.g. storage tank too cold, storage tank not yet fully loaded, etc.) proceed as follows:

- Slowly open the insulated door and fuel loading door and check the fuel



If the fuel in the boiler has burnt down:

- Refill with fuel
 - ⇒ See "Determining the right amount of fuel" [page 21]

If there is enough fuel in the boiler:

- Close the fuel loading door immediately

4 Boiler Servicing

4.1 General information on servicing

DANGER



When working on electrical components:

Risk of electrocution!

When work is carried out on electrical components:

- Only have work carried out by a qualified electrician
- Observe the applicable standards and regulations
 - ➔ Work must not be carried out on electrical components by unauthorised persons

WARNING



During inspection and cleaning work on the hot boiler:

Hot parts and the flue spigot can cause serious burns!

- Always wear protective gloves when working on the boiler
- Only operate the boiler using the handles provided
- Before inspection and cleaning work in/on the boiler, allow the fuel in the boiler to burn off
- Allow boiler to cool off and switch off main switch

WARNING



When inspecting and cleaning the boiler with the main switch on:

Serious injuries possible due to boiler/individual components starting up automatically (induced draught)!

Before inspection and cleaning work in/on the boiler:

- Allow the fuel in the boiler to burn off
- Allow boiler to cool off and switch off main switch

WARNING



Incorrect inspection and cleaning:

Incorrect or insufficient inspection and cleaning of the boiler can cause serious faults in combustion (e.g. spontaneous combustion of carbonisation gases / flash fires) and this can lead to serious accidents and damage!

Take the following precautions:

- Clean the boiler following the instructions in the instruction manual. Follow the boiler operating instructions.

NOTICE

We recommend you keep a maintenance book in accordance with ÖNORM M7510.

4.2 Inspection and cleaning

- Regular cleaning of the boiler extends its life and is a basic requirement for smooth running.
- Recommendation: use an ash vacuum for cleaning.

4.2.1 Inspection

Checking the system pressure



- Check the system pressure on the pressure gauge
 - The value must be 20% above the pre-stressed pressure of the expansion tank
- NOTICE! Check that the position of the pressure gauge and rated pressure of the expansion tank match your installer's specifications!**

If the system pressure decreases:

- Top up with water
 - NOTICE! If this happens frequently, the seal of the heating system is faulty! Inform your installer**

If large pressure fluctuations are observed:

- Ask an expert to inspect the expansion tank

Checking the thermal discharge safety device



- Check the seal of the discharge valve
 - The discharge pipe must not drip
- NOTICE! Exception: Boiler temperature > 100 °C**

If water is dripping from the discharge pipe:

- Clean the discharge safety device in accordance with the manufacturer's instructions or have it checked/replaced by the installer if necessary

Checking the safety valve



- Check the seal of the safety valve regularly and ensure that the valve is not dirty
- NOTICE! Inspection work must be carried out in accordance with the manufacturer's instructions.**

4.2.2 Cleaning

The frequency at which the following cleaning work is carried out depends on energy requirements, fuel quality and number of operating hours.

Removing ash

Recommendation: Do not remove the ash in the combustion chamber each time you heat up the boiler, only when the middle row of holes in the cladding plates is no longer visible. This protects the combustion chamber and makes the heating-up process more efficient.

Carry out all other cleaning work described in the Cleaning section in the same way.



- Open the fuel loading door and remove ash from above the combustion chamber using the ash shovel
- Move the remaining ash down into the combustion chamber below with the furnace tool
- Open the combustion chamber door



- Scrape the ash in the combustion chamber into the ash shovel
- Scrape the ash from the sides of the combustion chamber into the ash shovel
- Shovel the ash into the container provided
 - Use a fire-proof container with cover

Cleaning the combustion grate

- Open the fuel loading door
- Remove the combustion grate
- Remove ash deposits from the combustion grate and secondary air inlets

Cleaning the heat-exchanger pipes (without WOS lever)

For boilers fitted with a WOS lever (optional):

⇒ See "Cleaning the heat-exchanger pipes (with WOS lever - optional)" [page 35]



- Lift off the controller cover and the side insulating mat



- Undo the screws and remove the cleaning lid
- Remove the WOS turbulators and clean them



- Clean the heat-exchanger pipes with the brush provided
 - Push the cleaning brush all the way through before pulling it up
 - The bristles cannot be turned in the pipe
- Clean the side passage to the flue gas pipe
 - TIP: Use an ash vacuum

- After cleaning, reassemble the components in the reverse order

4.2.3 Periodic inspection and cleaning

The boiler must be cleaned and inspected at appropriate intervals depending on the service hours and fuel quality.

