

froling

Installation instructions

Wood chip boiler T4e 20-180



Translation of original German version of installation instructions for technicians.

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



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1 General	4
1.1 About this manual	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	7
3.1.4 Regulations and standards for permitted fuels	8
3.2 Installation and approval	8
3.3 Installation site	8
3.4 Chimney connection/chimney system	9
3.4.1 Connection line to the chimney	10
3.4.2 Measuring port	11
3.4.3 Draught limiter	11
3.4.4 Explosion flap	11
3.5 Combustion air	12
3.5.1 Combustion air supply at the installation room	12
3.5.2 Simultaneous operation with other air-drawing systems	13
3.6 Domestic hot water	14
3.7 Pressure maintenance systems	15
3.8 Storage tank	16
3.9 Return temperature control	16
3.10 Boiler ventilation	16
4 Technical information	17
4.1 Dimensions T4e 20-180	17
4.2 Components and connections	19
4.3 Technical specifications	20
4.3.1 T4e 20 - 35	20
4.3.2 T4e 20 - 35 ESP	21
4.3.3 T4e 45 - 60	23
4.3.4 T4e 45 - 60 ESP	24
4.3.5 T4e 80 - 110	26
4.3.6 T4e 80 - 110 ESP	27
4.3.7 T4e 130 - 150	29
4.3.8 T4e 130 - 150 ESP	30
4.3.9 T4e 160 - 180	32
4.3.10 T4e 160 - 180 ESP	33
4.3.11 Boiler data for planning the flue gas system	35
4.3.12 Data for planning a backup power supply	37
5 Transport and storage	38
5.1 Delivery configuration	38
5.2 Temporary storage	38
5.3 Positioning	39
5.4 Positioning at the installation site	40
5.4.1 Remove boiler from pallet	40
5.4.2 Operating and maintenance areas of the equipment	42

6 Assembly	43
6.1 Assembly overview	43
6.2 Accessories supplied	43
6.3 Installing the boiler	44
6.3.1 Levelling the boiler	44
6.3.2 Installing the stoker unit	44
6.3.3 Control the return temperature control	46
6.3.4 Install line regulating valve (T4e 20-60 - optional)	47
6.3.5 Install line regulating valve (T4e 80-180 - optional)	48
6.3.6 Adjusting the height of the ash container	49
6.4 Hydraulic connection	50
6.5 Electrical connection	52
6.5.1 Board overview	53
6.5.2 Laying cables	55
6.5.3 Attach the mains connection to the boiler	56
6.5.4 Potential equalisation	56
6.6 Final installation steps	57
6.6.1 Insulate the connection line	59
6.6.2 Install the brackets for accessories	59
6.6.3 Stick on an additional identification plate (applicable to T4e ESP)	60
7 Start-up.....	61
7.1 Before commissioning / configuring the boiler	61
8 Decommissioning	62
8.1 Mothballing	62
8.2 Disassembly	62
8.3 Disposal	62

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 boiler sizes T4e / T4e ESP:

20, 25, 30, 35, 45, 50, 60, 80, 90, 100, 108¹⁾, 110, 130, 140, 150, 160, 170, 180;

1) T4e 108 and T4e 108 ESP only available in Italy

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

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
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
EN ISO 17225-4	Solid bio-fuel - Fuel specifications and classes Part 4: Wood chips for non-industrial use

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.

3.3 Installation site

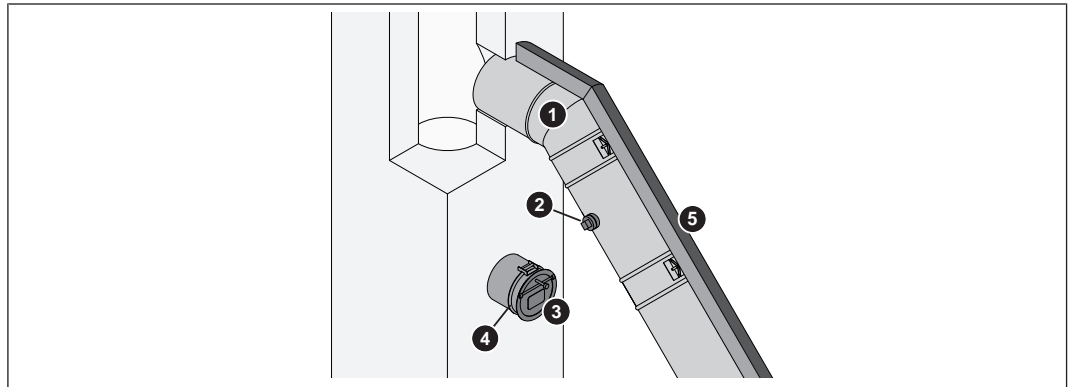
Requirements for the load bearing substrate:

- 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 | Draught limiter |
| 4 | Explosion flap (for automatic boilers) |
| 5 | 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.

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 within the permissible operating range of the boiler flue gas temperatures lower than 160K above room temperature may occur.

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)
- thermally insulated

MFeuV ¹⁾ (Germany)	EN 15287-1 and EN 15287-2
<p>[mm]</p>	<p>[mm]</p>
<p>1. Observe the fire regulations of the respective federal state</p> <p>2. Component made of flammable material</p> <p>3. Nonflammable insulating material</p> <p>4. Radiation shield with rear ventilation</p>	

Minimum distance from flammable substances as per MFeuV¹⁾ (Germany):

- 400 mm excluding thermal insulation
- 100 mm if at least 20 mm thermal insulation is installed

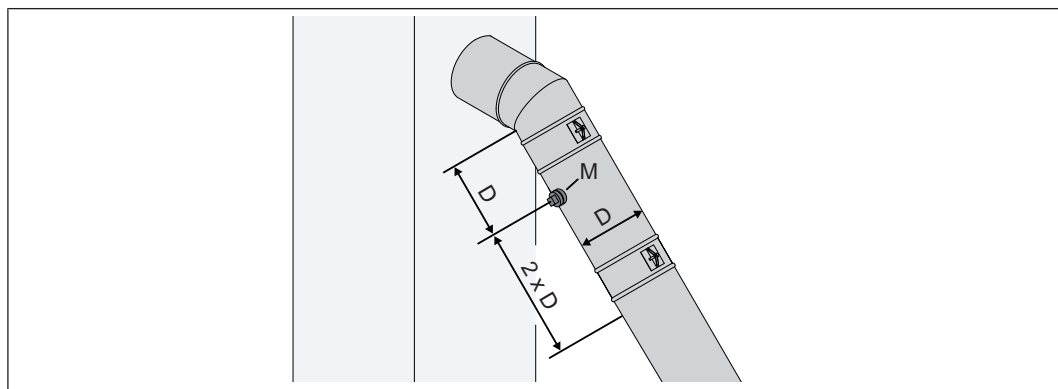
Minimum distance from flammable materials as per EN 15287-1 and EN 15287-2:

- 3 x nominal diameter of connection line, but at least 375 mm (NM)
- 1.5 x nominal diameter of connection line for radiation shield with rear ventilation, but at least 200 mm (NM)

NOTICE! The minimum distances must be observed in accordance with the standards and guidelines applicable in the region

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.

3.4.3 Draught limiter

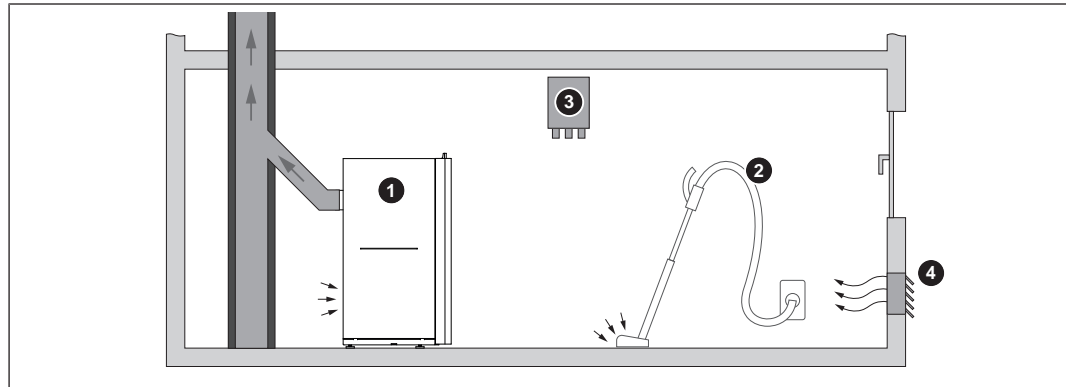
We generally recommend the installation of a draught limiter. A draught limiter must be installed if the maximum permissible feed pressure as given in the boiler data for planning the flue gas system is exceeded.

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

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



- | | |
|---|--|
| 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
TRVB H118 - Technical directives on fire protection/prevention

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:

A gauge that monitors the negative pressure gauge (e.g. air pressure sensor P4) and is approved by the DIBt (German Technical Authority in the Construction Sector) must be used. This monitor tracks the maximum negative pressure of 4 Pa at the installation site.

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 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 8.2 and 9.0
- ☐ 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
- ☐ The heating water must be clear and free from substances that lead to sediments.
- ☐ With regard to corrosion protection, the use of fully demineralised filling and make-up water with an electrical conductivity of up to 100 µS/cm is recommended in accordance with EN 14868

Advantages of low-salt or fully demineralised 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

Filling and make-up water as well as heating water in accordance with VDI 2035:

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

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

Additional requirements for Switzerland

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

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

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

Inspection:

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

3.7 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.**

3.8 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 Fröling.

Additional requirements for Switzerland in accordance with LRV Appendix 3, section 523

Automatic boilers with a rated thermal output ≤ 500 kW must be equipped with a heat accumulator of a volume of at least 25 litres per kW rated thermal output.

3.9 Return temperature control

As long as the hot water return is below the minimum return temperature, part of the hot water flow is added. This function is assumed by the function which increases the temperature inside the boiler.

3.10 Boiler ventilation



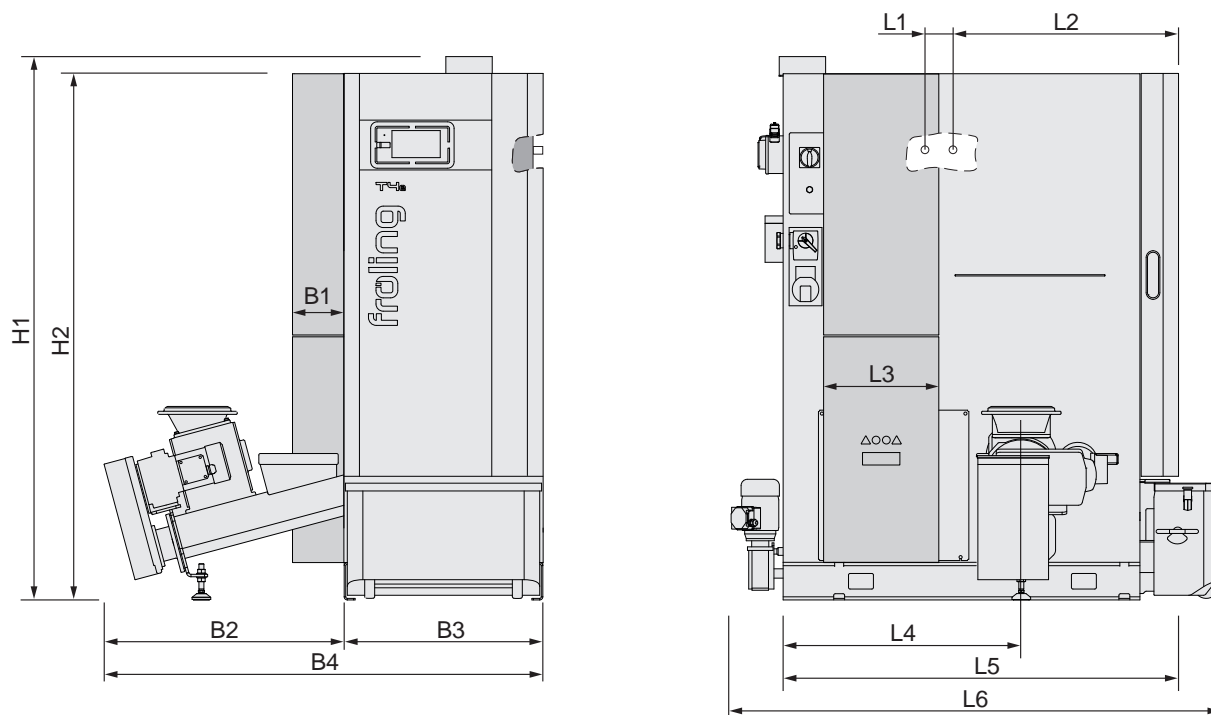
- ☐ Fit the automatic ventilating valve at the highest point on the boiler or at the ventilation connection (if present).
 - ↳ This ensures that air in the boiler is constantly expelled, thus preventing malfunctions caused by air in the boiler
- ☐ Check that the boiler ventilation is working properly
 - ↳ 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!

