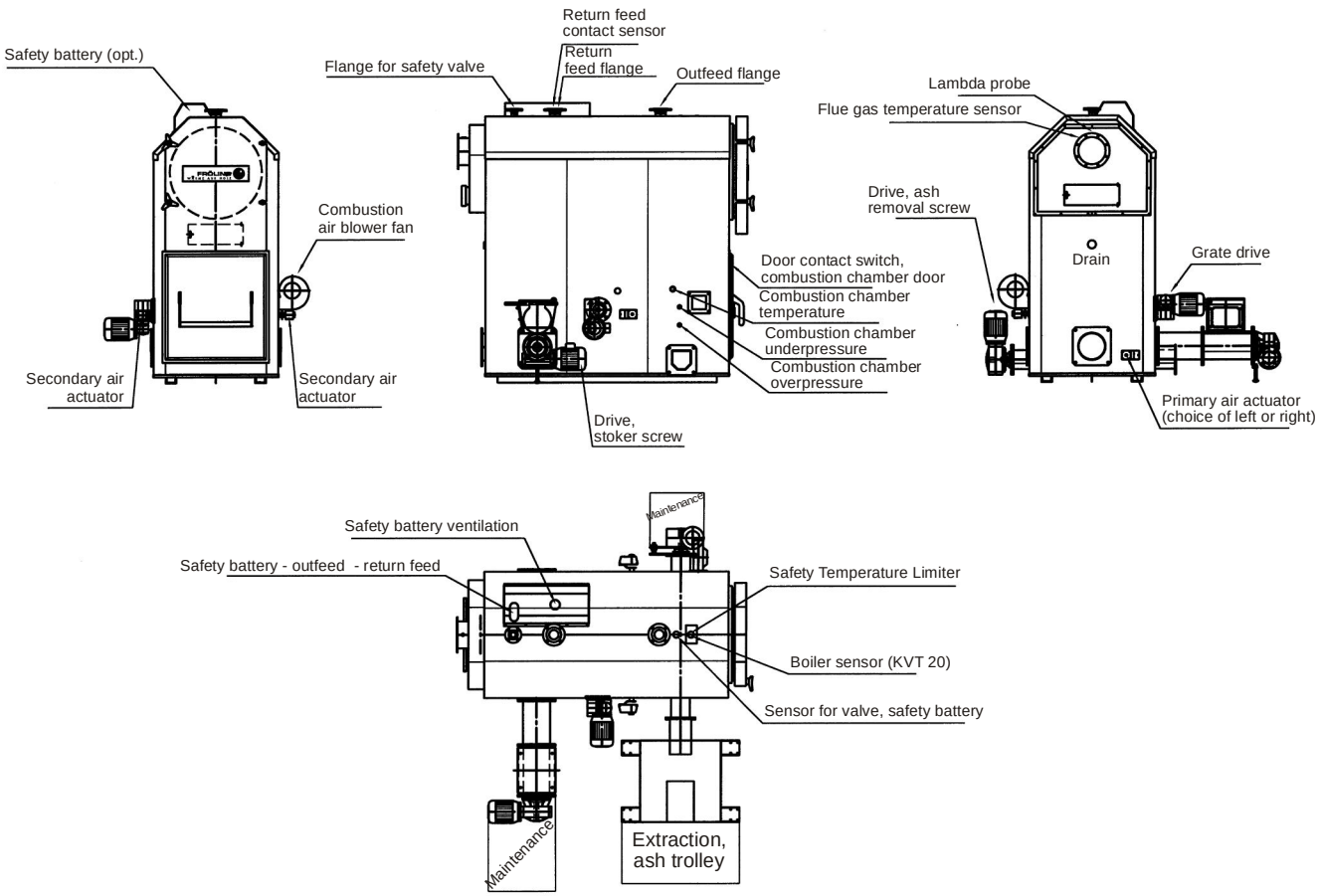
FRÖLING
WARMTH FROM WOOD

Operating and Installation instructions

LAMBDAMAT INDUSTRY



Please read this document before startup.
Failure to observe the installation instructions can void your warranty.

Subject to technical change.
Revised February 2004

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Dear customer,

You have chosen to purchase one of our firm's quality products. We appreciate your choosing our product and we hope that you too will soon join the growing number of satisfied customers.

Our systems represent the culmination of many long years of experience and the on-going development of the latest technological advances which result from that experience.

Conscientious processing and control are the important objectives in our firm. Defects can rarely be 100% ruled out, so, if in spite of all our efforts a defect should appear, our generous guarantee provides you with a high degree of security.

It's important to note, however, that even the best-designed product will only perform well over a long period of time if it is properly serviced and operated.

To ensure your long-term satisfaction with our product, we would like to remind you that you can sign a maintenance contract with us.

1. Fuels

The LAMBDAMAT series heating system is suitable for burning scrap wood with the following specifications:

Fuels as per ÖNORM M 7133: Wood chip with or without bark
(Coarse and fine proportions maximum 20% each, main proportion 60% to 100%).

Water content

W20 (air dried)
W30 (requires storage)
W35 (requires limited storage)
W40 (damp)

Size

G 30 (Fine wood chip)
G 50 (Medium wood chip)

Fuels as per 1st BImSchV (Federal Emission Control Ordinance) of 15th July 1988:
Painted, varnished or coated wood, plywood, chipboard, fibreboard or other glued wood, and residues proceeding from these, provided that no wood preservatives have been applied or are contained in it and coatings are not made of halogenated organic compounds.

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2. Chimney - Flue gas temperature - O_2 value

2.1. Chimney

The chimney must be correctly measured and installed by the chimney manufacturer in accordance with DIN 4705 (see overview of standards) for smooth running of the boiler. The chimney height and cross-section should be in line with the boiler output.
The chimney must be absolutely sealed (soot doors).

The flue gas pipe connection should be insulated.

The boiler room must be sufficiently ventilated.

2.2. Flue gas temperature

For light load operation (20% of the rated power with underpressure controller) the *flue gas temperature* can be approx. *100°C* or less in continuous operation. For this case it is essential for the smoke trap sweeper responsible to test the suitability of the chimney. In case of *seepage* damage to the chimney because the above advice has not been followed, the manufacturer cannot be held responsible.

2.3. O_2 value

Setting values:

	dry material (w ≤ 10%)	**medium material (w = 10% to 30%)**	**wet material (w ≥ 30%)**
Flue gas temp. [°C]	200 - 240	180 - 220	160 - 200
CO2 content [%]	9 - 10	10 - 11	11 - 13
O2 content [%]	**11 - 12**	**10 - 11**	**8 - 10**
CO content*	≤ 250	≤ 250	≤ 250
Dust*	≤ 150 (100)	≤ 150 (100)	≤ 150 (100)

w... Water content
***** … [mg/m³] for standard conditions and 13% O_2
Applies for wood chip as per ÖNORM M7133.
The separation rate depends on the dust separator used.

Incorrect setting of the O_2 value (too low a value) can lead to damage of the fire bricks due to increased combustion temperature.
The correct setting values can be taken from the table above.

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3. Startup

The initial startup of the whole system is carried out by FRÖLING customer services. The system is set up for the fuel in use, so that it operates correctly and with optimum combustion. In case of a later significant change to the material composition, the system should be re-adjusted as specified in the table “Setting values”.

The following points should be observed in case of startup by the operator:

Before switching on the system

1. Find out about the function of all system components (controls, etc.).
2. Follow the maintenance and check plan.
3. The heating distribution system should be flushed out, filled and ventilated.
4. Check if there is operating pressure.
5. All safety and control devices must be functioning correctly.
6. The circulating pumps must run at the correct time.
7. Check if there are sufficient ventilation openings in the boiler room.
   (in accordance with applicable standards)

Heating up

1. Set the main switch on the switch cabinet to “On”.

2. Open the combustion chamber door - the ID fan will start up. Put fuel (paper, cardboard, wood) on the grate and ignite, close the combustion chamber door.

3. Switch the system to automatic operation - Stoker screw feeds fuel. Check through the gauge glass whether ignition has been successful and the fuel is being burnt.