For fuels with a low ash content, annual cleaning and inspection (1000 to 1500 service hours) is usually sufficient. For less efficient fuels and fuels with a high ash content (indicated by short emptying intervals for the ash container), the work should be carried out correspondingly more frequently.

Cleaning the carbonisation gas duct



- Open the fuel loading door and clean the carbonisation gas duct with a small brush

Checking the primary air openings

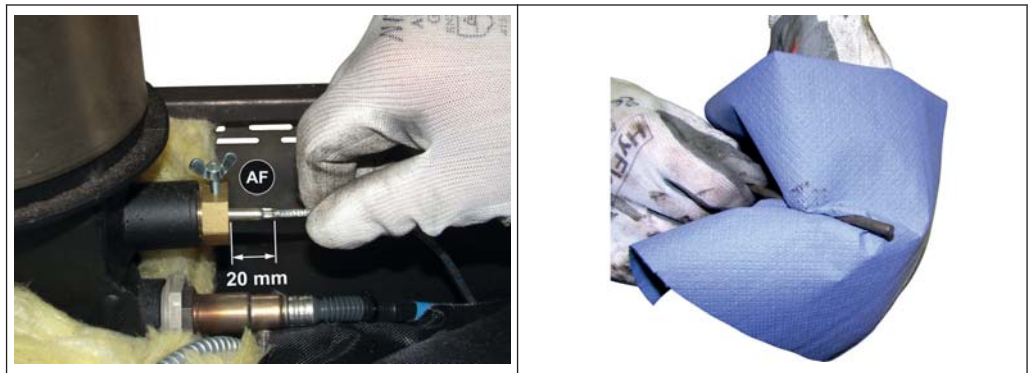


- Open the fuel loading door and unhinge the cladding plates
- Check the primary air openings inside the boiler for unobstructed air flow and clean if necessary



- Unhinge the front air guide plate
- Clean the air openings in the guide plate
- Check the air inlet inside the boiler for unobstructed air flow and clean if necessary

Cleaning the flue gas temperature sensor



- Release the retaining screw and take the flue gas temperature sensor (AF) out of the flue gas pipe
- Wipe the flue gas temperature sensor with a clean cloth
- Push in the flue gas temperature sensor until about 20 mm of the sensor remains protruding from the bushing and secure with fixing screw

Cleaning the flue gas pipe

- Switch off the induced draught fan
 - This prevents damage to the fan from the cleaning brush
- Remove the inspection cover on the connecting pipe
- Clean the connecting pipe between the boiler and chimney with a chimney sweeping brush
 - Depending on the layout of the flue gas pipes and the chimney draught, cleaning once a year may not be enough!

