

froling

Installation instructions

Pellet condensing boiler PE1c Pellet



Translation of original German version of installation instructions for technicians.

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



M2130821_en | Edition 12/07/2021

1 General	4
1.1 About this manual	4
1.2 What do we mean by condensing boiler technology	4
2 Safety.....	5
2.1 Hazard levels of warnings.....	5
2.2 Qualification of assembly staff	6
2.3 Personal protective equipment for assembly staff	6
3 Design Information.....	7
3.1 Overview of standards	7
3.1.1 General standards for heating systems	7
3.1.2 Standards for structural and safety devices.....	7
3.1.3 Standards for heating water	8
3.1.4 Regulations and standards for permitted fuels	8
3.2 Installation and approval.....	8
3.2.1 Obligation to report as a condensing boiler system	8
3.3 Installation site	9
3.4 Chimney connection/chimney system	9
3.4.1 Connection line to the chimney.....	10
3.4.2 Measuring port	10
3.4.3 Draught limiter.....	11
3.4.4 Explosion flap.....	11
3.5 Combustion air for room air-dependent operation	11
3.5.1 Combustion air supply at the installation room	11
3.5.2 Simultaneous operation with other air-drawing systems.....	12
3.6 Combustion air for room air-independent operation	13
3.6.1 Definition of terms	13
3.6.2 Supply air line	14
3.6.3 Condensation.....	14
3.7 Domestic hot water	15
3.8 Pressure maintenance systems.....	16
3.9 Storage tank	17
3.10 Wash-down water	17
3.11 Condensate drainage	18
3.12 Boiler ventilation	18
4 Technical information	19
4.1 Dimensions - PE1c Pellet 16-22	19
4.2 Components and connections	20
4.3 Technical specifications.....	21
4.3.1 PE1c Pellet 16-22	21
4.3.2 Boiler data for planning the flue gas system	23
5 Assembly.....	24
5.1 Materials supplied	24
5.2 Tools required.....	24
5.3 Positioning	24
5.4 Temporary storage	26
5.5 Setting up in the boiler room.....	26
5.5.1 Remove boiler from pallet.....	26
5.5.2 Lift the boiler off of the pallet using the KHV 1400 boiler lifting system	26
5.5.3 Moving the boiler in the boiler room.....	27

5.5.4	Operating and maintenance areas of the equipment.....	27
5.6	Align the boiler with the floor.....	28
5.7	Change the flue gas and drain pipe connection to the right side of the boiler	28
5.8	Installing the optional pump assemblies	30
5.9	Install supply air line (For room air independent operation).....	30
5.10	Install suction hoses	31
5.10.1	Assembly information for hose lines	32
5.11	Connect the connection line to the chimney	34
5.12	Installing the condensation drain	35
5.13	Connect the water supply to the boiler	35
5.14	Hydraulic connection	36
5.14.1	Direct supply of heating circuit/boiler without storage tank charge	36
5.14.2	Connection on systems with storage tanks.....	37
5.15	Electrical connection.....	38
5.15.1	Board overview	39
5.15.2	Potential equalisation.....	39
5.16	Final installation steps	40
5.16.1	Insulate the connection line	40
5.16.2	Install the brackets for accessories.....	40
6	Start-up.....	41
6.1	Before commissioning / configuring the boiler	41
6.2	Initial startup	42
6.2.1	Permitted fuels	42
6.2.2	Non-permitted fuels.....	42
6.2.3	Heating up for the first time	42
7	Decommissioning.....	43
7.1	Mothballing	43
7.2	Disassembly	43
7.3	Disposal	43

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.

1.1 About this manual

These installation instructions contain information for the following sizes of PE1c Pellet boilers:

PE1c Pellet 16, PE1c Pellet 22

1.2 What do we mean by condensing boiler technology

Each type of fuel has a certain water content. During combustion, the moisture released (as steam) would normally dissipate with the flue gases through the chimney. If the flue gas temperature is very low, the moisture condenses. Die condensing boiler technology uses the heat of condensation of the moisture to capture additional heat.

2 Safety

2.1 Hazard levels of warnings

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

2.2 Qualification of assembly staff

CAUTION



Assembly and installation by unqualified persons:

Risk of personal injury and damage to property

During assembly and installation:

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

Assembly, installation, initial startup and servicing must always be carried out by qualified personnel:

- Heating technician / building technician
- Electrical installation technician
- Providing customer services

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

2.3 Personal protective equipment for assembly staff

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



- During transport, erection and installation:
 - wear suitable work wear
 - wear protective gloves
 - wear safety shoes (min. protection class S1P)

3 Design Information

3.1 Overview of standards

Perform installation and commissioning of the system in accordance with the local fire and building regulations. Unless contrary to other national regulations, the latest versions of the following standards and guidelines apply:

3.1.1 General standards for heating systems

EN 303-5	Boilers for solid fuels, manually and automatically fed combustion systems, nominal heat output up to 500 kW
EN 12828	Heating systems in buildings - design of water-based heating systems
EN 13384-1	Chimneys - Thermal and fluid dynamic calculation methods Part 1: Chimneys serving one appliance
ÖNORM H 5151	Planning of central hot water heating systems with or without hot water preparation
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
ÖNORM M 7551	Boiler – Wood condensing boiler, combustion systems with manual and automatic loading, nominal heat output up to 500 kW – Terminology, requirements and testing

3.1.2 Standards for structural and safety devices

ÖNORM H 5170	Heating installation - Requirements for construction and safety engineering, as well as fire prevention and environmental protection
ÖNORM M 7137	Compressed untreated wood – Requirements for storing pellets at the end customer's site
TRVB H 118	Technical directives for fire protection/prevention (Austria)

3.1.3 Standards for heating water

ÖNORM H 5195-1	Prevention of damage by corrosion and scale formation in closed warm water heating systems at operating temperatures up to 100°C (Austria).
VDI 2035	Prevention of damage hot water heating systems (Germany)
SWKI BT 102-01	Water quality for heating, steam, cooling and air conditioning systems (Switzerland)
UNI 8065	Technical standard regulating hot water preparation. DM 26.06.2015 (Ministerial Decree specifying the minimum requirements) Follow the instructions of this standard and any related updates. (Italy)

3.1.4 Regulations and standards for permitted fuels

1. BImSchV	First Order of the German Federal Government for the implementation of the Federal Law on Emission Protection (Ordinance on Small and Medium Combustion Plants) in the version published on 26 January 2010, BGBl. JG 2010 Part I No. 4.
EN ISO 17225-2	Solid bio-fuel - Fuel specifications and classes Part 2: Wood pellets for use in industrial and domestic systems

3.2 Installation and approval

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

Note on standards

EN 12828 - Heating Systems in Buildings

IMPORTANT: Every heating system must be officially approved.

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

Austria: report to the construction authorities of the community or magistrate

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

3.2.1 Obligation to report as a condensing boiler system

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

3.3 Installation site

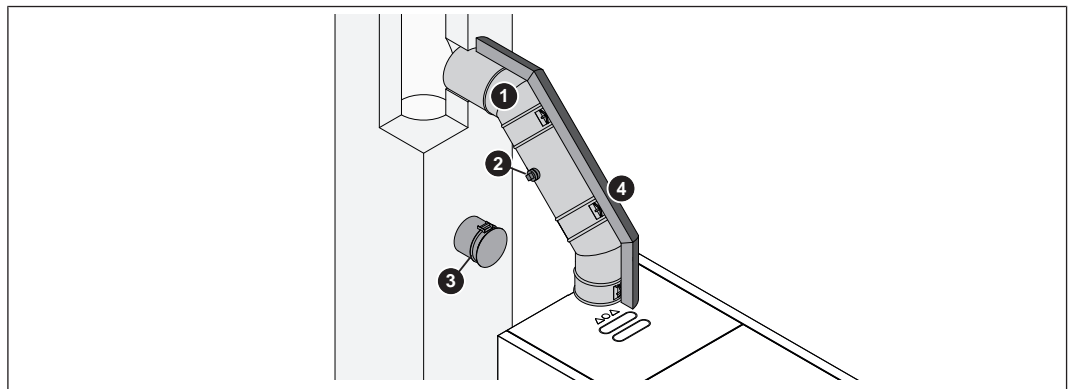
Requirements for the load bearing substrate:

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

Conditions at the installation site:

- Frost-free
- Sufficiently well lit
- Free of explosive atmospheres such as flammable substances, hydrogen halides, cleaning agents and consumables
- Installation at altitude higher than 2000 metres above sea level only after consultation with the manufacturer
- The system must be protected against gnawing and nesting by animals (such as rodents)
- No flammable materials in proximity to the system

3.4 Chimney connection/chimney system



1	Connection line to the chimney
2	Measuring port
3	Explosion flap (for automatic boilers)
4	Thermal insulation

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

The entire flue gas system (chimney and connection) must be laid out as per ÖNORM / DIN EN 13384-1 or ÖNORM M 7515 / DIN 4705-1.

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

Local regulations and other statutory regulations are also applicable.

- Wood fuel may only be used with soot-fire-resistant chimney systems. Plastic pipes are not permitted.
- Due to the low flue gas temperatures, only moisture resistant chimneys with suitable condensation drainage can be used with condensing boiler technology.

3.4.1 Connection line to the chimney

Requirements for the connection line:

- This should be as short as possible and follow an upward incline to the chimney (30 - 45° (recommended))
- Leak-tight against overpressure
- Thermal insulation recommended

Distance from flammable components:

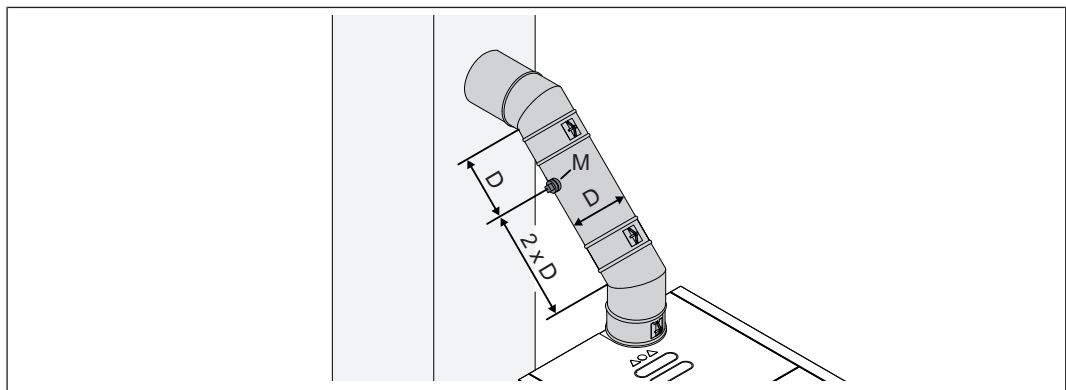
- 100 mm if at least 20 mm thermal insulation is installed
 - 375 mm if no thermal insulation is present
- Recommendation: three times the diameter of the connection line

Any backflow of condensation in the condensing boiler heat exchanger does not pose a problem as it will be drained through the siphon. A condensation trap is therefore not required.

We generally recommend using the Froling FAR connection pipe. This connection pipe is pressure-tight and, therefore, perfect for the boiler system. Together with the boiler system, the FAR connection pipe is designed in accordance with machine guidelines and is the optimal connection to the boiler.

3.4.2 Measuring port

For emissions measurement on the system, a suitable measuring port must be installed in the connection line between the boiler and chimney system.



