

# froling

Operating instructions

## Firewood boiler S3 Turbo 18-45



Translation of original German version of operating instructions for operators.

Read and follow all instructions and safety instructions.  
All errors and omissions excepted.

CE

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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](mailto:doku@froeling.com).

Subject to technical change.

## Warranty and Guarantee Conditions

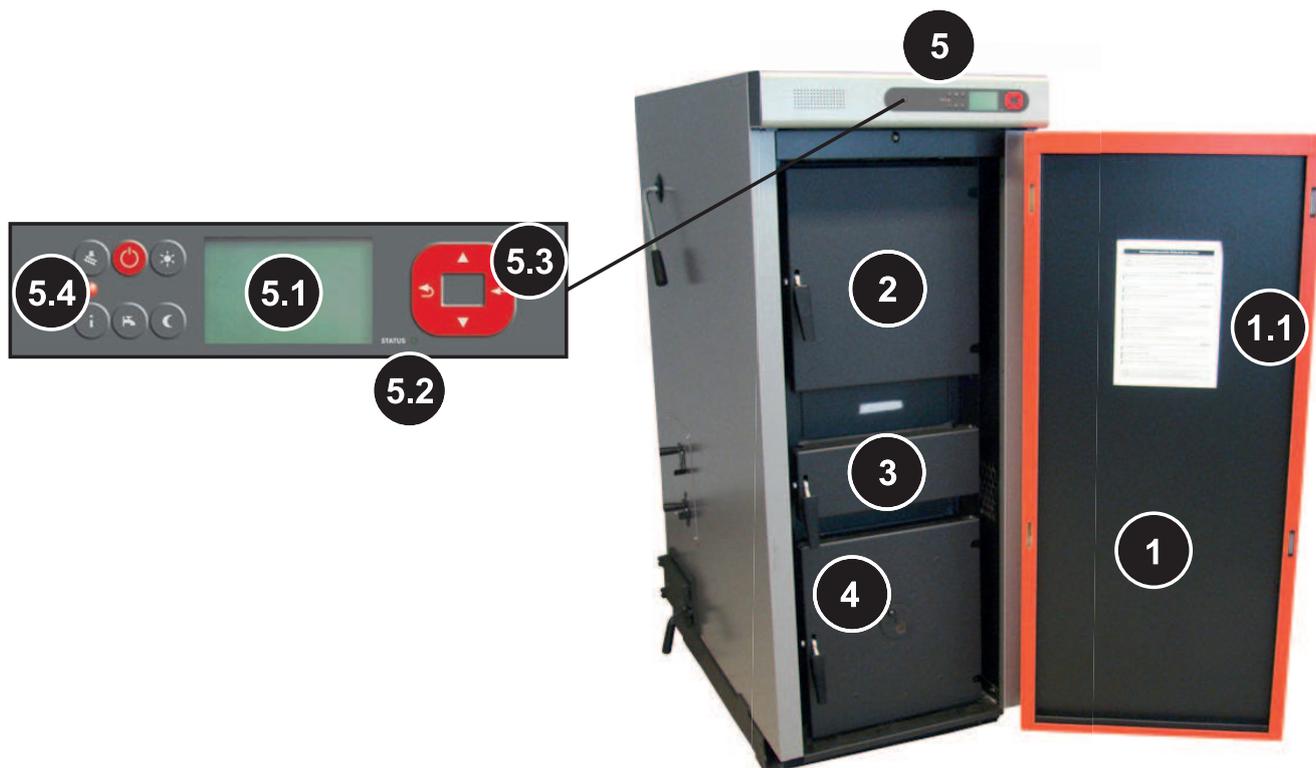
Our sale and delivery conditions will be applicable. These conditions have been made available to customers, and customers have been made aware of them at the time of order completion.

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

## 1.1 Operating principle

The Fröling S3 Turbo is a wood boiler for the non-condensing combustion of firewood. The fuel loading chamber is filled with fuel via the fuel loading door located behind the heat insulated door on the front of the boiler. The combustion grate, through which the combustion gases are sucked into the combustion chamber by the induced draught fan, is located below the fuel loading chamber. When the induced draught fan is used, the combustion air around the pre-heating chamber door is sucked in and channelled to the fuel via regulating flaps on the side air boxes (primary and secondary air). The boiler water and flue gas temperature are regulated by the induced draught fan. The primary air is used to adjust the boiler to the fuel and set the required output. The secondary air is used to set the combustion performance which can be done optionally using the manual adjuster or the Lambda probe and servo-motor. The flue gas travels through the heat exchanger to the flue gas outlet. In order to optimise heat transfer and for cleaning purposes, the heat exchanger pipes are fitted with a manual Efficiency Optimisation System (WOS), which can be operated using a lever on the outside of the boiler. The ash deposits at the bottom of the combustion chamber and below the heat exchanger pipes can be removed via the combustion chamber door on the front of the boiler.

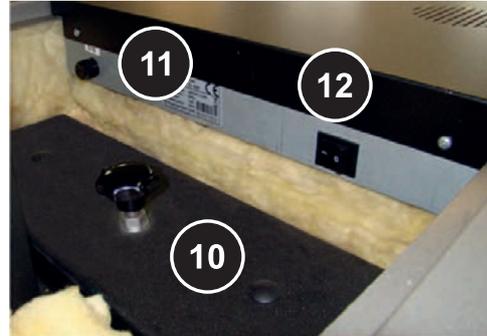
## 1.2 S3 Turbo Product Overview



1	Insulated door
1.1	Maintenance overview
2	Fuel loading door
3	Pre-heating chamber door
4	Combustion chamber door with inspection glass
5	S-Tronic Plus / S-Tronic Lambda controller
5.1	Visual display showing operating statuses and parameters
5.2	Status LED to display the operating status: <ul style="list-style-type: none"> <li>- GREEN constant: BOILER ACTIVE (operating status: warming up/heating)</li> <li>- GREEN flashing (interval: 5 sec. OFF, 1 sec. ON): OFF</li> <li>- ORANGE flashing: WARNING</li> <li>- RED flashing: FAULT</li> </ul>
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
<b>NOTICE! For the assignment of the keys see the operating instructions for boiler controller</b>	



Underneath the back insulating cover (9):



6	Lever of the heat exchanger cleaner (WOS system)
7	<b>for S-Tronic Plus:</b> Manual adjusters for primary and secondary air <b>for S-Tronic Lambda:</b> Servo-motors for primary and secondary air (Air flow is set by the specialist during initial commissioning)
8	Cleaning door
9	Back insulating cover
10	Heat exchanger cover: Maintenance opening for cleaning the WOS system and heat exchanger
11	STL high-limit thermostat
12	Main switch

## 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.*

#### **NOTICE**

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

## 2.2 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 respective manuals.
- Any work above and beyond this (e.g. servicing) must be carried out by a heating engineer approved by Fröling Heizkessel- und Behälterbau GesmbH or by Fröling 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.

## 2.3 Permitted uses

The Froling Firewood boiler S3 Turbo is designed solely for heating domestic water. Only the fuels specified in the "Permitted fuels" section may be used.

➔ "Permitted fuels" [▶ 9]

The unit should only be operated when it is in full working order. It must 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 must 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.

Only original spare parts or specific alternative spare parts authorised by the manufacturer may be used. Any kind of change or modification made to the product will invalidate the manufacturer's conformity with the applicable guideline(s). In such cases, the product will need to undergo new hazard evaluation procedures by the operator. The operator will then be fully responsible for the declaration of conformity according to the valid guideline(s) for the product and will need to issue a corresponding declaration for the device. This person will then assume all of the rights and responsibilities of a manufacturer.

### 2.3.1 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.

The Froling S3 Turbo 20, S3 Turbo 30, S3 Turbo 40 and S3 Turbo 45 have been recommended as suitable for use in smoke control areas when burning fuels as listed under "Permitted fuels".

### 2.3.2 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 as per EN ISO 17225 – Part 5: Firewood class A2 / D15 L50
Additional for Germany:	Fuel class 4 (§3 of the First Federal Emissions Protection Ordinance (BimSchV) in the last amended version)

*Tips for storing wood*

- 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
- Create a dry underlay, where possible with air access (line with round timber, pallets, etc.)
- stack split wood and store in such a way that it is protected from the elements
- If possible, stock fuel for the day in a warm place (e.g. in boiler room) (pre-heats the fuel!)

## Storage time dependent upon water content

	Wood type	Water content	
		15 – 25%	less than 15 %
Storage in heated and ventilated room (approx. 20°C)	Soft wood (e.g. spruce)	approx. 6 months	from 1 year
	Hardwood (e.g. beech)	1 – 1.5 years	from 2 years
Outdoor storage (protected from elements, exposed to wind)	Soft wood (e.g. spruce)	2 summers	from 2 years
	Hardwood (e.g. beech)	3 summers	from 3 years

Freshly cut wood has an approximate water content of 50 to 60% depending on when it was harvested. As the above table shows, the water content of the firewood decreases the longer the wood is stored depending on how dry and warm the storage location is. The ideal water content of firewood is between 15 and 25%. If the water content falls below 15%, we recommend you adjust the combustion control to the fuel.

## 2.3.3 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 as per EN ISO 17225 - Part 3: wood briquettes class B / D100 L500 Form 1 - 3
Additional for Germany:	Fuel class 5a (§3 of the First Federal Emissions Protection Ordinance (BImSchV) - applicable version)

*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 ISO 17225-5 (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.

### 2.3.4 Non-permitted fuels

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

#### NOTICE

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:

- Use only the permitted fuels

### 2.4 Qualification of operating staff

#### ⚠ CAUTION



If unauthorised persons enter the Installation 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.

