Installation Instructions

Turbomat TM 400-500

Translation of the original German installation instructions for technicians
Read and follow the instructions and safety information!
Technical changes, typographical errors and omissions reserved!
M0690213_en | Edition 31/03/2014

Fröling GesmbH | 4710 Grieskirchen, Industriestraße 12 | www.froeling.at
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1 General

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

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

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

Subject to technical change.

Issuing a delivery certificate

The EC Declaration of Conformity is only valid in conjunction with a delivery certificate, which has been filled in correctly and signed as part of the commissioning process. The original document remains at the installation site. Commissioning installers or heating engineers are requested to return a copy of the delivery certificate together with the guarantee card to Froling. On commissioning by FROLING Customer Service the validity of the delivery certificate will be noted on the customer service record.
2 Safety

2.1 Hazard levels of warnings

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

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

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

- **CAUTION**
  
  *The dangerous situation may occur and if measures are not observed it will lead to minor injuries or damage to property.*
2.2 Qualification of assembly staff

**CAUTION**

Assembly and installation by untrained personnel:

*Risk of personal injury and damage to property.*

During assembly and installation:
- Observe the instructions and information in the manuals
- Only allow trained staff to carry out assembly and installation

Assembly, installation, initial startup and servicing must always be carried out by qualified personnel:
- Heating technician / building technician
- Electrical installation technician
- Froling customer services

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

2.3 Protective equipment for assembly staff

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

- For transportation, setup and assembly:
  - suitable workwear
  - protective gloves
  - sturdy shoes

2.4 Design Information

2.4.1 Notes on standards

The system must be installed and commissioned in accordance with the local fire and building regulations. The following standards and regulations should always be observed:

**General standards for heating systems**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
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<tr>
<td>EN 303-5</td>
<td>Boilers for solid fuels, manually and automatically fed combustion systems, nominal heat output up to 500 kW</td>
</tr>
<tr>
<td>EN 12828</td>
<td>Heating systems in buildings - design of water-based heating systems</td>
</tr>
<tr>
<td>EN 13384-1</td>
<td>Chimneys - Thermal and fluid dynamic calculation methods Chimneys serving one appliance</td>
</tr>
<tr>
<td>Standard Code</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
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</tr>
</tbody>
</table>
| ÖNORM M 7510-1 | Guidelines for checking central heating systems  
Part 1: General requirements and one-off inspections |
| ÖNORM M 7510-4 | Guidelines for checking central heating systems  
Part 4: Simple check for heating plants for solid fuels |

**Standards for structural and safety devices**

<table>
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<th>Standard Code</th>
<th>Description</th>
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<tr>
<td>ÖNORM H 5170</td>
<td>Heating installation - Requirements for construction and safety engineering, as well as fire prevention and environmental protection</td>
</tr>
<tr>
<td>TRVB H 118</td>
<td>Technical directives for fire protection/prevention (Austria)</td>
</tr>
</tbody>
</table>

**Standards for heating water**

<table>
<thead>
<tr>
<th>Standard Code</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>ÖNORM H 5195-1</td>
<td>Prevention of damage by corrosion and scale formation in closed warm water heating systems at operating temperatures up to 100 °C (Austria).</td>
</tr>
<tr>
<td>VDI 2035 Sheet 1</td>
<td>Prevention of damage in water heating systems - Scale formation in domestic water heating systems and hot water heating systems (Germany)</td>
</tr>
<tr>
<td>SWKI 97-1</td>
<td>Water quality for heating, steam, cooling and air conditioning systems (Switzerland)</td>
</tr>
<tr>
<td>D.P.R. no. 412</td>
<td>Regulations for the planning, installation, running/operation and maintenance of heating systems in buildings to reduce energy consumption with reference to Article 4, Comma 4 of the Legislative Decree of 9 January 1991, No. 10 (Italy)</td>
</tr>
</tbody>
</table>

**Standards for permitted fuels**

<table>
<thead>
<tr>
<th>Standard Code</th>
<th>Description</th>
</tr>
</thead>
</table>
| EN 14961-2    | Solid biofuel, fuel specifications and classes.  
Part 2: Wood pellets for non-industrial use |
| EN 14961-4    | Solid biofuel, fuel specifications and classes.  
Part 2: Wood chips for non-industrial use |
| 1. BImSchV   | First Ordinance of the German Federal Government for implementation of the Federal Emission Protection Law, BGBl. I P. 491, in the applicable version. |

### 2.4.2 Installation and approval of the heating system

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

**Note on standards**

<table>
<thead>
<tr>
<th>Standard Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ÖNORM / DIN EN 12828</td>
<td>Heating Systems in Buildings</td>
</tr>
</tbody>
</table>
NOTICE! Each heating system must be officially approved.
The appropriate supervisory authority (inspection agency) must always be informed when installing or modifying a heating system, and authorisation must be obtained from the building authorities:

Austria: Inform the civic/municipal building authorities.
Germany: Notify an approved chimney sweep and the building authorities.