Upstream of the measuring port (M) there should be a straight run-in section with a length about twice the diameter (D) of the connection line. Downstream of the measuring port (M) there should be a straight run-out section with a length about the diameter (D) of the connection line. The measuring port must remain closed whenever the system is in operation.

The diameter of the measuring probe used by Froling customer service is 14 mm. To avoid measuring errors due to the ingress of false air, the diameter of the measuring port must not exceed 21 mm.

Recommendation: When using the Froling FAR connection pipe, a flue pipe element with integrated measuring port can be used.

3.4.3 Draught limiter

As the connection line to the chimney must be pressure-tight on systems with condensing boiler technology, it is not permitted to install a draught limiter in the connection line.

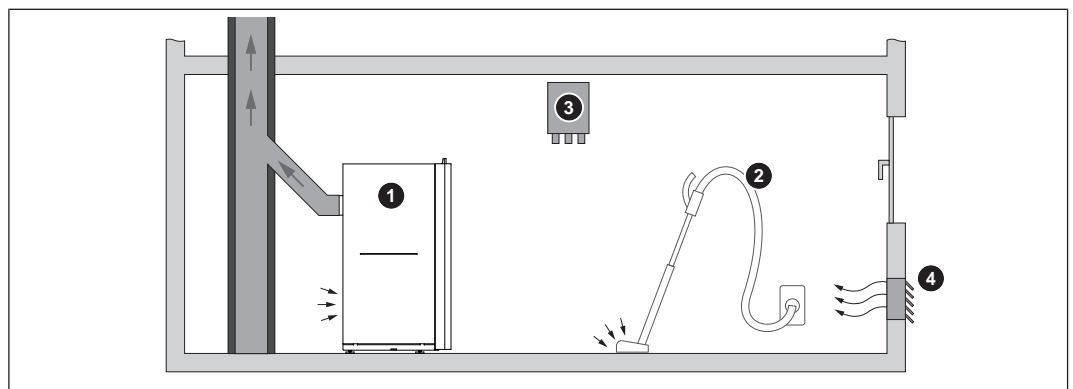
Likewise, if the entire chimney unit is designed with overpressure, a draught limiter must not be fitted.

Exception: If the chimney is calculated or operated with underpressure, it is recommended that a draught limiter be fitted in the chimney below the connection line.

3.4.4 Explosion flap

TRVB H 118 (only Austria) stipulates that an explosion flap must be installed in the connection line to the chimney, directly next to the boiler. It should be situated in such a way that it poses no risk to persons!

3.5 Combustion air for room air-dependent operation



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

3.5.1 Combustion air supply at the installation room

The system is operated in open flue mode, i.e. the combustion air required to operate the boiler is drawn from the installation room.

Requirements:

- Opening to the atmosphere
 - Weather conditions must not affect the air flow in any way (e.g. snow and foliage)
 - Cross-section area free of obstructions such as cover gratings and slats
- Air supply lines
 - For air supply lines longer than 2 metres and where mechanical means are used to feed combustion air, the flow rate must be calculated (maximum flow rate = 1 m/s)

Note on standards

ÖNORM H 5170 - Construction and fire protection requirements

3.5.2 Simultaneous operation with other air-drawing systems

Where the boiler is operated in room air-dependent mode with simultaneous operation of other air-drawing systems (such as room ventilation), safety devices are necessary:

- Air pressure monitor
- Flue gas thermostat
- Window-tilting drive system, window-tilting switch

NOTICE! Clarify the safety devices with appropriate flue sweep / chimney sweep

Recommendation for room ventilation:

Use “intrinsically-safe” room ventilation systems with F classification

As a basic rule:

- Room under-pressure max. 8 Pa
- Air-drawing systems must not exceed the room under-pressure value
 - If the room under-pressure value is exceeded, safety equipment (under-pressure monitoring system) is necessary

In Germany, the following additional requirement must be observed:

DiBt requires that an approved under-pressure monitoring system (such as air pressure monitor P4) which monitor the maximum under-pressure to 4 Pa must be installed in the installation room.

In addition, at least one of the following three requirements must be met:

(Source: Section 4 MFeuV 2007 / 2010)

- Dimension the cross-section of the combustion air opening so that when the boiler is in operation the maximum under-pressure is not exceeded (simultaneous operation)
- Use safety equipment that prevents simultaneous operation (alternate operation)
- Monitor the flue gas outlet using safety devices (such as a flue gas thermostat)

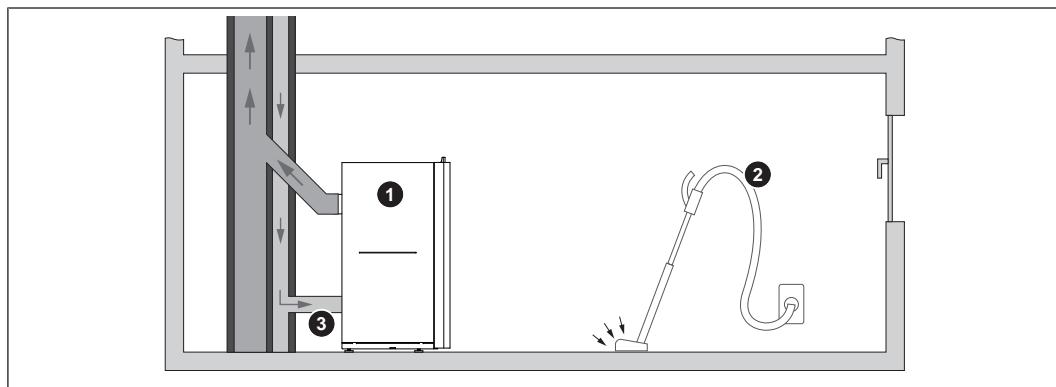
Simultaneous operation

An approved safety system (such as an air pressure monitor) ensures that during simultaneous operation of the boiler and the air-drawing appliance the pressure conditions are maintained. In the event of a fault, the safety system will switch off one of the air-drawing systems.

Alternating operation

An approved safety system (such as a flue gas thermostat) ensures (e.g. by switching off the power supply) that the boiler cannot be operated simultaneously with the air-drawing appliance.

3.6 Combustion air for room air-independent operation



- | | |
|---|--|
| 1 | Boiler |
| 2 | Air extraction system (such as centralised dust extraction system, room ventilation) |
| 3 | Combustion air supply from outside (irrespective of ambient air) |

3.6.1 Definition of terms

There is a central air connection on the back of the boiler. If appropriate supply air and flue gas connections are installed, the boiler can be classified according to EN 15035 as a type C₄₂ / type C₈₂ or according to DIBt as a type FC_{42x} / type FC_{52x}.

The conditions for room air-independent operation of the boiler at the installation site must be clarified with the local authority responsible (authority, chimney sweep, ...).

Definitions as per EN 15035

Type C₄ Boiler that is connected via its combustion air supply and flue gas outlet, with a connecting piece that may be supplied, to a shared chimney with a shaft for combustion air supply and a shaft for flue gas outlet. The mouths of the air and flue gas chimney are either concentric or so close to each other that similar wind conditions apply.

NOTICE! Air is supplied by an air and flue gas system!

Type C₈ A boiler that is connected via its combustion air supply and flue gas outlet, with a connecting piece, to a wind protection device and a single or shared chimney.

NOTICE! Air supply via an air supply line that is independent from the chimney system!

NOTICE! This design requires a wind protection device. If a protective grating is fitted, you must ensure that the mesh size is sufficiently large to prevent a significant loss of pressure and/or seal from dirt!

The second index "2" (C₄₂ / C₈₂) indicates type C boilers with a blower fan downstream of the combustion chamber or the heat exchanger.

Definitions as per DIBt

Type FC_{42x} One appliance with flue gas fan for connection to an air/flue system. The combustion air line from the air shaft and the connecting piece to the chimney are part of the appliance.

Type FC_{52x} One appliance with flue gas fan for connection to a chimney. The combustion air line from the air shaft and the connecting piece to the chimney are part of the appliance.

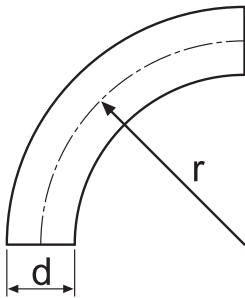
3.6.2 Supply air line

NOTICE! Install the combustion air supply (piping) in accordance with the applicable standards

➞ ["Overview of standards" \[► 7\]](#)

- ☐ Connect the supply air line leak-tight to the connection on the boiler
- ➞ Refer to the dimensions of the supply air line connection on the boiler in the Technical Data

When dimensioning pipe bends in the supply air line, ensure that:



The ratio of the radius of curvature (r) to pipe diameter (d) is greater than 1

$$r:d \geq 1$$

For example:

- supply air line diameter = 160 mm
- minimum radius of pipe bends = 160 mm

- The supply air line should be as straight as possible and take the shortest path
- Keep the number of pipe bends to a minimum
- Max. resistance of the supply air line: 20 Pa

3.6.3 Condensation

NOTICE! The greater the difference between the temperature of the outside air being drawn in and the room temperature, the greater the risk of condensation

In Germany, the following additional requirement must be observed: The lines must be installed with an incline making sure that any condensation water can drain away and the outside air can be drawn in without allowing water or animals from entering the building.

To avoid condensation:

- ☐ Jacket the entire supply air line with suitable thermal insulation

3.7 Domestic hot water

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

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

Observe the standards and also follow the recommendations below:

- ☐ Aim for a pH value of between 8.2 and 10.0. If the central heating water comes into contact with aluminium, the pH value must be between 8.0 and 8.5
- ☐ Use prepared water which complies with the standards cited above for filling and make-up water
- ☐ Avoid leaks and use a closed heating system to maintain water quality during operation
- ☐ When filling with make-up water, always bleed the filling hose before connecting, in order to prevent air from entering the system

Advantages of prepared water:

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

Permitted water hardness for the fill and make-up water in accordance with VDI 2035:

Overall heat output	Total hardness at <20 l/kW minimum individual heat output ¹⁾		Total hardness at >20 ≤50 l/kW minimum individual heat output ¹⁾		Total hardness at >50 l/kW minimum individual heat output ¹⁾	
kW	°dH	mol/m³	°dH	mol/m³	°dH	mol/m³
≤50	no demand or		11.2	2	0.11	0.02
	<16.8 ²⁾	<3 ²⁾				
>50 ≤200	11.2	2	8.4	1.5		
>200 ≤600	8.4	1.5	0.11	0.02		
>600	0.11	0.02				

1. From specific system volume (litres nominal capacity/heat output; for multi-boiler systems use the smallest individual heat output)

2. In the case of systems with central heating boilers and for systems with electric heating elements

Additional requirements for Switzerland

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

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

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

Inspection:

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

3.8 Pressure maintenance systems

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

Compressor-controlled pressure maintenance

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

Pump-controlled pressure maintenance

A pump-controlled pressure maintenance unit essentially consists of a pressure-maintenance pump, relief valve and an unpressurised receiving tank. The valve releases hot water into the receiving tank if the pressure is too high. If the pressure drops below a preset value, the pump draws water from the receiving tank and feeds it back into the heating system. Pump-controlled pressure maintenance systems with **open expansion tanks** (e.g. without a diaphragm) introduce ambient oxygen via the surface of the water, exposing the connected system components to the risk of corrosion. These systems offer no oxygen removal for the purposes of corrosion control as required by VDI 2035 and **in the interests of corrosion protection should not be used.**

3.9 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.

