fröling

Installation instructions

Turbomat TM 320-550

Translation of original German version of installation instructions for technicians.

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

CE

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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 only be carried out by qualified personnel:

- Heating technicians/building technicians
- Electrical installation technicians
- 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!

- 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

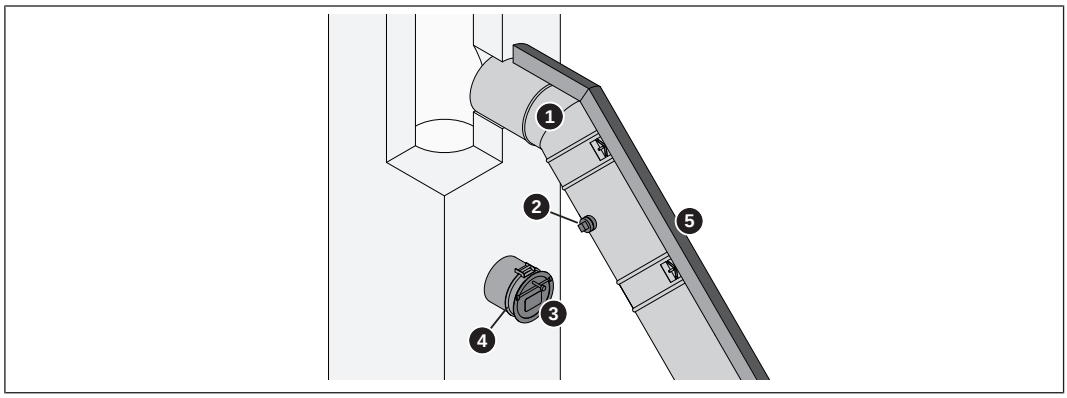
Requirements for the load bearing substrate:

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

Conditions at the installation site:

- Protecting the system against frost
- 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
- Observe national and regional regulations regarding the installation of smoke detectors and carbon monoxide detectors

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.

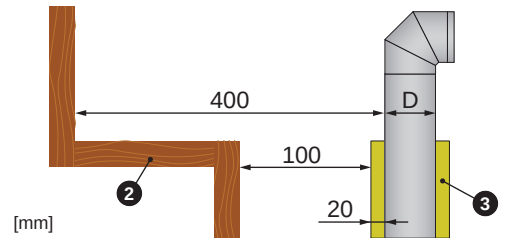
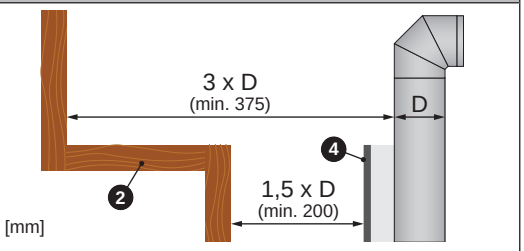
Local regulations and other statutory regulations are also applicable.

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
	

1. Observe the fire regulations of the respective federal state
2. Component made of flammable material
3. Nonflammable insulating material
4. Radiation shield with rear ventilation

Minimum distance from flammable substances as per MFeuV[1] (Germany):

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

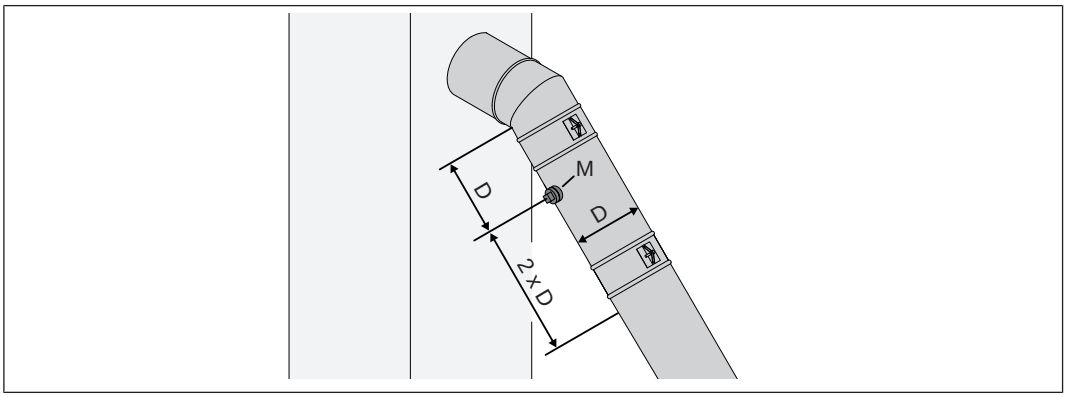
Minimum distance from flammable materials as per EN 15287-1 and EN 15287-2:

- 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. If the values for the maximum permissible feed pressure stated in the section “Data for designing the flue gas system” are exceeded, a draught limiter must be installed.

NOTICE! For boilers with an electrostatic particle separator, the installation of a draught limiter is mandatory.

NOTICE! Install the draught limiter directly under the mouth of the flue duct, as there is persistent under-pressure at this point, which largely prevents the escape of dust from the draught limiter.

3.5 Combustion air

3.5.1 General requirement

For safe operation, the boiler requires around 1.5 - 3.0 m³ of combustion air per kW nominal heat output and operating hour. The air supply can be provided by free ventilation (e.g. windows, air shaft), mechanical ventilation from outside or, if necessary, from the group of rooms.