2.4.3 General information for installation room (boiler room)

Boiler room characteristics

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

Ventilation of the boiler room

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

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

Note on standards

ÖNORM H 5170 - Construction and fire protection requirements
TRVB H118 - Technical directives on fire protection/prevention

2.4.4 Requirements for central heating water

The following standards and guidelines apply:

Note on standards

<table>
<thead>
<tr>
<th>Country</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>ÖNORM H 5195-1</td>
</tr>
<tr>
<td>Germany</td>
<td>VDI 2035</td>
</tr>
<tr>
<td>Switzerland</td>
<td>SWKI 97-1</td>
</tr>
<tr>
<td>Italy</td>
<td>D.P.R. no. 412</td>
</tr>
</tbody>
</table>

NOTICE! Note on filling with make-up water: always bleed the filling hose before connecting, in order to prevent air from entering the system.
Observe the standards and also follow the recommendations below:

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

**2.4.5 Notes for using pressure maintenance systems**

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

*Compressor-controlled pressure maintenance*

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

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

⚠️ CAUTION

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

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

Take the following precautions:

- Regulations stipulate the use of a return temperature control.
- The minimum return temperature is 65 °C. We recommend fitting some sort of control device (e.g. thermometer).

2.4.7 Use with storage tank

⚠️ NOTICE

In principle it is not necessary to use a storage tank for the system to run smoothly. However, we recommend that you use the system with a storage tank, as this ensures a continuous supply of fuel in the ideal output range of the boiler.

For the correct dimensions of the storage tank and the line insulation (in accordance with ÖNORM M 7510 or guideline UZ37) please consult your installer or Froling.

⇨ See "Addresses" [page 69]
2.4.8 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.

The flue gas temperatures (for clean systems) and additional flue gas values can be found in the table below.

The connection between the boiler and the chimney system should be as short as possible. The upward angle of the connection should not exceed 30° - 45°. Insulate the connection. The entire flue gas system - chimney and connection - should be calculated in accordance with EN 13384-1.

Local regulations and other statutory regulations also apply.

NOTICE! The chimney must be authorised by a smoke trap sweeper or chimney sweep.

**Draught limiter**

The installation of a draught limiter is recommended.

NOTICE! Install the draught limiter directly under the mouth of the flue line, as the pressure is constantly low at this point.

**Boiler data for planning the flue gas system**

<table>
<thead>
<tr>
<th>Description</th>
<th>TM</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>400</td>
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<tr>
<td>Flue gas temperature at nominal load °C</td>
<td>140</td>
</tr>
<tr>
<td>Flue gas temperature at partial load</td>
<td>110</td>
</tr>
<tr>
<td>Flue gas mass flow with wood chip W30, 14% O₂ kg/h</td>
<td>2,060</td>
</tr>
<tr>
<td>Flue gas mass flow with wood chip W30, 9% O₂</td>
<td>1,111</td>
</tr>
<tr>
<td>Flue gas mass flow with wood pellets 14% O₂</td>
<td>1,729</td>
</tr>
<tr>
<td>Flue gas mass flow with wood pellets 9% O₂</td>
<td>939</td>
</tr>
<tr>
<td>Required feed pressure at nominal load mbar</td>
<td>0.05</td>
</tr>
<tr>
<td>Required feed pressure at partial load</td>
<td>0.02</td>
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<tr>
<td>Flue pipe diameter mm</td>
<td>350</td>
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3 Technology

3.1 Dimensions

<table>
<thead>
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<th>Description</th>
<th>Unit</th>
<th>TM 400</th>
<th>TM 500</th>
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<tbody>
<tr>
<td>H1</td>
<td>Height, boiler incl. insulation</td>
<td>mm</td>
<td>2,660</td>
<td>2,660</td>
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<tr>
<td>H2</td>
<td>Height of return connection</td>
<td>mm</td>
<td>710</td>
<td>710</td>
</tr>
<tr>
<td>H3</td>
<td>Height of flow connection</td>
<td>mm</td>
<td>2,000</td>
<td>2,000</td>
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<tr>
<td>H4</td>
<td>Height, flue gas pipe connection excl. flue gas return</td>
<td>mm</td>
<td>985</td>
<td>985</td>
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<tr>
<td>H5</td>
<td>Height, flue gas pipe connection incl. flue gas return</td>
<td>mm</td>
<td>2,075</td>
<td>2,075</td>
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<tr>
<td>B</td>
<td>Total width incl. fittings</td>
<td>mm</td>
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<td>2,990</td>
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<tr>
<td>B1</td>
<td>Width, boiler incl. insulation</td>
<td>mm</td>
<td>2,495</td>
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<tr>
<td>L</td>
<td>Total length incl. fittings</td>
<td>mm</td>
<td>3,595</td>
<td>3,595</td>
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<tr>
<td>L1</td>
<td>Length, stoker unit</td>
<td>mm</td>
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### 3.2 Components and connections