3.10 Wash-down water

Normal drinking water or rainwater can be used for flushing the condensing boiler heat exchanger; the use of grey water is not permitted.

NOTE: When making connections to the public water supply, comply with the local regulations.

The condensing boiler heat exchanger is flushed every 10-20 heating hours and requires about 22-35 litres of flushing water for each flushing operation.

The temperature of the flushing water at the heat exchanger outlet is a maximum of 40 °C.

The following specifications must be observed for the flushing water connection:

- At least Water pressure: 3 bar
- Max. water pressure: 6 bar
- Maximum water temperature: 25°C

3.11 Condensate drainage

The condensate must be continuously drained into the waste water system in accordance with local regulations for heating systems with condensing boiler technology.

In respect of the condensate drainage, ensure:

- Line of raw material resistant to condensate
- Diameter at least 50 mm
- Lengths of line as short as possible
- Fall gradient at least 3°
- Frost-free
- Easily accessible for disassembly and cleaning
- Inspection at regular intervals

NOTICE! The condensate connection may not be changed or closed.

NOTICE! If the pipework to the drain cannot be installed in a correct fashion, the use of waste water pumping system is recommended. Suitable systems are available on request from Fröling GesmbH.

3.12 Boiler ventilation



- ☐ Fit the automatic ventilating valve at the highest point on the boiler or at the ventilation connection (if present).
 - ↳ This ensures that air in the boiler is constantly expelled, thus preventing malfunctions caused by air in the boiler
- ☐ Check that the boiler ventilation is working properly
 - ↳ After installation and periodically according to manufacturer's instructions

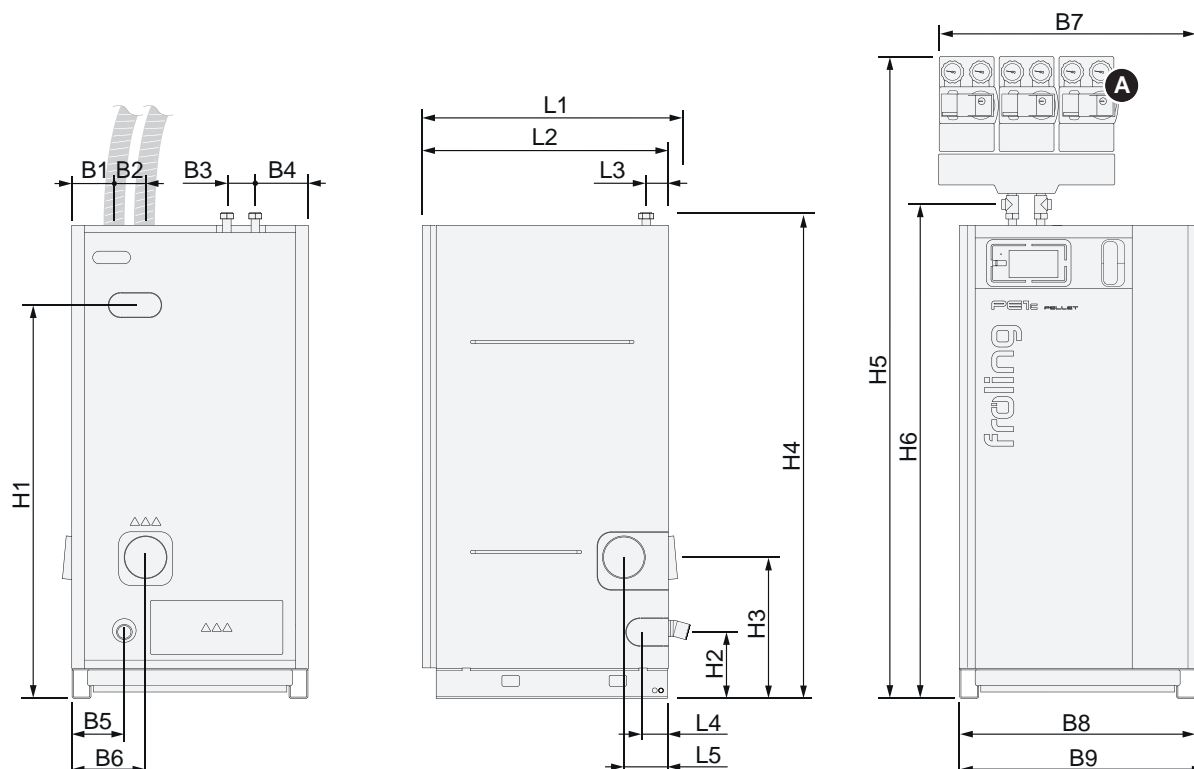
Tip: ☐ Fit a vertical pipe as a calming section in front of the automatic ventilating valve in such a way that the ventilating valve is positioned above the water level in the boiler

Recommendation: ☐ Fit a microbubble separator in the pipes to the boiler

- ↳ Follow the manufacturer's instructions!

4 Technical information

4.1 Dimensions - PE1c Pellet 16-22

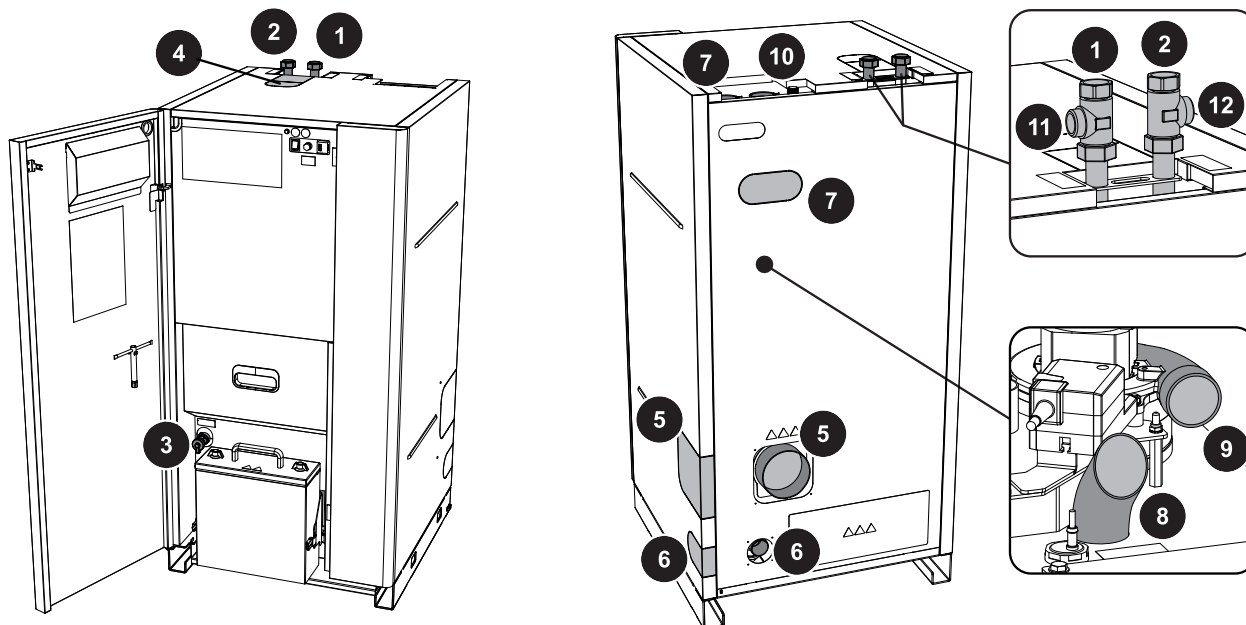


Dimensi on	Description	Unit	16-22
L1	Total length incl. flue gas pipe connection	mm	820
L2	Length of boiler		790
L3	Distance of flow/return connection		70
L4	Distance of condensation drain connection (side)		90
L5	Distance of flue gas pipe connection (side)		125
B1	Distance of suction hose connection to side of boiler		155
B2	Distance of suction hose connections		90
B3	Distance of flow/return connections		90
B4	Distance of flow/return connections to side of boiler		170
B5	Distance of condensation drain connection (at the back)		165
B6	Distance of flue gas pipe connection (side)		235
B7 ¹⁾	Width of boiler incl. distributor bar for three pump assemblies (A)		815
B8	Width, boiler		750
B9	Width of boiler incl. flue gas pipe (side)		780
H1	Height of suction hose connections		1250
H2	Height, condensation drain connection		210
H3	Height, flue pipe connection		450
H4	Height of the flow/return connection / connection for the suction system / connection for the flushing water		1540

Dimension	Description	Unit	16-22
H5 ¹⁾	Height of the boiler incl. T-piece and distributor bar for two/three pump assemblies (A)		2035
H6	Height of the safety group connection / expansion tank / tank		1565

1. For optional pump assembly with distributor bar and T-piece

4.2 Components and connections



Item	Description	PE1c Pellet 16-22
1	Boiler flow (union nut, flat sealing)	1" IT
2	Boiler return (union nut, flat sealing)	1" IT
3	Drainage connection	1/2" ET
4	Supply air connection for room air-independent operation	DA 80 mm
5	Flue gas pipe connection (side option)	TU 132 mm
6	Condensation drain connection (side option)	DN 50
7	Suction hose inlet (rear option)	-
8	Pellet suction line connection	DA 50 m
9	Return-air line connection	DA 50 m
10	Wash water connection (flat sealing)	3/4" ET
11	Safety group connection ¹⁾	1" IT
12	Expansion tank-membrane connection ¹⁾	1" IT

1. For optional pump assembly with distributor bar and T-piece

4.3 Technical specifications

4.3.1 PE1c Pellet 16-22

Description		PE1c Pellet	
		16	22
Nominal output	kW	15	20.4
Nominal thermal output (condensation)		16.2	22
Output range		4.5 - 15	6 - 20
Thermal output range (condensation)		4.8 - 16.2	6.4 – 22
Electrical connection		230 V / 50 Hz / fused C16A	
Electrical power consumption	W	28 - 44	28 - 54
Power consumption with electrostatic particle separator (optional)		29 - 59	29 - 69
Boiler weight	kg	370	375
Total boiler capacity (water)	l	75	75
Pellet container capacity		60	60
Ash box capacity		18	18
Permitted operating pressure	bar	3	3
Water pressure drop (ΔT = 10 K/20 K)	mbar	18 / 3.1	34 / 7.2
Minimum boiler return temperature		Not applicable due to condenser	
Maximum boiler temperature setting	°C	90	
Minimum boiler temperature setting		20	
Permitted operating temperature		90	
Airborne sound level	dB(A)	< 70	
Condensate per nominal load hour	l	1.0 – 1.5	1.8 – 2.2
Minimum water pressure for the flushing device	bar	3	
Maximum water pressure for the flushing device		6	
Water demand per flushing cycle	l	22 - 35	
Maximum temperature of flushing water	°C	25	
Recommended storage volume	l	700	
Test book number		PB 129	PB 130
Boiler class as per EN 303-5:2012		5	
Permitted fuel		Fuel as per EN ISO 17225 – Part 2: wood pellets Class A1 / D06	
1. The technical specifications of the optional components can be found in the enclosed supplier documentation			

Regulation (EU) 2015/1187		PE1c Pellet	
		16	22
Energy efficiency class of boiler		A++	A++
Energy efficiency index (EEI) of boiler		136	137
Heating space annual rate of use η_s	%	93	93
Energy efficiency index (EEI) of boiler and controller combined		138	139
Energy efficiency class (EEI) of boiler and controller combined		A++	A++