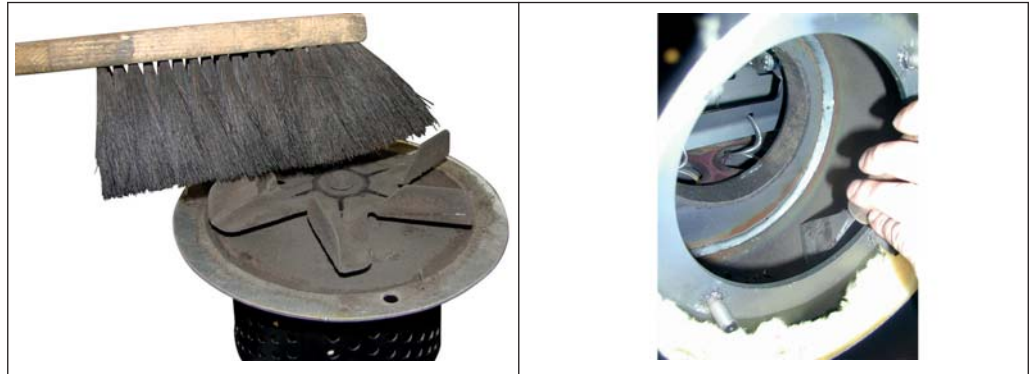
Checking the draught controller flap

- Check that the draught controller flap moves freely

Cleaning the induced draught fan

Check the induced draught fan for dirt and deposits and clean if necessary

Cleaning (if required)



- Unplug the connection cable of the induced draught fan
- Remove the induced draught fan from the back of the boiler
 - Take care not to damage the seal
- Check for damage
- Clean the fan wheel from the inside out using a soft brush or paint brush

- Remove dirt and deposits from the induced draught housing using a scraper
- Remove any ash which has gathered using an ash vacuum
- Fit the induced draught fan
- Plug in the connection cable and secure with cable ties

Cleaning the heat-exchanger pipes (with WOS lever - optional)

On boilers not fitted with a WOS lever, the heat-exchanger pipes will need cleaning correspondingly more often.

⇒ See "Cleaning the heat-exchanger pipes (without WOS lever)" [page 30]



- Lift off the controller cover and the side insulating mat



- Undo the screws and remove the cleaning lid
- Remove the cover from the front of the insulation



- Push the WOS lever down and remove it from the shaft
- Remove the pipe locking pin connecting the shaft and the stay tube



- Pull the shaft out of the brass bushing
- Remove the WOS turbulators together with the stay tube and clean them



- Clean the heat-exchanger pipes with the brush provided
 - Push the cleaning brush all the way through before pulling it up
 - The bristles cannot be turned in the pipe
- Clean the side passage to the flue gas pipe
 - TIP: Use an ash vacuum

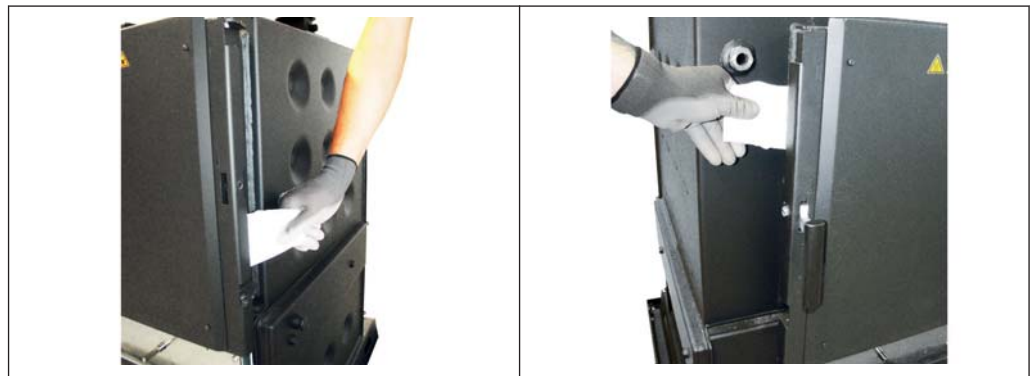
- After cleaning, reassemble the components in the reverse order

Checking the seal on the doors

The example below shows how to check the seal on the fuel loading door. The procedure is the same for checking the seal on the combustion chamber door.