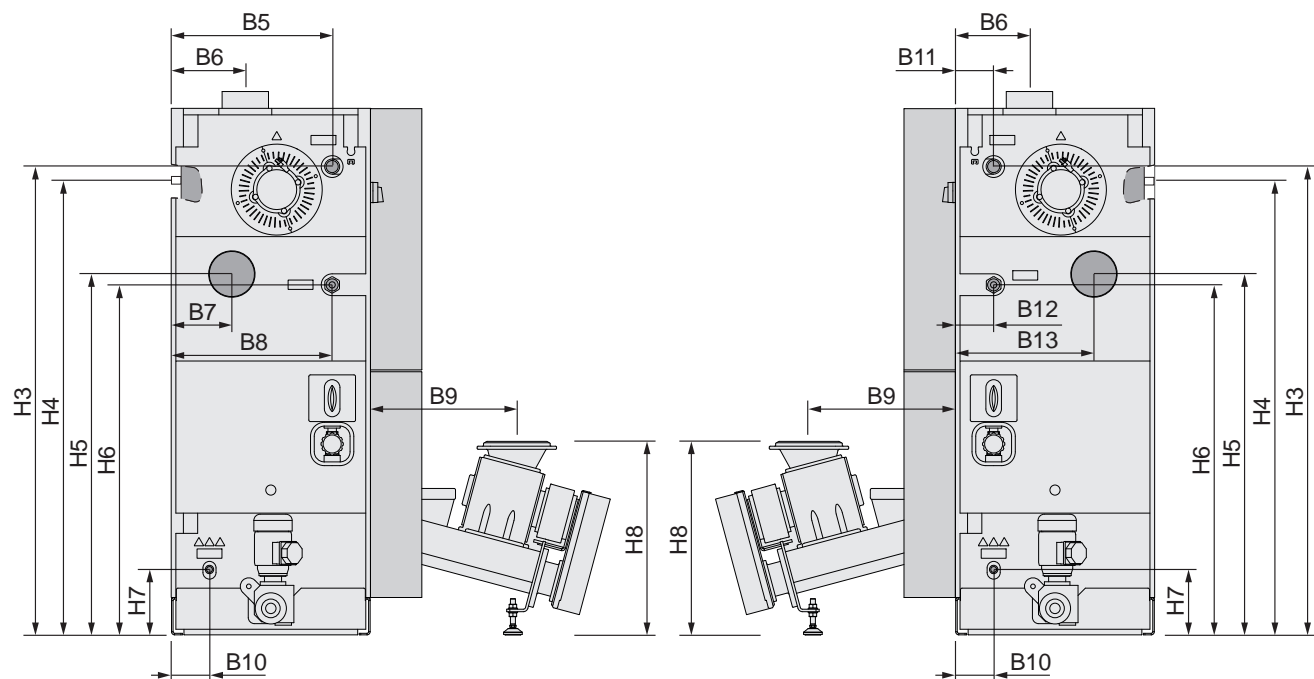
4 Technical information

4.1 Dimensions T4e 20-180



Dimension	Description		20-35	45-60	80-110	130-180
L1	Distance between safety heat exchanger connections ¹⁾	mm	-			65
L2	Distance between safety heat exchanger connection and front of the boiler ¹⁾		-			850
L3	Length of particle separator (optional)		370	370	550	715
L4	Distance between stoker and back of the boiler		690	770	890	1165
L5	Boiler length		1170	1270	1415	1770
L6	Total length		1475	1575	1795	2110
B1	Width of particle separator (optional)		165	165	165	165
B2	Width of stoker unit		770	770	770	780
B3	Width, boiler		640	640	800	785
B4	Total width, including stoker unit		1410	1410	1570	1565
H1	Total height incl. flue gas nozzle		1545	1745	1790	1895
H2	Height, boiler		1490	1690	1740	1840

1. Safety heat exchanger connection opposite stoker



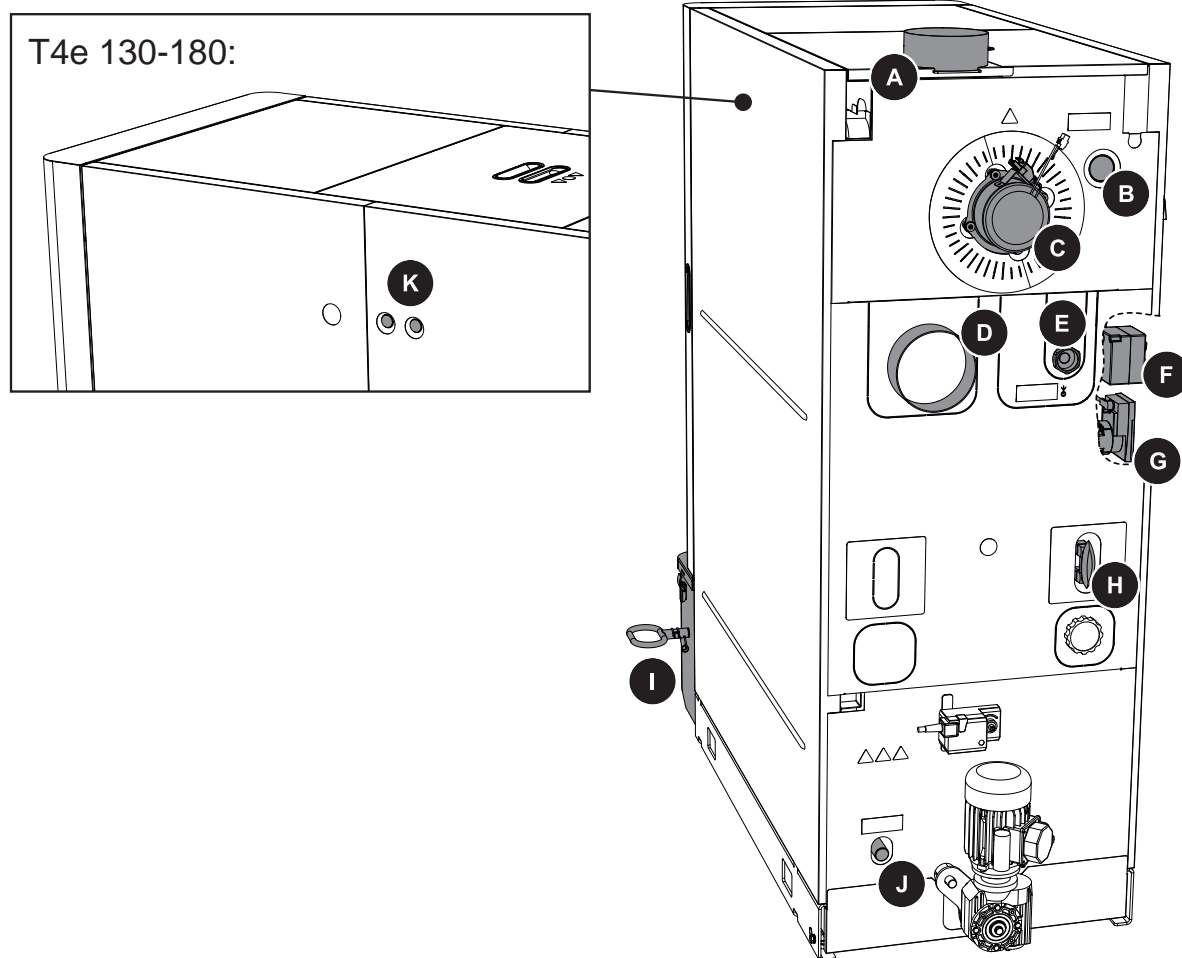
Dimension	Description		20-35	45-60	80-110	130-180
W5	Distance to flow connection (stoker left)	mm	515	515	660	655
B6	Distance between flue gas pipe connection and side of boiler		240	240	295	275
W7	Distance between rear flue gas pipe and side of boiler (stoker left) ¹⁾		195	195	225	315
W8	Distance to return connection (stoker left)		515	515	660	655
W9	Distance between stoker connection and back of the boiler		470	470	470	470
B10	Distance between drainage connection and side of boiler		125	125	125	120
B11	Distance to flow connection (stoker right)		125	125	130	130
B12	Distance to return connection (stoker right)		125	125	140	130
B13	Distance between rear flue gas pipe connection and side of the boiler (stoker right) ¹⁾		485	485	600	-
H3	Height, flow connection		1305	1505	1545	1660
H4	Height, safety heat exchanger connection		-			1620
H5	Height of rear flue gas pipe connection ¹⁾		960	1160	1205	1290
H6	Height, return connection with integrated return feed boost		955	1155	1130	1210
H7	Height, drainage connection		210	210	200	200
H8	Height of stoker connection		620	620	620	620

1. Optional

NOTE:

- Flow and return connections are located on the stoker side
- Rear flue gas pipe connection (optional) on the side facing away from the stoker (T4e 20-110) or on the left side of the boiler, respectively (T4e 130-180)
- Safety heat exchanger on the side facing away from the stoker (T4e 130-180)

4.2 Components and connections



Item	Description	20 - 60	80-110	130-180
A	Top flue gas pipe connection	149 mm	179 mm	199 mm
W	Boiler flow	1 1/4"	2"	2"
C	Induced draught fan	-		
D	Rear flue gas pipe connection (optional)	149 mm	179 mm	199 mm
E	Boiler return	1 1/4"	2"	2"
F	Mixing valve for the return temperature control	-		
G	Pump for the return temperature control	-		
H	Line regulating valve (optional)	-		
I	Ash container	40 Litres	55 Litres	75 Litres
J	Drainage	1/2"	1"	1"
K	Safety heat exchanger	-	-	1/2"

4.3 Technical specifications

4.3.1 T4e 20 - 35

Description		T4e 20 - 35			
		20	25	30	35
Nominal output	kW	19.9	25.1	30	35
Electrical connection		400V / 50Hz / fused C16A			
Weight of boiler (including stoker, without water)	kg	740			
Boiler capacity (water)	l	117			
Available feed height of pump ¹⁾ (with $\Delta T = 20K$)	mbar	575	503	461	414
Max. permitted operating temperature	°C	90			
Permitted operating pressure	bar	4			
Boiler class as per EN 303-5: 2012		5			
Airborne sound level	dB(A)	<70			
Permitted fuel as per EN ISO 17225 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06			
Test book number		PB 121	PB 122	PB 123	PB 124

1. Pump output less water resistance in the boiler

2. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"

Regulation (EU) 2015/1187		T4e 20 - 35			
		20	25	30	35
Energy efficiency class of boiler		A+	A+	A+	A+
Energy efficiency index (EEI) of boiler		116	116	117	118
Heating space annual rate of use η_s	%	79	79	80	80
Energy efficiency index (EEI) of boiler and controller combined		118	118	119	120
Energy efficiency class of boiler and controller combined		A+	A+	A+	A+

Additional data for regulation (EU) 2015/1189

Description		T4e 20 - 35			
		20	25	30	35
Heating up mode		automatic			
Condensing boiler		No			
Solid fuel boiler for combined heat and power		No			
Combined heating system		No			
Storage tank volume		↻ "Storage tank" ▶ 16]			
Characteristics when operated exclusively with the preferred fuel					
Useful heat delivered at rated heat output (P _n)	kW	19.9	25.1	30.0	35.0
Useful heat delivered at 30% of rated heat output (P _p)		5.9	7.5	9.0	10.5
Fuel efficiency at rated heat output (η _n)	%	83.9	83.5	83.8	84.2
Fuel efficiency at 30% of rated heat output (η _p)		82.9	83.2	83.4	83.6

Description		T4e 20 - 35			
		20	25	30	35
Auxiliary current consumption at rated heat output ($e_{l,max}$)	kW	0.048	0.055	0.059	0.062
Auxiliary current consumption at 30% of rated heat output (η_p)		0.039	0.039	0.039	0.038
Auxiliary current consumption in standby mode (P_{SB})		0.005	0.005	0.005	0.005

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 T4e 20 - 35 ESP

Description		T4e 20 - 35 ESP			
		20	25	30	35
Nominal output	kW	19.9	25.1	30	35
Electrical connection		400V / 50Hz / fused C16A			
Weight of boiler (including stoker, without water)	kg	740			
Boiler capacity (water)	l	117			
Available feed height of pump ¹⁾ (with $\Delta T = 20K$)	mbar	575	503	461	414
Max. permitted operating temperature	°C	90			
Permitted operating pressure	bar	4			
Boiler class as per EN 303-5: 2012		5			
Airborne sound level	dB(A)	<70			
Permitted fuel as per EN ISO 17225 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06			
Test book number		PB 125	PB 126	PB 127	PB 128
1. Pump output less water resistance in the boiler					
2. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"					

Regulation (EU) 2015/1187		T4e 20 - 35 ESP			
		20	25	30	35
Energy efficiency class of boiler		A+	A+	A+	A+
Energy efficiency index (EEI) of boiler		117	118	118	119
Heating space annual rate of use η_s	%	79	80	80	80
Energy efficiency index (EEI) of boiler and controller combined		119	120	120	121
Energy efficiency class of boiler and controller combined		A+	A+	A+	A+

Additional data for regulation (EU) 2015/1189

Description		T4e 20 - 35 ESP			
		20	25	30	35
Heating up mode		automatic			
Condensing boiler		No			
Solid fuel boiler for combined heat and power		No			
Combined heating system		No			
Storage tank volume		↻ "Storage tank" ► 16]			
Characteristics when operated exclusively with the preferred fuel					
Useful heat delivered at rated heat output (P_n)	kW	19.5	25.1	30.0	35.0
Useful heat delivered at 30% of rated heat output (P_p)		5.9	7.5	9.0	10.5
Fuel efficiency at rated heat output (η_n)	%	84.2	83.2	83.5	83.7
Fuel efficiency at 30% of rated heat output (η_p)		84.0	84.3	84.2	84.0
Auxiliary current consumption at rated heat output ($e_{l_{max}}$)	kW	0.066	0.074	0.077	0.079
Auxiliary current consumption at 30% of rated heat output (η_p)		0.050	0.050	0.053	0.055
Auxiliary current consumption in standby mode (P_{SB})		0.005	0.005	0.005	0.005

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	

4.3.3 T4e 45 - 60

Description		T4e 45 - 60		
		45	50	60
Nominal heat output	kW	45	49.9	60
Electrical connection		400V / 50Hz / fused C16A		
Weight of boiler (including stoker, without water)	kg	850		
Boiler capacity (water)	l	155		
Available feed height of pump ¹⁾ (with $\Delta T = 20K$)	mbar	500	438	326
Max. permitted operating temperature	°C	90		
Permitted operating pressure	bar	4		
Boiler class as per EN 303-5: 2012		5		
Airborne sound level	dB(A)	< 70		
Permitted fuel as per EN ISO 17225 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06		
Test book number		PB 105	PB 106	PB 107

1. Pump output less water resistance in the boiler
2. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"

Regulation (EU) 2015/1187		T4e 45 - 60		
		45	50	60
Energy efficiency class of boiler		A+	A+	A+
Energy efficiency index (EEI) of boiler		119	119	119
Heating space annual rate of use η_s	%	81	81	81
Energy efficiency index (EEI) of boiler and controller combined		121	121	121
Energy efficiency class of boiler and controller combined		A+	A+	A+