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<th>Description</th>
<th>Unit</th>
<th>TM 400</th>
<th>TM 500</th>
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<tbody>
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<td>A</td>
<td>Boiler flow connection</td>
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<tr>
<td>B</td>
<td>Boiler return connection</td>
<td>inches</td>
<td>DN100 / PN 16</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Thermal discharge safety device connection</td>
<td>inches</td>
<td>¾” ET</td>
<td>¾” ET</td>
</tr>
<tr>
<td>D</td>
<td>Flue gas pipe connection without FGR (flue gas recirculation)</td>
<td>mm</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>E</td>
<td>Flue gas pipe connection with FGR (flue gas recirculation)</td>
<td>mm</td>
<td>350</td>
<td>350</td>
</tr>
</tbody>
</table>
### 3.3 Technical specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal heat output kW</td>
<td>399</td>
<td>499</td>
</tr>
<tr>
<td>Heat output range kW</td>
<td>119-399</td>
<td>149-499</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>400 V / 50 Hz / 35 A or as per circuit diagram</td>
<td></td>
</tr>
<tr>
<td>Power consumption (pellets, wood chip) kW</td>
<td>1.38 / 1.75</td>
<td>1.57 / 2.08</td>
</tr>
<tr>
<td>Total weight incl. fittings kg</td>
<td>8,400</td>
<td>8,400</td>
</tr>
<tr>
<td>Weight - combustion chamber kg</td>
<td>2,200</td>
<td>2,200</td>
</tr>
<tr>
<td>Weight - heat exchanger kg</td>
<td>2,150</td>
<td>2,150</td>
</tr>
<tr>
<td>Heat exchanger water capacity l</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Water pressure drop (ΔT = 10 / 20 K) mbar</td>
<td>14.3 / 5.6</td>
<td>19 / 8.5</td>
</tr>
<tr>
<td>Minimum boiler return temperature °C</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Maximum permitted operating temperature °C</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Permitted operating pressure bar</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Boiler class as per EN 303-5:2012</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Permitted fuel as per EN 14961 ¹)</td>
<td>Part 2: Wood pellets class A1 / D06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Part 4: Wood chips class A2 / P16A-P45A</td>
<td></td>
</tr>
<tr>
<td>Airborne sound level dB(A)</td>
<td>&lt; 70</td>
<td></td>
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¹. Detailed information on the fuel is included in the operating instructions in the section on "Permitted fuels"

<table>
<thead>
<tr>
<th>Description</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing institute TÜV Austria ¹)</td>
<td>11-UW/Wels-EX-177/5</td>
<td>11-UW/Wels-EX-177/1</td>
</tr>
<tr>
<td>Date of issue</td>
<td>20/03/2012</td>
<td>18/09/2011</td>
</tr>
</tbody>
</table>

¹. TÜV Austria Services GmbH, Geschäftsbereich Umweltschutz, Am Thalbach 15, A-4600 Thalheim/Wels

#### Test data for wood chips - emissions in [mg/MJ] (nominal load/partial load)

<table>
<thead>
<tr>
<th>Description</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide (CO) mg/MJ</td>
<td>9 / 4</td>
<td>&lt;2 / 4</td>
</tr>
<tr>
<td>Nitrogen oxide (NOx) mg/MJ</td>
<td>44 / 51</td>
<td>46 / 51</td>
</tr>
<tr>
<td>Organic hydrocarbons (OGC) mg/MJ</td>
<td>&lt;1 / &lt;2</td>
<td>&lt;1 / &lt;2</td>
</tr>
<tr>
<td>Dust mg/MJ</td>
<td>15 / 11</td>
<td>18 / 11</td>
</tr>
<tr>
<td>Boiler efficiency %</td>
<td>93.9 / 90.3</td>
<td>93.6 / 90.3</td>
</tr>
</tbody>
</table>

#### Test data for wood chips - emissions in [mg/m³] ¹) (nominal load/partial load)

<table>
<thead>
<tr>
<th>Description</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide (CO) mg/m³</td>
<td>14 / 5</td>
<td>&lt;2 / 5</td>
</tr>
<tr>
<td>Nitrogen oxide (NOx) mg/m³</td>
<td>65 / 76</td>
<td>67 / 76</td>
</tr>
<tr>
<td>Organic hydrocarbons (OGC) mg/m³</td>
<td>&lt;1 / &lt;3</td>
<td>&lt;1 / &lt;3</td>
</tr>
<tr>
<td>Dust mg/m³</td>
<td>22 / 16</td>
<td>26 / 16</td>
</tr>
</tbody>
</table>

¹. Emissions values based on dry flue gas at standard temperature and pressure (0°C, 1,013 mbar) with a volume content of oxygen of 13%
<table>
<thead>
<tr>
<th></th>
<th>Test data for pellets - emissions in [mg/MJ] (nominal load/partial load)</th>
<th>Test data for pellets - emissions in [mg/m³]¹ (nominal load/partial load)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide (CO)</td>
<td>mg/MJ  (&lt;2 / &lt;3)</td>
<td>(&lt;2 / &lt;3)</td>
</tr>
<tr>
<td>Nitrogen oxide (NOx)</td>
<td>mg/MJ  (63 / 71)</td>
<td>(66 / 71)</td>
</tr>
<tr>
<td>Organic hydrocarbons (OGC)</td>
<td>mg/MJ  (&lt;1 / &lt;2)</td>
<td>(&lt;1 / &lt;2)</td>
</tr>
<tr>
<td>Dust</td>
<td>mg/MJ  (12 / 10)</td>
<td>(13 / 10)</td>
</tr>
<tr>
<td>Boiler efficiency</td>
<td>%  (93.9 / 92.0)</td>
<td>(94.4 / 92.0)</td>
</tr>
</tbody>
</table>

¹. Emissions values based on dry flue gas at standard temperature and pressure (0°C, 1,013 mbar) with a volume content of oxygen of 13%
4 Assembly

4.1 Transport

**NOTICE**

Damage to components if handled incorrectly

- Follow the transport instructions on the packaging
- Transport components with care to avoid damage
- Protect the packaging against damp
- Operate unloading, positioning and mounting only by trained professionals!
  Staff has to be familiar with the handling and moving of heavy loads! (tools and lifting tools, lashing points, etc.)

