

Installation Instructions Wood chip boiler T4e 20-180



Translation of the original German operating instructions for technicians

Read and follow the instructions and safety information!

Technical changes, typographical errors and omissions reserved!

M1980520_en | Edition 15/09/2020



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1 General

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

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

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

Subject to technical change.

Issuing a delivery certificate

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

2 Safety

2.1 Hazard levels of warnings

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



DANGER

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



WARNING

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



CAUTION

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

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
- Froling 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.



- For transportation, setup and assembly:
 - suitable work wear
 - protective gloves
 - sturdy shoes (min. protection class S1P)

3 Design Information

3.1 Notes on standards

The system must be installed and commissioned 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
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
EN ISO 17225-4	Solid bio-fuel - Fuel specifications and classes Part 4: Wood chips for non-industrial use

3.2 Installation and approval of the heating system

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

Note on standards

EN 12828 - Heating Systems in Buildings

NOTICE! Each heating system must be officially approved.

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

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

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

3.3 General information for installation room (boiler room)

Boiler room characteristics

- The floor must be even, clean and dry and have an adequate load-bearing capacity.
- There must not be a potentially explosive atmosphere in the boiler room as the boiler is not suitable for use in potentially explosive environments.
- The boiler room must be frost-free.
- The boiler does not provide any light, so the customer must ensure sufficient lighting in the boiler room in accordance with national workplace design regulations.
- When using the boiler above 2000 metres above sea level you should consult the manufacturer.
- Danger of fire due to flammable materials.
The floor of the boiler room must not be flammable. No flammable materials should be stored near the boiler. Flammable objects (e.g. clothing) must not be put on the boiler to dry.
- Damage due to impurities in combustion air.
Do not use any solvents or cleaning agents containing chlorine and hydrogen halides in the room where the boiler is installed (e.g. chlorination units for swimming pools).
- Keep the air suction opening of the boiler free of dust.
- The system must be protected against the chewing or nesting of animals (e.g. rodents etc.).

Ventilation of the boiler room

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

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

Note on standards

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

3.4 Requirements for central heating 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	:	UNI 8065
		Italy:	

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

3.5 Notes for using pressure maintenance systems

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

Compressor-controlled pressure maintenance

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

Pump-controlled pressure maintenance

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

3.6 Return temperature control

If the hot water return is below the minimum return temperature, some of the hot water outfeed will be mixed in. This is done by the return temperature control, which is integrated in the hydraulics on the side panel of the boiler.

3.7 Use with storage tank

NOTICE

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

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

⇒ See "Addresses" [page 48]

3.8 Chimney connection/chimney system



EN 303-5 specifies that the entire flue gas system must be designed to prevent, wherever possible, damage caused by seepage, insufficient feed pressure and condensation. Please note in this respect that flue gas temperatures lower than 160K above room temperature can occur in the permitted operating range of the boiler.

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

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

Local regulations and other statutory regulations also apply.

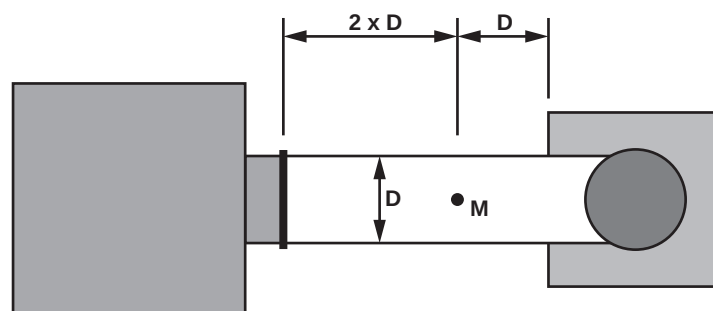
NOTICE! The chimney must be authorised by a smoke trap sweeper or chimney sweep.

3.8.1 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.

3.8.2 Measuring port



In front of the measuring port (M) a straight inlet section should be located at a distance corresponding to about twice the diameter (D) of the connecting piece. A straight outlet section at a distance corresponding to about the single diameter of the connecting piece should be provided after the measuring port. 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.

3.9 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

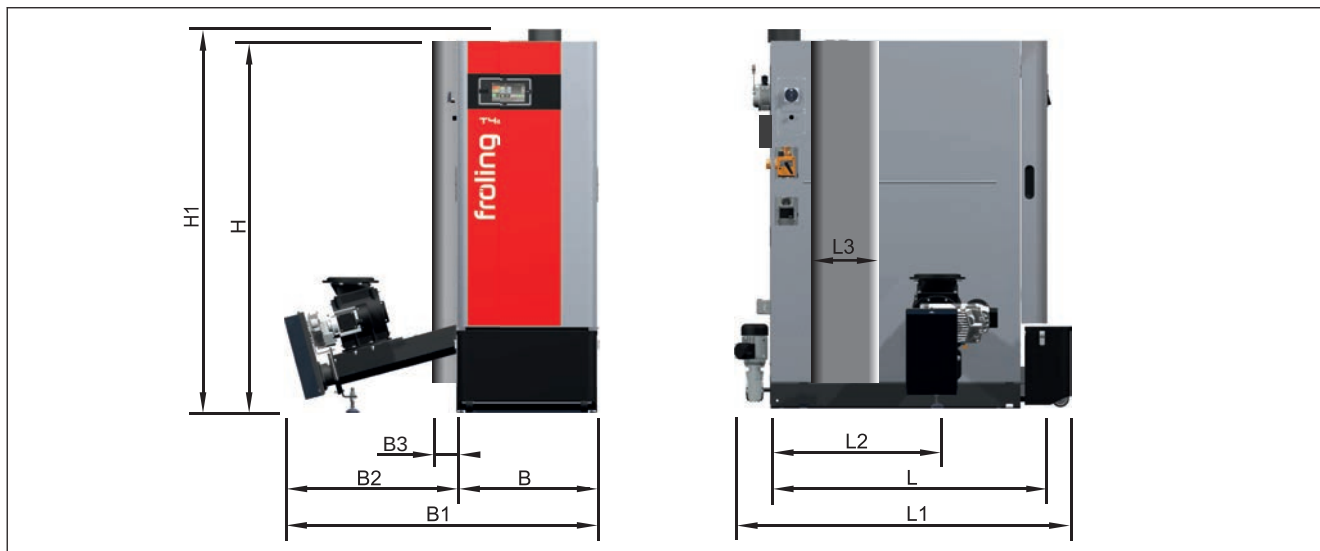
Tip: ☐ Fit a vertical pipe as a calming section in front of the automatic ventilating valve in such a way that the ventilating valve is positioned above the water level in the boiler

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

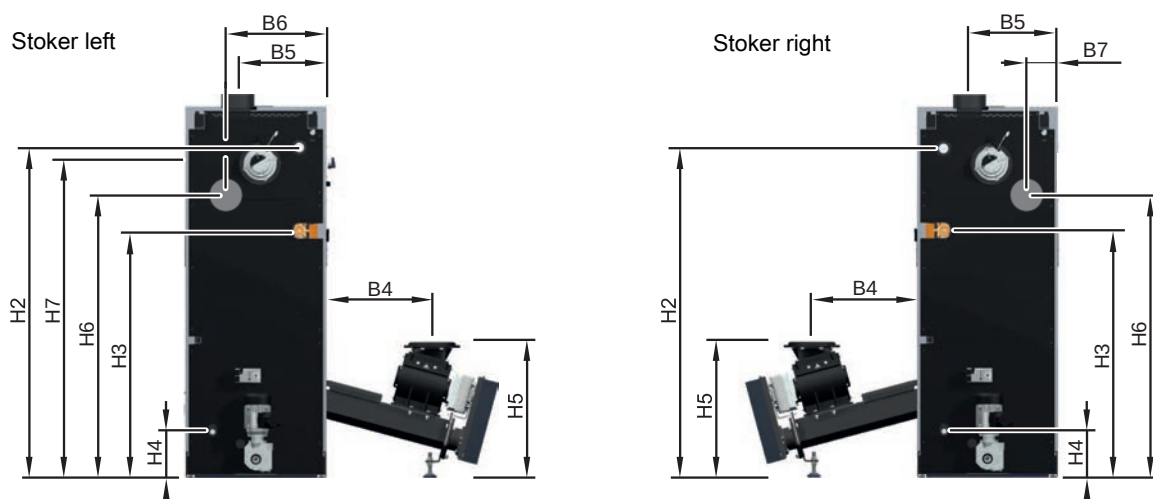
- Follow the manufacturer's instructions!