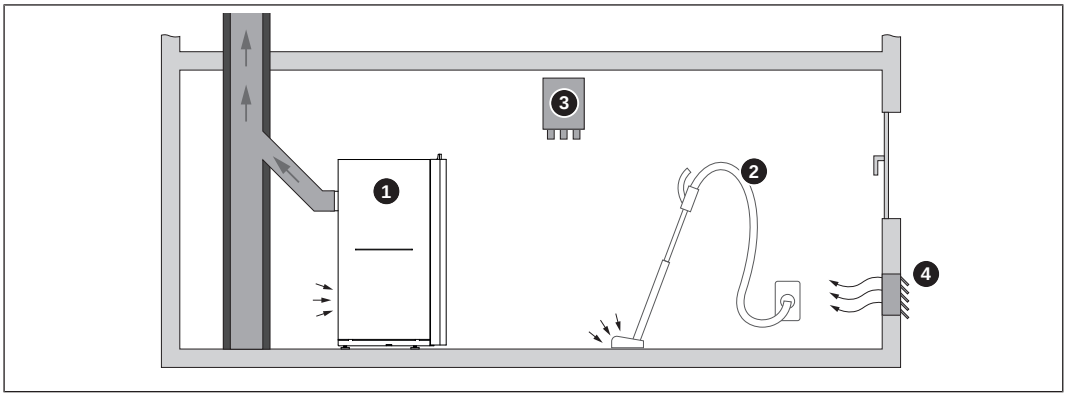
The boiler is operated depending on the room air, whereby the combustion air is taken from the installation site.

A suitable air supply must ensure that no impermissible under-pressure greater than 4 Pa is created at the installation site. The use of safety devices (under-pressure monitoring system) may be necessary, particularly if the boiler is operated concurrently with air-suction systems (such as an extractor fan).

Local **NOTICE! Safety equipment and conditions for the operation of the boiler (room air-dependent / room air-independent) must be clarified with the local authority (authority, chimney sweep, ...).**

3.5.2 Room air-independent operation

The combustion air is taken from the installation site. The unpressurised flow of the required air quantity must be ensured accordingly.



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

The minimum cross-sectional area of the supply air opening from outside depends on the nominal heat output of the boiler.

Austria	400 cm² net minimum cross-sectional area plus 4 cm² for every kW of nominal heat output above 100 kW
Germany	150 cm² net minimum cross-sectional area plus an additional 2 cm² for every further kW of nominal heat output above 50 kW

Examples

Minimum free cross-section [cm²]										
Nominal heat output [kW]	**10**	**15**	**20**	**30**	**50**	**100**	**150**	**250**	**350**	**500**
Austria	400	400	400	400	400	400	600	1000	1400	2000
Germany	150	150	150	150	150	250	350	550	750	1050

Combustion air can also be supplied from other rooms if it can be proven that sufficient combustion air can flow in whilst all mechanical and natural ventilation systems are in operation. The installation site must have a minimum volume in accordance with the applicable regional standards.

Note on standards

Austria:	OIB Guideline 3 - Hygiene, health and environmental protection
Germany:	Model Firing Ordinance (MFeuV)

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:

- ❒ 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 top-up water, always vent the filling hose before connecting it, in order to prevent air being drawn into the system
- ❒ Check that the heating water is clear and free of substances that can be deposited as sediments
- ❒ Check that the pH value is 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, as specified in VDI 2035
- ❒ The use of fully demineralised filling and top-up water with an electrical conductivity not exceeding 100 µS/cm is recommended by EN 14868
- ❒ After the first 6-8 weeks, check the heating water to ensure that the specified values are being adhered to
- ❒ Unless specified otherwise by regional standards and regulations, perform an annual check on the heating water

Filling and make-up water as well as heating water to VDI 2035 Sheet 1:2021-03:

Total heat output in kW	**Total earth alkalis in mol/m³ (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
- Annually: values must be recorded by the owner

Advantages of heating water treated in accordance with the 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

Frost protection

When operating the system with frost-protected heat transfer media, the following instructions and ÖNORM H 5195-2 must be observed:

- Antifreeze dosage according to the manufacturer's data sheet
  IMPORTANT: If the medium contains too much or too little antifreeze it becomes highly corrosive
- Adding antifreeze reduces the specific heat capacity of the medium; therefore design components (pumps, pipework, etc.) accordingly
- Add frost protection only to heat transfer medium in those areas that may be affected by frost (TIP: system separation)
- Check the antifreeze dosage regularly according to the manufacturer's instructions
- Dispose of frost-protected heat transfer medium at the end of its shelf life and refill the system