4. If there is a fault in the heating up process, it should be resolved on the basis of the error messages listed in the control description and if necessary the process should be repeated.

The system should be supervised during the entire heating up process. Observe safety regulations - Ventilate boiler room sufficiently.
Do not bring any easily flammable materials into the combustion chamber. **Risk of flashback!**

You can see if there is good combustion on the basis of the flames (yellow to light yellow). A white flame indicates overload, which can lead to ash vitrification on the fire brick walls, which in turn can lead to early wear of the cladding of the combustion chamber. The boiler, chimney and deduster also suffer from this overload.
The combustion chamber has a corresponding service life, if it is maintained and fired according to regulations. Incorrect operation of the system can lead to increased and accelerated wear.

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Switching off the system

1. Switch off the system with the stop key on the control.
   The system is then automatically shut down.

2. Circulating pumps must remain switched on and can only be switched off after 6 hours.

3. Main switch off.

4. When the system is switched off due to errors or before the start of work on the system the main switch should be secured or labelled, to ensure that the system cannot be switched on without authorisation.

5. If the boiler will not be operated for a long time (over summer) the following measures must be taken:
   - The boiler must be carefully cleaned (if appropriate with ash vacuum)
   - Place approx. 5 kg of loose lime in the chamber so that the air humidity is absorbed and corrosion is prevented while the boiler is out of service.
   - Completely close all doors and flaps
   - If the boiler is not operated in winter, there is a danger that frost can destroy parts that carry water. To counteract this, the water carrying parts should be completely emptied by a heating professional.
   - A heating professional should also carry out the refilling before it is put back in operation, as the requirements for heating water as per ÖNORM H5195 (see overview of standards) must be observed.

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General

The output range lies between 150 and 1000 kW, with a maximum permissible operating temperature of 110 °C and a maximum permissible operating pressure of 4 bar.
A return feed lift is required, to prevent the temperature dropping below the dew point and avoid condensation in the boiler. Combined with combustion residues it may form aggressive condensation, which can shorten the service life of the boiler.

The wood-chip system should not be installed in explosion-protected areas.

You should ensure that the supply bin or sile is never emptied except for the purposes of cleaning and maintenance.

The heating system must be absolutely sealed and should not be constantly topped up with fresh water (boiler scaling).

Equally, no water should be taken from the system.

The boiler feed water quality must meet the VDI guidelines 2034 and 2035 (see overview of standards).

Alterations and repairs of any type should only be carried out by Fröling engineers.

The operating personnel must be instructed in safety, operation and maintenance.

The system must be authorised against unauthorised operation.

The identification plates must be applied clearly visibly, at eye level, laterally in the front third of the boiler insulation.

Manual loading

Manual loading of the heating system (with the exception of heating up) is not permitted for safety reasons (risk of flashback, etc.), and because of the government imposed emission values.

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4. Overview of standards

4.1 Marketing, commissioning tests, service testing

4.1.1 European Union directives and standards:

- EU IVU Directive
- EC Air Quality Framework Directive
- "1st daughter" directive to EC Air Quality Framework Directive
- European Council Directive on the Incineration of Waste
- ÖNORM / DIN EN 303-5:1999

4.1.2 Austrian national and regional standards

- Agreements as per Art. 15a Austrian Constitutional Law
- Austrian national energy regulations
  - FAV- Heating plant regulations (Feuerungsanlagenverordnung)
- Austrian regional energy and clean air laws and regulations:
  - Burgenland LHG 1999
  - Burgenland LHG-VO 2000
  - K-HeizG 1998
  - Niederösterreich Bauordnung 1996
  - Niederösterreich BTV 1997
  - Oberösterreich LuftREnTG 2002
  - Salzburg LRHG 1994
  - Salzburg HeizV 2001
  - Steiermark FAnlG 2001
  - Steiermark HeizV 1993
  - T-HeizG 2000
  - T-HeizV 2000
  - Vorarlberg LRHG 1994
  - Vorarlberg LRHV 1994
  - Wiener FP-LRHG 2000
  - Wiener AGEGWV 1989
- Austrian national construction standards
  - ÖNORM M 7550:2002
- Austrian national standards for site testing
  - ÖNORM M 9466:1998

4.1.3 German Federal Republic and German Regions

- Federal German emission protection regulations
  - BImSchG 1990
  - 1.BImSchV
  - 4.BImSchV
  - TA Luft 2002
  - 17.BImSchV
- German national standards (DIN)
  - DIN 4702-1:1993
  - DIN 4702-2:1993
  - DIN 4702-4:1990

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4.2 Structural engineering:

4.2.1 Chimney stacks and flues

- EU standards and directives
  - ÖNORM / DIN EN 13384-1:2002
- Austrian national standards and directives:
  - ÖNORM M 5861-1:1993
- German national standards and directives:
  - DIN 4705-1:1993
  - DIN 18160-1:2001

4.2.2 Water / heating installation

- EU standards and directives
  - ÖNORM / DIN EN 12828:2003
- Austrian national standards and directives:
  - ÖNORM H 5195-1:2001
  - ÖNORM B 8131
  - ÖNORM M 7425:2001
- German national standards and directives:
  - DIN 4751
  - VDI 2035

4.2.3 Electrical installation and equipotential bonding

- EU standards and directives
  - Low Voltage Directive
- Austrian national standards and directives:
  - ÖVE-EN 1
  - ESV 2003 - Electrical safety regulations
- German national standards and directives
  - VDE 0100

4.3 Fuels:

- EU standards and directives
  - CEN TC 335
- Austrian national standards and directives:
  - ÖNORM M 7132
  - ÖNORM M 7133
  - ÖNORM M 7135
- German national standards and directives:
  - 1.BImSchV
  - ÖNORM M 7531

In addition to the local fire and building regulations, the current applicable standards must be observed.

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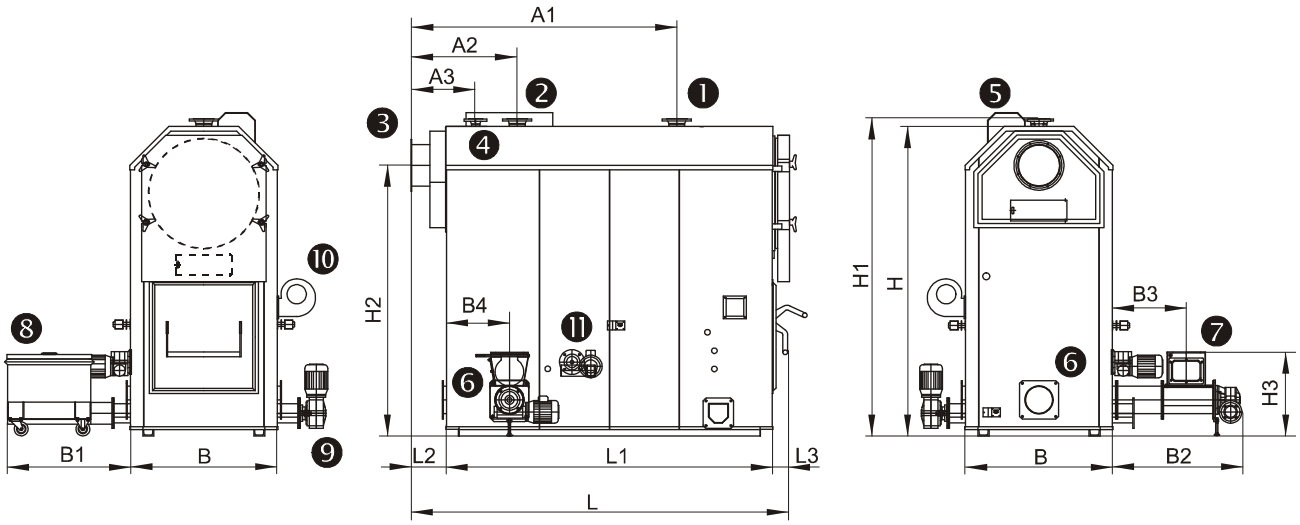
5. Technical data