4 Technical information

4.1 Dimensions



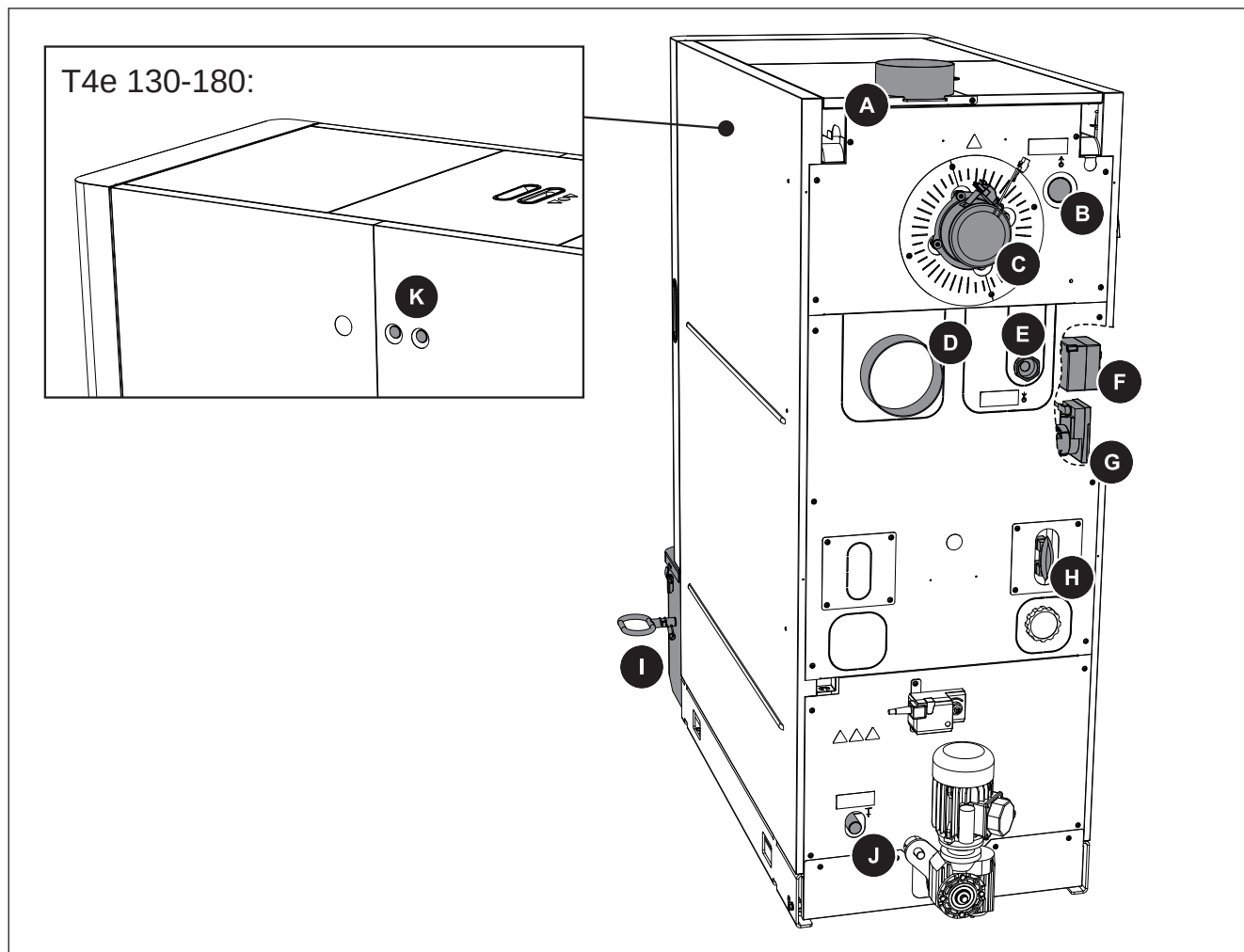
Item	Description		20 - 35	45 - 60	8 - 110	130 - 180
H	Boiler height	mm	1490	1690	1740	1840
H1	Total height including flue gas pipe connection		1545	1745	1790	1895
B	Boiler width		640	640	790	790
B1	Total width with stoker unit		1410	1410	1570	1560
W2	Width of stoker unit		770	770	780	780
B3	Width of particle separator (optional)		165	165	165	165
L	Boiler length		1170	1270	1420	1770
L1	Total length		1475	1550	1795	2105
L2	Length, back of boiler to stoker connection		690	770	890	1160
L3	Length of particle separator (optional)		370	370	550	715



CAUTION: The flow and return connections are located on the stoker side (T4e 20-180). The rear flue pipe connection (optional) is installed on the averted side of the stoker (T4e 20-110). In the case of the T4e 130-180, the rear flue pipe connection (optional) is always on the left side of the boiler.

Item	Description		20 - 35	45 - 60	8 - 110	130 - 180
H2	Height, flow connection	mm	1305	1505	1545	1660
H3	Height, return connection with integrated return feed boost		955	1155	1135	1210
H4	Height, drainage connection		210	210	200	200
H5	Height, rotary valve connection		615	615	615	615
H6	Optional rear flue gas pipe connection		960	1160	1210	1290
H7	Height, safety heat exchanger		-	-	-	1620
B4	Distance from boiler side to stoker connection		470	470	480	480
B5	Clearance flue gas pipe connection to side of boiler		400	400	495	515
B6	Clearance optional rear flue gas pipe connection to side of boiler (stoker left)		445	445	560	470
B7	Clearance optional rear flue gas pipe connection to side of boiler (stoker right)		155	155	190	470

4.2 Components and connections



Item	Description	20 - 60	80-110	130-180
A	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	WILO Para 25-180/8-75	WILO Stratos Para 30/1-8	WILO Stratos Para 30/1-12
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
Heat output range		5.95 - 19.9	7.51 - 25.1	9 - 30	10.5 - 35
Electrical connection		400V / 50Hz / fused C16A			
Power consumption (NL/PL) for boiler without ESP ¹⁾ , wood chips for fuel	W	48 / 39	55 / 39	59 / 39	63 / 38
Power consumption (NL/PL) for boiler with ESP ¹⁾ , wood chips for fuel		66 / 50	74 / 50	77 / 53	80 / 56
Power consumption (NL/PL) for boiler without ESP ¹⁾ , wood pellets for fuel		55 / 42	60 / 40	73 / 43	84 / 46
Weight of boiler (including stoker, without water)	kg	740			
Boiler capacity (water)	l	117			
Available feed height of pump ²⁾ (with ΔT = 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 ³⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06			
Test book number (boiler without ESP ¹⁾)		PB1210018	PB1220018	PB1230018	PB1240018
Test book number (boiler with ESP ¹⁾)		PB1250018	PB1260018	PB1270018	PB1280018
1. ESP: electrostatic particle separator (optional) 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		T4e 20 - 35			
		20	25	30	35
Energy efficiency class of boiler		A+	A+	A+	A+
Energy efficiency index (EEI) of boiler		112	113	113	114
Heating space annual rate of use η_s	%	76	77	77	77
Energy efficiency index (EEI) of boiler and controller combined		114	115	115	116
Energy efficiency class of boiler and controller combined		A+	A+	A+	A+

Regulation (EU) 2015/1187		T4e 20 - 35 with electrostatic particle separator			
		20	25	30	35
Energy efficiency class of boiler		A+	A+	A+	A+
Energy efficiency index (EEI) of boiler		113	115	115	115
Heating space annual rate of use η_s	%	77	78	78	78

Regulation (EU) 2015/1187	T4e 20 – 35 with electrostatic particle separator			
	20	25	30	35
Energy efficiency index (EEI) of boiler and controller combined	115	117	117	117
Energy efficiency class of boiler and controller combined	A+	A+	A+	A+

Regulation (EU) 2015/1189 - Emissions in [mg/m³] ¹⁾	
seasonal space heating emissions of particulate (PM)	≤ 40
seasonal space heating emissions of organic gaseous compounds (OGC)	≤ 20
seasonal space heating emissions of carbon monoxide (CO)	≤ 500
seasonal space heating emissions of nitrogen oxides (NO _x)	≤ 200
1. Emissions of particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides shall be expressed standardised to a dry flue gas basis at 10 % oxygen and standard conditions at 0°C and 1013 millibar	

4.3.2 T4e 45 - 60

Description		T4e 45 - 60		
		45	50	60
Nominal heat output	kW	45	49.9	60
Heat output range		13.5 - 45.0	14.9 - 49.9	18.0-60.0
Electrical connection		400V / 50Hz / fused C16A		
Power consumption (NL/PL) for boiler without ESP ¹⁾ , wood chips for fuel	W	70 / 37	77 / 37	90 / 37
Power consumption (NL/PL) for boiler with ESP ¹⁾ , wood chips for fuel		85 / 61	94 / 61	113 / 61
Power consumption (NL/PL) for boiler without ESP ¹⁾ , wood pellets for fuel		96 / 49	97 / 49	99 / 49
Weight of boiler (including stoker, without water)	kg	850		
Boiler capacity (water)	l	155		
Available feed height of pump ²⁾ (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 ³⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06		
Test book number (boiler without ESP ¹⁾)		PB 105 00 18	PB 106 00 18	PB 107 00 18
Test book number (boiler with ESP ¹⁾)		PB 109 00 18	PB 110 00 18	PB 111 00 18
¹⁾ ESP: electrostatic particle separator (optional) 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		T4e 45 - 60		
		45	50	60
Energy efficiency class of boiler		A+	A+	A+
Energy efficiency index (EEI) of boiler		115	115	115
Heating space annual rate of use η_s	%	78	78	78
Energy efficiency index (EEI) of boiler and controller combined		117	117	117
Energy efficiency class of boiler and controller combined		A+	A+	A+

Regulation (EU) 2015/1187		T4e 45 - 60 with electrostatic particle separator		
		45	50	60
Energy efficiency class of boiler		A+	A+	A+
Energy efficiency index (EEI) of boiler		115	115	115
Heating space annual rate of use η_s	%	78	78	77
Energy efficiency index (EEI) of boiler and controller combined		117	117	117
Energy efficiency class of boiler and controller combined		A+	A+	A+

Regulation (EU) 2015/1189 - Emissions in [mg/m ³] ¹⁾	
seasonal space heating emissions of particulate (PM)	≤ 40
seasonal space heating emissions of organic gaseous compounds (OGC)	≤ 20
seasonal space heating emissions of carbon monoxide (CO)	≤ 500
seasonal space heating emissions of nitrogen oxides (NO _x)	≤ 200
1. Emissions of particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides shall be expressed standardised to a dry flue gas basis at 10 % oxygen and standard conditions at 0°C and 1013 millibar	