4.2 Positioning

- Attach a cable winch or similar lifting device to the eyelet(s) on the boiler

4.3 Temporary storage

If the system is to be assembled at a later stage:

- Store components at a protected location, which is dry and free from dust
  ➡ Damp conditions and frost can damage components, particularly electric ones!

4.4 Setting up in the boiler room

4.4.1 Moving the boiler in the boiler room

- Position a fork-lift or similar lifting device with a suitable load-bearing capacity at the base frame
- Lift and transport to the intended position in the installation room
  ➡ Observe the minimum distances in the boiler room.
4.4.2 Minimum distances in the boiler room

- The system should generally be set up so that it is accessible from all sides allowing quick and easy maintenance.
- Regional regulations regarding necessary maintenance areas for inspecting the chimney should be observed in addition to the specified minimum distances!
- Observe the applicable standards and regulations when setting up the system.
- Observe additional standards for noise protection (ÖNORM H 5190 - Noise protection measures)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>TM 400/500</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Space required for inspection area of infeed</td>
<td>mm</td>
<td>500</td>
</tr>
<tr>
<td>B</td>
<td>Space required for inspection area of heat exchanger - lateral</td>
<td>mm</td>
<td>500</td>
</tr>
<tr>
<td>C</td>
<td>Space required for inspection area - front</td>
<td>mm</td>
<td>1,000</td>
</tr>
<tr>
<td>D</td>
<td>Space required for inspection area of combustion chamber - lateral</td>
<td>mm</td>
<td>950</td>
</tr>
<tr>
<td></td>
<td>Minimum room height</td>
<td></td>
<td>3,300</td>
</tr>
</tbody>
</table>
4.5 Installing the boiler

**NOTICE**

Reduction in performance due to air leakage

*The use of flanges without sealing cords can result in a reduction in performance due to air leakage*

Therefore:

- sealing cords or the surface sealant provided must be used on all the flanged connections on the following components: loading; ash removal; pressure ducting; air ducts for primary, secondary and tertiary air; ducting for combustion air fan; flue gas and flue gas return piping.

---

**4.5.1 General information**

*Front and back of boiler*

The front of the boiler is its operating side. All of the elements necessary for operating the unit, e.g. combustion chamber, burning chamber and ash can can be found on the front.

The back of the boiler is opposite the front and is where the stoker unit, EOS drive and complete flue gas system can be found.

*Heat exchanger on the left or right*

A general distinction is made between whether the heat exchanger is located to the left or right of the combustion chamber (as seen from the front = operating side). It is important to determine whether the heat exchanger will be installed to the left or right if there is no existing layout plan.

The following images show the instructions for installing a heat exchanger to the right of the combustion chamber. If it is to be installed to the left, the steps should be carried out in the same way but on the other side.

**4.5.2 Bolting together the combustion chamber and heat exchanger**

- Position the combustion chamber as per the layout plan ensuring it is level.
- Weld the nuts (M12) on the grate shaft of the heat exchanger.
Fit the seal cord

Position the heat exchanger on the combustion chamber
  ➤ Ensure that the locating pins are inserted correctly

Check the caps on the end of the grate shafts
  ➤ If necessary, tighten to the stop

Fix the heat exchanger to the flange with 6 M12 nuts and washers (socket spanner size SW 19 mm)
  ➤ Tighten the nuts so that the flange ring is seated inside the cord seal channel
4. Ensure the complete assembly is level by adjusting the feet (spanner size SW 30 mm)
   ▶ Check that none of the adjustable feet are loose

5. Slide the insulation sheet steel panels (1) on both sides under the heat exchanger and feed through the pins (2)

4.5.3 Assembling the stoker unit

6. Secure the stoker duct to the slide-on duct using 4 M10x40 bolts and M10 nuts
7. Secure the flange plate with 4 M10x20 bolts and M10 nuts
8. Fix the rotary valve or the burn back flap (depending on the version) in place using four M12 screws and nuts.
   ▶ Fit the burn back flap so that the pivot point of the flap is on the side opposite the boiler.

9. Push in the stoker screw
10. Fit the flange plate onto the stoker screw and align it parallel to the stoker duct flange
    ▶ Check that the stoker screw can turn freely
Secure the flange plate with 4 M 10x40 bolts and M10 nuts
Remove the protective tape and the key from the stoker screw
Grease the shaft stub
Remove the transport clamp from the stoker gearbox and fit the vent screw
Slide the stoker gearbox onto the stoker screw. Secure it to the flange plate with four M10x40 screws

Fit the adjustable feet (M16x150 screws) to the stoker duct flange and tighten slightly
Fix in place using lock-nuts
Insert the key in its groove on the shaft and motor and secure with the shaft circlip
Fit the discharge system (feed screw, etc.) according to the installation instructions enclosed

4.5.4 Repositioning the EOS rods (if required)

The EOS drive is always fitted to the back of the boiler. The EOS rods may therefore need repositioning depending on the side where the heat exchanger is fitted:

Open the heat exchanger cover
Loosen the clamping jaw on the operating lever and remove it from the heat-exchanger shaft
Unscrew the bearing bush on the shaft
Unscrew the blind plug mounted on the opposite side of the heat-exchanger shaft
Remove the securing pins from the heat-exchanger shaft
Reinsert the heat-exchanger shaft from the opposite side and push through
Replace the securing pins
Replace the bearing bush and blind plug that you removed previously on the opposite side
Also remove the tension hook and fix it on the opposite side