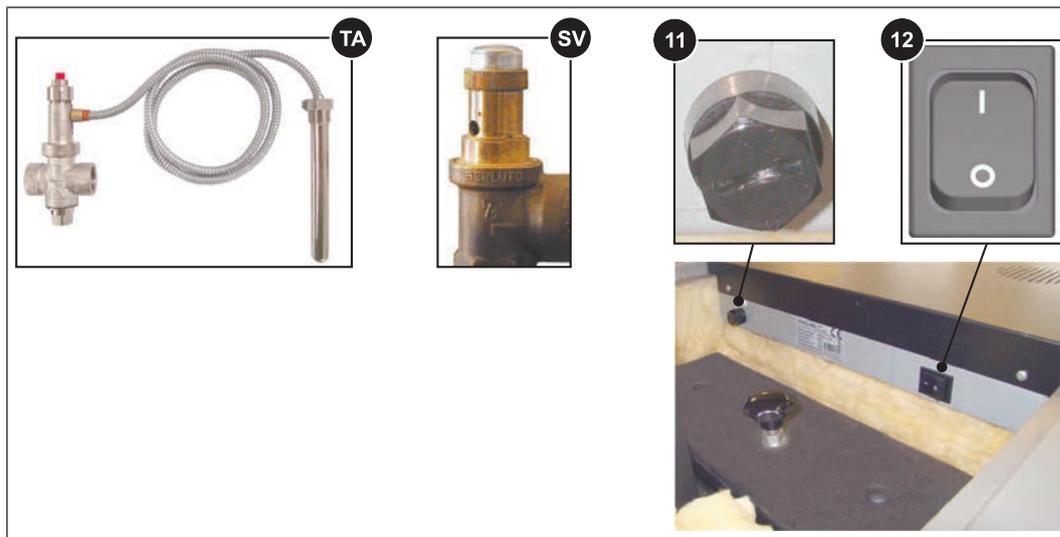
### 2.5 Protective equipment for operating staff

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
  - dust mask

## 2.6 Safety devices



Underneath the back insulating cover:

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

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

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

For shutting down the entire system

- 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.

**TA THERMAL DISCHARGE VALVE** (*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.

## 2.7 Residual risks

### WARNING

When the main switch is switched off in heating mode:

**The boiler is placed in an uncontrolled state. Any resulting boiler malfunctions can cause serious injury and damage.**

Therefore:

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

### 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 according to procedure ("Off" operating status) and allow it to cool down
- Protective gloves must usually be worn for work on the boiler, and it should only be operated using the handles provided
- Insulate the flue gas pipes and do not touch them during operation

### WARNING

If you open the combustion chamber door, pre-heating door, fuel loading door during operation:

**This may result in injury, damage or flue gas generation!**

Take the following precautions:



- Do not open the combustion chamber door or pre-heating chamber door while the boiler is running
- Keep the fuel loading door closed during operation and only open briefly during reloading intervals
- Protective gloves must be worn for work on the boiler, and it should only be operated using the handles provided

### 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.

### 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

## 2.8 Emergency procedure

### 2.8.1 Overheating of the system

If the system overheats and the safety devices fail to operate, 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 takes on this function in automatic operation.
- Leave the boiler room and close the door
- Open any thermostatic valves on the radiator and ensure sufficient heat dissipation from the rooms

**If the temperature does not drop:**

- Contact the installer or Froling customer services

### 2.8.2 Smell of flue gas

**⚠ DANGER**



If you smell flue gas in the boiler room:

**Inhaling toxic flue gas can potentially be fatal!**



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

- Keep all the doors on the boiler closed
- Ventilate the room where the boiler is installed
- Close the fire door and doors to living areas
- Allow the fire to burn out completely and let the boiler cool

**Recommendation:** Do not install smoke alarms and carbon monoxide detectors near the system.

### 2.8.3 Power failure / induced draught fan failure

A power failure, among others, can be identified based on the following points:

- Display remains dark despite touching it
- LED status does not flash / light up
- No noise from the units (e.g. induced draught fan) can be heard

If the induced draught fan fails when there is power supply, the display shows the error message “ID fan does not rotate, in spite of full activation”.

#### DANGER



In the event of a power failure or induced draught fan failure during heating mode:

***The boiler is placed in an uncontrolled state. Life-threatening injury is possible when opening the doors.***



What to do in the event of a power failure / induced draught fan failure:

- Keep all the doors on the boiler closed
- Ventilate the room where the boiler is installed
- Close the fire door and doors to living areas
- Allow the fire to burn out completely and let the boiler cool

**Recommendation:** Equip the boiler with an uninterruptible power supply (UPS). This ensures correct combustion of the firewood and prevents possible uncontrolled conditions (tarring of the heat exchanger etc.).

Please refer to section entitled “Technical specifications” in the installation instructions for the boiler on how to design an uninterruptible power supply.

**Recommendation:** Do not install smoke alarms and carbon monoxide detectors near the system.

### 2.8.4 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 room in which the boiler is installed and close the doors
- Press the on-site EMERGENCY STOP button
- Inform the fire department

## 3 Notes for operating a heating system

Carrying out modifications to the system and changing or disabling safety equipment is prohibited.

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

### 3.1 Installation and approval

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

*Note on standards*

EN 12828 - Heating Systems in Buildings

**IMPORTANT: Every 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:** report to the construction authorities of the community or magistrate

**Germany:** report new installations to an approved chimney sweep / the building authorities.

#### 3.1.1 Obligation to report as a condensing boiler system

A condensing boiler system with condensate discharge must be reported to the responsible regional authorities (for instance the water and sewage board in Austria).

### 3.2 Installation site

**Requirements for the load bearing substrate:**

- Flat, clean and dry
- Non-combustible and with sufficient load-bearing capacity

**Conditions at the installation site:**

- Protecting the system against frost
- Sufficiently well lit
- Free of explosive atmospheres such as flammable substances, hydrogen halides, cleaning agents and consumables
- Installation at altitude higher than 2000 metres above sea level only after consultation with the manufacturer
- The system must be protected against gnawing and nesting by animals (such as rodents)
- No flammable materials in proximity to the system
- Observe national and regional regulations regarding the installation of smoke detectors and carbon monoxide detectors

## 3.3 Combustion air

### 3.3.1 General requirement

For safe operation, the boiler requires around 1.5 - 3.0 m<sup>3</sup> of combustion air per kW nominal heat output and operating hour. The air supply can be provided by free ventilation (e.g. windows, air shaft), mechanical ventilation from outside or, if necessary, from the group of rooms.

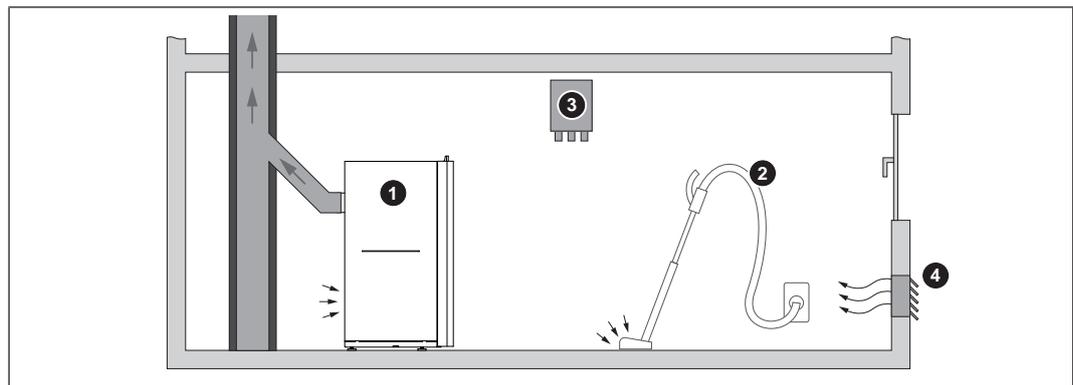
The boiler is operated depending on the room air, whereby the combustion air is taken from the installation site.

A suitable air supply must ensure that no impermissible under-pressure greater than 4 Pa is created at the installation site. The use of safety devices (under-pressure monitoring system) may be necessary, particularly if the boiler is operated concurrently with air-suction systems (such as an extractor fan).

Local **NOTICE! Safety equipment and conditions for the operation of the boiler (room air-dependent / room air-independent) must be clarified with the local authority (authority, chimney sweep, ...).**

### 3.3.2 Room air-independent operation

The combustion air is taken from the installation site. The unpressurised flow of the required air quantity must be ensured accordingly.



- |   |  |
|---|--|
| 1 | Boiler in room air-dependent operation   |
| 2 | Air extraction system (such as centralised dust extraction system, room ventilation) |
| 3 | Under-pressure monitoring system   |
| 4 | Combustion air supply from outside   |

The minimum cross-sectional area of the supply air opening from outside depends on the nominal heat output of the boiler.

Austria	400 cm <sup>2</sup> net minimum cross-sectional area plus 4 cm <sup>2</sup> for every kW of nominal heat output above 100 kW
Germany	150 cm <sup>2</sup> net minimum cross-sectional area plus an additional 2 cm <sup>2</sup> for every further kW of nominal heat output above 50 kW

Examples

Nominal heat output [kW]	Minimum free cross-section [cm <sup>2</sup> ]									
	10	15	20	30	50	100	150	250	350	500
Austria	400	400	400	400	400	400	600	1000	1400	2000
Germany	150	150	150	150	150	250	350	550	750	1050

Combustion air can also be supplied from other rooms if it can be proven that sufficient combustion air can flow in whilst all mechanical and natural ventilation systems are in operation. The installation site must have a minimum volume in accordance with the applicable regional standards.

Note on standards

Austria:	OIB Guideline 3 - Hygiene, health and environmental protection
Germany:	Model Firing Ordinance (MFeuV)

### 3.4 Domestic hot water

Unless contrary to other national regulations, the latest versions of the following standards and guidelines apply:

Austria:	ÖNORM H 5195	Switzerland:	SWKI BT 102-01
Germany:	VDI 2035	Italy:	UNI 8065

Observe the standards and also follow the recommendations below:

- Use prepared water which complies with the standards cited above for filling and make-up water
- Avoid leaks and use a closed heating system to maintain water quality during operation
- When filling with top-up water, always vent the filling hose before connecting it, in order to prevent air being drawn into the system
- Check that the heating water is clear and free of substances that can be deposited as sediments
- Check that the pH value is between 8.2 and 10.0. If the central heating water comes into contact with aluminium, the pH value must be between 8.2 and 9.0, as specified in VDI 2035
- The use of fully demineralised filling and top-up water with an electrical conductivity not exceeding 100 µS/cm is recommended by EN 14868
- After the first 6-8 weeks, check the heating water to ensure that the specified values are being adhered to
- Unless specified otherwise by regional standards and regulations, perform an annual check on the heating water

#### Filling and make-up water as well as heating water to VDI 2035 Sheet 1:2021-03:

Total heat output in kW	Total earth alkalis in mol/m <sup>3</sup> (total hardness in °dH)		
	Specific system volume in l/kW heat output <sup>1)</sup>		
	≤ 20	20 to ≤40	> 40
≤ 50 specific water content heat generator ≥ 0.3 l/kW <sup>2)</sup>	none	≤ 3.0 (16.8)	< 0.05 (0.3)
≤ 50 specific water content heat generator < 0.3 l/kW <sup>2)</sup> (e.g. circulation water heater) and systems with electric heating elements	≤ 3.0 (16.8)	≤ 1.5 (8.4)	
> 50 to ≤ 200	≤ 2.0 (11.2)	≤ 1.0 (5.6)	
> 200 to ≤ 600	≤ 1.5 (8.4)	< 0.05 (0.3)	
> 600	< 0.05 (0.3)		

1. For calculating the specific system volume, the smallest individual heating capacity is to be used for systems with several heat generators.  
2. In systems with several heat generators with different specific water contents, the smallest specific water content is decisive in each case.