1 ... Outfeed connection
2 ... Return feed connection
3 ... Flue gas nozzle
4 ... Safety valve connection
5 ... Safety battery (optional)
6 ... Stoker optional (right/left/back)
7 ... Burn back flap
8 ... Ash container (right/left)
9 ... Ash removal screw drive
10 ... Combustion air blower fan
11 ... Grate drive

Wood chip boiler Lambdamat IND/V 1000			***150***	***220***	***320***	***500***	***750***
Boiler rating	kW	100-150	150-200	200-300	300-500	500-750	750-1000
Permissible working over-pressure	bar	4	4	4	4	4	4
Max. permitted operating temperature	°C	110	110	110	110	110	110
Boiler capacity (water)	Liter	440	850	760	1060	1740	2390
Total boiler weight	kg	2166	3738	3878	5019	8510	11800
Chamber / Fire brick	kg	740 / 622	1252 / 1236	1252 / 1236	1480 / 1579	2260 / 3080	2400 / 4300
Heat exchanger	kg	804	1250	1390	1960	3170	5100
Upstream resistance (ΔT=20K)	mbar	14	15	18	15	15	15
Flow (ΔT=20K)	m³/h	5,17	8,61	13,78	21,53	32,30	42,87
Heating surface	mm²	13,5	22,6	28,1	46,2	70,2	99,5
Chimney design data:							
Flue gas temperature*	°C	220	220	220	220	220	220
Amount of fuel required at G50 W20	kg/h	45	70	100	155	230	305
Flue gas mass flow at G50 W 20 Lambda=2	m³/h	660	969	1409	2201	3302	4403
Draught requirement at chimney inlet	Pa	± 0	± 0	± 0	± 0	± 0	± 0
Flue pipe diameter	mm	200	250	300	350	400	450
Structural dimensions							
L Boiler depth 1)	mm	2165	2715	2715	2760	3070	3740
B Boiler width	mm	926	1066	1066	1266	1500	1630
H Boiler height 2)	mm	1971	2243	2243	2501	2867	3140
H1 Outfeed / return feed height	mm	2030	2300	2300	2550	2930	3200
H2 Flue gas pipe height	mm	1709	1961	1961	2207	2520	2850
H3 Stoker height (inc. BBF)	mm	609	609	609	675	705	n/a
Outfeed / return feed connection	DN/PN6	65	100	100	100	100	125
Safety valve connection	DN/PN6	32	50	50	50	65	65
L1 Length of boiler	mm	1806	2356	2356	2356	2710	3380
L2 Depth of settling chamber	mm	254	253	253	299	250	250
L3 Depth of door	mm	105	105	105	105	110	110
A1 Distance, outfeed	mm	1546	1916	1916	2062	2322	3000
A2 Distance, return feed	mm	766	766	766	912	910	920
A3 Distance, safety valve	mm	466	466	466	612	510	550
B3 Distance from centre of stoker to boiler	mm	521	521	521	521	500	n/a
B4 Depth of stoker connection, lateral	mm	384	453	453	477	501	n/a

1)... Length inc. door and settling chamber
2)... Height without safety heat exchanger

Dimensions in mm, subject to technical alterations Preliminary draft end 2001

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6. Installation

Installation should only be carried out by trained personnel, who have been provided with the operating instructions and the applicable regulations for work safety and accident prevention.

Transport:

Type	Load area	Weight
Lambdamat 150	2 m x 3 m	2,166 kg
Lambdamat 200	2 m x 3 m	3,738 kg
Lambdamat 320	2 m x 4 m	3,878 kg
Lambdamat 500	2.5 m x 6 m	5,019 kg
Lambdamat 750	2.5 m x 8 m	8,510 kg
Lambdamat 1000	2.5 m x 12 m	11,800 kg

A fork lift with relevant lifting power or a special crane is required. There are eyelets on the chamber, along the length of the heat exchanger profiles are welded on, which the forks of fork lifts can hold, so the system can be brought into position using a crane, fork lift or similar, depending on the conditions in the building.

The following procedures for installation:

1. Set-up

The system should be positioned in the boiler room in accordance with the installation plan, observing the building regulations and the boiler room guidelines (VDI 2050). Before the heat exchanger and chamber are placed opposite each other, the ceramic fibre pack supplied should be put into the seal groove on the chamber.

From the Lambdamat 200 up, the masonry around the chamber should be built on-site before the installation of the heat exchanger, in accordance with the accompanying firebrick diagram.

2. Insulation

Screw the floor rails for the panel with the U profiles
on the underside of the chamber.

Lean the front part onto it and thread in the two front corners.
The same procedure should be used with the back parts.

Thread in lateral parts and screw in the top insulating rails on the left and right.
Secure frame at the combustion chamber door and hang the front cover plate of the door.

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Bolt on the gauge glass.

Hang reversing chamber door.

Thread the large insulation frame over the settling chamber and put aluminium insulation.
Thread in the small insulation frame and screw it on.

Put on the halves of the cover of the insulation and screw them on above.

Screw on all rosettes on the pre-bored holes.

3. Small parts

Now screw in the boiler sensor (KVT20) with the immersion sleeve in the sleeve provided (top front). The return feed sensor is a contact sensor and must be positioned on the return feed directly before the boiler on the pipe. Equally position the STL, directly, not with immersion sleeve.
Installation of the thermocouple together with bushing for the flue gas temperature in the flue gas pipe nozzless.
Screw the Lambda probe into the teflon bushing and fit both in the sleeve welded into the flue gas pipe.
There is a plug on the Lambda probe, which should be cut off during electrical wiring so a socket can be put on for extension of the cable.

Fit a limit switch to the combustion chamber door using a handle and plate, so the system switches off immediately when the door is opened.

Screw the combustion air blower fan to the frame.

Screw in the overpressure flue gas thermostat with the extension supplied.

Fit the secondary air actuators on both sides. Push the mount over the square and push the actuator onto the shaft of the rotary slide valve.
If the slot in the shaft is horizontal, the actuator can be screwed in. Secure the square with the grub screw.
Fit the primary air actuator on the back using the same procedure.

If there is combustion chamber temperature monitoring the sensor should be carefully screwed into the chamber the relevant adaptor.

If there is underpressure monitoring in the combustion chamber the mount should be screwed to the insulation, so that it is near the screw-in sleeve with the nipple. Fit the differential pressure transmitter on the mount and connect it from nipple to nipple with a silicon hose.

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4. Stoker screw

Screw in the stoker trough with the slide-in part and thread in the screw and screw it to the trough with the gear adapter flange.

Push the geared motor onto the shaft end, which has been previously well lubricated (to ease dismantling after prolonged operation) and connect the geared motor with the gear adapter flange. Secure the shaft end with the locking washer and the screw.

Depending on the cause, dismantling is carried out in the same way as assembly.

The parts described should be disposed of according to the nationally applicable regulations.

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7. Maintenance and cleaning

In order to achieve optimum combustion, problem-free automatic operation, and good system efficiency, ash, cinders and unburned residual fuel must be removed from the combustion chamber and the settling chamber under the heat-exchanger at regular intervals. In this case the material feed should be throttled, so that there is not too much fuel and embers in the combustion chamber. After a short time the system can then be switched off. The ash can be cleaned through the pre-heating chamber door with the cleaning device supplied.

For systems with mechanical ash removal the combustion chamber or the grate surface, particularly the step grates, must be cleaned at regular intervals (approx. once a month). If flue dust has settled in the post combustion area, this should also be cleaned into the combustion chamber with the cleaning device supplied. Ensure that the combustion air fan is switched off, but the ID fan is in operation. Otherwise if the cleaning doors are open and fresh air is flowing in, there can be a flash fire.

Boiler conservation

Important: A return feed lift must ensure that the return feed temperature never falls below 65°C. Otherwise **premature corrosion** of the heating surfaces is possible.
You should also ensure that no condensation occurs in the boiler and flue gas pipes during the light load phase.

During shut-down periods in the summer months, you must ensure that all of the boiler circuit water is circulated at least 1 x per month, to avoid deposits and changes to the concentrations.

The boiler should generally only be cleaned when the system is switched off and with the ID fan running.

Important:

Ensure that you follow the enclosed maintenance and check plan.