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 Return lift

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

NOTICE

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

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

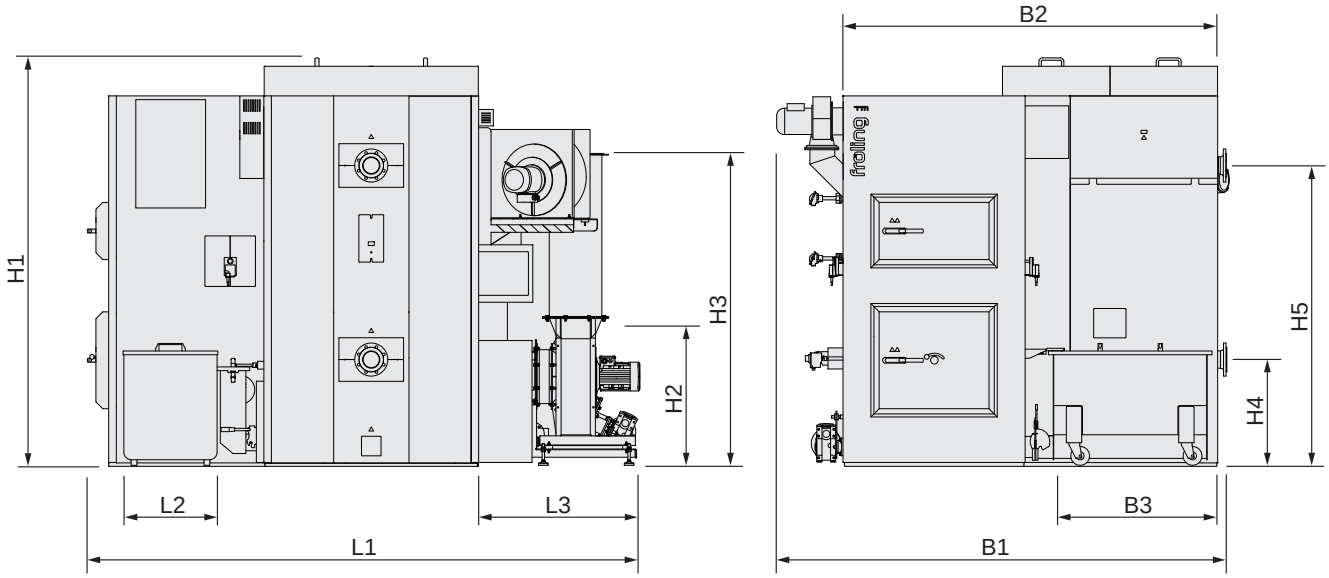
Take the following precautions:

❒ Regulations stipulate the use of a return temperature control.

↳ The minimum return temperature is 60 °C. We recommend fitting some kind of control device (e.g. thermometer).

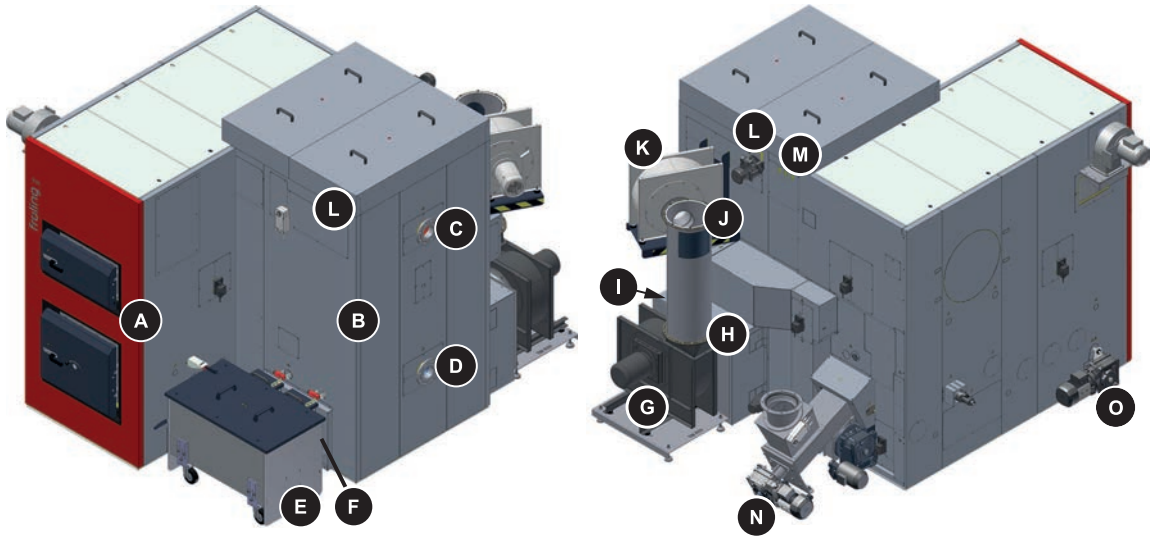
4 Technology

4.1 Dimensions



Dimension	Name		TM 320	TM 400-550
H1	Height of the boiler including insulation	mm	2560	2660
H2	Height of the stoker including burn back protection system		815	930
H3	Height of the flue gas pipe connection		2005	2075
H4	Height of the return connection		640	710
H5	Height of the flow connection		1850	2000
B1	Total width including fittings		2780	2990
B2	Width, boiler including insulation		2195	2495
B3	Width, combustion chamber ash container		730	1165
L1	Total length including fittings		3340	3595
L2	Length, combustion chamber ash container		600	630
L3	Length, stoker unit		940	1050

4.2 Components and connections



Item	Name	TM 320	TM 400-550
A	Combustion chamber	-	
B	Heat exchanger	-	
C	Boiler flow connection	DN100 / PN 16	
D	Boiler return connection	DN100 / PN 16	
E	Combustion chamber ash container	-	
F	Heat exchanger ash container	-	
G	Induced draught unit fan	-	
H	Flue gas pipe connection without FGR (flue gas recirculation)	300 mm	350 mm
I	Heat exchanger drainage	2“ IT	2“ IT
J	Flue gas pipe connection with FGR (flue gas recirculation)	300 mm	350 mm
K	FGR blower fan	-	
L	WOS drive ▪ TM 320: rear ▪ TM: 400-550: front	-	
M	Safety heat exchanger connection	3/4" ET	3/4" ET
	Air vent heat exchanger connection	1/2“ IT	1/2“ IT
N	Stoker unit	-	
O	Combustion chamber ash removal drive	-	