4.3.3 T4e 80 - 110

Description		T4e 80 - 110			
		80	90	100	110
Rated heat output	kW	80	90	100	110
Heat output range		24 - 80	27 - 90	30 - 100	33 - 110
Electrical connection		400V / 50Hz / fused C16A			
Power consumption (NL/PL) for boiler without ESP ³⁾ , wood chips for fuel	W	114 / 47	126 / 51	138 / 56	138 / 57
Power consumption (NL/PL) for boiler with ESP ³⁾ , wood chips for fuel		154 / 81	174 / 91	194 / 101	194 / 100
Power consumption (NL/PL) for boiler without ESP ³⁾ , wood pellets for fuel		102 / 48	116 / 49	129 / 48	128 / 49
Weight of boiler (including stoker, without water)	kg	1160			
Boiler capacity (water)	l	228			
Available feed height of pump ¹⁾ (with $\Delta T = 20K$)	mbar	628	566	525	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 ²⁾		Part 4: Wood chips class A2 / P16S-P31S Part 2: Wood pellets class A1 / D06			
Test book number (boiler without ESP ³⁾)		PB1310019	PB1320019	PB1330019	PB1340019
Test book number (boiler with ESP ³⁾)		PB1370019	PB1380019	PB1390019	PB1400019
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" 3. ESP: electrostatic particle separator (optional)					

Regulation (EU) 2015/1187

Heating space annual rate of use η_s	%	≥ 77
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Regulation (EU) 2015/1189 - Emissions in [mg/m³]¹⁾

seasonal space heating emissions of particulate (PM)	≤ 40
seasonal space heating emissions of organic gaseous compounds (OGC)	≤ 20
seasonal space heating emissions of carbon monoxide (CO)	≤ 500
seasonal space heating emissions of nitrogen oxides (NO _x)	≤ 200
1. Emissions of particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides shall be expressed standardised to a dry flue gas basis at 10 % oxygen and standard conditions at 0°C and 1013 millibar	

4.3.4 T4e 130 - 150

Description		T4e 130 - 150		
		130	140	150
Rated heat output	kW	130	140	150
Output range		39-130	47-140	45-150
Electrical connection		400V / 50Hz / fused C16A		
Power consumption (NL/PL) for boiler without ESP ³⁾ , wood chips for fuel	W	137 / 58	137 / 58	136 / 59
Power consumption (NL/PL) for boiler with ESP ³⁾ , wood chips for fuel	W	193 / 98	193 / 97	193 / 96
Power consumption (NL/PL) for boiler without ESP ³⁾ , wood pellets for fuel	W	126 / 50	125 / 51	124 / 52
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 (boiler without ESP ³⁾)		PB 150 00 20	PB 151 00 20	PB 152 00 20
Test book number (boiler with ESP ³⁾)		PB 159 00 20	PB 160 00 20	PB 161 00 20
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" 3. ESP: electrostatic particle separator (optional)				

Regulation (EU) 2015/1187

Heating space annual rate of use η_s	%	≥ 77
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Regulation (EU) 2015/1189 - Emissions in [mg/m³]¹⁾

seasonal space heating emissions of particulate (PM)	≤ 40
seasonal space heating emissions of organic gaseous compounds (OGC)	≤ 20
seasonal space heating emissions of carbon monoxide (CO)	≤ 500
seasonal space heating emissions of nitrogen oxides (NO _x)	≤ 200

1. Emissions of particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides shall be expressed standardised to a dry flue gas basis at 10 % oxygen and standard conditions at 0°C and 1013 millibar

4.3.5 T4e 160 - 180

Description		T4e 160 - 180		
		160	170	180
Nominal output	kW	160	170	180
Output range		48-160	51-170	59-180
Electrical connection		400V / 50Hz / fused C16A		
Power consumption (NL/PL) for boiler without ESP ³⁾ , wood chips for fuel	W	136 / 60	136 / 60	136 / 61
Power consumption (NL/PL) for boiler with ESP ³⁾ , wood chips for fuel		193 / 96	193 / 95	192 / 94
Power consumption (NL/PL) for boiler without ESP ³⁾ , wood pellets for fuel		124 / 52	123 / 53	122 / 54
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 (boiler without ESP ³⁾)		PB 153 00 20	PB 154 00 20	PB 155 00 20
Test book number (boiler with ESP ³⁾)		PB 162 00 20	PB 163 00 20	PB 164 00 20
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" 3. ESP: electrostatic particle separator (optional)				

Regulation (EU) 2015/1187

Heating space annual rate of use η_s	%	≥ 77
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Regulation (EU) 2015/1189 - Emissions in [mg/m³]¹⁾

seasonal space heating emissions of particulate (PM)	≤ 40
seasonal space heating emissions of organic gaseous compounds (OGC)	≤ 20
seasonal space heating emissions of carbon monoxide (CO)	≤ 500
seasonal space heating emissions of nitrogen oxides (NO _x)	≤ 200
1. Emissions of particulate matter, organic gaseous compounds, carbon monoxide and nitrogen oxides shall be expressed standardised to a dry flue gas basis at 10 % oxygen and standard conditions at 0°C and 1013 millibar	

4.3.6 Boiler data for planning the flue gas system

Description		T4e			
		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 / 11.3	13.3 / 11.8		13.8 / 12.3
Flue gas mass flow at nominal load	kg/h	51	61	71	83
	kg/s	0.014	0.017	0.02	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			

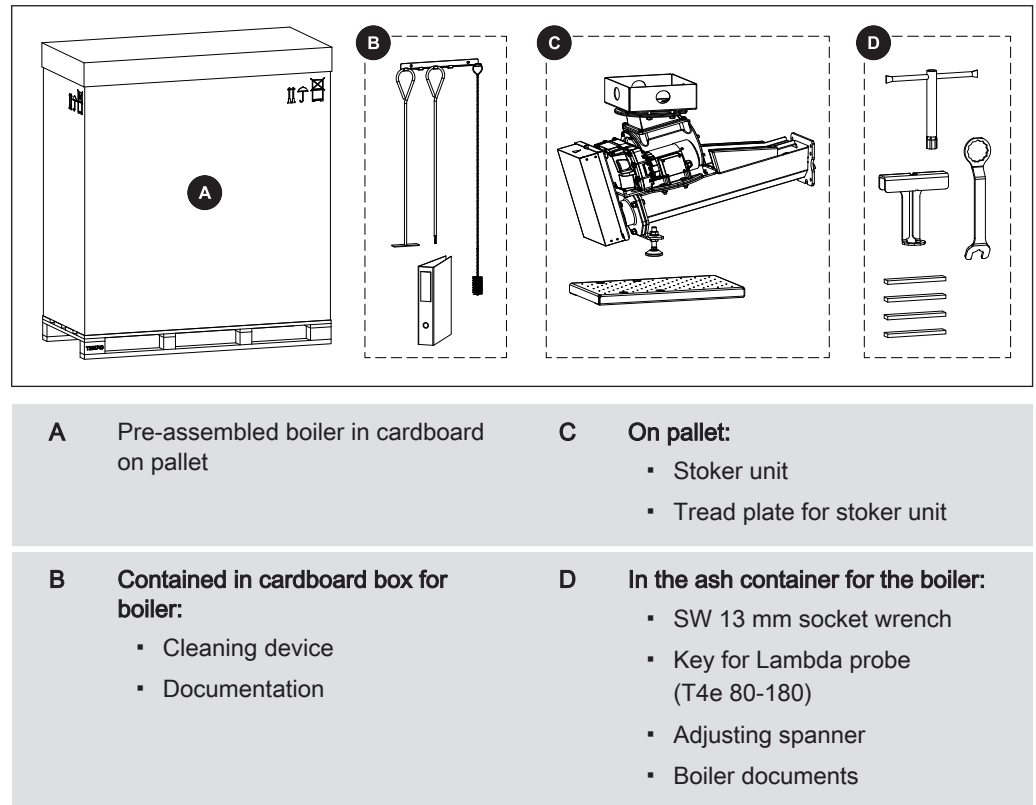
Description		T4e		
		45	50	60
Flue gas temperature at nominal load	°C	125	130	135
Flue gas temperature at partial load		80	80	85
CO ₂ - volume concentration at nominal load / partial load	%	13.3 / 11.8		13.8 / 12.3
Flue gas mass flow at nominal load	kg/h	118	127	142
	kg/s	0.033	0.035	0.039
Flue gas mass 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			
		80	90	100	110
Flue gas temperature at nominal load	°C	120	125	130	135
Flue gas temperature at partial load		80		85	
CO ₂ - volume concentration at nominal load / partial load	%	13.3 / 11.8		13.8 / 12.3	
Flue gas mass flow at nominal load	kg/h	208	230	245	259
	kg/s	0.058	0.064	0.068	0.072
Flue gas mass flow at partial load	kg/h	64	72	75	83
	kg/s	0.018	0.020	0.021	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					
		130	140	150	160	170	180
Flue gas temperature at nominal load	°C	125		130	135	140	145
Flue gas temperature at partial load		80			85		
CO ₂ - volume concentration at nominal load / partial load	%	13.3 / 11.8			13.3 / 12.3	13.8 / 12.8	
Flue gas mass flow at nominal load	kg/h	325	350	376	420	413	439
	kg/s	0.090	0.097	0.104	0.112	0.115	0.136
Flue gas mass flow at partial load	kg/h	102	110	117	126	129	136
	kg/s	0.028	0.030	0.033	0.035	0.038	0.043
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					

5 Assembly

5.1 Materials supplied



5.2 Transport

The product is delivered in cardboard packaging.