4.5.5 Assemble the case cooling duct (optional)

Remove the blanking plate from the front of the heat exchanger
Position the case cooling duct between the heat exchanger and the combustion chamber

Fix the duct onto the heat exchanger and combustion chamber using M8 screws

Attach the cover plate to the duct

Fix the air damper rods in place with a pressure spring, spacer washer and air flap

Fix the glass fibre braid onto the air controller cover plate and attach the cover plate to the duct

Assemble the torque support for the actuator on the cover plate
### 4.5.6 Assembling the insulation floor base frame

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Left combustion chamber longitudinal element</td>
</tr>
<tr>
<td>B</td>
<td>Right combustion chamber longitudinal element</td>
</tr>
<tr>
<td>C</td>
<td>Back combustion chamber cross-piece</td>
</tr>
<tr>
<td>D</td>
<td>Front combustion chamber cross-piece</td>
</tr>
<tr>
<td>E</td>
<td>Front heat exchanger cross-piece</td>
</tr>
<tr>
<td>F</td>
<td>Back heat exchanger cross-piece</td>
</tr>
<tr>
<td>G</td>
<td>Angled elements</td>
</tr>
<tr>
<td>H</td>
<td>Right heat exchanger longitudinal element</td>
</tr>
</tbody>
</table>

- Position the left combustion chamber longitudinal element (A)
Position the left longitudinal element (B) between the combustion chamber and the heat exchanger
Attach these elements to the combustion chamber at the specified points

Position the back (C) and front (D) combustion chamber cross-piece
- The lugs on the cross-pieces and longitudinal elements must overlap correctly
  (1)
Attach the cross-pieces to the combustion chamber at the specified points
Fix the cross-pieces to the longitudinal elements with thread forming screws

Position the heat exchanger front (E) and back (F) cross-pieces on the heat exchanger
Attach the angled elements (G) to the front and back of the right-hand side of the heat exchanger using M8x25 hexagon bolts
Attach the right heat exchanger longitudinal element (H) to the heat exchanger at the angled elements
Fix the front and back cross-pieces to the heat exchanger longitudinal element on the right and to the combustion chamber longitudinal element on the left with thread forming screws
Align the floor base frame on all sides using M8x40 hexagon bolts
4.5.7 Fitting thermal insulation to the boiler

- Insert the heat insulation mat into the bottom right between the combustion chamber and heat exchanger.
- Lay 4 insulated panels on top of the combustion chamber
  ➔ 2 at the front, 2 at the back

- Lay a heat insulation mat from the back left over the combustion chamber
  ➔ Insert the other end of the heat insulation mat between the combustion chamber and heat exchanger

- Lay the heat insulation mat over the combustion chamber from the front
  ➔ from the front of the boiler right underneath and up to above the secondary air box on the back of the boiler
Lay the heat insulation mat over the combustion chamber from the side

Fix the heat insulation mats in place using tension springs

View of the combustion chamber from the back:
4.5.8 Assembling the upper insulation base frame

<table>
<thead>
<tr>
<th>A</th>
<th>Combustion chamber support members</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Left combustion chamber longitudinal element</td>
</tr>
<tr>
<td>C</td>
<td>Combustion chamber cross-pieces</td>
</tr>
<tr>
<td>D</td>
<td>Right combustion chamber longitudinal element</td>
</tr>
<tr>
<td>E</td>
<td>Central combustion chamber frame element</td>
</tr>
<tr>
<td>F</td>
<td>Heat exchanger support element</td>
</tr>
<tr>
<td>G</td>
<td>Heat exchanger cross-pieces</td>
</tr>
<tr>
<td>H</td>
<td>Heat exchanger longitudinal element</td>
</tr>
</tbody>
</table>
Insert the combustion chamber support elements (A) into the floor base frame at the front and back on the left and right.

Attach thermal insulation to the support elements using tension springs.

Position the left combustion chamber longitudinal element (B) on the support elements.

Position the combustion chamber cross-pieces at the front and back between the support elements.

Position the right combustion chamber longitudinal element (D) on the support elements.
❒ Place the central combustion chamber frame element (E) between the front and back insulation panels
❒ Check that all of the lugs are placed correctly

❒ Line up the frame and screw the frame elements in place
❒ Insert the heat exchanger support element (F) into the floor base frame

❒ Position the heat exchanger cross-pieces (G) and longitudinal elements (H)
4.5.9 Installing the insulating side panels

- Line up the frame and screw the frame elements in place

- Remove the protective film from all of the insulating side panels

- Cut out all of the perforated areas from the insulating side panels depending on the boiler in question
  - Cut away and remove any thermal insulation below the panels using a knife
idores side panel (1) into place at the bottom and onto the lug in the floor frame (2)

- Slide the insulating side panel (1) into place at the top and onto the lugs in the frame (3)

- Slide insulating side panel A into the upper and lower frames

- Slide insulating side panels B and C into place

- Slide insulating side panels D and E into place
Slide insulating side panels F and H into place

Slide insulating side panels G and I into place

Slide insulating side panels J and K into place

Attach all insulating side panels to the frame with screws

Position the heat exchanger ash removal insulation (L) and attach at the top using three screws
❒ Slide insulating side panel L into place
❒ Slide insulating side panels M and N into place

❒ Slide insulating side panel O into place

❒ Mount the cover plate (two parts) onto the case cooling (optional)
  ➔ If there is no case cooling, the cover plate is a single piece
  ➔ Mount the cover plate to the left of the case cooling
4.5.10 Installing the heat exchanger ash removal unit

**Front of boiler**

- Insert the ash screw

**Back of boiler**

- Assemble both flanges (1) for the heat exchanger ash removal
- Grease the shaft stub on both ash screws
- Place the motor on the right-hand shaft and fix in place with screws
Place the pedestal on the left-hand shaft and fix in place with screws and spacer washers.