Additional data for regulation (EU) 2015/1189

Description		PE1c Pellet	
		16	22
Heating up mode		automatic	
Condensing boiler		Yes	
Solid fuel boiler for combined heat and power		No	
Combined heating system		No	
Storage tank volume		↻ "Storage tank" [► 17]	
Characteristics when operated exclusively with the preferred fuel			
Useful heat delivered at rated heat output (P_n)	kW	16.2	21.0
Useful heat delivered at 30% of rated heat output (P_p)		4.7	4.7
Fuel efficiency at rated heat output (η_n)	%	98.4	98.5
Fuel efficiency at 30% of rated heat output (η_p)		97.2	97.2
Auxiliary current consumption at rated heat output ($e_{l_{max}}$)	kW	0.046	0.055
Auxiliary current consumption at 30% of rated heat output (η_p)		0.029	0.029
Auxiliary current consumption in standby mode (P_{SB})		0.011	0.011

Regulation (EU) 2015/1189 – emissions in [mg/m ³] ¹⁾	
Annual space heating emissions of dust (PM)	≤ 30
Annual space heating emissions of gaseous organic compounds (GOC)	≤ 20
Annual space heating emissions of carbon monoxide (CO)	≤ 380
Annual space heating emissions of nitrogen oxides (NO _x)	≤ 200

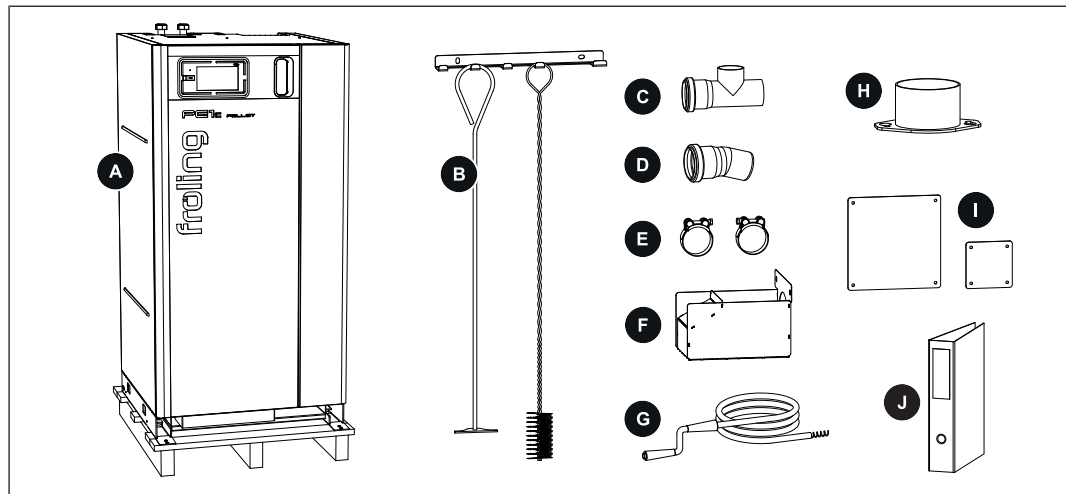
1. The emissions of dust, gaseous organic compounds, carbon monoxide and nitrogen oxides are stated in a standardised form based on dry flue gas with a oxygen content of 10 % and under standard conditions at 0°C and 1013 millibar

4.3.2 Boiler data for planning the flue gas system

Description		PE1c Pellet 16	PE1c Pellet 22
Flue gas temperature at nominal load	°C	40 – 70	
CO ₂ - volume concentration at nominal load / partial load	%	11 / 9	
Flue gas mass flow at nominal load / partial load	kg/h	34 / 12	48 / 20
	kg/s	0.009 / 0.003	0.013 / 0.006
Available feed pressure of blower fan ¹⁾	Pa	10	
	mbar	0.1	
Flue spigot diameter (inner)	mm	132	
Combustion air volume at nominal load	m ³ /h	29	39
1. If the connection line and the junction to the chimney are pressure-tight, the resistance in the flue gas system at the flue gas connection on the boiler can be 10 Pascals			

5 Assembly

5.1 Materials supplied



A	Boiler PE1c Pellet mounted on a pallet	F	Collection container
B	Furnace tool (flat scraper and cleaning brush)	G	Pipe cleaning feather
C	Drain pipe with cleaning opening	H	Air connection bracket
D	Drain pipe 15°	I	Shutter masks
E	Hose clips	J	Documentation

5.2 Tools required



The following tools are required for assembling the boiler and suction module:

- Spanner or box wrench set
- Flat head and cross-head screwdrivers
- Pipe wrench or water pump pliers (1")
 - We recommend the use of a plier wrench for the flat sealing joints.
- Cordless screwdriver and set of Torx bits (T20, T25, T30)
- Half-round file

5.3 Positioning

NOTICE



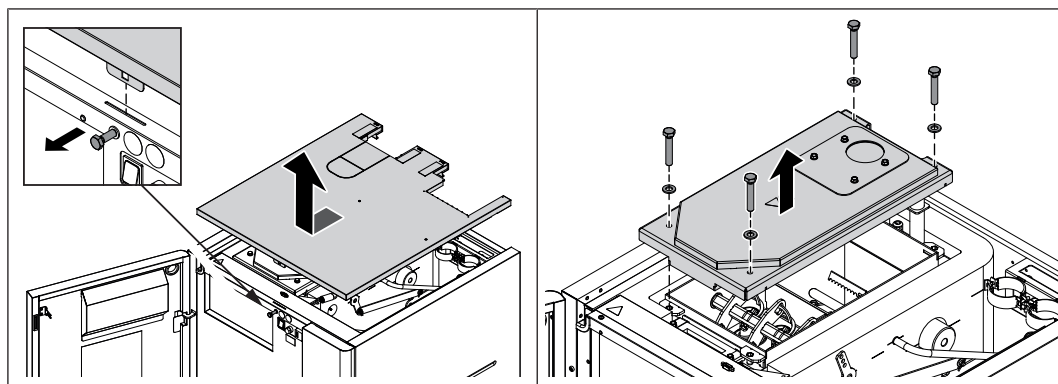
Damage to components if handled incorrectly

- ☐ Follow the transport instructions on the packaging
- ☐ Transport components with care to avoid damage
- ☐ Protect the packaging against damp conditions
- ☐ Pay attention to the pallet's centre of gravity when lifting

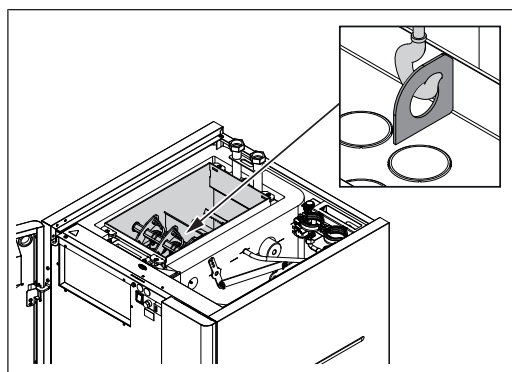
Positioning using forklift or similar lifting device

- ☐ Position a fork-lift or similar lifting device at the pallet and bring in the components

Positioning using a crane



- ☐ Open the insulated door
- ☐ Unlock the cover by undoing the retaining screw
- ☐ Lift the cover on the front edge slightly and remove it towards the front
- ☐ Dismantle the cleaning cover on the heat exchanger



- ☐ Attach the crane hook to the attachment point correctly and position the boiler

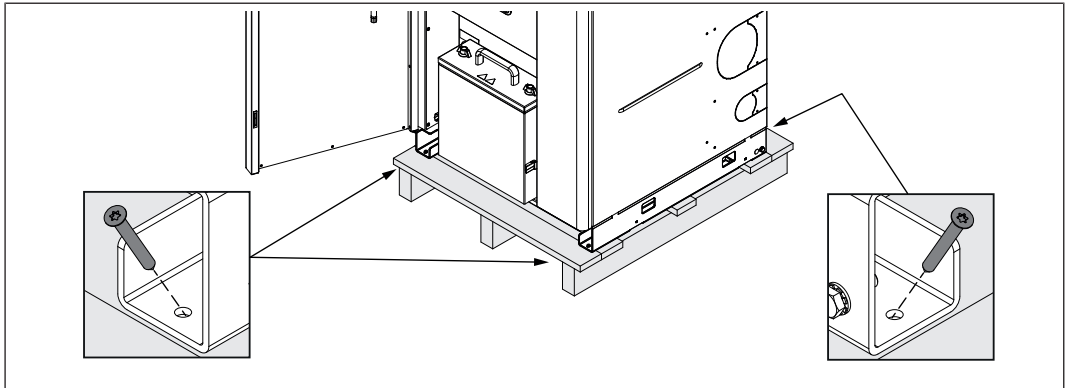
5.4 Temporary storage

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!

5.5 Setting up in the boiler room

5.5.1 Remove boiler from pallet

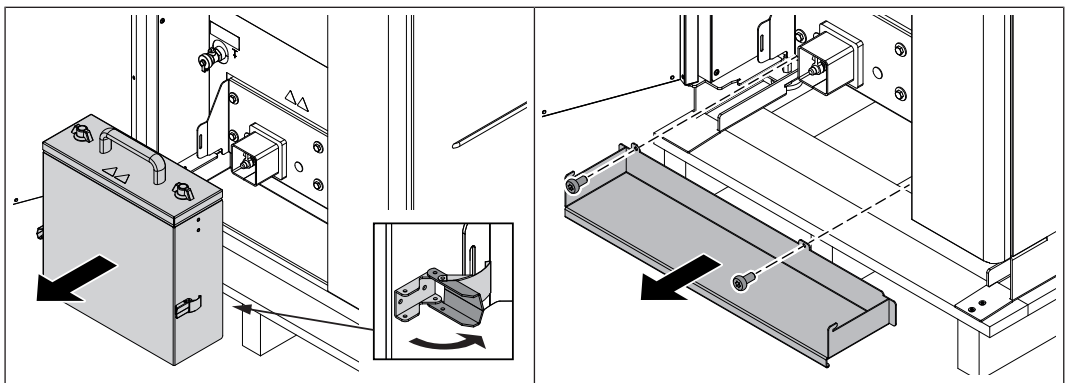


- ☐ Lift the cardboard up and off the pallet
- ☐ Remove the transport locks at the front and back of the boiler
- ☐ Lift boiler from pallet



TIP: Use Froling's KHV 1400 boiler lifting system to facilitate pallet removal!

5.5.2 Lift the boiler off of the pallet using the KHV 1400 boiler lifting system



- ☐ Open the insulated door
- ☐ Open the side fasteners on the ash container and remove the ash container
- ☐ Remove the protective plate below the connection flange
- ☐ Lift the boiler off of the pallet using the KHV 1400 boiler lifting system

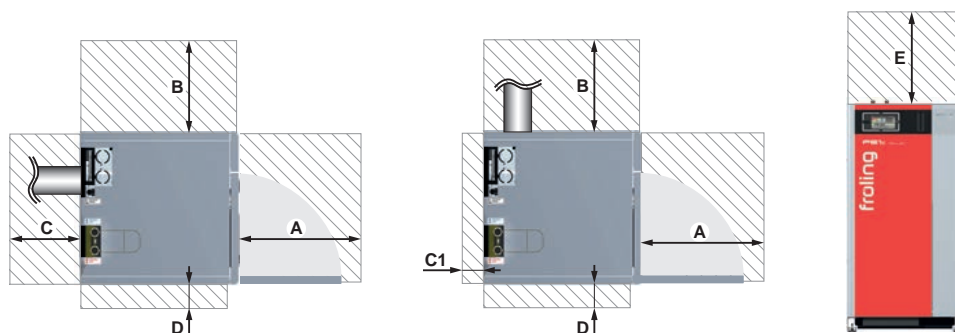
5.5.3 Moving the boiler in the boiler room

- ❑ Position a forklift 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.
 - ⚠ Pay attention to the operating and maintenance areas of the equipment in the process!