Additional data for regulation (EU) 2015/1189

Description		T4e 45 - 60		
		45	50	60
Heating up mode		automatic		
Condensing boiler		No		
Solid fuel boiler for combined heat and power		No		
Combined heating system		No		
Storage tank volume		↻ "Storage tank" ▶ 16]		
Characteristics when operated exclusively with the preferred fuel				
Useful heat delivered at rated heat output (P _n)	kW	45.0	49.9	60.0
Useful heat delivered at 30% of rated heat output (P _p)		13.5	15.0	18.0
Fuel efficiency at rated heat output (η _n)	%	84.9	84.6	83.9
Fuel efficiency at 30% of rated heat output (η _p)		84.1	84.0	83.9
Auxiliary current consumption at rated heat output (e _{I_{max}})	kW	0.070	0.077	0.090
Auxiliary current consumption at 30% of rated heat output (η _o)		0.037	0.037	0.037

Description		T4e 45 - 60		
		45	50	60
Auxiliary current consumption in standby mode (P_{SB})		0.005	0.005	0.005

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	

4.3.4 T4e 45 - 60 ESP

Description		T4e 45 – 60 ESP		
		45	50	60
Nominal heat output	kW	45	49.9	60
Electrical connection		400V / 50Hz / fused C16A		
Weight of boiler (including stoker, without water)	kg	850		
Boiler capacity (water)	l	155		
Available feed height of pump ¹⁾ (with $\Delta T = 20K$)	mbar	500	438	326
Max. permitted operating temperature	°C	90		
Permitted operating pressure	bar	4		
Boiler class as per EN 303-5: 2012		5		
Airborne sound level	dB(A)	< 70		
Permitted fuel as per EN ISO 17225 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06		
Test book number		PB 109	PB 110	PB 111
1. Pump output less water resistance in the boiler				
2. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"				

Regulation (EU) 2015/1187		T4e 45 – 60 ESP		
		45	50	60
Energy efficiency class of boiler		A+	A+	A+
Energy efficiency index (EEI) of boiler		118	119	119
Heating space annual rate of use η_s	%	80	81	81
Energy efficiency index (EEI) of boiler and controller combined		120	121	121
Energy efficiency class of boiler and controller combined		A+	A+	A+

Additional data for regulation (EU) 2015/1189

Description		T4e 45 – 60 ESP		
		45	50	60
Heating up mode		automatic		
Condensing boiler		No		
Solid fuel boiler for combined heat and power		No		
Combined heating system		No		
Storage tank volume		↻ "Storage tank" ► 16]		
Characteristics when operated exclusively with the preferred fuel				
Useful heat delivered at rated heat output (P_n)	kW	45.0	49.9	60.0
Useful heat delivered at 30% of rated heat output (P_p)		13.5	15.0	18.0
Fuel efficiency at rated heat output (η_n)	%	83.0	83.0	83.1
Fuel efficiency at 30% of rated heat output (η_p)		83.8	83.7	84.0
Auxiliary current consumption at rated heat output ($e_{l_{max}}$)	kW	0.097	0.103	0.121
Auxiliary current consumption at 30% of rated heat output (η_p)		0.059	0.061	0.069
Auxiliary current consumption in standby mode (P_{SB})		0.004	0.004	0.007

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	

4.3.5 T4e 80 - 110

Description		T4e 80 - 110				
		80	90	100	108 ¹⁾	110
Rated heat output	kW	80	90	100	108	110
Electrical connection		400V / 50Hz / fused C16A				
Weight of boiler (including stoker, without water)	kg	1160				
Boiler capacity (water)	l	228				
Available feed height of pump ²⁾ (with $\Delta T = 20K$)	mbar	628	566	525	473	460
Max. permitted operating temperature	°C	90				
Permitted operating pressure	bar	4				
Boiler class as per EN 303-5: 2012		5				
Airborne sound level	dB(A)	<70				
Permitted fuel as per EN ISO 17225 ³⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06				
Test book number		PB 131	PB 132	PB 133		PB 134
1. T4e 108 only available in the Italian language 2. Pump output less water resistance in the boiler 3. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"						

Regulation (EU) 2015/1187		
Heating space annual rate of use η_s	%	≥ 78

Additional data for regulation (EU) 2015/1189

Description		T4e 80 - 110				
		80	90	100	108	110
Heating up mode		automatic				
Condensing boiler		No				
Solid fuel boiler for combined heat and power		No				
Combined heating system		No				
Storage tank volume		↻ "Storage tank" ► 16]				
Characteristics when operated exclusively with the preferred fuel						
Useful heat delivered at rated heat output (P _n)	kW	80	90	100	108	110
Useful heat delivered at 30% of rated heat output (P _p)		24.0	27.0	30.0	32.4	33.0
Fuel efficiency at rated heat output (η _n)	%	83.6	83.5	83.3	83.5	83.5
Fuel efficiency at 30% of rated heat output (η _p)		84.1	84.1	84.2	84.2	84.2
Auxiliary current consumption at rated heat output (e _{lmax})	kW	0.114	0.126	0.138	0.138	0.138
Auxiliary current consumption at 30% of rated heat output (η _p)		0.047	0.051	0.056	0.056	0.057
Auxiliary current consumption in standby mode (P _{SB})		0.010	0.012	0.015	0.014	0.014

Regulation (EU) 2015/1189 – emissions in [mg/m ³] ¹⁾	
Annual space heating emissions of dust (PM)	≤ 30

Regulation (EU) 2015/1189 – emissions in [mg/m ³] ¹⁾	
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	

4.3.6 T4e 80 - 110 ESP

Description		T4e 80 – 110 ESP				
		80	90	100	108 ¹⁾	110
Rated heat output	kW	80	90	100	108	110
Electrical connection		400V / 50Hz / fused C16A				
Weight of boiler (including stoker, without water)	kg	1160				
Boiler capacity (water)	l	228				
Available feed height of pump ²⁾ (with ΔT = 20K)	mbar	628	566	525	473	460
Max. permitted operating temperature	°C	90				
Permitted operating pressure	bar	4				
Boiler class as per EN 303-5: 2012		5				
Airborne sound level	dB(A)	<70				
Permitted fuel acc. to EN ISO 17225 ³⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06				
Test book number		PB 137	PB 138	PB 139		PB 140
1. T4e 108 ESP only available in the Italian language						
2. Pump output less water resistance in the boiler						
3. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"						

Regulation (EU) 2015/1187		
Heating space annual rate of use η _s	%	≥ 78

Additional data for regulation (EU) 2015/1189

Description		T4e 80 – 110 ESP				
		80	90	100	108	110
Heating up mode		automatic				
Condensing boiler		No				
Solid fuel boiler for combined heat and power		No				
Combined heating system		No				
Storage tank volume		☞ "Storage tank" ► 16]				
Characteristics when operated exclusively with the preferred fuel						
Useful heat delivered at rated heat output (P _n)	kW	80	90	100	108	110
Useful heat delivered at 30% of rated heat output (P _p)		24.0	27.0	30.0	32.4	33.0
Fuel efficiency at rated heat output (η _n)	%	83.8	83.7	83.7	83.7	83.7

Description		T4e 80 – 110 ESP				
		80	90	100	108	110
Fuel efficiency at 30% of rated heat output (η_p)		84.5	84.9	85.3	85.1	85.1
Auxiliary current consumption at rated heat output ($e_{l_{max}}$)	kW	0.158	0.176	0.194	0.196	0.196
Auxiliary current consumption at 30% of rated heat output (η_p)		0.085	0.093	0.101	0.100	0.100
Auxiliary current consumption in standby mode (P_{SB})		0.012	0.015	0.017	0.019	0.019

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	

4.3.7 T4e 130 - 150

Description		T4e 130 - 150		
		130	140	150
Rated heat output	kW	130	140	150
Electrical connection		400V / 50Hz / fused C16A		
Weight of boiler (including stoker, without water)	kg	1500		
Boiler capacity (water)	l	320		
Available feed height of pump ¹⁾ (with $\Delta T = 20K$)	mbar	913	860	787
Max. permitted operating temperature	°C	90		
Permitted operating pressure	bar	4		
Boiler class as per EN 303-5: 2012		5		
Airborne sound level	dB(A)	<70		
Permitted fuel as per EN ISO 17225 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06		
Test book number		PB 150	PB 151	PB 152

1. Pump output less water resistance in the boiler
2. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"

Regulation (EU) 2015/1187		
Heating space annual rate of use η_s	%	≥ 78

Additional data for regulation (EU) 2015/1189

Description		T4e 130 - 150		
		130	140	150
Heating up mode		automatic		
Condensing boiler		No		
Solid fuel boiler for combined heat and power		No		
Combined heating system		No		
Storage tank volume		↻ "Storage tank" ► 16]		
Characteristics when operated exclusively with the preferred fuel				
Useful heat delivered at rated heat output (P_n)	kW	130	140	150
Useful heat delivered at 30% of rated heat output (P_p)		39.0	42.0	45.0
Fuel efficiency at rated heat output (η_n)	%	83.9	84.1	84.3
Fuel efficiency at 30% of rated heat output (η_p)		84.3	84.3	84.4
Auxiliary current consumption at rated heat output ($e_{l_{max}}$)	kW	0.137	0.137	0.136
Auxiliary current consumption at 30% of rated heat output (η_p)		0.058	0.058	0.059
Auxiliary current consumption in standby mode (P_{SB})		0.014	0.014	0.014

Regulation (EU) 2015/1189 – emissions in [mg/m ³] ¹⁾	
Annual space heating emissions of dust (PM)	≤ 30

Regulation (EU) 2015/1189 – emissions in [mg/m ³] ¹⁾	
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	

4.3.8 T4e 130 - 150 ESP

Description		T4e 130 – 150 ESP		
		130	140	150
Rated heat output	kW	130	140	150
Electrical connection		400V / 50Hz / fused C16A		
Weight of boiler (including stoker, without water)	kg	1500		
Boiler capacity (water)	l	320		
Available feed height of pump ¹⁾ (with ΔT = 20K)	mbar	913	860	787
Max. permitted operating temperature	°C	90		
Permitted operating pressure	bar	4		
Boiler class as per EN 303-5: 2012		5		
Airborne sound level	dB(A)	<70		
Permitted fuel as per EN ISO 17225 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06		
Test book number		PB 159	PB 160	PB 161
1. Pump output less water resistance in the boiler				
2. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"				

Regulation (EU) 2015/1187		
Heating space annual rate of use η _s	%	≥ 78

Additional data for regulation (EU) 2015/1189

Description		T4e 130 – 150 ESP		
		130	140	150
Heating up mode		automatic		
Condensing boiler		No		
Solid fuel boiler for combined heat and power		No		
Combined heating system		No		
Storage tank volume		↻ "Storage tank" [► 16]		
Characteristics when operated exclusively with the preferred fuel				
Useful heat delivered at rated heat output (P _n)	kW	130	140	150
Useful heat delivered at 30% of rated heat output (P _p)		39.0	42.0	45.0
Fuel efficiency at rated heat output (η _n)	%	83.7	83.7	83.7
Fuel efficiency at 30% of rated heat output (η _p)		84.8	84.6	84.5

Description		T4e 130 – 150 ESP		
		130	140	150
Auxiliary current consumption at rated heat output ($e_{l_{max}}$)	kW	0.201	0.204	0.206
Auxiliary current consumption at 30% of rated heat output (η_p)		0.098	0.097	0.096
Auxiliary current consumption in standby mode (P_{SB})		0.021	0.022	0.023

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	

4.3.9 T4e 160 - 180

Description		T4e 160 - 180		
		160	170	180
Nominal output	kW	160	170	180
Electrical connection		400V / 50Hz / fused C16A		
Weight of boiler (including stoker, without water)	kg	1500		
Boiler capacity (water)	l	320		
Available feed height of pump ¹⁾ (with $\Delta T = 20K$)	mbar	740	620	530
Max. permitted operating temperature	°C	90		
Permitted operating pressure	bar	4		
Boiler class as per EN 303-5: 2012		5		
Airborne sound level	dB(A)	<70		
Permitted fuel as per EN ISO 17225 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06		
Test book number		PB 153	PB 154	PB 155

1. Pump output less water resistance in the boiler
 2. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"

Regulation (EU) 2015/1187		
Heating space annual rate of use η_s	%	≥ 78

Additional data for regulation (EU) 2015/1189

Description		T4e 160 - 180		
		160	170	180
Heating up mode		automatic		
Condensing boiler		No		
Solid fuel boiler for combined heat and power		No		
Combined heating system		No		
Storage tank volume		↻ "Storage tank" [► 16]		
Characteristics when operated exclusively with the preferred fuel				
Useful heat delivered at rated heat output (P_n)	kW	160	170	180
Useful heat delivered at 30% of rated heat output (P_p)		48	51	54
Fuel efficiency at rated heat output (η_n)	%	84.5	84.7	84.9
Fuel efficiency at 30% of rated heat output (η_p)		84.4	84.4	84.5
Auxiliary current consumption at rated heat output ($e_{l_{max}}$)	kW	0.136	0.136	0.136
Auxiliary current consumption at 30% of rated heat output (η_p)		0.060	0.060	0.061
Auxiliary current consumption in standby mode (P_{SB})		0.014	0.013	0.013

Regulation (EU) 2015/1189 – emissions in [mg/m ³] ¹⁾	
Annual space heating emissions of dust (PM)	≤ 30

Regulation (EU) 2015/1189 – emissions in [mg/m ³] ¹⁾	
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	

4.3.10 T4e 160 - 180 ESP

Description		T4e 160 – 180 ESP		
		160	170	180
Nominal output	kW	160	170	180
Electrical connection		400V / 50Hz / fused C16A		
Weight of boiler (including stoker, without water)	kg	1500		
Boiler capacity (water)	l	320		
Available feed height of pump ¹⁾ (with ΔT = 20K)	mbar	740	620	530
Max. permitted operating temperature	°C	90		
Permitted operating pressure	bar	4		
Boiler class as per EN 303-5: 2012		5		
Airborne sound level	dB(A)	<70		
Permitted fuel as per EN ISO 17225 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06		
Test book number		PB 162	PB 163	PB 164
1. Pump output less water resistance in the boiler				
2. Detailed information on the fuel can be found in the operating instructions in the section entitled "Permitted fuels"				