### Additional requirements for Switzerland

The filling and make-up water must be demineralised (fully purified)

- The water must not contain any ingredients that could settle and accumulate in the system
- This makes the water non-electroconductive, which prevents corrosion
- It also removes all the neutral salts such as chloride, sulphate and nitrate which can weaken corrosive materials in certain conditions

If some of the system water is lost, e.g. during repairs, the make-up water must also be demineralised. It is not enough to soften the water. The heating system must be professionally cleaned and rinsed before filling the units.

#### Inspection:

- After eight weeks, the pH value of the water must be between 8.2 and 10.0. If the central heating water comes into contact with aluminium, the pH value must be between 8.0 and 8.5
- Annually: values must be recorded by the owner

### Advantages of heating water treated in accordance with the standards:

- Less of a drop in output due to reduced limescale build-up
- Less corrosion due to fewer aggressive substances
- Long-term cost savings thanks to improved energy efficiency

### Frost protection

When operating the system with frost-protected heat transfer media, the following instructions and ÖNORM H 5195-2 must be observed:

- Antifreeze dosage according to the manufacturer's data sheet  
IMPORTANT: If the medium contains too much or too little antifreeze it becomes highly corrosive
- Adding antifreeze reduces the specific heat capacity of the medium; therefore design components (pumps, pipework, etc.) accordingly
- Add frost protection only to heat transfer medium in those areas that may be affected by frost (TIP: system separation)
- Check the antifreeze dosage regularly according to the manufacturer's instructions
- Dispose of frost-protected heat transfer medium at the end of its shelf life and refill the system

### 3.5 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 heating 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.**

### 3.6 Return lift

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

#### NOTICE

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 kind of control device (e.g. thermometer).

### 3.7 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 S3 Turbo

### 3.8 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!**

## 4 Operating the system

### 4.1 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 S3 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 boiler controller!**

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
- Connect flue gas including all insulation work
- Work must comply with local fire protection regulations
- Correct assembly / setting of the air duct according to firewood used, see boiler assembly instructions
  
- When heating up the boiler for the first time to dry out the fireclay concrete, the customer must provide approx. 0.5 m<sup>3</sup> of dry firewood.
- 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.

## 4.2 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

## 4.3 Switching on the boiler

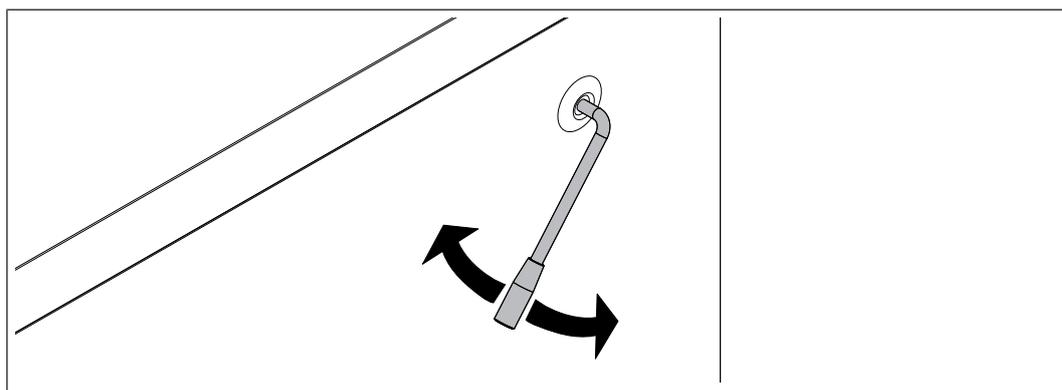


- For other modes press the relevant function key
  - ↪ Information on function keys in the relevant operating instructions of the boiler controller

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

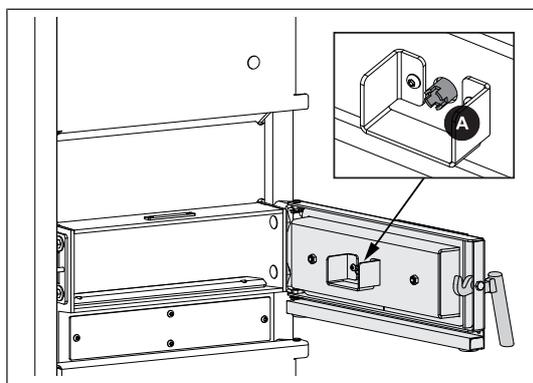
## 4.4 Before heating up the boiler

### 4.4.1 Clean the heat exchanger pipes



- Pull the lever of the cleaning system several times before heating up (up and down 5 – 10 times)

### 4.4.2 Check the igniter tube (for automatic ignition)



- Before filling the fuel loading chamber, check the igniter tube (A) of the automatic ignition for dirt and clean if necessary.

### 4.4.3 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
	<p>No bars or one bar in the store load status means that the storage tank needs to be heated up by approx. 35°C.</p> <p>➔ <a href="#">"Determining the right amount of fuel" [▶ 27]</a></p>
	<p>Two bars in the store load status mean that the storage tank needs to be heated up by approx. 20°C.</p> <p>➔ <a href="#">"Determining the right amount of fuel" [▶ 27]</a></p>
	<p>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!</p>

#### 4.4.4 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)

$\Delta t$  = temperature difference between start and end temperature<sup>1)</sup>

Mass (m) x heat capacity (c) x temperature difference ( $\Delta t$ ) = energy (Q)

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

69 780 Wh = **69.8 kWh**

Heating a 2,000 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. ([↻ "Fuel table" | ▶ 28\]](#))

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 2,000 litre storage tank from 50°C to 80°C.

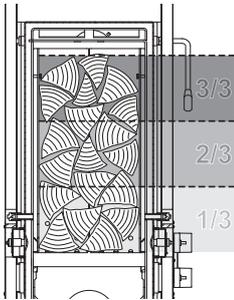
## Fuel table

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 S3 Turbo 40 would, therefore, be approx. one third.



Fill level		Weight at fill level	
		S3 Turbo 20/30	S3 Turbo 40/45
3/3	Beech	approx. 40 kg	approx. 65 kg
	Spruce	approx. 24 kg	approx. 39 kg
2/3	Beech	approx. 27 kg	approx. 43 kg
	Spruce	approx. 16 kg	approx. 26 kg
1/3	Beech	approx. 13 kg	approx. 22 kg
	Spruce	approx. 8 kg	approx. 13 kg

### 4.4.5 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!)

## 4.5 Filling the boiler with firewood

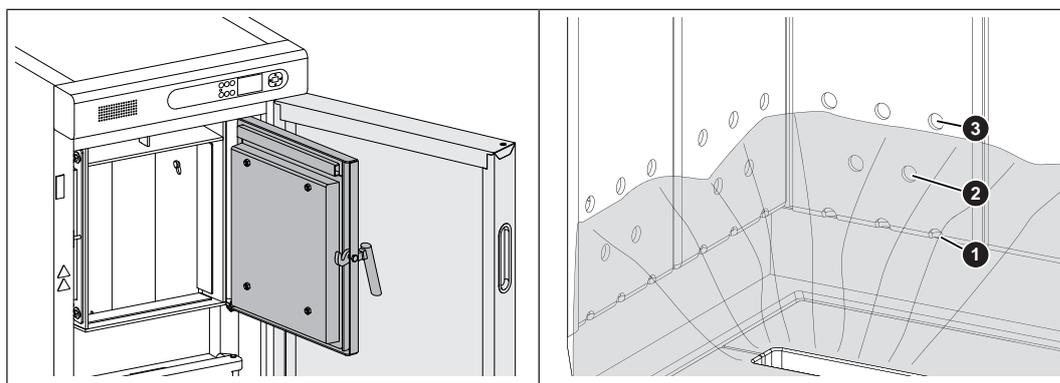
### NOTICE

Fill fuel loading chamber for later manual / automatic ignition

**Premature self-ignition of the firewood by residual heat / temperature of the combustion chamber possible**

Therefore:

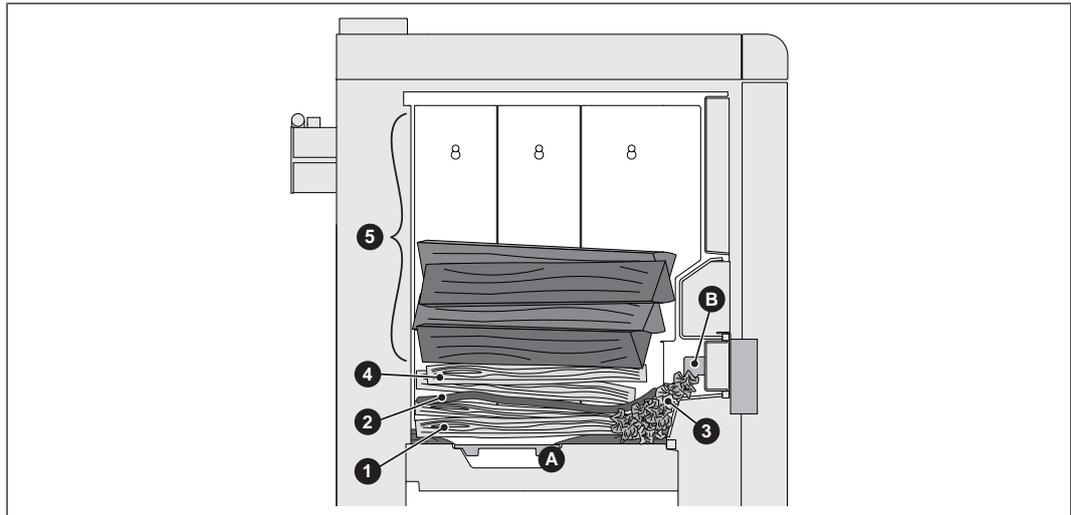
- Completely remove residual embers from the combustion chamber
- Allow the combustion chamber to cool down
- An ash layer up to the middle row of holes in the combustion chamber guards facilitates the ignition process



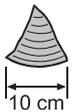
- Open the insulated door and the fuel loading door
- Check the ash level in the combustion chamber and remove if necessary  
Emptying ash

**Recommendation:** Do not remove the ash in the combustion chamber each time you heat up the boiler, but rather only when the middle row of holes (2) in the combustion chamber guard is no longer visible. An even layer of ash protects the combustion chamber and makes the heating-up process more efficient.