Mount a simple chain wheel onto the geared motor.

Mount the chain wheel and chain tensioner on the pedestal.

Wind the chain around the motor and pedestal and hold in place using the spacer sleeve.
Assemble the locking lever onto the ash removal flanges as shown in the diagram.

Fit the foam rubber seal on the ash removal flanges over the shaft.

Fit the plastic handles on the locking levers.

If necessary, use a rubber mallet to knock it into place.
Assemble both ash removal flanges with 4 M8x20 hexagon bolts and M8 spacer washers

- Position the flanges so that the levers on the locking mechanism face outwards

Install the insulation

Mount the lower bracket to the insulation

Position both ash cans on the flanges

- Push the lever on the side of the boiler downwards to lock the ash container in place
Assemble the safety switch on the bracket
Mount the safety switch and bracket onto the boiler insulation and align

Push the key plate into the safety switch on the boiler

4.5.11 Installing the induced draught fan

Fit seal cord around the induced draught fan flange on the back of the boiler
Mount the induce draught fan bracket onto the flange
  Align correctly using the adjustable feet and fix in place using the spacer washer and hexagon bolt
Fit seal cord around the flue pipe compensator and mount the flue pipe compensator onto the induced draught fan bracket.

Mount the induced draught fan onto the flue pipe compensator:
- Also add an earthing connection
- Align correctly using the rubber buffer and fix in place using the spacer washer and hexagon bolt

Mount the transitional flange (square to round for smoke flue pipe) onto the induced draught fan.

Fit the broadband probe:
- Unscrew the pre-installed bushing from the broadband probe
- Screw the bushing into the induced draught fan flange and gently tighten
- Screw the broadband probe into the bushing and gently tighten using an Allen wrench (22 mm)

Screw in the brass bushing for the flue gas temperature sensor.

Push the flue gas temperature sensor in so that it protrudes approx. 20 mm from the housing and secure the position with the wing screw.
Wrap heat insulation around the induced draught fan flange and fix in place using tension springs
Run the cable from the broadband probe and flue gas temperature sensor out from the thermal insulation

Mount the induced draught fan flange cover plate to the insulation

Lay the upper induced draught fan flange cover plate in place and fix with screws
Run the cable from the broadband probe and flue gas temperature sensor out from the provided opening (1)

4.5.12 Assembling the FGR (optional)

Mount the FGR duct to the flue pipe elbow on the back of the boiler
Mount the FGR bracket onto the flue pipe elbow
- Mount the rubber buffer on the underside of the FGR blower fan
- Position the FGR blower fan on the bracket

- Mount the FGR blower fan using rubber buffers
- Wrap the complete FGR duct incl. the flue pipe elbow in thermal insulation
  - Fix the thermal insulation in place using tension springs

- Mount the vertical cover on the FGR duct
Mount the cover on the horizontal part of the FGR duct

Mount the cover on the flue pipe elbow
Mount all the inspection opening covers onto the FGR duct cover

4.5.13 Mounting the cover on the slide-on duct

Mount the lateral slide-on duct covers to the insulation
Mount the top slide-on duct covers to the side covers

4.5.14 Assembling the automatic ignition

- Insert the igniter tube
- Place the double screw clip onto the igniter tube
- Insert the ignition blower into the igniter tube and fix in place using the double screw clip
- Mount the cover over the automatic ignition
4.5.15 Installing the combustion chamber overpressure and temperature sensors

- Punch the holes for the combustion chamber overpressure and temperature sensors out of the insulation and remove the blind plugs
- Mount the brass bushing on the combustion chamber overpressure sensor pipe
- Mount the pipe where the blind plug was
- Slide the overpressure sensor pipe right in and tighten the retaining screw slightly
- Insert the combustion chamber temperature sensor bracket
- Insert the combustion chamber temperature sensor to a distance of approx. 40 - 50 mm inside the combustion chamber
4.5.16 Installing the combustion chamber ash removal unit

- Tighten it in place using clamping screws
- Remove the cover and connect the compensating line
  - green wire to terminal with green dot
  - white wire to unmarked terminal
  - shield not connected

- Fit torque support to gears using eight bolts
- Remove the screw to be replaced by the vent screw

- Screw the vent screw (1) into the gear assembly
  ➤ The vent screw must face upwards in the mounted gear assembly
Mount the flange with bearings onto the left-hand side of the combustion chamber and grease the shaft stub (e.g. using copper paste)

Install the gear assembly with torque support onto the shaft stub

Insert the key and fix in place

Mount the locking lever on the ash removal flange
Fit the foam rubber seal on the ash removal flange over the shaft
Fit the ash removal flange to the opposite side of the gear assembly
Assemble the safety switch on the bracket
Mount the safety switch and bracket onto the boiler insulation
Position the ash container
  ➡ Push the lever on the side of the boiler downwards to lock the ash container in place
Push the key plate into the safety switch on the boiler

4.5.17 Installing the grate drive

Mount the 4 nuts and spacer washers on the blind flange
Remove the locking screw and fitting key from the stub shaft
Grease the shaft stub