Regulation (EU) 2015/1187		
Heating space annual rate of use η _s	%	≥ 78

Additional data for regulation (EU) 2015/1189

Description		T4e 160 – 180 ESP		
		160	170	180
Heating up mode		automatic		
Condensing boiler		No		
Solid fuel boiler for combined heat and power		No		
Combined heating system		No		
Storage tank volume		↻ "Storage tank" [► 16]		
Characteristics when operated exclusively with the preferred fuel				
Useful heat delivered at rated heat output (P _n)	kW	160	170	180
Useful heat delivered at 30% of rated heat output (P _p)		48	51	54
Fuel efficiency at rated heat output (η _n)	%	83.7	83.8	83.8
Fuel efficiency at 30% of rated heat output (η _p)		84.3	84.1	84.0

Description		T4e 160 – 180 ESP		
		160	170	180
Auxiliary current consumption at rated heat output ($e_{l_{max}}$)	kW	0.209	0.211	0.213
Auxiliary current consumption at 30% of rated heat output (η_p)		0.096	0.095	0.094
Auxiliary current consumption in standby mode (P_{SB})		0.024	0.026	0.027

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	

4.3.11 Boiler data for planning the flue gas system

Description		T4e / T4e ESP			
		20	25	30	35
Flue gas temperature at nominal load	°C	120	125	130	135
Flue gas temperature at partial load		80	80	85	85
CO ₂ - volume concentration at nominal load / partial load	%	12.8 / 11.8	13.3 / 12.3	13.3 / 12.3	13.8 / 12.8
O ₂ -Volume concentration at nominal load/partial load		7.5 / 8.5	7.0 / 8.0	7.0 / 8.0	6.5 / 7.5
Flue gas mass flow at nominal load	kg/h	51	61	71	83
	kg/s	0.014	0.017	0.020	0.023
Flue gas mass flow at partial load	kg/h	16	20	23	27
	kg/s	0.004	0.006	0.006	0.007
Required feed pressure at nominal load	Pa	5			
	mbar	0.05			
Required feed pressure at partial load	Pa	2			
	mbar	0.02			
Maximum permissible feed pressure	Pa	30			
	mbar	0.3			
Flue pipe diameter	mm	149			

Description		T4e / T4e ESP		
		45	50	60
Flue gas temperature at nominal load	°C	125	130	135
Flue gas temperature at partial load		80	80	85
CO ₂ - volume concentration at nominal load / partial load	%	13.3 / 12.3	13.3 / 12.3	13.8 / 12.8
O ₂ -Volume concentration at nominal load/partial load		7.0 / 8.0	7.0 / 8.0	6.5 / 7.5
Flue gas mass flow at nominal load	kg/h	118	127	142
	kg/s	0.033	0.035	0.039
Flue gas mass flow at partial load	kg/h	41	43	48
	kg/s	0.011	0.012	0.013
Required feed pressure at nominal load	Pa	5		
	mbar	0.05		
Required feed pressure at partial load	Pa	2		
	mbar	0.02		
Maximum permissible feed pressure	Pa	30		
	mbar	0.3		
Flue pipe diameter	mm	149		

Description		T4e / T4e ESP				
		80	90	100	108	110
Flue gas temperature at nominal load	°C	120	125	130	135	135
Flue gas temperature at partial load		80	80	85	85	85
CO ₂ - volume concentration at nominal load / partial load	%	13.3 / 12.3	13.3 / 12.3	13.8 / 12.8	13.8 / 12.8	13.8 / 12.8

Description		T4e / T4e ESP				
		80	90	100	108	110
O ₂ -Volume concentration at nominal load/partial load		7.0 / 8.0	7.0 / 8.0	6.5 / 7.5	6.5 / 7.5	6.5 / 7.5
Flue gas mass flow at nominal load	kg/h	208	230	245	256	259
	kg/s	0.058	0.064	0.068	0.071	0.072
Flue gas mass flow at partial load	kg/h	64	72	75	81	83
	kg/s	0.018	0.020	0.021	0.023	0.023
Required feed pressure at nominal load	Pa	5				
	mbar	0.05				
Required feed pressure at partial load	Pa	2				
	mbar	0.02				
Maximum permissible feed pressure	Pa	30				
	mbar	0.3				
Flue pipe diameter	mm	179				

Description		T4e / T4e ESP		
		130	140	150
Flue gas temperature at nominal load	°C	125	125	130
Flue gas temperature at partial load		80	80	80
CO ₂ - volume concentration at nominal load / partial load	%	13.3 / 12.3	13.3 / 12.3	13.3 / 12.3
O ₂ -Volume concentration at nominal load/partial load		7.0 / 8.0	7.0 / 8.0	7.0 / 8.0
Flue gas mass flow at nominal load	kg/h	325	350	376
	kg/s	0.090	0.097	0.104
Flue gas mass flow at partial load	kg/h	102	110	117
	kg/s	0.028	0.030	0.033
Required feed pressure at nominal load	Pa	5		
	mbar	0.05		
Required feed pressure at partial load	Pa	2		
	mbar	0.02		
Maximum permissible feed pressure	Pa	30		
	mbar	0.3		
Flue pipe diameter	mm	199		

Description		T4e / T4e ESP		
		160	170	180
Flue gas temperature at nominal load	°C	135	140	145
Flue gas temperature at partial load		85	85	85
CO ₂ - volume concentration at nominal load / partial load	%	13.3 / 12.3	13.8 / 12.8	13.8 / 12.8
O ₂ -Volume concentration at nominal load/partial load		7.0 / 8.0	6.5 / 7.5	6.5 / 7.5
Flue gas mass flow at nominal load	kg/h	402	413	439
	kg/s	0.112	0.115	0.122
Flue gas mass flow at partial load	kg/h	126	129	136

Description		T4e / T4e ESP		
		160	170	180
	kg/s	0.035	0.036	0.038
Required feed pressure at nominal load	Pa	5		
	mbar	0.05		
Required feed pressure at partial load	Pa	2		
	mbar	0.02		
Maximum permissible feed pressure	Pa	30		
	mbar	0.3		
Flue pipe diameter	mm	199		

4.3.12 Data for planning a backup power supply

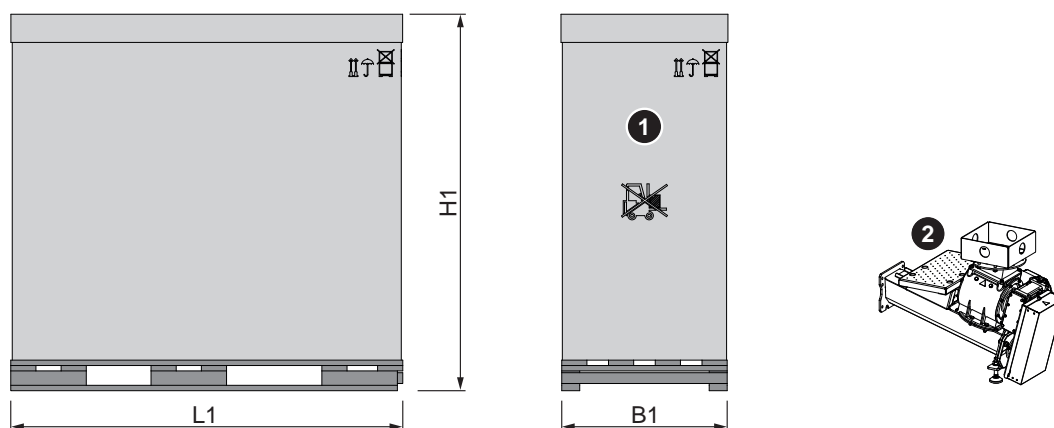
The system can be operated with an emergency generator. The following information must be observed during planning.

Description		Value
Continuous output (three phase)	VA	6375
Nominal voltage	VAC	400 ± 6%
Frequency	Hz	50 ± 2%

5 Transport and storage

5.1 Delivery configuration

The boiler and associated components are delivered on a pallet.



Item	Description	Unit	T4e			
			20-35	45-60	80-110	130-180
L1	Length	mm	1550	1680	1870	2180
B1	Width		780	780	920	920
H1	Height		1730	1930	1995	2095
Weight of the components:						
1	Boiler	kg	615	730	1060	1390
2	Stoker unit		105	105	115	110

5.2 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!

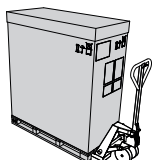
5.3 Positioning

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

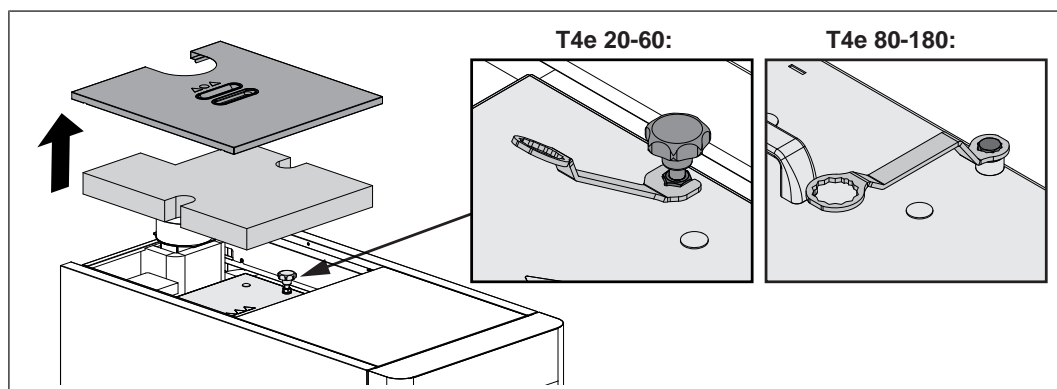


- ☐ Position a fork-lift or similar lifting device at the pallet and bring in the components

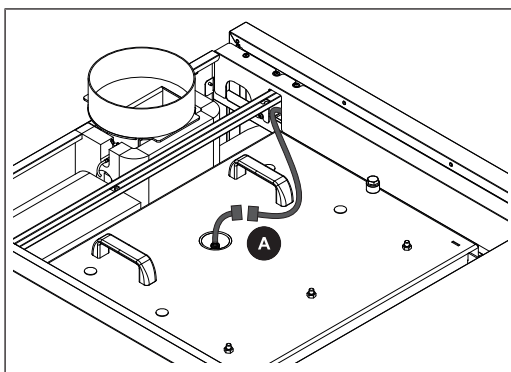
If the boiler cannot be brought in on the pallet:

- ☐ Remove the cardboard and take the boiler off the pallet
 - ➔ "Remove boiler from pallet" [► 40]

Positioning using a crane:

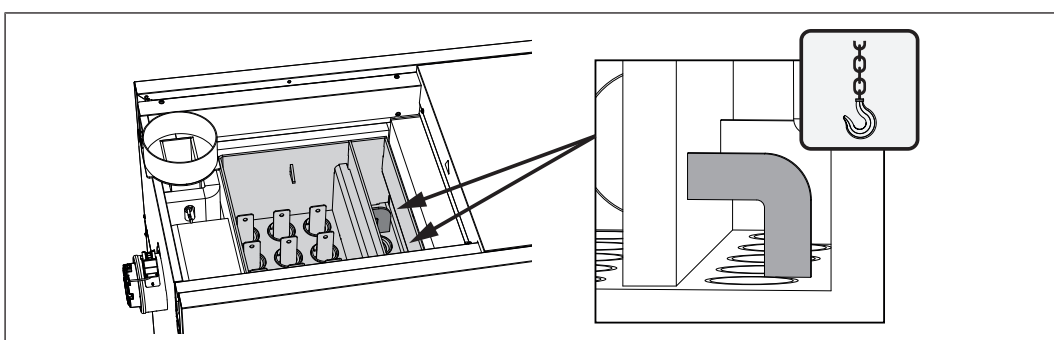


- ☐ Remove the insulating cover and thermal insulation
 - ➔ T4e 20-110: one insulated cover
 - ➔ T4e 130-180: two insulating covers
- ☐ Undo the screw connection and open the heat exchanger cover
 - ➔ Use the spanner provided



Also for T4e 80-110:

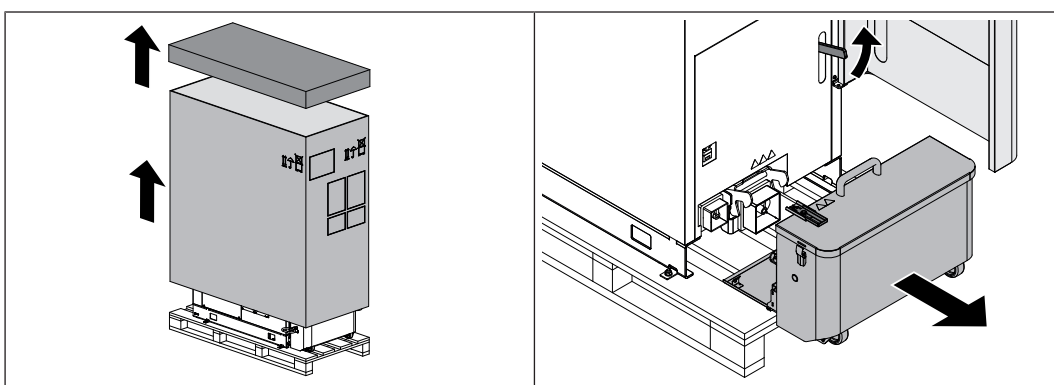
- ☐ Disconnect the plug connection (A) from the Lambda probe cable
- ☐ Protect the cable from damage