5.5.4 Operating and maintenance areas of the equipment

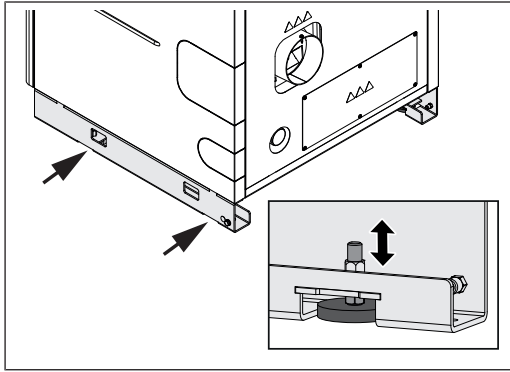
- The system should generally be set up so that it is accessible from all sides allowing quick and easy maintenance.
- Regional regulations regarding necessary maintenance areas for inspecting the chimney should be observed in addition to the specified distances!
- Observe the applicable standards and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

Recommended clearances - PE1c Pellet



	PE1c Pellet
A	550 mm
B	500 mm
C	400 mm ¹⁾
C1	30 m ²⁾
D	30 m (70 mm ³⁾)
E	500 mm ⁴⁾
1. Rear flue pipe connection 2. Fit the flue pipe connection to the right-hand side of the boiler 3. For distributor bars for three pump assemblies 4. Maintenance area to expand the WOS springs upwards	

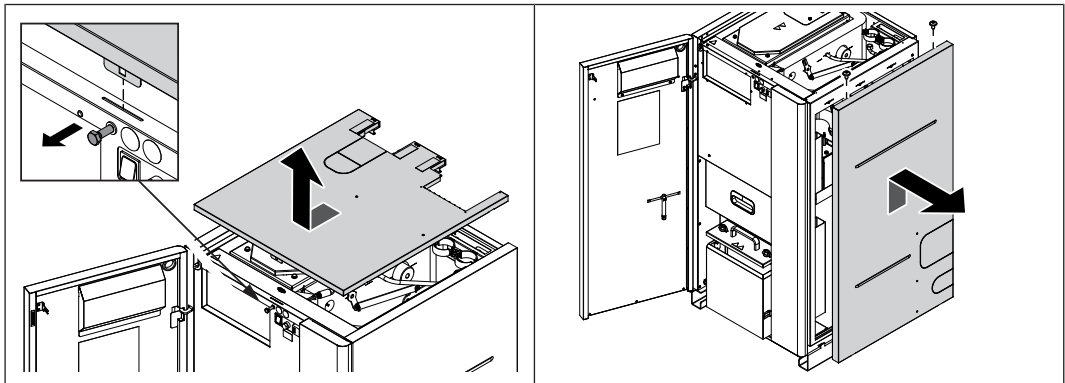
5.6 Align the boiler with the floor



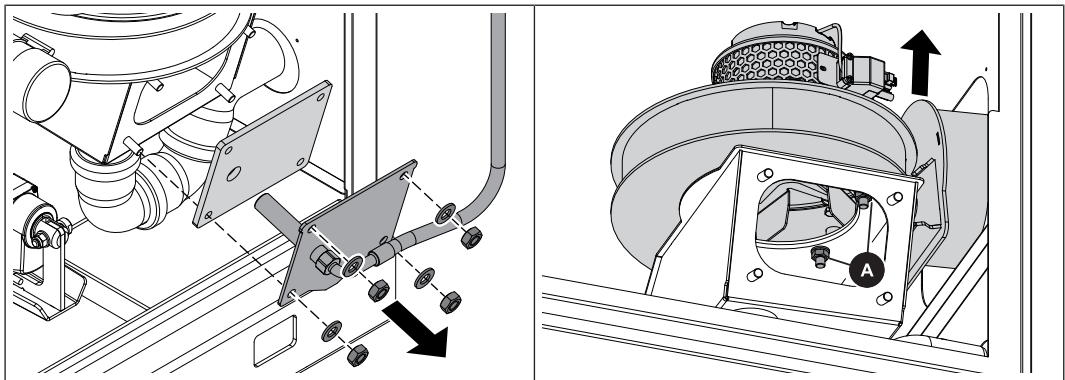
- ☐ Lift the boiler up off the floor and use the adjustable feet to level it
 - ↳ To avoid structure-borne sound transmission, the bottom of the boiler may not rest on the floor

5.7 Change the flue gas and drain pipe connection to the right side of the boiler

If the boiler is positioned with its back to the wall, the flue gas pipe and drain pipe can be turned to the right-hand side of the boiler.

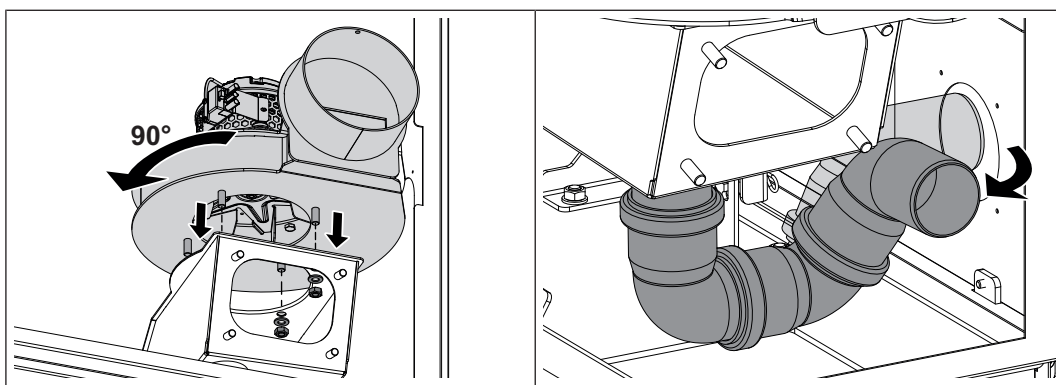


- ☐ Open the insulated door
- ☐ Unlock the cover by undoing the retaining screw
- ☐ Lift the cover on the front edge slightly and remove it towards the front
- ☐ Undo the screws on the top and unhook the side panel

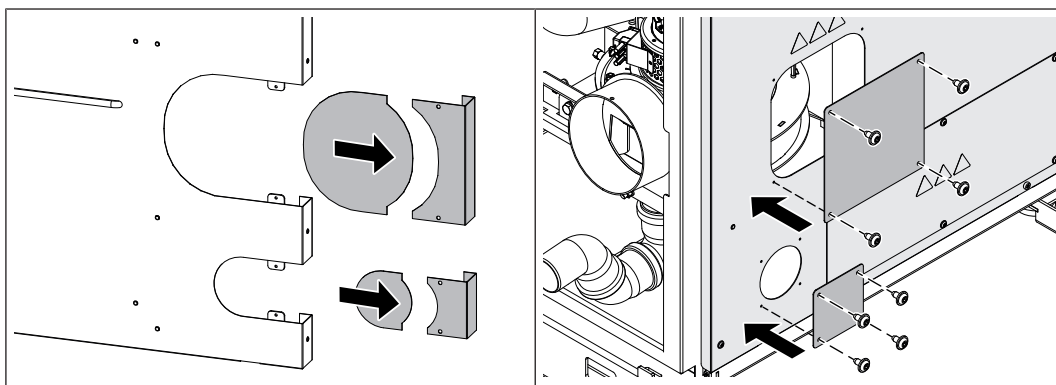


- ☐ Remove the blanking plate and seal from the outflow tub

- ❑ Undo screw connection (A) on the induced draught unit housing in the outflow tub

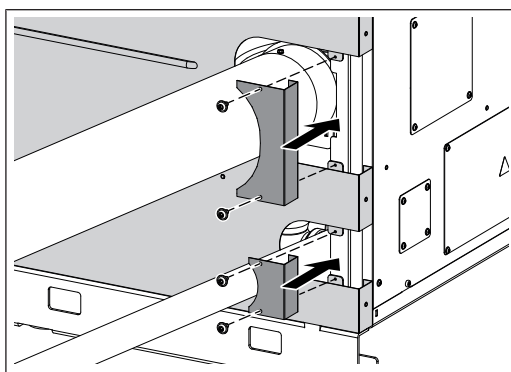


- ❑ Turn the induced draught unit housing 90° and affix to the outflow tub
 - ↳ The flue gas pipe connection points to the right
- ❑ Turn the siphon on the outflow tub 90° to the right-hand side of the boiler
- ❑ Fit the blanking plate and seal to the outflow tub again



- ❑ Take out the perforations on the right side panel and remove the burrs using a half-round file.
- ❑ Close the openings on the rear panel using the supplied shutter masks

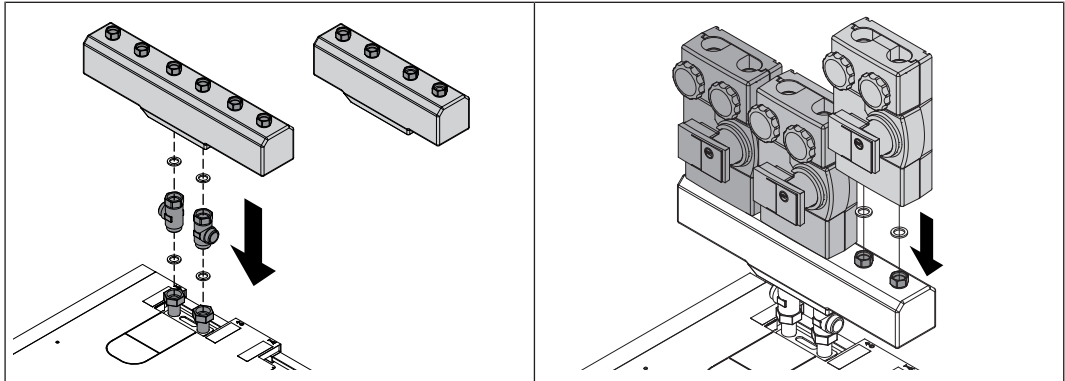
After establishing the connection to the chimney as well as the condensation drain:
 (⇒ "Connect the connection line to the chimney" [▶ 34], ⇒ "Installing the condensation drain" [▶ 35])



- ❑ Install the side panel on the boiler
- ❑ Use screws to attach the angled parts to the cut-outs again

5.8 Installing the optional pump assemblies

The following steps illustrate assembly of the distributor bar and three connections for pump assemblies. Assemble the version with two connections in the same way.