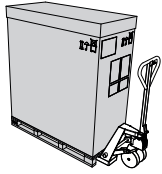


NOTICE

Possibility of damage to components if handled incorrectly

- ☐ Follow the transport instructions on the packaging
- ☐ Transport components with care to avoid damage
- ☐ Protect components against damp

5.3 Positioning

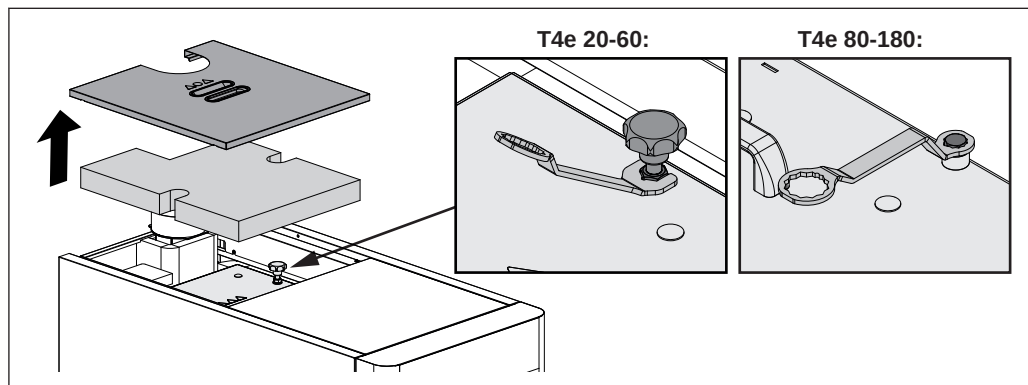


- ☐ Position a fork-lift or similar lifting device at the pallet and bring in the components

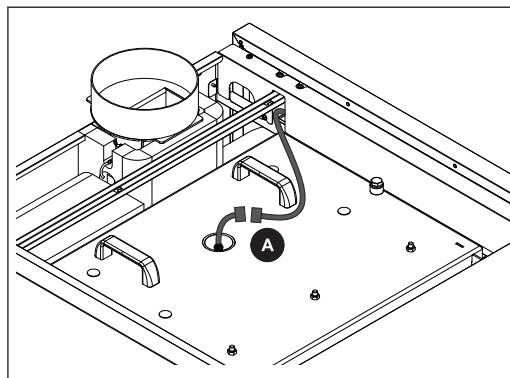
If the boiler cannot be brought in on the pallet:

- ☐ Remove the cardboard and take the boiler off the pallet
⇒ See "Remove boiler from pallet" [page 29]

Positioning using a crane:

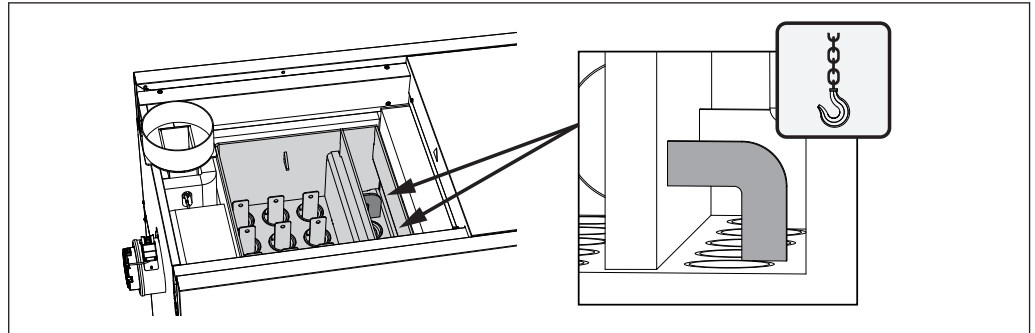


- ☐ Remove the insulating cover and thermal insulation
 - T4e 20-110: one insulated cover
 - T4e 130-180: two insulated covers
- ☐ Undo the screw connection and open the heat exchanger cover
 - Use the spanner provided



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

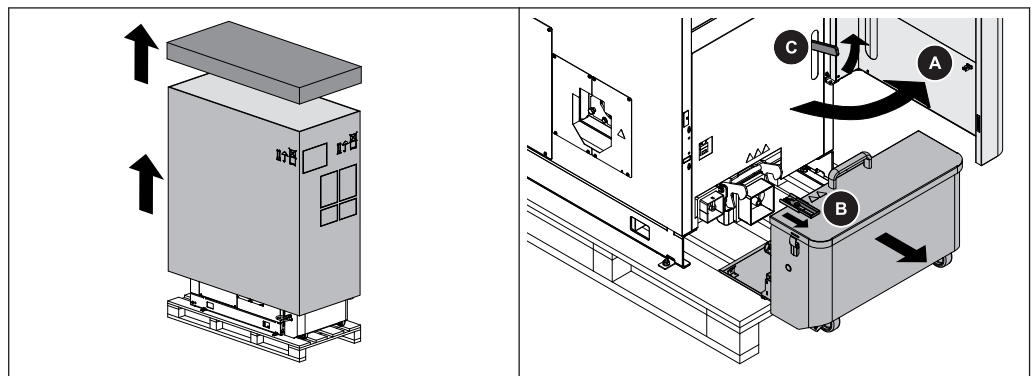
5.4 Temporary storage

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

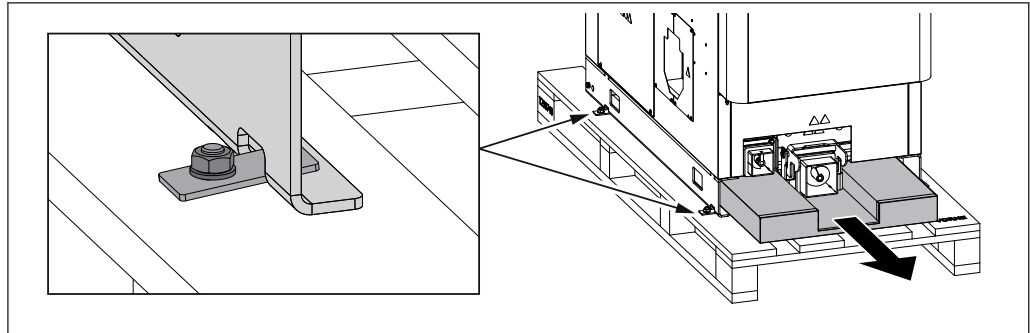
- ☐ Store components at a protected location, which is dry and free from dust
 - ➔ Damp conditions and frost can damage components, particularly electric ones!

5.5 Setting up in the boiler room

5.5.1 Remove boiler from pallet



- ☐ Cut through the strapping and lift off the cardboard
- ☐ Open the insulating door (A) of the boiler
- ☐ Remove the key plate (B) from the safety limit switch
- ☐ Unlock the ash container using the locking lever (C) and remove 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

TIP: We recommend using Froling's KHV 1400 boiler lifting system to make pallet removal easier

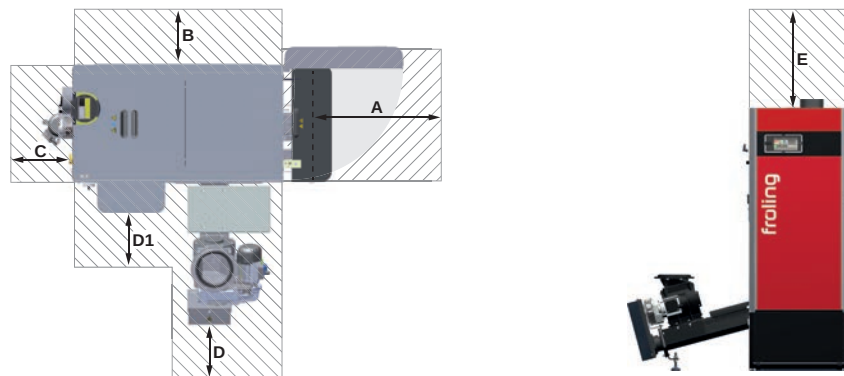


5.5.2 Moving the boiler in the boiler room

- ☐ 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!

5.5.3 Operating and maintenance areas of the equipment

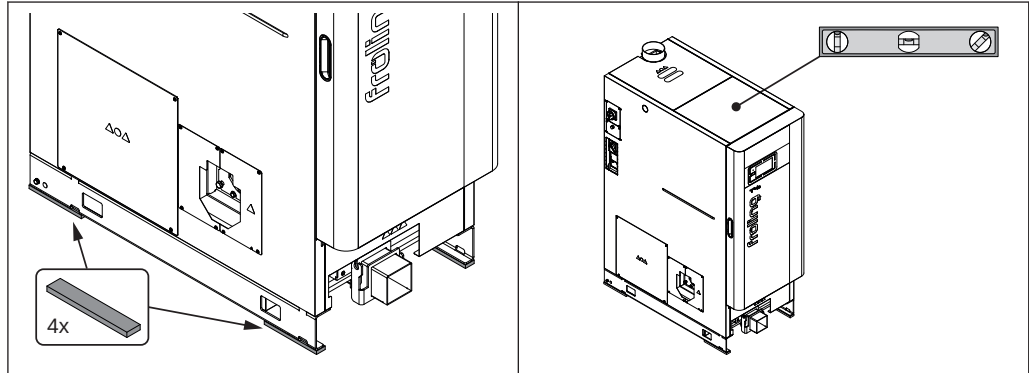
- The system should generally be set up so that it is accessible from all sides allowing quick and easy maintenance.
- Regional regulations regarding necessary maintenance areas for inspecting the chimney should be observed in addition to the specified distances!
- Observe the applicable standards and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