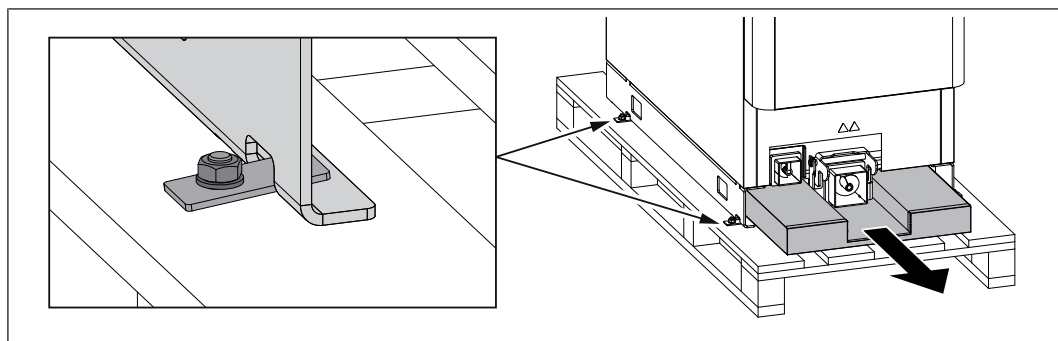
- ☐ Hang the crane hook on the two eye bolts in the flue gas collection chamber and bring in the boiler

5.4 Positioning at the installation site

5.4.1 Remove boiler from pallet



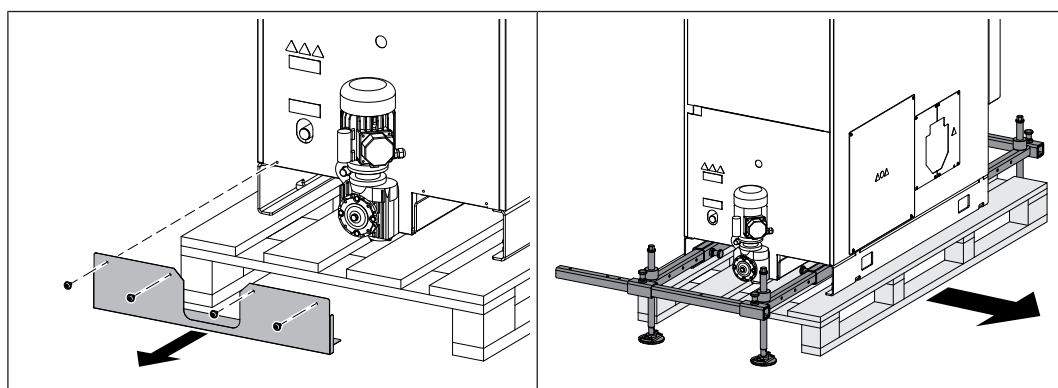
- ☐ Cut through the strapping and lift off the cardboard
- ☐ Open the insulated door and pull the key plate from the safety limit switch
- ☐ Use the locking lever to unlock the ash container and pull off the ash container from the boiler



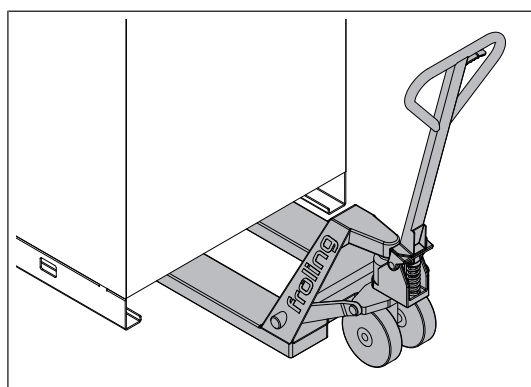
- ☐ Remove securing devices used during transportation on the left and right side of the boiler
- ☐ Pull out floor insulation
- ☐ Lift boiler from pallet



When using the Fröling boiler lifting system KHV 1400:



- ☐ Remove the lower cover plate on the boiler's back panel
- ☐ Use the boiler lifting system to raise the boiler and pull out the palette
 - ↪ See operating instructions for the boiler lifting system

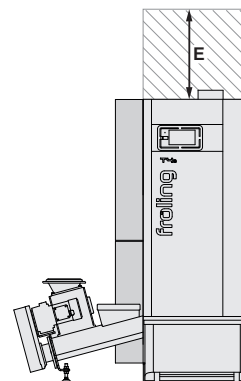
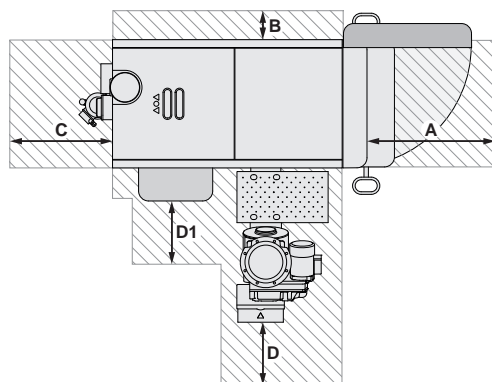


- ☐ Position a fork-lift or similar lifting device with a suitable load-bearing capacity at the base frame
- ☐ Lift it and transport it to the intended position
 - ↪ Observe the operating and maintenance areas of the equipment in the process!

NOTICE! The insertion dimensions match the dimensions of the boiler, see chapter "Dimensions".

5.4.2 Operating and maintenance areas of the equipment

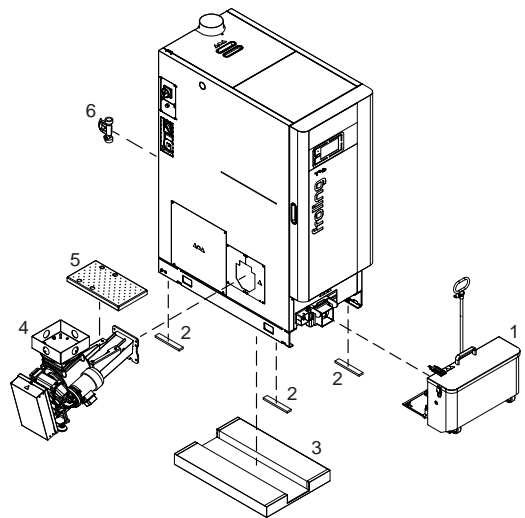
- The system should generally be set up so that it is accessible from all sides to allow quick and easy maintenance!
- Regional regulations regarding necessary maintenance areas for inspecting the chimney should be observed in addition to the specified distances!
- Observe the applicable standards and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



	T4e 20-60	T4e 80-110	T4e 130-180
A	700 mm	800 mm	800 mm
W	150 mm		
C	500 mm		
D	300 mm		
D1	300 mm ¹⁾		
E	500 mm ²⁾		
1. When using electrostatic particle separator ESP (optional)			
2. Maintenance area to expand the WOS springs upwards			

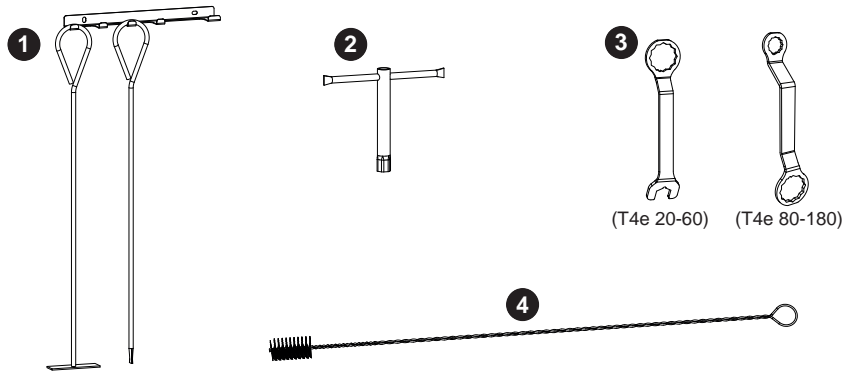
6 Assembly

6.1 Assembly overview



1	Ash container	4	Stoker unit
2	Boiler documents (4 items)	5	Tread plate
3	Floor insulation	6	Line regulating valve (optional)

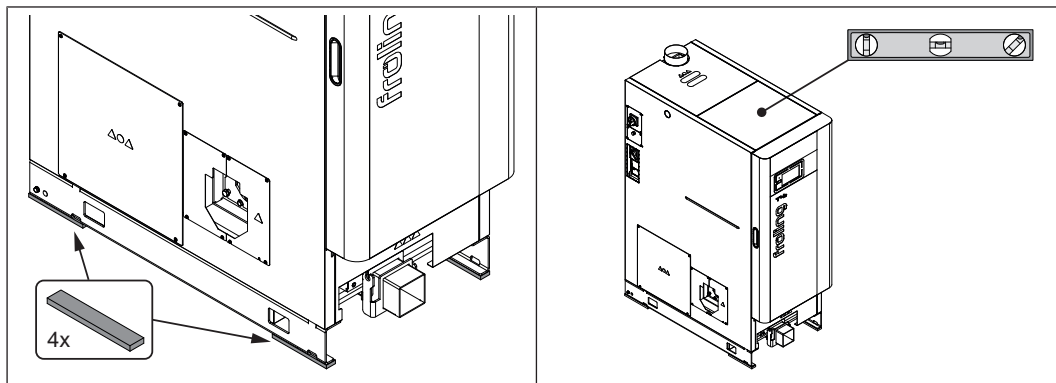
6.2 Accessories supplied



1	Furnace tool with bracket	3	Key for door mountings and WOS cover
2	Socket wrench AF 13	4	Cleaning brush 24 x 50 x 1200

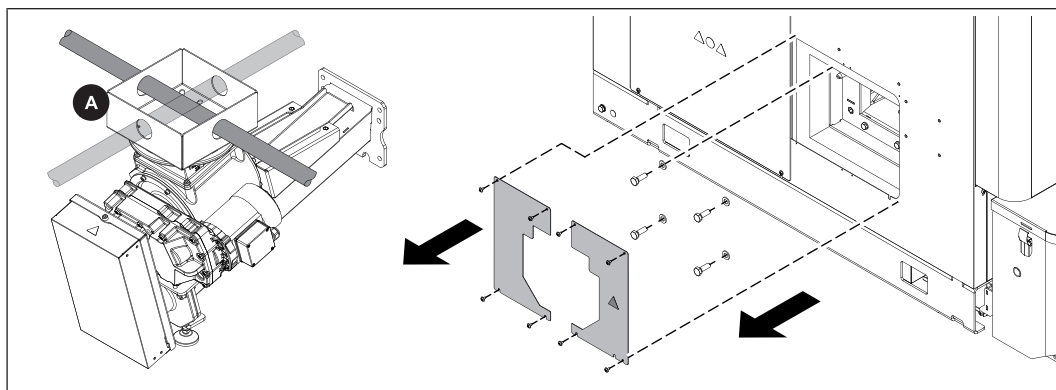
6.3 Installing the boiler

6.3.1 Levelling the boiler

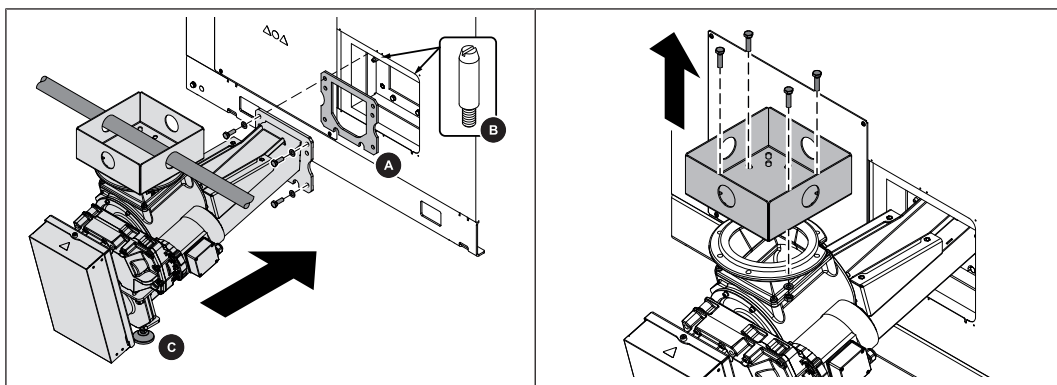


- ☐ Lift the boiler using an appropriate lifting device
- ☐ Position a Sylomer pad under the boiler base
 - ↳ Sylomer pads prevent the transmission of noise to the ground
- ☐ Carefully release the lifting device and check that the boiler is level
- ☐ If necessary, level the boiler using load-bearing pads

6.3.2 Installing the stoker unit

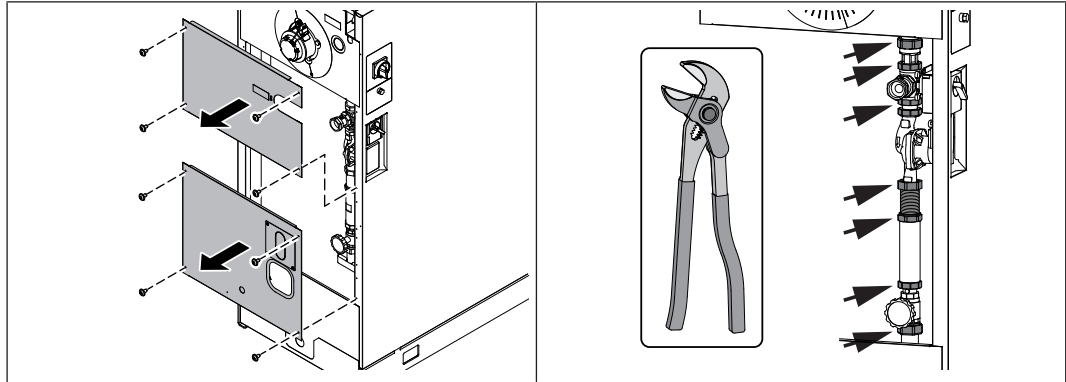


- ☐ Insert the appropriate pipe (e.g. 1" pipe) into the bracket (A) of the stoker unit and transport the stoker unit to the boiler
- ☐ Remove the shutter masks from the stoker side
- ☐ Remove the pre-installed screws on the connection flange