Heat up firewood manually / with automatic ignition



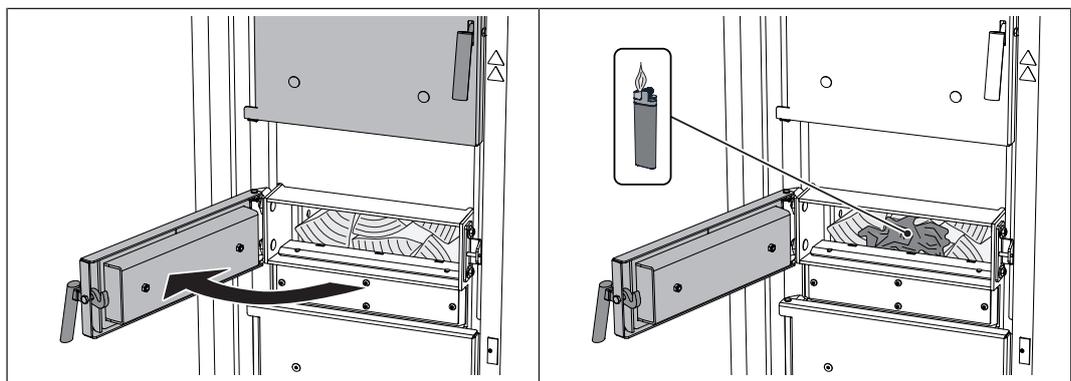
1. First layer of small pieces of split wood
  - Length approx. 50 cm
  - Parts of the burn-out opening (A) in the grating must remain clear
2. Second layer with a generous amount of cardboard packaging
3. Crumpled paper under the cardboard up to the pre-heating chamber door
  - Up to the basket plate (B) for automatic ignition
4. Third layer with more small pieces of split wood
5. Depending on power consumption, fill the fuel loading chamber with firewood
  - ➔ "Determining the right amount of fuel" [▶ 27]



**Definition – small pieces of split firewood:**

- Maximum length of 10 cm along the cut edge
- Arrange firewood with a length of approximately 50 cm lengthwise in the fuel loading chamber

### 4.6 Heat up firewood manually



- Close the fuel loading door
- Open the pre-heating door, insert crumpled up paper and light
  - ↳ If the underpressure is too strong to ignite: switch off the induced draught fan by tapping "Induced draught OFF" on the boiler display

- ↪ Once successfully ignited:  
switch induced draught fan back on by tapping "Induced draught ON"
- Leave the pre-heating chamber door open for approximately 5 minutes
  - ↪ A bed of embers forms
  - ↪ Wait for the message on the boiler display to close the pre-heating chamber door
- Close the pre-heating chamber door and the insulated door

## 4.7 Operate boiler using the button display

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

**NOTICE! See operating instructions for boiler controller!**

## 4.8 Reloading firewood

### WARNING



Touching hot surfaces behind the insulated door

**can cause burns!**



By the nature of its operation, the surfaces and operating elements in the area behind the insulated door get hot! When working with firewood, there is also a risk of injury from splinters.

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

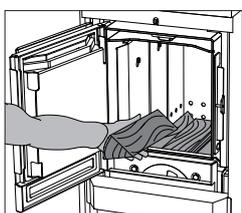
### WARNING



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



- Open the fuel loading door slowly and check the fuel

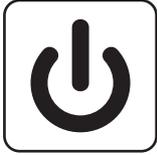
If the fuel in the boiler has burnt down:

- Refill with fuel
  - ↪ "Determining the right amount of fuel" [▶ 27]

If the fuel in the boiler has not finished burning down or if enough flue gases are still forming:

- Close the fuel loading door immediately

## 4.9 Switching off the boiler



- Press the standby key (key control panel)
  - ↳ The boiler follows the shutdown program and switches to "Off" status
  - ↳ The combustion unit is switched off, the chamber discharge unit and the entire hydraulic system remain active

## 4.10 Switching off the power supply

### **WARNING**

When the main switch is switched off in heating mode:

***The boiler is placed in an uncontrolled state. Any resulting boiler malfunctions can cause serious injury and damage.***

Therefore:

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



- Turn off the main switch
  - ↳ Boiler controller is switched off
  - ↳ There is no power supply to any of the boiler components

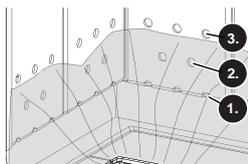
**NOTICE! Frost protection function is no longer active!**

## 4.11 Checking the ash level in the boiler

### NOTICE

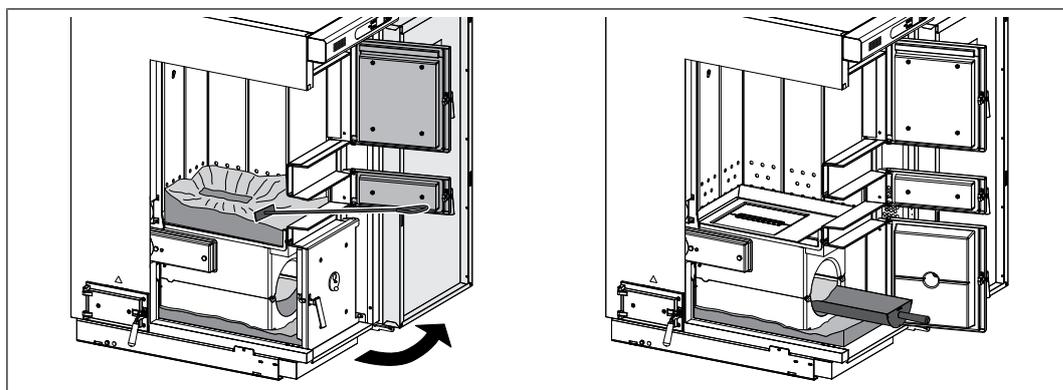
Cracks in the combustion chamber may occur during operation. If the fireclay elements and the surrounding seals remain in their original position, existing cracks do not represent a malfunction!

### 4.11.1 Removing ash

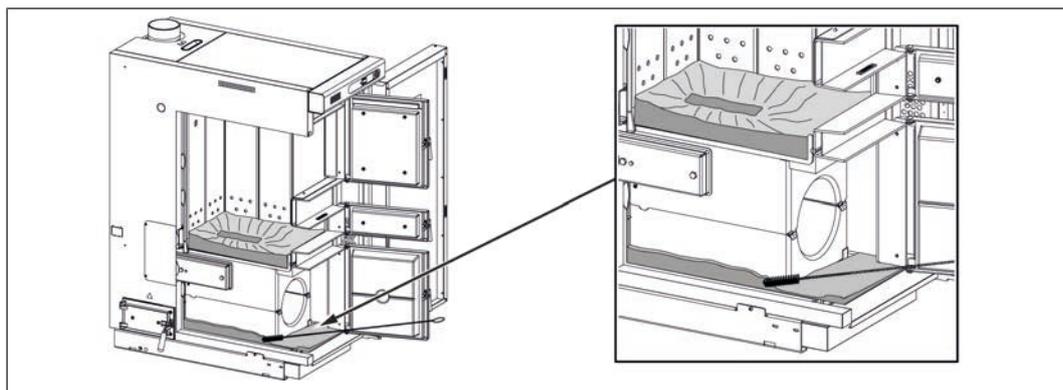


**Recommendation:** Do not remove the ash in the combustion chamber each time you heat up the boiler, only when the middle row of holes in the cladding plates is no longer visible. This protects the combustion chamber and makes the heating-up process more efficient.

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

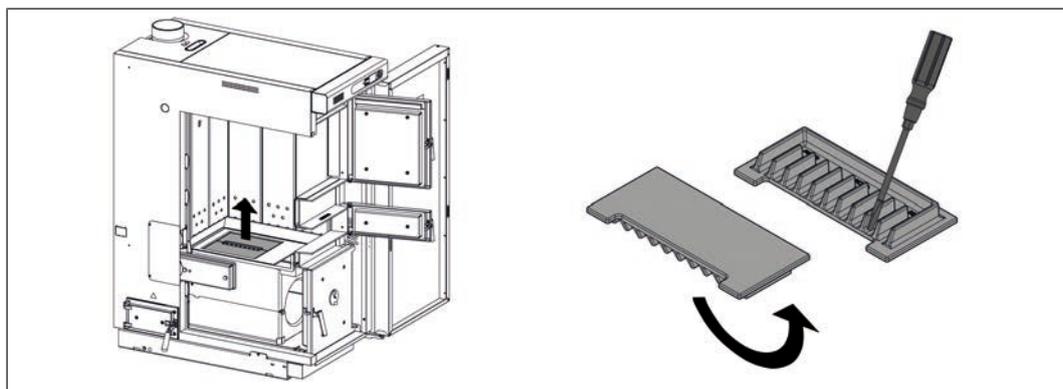


- Open the insulated door, pre-heating chamber door and the fuel loading chamber door
- Move the ash in the fuel loading chamber down into the combustion chamber below with the furnace tool
- Open the combustion chamber door and remove ash with a round ash shovel



- Clean the passage to the left and right of the combustion chamber with small brush and remove ash
- Empty the ash into the container provided
  - ↳ Use a fire-proof container with cover

#### 4.11.2 Clean the grating



- Open the insulated door and the fuel loading chamber door
- Remove the two-part grating
- Remove ash deposits under the grating to ensure proper intake of secondary air.
  - ↳ Tip: use an ash vacuum!