4.3 Technical data

4.3.1 TM 320-450

Name		TM 320	TM 400	TM 450
Rated heat output at nominal load	kW	320	399	450
Output range		96 - 320	119.7 - 399	135 – 450
Nominal thermal input of fuel with wood chips[1)]		341	424	481
Required fuel consumption at nominal load wood chips water content 30 %	kg/h	93	116	131
Nominal thermal input of fuel with pellets[1)]	kW	340	425	480
Required fuel consumption at nominal load pellets water content 8 %	kg/h	65	81	92
Boiler efficiency (NCV) with wood chips at nominal load / PL[2)]	%	93.8 / 94.7	94.1 / 95.7	93.6 / 95.7
Boiler efficiency (NCV) with wood pellets at nominal load / PL[2)]		94.0 / 91.8	93.8 / 91.8	93.7 / 91.9
Mains connection		400 V / 50 Hz		
Electrical fuses[3)]	A	C35		
Weight of the combustion chamber / fireclay / heat exchanger	kg	1450 / 2150 / 1600	2200 / 2700 / 2220	
Total dry weight including attachments		6330	8470	
Boiler capacity (water)	l	780	1040	
Minimum room height	mm	3100	3350	
Installation dimensions for the combustion chamber (L x W x H)		2550 x 1100 x 2020	2800 x 1150 x 2280	
Installation dimensions for the heat exchanger (L x W x H)		1310 x 1220 x 2440	1510 x 1410 x 2540	
Minimum ventilation opening to ÖNORM H 5170	cm²	1280	1596	1800
Water pressure drop (ΔT = 10 / 20 K)	mbar	12 / 2	11.5 / 3.2	13.5 / 4
Flow rate (ΔT = 10 / 20 K)	m³/h	27.5 / 13.8	34.5 / 17.2	38.7 / 19.3
Minimum boiler return temperature	°C	60		
Maximum boiler temperature setting		90		
Maximum permitted working overpressure	bar	6		
Boiler class to EN 303-5:2012		5		
Boiler category		1		
Airborne sound level of boiler	dB (A)	<70		
Duct sound power level[4)]		90	91	
1m measurement areas sound pressure level[5)]		67	68	
Permitted fuel to EN ISO 17225[6)]		Part 2: Wood pellets D06 / class A1		
		Part 4: Wood chips		
		P16s – P31s class A1+A2 / M35	P16s – P45s class A1+A2 / M35	

1. Rate thermal input at nominal load
2. Boiler efficiency in relation to heating value (NCV)
3. May vary depending on the system, see electrical diagram
4. Noise level in the pipe after the induced draught
5. Sound pressure level determined at 1m alongside the connected fan

Name	TM 320	TM 400	TM 450
6. Detailed information on the fuel can be found in the operating instructions in the section entitled “Permitted fuels”			

Product data in accordance with the regulations (EU) 2015/1187 and 2015/1189

Name		TM 320	TM 400	TM 450
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		
Preferred fuel		Wood chips, water content 15-35%		
Useful heat delivered at rated heat output (P_n)	kW	320	399	450
Useful heat delivered at 30% of rated heat output (P_p)		96	119.7	135
Fuel efficiency[1)] at rated heat output (η_n)	%	86.4	84.7	86.4
Fuel efficiency[1)] at 30% of rated heat output (η_p)		84.7	85.9	84.7
Auxiliary current consumption at rated heat output (el_{max})	W	634	847	1084
Auxiliary current consumption at 30% of rated heat output (η_p)		280	329	329
Auxiliary current consumption in standby mode (P_{SB})		25	24	24
Temperature controller used		PLC 4000 / Lambdatronic H3200		SPS 4000
Class of the temperature controller		II		
Contribution of the temperature controller to the EEL of a combined system	%	2		
Heating space annual rate of use ηs	%	81	82	82
Annual space heating emissions of dust (PM)[2)]	mg/m³	15	6	8
Annual space heating emissions of gaseous organic compounds (GOC)[2)]		< 1	< 1	< 1
Annual space heating emissions of carbon monoxide (CO)[2)]		86	76	69
Annual space heating emissions of nitrogen oxides (NOx)[2)]		94	63	65
Other permitted fuels		Compressed wood in the form of pellets		
Heating space annual rate of use ηs	%	81	81.2	81
Annual space heating emissions of dust (PM)[2)]	mg/m³	21	19	16
Annual space heating emissions of gaseous organic compounds (GOC)[2)]		114	73	37
Annual space heating emissions of carbon monoxide (CO)[2)]		118	128	136
Annual space heating emissions of nitrogen oxides (NOx)[2)]		< 2	< 3	< 3

1. Boiler efficiency in relation to the condenser (GCV)
2. Specified emission values refer to dry flue gas with an oxygen content of 10 % and under standard conditions at 0°C and 1013 bars

Test report used

Name	TM 320	TM 400	TM 450
Testing institute	TÜV[1)]		
Test report no.	23-IN-AT-UW-OÖ-EX-048/3		
Date of issue	22.05.2023		

1. TÜV AUSTRIA SERVICES GMBH, Industry & Energy, Environmental Protection Business Unit, Wiener Bundesstraße 8, A-4060 Leonding