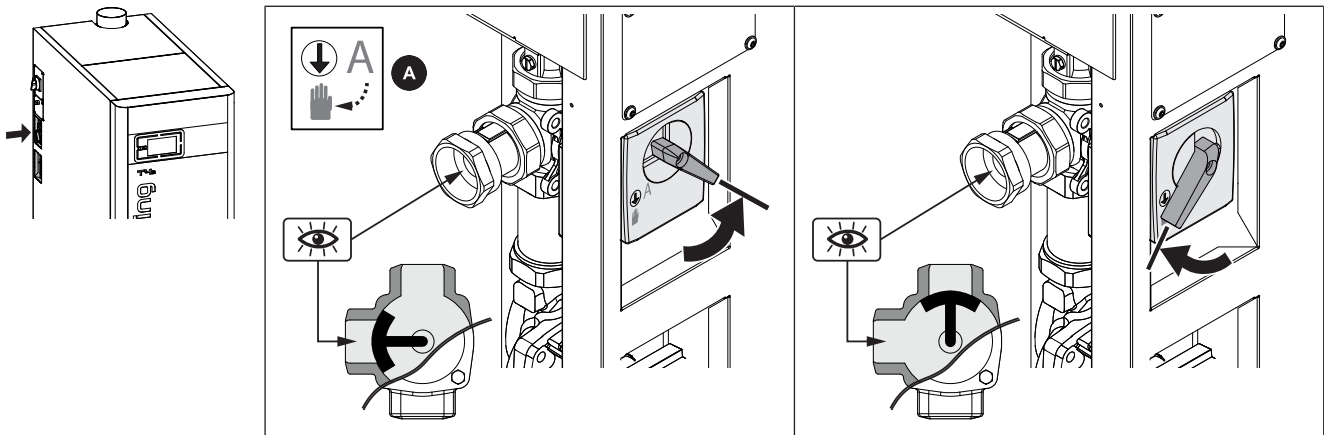
- ☐ Position seal (A) on the connection flange
- ☐ Move the stoker unit towards the boiler and insert into the connection flange at the two lock bolts (B)
 - ⚠ Pay attention to the ignition element when positioning the stoker unit!
- ☐ Adjust the height using the adjustable base (C) as required
- ☐ Secure the stoker unit to the connection flange using the previously removed screws
- ☐ Remove the bracket. It is no longer needed
- ☐ Assemble the entire discharge system

6.3.3 Control the return temperature control



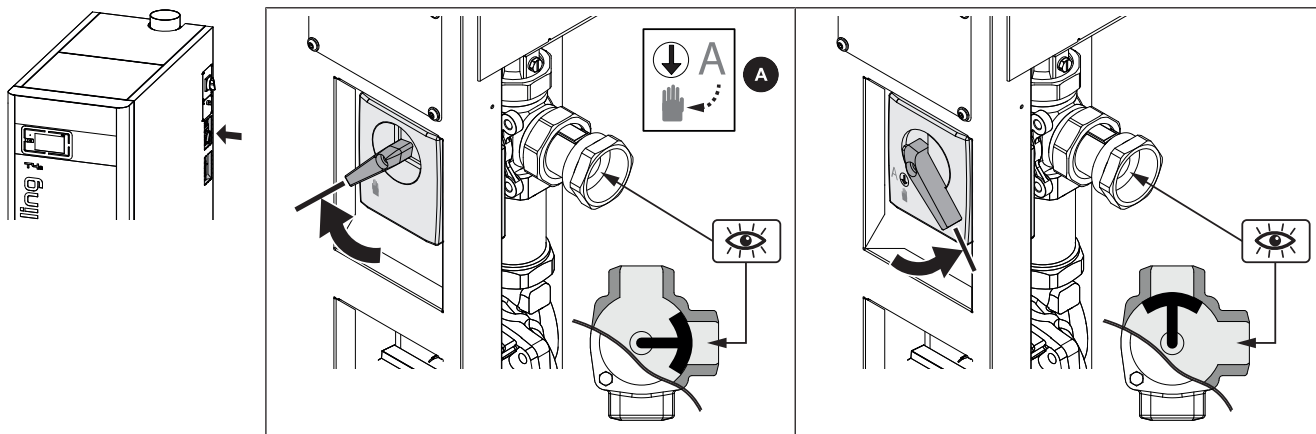
- ❑ Remove both back panels
- ❑ Tighten all of the connections on the return temperature control using a pipe wrench
 - ↳ Connections may have loosened during transport.
 - ↳ **IMPORTANT:** Before and after filling the system with heated water, check the seal of the screw connections on the return temperature control

Return temperature control left



- ❑ Set the knob on the housing of the mixing drive to manual mode (A)
- ❑ Turn the mixing drive counter clockwise until it stops
 - ↳ The mixer valve completely closes off the system return
- ❑ Turn the mixing drive clockwise until it stops
 - ↳ The system return is completely open and the bypass line coming from above is completely closed

Return temperature control right



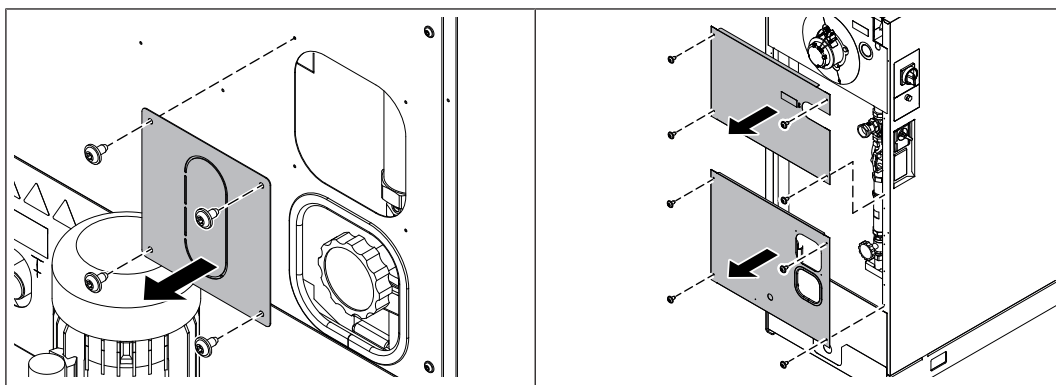
- ☐ Set the knob on the housing of the mixing drive to manual mode (A)
 - ☐ Turn the mixing drive clockwise until it stops
 - ↪ The mixer valve completely closes off the system return
 - ☐ Turn the mixing drive counter clockwise until it stops
 - ↪ The system return is completely open and the bypass line coming from above is completely closed

After checking that the return temperature control is functioning properly:

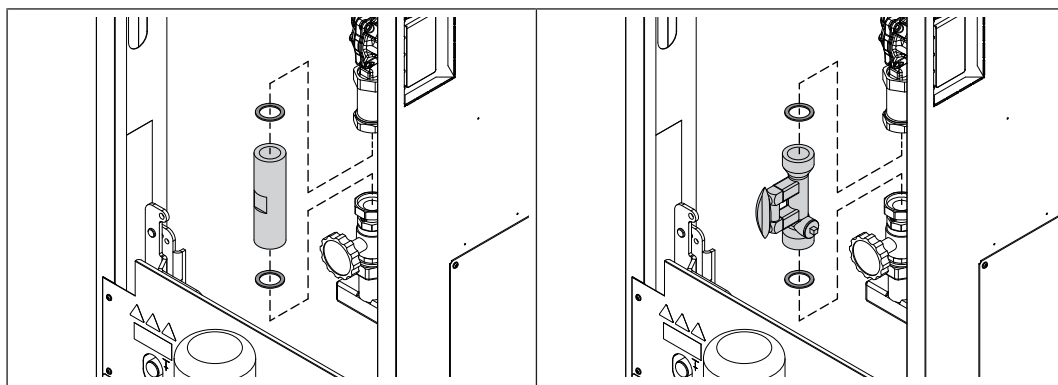
- ☐ Turn the knob on the housing of the mixing drive back to automatic mode
- ☐ Install the back panels

NOTICE! After filling the boiler with domestic hot water, check the return temperature control for leaks!

6.3.4 Install line regulating valve (T4e 20-60 - optional)



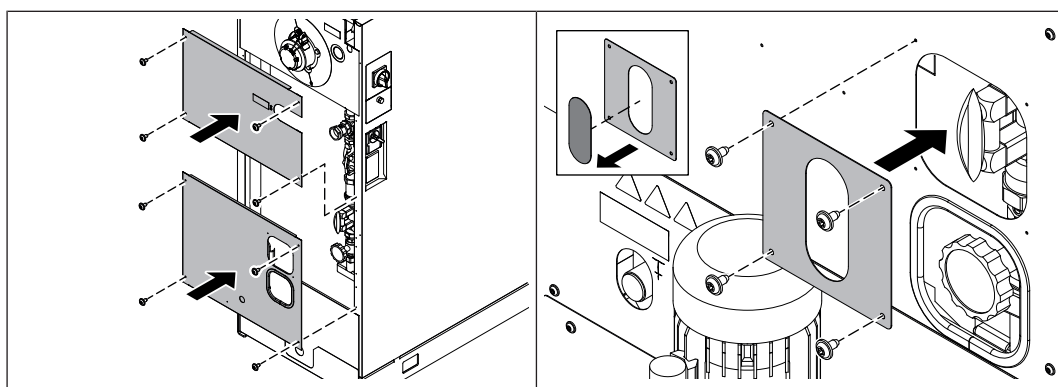
- ☐ Remove rear cover plate and both rear panels



☐ Remove pipe section

☐ Seal line regulating valve instead

↳ **IMPORTANT:** Pay attention to direction of flow. The arrow on the line regulating valve must point downward!



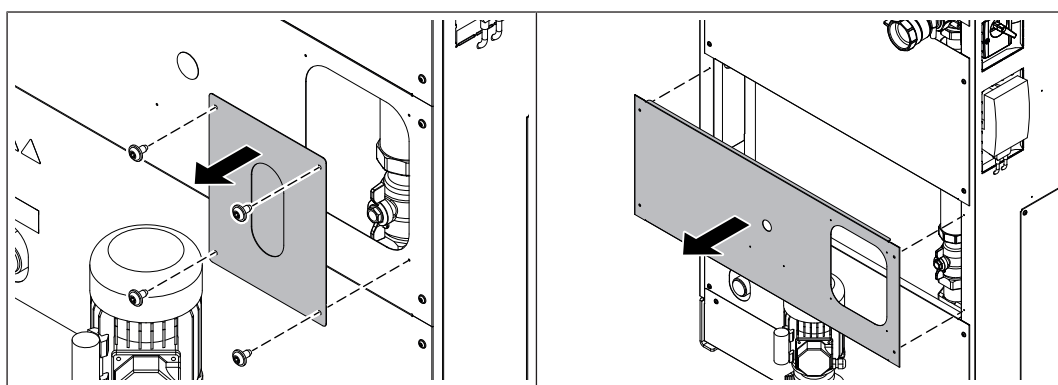
☐ Fit both rear panels

☐ Remove the perforation on the rear cover plate

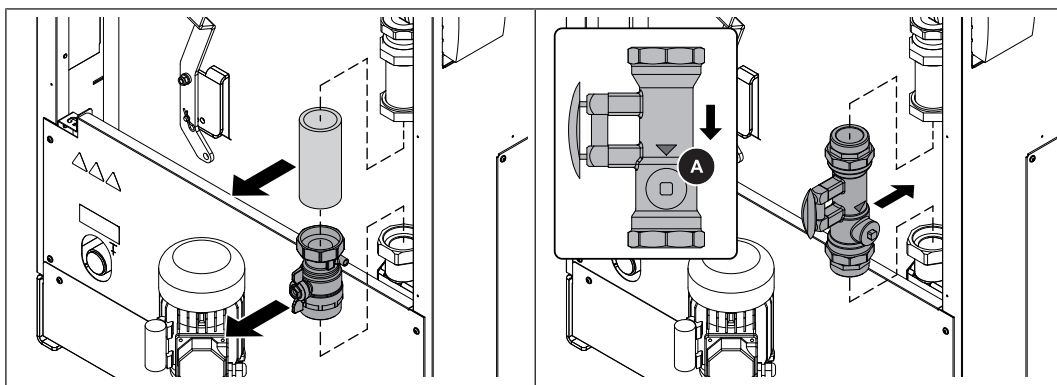
↳ Remove the burrs with a half-round file

☐ Install rear cover plate on the line regulating valve

6.3.5 Install line regulating valve (T4e 80-180 - optional)



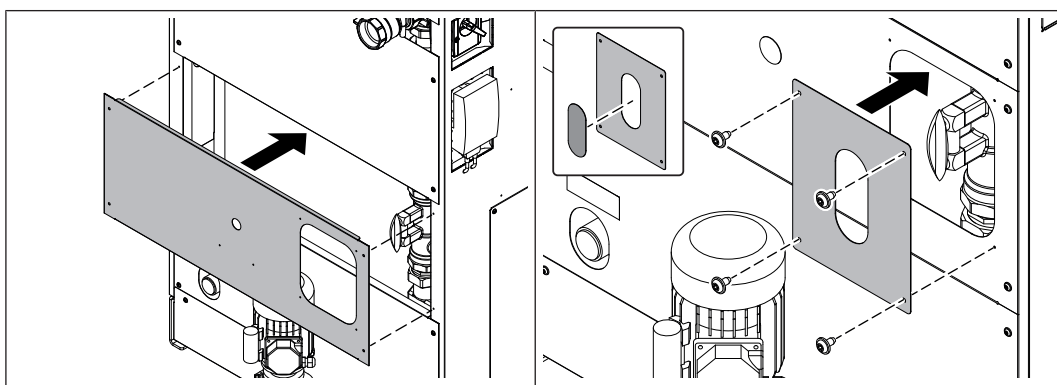
☐ Remove cover plate from back panel and centre back panel



❑ Remove the pipe section and ball valve

❑ Seal line regulating valve instead

↪ IMPORTANT: Pay attention to direction of flow. Arrow (A) must point downward!