## 5 Servicing the system

### 5.1 General information on servicing

#### DANGER



When working on electrical components:

#### **Risk of electrocution!**

When work is carried out on electrical components:

- Always 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

#### NOTICE

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

#### WARNING



Incorrect inspection and cleaning:

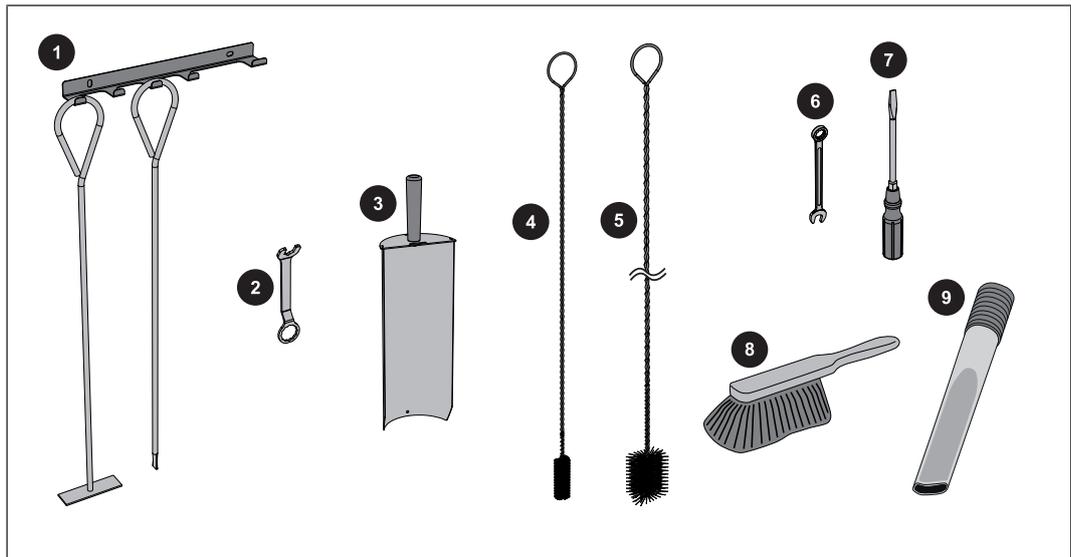
#### **Incorrect or insufficient inspection and cleaning of the boiler can cause serious faults in combustion (e.g. spontaneous combustion of carbonisation gases / flash fires) and this can lead to serious accidents and damage!**

Take the following precautions:

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

### 5.2 Required tools

The following tools are required for carrying out cleaning and maintenance work:



Included in delivery:	
1	Furnace tool with bracket
2	Spanner for door mountings
3	Ash shovel
4	Cleaning brush (30x20) for cleaning the carbonisation gas duct
5	Cleaning brush (Ø54) for cleaning the heat exchanger
Not included:	
6	Spanner or box wrench AF 13
7	Screwdriver set (Philips, flat head, Torx T20)
8	Small brush or cleaning brush
9	Ash vacuum

### 5.3 Maintenance work by the operator

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

**Reassemble the boiler components dismantled during maintenance in the reverse order after the work has been completed..**

#### 5.3.1 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:

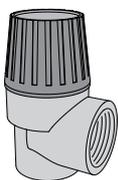
- Ask an expert to inspect the expansion tank

### Checking the thermal discharge safety device



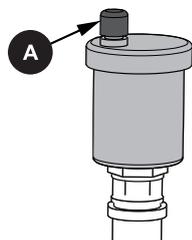
- Regularly check the function and seal of the thermal discharge valve in accordance with the manufacturer's instructions

### Checking the safety valve



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

### Checking the quick vent valve



- Regularly check all the quick vent valves on the entire heating system for leaks
  - ↳ If any liquid is leaking, replace the quick vent valves

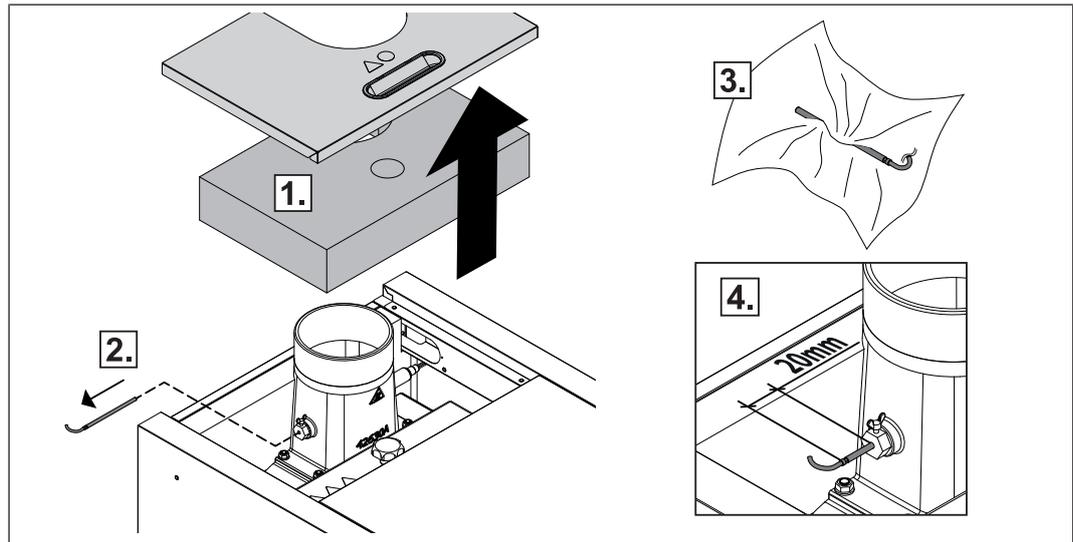
**NOTICE! The vent cap (A) must be loose (screw on approx. two revolutions) to ensure correct functioning.**

### 5.3.2 Periodic inspection and cleaning

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

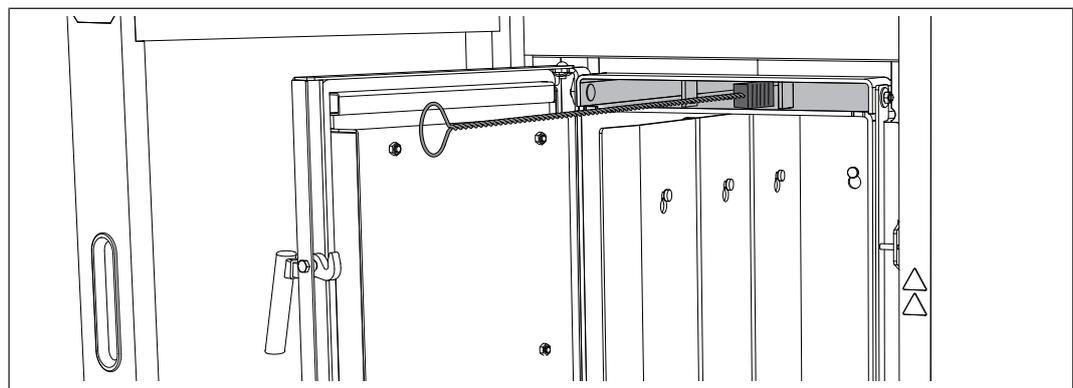
Inspection and cleaning must be repeated after not more than 1500 operating hours or at least once a year. For less efficient fuels (e.g. high ash content) this work needs to be carried out more frequently.

#### *Cleaning the flue gas temperature sensor*



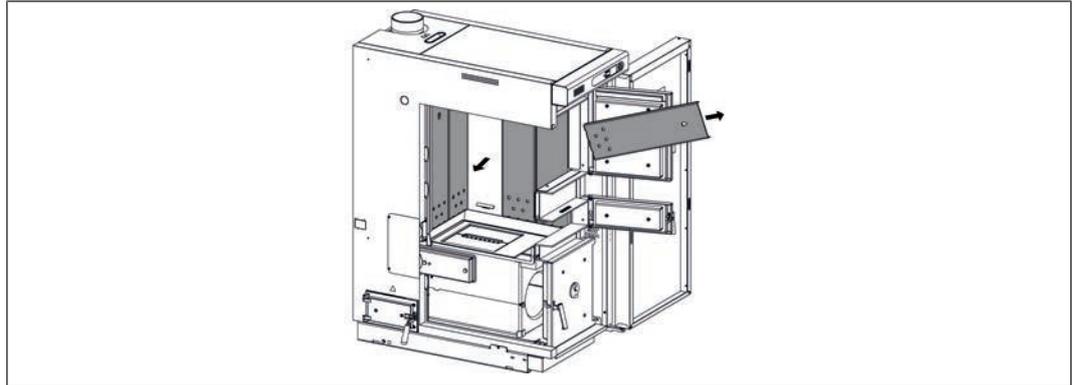
- Remove the insulating cover and thermal insulation
- Release the retaining screw and remove the flue gas temperature sensor from the flue gas pipe
- Wipe the flue gas temperature sensor with a clean cloth
- Push in the flue gas temperature sensor until about 20 mm of the sensor remains protruding from the bushing and secure with fixing screw

#### *Cleaning the carbonisation gas duct*

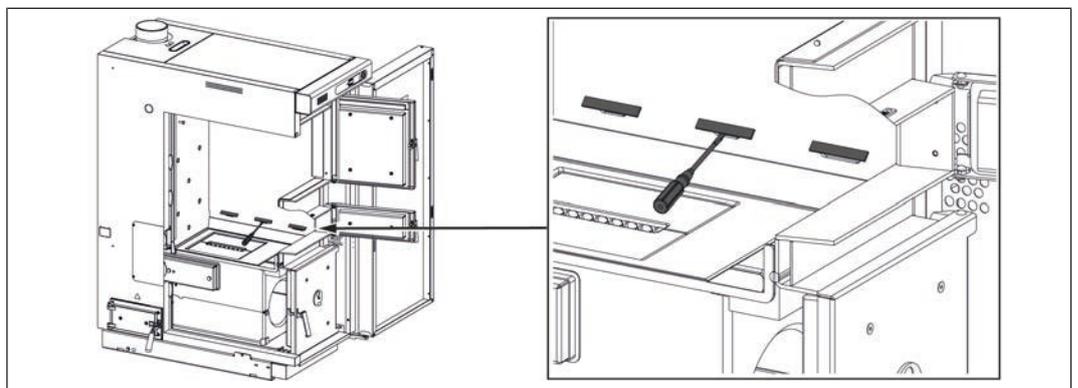


- Open the insulated door and the fuel loading chamber door
- Switch off the induced draught fan
  - ↳ This prevents damage to the fan from the cleaning brush
- Clean the carbonisation gas duct with a small brush

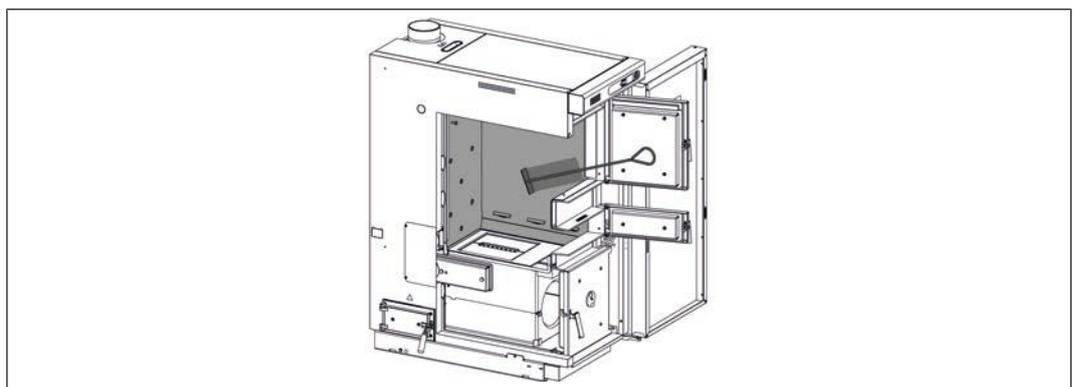
## Checking the primary air openings



- Open the insulated door and the fuel loading chamber door
- Hang out and remove the combustion chamber guards