	T4e 20-60	T4e 80-110	T4e 130-180
A	700 mm	800 mm	800 mm
B	150 mm		
C	500 mm		
D	300 mm		
D1	300 mm		
E	500 mm ¹⁾		
1. Maintenance area to expand the WOS springs upwards			

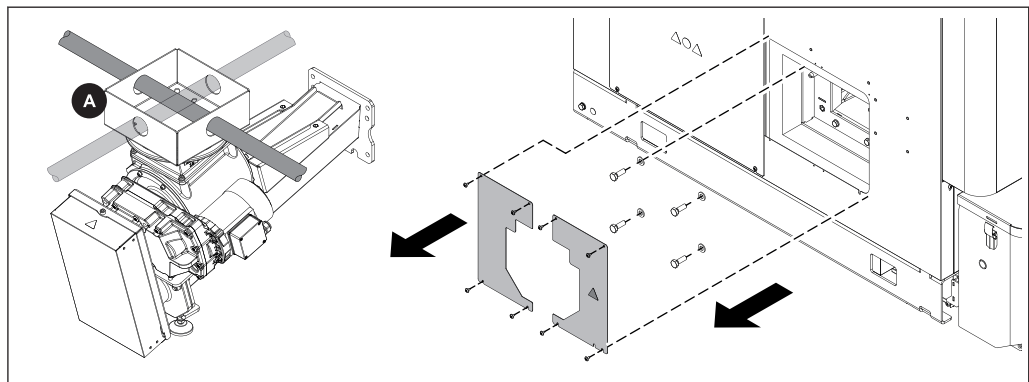
5.6 Assembly work

5.6.1 Levelling the boiler

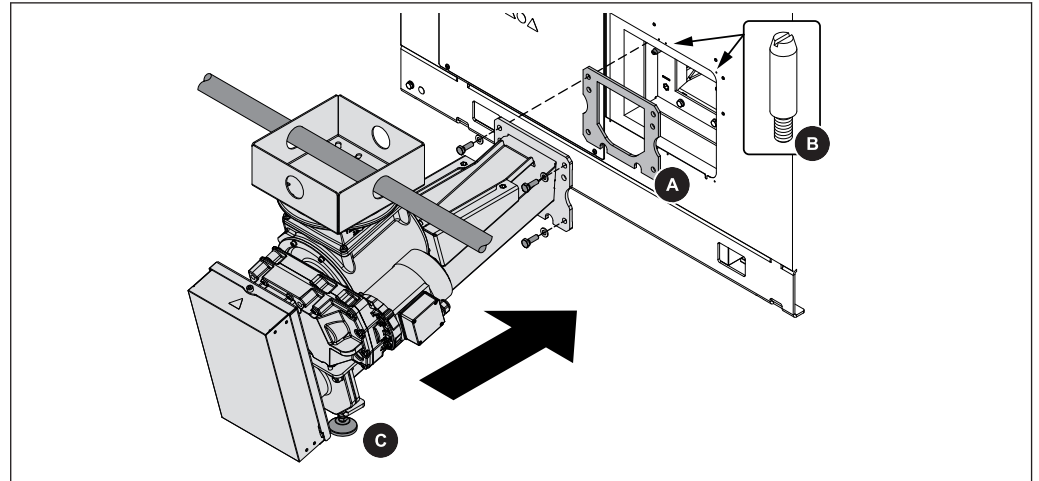


- ☐ Lift the boiler using an appropriate lifting device
- ☐ Position a Sylomer pad under the boiler base
 - ➔ Sylomer pads prevent the transmission of noise to the ground
- ☐ Carefully release the lifting device and check that the boiler is level
- ☐ If necessary, level the boiler using load-bearing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

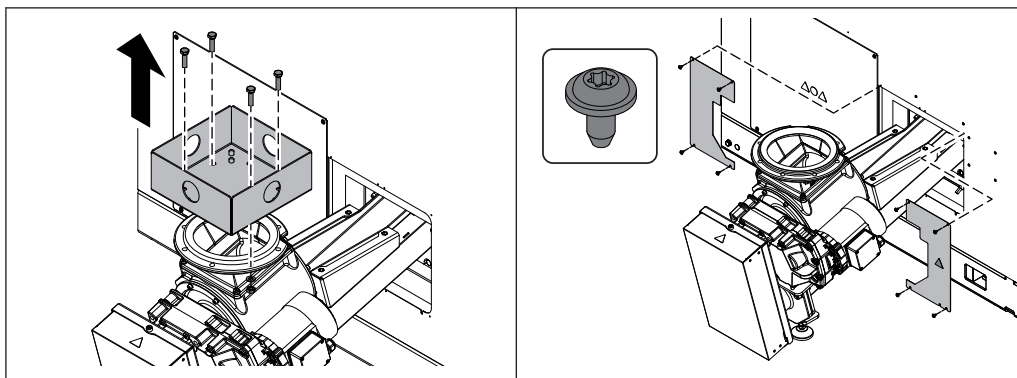
5.6.2 Installing the stoker unit



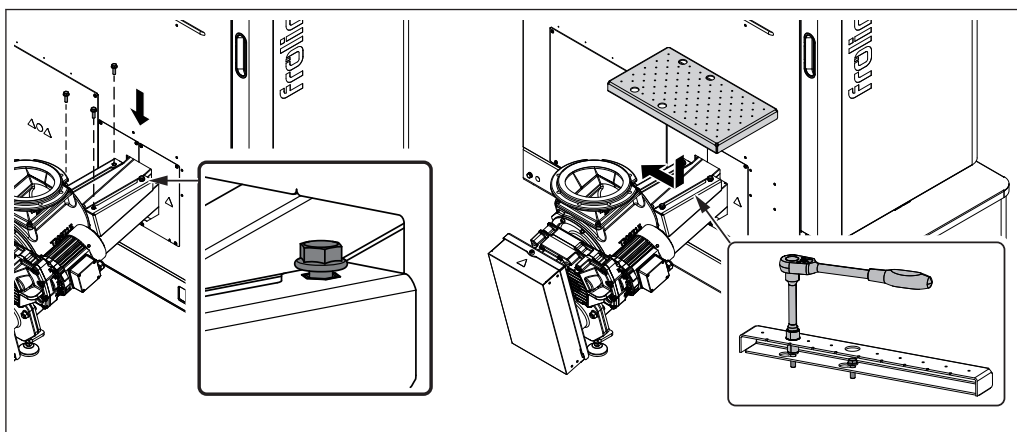
- ☐ Insert the appropriate pipe (e.g. 1" pipe) into the bracket (A) of the stoker unit and transport the stoker unit to the boiler
- ☐ Remove the shutter masks from the stoker side
- ☐ Remove the pre-installed screws on the connection flange



- ☐ 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

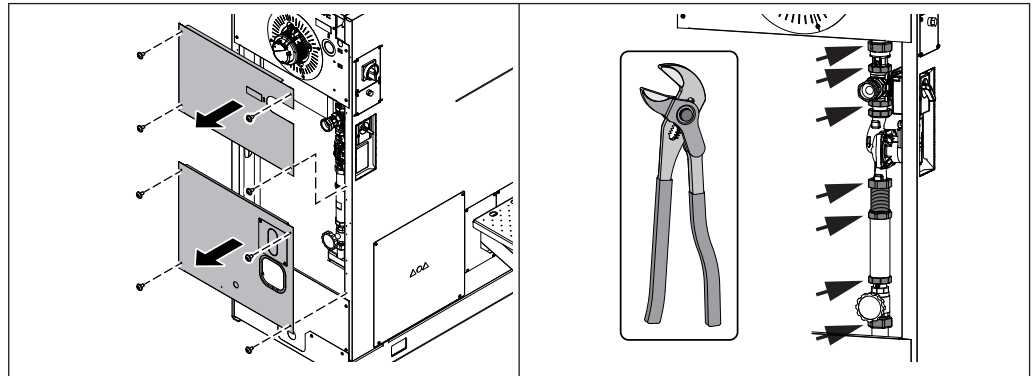


- ☐ Remove the bracket. It is no longer needed
- ☐ Assemble the entire discharge system
- ☐ Lay the cable via the side panel to the controller box for the boiler
 - Geared motor stoker, geared motor feed system, cable limit switch gravity shaft cover
- ☐ Attach the previously removed shutter masks to the stoker duct



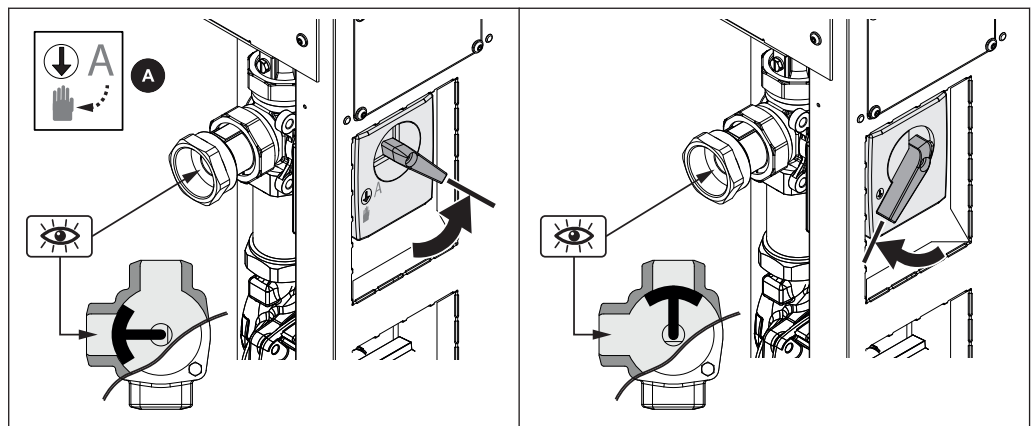
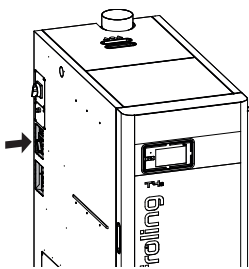
- ☐ Pre-assemble four hexagonal screws on the stoker duct
 - Do not screw the screws in all the way
- ☐ Fit the tread to the screw heads, move it sideways until it clicks and then attach
 - The tread makes it easier to perform maintenance on the heat exchanger and controller box