4.3.2 TM 500-550

Name		TM 500	TM 550
Rated heat output at nominal load	kW	499	550
Output range		149.7 - 499	165 – 550
Nominal thermal input of fuel with wood chips[1)]		535	589
Required fuel consumption at nominal load wood chips water content 30 %	kg/h	145	160
Nominal thermal input of fuel with pellets[1)]	kW	534	-
Required fuel consumption at nominal load pellets water content 8 %	kg/h	102	-
Boiler efficiency (NCV) with wood chips at nominal load / PL[2)]	%	93.4 / 95.7	93.4 / 95.7
Boiler efficiency (NCV) with wood pellets at nominal load / PL[2)]		93.6 / 91.9	-
Mains connection		400 V / 50 Hz	
Electrical fuses[3)]	A	C35	
Weight of the combustion chamber / fireclay / heat exchanger	kg	2200 / 2700 / 2220	
Total dry weight including attachments		8470	
Boiler capacity (water)	l	1040	
Minimum room height	mm	3350	
Installation dimensions for the combustion chamber (L x W x H)		2800 x 1150 x 2280	
Installation dimensions for the heat exchanger (L x W x H)		1510 x 1410 x 2540	
Minimum ventilation opening to ÖNORM H 5170	cm²	1996	2200
Water pressure drop (ΔT = 10 / 20 K)	mbar	15.6 / 5.0	17.7 / 6.3
Flow rate (ΔT = 10 / 20 K)	m³/h	43 / 21.5	47.4 / 23.7
Minimum boiler return temperature	°C	60	
Maximum boiler temperature setting		90	
Maximum permitted working overpressure	bar	6	
Boiler class to EN 303-5:2012		5	
Boiler category		1	
Airborne sound level of boiler	dB (A)	< 70	
Duct sound power level[4)]		91	
1m measurement areas sound pressure level[5)]		68	
Permitted fuel to EN ISO 17225[6)]		Part 2: Wood pellets D06 / class A1	-
		Part 4: Wood chips P16s - P45s class A1+A2 / M35	

1. Rate thermal input at nominal load
2. Boiler efficiency in relation to heating value (NCV)
3. May vary depending on the system, see electrical diagram
4. Noise level in the pipe after the induced draught
5. Sound pressure level determined at 1m alongside the connected fan
6. Detailed information on the fuel can be found in the operating instructions in the section entitled “Permitted fuels”

Product data in accordance with the regulations (EU) 2015/1187 and 2015/1189

Name		TM 500	TM 550
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	
Preferred fuel		Wood chips, water content 15-35%	
Useful heat delivered at rated heat output (P_n)	kW	499	550
Useful heat delivered at 30% of rated heat output (P_p)		149.7	165
Fuel efficiency[1] at rated heat output (η_n)	%	84.2	84.2
Fuel efficiency[1] at 30% of rated heat output (η_p)		85.9	85.9
Auxiliary current consumption at rated heat output (el_{max})	W	1321	1558
Auxiliary current consumption at 30% of rated heat output (η_p)		329	329
Auxiliary current consumption in standby mode (P_{SB})		24	24
Temperature controller used		PLC 4000 / Lambdatronic H3200	SPS 4000
Class of the temperature controller		II	
Contribution of the temperature controller to the EEL of a combined system	%	2	
Heating space annual rate of use ηs		81.9	81.9
Annual space heating emissions of dust (PM)[2]	mg/m³	8	8
Annual space heating emissions of gaseous organic compounds (GOC)[2]		76	76
Annual space heating emissions of carbon monoxide (CO)[2]		64	64
Annual space heating emissions of nitrogen oxides (NOx)[2]		< 1	< 1
Other permitted fuels		Compressed wood in the form of pellets	
Heating space annual rate of use ηs	%	81.6	-
Annual space heating emissions of dust (PM)[2]	mg/m³	15	-
Annual space heating emissions of gaseous organic compounds (GOC)[2]		< 3	-
Annual space heating emissions of carbon monoxide (CO)[2]		21	-
Annual space heating emissions of nitrogen oxides (NOx)[2]		141	-

1. Boiler efficiency in relation to the condenser (GCV)
2. Specified emission values refer to dry flue gas with an oxygen content of 10 % and under standard conditions at 0°C and 1013 bars

Test report used

Name	TM 500	TM 550
Testing institute	TÜV[1)]	
Test report no.	23-IN-AT-UW-OÖ-EX-048/3	
Date of issue	22.05.2023	

1. TÜV AUSTRIA SERVICES GMBH, Industry & Energy, Environmental Protection Business Unit, Wiener Bundesstraße 8, A-4060 Leonding

4.3.3 Boiler data for planning the flue gas system

Name		TM 320	TM 400	TM 450
Flue gas temperature at nominal load	°C	140		
Flue gas temperature at partial load		110		
CO_2- volume concentration at nominal load / partial load	%	11.3 / 11.3		
O_2-Volume concentration at nominal load/partial load		9 / 9		
Required feed pressure at outlet of induced draught housing at nominal load	Pa	5		
Required feed pressure at outlet of induced draught housing at partial load		2		
Recommended maximum chimney draught		60		
Flue gas pipe diameter	mm	300	350	
FGR pipe diameter		180		
Flue gas volumetric flow rate for wood chips water content 30%, residual oxygen content 9%	m^3/h	1025	1280	1440
Flue gas gravimetric flow rate for wood chips water content 30%, residual oxygen content 9%	kg/h	865	1080	1215
Flue gas volumetric flow for wood pellets water content 8%, Residual oxygen content 9%	m^3/h	870	1090	1225
Flue gas gravimetric flow for wood pellets water content 8%, Residual oxygen content 9%	kg/h	745	930	1045
Flue gas volumetric flow rate for wood chips based on dry flue gas at standard temperature and pressure (0°C, 1013 mbar)	m^3/h	590	735	830
Flue gas gravimetric flow rate for wood chips based on dry flue gas at standard temperature and pressure (0°C, 1013 mbar)	kg/h	795	990	1120
Flue gas volumetric flow rate for wood pellets based on dry flue gas at standard temperature and pressure (0°C, 1013 mbar)	m^3/h	540	675	760
Flue gas gravimetric flow rate for wood pellets based on dry flue gas at standard temperature and pressure (0°C, 1013 mbar)	kg/h	730	910	1030