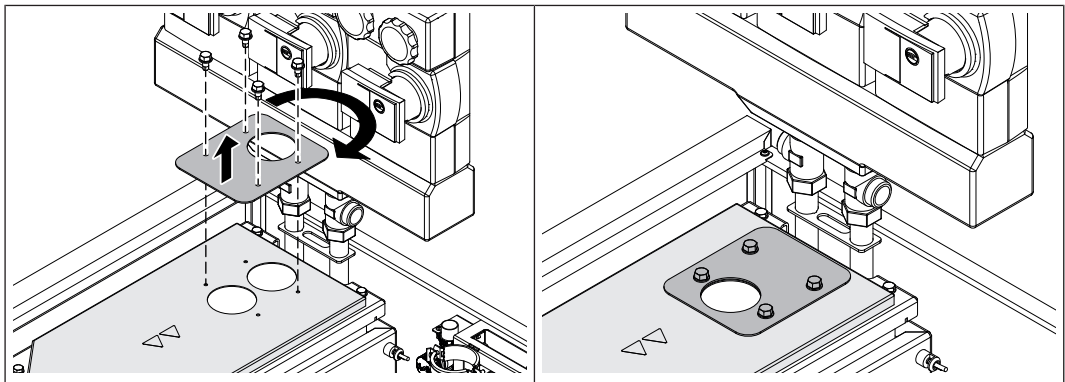


- ☐ Install T-pieces with flat seals on the front and rear connection of the boiler
- ☐ Install distributor bar with flat seals to the T-pieces
- ☐ Install pump assemblies with flat seals to the distributor bar

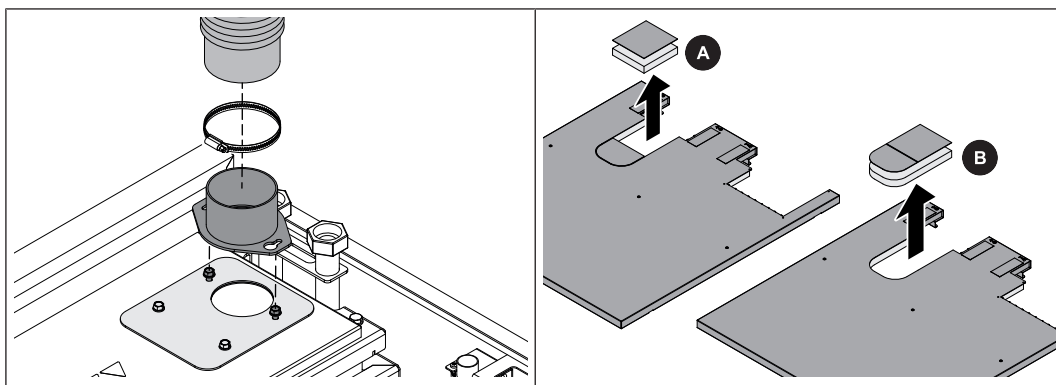
TIP: To facilitate installation, remove the thermal insulation from the distributor bar and pump assemblies

5.9 Install supply air line (For room air independent operation)

In addition, when connecting a distributor bar to the flow and return:

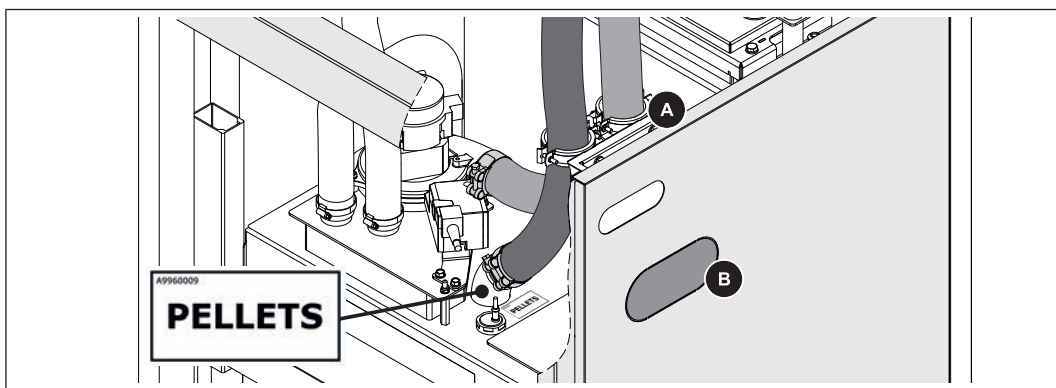


- ☐ Remove the cover plate, turn as illustrated and install on the cleaning cover again



- ☐ Loosen both screws on the supply air opening
- ☐ Turn the bracket clockwise until it stops
- ☐ Secure the bracket using screws
- ☐ Secure the supply air hose and hose clamp to the bracket
- ☐ Make the air supply hose a flexible connection to the air suction point (e.g. air-flue gas-system)
- ☐ Take out the perforation on the cover and remove the burrs using a half-round file
 - ↪ Cut-out A: without distributor bar on flow/return
 - ↪ Cut-out B: with distributor bar on flow/return

5.10 Install suction hoses

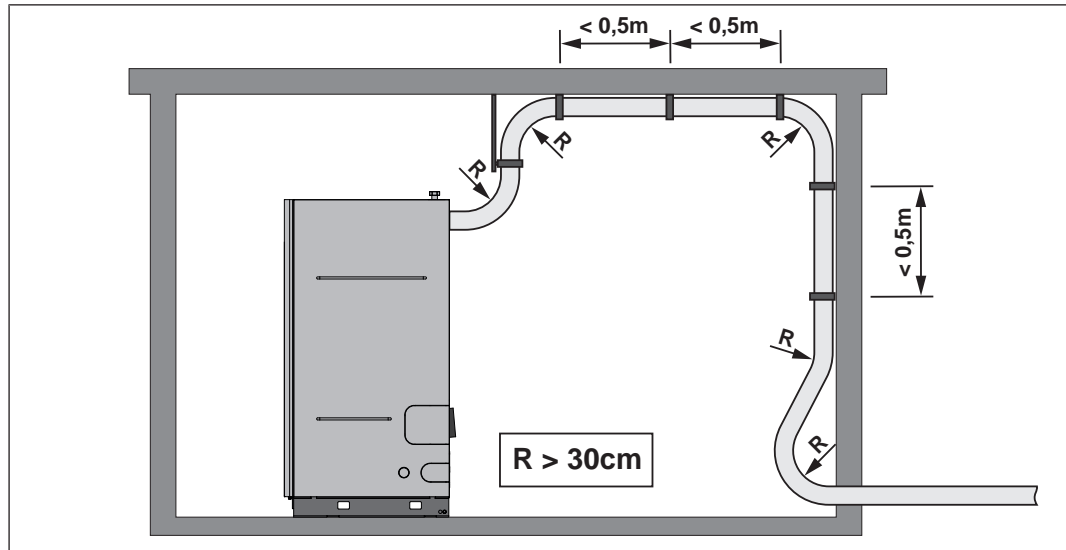


- ☐ Thread the suction hoses on the top of the boiler to the cyclone cover and use hose clamps to secure them to the connections
 - ↪ Connect the pellet hose to the nozzle with the "PELLETS" sticker
 - ↪ Connect the return air line to the suction turbine
 - ↪ **CAUTION: Pay attention to earthing, see installation instructions for the discharge system**
- ☐ Secure the suction hoses using pipe clamps (A)

As an option, the suction hoses can also be run across the back panel to the pellet container:

- ☐ Take out the perforation (B) on the back panel and remove the burrs using a half-round file
- ☐ Insert the suction hoses through the cut-out and secure as described above

5.10.1 Assembly information for hose lines

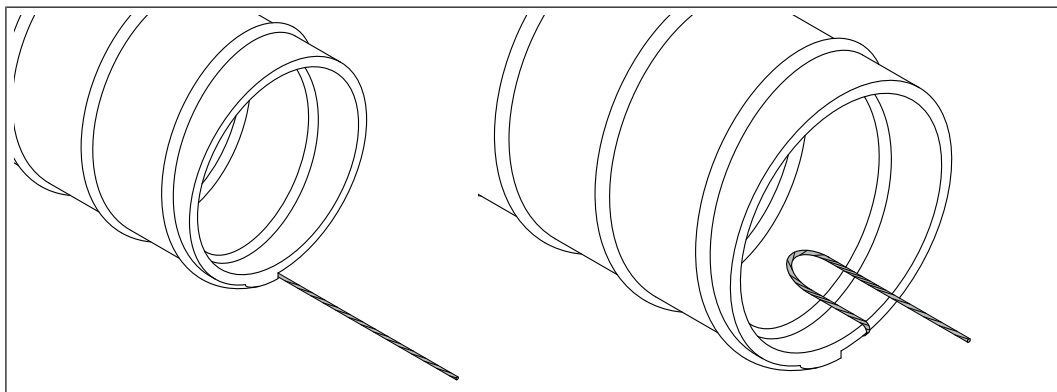


Please note the following with regard to the hose lines used in Froling vacuum discharge systems:

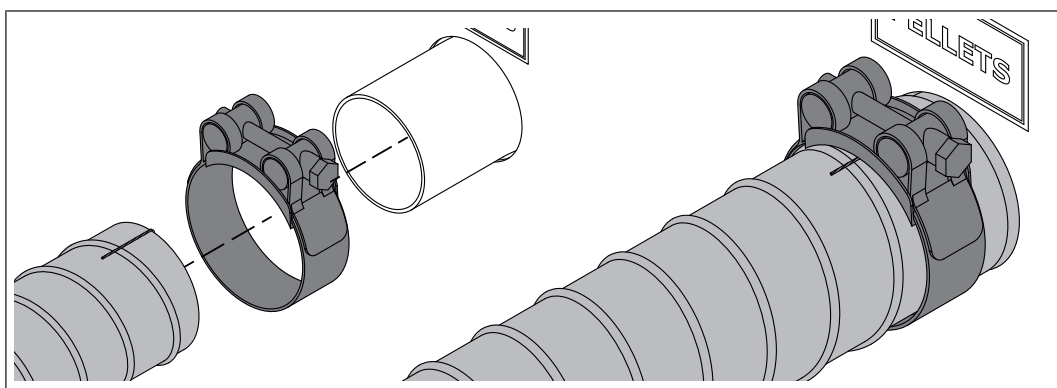
- Do not kink the hose lines! Minimum bending radius = 30cm
- Lay the hose lines as straight as possible! Sagging lines can lead to so-called “pockets”, which may cause problems with the pellet feed.
- Lay the hose lines in short sections away from walking areas.
- Hose lines are not UV-proof. Therefore: Do not lay the hose lines outdoors.
- Hose lines are suitable for temperatures up to 60°C. Therefore: Hose lines must not come into contact with flue gas pipes or uninsulated heating pipes.
- Hose lines must be earthed on both sides to ensure that no static charge builds up as a result of transporting the pellets.
- The suction hose to the boiler must be in a single section.
- The return-air line can be made up of several sections, but consistent potential equalisation must be established throughout the line.
- For systems over 35 kW, only suction hoses with PU inlet are recommended due to the increased load

Potential equalisation

When connecting the hose lines to the individual connections, ensure there is consistent potential equalisation throughout the line.