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8. Corrosion problems

Although in this special heating boiler you have chosen a reliable and problem-free product, we must also point out that ***incorrect operation*** or insufficient maintenance and cleaning can ***severely shorten*** the ***service life*** of the boiler. We will explain the points which are particularly important in this context in greater detail later on:

1. During operation the boiler temperature should not be below 70°C under any circumstances (boiler return feed temperature not below 65°C), because otherwise there could be condensation because the temperature has fallen below the dew point. Combined with combustion residues it may form aggressive condensation, which can shorten the service life of the boiler.
(*Return feed lift must be provided!).*

2. Generally you should only use natural, *dry wood fuel*, under no circumstances plastic, rubber etc.

3. The boiler should be *thoroughly cleaned* regularly, and precise cleaning is necessary above all at the end of the heating period.
All boiler doors should be closed with a full seal (because of corrosion when the boiler is out of service).

4. For systems with automatic make-up systems, or systems containing over 3000 litres of heating water, it is absolutely necessary to use prepared and softened water (boiler scaling).

CAUTION!

In case of corrosion damage caused by excessively low operating temperatures, use of unlisted fuels or insufficient cleaning and maintenance we provide no guarantee.
For this reason we recommend you sign a maintenance contract with Fröling customer services.

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9. Safety information - Fault

The operator is generally forbidden from changing, replacing, deactivating or resetting, safety equipment, which should be installed in accordance with DIN 4751, DIN 4752, DIN 3440 and TRD 702 (as in overview of standards).
The boiler system's type and power rating also may not be modified without the approval of an expert. The operating doors should only be opened, when the ID fan is running.

Devices to counter over-heating

- **Boiler controller**: Switches off the boiler if the boiler temperature is higher than the specified boiler target temperature by a value that can be set in the controller.

- **STL (Safety temperature limiter)**: disengages the induced draught when the boiler temperature reaches 100°C (the pumps continue to run). Unlock mechanically the STL fitted to the cover as soon as the temperature has fallen again. . Unscrew the protective cap and press the red button using a thin object or activate the unlocking mechanism on the device.

- **Safety battery (optional):** At a temperature of 105 °C a valve is opened by a capillary pipe valve, which allows cold water to flow into the safety battery (safety heat exchanger) cooling the heat exchanger.

- **Safety valve (SV)**: If all devices previously mentioned to now prevent the temperature from rising further, the pressure in the system also rises. If this is the case, the safety valve opens and vents the hot water in the form of steam. If this happens, water must be added before a new system start-up.

What to do if unit stops operating

If you discover damage to the heat producing component (boiler), the expansion tank, or the safety equipment, you must stop operating the system.

- Check the power supply (fuses).
- Boiler controller correctly set (everything on “AUTO”)?
- Check the STL Safety Temperature Limiter

- **Boiler output is too low**: Boiler may need cleaning, or the fuel used is too moist.

- **Overheating**: If the boiler system should over-heat in spite of all the safety systems, take the following precautions:
  Close all doors and covers on the boiler and switch off the fan.
  Switch on all the pumps and open the mixer.
  Then leave the boiler room
  For faults that occur on a frequent basis or for faults that can't be cleared by the operator, notify the installer, heating technician, or our customer services or call us on another number listed above.

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10. Replacement part list

Ea.	Item No.	Designation
		Sensor
1	68074	Combustion chamber sensor (Thermocouple Ni-Cr-Ni; 355 mm) for H 3000
1	68084	Combustion chamber sensor (Thermocouple Ni-Cr-Ni; 500 mm) for H 3000
1	67526	Lambda Probe (0 258 104 002)
1	70533	Teflon bushing (Lambda probe adapter)
1	67486	Immersion sensor KVT 20 -5m (boiler sensor)
1	67051	External Sensor AF 200
1	67391	Outfeed or return feed sensor VF 204 (system sensor)
1	68075	Flue gas sensor (Thermocouple 110x5mm) for H2000/3000
		Actuators
1	54819	Actuator for air damper JUVENTA (DMS 1.1)
1	54825	Actuator for burn back flap Belimo AF 230-S
		Lambdamat electrical fittings
1	66629	OMRON Final cut-out switch (D4B-1111N/V1) (combustion chamber door, gravity shaft cover)
1	68056	Vacuum advance unit (differential pressure measuring transducer DPS; measuring range 0-250 Pa)
1	67053	Safety temperature limiter (double thermostat type KS 75)
1	68030	Combustion chamber overpressure sensor (Flue gas thermostat Giesen - GTI 700/1)
1	38053A	Ignition fan for Lambdamat 3,4kW; 230V
1	38056A	Heating element for ignition 2AS (item no.: 38053A) from KW 41/01
		Control components
		H3000
1	67789	Digital module H2000/3000 UNI/LAMBDA
1	67396	Base PCB for Digital module (H2000/3000 UNI/LAMBDA)
1	67397	Power supply module (H2000/3000 UNI/LAMBDA)
1	67785A	Basic module (H3000-UNI/LAMBDA inc. expansion and Eprom)
1	67393A	Basic module base PCB (H3000 inc. expansion UNI/LAMBDA)
1	67787	Display module (H2000/3000 UNI/LAMBDA complete with cable)
1	67788A	Lambdamat module H3000 inc. FRT sensor UNI/LAMBDA
1	67395A	Lambdamat module base PCB H3000 inc. FTR sensor UNI/LAMBDA
1	67378	Heating control base PCB H2000/3000 UNI/LAMBDA
1	67379	Heating control module H2000/3000 UNI/LAMBDA
1	67392	Mains filter H2000/3000 EMI CA1 UNI/LAMBDA
1	67349	Eprom H3000
		Frequency convertor
		Frequency convertor E82EV from approx. 2002
1	55931A	Frequency convertor keypad (control unit)
1	55935A	Frequency convertor E82EV371-2B 0,37 kW (1 phase)
1	55929A	Frequency convertor E82EV751-2B 0,37 kW (1 phase)

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1	55930A	Frequency convertor E82EV152-2B 1,5 kW (1 phase)
1	55928A	Frequency convertor E82EV222-2B 2,2kW (1 phase)
1	55933A	Frequency convertor E82EV302-4B 3kW (3 phases)
1	55949A	Frequency convertor E82EV402-4B 4kW (3 phases)
1	55992A	Frequency convertor E82EV552-4B 5.5kW (3 phases)
1	55990A	Frequency convertor E82EV752-4B 7.5kW (3 phases)
1	55873A	Frequency convertor module E82ZAFS100
		Slide-in ducts
1	97020	Slide-in duct for Lambdamat 120, 150, 200, 320
1	97020	Slide-in duct for Lambdamat 500
1	97020	Slide-in duct for Lambdamat 750
		Combustion trough
1	95365	Combustion trough, slide-in, rear 120 - 320 IND/V
1	95365L	Combustion trough, slide-in, left 120 - 320 IND/V
1	95365R	Combustion trough, slide-in, right 120 - 320 IND/V
1	95364	Combustion trough, slide-in, rear 500 IND/V
1	95364L	Combustion trough, slide-in, left 500 IND/V
1	95364R	Combustion trough, slide-in, right 500 IND/V
1	95365A	Combustion trough, slide-in, rear 750 IND/V
1	95364AL	Combustion trough, slide-in, left 750 IND/V
1	95364AR	Combustion trough, slide-in, right 750 IND/V
		Fixed step grates for Lambdamat 1000 IND
1	97020	Step grates for Lambdamat 1000 IND
		Grate elements for Lambdamat 150 - 320 IND/V
6	42669	Grate element for Lambdamat IND/V 150 - 320
1	42667	Grate side plate, right, for Lambdamat IND/V 150 - 500
1	42668	Grate side plate, left, for Lambdamat IND/V 150 - 500
6	66502	Countersunk head screw, hexagon socket M12x25
		Grate elements for Lambdamat 500 IND/V
9	42669	Grate elements for Lambdamat 500 IND/V
1	42667	Grate side plate, right, for Lambdamat IND/V 150 - 500
1	42668	Grate side plate, left, for Lambdamat IND/V 150 - 500
6	66502	Countersunk head screw, hexagon socket M12x25
		Grate elements for Lambdamat 750 IND/V
60	42666	Grate plate 208 mm/LM
1	97020	Grate side plate, right, for Lambdamat 750 IND/V
1	97020	Grate side plate, left, for Lambdamat 750 IND/V
8	66502	Countersunk head screw, hexagon socket M12x25
		Stoker screw d=150
1	97020	Stoker screw Dm=150mm; L total inc. end=1100mm
		Extension/shortening of screw every 100 mm for Dm=150
		Stoker screw d=200
1	97020	Stoker screw Dm=200mm; L total inc. end=1700mm
		Extension/shortening of screw every 100 mm for Dm=200