Name		TM 500	TM 550
Flue gas temperature at nominal load	°C	140	
Flue gas temperature at partial load		110	
CO_2- volume concentration at nominal load / partial load	%	11.3 / 11.3	
O_2-Volume concentration at nominal load/partial load		9 / 9	

Name		TM 500	TM 550
Required feed pressure at outlet of induced draught housing at nominal load	Pa	5	
Required feed pressure at outlet of induced draught housing at partial load		2	
Recommended maximum chimney draught		60	
Flue gas pipe diameter	mm	350	
FGR pipe diameter		180	
Flue gas volumetric flow rate for wood chips water content 30%, residual oxygen content 9%	m^3/h	1600	1760
Flue gas gravimetric flow rate for wood chips water content 30%, residual oxygen content 9%	kg/h	1350	1485
Flue gas volumetric flow for wood pellets water content 8%, Residual oxygen content 9%	m^3/h	1360	-
Flue gas gravimetric flow for wood pellets water content 8%, Residual oxygen content 9%	kg/h	1160	-
Flue gas volumetric flow rate for wood chips based on dry flue gas at standard temperature and pressure (0°C, 1013 mbar)	m^3/h	920	1015
Flue gas gravimetric flow rate for wood chips based on dry flue gas at standard temperature and pressure (0°C, 1013 mbar)	kg/h	1240	1365
Flue gas volumetric flow rate for wood pellets based on dry flue gas at standard temperature and pressure (0°C, 1013 mbar)	m^3/h	845	-
Flue gas gravimetric flow rate for wood pellets based on dry flue gas at standard temperature and pressure (0°C, 1013 mbar)	kg/h	1140	-

5 Assembly

⚠ WARNING

Risk of falling when working at a height

Therefore:

❒ Implement appropriate measures in accordance with the applicable national industrial safety guidelines to protect against the risk of falling (e.g. ladders, platforms, etc.)

5.1 Transport

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

❒ Unloading, positioning and installation should only be performed by trained professionals! Staff must be trained in techniques for moving heavy loads (correct tools and lifting equipment, hooking and slinging points, etc.)

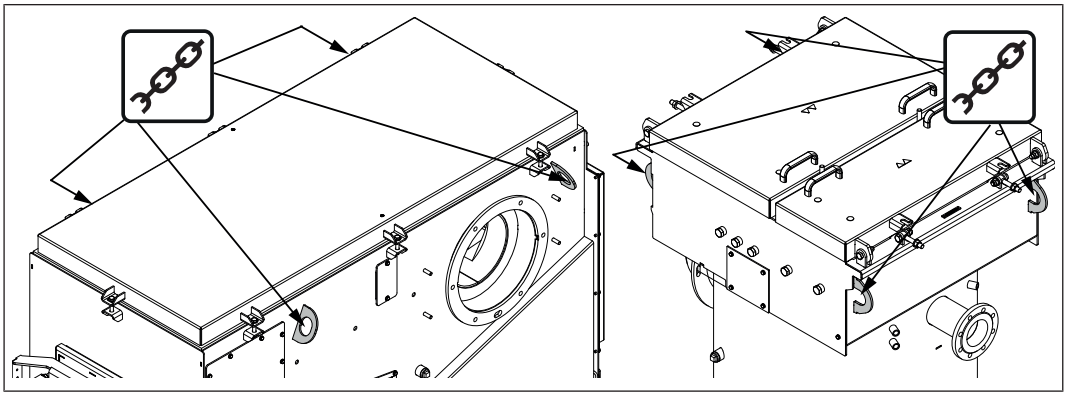
5.2 Temporary storage

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

❒ Store components at a protected location, which is dry and free from dust

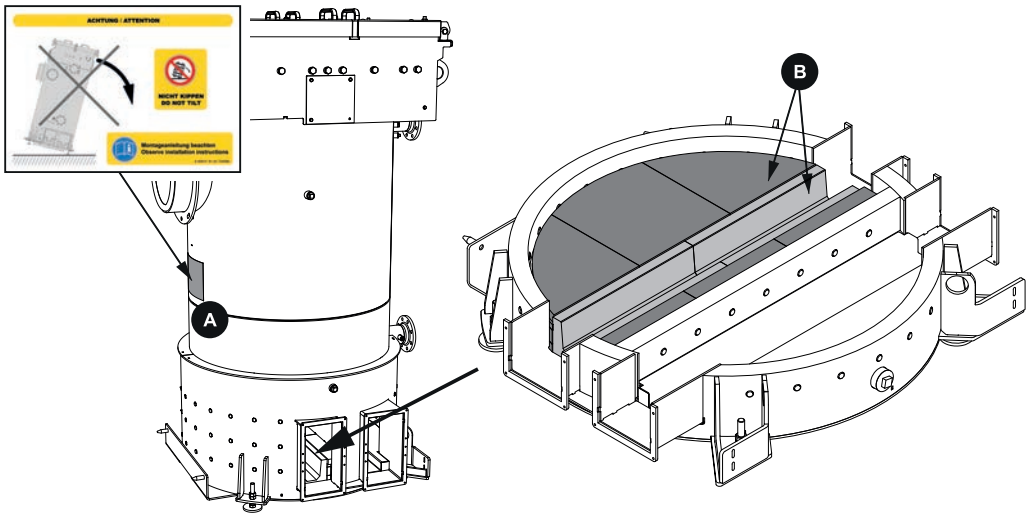
↳ Damp conditions and frost can damage components, particularly electric ones!