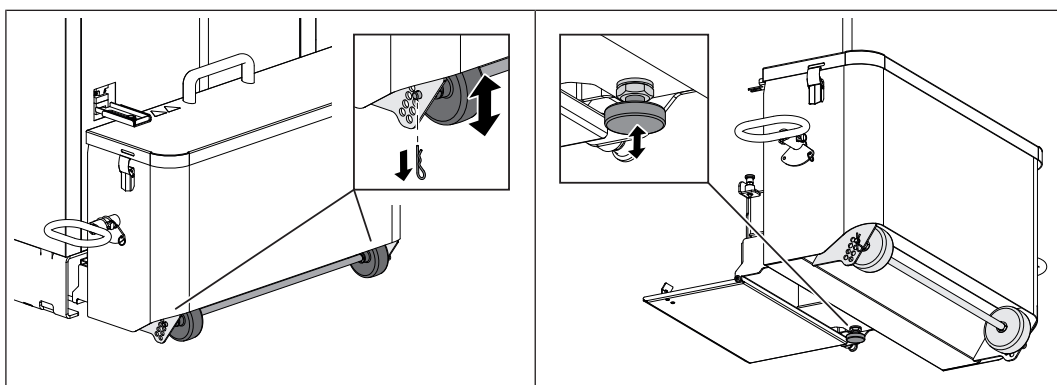
❑ Install centre back panel

❑ Remove the perforation on the cover plate

↪ Remove the burrs with a half-round file

❑ Install cover plate on the balancing valve

6.3.6 Adjusting the height of the ash container

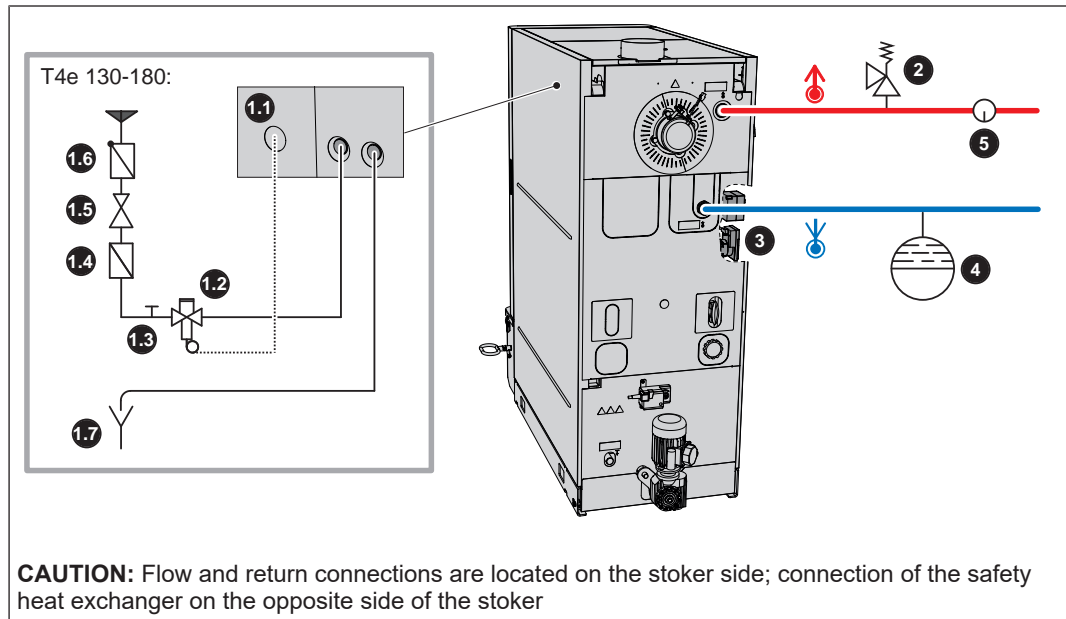


❑ Pull out the spring cotter on the transport wheels and adjust the height

↪ If the ash container is mounted, the wheels rest on the ground

❑ Remove the ash container from the boiler and level it using the adjustable foot

6.4 Hydraulic connection



1 Thermal discharge valve

- The thermal discharge safety device must be connected in accordance with ÖNORM/ DIN EN 303-5 and as shown in the diagram above
- The discharge safety sensor must be connected to a pressurised cold water mains supply (temperature $\leq 15^{\circ}\text{C}$) in such a way that it cannot be shut off
- A pressure reducing valve (1.5) is required for a cold water pressure of ≥ 6 bar
Minimum cold water pressure = 2 bar

- 1.1 Sensor of thermal discharge safety device
 1.2 Thermal discharge valve (opens at approx. 95°C)
 1.3 Cleaning valve (T-piece)
 1.4 Dirt trap
 1.5 Pressure reducing valve
 1.6 Backflow preventer to prevent stagnation water from entering the drinking water network
 1.7 Free outlet without counter pressure with observable flow path (e.g. discharge funnel)

2 Safety valve

- Requirements for safety valves as specified by DIN EN ISO 4126-1
- Minimum diameter for the inlet to the safety valve as specified by EN 12828:
DN15 (≤ 50 kW), DN20 (> 50 to ≤ 100 kW), DN25 (> 100 to ≤ 200 kW), DN32 (> 200 to ≤ 300 kW), DN40 (> 300 to ≤ 600 kW), DN50 (> 600 to ≤ 900 kW)
- Maximum pressure setting in terms of the permissible operating pressure of the boiler, see the section "Technical Data"
- The safety valve must be installed in an accessible place on the boiler or in direct proximity in the flow pipe in such a way that it cannot be shut off
- Unhindered and safe escape of the steam or water that is released must be ensured

3 Return temperature control

4 Diaphragm expansion tank

- The diaphragm pressurised expansion tank must conform to EN 13831 and hold at least the maximum expansion volume of the heated water in the system, including a water seal
- Its size must comply with the design information in EN 12828 - Appendix D
- Ideally it should be installed in the return line. Follow the manufacturer's installation instructions

5 We recommend installing some sort of monitoring device (such as a thermometer)

6.5 Electrical connection

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

CAUTION



If cables come into contact with hot surfaces:

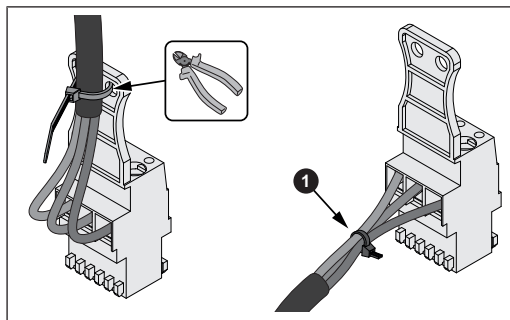
Possible fire hazard of the system and electric shock!

The following applies to assembly work:

- ☐ Keep cables away from boiler components that become hot during operation (e.g. stoker duct, inspection cover, flue gas pipe, ash removal, etc.)
- ☐ Lay cables in the cable ducts provided and use cable ties to secure against slipping

Prepare the plug

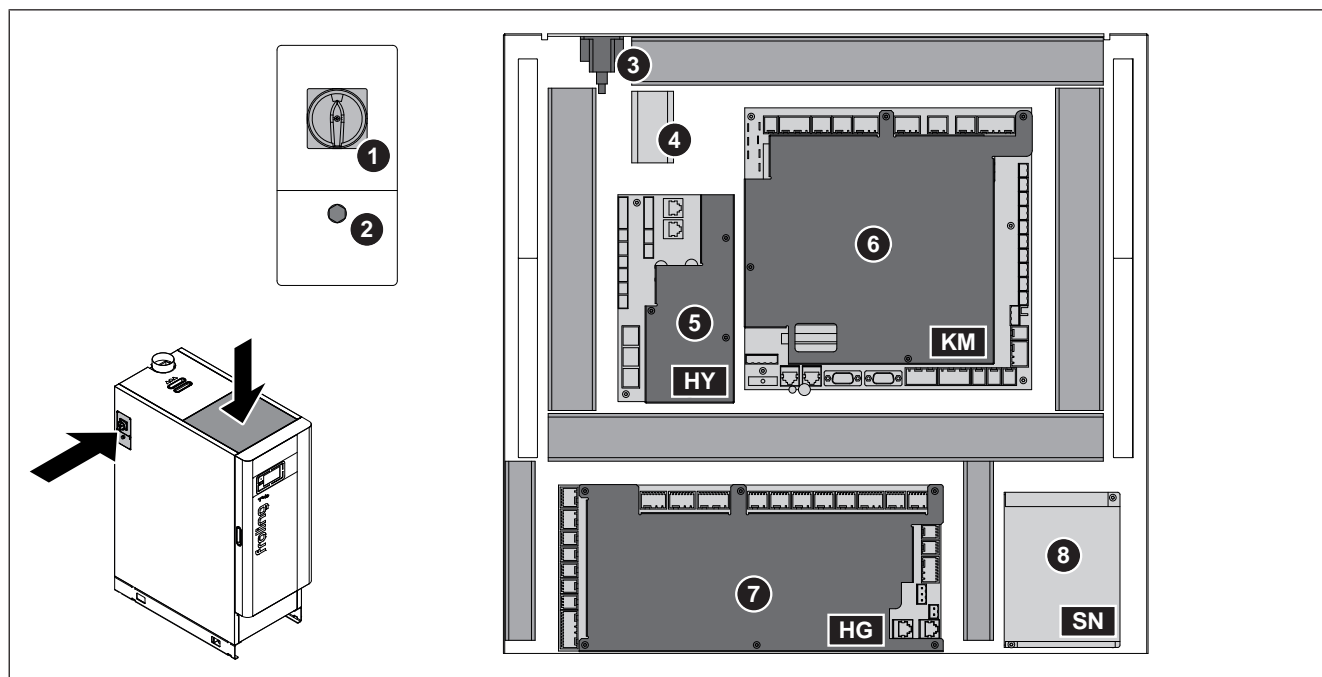
some components come ready to connect with the cable fixed to the tag connector with cable tie.



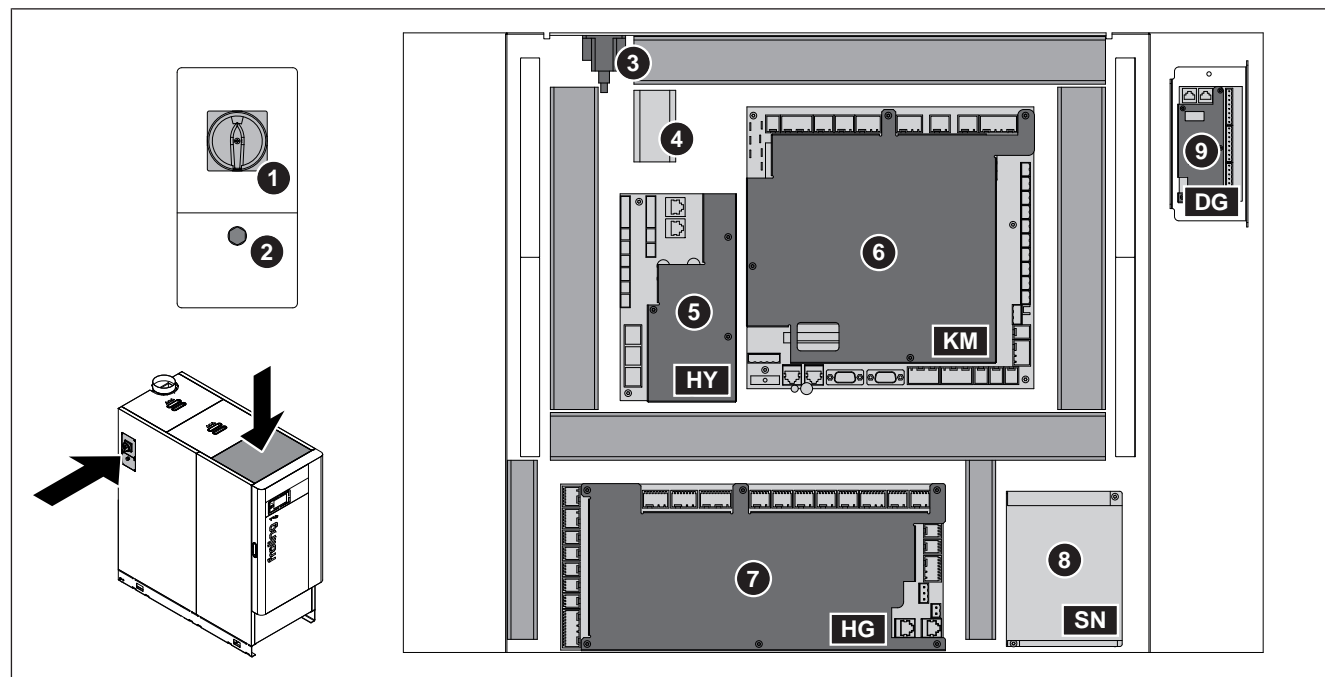
- ☐ Remove the cable ties from the tag connector
- ☐ Bind the individual cores together with cable ties (A)

6.5.1 Board overview

T4e 20-60

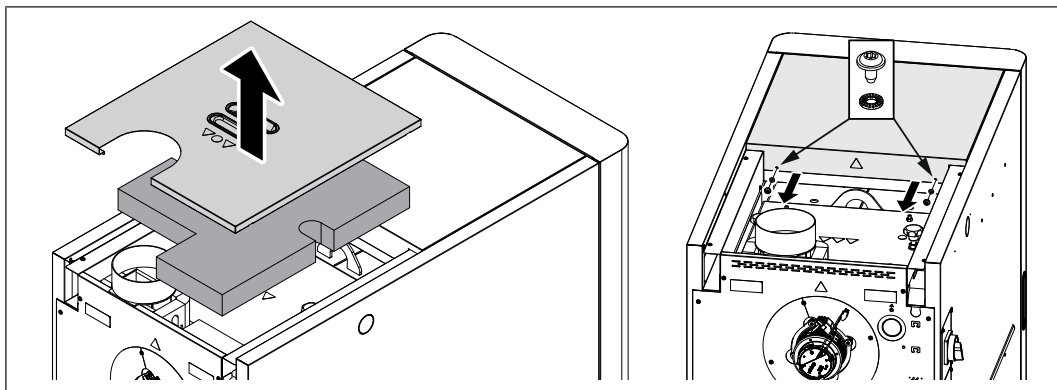


Item	Description	Item	Description
1	Main switch	5	Hydraulic module
2	High-limit thermostat (STL)	6	Core module
3	Service interface	7	Wood chip module
4	Device connection terminal	8	Plug power pack