Remove the transport lock from the geared motor
Install the vent screw (included) at the highest point
Place the geared motor into position and secure it using the previously removed nuts and spacer washers

- Insert the fitting key into the groove on the shaft and secure it with a locking screw

4.5.18 Installing the air flap actuators

- Mount the case cooling actuator (optional) (1) onto the torque support
- Fix actuator I for tertiary air (2) in place
- Fit the cover plates

- Mount actuator II for tertiary air (3)
- Fit the cover plates

- Mount the actuator for secondary air (4)
- Fit the cover plates
Mount the secondary air (5) and primary air (6) actuators for flue gas recirculation (FGR)

Fit the cover plates

- Upper actuator (5) = secondary air flue gas recirculation
- Lower actuator (6) = primary air flue gas recirculation

Mount the primary air actuator (7)

Fit the cover plates
4.5.19 Installing the combustion air fan

- Mount the top and bottom cover on the supply air box onto the insulation
- Remove the grill from the combustion air fan
- Mount the connector supports onto the combustion air fan
- Mount the adapter for the blower fan onto the supply air box
Mount the blower fan onto the supply air box
Mount the combustion air fan cover onto the insulation

4.5.20 Installing the STL and boiler and undergrate sensor

Push the STL sensor through the frame and into the immersion sleeve
Push the STL through the back of the cover and fix in place using the nuts supplied
Mount the cover with STL onto the insulation using six captive screws

Run the sensor cable through the opening

Attach the black STL button protective cap

Slide the sensor (length: 200 mm) under the moving grate and fix it in place with the screw

Cut out the pre-cut perforations

Slide the sensor (length: 200 mm) into the immersion sleeve and mount the cover
4.5.21 Assembling the EOS drive with function monitoring

- Attach the motor mount (1) to the threaded bolts in the heat exchanger and fix in place using 4 M8 safety nuts
- Mount the drive wheel (2) in the geared motor
- Mount the geared motor with the bracket for function monitoring (3)

- Fix the function monitoring (4) to the bracket
- Fit the cover plates

4.5.22 Assembling the insulated doors and covers

- Place both the front insulating covers on top of the combustion chamber
Place both the back insulating covers on top of the combustion chamber

Mount the combustion chamber door frame

Mount the burning chamber door frame

Mount the burning and combustion chamber door covers

Thread the door contact switch cable through the door frame and insulation for the burning and combustion chamber door
- Install a door contact switch on both the burning and combustion chamber door frames.
- Ensure that the door contact switches only respond once the doors are closed.

- Tighten the four screws on the outside of the heat exchanger cover.
- Insert a washer into the two central threaded bolts and fix in place using nuts.

- Fit both heat exchanger insulating covers.
4.5.23 Assembling the burner pivoting mechanism (optional)

- Mount the hinged joint to fix the mechanism in place (A)
  - This hinged joint needs to be mounted before the insulating side panels!

- Mount the intermediate hinge (B) onto the hinge joint (A) using a long bolt (D)
- Mount the end hinge (C) onto the intermediate hinge (B) using a long bolt (D)
- Mount the blind flange (E) and oil burner flange (F) onto the end hinges (C) using short bolts (G)
- Mount the adapter flange for the oil burner (H)
- Mount the limit switch (I) or burner flange with bracket onto the drill holes in the insulation
Close the pivoting mechanism with the blind flange and fix in place using the spacer washers and nuts from the pre-assembled blanking plate

- Carefully insert the pins

Place the cover on the insulation

- Carefully insert the press-on fasteners

4.5.24 Installing the boiler controller when operating the burner (optional)

Loosen the 2 slotted screws on the front of the boiler controller and remove the housing

Mount onto the insulation cover using the slotted screws

Mount the cover with the boiler controller onto the heat exchanger
4.6 Power connection and wiring

**DANGER**

When working on electrical components:

*Risk of electrocution!*

When work is carried out on electrical components:

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

- Lay the cables from the components through the cable ducts to the control cabinet
- Wire the connections according to the wiring diagram
- Secure the cables in the control cabinet to the terminal strips provided using cable ties (= strain relief)

**Notes regarding the laying of cables**

- Tie any freely hanging cables to the drive motors using cable ties. The cables must not come into contact with the stoker duct.

**Potential equalisation**

- The potential equalisation must comply with current directives, regulations and standards.
4.7 Thermal discharge safety device connection

- Connect the thermal discharge safety device according to EN 303-5 and the following connection diagram!
- The discharge safety device must be connected to a pressurised mains water supply in such a way that it cannot be shut off.

1. required when the cold water pressure is greater than 6 bar. It must be impossible to shut off the connection manually. Minimum cold water pressure = 2 bar, 10°C

☐ Insert the thermal discharge safety device sensor (AVTA) into the immersion sleeve
  ➜ no refitting required!
4.8 Connecting the slide-on duct cooling

The following is a schematic diagram:

1. Boiler flow
2. Boiler return
3. Slide-on duct flow
4. Heat exchanger drainage
5. Slide-on duct return
6. Slide-on duct loading pump:
   - no gravitational brake!
   - output up to 500 kW: alpha2 25-40 or similar
7. Gate valve or ball valve
   - shut-off
   - no press fit!
   - must be possible to disassemble without removing the pipe!
5 Commissioning

5.1 Before commissioning / configuring the boiler

The boiler must be adjusted to the heating system during commissioning.