5.3 Positioning



❒ Secure the slings or similar lifting gear to the attachment points and position the boiler

5.3.1 Installing the heat exchanger

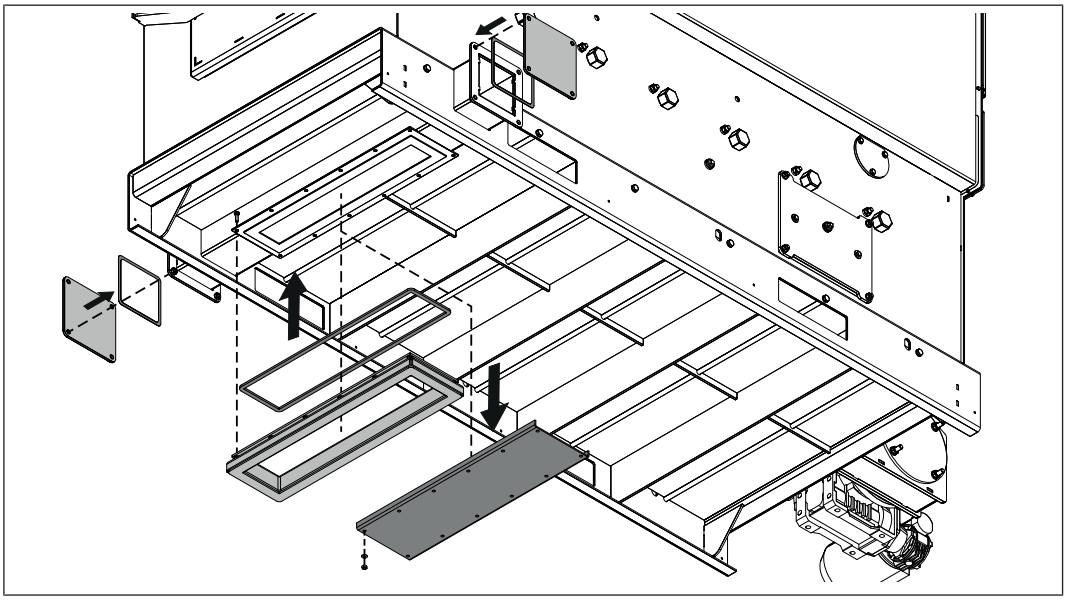


CAUTION: Do not tilt the heat exchanger during installation or assembly! – see sticker (A).

After positioning the heat exchanger, check the correct position of the firebricks (B).

5.3.2 Fitting the underfloor ash removal system (optional)

If an underfloor ash removal system (optional) is to be installed, the adapter should be fitted as follows when the combustion chamber is being positioned.



- ❒ Remove the blanking plate on the underside of the combustion chamber
- ❒ Fit the underfloor ash removal system adapter and the seal
- ❒ Secure the ash duct on the left and right of the combustion chamber using blanking plates

5.4 Setting up in the boiler room

5.4.1 Moving the boiler in the boiler room

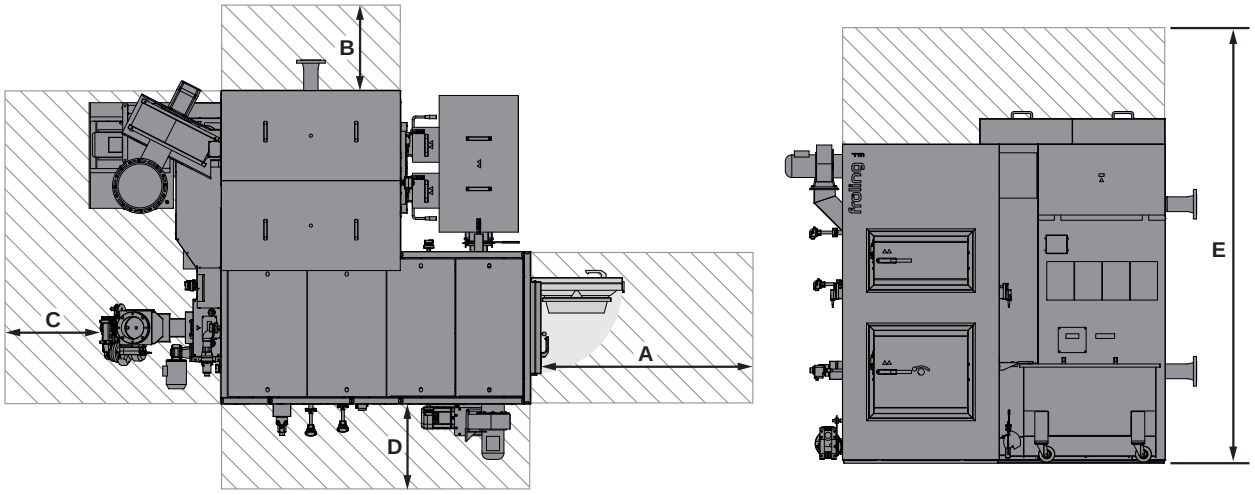
❒ Position a forklift or similar lifting device with a suitable load-bearing capacity at the base frame

❒ 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!