5.6.3 Control the return temperature control

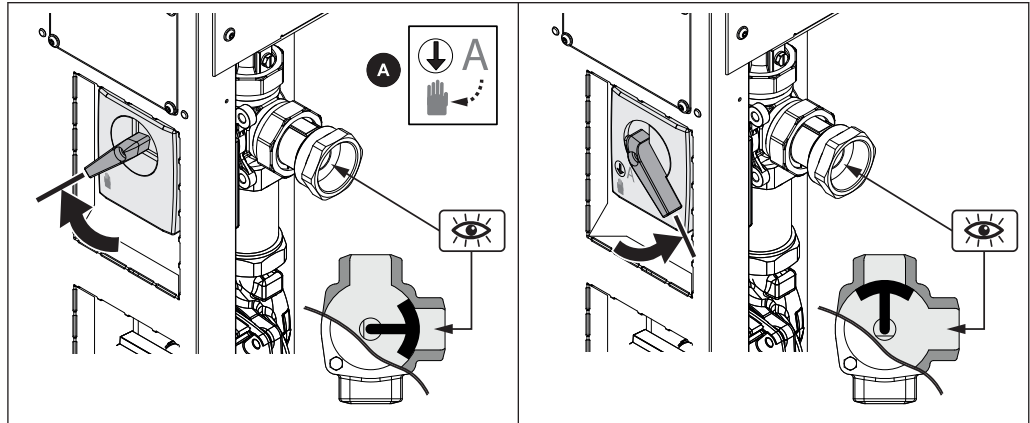
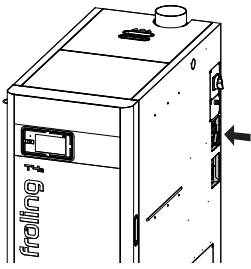


- ☐ Remove both back panels
- ☐ Tighten all of the connections on the return temperature control using a pipe wrench
 - Connections may have loosened during transport.
 - **IMPORTANT:** Before and after filling the system with heated water, check the seal of the screw connections on the return temperature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

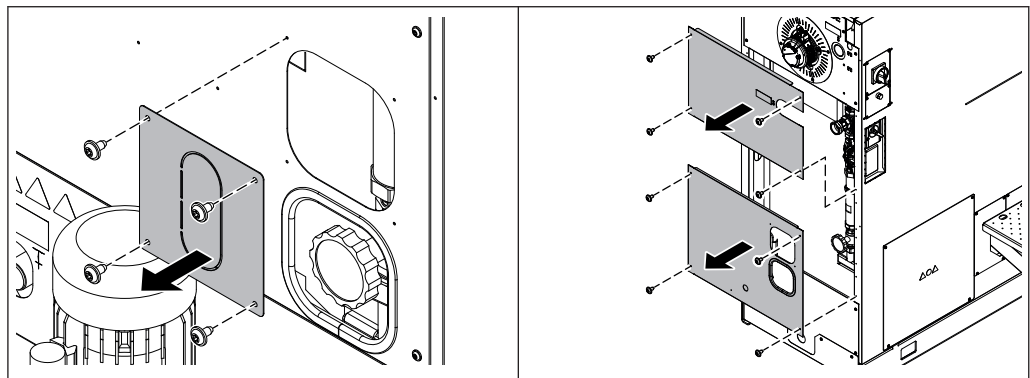
- ☐ Set the knob on the housing of the mixing drive to manual mode (A)
 - ☐ Turn the mixing drive clockwise until it stops
 - The mixer valve completely closes off the system return
 - ☐ Turn the mixing drive counter clockwise until it stops
 - The system return is completely open and the bypass line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

After checking that the return temperature control is functioning properly:

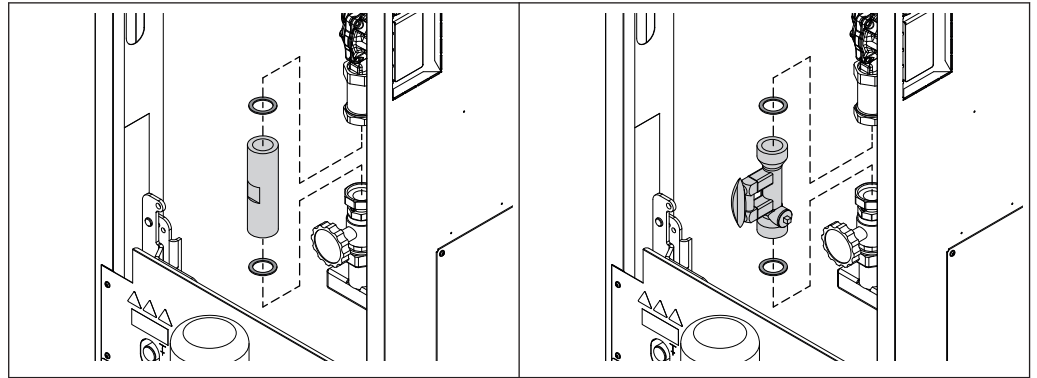
- ☐ Turn the knob on the housing of the mixing drive back to automatic mode
- ☐ Replace the centre back panel
- ☐ Fill the boiler with domestic hot water and check the return temperature control for leaks

NOTICE! After connecting the hydraulics and filling the boiler with domestic hot water it is essential to check the return temperature control for leaks.

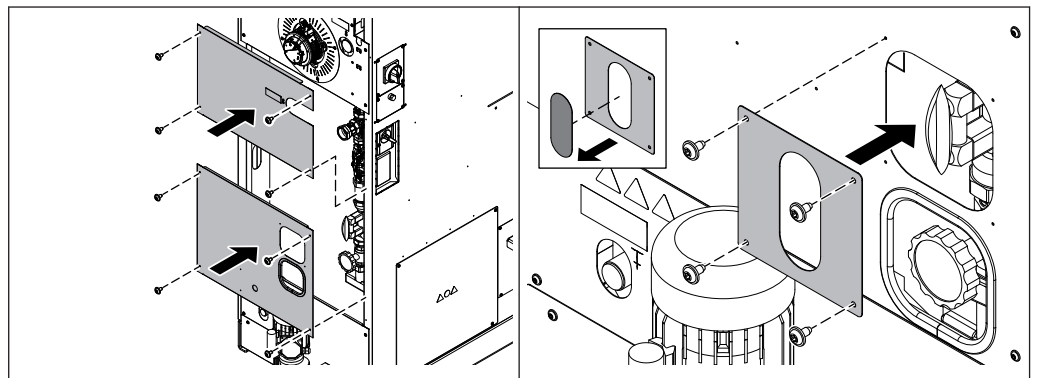
5.6.4 Install line regulating valve (T4e 20-60 - optional)



- ☐ Remove rear cover plate and both rear panels

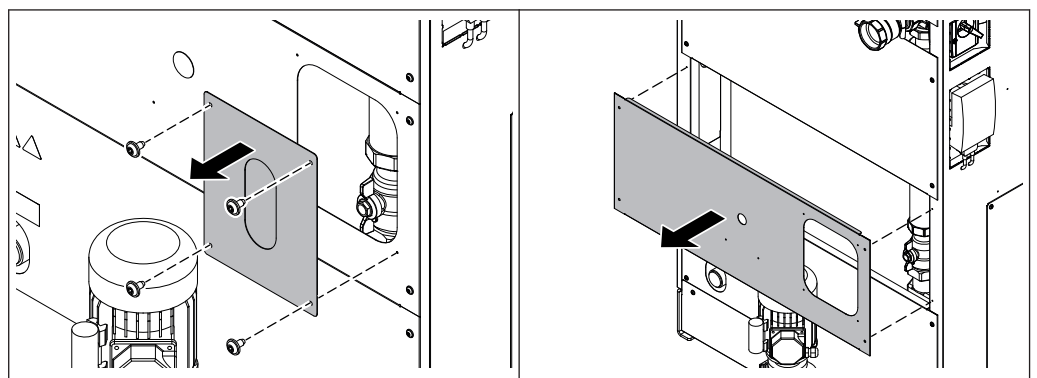


- ☐ Remove pipe section
- ☐ Seal line regulating valve instead
 - **IMPORTANT:** Pay attention to direction of flow. The arrow on the line regulating valve must point downward!