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		Stoker screw d=250
1	97020	Stoker screw Dm=250mm; L total inc. end=1500mm
		Extension/shortening of screw every 100 mm for Dm=250
		Gravity shaft bottom - semi-circular for stoker
1	97020	Gravity shaft bottom - semi-circular for stoker, screw diameter d=150: L=370mm
1	97020	Gravity shaft bottom - semi-circular for stoker, screw diameter d=200: L=420mm
		Stoker trough pipe
1	97020	Stoker trough pipe for screw d=150 L=330
		Trough pipe extension / shortening for screw 150 every 100mm
1	97020	Stoker trough pipe for screw d=200 L=280
		Trough pipe extension / shortening for screw 200 every 100mm
		Stoker screw end
1	95485BR	Stoker screw end d=150mm, screw spiral right-handed, stoker connection left
1	95485BL	Stoker screw end d=150mm, screw spiral left-handed, stoker connection right
1	95485CR	Stoker screw end d=200mm, screw spiral right-handed, stoker connection left
1	95485CL	Stoker screw end d=200mm, screw spiral left-handed, stoker connection right
		Screw end
1	95476J	End, screw d=150 (flanged gearing)
1	95384	End, screw d=150 (with flange bearing)
1	95384C	End, screw d=200 (flanged gearing)
1	95384D	End, screw d=200 (with flange bearing)
1	97020	Extension end for screw 150 L=200
1	97020	Extension end for screw 200 L=200
		Rotary valves
1	55561	Geared motor GFL05-2MHRC080-32/ 0,75kW - 1400U for rotary valve 180
1		Geared motor for rotary valve 250
		Flange bearing
1	55195	Flange bearing UCF207
1	55188	Flange bearing UCF209
1	95193	Steep feed screw bearing
		Ash removal
1	95294	Ash screw L150 lg=1750 for ash container 180 L
1	95294A	Ash screw L220IND/V, 320IND/V and KOM lg=1900 for ash container 180 L
1	95294B	Ash screw 500IND/V and KOM lg=2100 for ash container 180 L
1	97020	Special ash removal screw d=110 L total inc. end = 1900mm
		Extension/shortening of screw every 100 mm for ash screw Dm=110
1	95209	Insert block, ash duct, Lambdamat 150-320 IND-V
1	95529B	Blind flange 220 x 220 x 8 for ash duct, Lambdamat
1	95191	Rosette, ash removal for Lambdamat 150-750 IND-V Pladur sheet, red 294 x 300
		Ash removal drive
1	55341A	Ash removal screw drive MRVF 86 P 1:168; to Lambdamat 750
1	54410	Motor for above gearing 0.55 kW; 1400 min^{-1}; 400 V
		Screw drive, Lambdamat 120 - 500
		with a density of 150kg/m³ (joinery material)
1	55045A	Stoker screw gearing WR 86 UFC1 - 168; for Lambdamat 150 IND/V

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1	55341A	Feed screw gearing WR 86 U - 168; for Lambdamat 150 IND/V
1	54410	Motor for above 2 gearings 0.55 kW; 1400 min^{-1}; 400 V
1	55254A	Stoker screw gearing WR 86 UFC1 - 138; for Lambdamat 220 and 500 IND/V
1	55255A	Feed screw gearing WR 86 U - 138; for Lambdamat 220 IND/V
1	54408	Motor for above 2 gearings 0.75 kW; 1400 min^{-1}; 400 V
1	55020A	Stoker screw gearing WR 86 UFC1 - 84; for Lambdamat 320 IND/V
1	55253A	Feed screw gearing WR 86 U - 84; for Lambdamat 320 IND/V
1	55278	Feed screw gearing MRVF 86 P 1:60; for Lambdamat 500 IND and IND/V
1	54416	Motor for above 3 gearings 1.1 kW; 1400 min^{-1}; 400 V
		Screw drive, Lambdamat 120 - 320
		with a density of 250kg/m³ (standard)
1	55015A	Stoker screw gearing VF 44/86 UFC 2:300; for Lambdamat 150
1	55265A	Feed screw gearing VF 44/86 U300 B8 CCW 3; for Lambdamat 150
1	54403	Motor for above 2 gearings 0.37 kW; 1400 min^{-1}; 400 V
1	55045A	Stoker screw gearing WR 86 UFC 1:168 P80 B5 B8; for Lambdamat 220
1	55341A	Feed screw gearing WR 86 U 1:168 P80 B5 B8; for Lambdamat 220
1	54410	Motor for above 2 gearings 0.55 kW; 1400 min^{-1}; 400 V
1	55254A	Stoker screw gearing WR 86 UFC 1:138 P80 B5 B8; for Lambdamat 320
1	55255A	Feed screw gearing WR 86 U 1:138 P80 B5 B8; for Lambdamat 320
1	54408	Motor for above 2 gearings 0.75 kW; 1400 min^{-1}; 400 V
1	55341	Feed screw gearing MRVF 86 P 1:168; for Lambdamat 200, 220 and 500
1	54410	Motor for above 2 gearings 0.55 kW; 1400 min^{-1}; 400 V
1	55254	Stoker screw gearing MRVF 86 FC 1:138; for Lambdamat 320
1	55255	Feed screw gearing MRVF 86 P 1:138; for Lambdamat 320
1	54408	Motor for above 2 gearings 0.75 kW; 1400 min^{-1}; 400 V
		Combustion air blower fan, Lambdamat 120-1500
1	72807A	Combustion air blower fan, Lambdamat 120 and 150; EBM G2E140AL40-01
1	72848A	Combustion air blower fan, Lambdamat 200 and 220; EBM G4D200CL12-01
1	72877	Combustion air blower fan, Lambdamat 320; Dietz DN 14
1	72873	Combustion air blower fan, Lambdamat 500; TEMF 01-225-4
1	72874	Combustion air blower fan, Lambdamat 750 and 1000; TEMF 01-250-42
		Grate drive, Lambdamat 150 IND/V - 500 IND/V
1	55432A	Grate drive gearing VF 30 W63 UFC1 - 1520; for Lambdamat 150 - 500 IND/V
1	54420	Motor for above 2 gearings 0.06 kW; 1400 min^{-1}; 400 V
1	33510	Pivot mount M16-BRF16
1	43034	Threaded rod M16 L=262mm
1	54225	Nut M16
1	50213	Shear bolt (grooved pin 10x 50)
		Grate drive, Lambdamat 750 IND/V
1	55426A	Gearing VF 44 W 86UP 1:1380
1	54433	Motor 0.12kW
		Doors
		Combustion chamber door
1	54310	Barrel nut M12
1	66551	Ring bolt M12x40 links
1	66173	Ring bolt M12x60 right
1	54260	Nut M12
2.2m	30012	Seal cord for combustion chamber door L120 to 1500
1	66401	Gauge glass, round 50x3