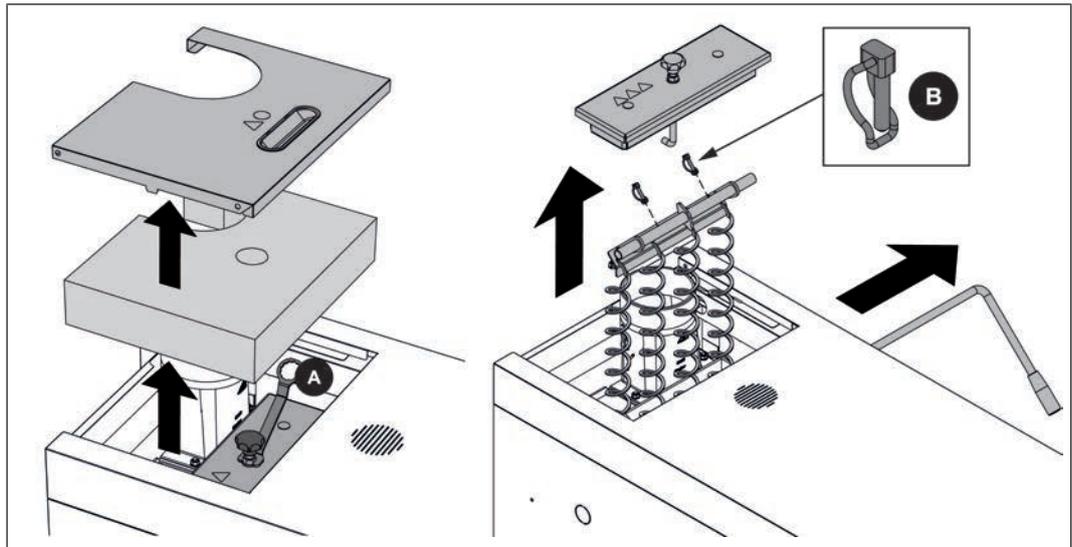


- Check the primary air openings for unobstructed air flow
- If necessary, clean the openings

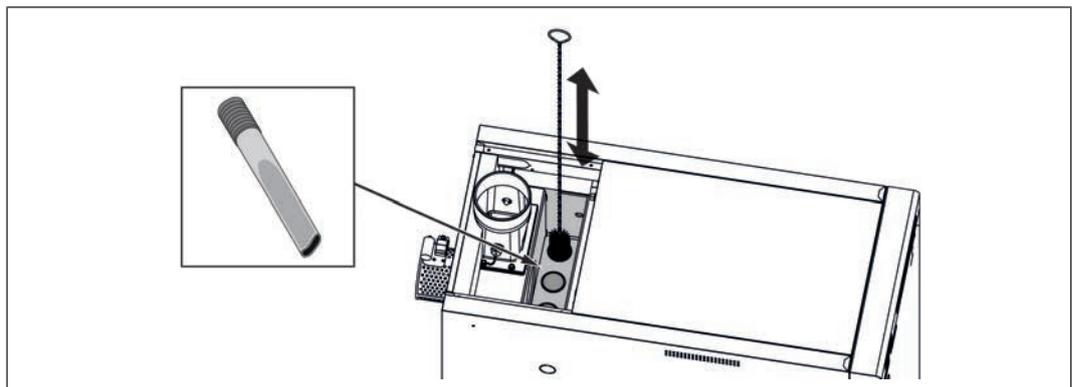


- Clean the boiler walls with the flat scraper
- Fit the combustion chamber guards in the original position and close all boiler doors

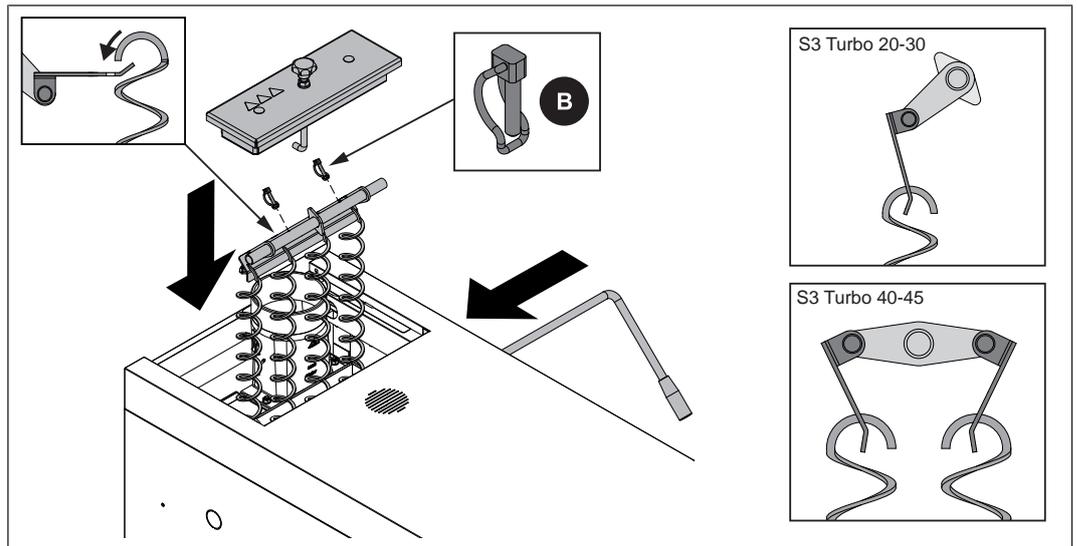
## Clean the heat exchanger pipes



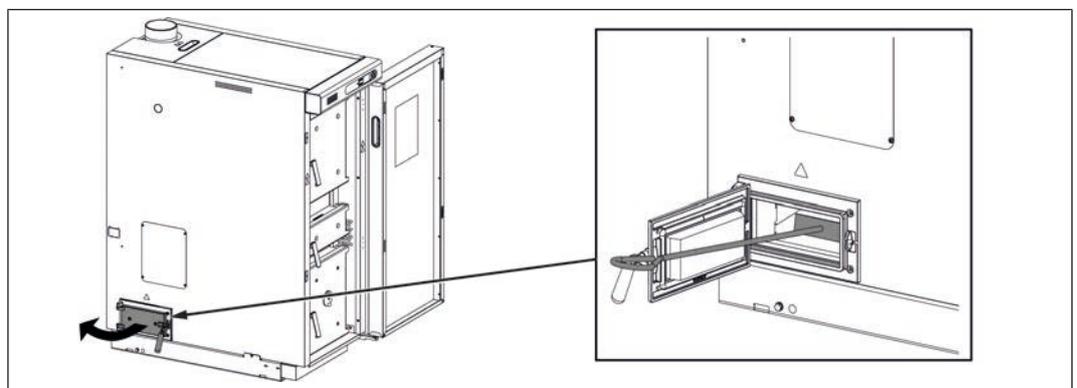
- Lift off the back insulating cover and remove the heat exchanger cover
  - ↳ Use spanner (A) provided
- Remove the pipe locking pin (B) and take out the WOS lever
- Lift out the turbulators together with the mounting bracket



- Remove the ash build-up in the pipes using the cleaning brush
  - ↳ The cleaning brush must be pushed all the way through before pulling it up.
  - ↳ The bristles cannot be turned in the pipe.



- ❑ Before fitting in the heat exchanger pipes, check that the WOS springs are correctly hooked into the linking plate
  - ↪ The protruding, canted sheet-metal strips must face upwards and the turbulators must be hooked in as shown
- ❑ Thread the turbulators into the heat exchanger pipes
- ❑ Insert the WOS lever and secure with pipe locking pin (B)
- ❑ Fit the heat exchanger cover and back insulating cover
  - ↪ Use spanner (A) provided

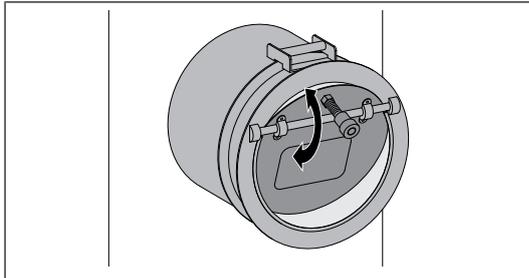


- ❑ Open the side cleaning door and remove the ash

### **Cleaning the flue gas pipe**

- ❑ Unplug the connection cable of 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!
- ❑ Plug in the connection cable of the induced draught fan

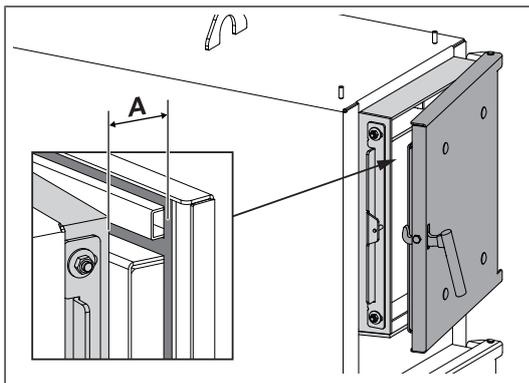
### **Checking the draught controller flap**



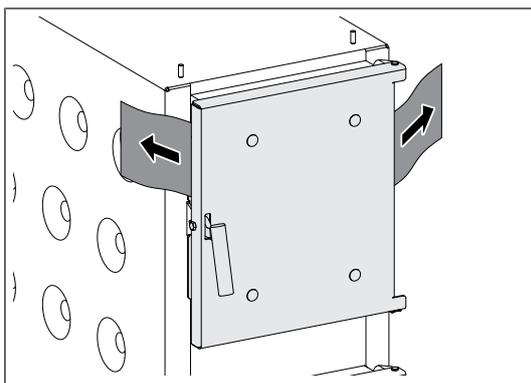
- ❑ Check that the draught regulation damper moves freely and clean the flap bearing if necessary

### **Checking the seal on the doors**

The following steps are illustrated based on the fuel loading door. Perform these steps in the same way for the door of the pre-heating and combustion chamber.