**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

- Adjust the boiler controller to the system type
- Apply boiler standard values

**NOTICE!** The keypad assignment and the steps necessary to modify the parameters are detailed in the operating instructions for the boiler control unit.

- Check the system pressure of the heating system
- Check that the heating system is completely vented
- Check that the safety devices are present and working correctly
- Check that there is sufficient ventilation in the boiler room
- Check the seal of the boiler
  - All doors and inspection openings must be tightly sealed!

- Check that drives and actuators are working and turning in the right direction

**NOTICE!** For how to check the analogue and digital outputs, see the operating instructions for the boiler controller

- Check that the door contact switch is working correctly

**NOTICE!** For how to check the digital inputs see the operating instructions for the boiler controller.
5.2 Initial startup

5.2.1 Permitted fuels

**Wood chips**

<table>
<thead>
<tr>
<th>Criterion</th>
<th>ÖNORM M 7133</th>
<th>CEN/TS 14961</th>
<th>Description as per ÖNORM M 7133</th>
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<tbody>
<tr>
<td>Water content</td>
<td>W20</td>
<td>M20</td>
<td>air-dried</td>
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<tr>
<td></td>
<td>W30</td>
<td>M30</td>
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</tr>
<tr>
<td></td>
<td>W35</td>
<td>-</td>
<td>limited suitability for storage</td>
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<td></td>
<td>W40 (^1)</td>
<td>M40</td>
<td>high-moisture wood chips</td>
</tr>
<tr>
<td></td>
<td>W50 (^1)</td>
<td>-</td>
<td>freshly-harvested wood chips</td>
</tr>
<tr>
<td>Size</td>
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<td>P16A / P16B</td>
<td>fine wood chip</td>
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<tr>
<td></td>
<td>G50</td>
<td>P45A</td>
<td>medium-sized wood chip</td>
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<tr>
<td></td>
<td>G100</td>
<td>P63/100</td>
<td>coarse wood chips (^2)</td>
</tr>
</tbody>
</table>

1. partial load conditions only to a limited extent
2. for hydraulic feeders only

NOTICE! In case of operating under partial load conditions and fuels with a water content of >W35, power consumption of less than 65% of the nominal output is not permitted!

**Note on standards**

EU: Fuel as per EN 14961 - Part 4: Wood chips class A2 / P16A-P63/100

Additional for Germany: Fuel class 4 (§3 of the First Federal Emissions Protection Ordinance [BimSchV] - applicable version)

**Wood pellets**

Wood pellets made from natural wood with a diameter of 6 mm

**Note on standards**

EU: Fuel acc. to EN 14961 - Part 2: Wood pellets class A1 / D06

and/or: Certification program ENplus or DINplus

**General note:**

Before refilling the store, check for pellet dust and clean if necessary.

**Wood shavings**

Wood shavings generally cause problems with combustion. Therefore their use is permitted only with authorisation from Froling. The following additional points also apply:
• Sawdust and carpentry waste should only be used with systems with a rotary valve.
• The store should be fitted with a pressure release device in accordance with regional regulations.
• The same limits apply for the permitted water content of sawdust as for wood chips.

**NOTICE**

For fuels with a water content < W30 the boiler's rated heat output can only be guaranteed if it is used with a flue gas recirculation system (FGR).

**Miscanthus**

Switchgrass or elephant grass (Latin name: miscanthus) is a C4 plant. Standards and regulations for burning these plants have not been standardised, so the following applies:

**NOTICE!** The regional regulations for burning miscanthus should be observed. Operation may only be possible by special permit.

**Changing the fuel**

**CAUTION**

Incorrect fuel parameter settings:

*Incorrect parameter settings have a significant adverse effect on the functioning of the boiler, and as a result this will invalidate the guarantee.*

Therefore:

- If the fuel is changed (e.g. from wood chips to pellets), the system must be reset by Froiling customer services.
5.2.2 Non-permitted fuels

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

**CAUTION**

In case of use of non-permitted fuels:

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

For this reason, when operating the boiler:
- Only use permitted fuels

5.3 Heating up for the first time

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

- Electrical installation
- Installation of water pipes
- Flue gas connection including all insulation work
- Work must comply with local fire protection regulations

- The operator must ensure that at least 50% of the boiler's rated heat output can be extracted from the network on commissioning.
- The necessary "dry run" of the system means that the discharge system must be empty at the start of initial startup. Fuel must be available, however, so that the discharge system can be filled once the system is released.
- When heating up the boiler for the first time to dry out the fireclay concrete, the customer must provide approx. 1 m³ 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.

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

NOTICE! See operating instructions for the SPS 4000
6 Decommissioning

6.1 Out of service for long periods

The following measures should be taken if the boiler is to remain out of service for several weeks (e.g. during the summer):

- Clean the boiler thoroughly and close the doors fully
- Place approx. 5 kg of loose lime in the combustion chamber
  - This absorbs moisture and thereby prevents corrosion when the boiler is out of service

If the boiler is to remain out of service during the winter:

- Have the system completely drained by a qualified technician
  - Protection against frost

6.2 Disassembly

To disassemble the system, follow the steps for assembly in reverse order.

6.3 Disposal

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

7.1 Addresses

7.1.1 Address of manufacturer

FRÖLING
Heizkessel- und Behälterbau GesmbH

Industriestraße 12
A-4710 Grieskirchen
AUSTRIA

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

7.1.2 Address of the installer

Stamp