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		Middle vault door, Lambdamat, communal
1	54310	Barrel nut M12
1	66551	Ring bolt M12x40 links
1	66173	Ring bolt M12x60 right
1	54260	Nut M12
1.7m	30012	Seal cord for middle vault door L200 to 1500 communal
		Reversing chamber door
2,6	30012	Seal for reversing chamber door L150 to 320
3,2	30012	Seal for reversing chamber door L500
3,9	30012	Seal for reversing chamber door L750 to 1000
1	43215	Star knob 130 M16 for reversing chamber door L120 to 500
1	43234	Star knob 140 M20 for reversing chamber door L750 to 1500
1	66565	Ring bolts M16x120 for reversing chamber door L120 to 500
1	66278	Ring bolts M20x120 for reversing chamber door L750 to 1500
		Cleaning doors, Lambdamat IND/V via vault (as with FHG)
1	43205	Door handle, cleaning door (FHG)
1	30026	Seal cord (glass fibre braid)
1	34027	Insulating plate
2	66596	Hexagonal screw M10x45 for insulating plate
2	32404	Spacer washer M10 for insulating plate
2	56009	Rivet 8x16 for hinge
2	66257	Safety ring for hinge
		Accessories, Lambdamat
1	97020	Complete cleaning device for Lambdamat
		Additional charge for separate upper cleaning device
1	65005	Cleaning brush, Lambdamat d = 53
1	43230	Manual adjuster, air damper
1	55455	Water valve, ABTB (safety battery)
1	65215	Thermal discharge safety device 3/4” STS20 (sprinkler)
1	95192	Ignition fixing, Lambdamat
1	95754	Ignition guiding tube for Lambdamat (two are needed) Lambdamat 200 - 750
1	97020	Primary air damper half, Lambdamat 150 -320 d=150
1	97020	Primary air damper half, Lambdamat 500 d=200
1	97020	Primary air damper half, Lambdamat 750 d=240
1	95201	Conversion of cleaning device, Lam. Flexible version
		Relays and protection
1	67637	Relays finder 40.31
1	67639A	Screw socket 95.83
1	67630A	Diode module 99.80.3000
1	67547	Relays Finder 55.34
1	67426A	Screw socket 94.84
1	67630A	Diode module 99.80.3000
1	67591	Relays Finder 60.13
1	67096	Screw socket 90.21
1	67176	Diode 1N007
1	67638	Relays Finder 40.52
1	67640	Screw socket 95.75

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1	67433	Relays Finder 55.34
1	67426	Screw socket
1	67180	Gold contact relays finder 40.31
1	67639A	Base 95.83
1	67630A	Electr. free wheeling diode
1	67669	Air-break contactor CA4-9C-D-01
1	67307	Air-break contactor CA4-9-01
1	67542	Auxiliary contact CA4-P-11 (1 N/C - 1 N/O)
1	67768A	Auxiliary contact 195-MB-22 (2 N/C - 2 N/O)
1	67685	Auxiliary contact CS4-P-20 (2 N/O)
1	67417	Time delay relays D6DM
1	67113	Current measuring relays (excess current relays)
1	67472	Mains transformer
1	67096	Screw socket TVE 11
1	67765A	Timer switch, 24h
1	66936	Relays for rotary field monitoring TPW
1	66937	Mains transformer TR 2
		Line protective circuit breaker
1	67152	Automatic circuit breaker 10A
1	67153	Automatic circuit breaker 10A
1	67178	Automatic circuit breaker 2A
1	67690	Automatic circuit breaker 6A
		Motor protection switch
		Motor protection switch 140M-C2E from approx. 2002
1	67736A	Motor protection switch 140M-C2E 0.25 - 0.40A
1	67737A	Motor protection switch 140M-C2E 0.40 - 0.63A
1	67670A	Motor protection switch 140M-C2E 0.63 - 1.00A
1	67543A	Motor protection switch 140M-C2E 1.00 - 1.60A
1	67544A	Motor protection switch 140M-C2E 1.60 - 2.50A
1	67545A	Motor protection switch 140M-C2E 2.50 - 4.00A
1	67671A	Motor protection switch 140M-C2E 4.00 - 6.30A
1	67672A	Motor protection switch 140M-C2E 6.30 - 10.00A
1	67675A	Motor protection switch 140M-C2E 10.00 - 16.00A
1	67284A	Motor protection switch 140M-C2E 16.00 - 20.00A
1	67410A	Motor protection switch 140M-C2E 20.00 - 25.00A
1	67305A	Auxiliary contact 140M-C/D/F140M-C-AFA01 1 N.C. (1 N/C)
1	67540A	Auxiliary contact 140M-C/D/F140M-C-AFA10 1 N.O. (1 N/O)
1	67546A	Auxiliary contact 140M-C/D/F140M-C-ASA11 1 N.C. (1 N/O, 1 N/C)
		Sensors and fill level monitors
1	66625	Fill level control, complete (Telco)
1	66625ST	Evaluation device, Telco (Telco relays)
1	66625S	Sender, Telco
1	66625E	Receiver, Telco
1	66637	Light scanner, Leuze (sliding floor)
1	66639	Mount for light scanner (Leuze)

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1	66638A	Proximity switch, inductive IFL8-18L
		Other switch cabinet components
1	67650	Switch cabinet fan 17901
1	67382	Filter mat 125x125
1	95492A	RC module 1000V - 1250V
1	95492	RC module 230V - 400V
		OIL
4L	55588	Gear oil, universal (4 Litre canister)
60L	55173	Hydraulic oil, HV 32 (60L barrel)
		Oil filter
		S K
1	55572	GO1991 for 10 RF-1-10C / FTA1 10Q V25 G8C
1		GO2003 for 20 RF-1-10C
		Firebrick repair material
1	46213S	Insulating concrete 1460P 5kg sack
1	60200	Fire cement, anthracite 310ml (silicone injection)
1	46212S	Repair concrete, Carath SIC 85 LC 5kg sack
1	97020	Concrete extension block, Ökomat 220 / 320
1	95253I	Concrete overlay 124x130x696
		Metal repair material
1	81833A	Mixed electrode for fire-proof transition to normal sheet 3.25
1	81863	Fire-proof electrode for fireproof sheet 2.5
1	81866	Fire-proof electrode for fireproof sheet 3.25
1m²	32184	Fire-proof sheet 3mm (panel: 2000x1000x3)
1m²	31975	Fire-proof sheet 4mm (panel: 2000x1000x4)
1m²	31996	Fire-proof sheet 6mm (panel: 2000x1000x6)
		Seal material
1	55449	Silicone - high temperature
1	30023	Ceramic pack 10x10 (seal cord for high temperature areas)
1	30011	Ceramic pack 15x15 (seal cord for high temperature areas)
1	30012	Ceramic pack 20x20 (seal cord for high temperature areas)
1	30013	Ceramic pack 30x30 (seal cord for high temperature areas)
1	30017	Glass fibre braid, round d=5mm (screw troughs)
1	30010	Glass fibre braid, round d=10mm (screw troughs)

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11. Enclosures: Maintenance and check plan Customer:

Lambdamat	Daily	Weekly	Monthly	Quarterly	Yearly
Hydraulics, sliding floor (see point 1)	Observe noises, seal of system	Oil temp. < 50 °C Clean photo cell	Clean hydraulic chamber and unit	Oil level	Oil change Change filter
Hydraulics, conveyor grate (see point 1)	Observe noises, seal of system	Oil temp. < 50 °C Clean photo cell	and unit	Oil level	Oil change
Hydraulic feeder unit (see point 2)	Observe noises		Limit switch Function test	Check shearing system for wear	General cleaning
Articulated arm delivery unit Bottom stirring apparatus Shavings container (see point 8)				Visual inspection, spring arms	Check coil for wear
Oblique screw		Visual inspection, smoothness		Gearing, check seal	Clean screw in silo
Horizontal screw		Visual inspection, smoothness		Lubricate bearing Gearing seal	Clean screw in silo
Delivery and/or dosing screw		Observe noises	Limit switch, function test	Gearing, check seal	Check coil for wear
Stoker screw		Observe noises		Gearing, check seal	Check coil for wear
Rotary valve		Noises and heat development			Clean valve
Chamber	Observe cinder build-up	Ash Removal	Clean vault, grate wear	Clean lateral firebrick walls	General cleaning, combustion chamber, check door seal
Boiler (see point 3)	Visual inspection		Clean flues, ash transfer chamber		Check seal of doors, inc. cleaning openings
Combustion air blower fan (see point 4)	Visual inspection		Clean protective grating		Clean running wheel
Dedusting and ID fan (see point 5)	Visual inspection	if necessary empty ashcan / running smoothness	Check V-belt tension (if present)	Clean running wheel and smoke flue pipes	
Switch cabinet control (see point 6)	Visual inspection			Test + clean combustion chamber sensor and flue gas sensor	Lambda probe test and cleaning
Safety devices (see point 7)		Burn back flap function test	Safety valve function test	Safety battery (opt.) Sprinkler system function test	STL function test
Heating system	Check system pressure	Seal and function of the fittings			Pressure maintaining system function test

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Legend for maintenance and check plan:

Point 1: See also the accompanying operating and maintenance instructions for hydraulic system.