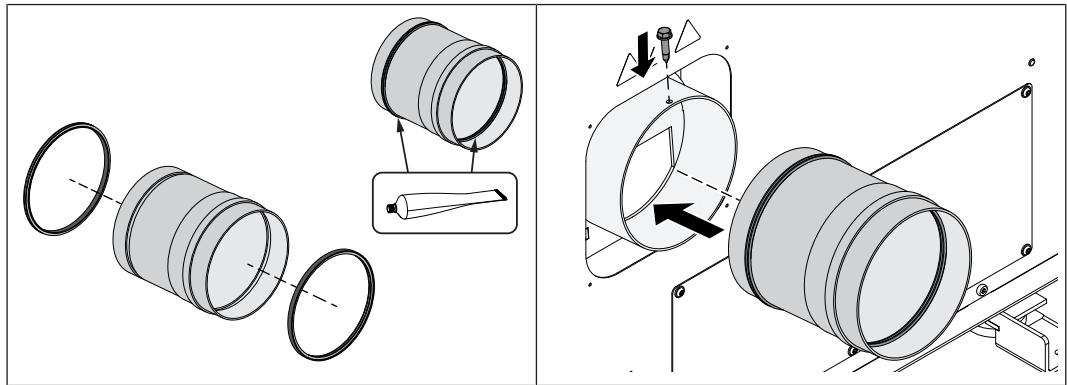
- ❑ Expose approximately 8 cm of the earth wire at the end of the hose line
 - ↪ **TIP:** Slit the insulation open along the wire with a knife
- ❑ Bend the earth wire inwards in a loop
 - ↪ This prevents the earth wire from being damaged by the pellet movement



- ❑ Slide the hose clamp onto the hose line
- ❑ Attach the hose line to the connector
 - ↪ Ensure that contact is established between the earth wire and the connector.
Remove paint from the affected area if necessary
 - ↪ **TIP:** If stiffness occurs when trying to attach the hoses to the connectors, pour a few drops of water onto the pipe (do not use lubrication grease!)
- ❑ Secure the hose line with a hose clamp

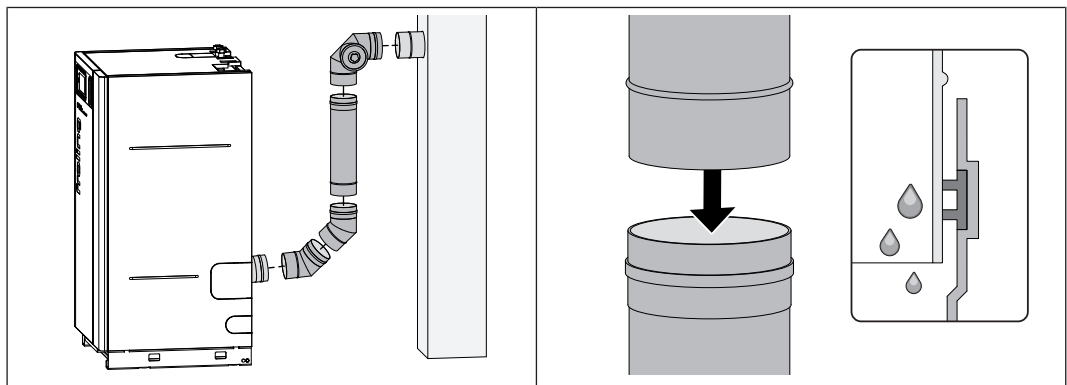
5.11 Connect the connection line to the chimney

Recommendation: Use the optional Froling connection pipe to connect to the chimney



- ☐ Insert seals in all components of the flue gas system
- ☐ Insert the boiler adapter into the flue gas pipe on the boiler and secure using a self-tapping screw

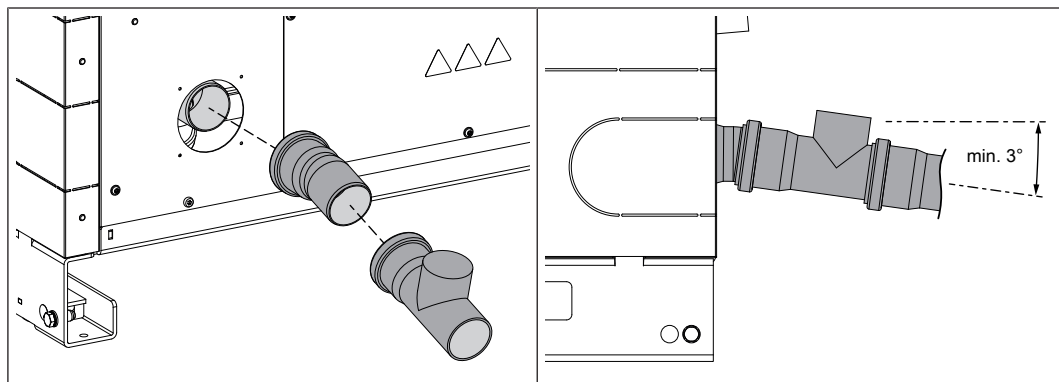
TIP: Grease the seal with suitable lubricant to facilitate installation!



- ☐ Connect the rest of the flue gas connection to the chimney connection
 - ↳ Horizontal piping with a slight slope
 - ↳ Arrange the connections so that any condensate that accumulates can flow back into the boiler unimpeded

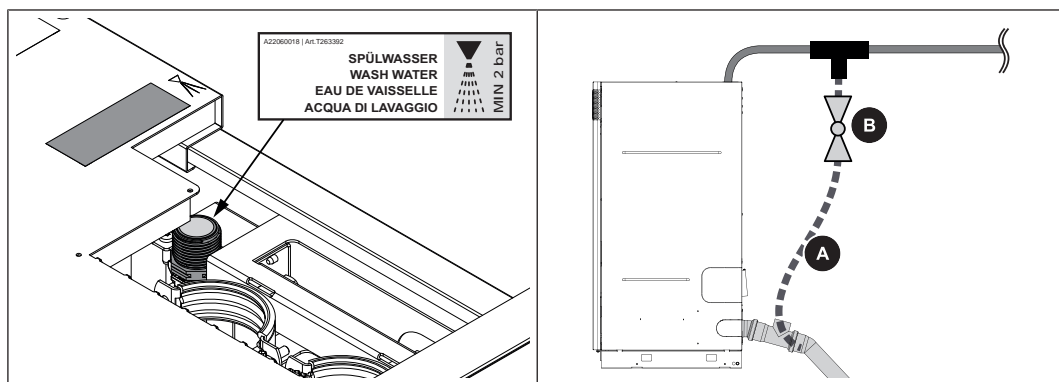
CAUTION: It is almost impossible to turn the pipes once they have been connected together!

5.12 Installing the condensation drain



- ☐ Install drain pipe at 15° as well as the drain pipe with cleaning opening on the siphon
- ☐ Connect other piping to join to the sewer
 - ↳ Observe design information (➔ ["Condensate drainage" \[► 18\]](#))

5.13 Connect the water supply to the boiler



- ☐ Run a flexible fresh water line to the wash water connection on the boiler (flat sealing reinforced hose)
 - ↳ In the process, provide a water connection (e.g. T-piece) for ½" hose (A) to manually flush the condensation drain
 - ↳ Ensure that the flushing line can be shut off (B)
 - ↳ Observe design information (➔ ["Wash-down water" \[► 17\]](#))

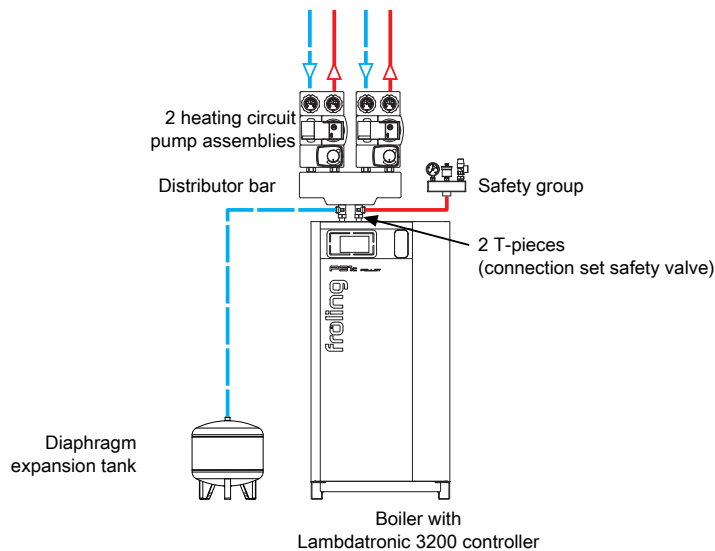
5.14 Hydraulic connection

5.14.1 Direct supply of heating circuit/boiler without storage tank charge

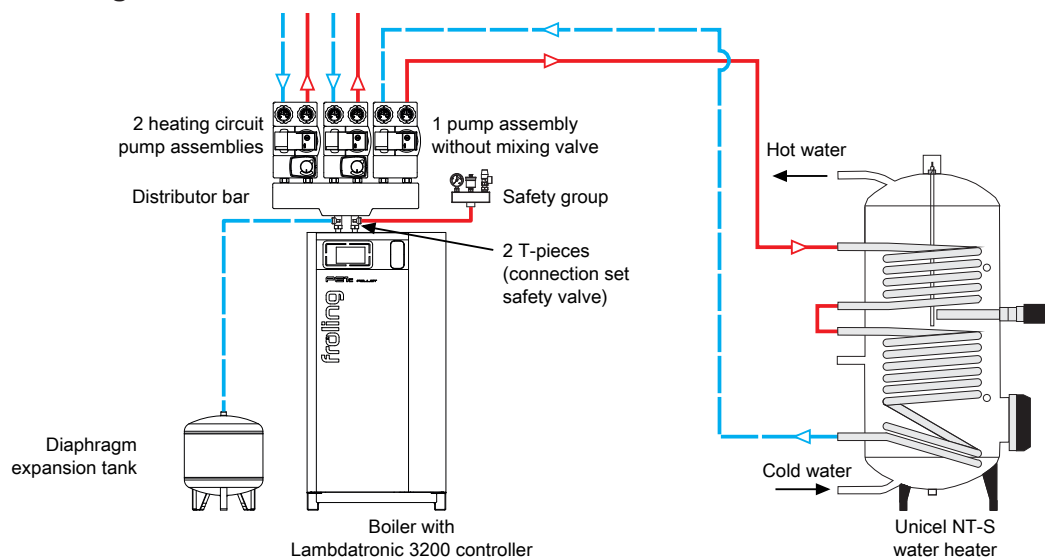
With this version, the pump assemblies including distributor bars are connected directly to the connections on the boiler.

NOTICE! It is not possible to charge the storage tank when heating circuits/DHW tanks are connected directly to the boiler!

PE1c Pellet with two heating circuits

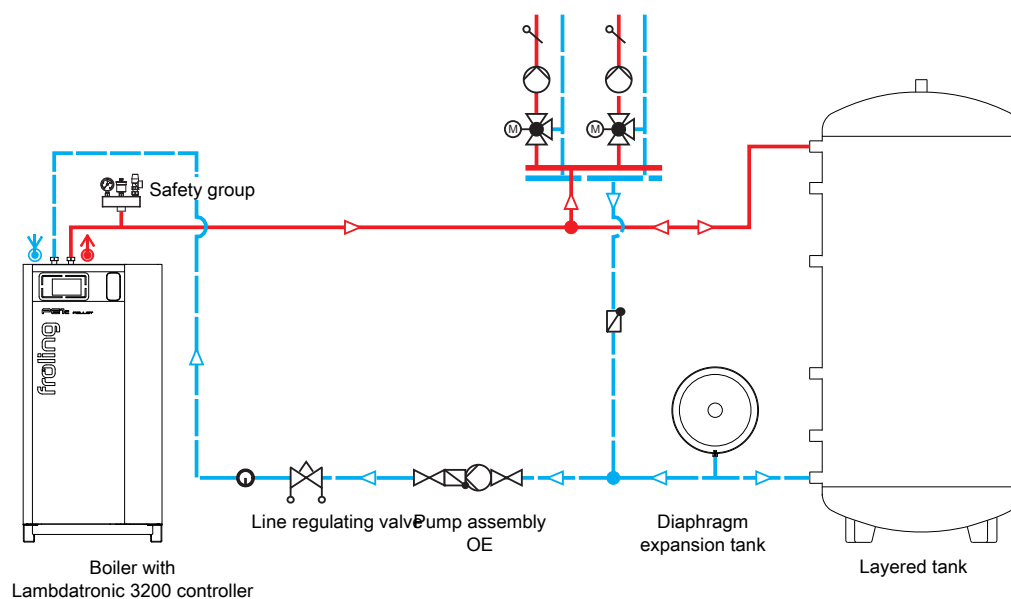


PE1c Pellet with two heating circuits and one DHW tank



5.14.2 Connection on systems with storage tanks

The following diagram shows the schematic layout of the hydraulic connection for systems with storage tanks:



5.15 Electrical connection

- ☐ Flexible sheathed cable must be used for the wiring; this must be of the correct size to comply with applicable regional standards and regulations.