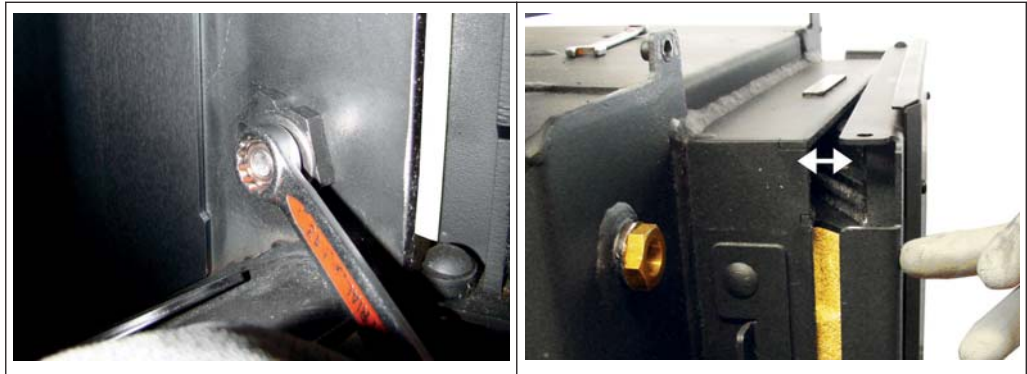
- Insert a sheet of paper at the side of the door stop at the top between the door and the boiler
- Close the door
- Try to pull out the sheet of paper
 - If the paper cannot be removed:
The door seal is OK and the settings are correct
 - If the paper can be removed:
The door seal is not OK and will need to be reset
Increase the contact pressure at the locking cam:
⇒ See "Positioning the doors" [page 38]
- Check the seal again after positioning the doors



- Repeat the procedure at the side of the door stop at the bottom and at the side of the door handle

Positioning the doors

The example below shows how to position the fuel loading door. The procedure is the same for positioning the combustion chamber door.



- Using an Allen key (13 mm), loosen the lock nuts on the locking cams at the top and bottom
- Close the door
 - With a gap of approx. 2 to 3 cm there must be a noticeable resistance



- If the resistance is too low or too high, move the locking cams backwards or forwards using an Allen key (32 mm)
 - The movement of the locking cams causes the hinged plate to move, allowing the contact pressure to be adjusted
 - Caution: Both locking cams (top and bottom) must be aligned in the same way
- Close the door
- If the door will not close, move the locking cams forward slightly
 - Caution: Both locking cams (top and bottom) must be aligned in the same way
- Secure the lock nuts again

The locking plate can be moved in the same way using the locking cam at the side of the door handle, allowing the contact pressure to be adjusted on this side

4.3 Emissions measurement by chimney sweep or regulatory body

Various legal regulations stipulate that heating systems must be inspected periodically. In Germany this is regulated by the First Federal Emissions Protection Ordinance (BimSchV) in the last amended version, and in Austria by various state laws. The boiler must always be cleaned 2-3 heating days prior to measurement. It is important to ensure that there is adequate heat consumption on the day of the measurement. (e.g. storage tank must be able to take heat for the duration of the measurement).

4.3.1 Measuring at rated load in firewood mode

- Press the service program key
- Activate "Chimney-sweep mode" in the quick menu
 - The boiler runs for 45 minutes at nominal load
 - Boiler temperature is set to 85°C
 - Heating pumps switch on and the mixer valves open
 - Boiler loading is activated
- Perform the measurement under the following conditions
 - Flue gas temperature at approx. 170°C
 - CO₂ content of the flue gas between 10 and 14%
 - Boiler temperature above 65°C

4.4 Maintenance agreement / Customer service

NOTICE! We recommend a yearly inspection by Froling customer services or an authorised partner (third party maintenance).

Regular maintenance and servicing by a heating specialist will ensure a long, trouble-free service life for your heating system. It will ensure that your system stays environmentally-friendly and operates efficiently and cost-effectively.

In the course of this maintenance the entire system is inspected and optimised, particularly regulation and control of the boiler. The emission measurement carried out can also be used to draw conclusions about the combustion performance of the boiler. For this reason, FROLING offers a service agreement, which optimises operating safety. Please see the details in the accompanying guarantee certificate.

Your Froling customer service office will also be happy to advise you.

NOTICE

All national and regional regulations relating to regular testing of the system must be observed. Please be advised that, in Austria, commercial systems with a rated heat output of 50 kW or more must be regularly tested at yearly intervals in accordance with the Heating Plant Regulations (Feuerungsanlagen-Verordnung).

4.5 Replacement parts

With Froling original replacement parts in your boiler, you are using parts that match perfectly. As the parts fit together so well, installation times are shortened and a long service life is maintained.

NOTICE

Installing non-original parts will invalidate the guarantee.