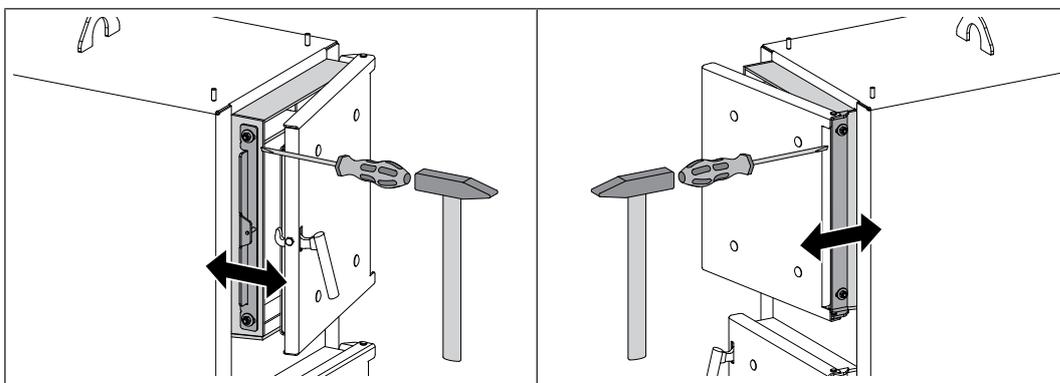
- ❑ Close the door
  - ↳ Slight resistance noticeable at a door gap (A) of 2-3 cm:  
It is acceptable to make an adjustment at the hinge side
  - ↳ No perceptible resistance:  
Move the hinge backwards  
➔ ["Adjusting the doors" \[▶ 43\]](#)
  - ↳ If a resistance is felt when there is a gap of 3 cm:  
Move the hinge plate forwards  
➔ ["Adjusting the doors" \[▶ 43\]](#)



- Open the door
- Place a sheet of paper on both sides of the door and close the door
- Try to pull out the sheet of paper
  - ↪ If the paper cannot be pulled out: the door is tightly sealed
  - ↪ If the paper can be pulled out: the door is not sealed properly – move the hinge or the locking plate backwards slightly
    - ➔ ["Adjusting the doors" \[▶ 43\]](#)

### Adjusting the doors

The following steps are illustrated based on the fuel loading door. Perform these steps in the same way for the door of the pre-heating and combustion chamber.



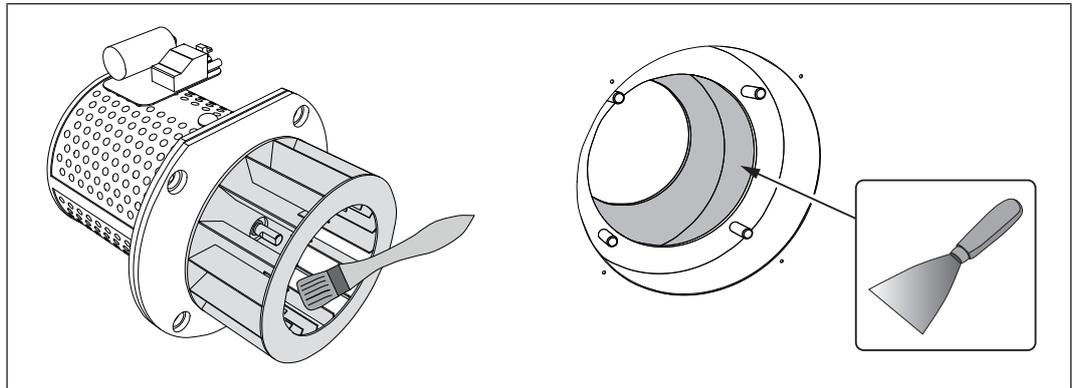
- Loosen the nuts on the locking plate and hinge
- Using a suitable tool, move the locking plate and hinge forwards or backwards
- Tighten the nuts

**IMPORTANT:** Align the locking plate and hinge identically at the top and bottom

- Once the doors have been adjusted, check them again for leaks, ➔ ["Checking the seal on the doors" \[▶ 42\]](#)

## Cleaning the induced draught fan

**NOTICE!** Deposits on the running wheel may imbalance the induced draught, which can generate noise or, in the worst case scenario, lead to bearing damage.



- Unplug the connection cable of the induced draught fan
- Remove the cover plate for ID fan and induced draught fan on the back of the boiler
- Check the seal for damage and replace if necessary
- Clean the fan wheel from the inside out using a soft brush or paint brush

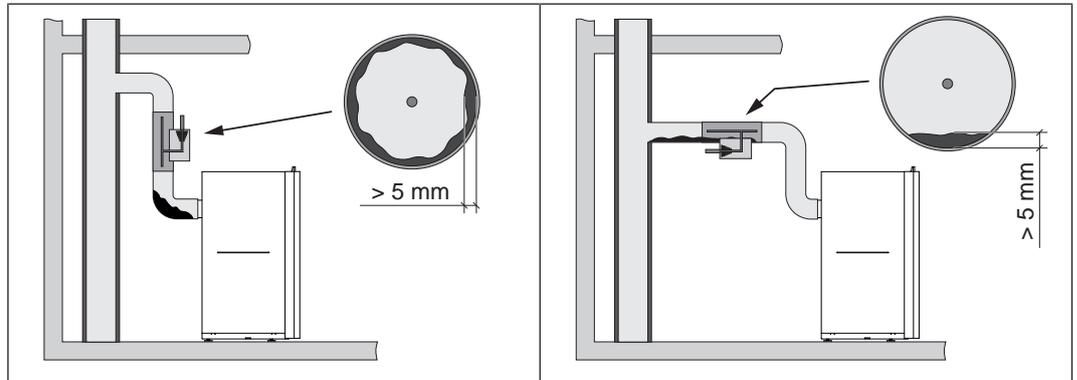
**NOTICE! Do not move the balancing weights on the blower wheel!**

- 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

### 5.3.3 Maintenance of the electrostatic particle separator in the flue gas line (optional)

The electrostatic particle separator must be inspected and cleaned at appropriate intervals depending on the operating hours and fuel quality.

Inspection and cleaning must be repeated after no more than 300 operating hours or at least once a month. With less fuels of lower efficiency (for instance with a high ash content) this work needs to be carried out more frequently.



- Check the entire exhaust duct before and after the electrostatic particle separator for contamination
- If there are visible deposits larger than 5 mm, clean the flue gas line in accordance with the manufacturer's instructions for the electrostatic particle separator

## 5.4 Maintenance work by technicians

### CAUTION

If maintenance work is carried out by untrained personnel:

***Risk of personal injury and damage to property!***

The following applies for maintenance:

- Observe the instructions and information in the manuals
- Only allow appropriately qualified personnel to work on the system

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Only qualified staff are permitted to carry out maintenance work in this chapter:

- Heating technicians / building technicians
- Electrical installation technicians
- Froling customer services

The maintenance staff must have read and understood the instructions in the documentation.

**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.

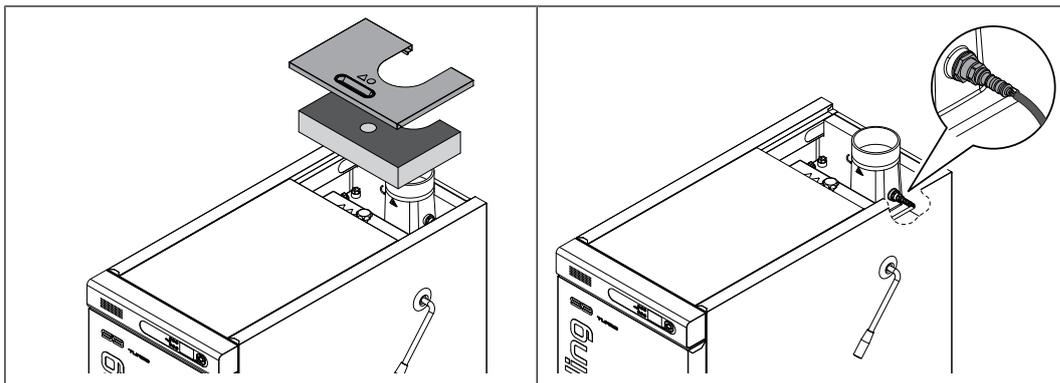
Your Froling customer service office will also be happy to advise you.

### NOTICE

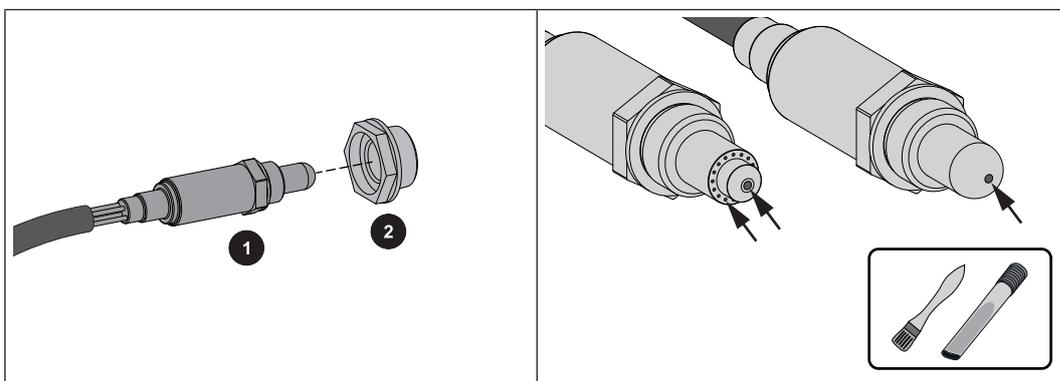
All national and regional regulations relating to regular testing of the system must be observed. Please be advised that, in Austria, commercial systems with a rated heat output of 50 kW or more must be regularly tested at yearly intervals in accordance with the Heating Plant Regulations (Feuerungsanlagen-Verordnung).