DANGER



When working on electrical components:

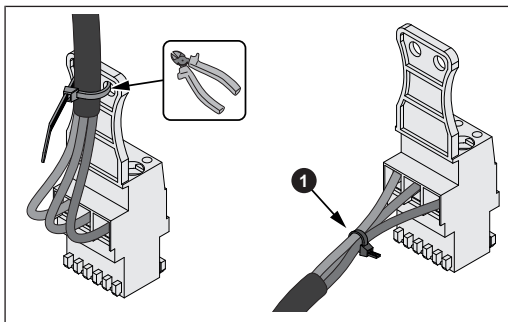
Risk of electrocution!

When work is carried out on electrical components:

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

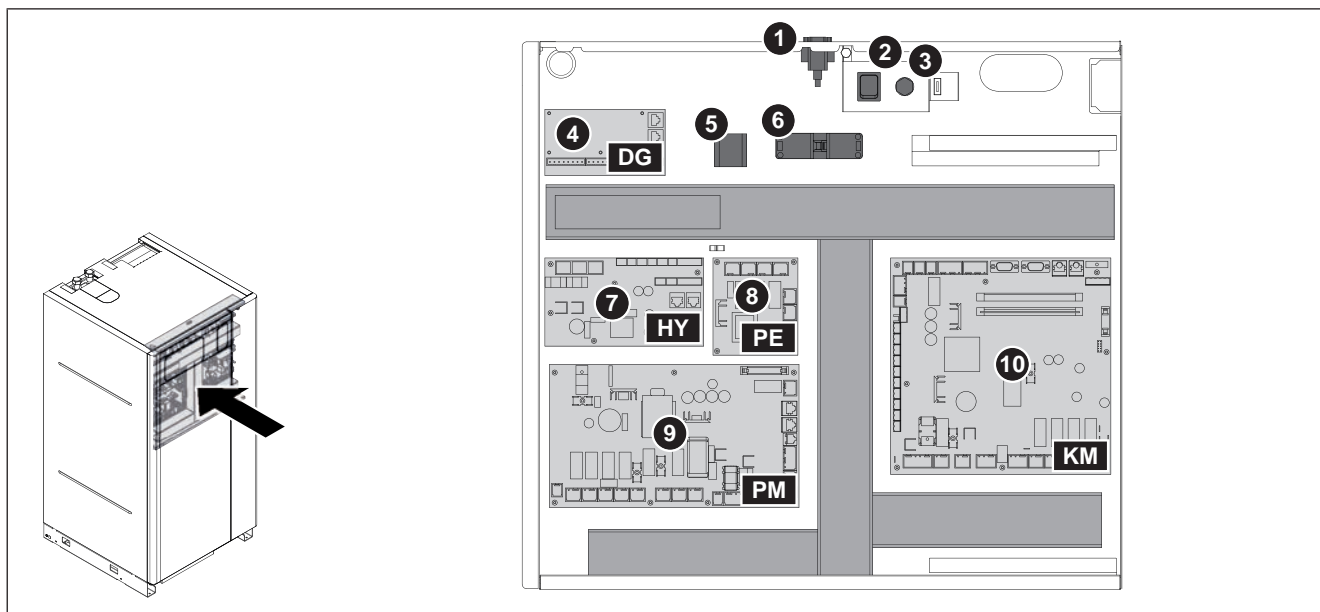
- ☐ Flexible sheathed cable must be used for the wiring; this must be of the correct size to comply with applicable regional standards and regulations.
- ☐ The power supply line (mains connection) must be fitted with a C16A fuse by the customer.

Prepare the plug some components come ready to connect with the cable fixed to the tag connector with cable tie.



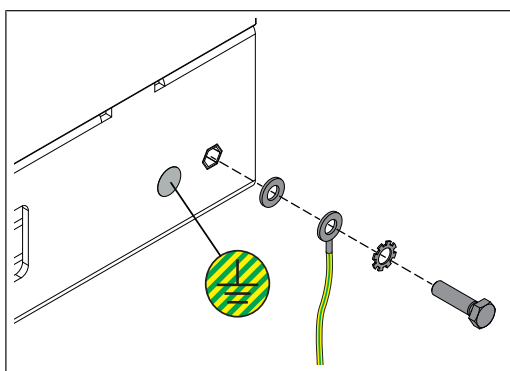
- ☐ Remove the cable ties from the tag connector
- ☐ Bind the individual cores together with cable ties (A)

5.15.1 Board overview



Item	Designation	Item	Designation
1	Service interface	6	Mains connection plug
2	Main switch	7	Hydraulic module
3	High-limit thermostat STL	8	Pellet module expansion (optional)
4	Digital module (optional)	9	Pellet module
5	Device connection terminal	10	Core module

5.15.2 Potential equalisation

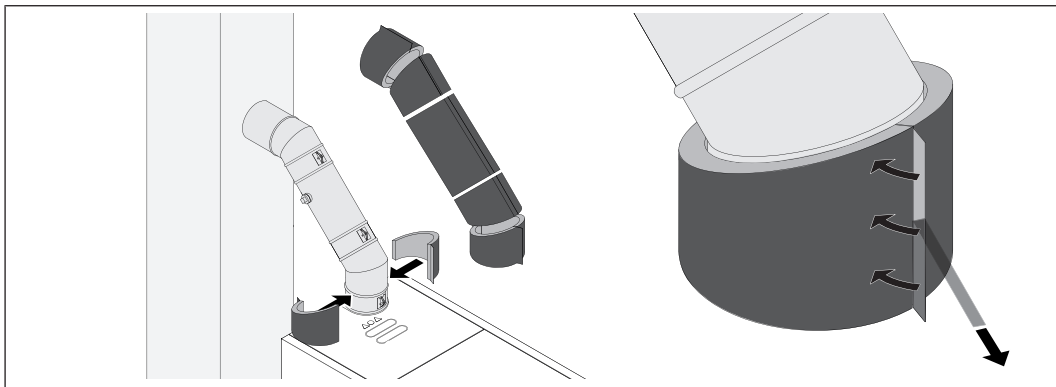


- ❑ The potential equalisation on the boiler base must comply with current directives, regulations and standards

5.16 Final installation steps

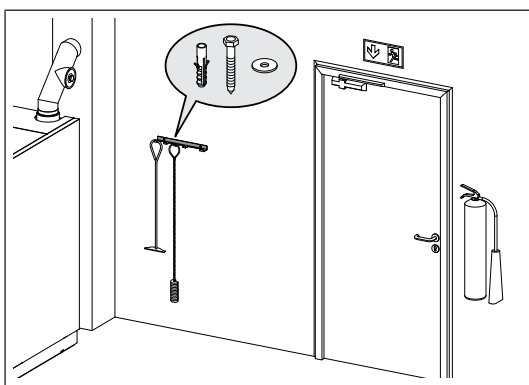
5.16.1 Insulate the connection line

When using the optionally available thermal insulation supplied by Fröling GesmbH, perform the following steps:



- ☐ Cut the half shells of thermal insulation to length and lay them on the connection line
- ☐ Create an opening for access to the measuring port
- ☐ Apply protective foil at the projecting lugs
- ☐ Glue the half shells to each other

5.16.2 Install the brackets for accessories



- ☐ Using appropriate fasteners, attach the brackets to the wall on the boiler
- ☐ Attach the accessories to the brackets

6 Start-up

6.1 Before commissioning / configuring the boiler

The boiler must be configured to the heating system during initial start-up!

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

NOTICE

Foreign bodies in the heating system impair its operational safety and can result in damage to property.

As a result:

- ☐ The whole system should be rinsed out before initial start-up in accordance with EN 14336.
- ☐ Recommendation: Make sure the hose diameter of the flush nozzles in the flow and return complies with ÖNORM H 5195 and is the same as the hose diameter in the heating system, however not more than DN 50.
- ☐ Turn on the main switch
- ☐ Set the boiler controller to the system type.
- ☐ Load the boiler default values.

NOTICE! For the keypad layout and instructions for modifying the parameters, see the instruction manual for the boiler controller.

- ☐ Check the system pressure of the heating system.
- ☐ Check that the heating system is fully ventilated
- ☐ Check all quick vent valves of the entire heating system for leaks
- ☐ Check that all water connections are tightly sealed
 - ↳ Pay particular attention to those connections from which plugs were removed during assembly.
- ☐ Check that all necessary safety devices are in place
- ☐ 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 all blanking plugs (e.g. drainage) for tightness
- ☐ Check that the drives and servo motors are working and turning in the right direction
- ☐ Check that the door contact switch is working efficiently.
- ☐ Check safety switch of ash box is working correctly
- ☐ Check the seal on the condensate drain

NOTICE! Check the digital and analogue inputs and outputs - See the instruction manual for the boiler controller.

6.2 Initial startup

6.2.1 Permitted fuels

Wood pellets

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

Note on standards

EU:	Fuel acc. to EN ISO 17225 - Part 2: Wood pellets class A1 / D06
and/or:	ENplus / DINplus certification scheme

General note:

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

TIP: Fit the Froling PST pellet deduster for separating the dust particles contained in the return air

6.2.2 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:

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

For this reason, when operating the boiler:

- ☐ Only use permitted fuels

6.2.3 Heating up for the first time

NOTICE

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

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

NOTICE! See boiler controller instruction manual for all the steps necessary to start up for the first time.

7 Decommissioning

7.1 Mothballing

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

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

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

7.2 Disassembly

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

7.3 Disposal

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

Manufacturer's address

Fröling Heizkessel- und Behälterbau GesmbH

Industriestraße 12
A-4710 Grieskirchen
+43 (0) 7248 606 0
info@froeling.com

Zweigniederlassung Aschheim

Max-Planck-Straße 6
85609 Aschheim
+49 (0) 89 927 926 0
info@froeling.com

Froling srl

Via J. Ressel 2H
I-39100 Bolzano (BZ)
+39 (0) 471 060460
info@froeling.it

Froling SARL

1, rue Kellermann
F-67450 Mundolsheim
+33 (0) 388 193 269
froling@froeling.com

Installer's address

Stamp

Froling customer services

Austria
Germany
Worldwide

0043 (0) 7248 606 7000
0049 (0) 89 927 926 400
0043 (0) 7248 606 0



www.froeling.com

froling