Point 2: Cleaning of hydraulic loading systems:

Check guides, slide frame and slide rods for wear. Empty the hydraulic loading system completely and sweep it out.
Leave all slider rods without material for a while and observe. Then check the slide rods, guides and the silo floor for deposits or compressed deposits and remove if necessary.

Point 3: Boiler cleaning:

Dirt on the heating surfaces affects heat transfer, the boiler output falls and the flue gas temperature rises.
The cleaning interval depends on the type of fuel and the type of operation. The day before cleaning the combustion system should be shut down following the instructions in the operating manual for decommissioning the system.
The flues can be cleaned from the front by opening the reversing chamber door. Push through the cleaning rod and remove the flue dust through the settling chamber mounted on the back. The ID fan must run constantly during this process (manual operation). It is best to carry out the cleaning with industrial vacuums, offered with special assembly kits.

Point 4: See also accompanying operating and maintenance instructions for combustion air blower fan.

Point 5: See also accompanying operating and maintenance instructions for dedusting system / ID fan.

Point 6: Lambda probe test (if installed):

Unscrewing probe - Display 21%
Test with cigarette, if O_2 value falls sharply

Point 7: Test sprinkler system:

Open ball valve only slightly. Heating the sensor (approx. 85 °C) means the mechanical valve must open and the water must be able to flow unhindered through the hole provided. The water must also flow if the red button on the sprinkler valve is pressed down. The sensor opening must be cleared of deposits of fuel.

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Safety temperature limiter (STL)

Take the temperature sensor out of the immersion sleeve and hold it in a heatable water basin with a temperature display, and heat it until the temperature of the water has reached the specified value of the safety temperature limiter.
Now the system must shut down and the alarm must light up. After the test the safety temperature limiter must be manually unlocked and put back in the immersion sleeve.

Safety battery / Safety heat exchanger (optional):

Take the temperature sensor out of the immersion sleeve and hold it in a heatable water basin with a temperature display, and heat it until the temperature of the water has reached the specified value of the valve. Now the valve must open and allow cold water to flow into the safety battery.
The temperature sensor must be put back into the immersion sleeve after the test. After it has cooled down, check that water is flowing (dripping) out of the safety battery drain pipe. If there are any leaks, either clean or replace if necessary. Otherwise there is a danger of scaling of the safety heat exchanger. However if the flow is very low because of existing scaling, the heat exchanger must be descaled by a professional company.

Point 8: See also accompanying operating and maintenance instructions for spring arm delivery or articulated arm delivery.

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Daily maintenance, testing and cleaning tasks on a FRÖLING water heater:

1. Flue gas temperature:	Optimum value lies between 120-250 °C It should never be above 290 °C!
2. Material in bunker:	Do not allow it to become empty.
3. Cinder build-up:	Combustion chamber temperature too high.
4. View of switch cabinet:	Fault messages
5. Check oil level:	Through the gauge glass on the hydraulic unit.
6. Hydraulic pump:	Watch out for unusual noises.
7. Heating system:	Check system pressure.

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Weekly maintenance, testing and cleaning tasks on a FRÖLING water heater

1. Ash chamber cleaning: If there is ash in the ash chamber (below the grates) or in the ash disposal funnel, this must be removed using a cleaning device.

2. Gear motors: Visual inspection for loss of oil.

3. Ash bucket: Empty if necessary.
   Ash container: Empty if necessary.

4. V-belts: Check the condition and tension of the V-belts.

5. Grates: Check for wear or deformation.

6. Operating temperature, Hydraulic oil:
   It should not be above 50 °C.

7. Seal of the hydraulic lines and fasteners:
   Otherwise tighten screws and fasteners or replace the lines.

8. Hydraulic cylinder: Seal.

9. Infra red light barrier: Clean the photo cell and check the switching point.

10. burn back flap: Clean the dust collection, function test of spring return feed motor.

11. Firebrick lining Visual inspection of vault/slide-in area/ventilation opening.

12. Rotary valve Check for noise and heat development.

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Monthly maintenance, testing and cleaning tasks on a FRÖLING water heater

1. Clean combustion chamber / grate surface: ash, cinders and all non-combustible residue must be removed from the combustion chamber.
2. Combustion chamber firebrick vault: Get rid of ash that has collected above the vault, using a cleaning device.
3. Cleaning the boiler flues: Clean by hand (brush) or with a boiler flue cleaning machine following procedure.
4. Flue gas fan: Check: imbalance of fan wheel, temperature of bearings and lubricant content in housing, other unusual noises.
5. Ash transfer chamber: Remove ash and clean.
6. Grates: Check for wear or deformation.
7. Hydraulic units: Clean and check the seal.
8. Multi-cyclone: Clean carefully.
9. Niche in the slide area of the boiler slide-in and the silo rods: Push the slide rods back and forth to bring fine pieces of fuel into the cylinder chamber. These must be removed at regular intervals. Otherwise damage is possible.
10. Shearing units: Check shearing knife for wear or deformation. If necessary weld it or replace it.
11. Flue gas sensor Check and clean.
12. Conveyor grate Check the conveyor grate carriage and its rollers. You must check for deformation and wear of the roller as well as seal of the cylinder and stroke length.
13. Combustion chamber thermocouple: Check function and wear.
14. Boiler room: After every time the boiler is cleaned.
15. Limit switch: Function test of all limit switches.
16. Safety valve: Function test.
17. Flue gas monitor: Function test and clean.

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Quarterly maintenance, testing and cleaning tasks on a FRÖLING water heater

1. Safety temperature limiter: Take the temperature sensor out of the immersion sleeve and hold it in a heatable water basin with a temperature display, and heat it until the temperature of the water has reached the specified value of the safety temperature limiter. Now the system must shut down and the alarm must light up. After the test the safety temperature limiter must be manually unlocked and put back in the immersion sleeve.

2. Water Sprinkler System: Open ball valve only slightly. Heating the sensor (approx. 85 °C) means the mechanical valve must open and the water must be able to flow unhindered through the hole provided. The water must also flow if the red button on the sprinkler valve is pressed down.
   The sensor opening must be cleared of deposits of fuel.

3. Safety battery / Safety heat exchanger (optional):
   Take the temperature sensor out of the immersion sleeve and hold it in a heatable water basin with a temperature display, and heat it until the temperature of the water has reached the specified value of the valve. Now the valve must open and allow cold water to flow into the safety battery. The temperature sensor must be put back into the immersion sleeve after the test. After it has cooled down, check that water is flowing (dripping) out of the safety battery drain pipe. If there are any leaks, either clean or replace if necessary. Otherwise there is a danger of scaling of the safety heat exchanger. However if the flow is very low because of existing scaling, the heat exchanger must be descaled by a professional company.

4. Underpressure measurement display: Screw the underpressure line to the underpressure measuring point at the boiler combustion chamber. The display must then be on zero. The measurement point at the combustion chamber must be free of ash (clean by blowing out).

5. Flue gas dedusting: Clean fan wheel using a wire brush. Clean the collected flue dust in the glue gas dedusting using a vacuum cleaner.

6. Combustion air blower fan: Clean protective grate (the fan must not be running)

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7. Ventilation openings: Remove the actuators and test the slide valves

8. Flue gas channels: Open the cleaning covers and remove the soot in all channels.

9. Complete stroke of the hydraulic cylinder: measure the stroke length and measure the time for a forwards and backwards motion.

10. The emergency off switch in the silo room: The hydraulic system must stop immediately if this switch is pressed.

11. Oil level and temperature sensors in the hydraulic units:
Remove the sensors from the units. The fault must light up.