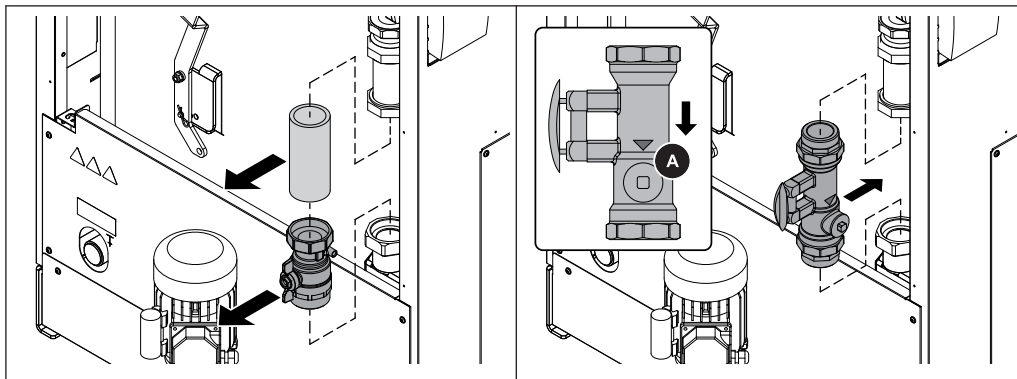


- ☐ Fit both rear panels
- ☐ Remove the perforation on the rear cover plate
 - Remove the burrs with a half-round file
- ☐ Install rear cover plate on the line regulating valve

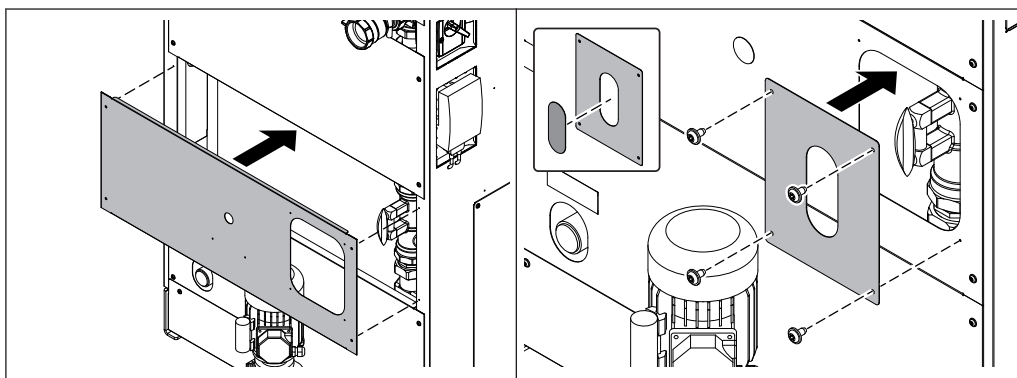
5.6.5 Install line regulating valve (T4e 80-180 - optional)



- ☐ Remove cover plate from back panel and centre back panel

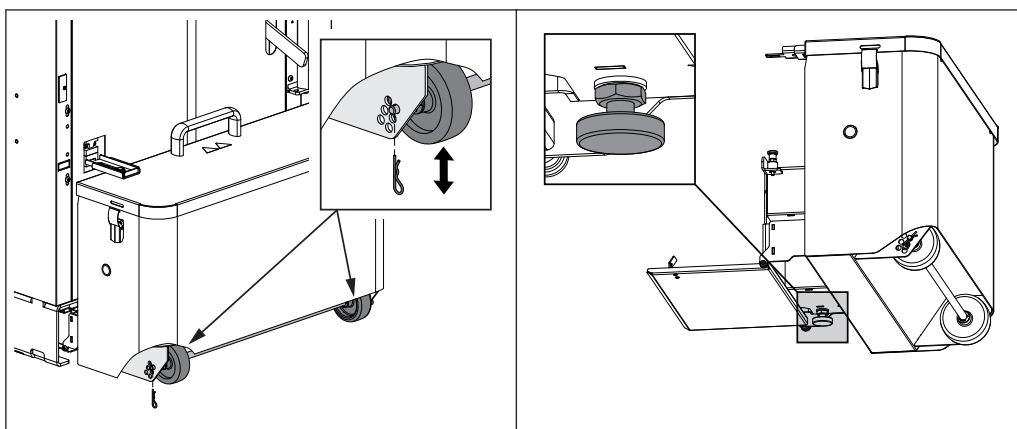


- ☐ Remove pipe section
- ☐ Seal line regulating valve instead
 - IMPORTANT: Pay attention to direction of flow. Arrow (A) must point downward!



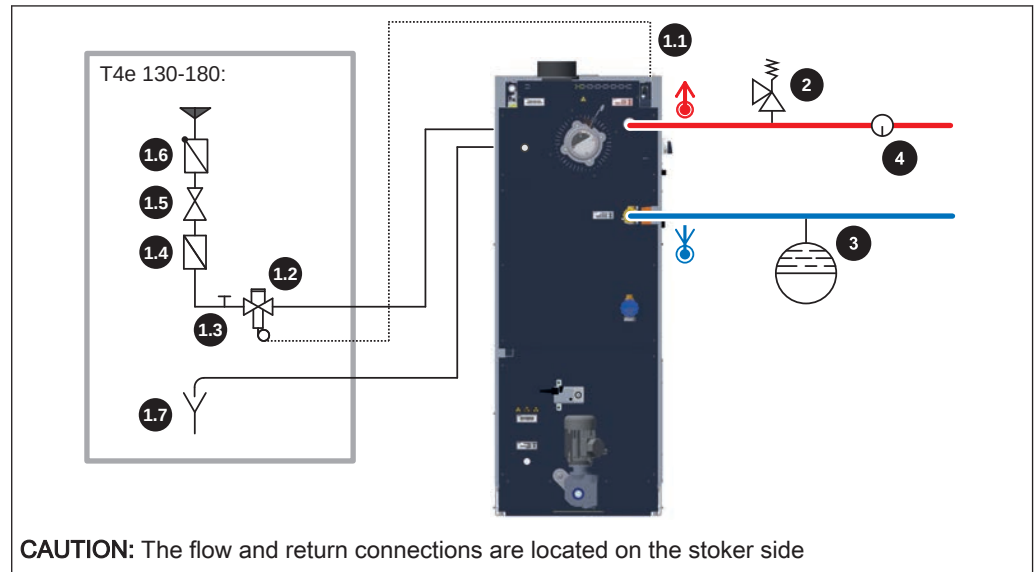
- ☐ Install centre back panel
- ☐ Remove the perforation on the cover plate
 - Remove the burrs with a half-round file
- ☐ Install cover plate on the balancing valve

5.6.6 Adjusting the height of the ash container



- ☐ Pull out the spring cotter on the transport wheels and adjust the height
 - The wheels rest on the ground when the ash container is mounted!
- ☐ Remove the ash container from the boiler and level it using the adjustable foot

5.7 Hydraulic connection



1 Thermal discharge safety device (T4e 130-180)

- 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

- Safety valve as per ÖNORM EN ISO 4126-1, diameter as per EN 12828 or national regulations
- The safety valve must be installed in an accessible place on the heat generator or in direct proximity in the flow pipe in such a way that it cannot be shut off

3 Diaphragm expansion tank

- The diaphragm pressurised expansion tank must conform to EN 13831 and hold at least the maximum expansion volume of the system's heated water 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

4 We recommend installing some sort of control device (e.g. thermometer)

5.8 Electrical connection

DANGER



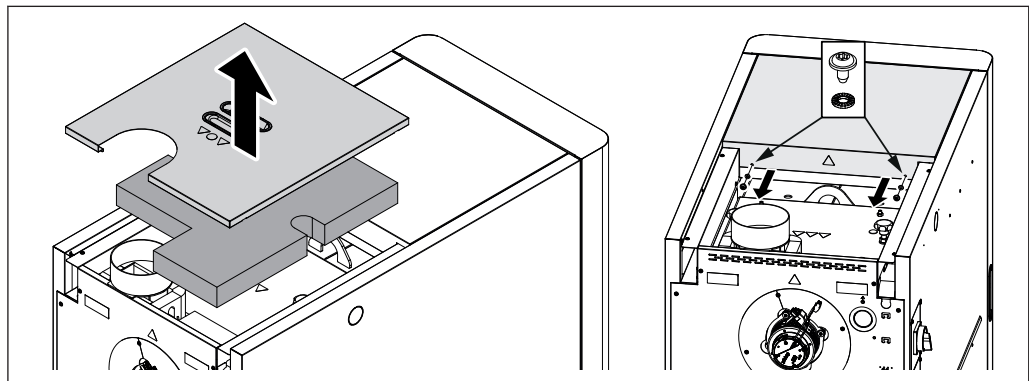
When working on electrical components:

Risk of electrocution!

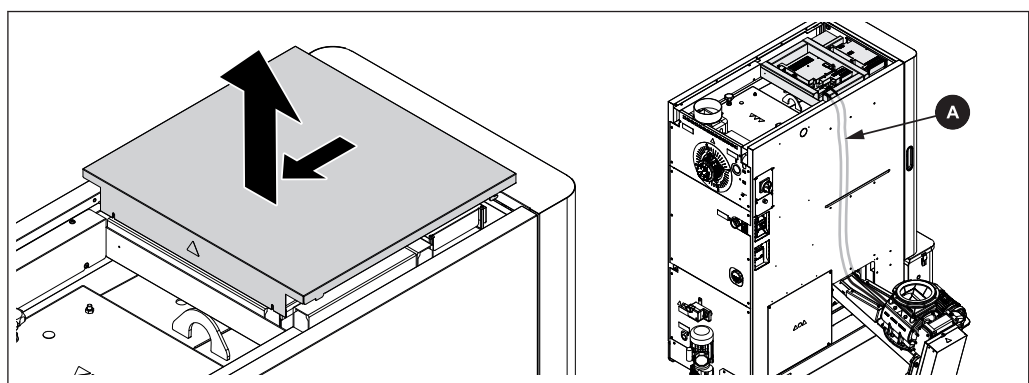
When work is carried out on electrical components:

- ☐ 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

5.8.1 Laying cables

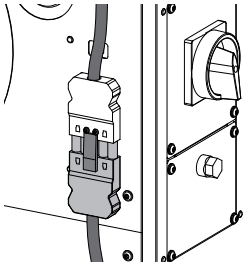


- ☐ Remove the insulating cover and thermal insulation
- ☐ Remove the retaining screw and contact washer from the controller cover



- ☐ 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

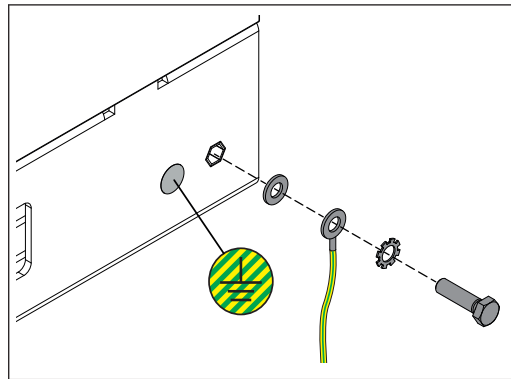
5.8.2 Mains connection



At the back of the boiler:

- ☐ Press the mains plug to release it and remove
- ☐ 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.