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### 5.4.1 Cleaning the Lambda probe



- Remove the back insulating cover and thermal insulation upwards



- Carefully remove the Lambda probe (1) and plastic bushing (2 – if installed)
  - ↪ Pay attention to the cables of the Lambda probe!
- Carefully remove impurities from the measuring ports with a fine brush and ash vacuum
  - ↪ Hold the Lambda probe with the tip downwards so that deposits can fall out of the measuring ports
- Check the plastic bushing (2) for dirt and cracks, replace if necessary
  - ↪ **IMPORTANT:** The seal surface of the plastic bushing must lie flat after assembly

#### CAUTION:

- Do not clean the Lambda probe with compressed air
- Do not use chemical cleaning agents (brake cleaner, etc.)
- Handle the Lambda probe carefully, i.e. do not “tap” it or use a wire brush to clean it

**NOTICE! Lambda probe only installed on S3 Turbo with S-Tronic Lambda!**

## 5.5 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 following minimum requirements must be met by the operator of the system for a successful measurement:

- Thoroughly clean the boiler 2 heating days (1 heating day = 1 day during which the boiler to be measured is in operation) before the measurement
- Ensure there is adequate fuel
  - ↳ Only use fuels of high quality which meet the requirements as stipulated in the boiler operating instructions (“Permitted fuels” chapter)
- 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)
- There must be a suitable measuring port in the straight flue gas pipe for the measurement. The measuring port must be twice the flue gas pipe diameter away from the last upstream bend.
  - ↳ If the measuring port is not correctly positioned, the measuring result will be distorted

### 5.5.1 General information on measurement

Observe the following basic conditions:

- Only use fuel permitted according to the operating instructions
  - ↳ Ensure that the water content (w) is greater than 15% and less than 25%
- Use short split wood (edge length  $EL < 10\text{ cm}$ ) to create the measuring conditions and for the measurement itself

	<p>Short split wood with an edge length <math>EL &lt; 10\text{ cm}</math></p> <p>The term “short split wood” has been defined in these instructions by Froling; there is no fuel standard or similar guidelines for this.</p>
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- The fuel must be dry, clean and uncontaminated (not painted, glued, etc.)
- The combustion process must not be interrupted during the measurement
 

Interruptions to the combustion process include:

  - Opening the boiler doors
  - Stoking the burning material
  - Switching off the ID fan (e.g. because of inadequate heat consumption)

## 5.5.2 Create the measurement conditions and perform the measurement

- ❑ Fill the boiler approx. 1/4 full with small pieces of split wood in accordance with the operating instructions and heat up
  - ↳ TIP: The smaller the wood is split, the better and faster the bed of embers forms
- ❑ Ensure that the operating conditions are fulfilled
  - ↳ Return temperature min. 60 °C, boiler temperature min. 70 °C, chimney draught in the range of 8-10 Pa
- ❑ Allow the fuel to burn off until a basic firebed is achieved
  - ↳ This will take at least one hour depending on the fuel used and the power consumption
- ❑ Open the fuel loading door, distribute the embers evenly with the furnace tool and gauge the height of the embers
  - ↳ The top row of holes in the combustion chamber guards must be visible
- ❑ Close the fuel loading door

Once the basic firebed has been achieved (top row of holes visible in the combustion chamber guards, the two lower rows of holes of the combustion chamber guards are covered with embers):

- ❑ With the doors closed, press the chimney sweep button (boiler with button display) or activate chimney sweep function (boiler with touchscreen) and select the menu item "FW nominal load"
  - ↳ The boiler temperature setpoint will be automatically set to 85°C for the duration of the measurement
  - ↳ All of the configured heating circuits will be activated at maximum flow temperature for the duration of the measurement
- ❑ Open the fuel loading door and fill the boiler with the maximum permitted amount of fuel
  - ↳ If the boiler has activated reload calculation, the amount of fuel required will be shown on the screen
- ❑ Close the doors and wait approx. 10 minutes until the combustion process is under way
- ❑ Take the measurement at the designated measuring port
  - ↳ The ready-to-measure state is shown on the display
  - ↳ Regularly check that the conditions are stable:
    - Boiler temperature > 70 °C
    - Flue gas temperature around 170 °C

## 5.6 Replacement parts

With Froling original replacement parts in your system, 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.
- 

## 5.7 Disposal information

### 5.7.1 Disposal of the ash

*Austria:*  dispose of ash in accordance with the Waste Management Act (AWG)

*Other countries:*  dispose of ash in accordance with local regulations

### 5.7.2 Disposal of system components

- Ensure that they are disposed of in an environmentally friendly way in accordance with waste management regulations in the country (e.g. AWG in Austria)
- You can separate and clean recyclable materials and send them to a recycling centre.
- The combustion chamber must be disposed of as builders' waste.

## 6 Troubleshooting

### 6.1 General fault with power supply

Error characteristics	Cause of error	Elimination of error
Nothing is shown on the display	General power failure	
No power to the controller	Main switch is turned off FI-protective circuit breaker, power line protection or SPS power line protection tripped	Turn on the main switch Switch on the protective circuit breaker

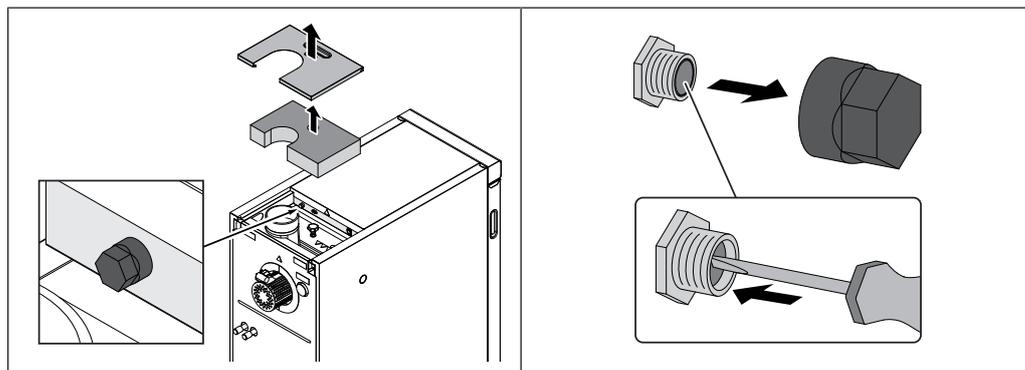
#### 6.1.1 Behaviour of system after a power failure

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.

### 6.2 Excessive temperature

The high-limit thermostat (STL) switches off the blower fan at a maximum boiler temperature of 105 °C. The pumps continue to run.



Once the temperature falls below approx. 75°C, the STL can be reset mechanically.

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

## 6.3 Faults with fault message - Key control

### 6.3.1 Troubleshooting

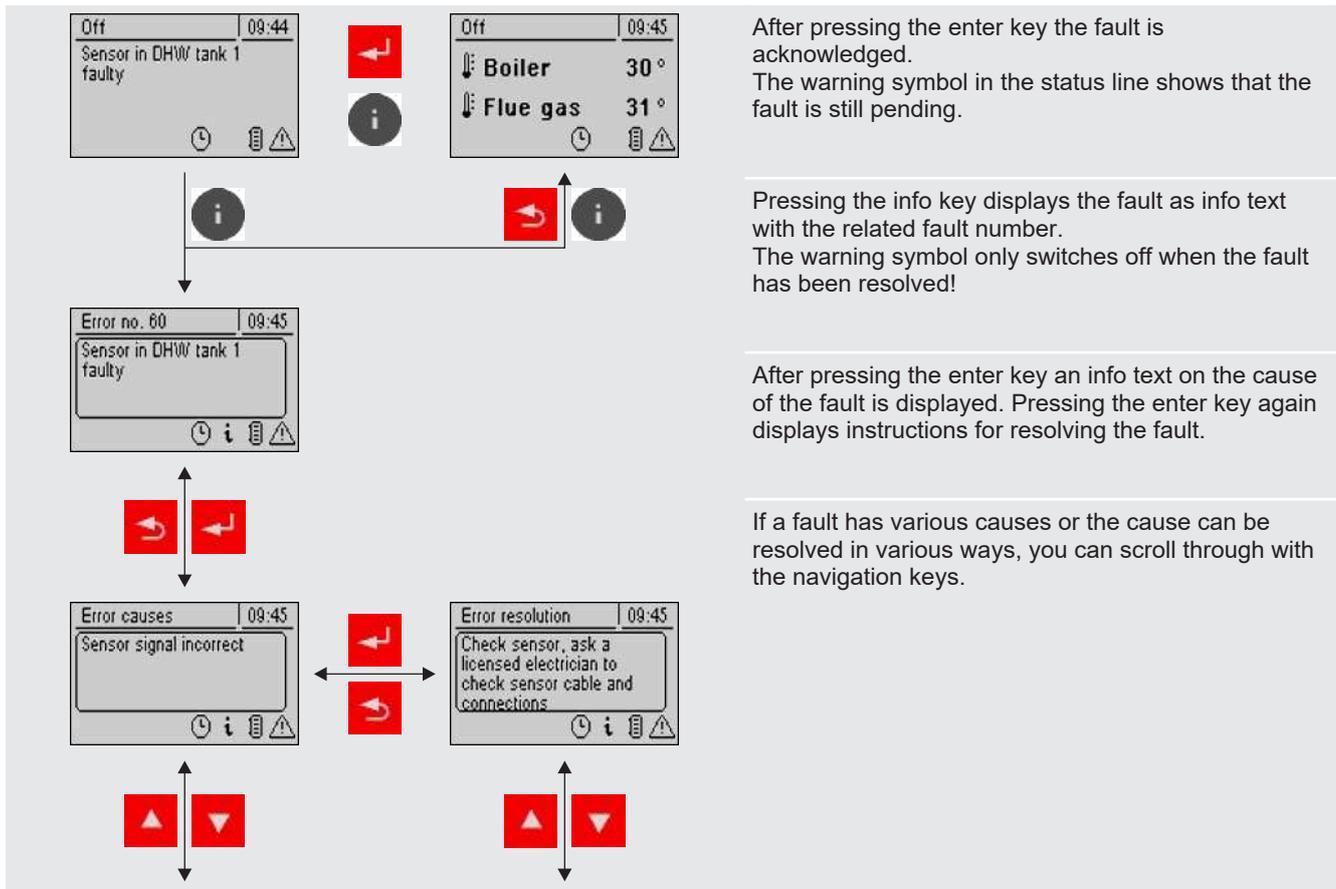
The term "fault" is a collective term for warnings, errors and alarms. The boiler reacts differently to the three types of message:

<b>WARNING</b>	In case of warnings the status LED flashes orange and the boiler initially continues controlled operation.
<b>ERROR</b>	In case of errors, the status LED flashes red, the boiler follows shutdown procedure and remains in operating status "Off", until the error is resolved. After troubleshooting, the boiler switches back to the operating status "Off".
<b>ALARM</b>	An alarm triggers a system emergency stop. The status LED flashes red, the boiler switches off immediately and the heating circuit controller and pumps remain active.

### Procedure for fault messages

When a fault occurs:

- The status LED flashes with a red or orange light
- The display shows the current fault messages and the warning symbol in the status line



## 6.4 Acknowledging a fault message

Trace and remove the fault and then:

Press the Enter key

- ↳ Status LED constant or flashing green light (depending on operating status)
  - Green constant: Heating up/Heating
  - Green flashing: Off





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