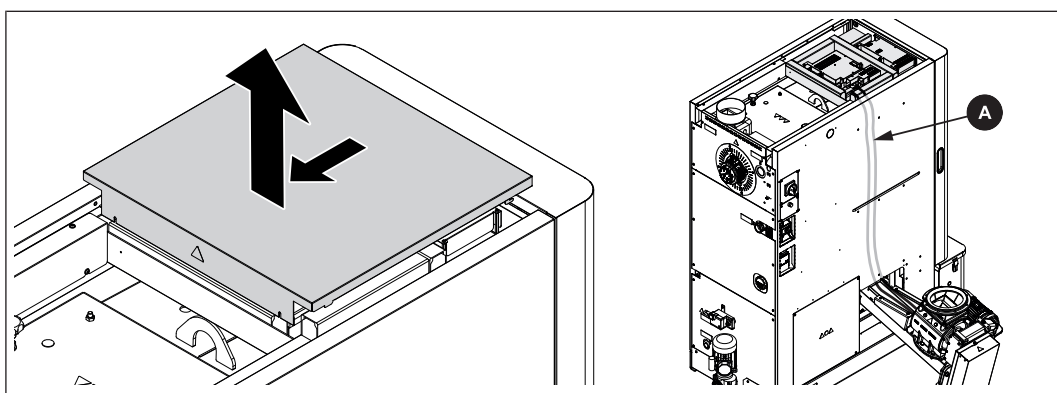
T4e 80-180

Item	Description	Item	Description
1	Main switch	6	Core module
2	High-limit thermostat (STL)	7	Wood chip module
3	Service interface	8	Plug power pack
4	Device connection terminal	9	Digital module (optional)
5	Hydraulic module		

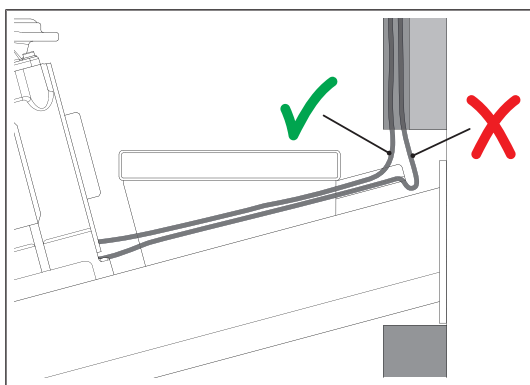
6.5.2 Laying cables



- ❑ Remove the insulating cover and thermal insulation
- ❑ Remove the retaining screw and contact washer from the controller cover

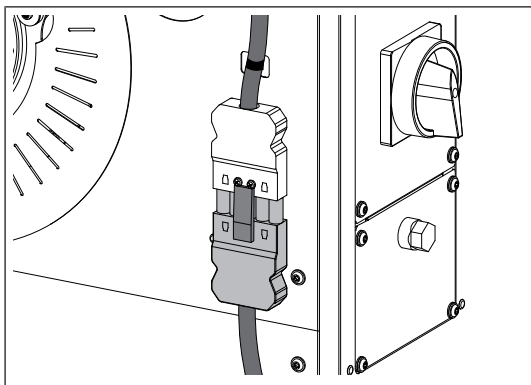


- ❑ Slide the controller cover backwards and lift off
- ❑ Wire all the components via cable duct (A) in the side panel to the controller box
 - ↪ Drive for feed screw / discharge system
 - ↪ Limit switch on gravity shaft cover (not pre-wired)
- ❑ Plug the following components into the cable that is already in place
 - ↪ Stoker drive
 - ↪ Glow igniters



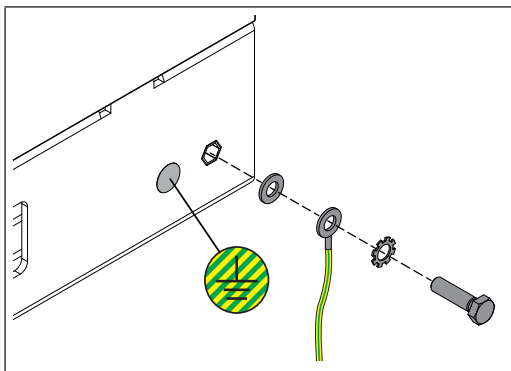
- ❑ Ensure that the cables do not touch the hot boiler components

6.5.3 Attach the mains connection to the boiler



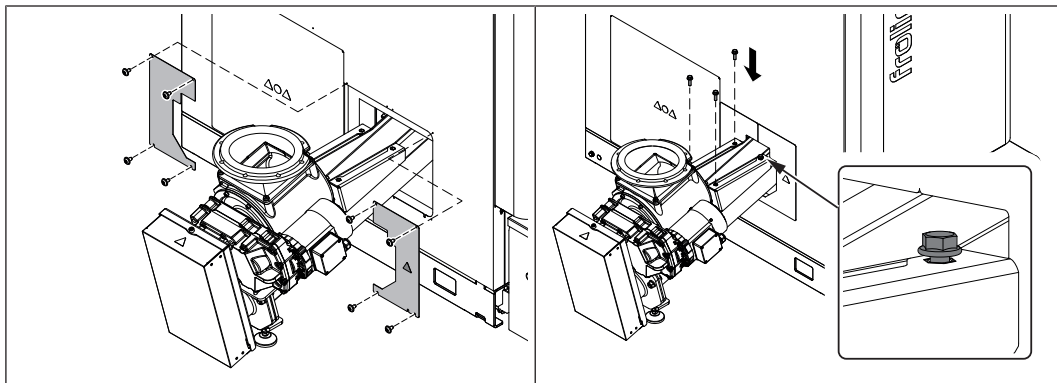
- ❑ Press the mains plug on the back of the boiler to release and remove it
- ❑ Open the plug and connect the mains connection cable
 - ↳ Flexible sheathed cable must be used for the wiring; this must be of the correct size to comply with applicable regional standards and regulations.
 - ↳ The power supply line (mains connection) must be fitted with a C16 A fuse by the customer.

6.5.4 Potential equalisation

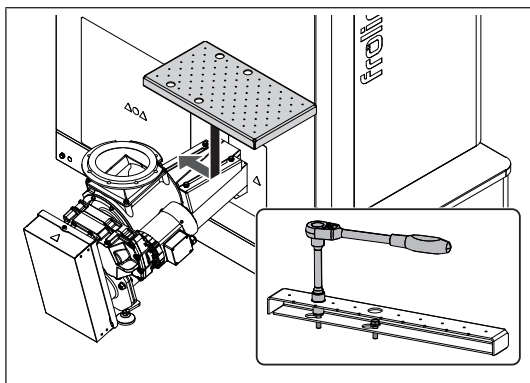


- ❑ The potential equalisation on the boiler base must comply with current directives, regulations and standards.

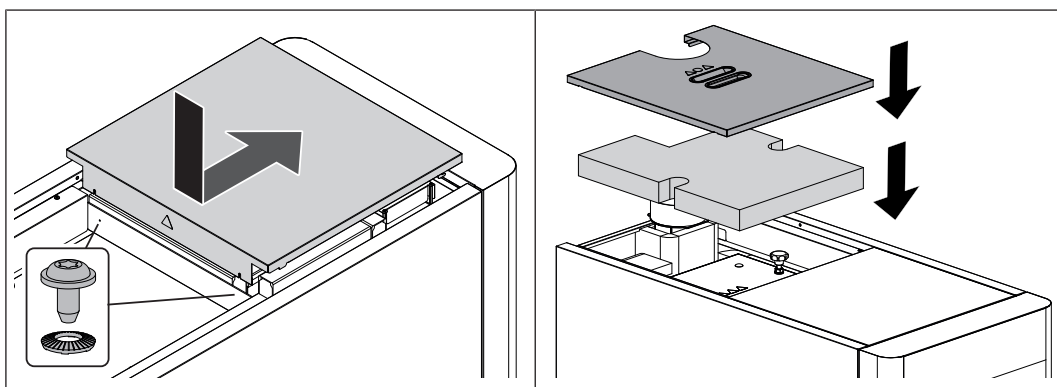
6.6 Final installation steps



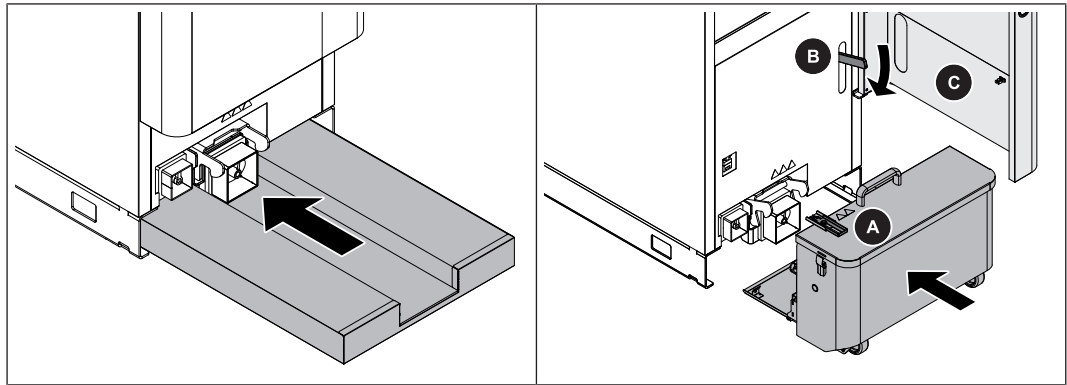
- Installing shutter masks on the side panel used in the stoker duct
- Pre-assemble four hexagonal screws on the stoker duct
 - ↳ Do not screw the screws in all the way



- Fit the tread to the screw heads, move it sideways until it clicks and then attach
 - ↳ The tread makes it easier to perform maintenance on the heat exchanger and controller box



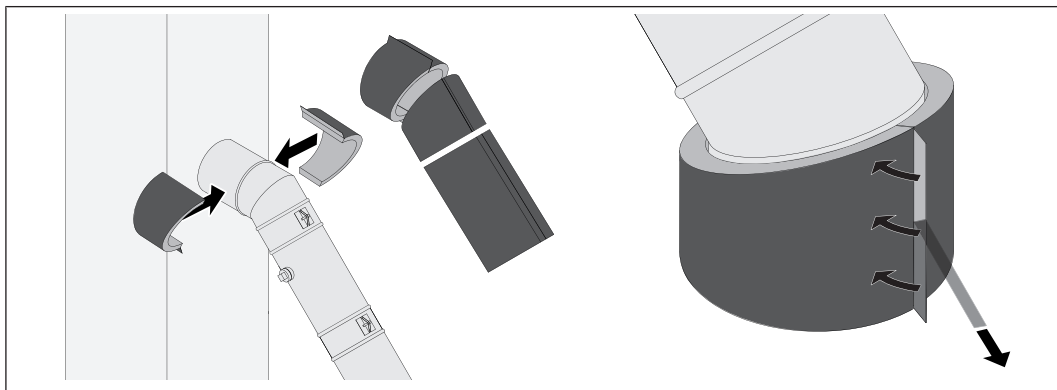
- Place the controller cover on the controller box and fix it
 - 2 lense-head screws M4 x 8 with contact washer
- Put on the heat exchanger cover and attach using star-shaped screws
- Put down the cover and thermal insulation
 - ↳ PT4e 20-110: one cover
 - ↳ PT4e 130-180: two covers



- ☐ Slide the floor insulation under the boiler until it stops
- ☐ Slide the ash container on to the ash duct of the boiler
- ☐ Push the key plate (A) into the safety limit switch
- ☐ Push the locking lever (B) down and close the insulated door (C)

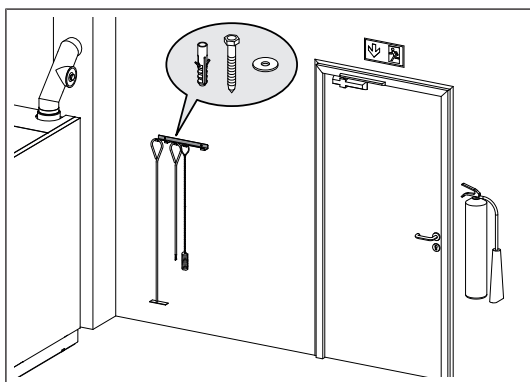
6.6.1 Insulate the connection line

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



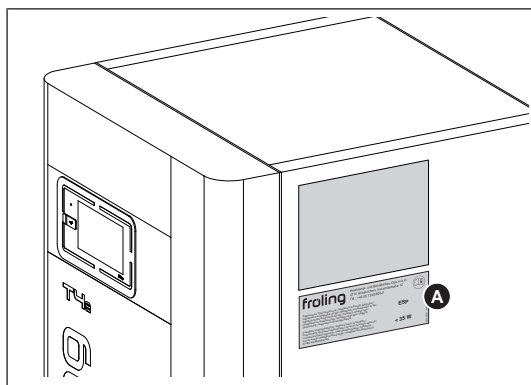
- ☐ Cut the half shells of thermal insulation to length and lay them on the connection line
- ☐ Create an opening for access to the measuring port
- ☐ Apply protective foil at the projecting lugs
- ☐ Glue the half shells to each other

6.6.2 Install the brackets for accessories



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

6.6.3 Stick on an additional identification plate (applicable to T4e ESP)



- ☐ Stick the additional identification plate (A) visibly on the side panel of the boiler

7 Start-up

7.1 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 the entire return temperature control for leaks and correct function
- ☐ 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 safety switch of ash box is working correctly

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

8 Decommissioning

8.1 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

8.2 Disassembly

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

8.3 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.
- ☐ The combustion chamber must be disposed of as builders' waste.

Notes

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