5.8.3 Potential equalisation



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

5.8.4 Information on circulating pumps

NOTICE

According to 2012/622/EU external, wet running circulating pumps must comply with the following limit values of the Energy Efficiency Index (EEI):

- *Effective from 01/01/2013: Wet running circulating pumps with $EEI \leq 0.27$*
- *Effective from 08/01/2015: Wet running circulating pumps with $EEI \leq 0.23$*

Only high efficiency pumps with a connection option for a control signal (PDM / 0-10V) should be connected to speed-controlled pump outputs (pump 1 on the core module and pump outputs on the hydraulic module). In this case, the control line is connected to the corresponding PDM outputs of the boards. Observe the connection instructions in the boiler controller documentation!

 CAUTION

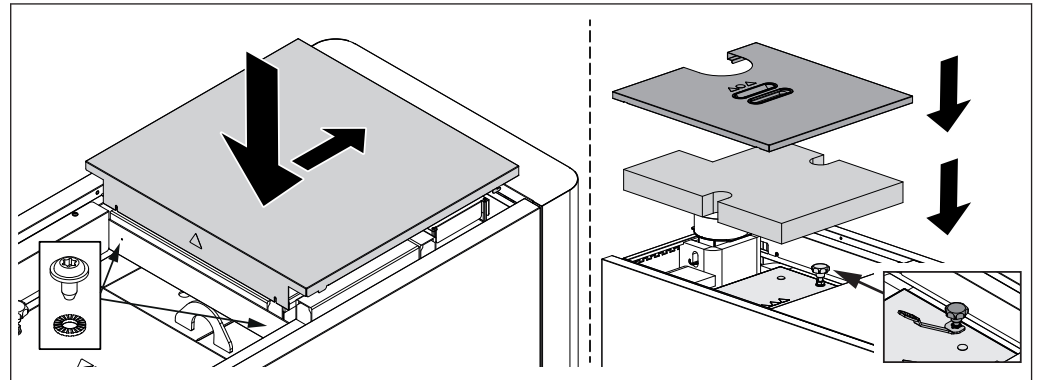
When using high efficiency pumps without an additional control line at speed-controlled pump outputs:

Malfunctions of the boiler, the pump and the hydraulic system may occur!

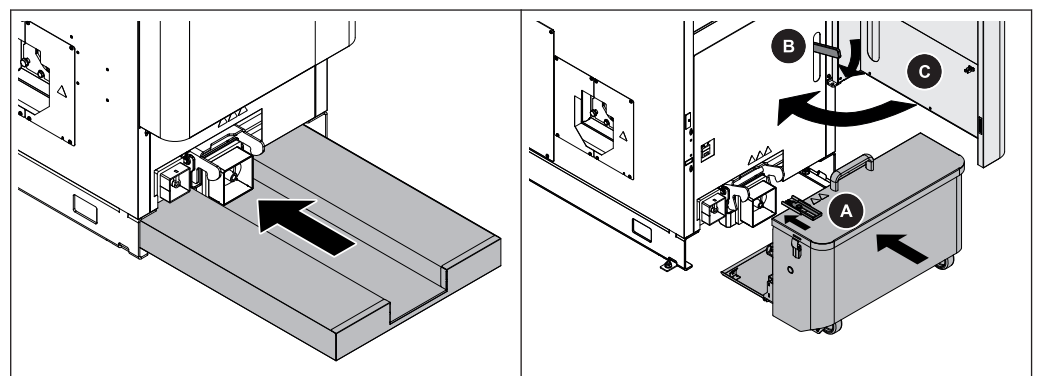
Therefore:

- ☐ Do not connect EC motor pumps without a control line to the speed-controlled pump outputs of the boards.
 - Only use special high efficiency pumps with a connection option for a control line (PDM/0-10V)!
 - Observe the additional instructions and information on board outputs in the operation instructions for the boiler controller.

5.9 Final installation steps



- ☐ Place the controller cover on the controller box and slide forward
- ☐ Attach the controller cover with retaining screw and contact washers
- ☐ Put on the heat exchanger cover and attach using star-shaped screws
- ☐ Put on the insulating cover and thermal insulation
 - T4e 20-110: one insulated cover
 - T4e 130-180: two insulated 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

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 Froeling 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 necessary 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 to see whether all of the 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 that the drives and servo motors are working and turning in the right direction.

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

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

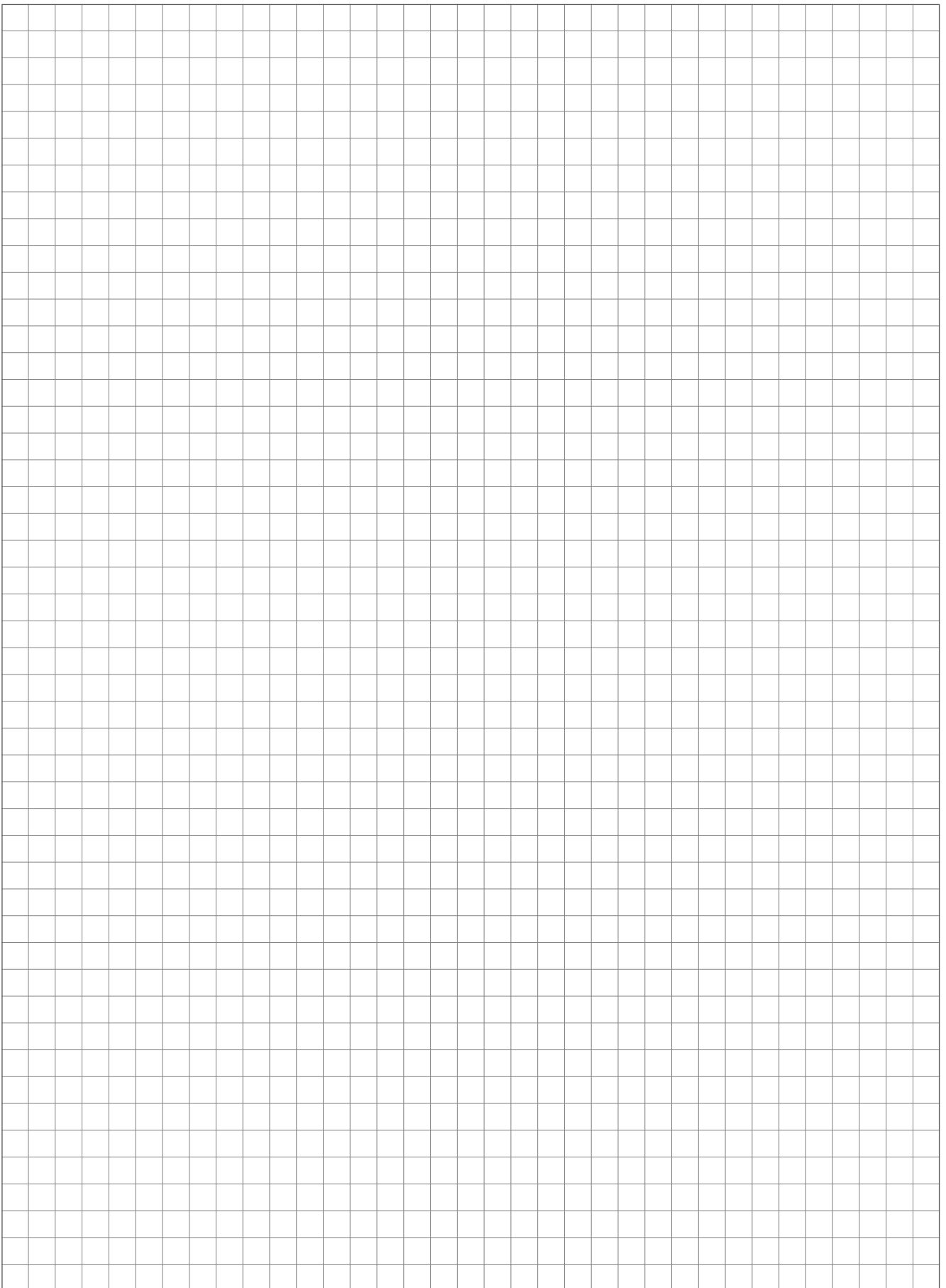
To disassemble the system, follow the steps for assembly in reverse order.

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

8 Notes

This image shows a full page of blank graph paper. The grid consists of small, uniform squares formed by thin, light gray lines. There are no margins, text, or other markings on the page.



9 Appendix

9.1 Addresses

9.1.1 Address of manufacturer

FRÖLING
Heizkessel- und Behälterbau GesmbH

Industriestraße 12
A-4710 Grieskirchen
AUSTRIA

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

Customer service

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

9.1.2 Address of the installer

Stamp