12. Ash screw: Watch out for unusual noises. Check bearings for temperature and lubricant content. Lubricate the bearings further, check screw blades for wear.

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Yearly maintenance, testing and cleaning tasks on a FRÖLING water heater

1. Oil change: Only when the system has been shut down

2. Change the hydraulic filter: Only when the hydraulic system has been shut down Carry out at the same time as an oil change.

3. Check the hydraulic pump at maximum pressure: This is done by shutting down the limit switch and pressure switch and allowing an overpressure to build up for a short time.

4. Hydraulic feed system: Check guides, slide frame and slide rods for wear. Empty the hydraulic loading system completely and sweep it out. Leave all slider rods without material for a while and observe. Then check the slide rods, guides and the silo floor for deposits or compressed deposits and remove if necessary.

5. Ventilation openings: Clean the primary (remove the grate) and secondary air openings.

6. Combustion air blower fan: Clean the running wheel carefully with a wire brush.

7. Bearing Lubricate cardan joint and all bearing.

8. Bottom stirring apparatus / articulated arm delivery unit:
   Visual inspection of the spring and articulated arms.

9. Stoker screw Check coil of the screw for wear.

10. Lambda probe Unscrew the probe - display 21 % test with cigarette if O2 value falls sharply.

11. Check seal of all doors and cleaning openings.

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Maintenance instructions for hydraulic system

Work on the hydraulic system should only be carried out by trained professionals.

1. Oil changes depend on a variety of factors including the age of the oil and the amount of dirt contained in it. The first oil and filter change must be carried out after between 50 to 100 service hours after initial startup Later the oil must be constantly monitored.
2. In any case, the oil must be changed after around 5000 service hours or yearly, and at this time the filter inserts (return feed and ventilation filters) must also be changed.
3. The oil level must be checked regularly (there should be no visible signs of foaming) and screws should be tightened.
4. The piping system should be checked regularly for leaks.
5. The return feed filter should be checked and cleaned approx. every 200 service hours (change the cartridge if necessary).
6. The oil temperature should not exceed + 50 °C or fall lower than - 30 °C.

The following procedure is recommended for oil changes:

- All hydraulic cylinders must be put to the end positions, so that the entire oil content can be removed.
- Empty or pump out the oil in the hydraulic unit.
- Remove the unit cover or open the inspection cover.
- Clean thoroughly in the interior of the oil tank and complete remove the oil sludge, if necessary wipe with a lint-free cleaning cloth.
- Replace the oil filter and the ventilation filter if there is one.
- Close the unit cover or the inspection cover.
- Fill the relevant hydraulic oil via a filter unit up to the mark on the gauge glass.
- In order to be able to remove the residual oil in the hydraulic cylinder the hydraulic hose at the opposite end of the cylinder that is pushed into the end position (the side that still contains old oil) must be closed.
  The hydraulic hose is taken off on the fixed piping side to be able to push the oil into a container.
- Using the unit the cylinders are now pushed into the other end position, and thus the old oil is transported out of the cylinder.
- Reconnect all hydraulic piping and hoses and check the seal.
- Fill up new hydraulic oil in the unit or the filter unit.
- With small hydraulic cylinders (grate, ash rake, …) short-circuit the hydraulic hoses at the cylinder connection and switch on the hydraulic pump (activate the valve), so that the oil is sent round in a circle, to remove air pockets from the system.
- Check the oil level and refill if necessary.

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Important points to be dealt with by the operator for measuring emissions:

1.) According to the stipulations of Austrian standard ÖNORM M 5861-1, the flue gas piping must have a built-in DN 100 test flange. (see enclosure)

2.) The entire system (ash container, chamber, vault, heat exchanger, flue gas pipe connection between boiler and cyclone, cyclone, container under cyclone, flue between cyclone and chimney) must be cleaned approx 2-3 days before the measurement.

3.) System performance must be measured at full load and at partial load.

4.) In the last two days before the test, system output must be increased to approximately the rated output of the boiler. This is to prevent the release during testing of any old deposits (e.g. tar) in the flue gas piping.

5.) Wood chips as per ÖNORM M 7133 with a maximum water content of 30 % must be provided by the operator.
Wood chip size:
Screw feed loading: max. G 50
Hydraulic loading: max. G 100

6.) One or two days before the test, the efficiency and settings of the system should be checked by our service technician. The system must be set up for the fuel to be used during the emission tests. (Test measurements by our service technicians)

7.) Our service technician will be present at the tests. Emission tests should be carried out by an accredited test institute or, in Germany, a chimney sweep.

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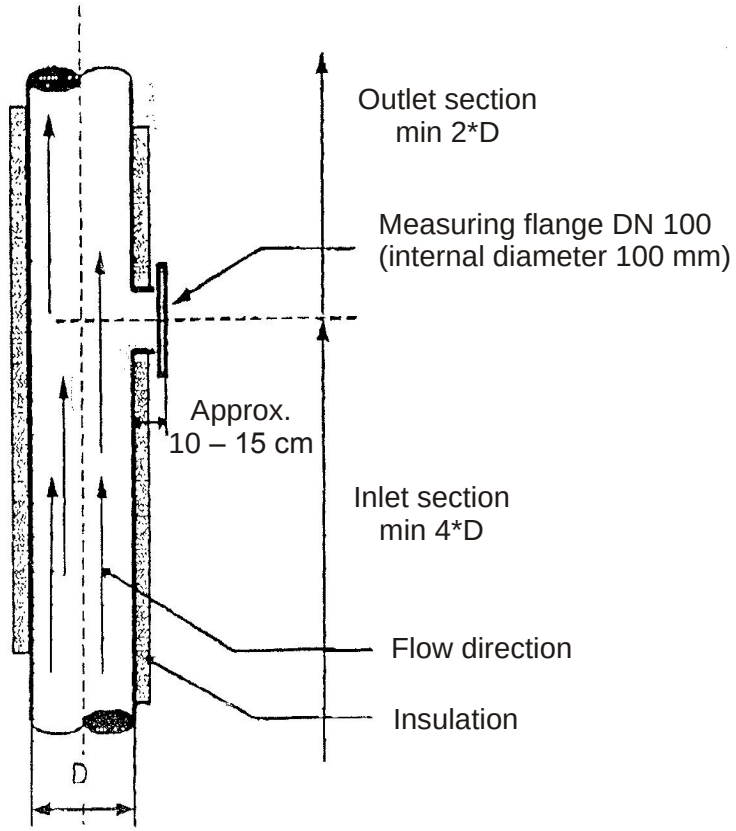
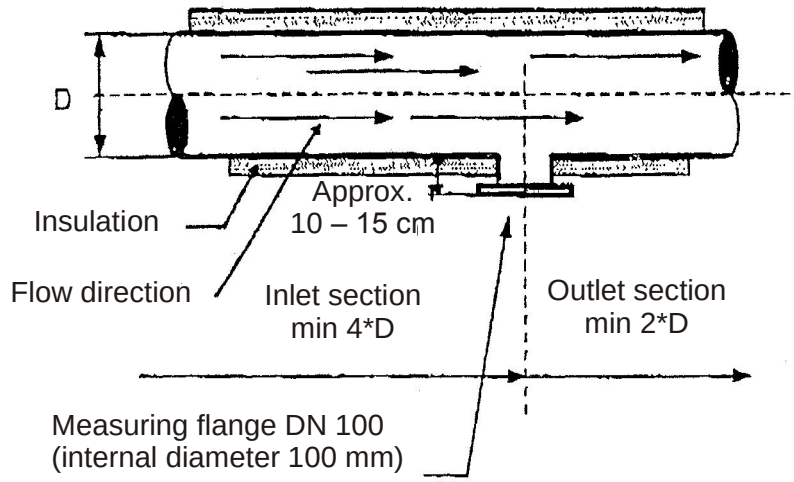
Measuring flange for measurement of total dust content as per ÖNORM M 5861-1 or VDI 2066 page 2 using filter casing or VDI 2066 page 7 using plane filter measuring head



With horizontal exhaust pipes the measuring point should be installed on the underside of the exhaust pipe if possible, to prevent the dust falling back down into the gas measurement channel.



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