- Only replace components or parts with original replacement parts

4.6 Disposal information

4.6.1 Disposal of the ash

- The ash should be disposed of in accordance with waste management regulations.

4.6.2 Disposal of system components

- Ensure that the system is disposed of in an environmentally friendly way in accordance with waste management regulations.
- You can separate and clean recyclable materials and send them to a recycling centre.
- The combustion chamber must be disposed of as builders' waste.

5 Troubleshooting

5.1 Carbonisation gas duct flap is stiff

Error characteristics	Possible cause	Elimination of error
Carbonisation gas duct flap is stiff Little or no draught through the combustion chamber when the flap is closed	Flap guide blocked Flap cannot be closed due to dirt and deposits	Check the area under the inspection cover for dirt and deposits and clean if necessary

Clean the carbonisation gas duct flap



- Lift off the controller cover and remove the insulating mat beneath it
- Unfasten the screws on the inspection cover



- Lift off the inspection cover
- Clean the carbonisation gas duct flap and flap guides
- Clean the entire area using a brush and ash vacuum

5.2 General fault with power supply

Error characteristics	Cause of error	Elimination of error
Nothing is shown on the display No power to the controller	General power failure Main switch is turned off FI circuit breaker or line protection is switched off Faulty fuse in the controller	Turn on the main switch Switch on the FI circuit breaker or line protection Replace the fuse – note the amperage (6.3AT)

5.2.1 Behaviour of system after a power failure

When the power supply has been restored, the boiler returns to the previous mode and is controlled according to the specified program.

- After a power failure, check whether the STL (high-limit thermostat) has tripped.
- Keep the doors of the boiler closed during and after the power failure, at least until the induced draught fan automatically starts up again.

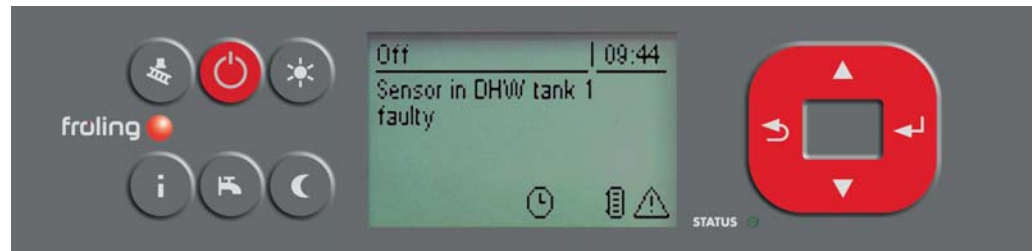
5.3 Excessive temperature



Once the temperature falls below approx. 75°C, the STL (high-limit thermostat) can be reset mechanically:

- Unscrew the cap on the STL (high-limit thermostat)
- Unlock the STL (high-limit thermostat) by pressing with a screwdriver

5.4 Faults with fault message



If a fault has occurred and has not yet been cleared:

- Status LED indicates the nature of the fault
 - Orange flashing: Warning
 - Red flashing: Error or alarm
- A fault message is shown on the display

5.4.1 Procedure for fault messages

The procedure in the case of a fault message, the causes of faults and procedure for troubleshooting are described in the operating instructions for the boiler controller:

IMPORTANT! See operating instructions for the Lambdatronic S 3200 S1

5.4.2 Acknowledging a fault message

Trace and remove the fault and then:

- Press the Enter key
 - Status LED constant or flashing green (depending on operating status)
 - Green constant: Heating
 - Green flashing: Off

Trace and remove the fault and then:

- Tap the "Cancel" symbol
 - Status LED constant or flashing green (depending on operating status)
 - Green constant: Heating
 - Green flashing: Off

6 Appendix

6.1 Addresses

6.1.1 Address of manufacturer

FRÖLING
Heizkessel- und Behälterbau GesmbH

Industriestraße 12
A-4710 Grieskirchen
AUSTRIA

TEL 0043 (0)7248 606 0
FAX 0043 (0)7248 606 600
INTERNET www.froeling.com

6.1.2 Address of the installer

Stamp