5.4.2 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)



Item	320	400-550
A	1000	1000
B	500	500
C	500	500
D	870	950
E	3100	3300

5.5 Installing the boiler

NOTICE

Reduction in performance due to air leakage

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

Therefore:

❒ Sealing cords or the surface sealant provided must be used on all the flanged connections on the following components: loading; ash removal; pressure ducting; air ducts; combustion air fan; flue gas and flue gas return piping.

5.5.1 General information

Front and back of boiler

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

The back of the boiler is opposite the front. The stoker unit and the complete flue gas system are on the back of the boiler.

Heat exchanger on the left or right

A general distinction is made between whether the heat exchanger is located on the left or right of the combustion chamber (as seen from the front = operating side). Before you start installation, check whether the heat exchanger is to be installed on the left or on the right. In some cases this is already indicated on the layout drawing.

NOTICE! The figures below show the assembly steps for installing a heat exchanger on the right, unless stated otherwise. If the heat exchanger is to be installed on the left, the steps should be carried out in the same way but on the other side.

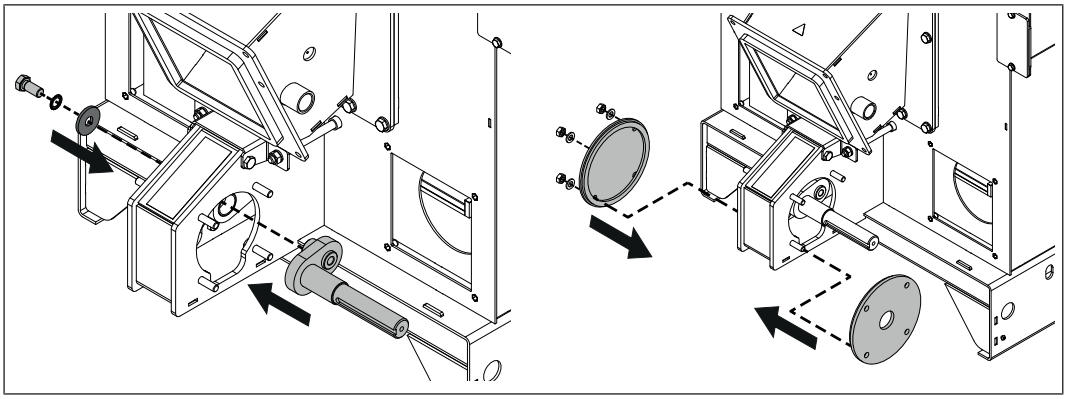
Turbomat TM boiler size

The majority of the images shown in these assembly instructions refer to the Turbomat TM 320. The assembly steps are the same for boiler sizes 320-550.

The only differences in installation for the TM 320 as compared to the TM 400-550 are described separately in the section entitled “Mounting the insulating side panels”.

➲ "Installing the insulating side panels" [▸ 50]

5.5.2 Installing the grate drive



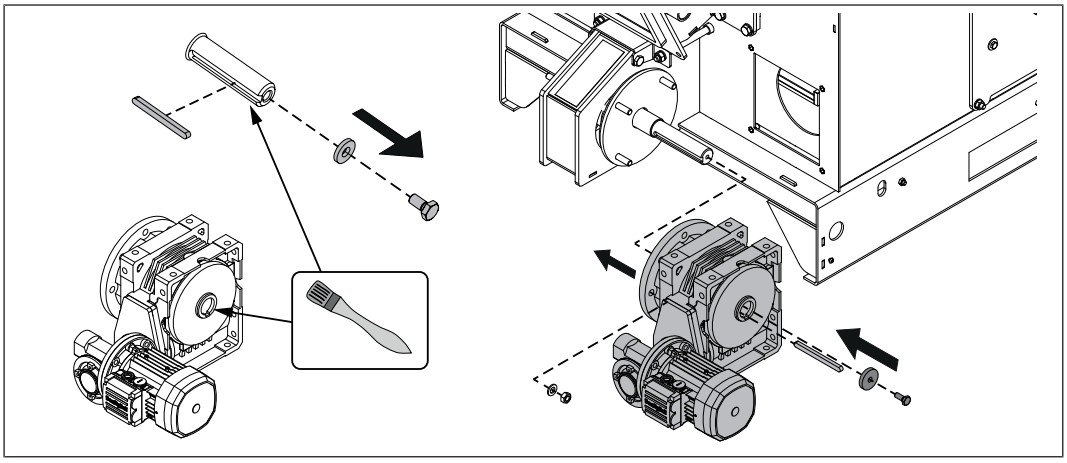
❒ Install the crankshaft
- 1x hexagonal screw M16 x 35

↳ Push/pull the moving grate forwards with the help of a suitable tool

↳ The shaft stub is on the opposite side of the heat exchanger

❒ Fit the blanking flange and thread the cover plate on to the crankshaft
- 4x hexagonal nuts M12

Heat exchanger on the right:



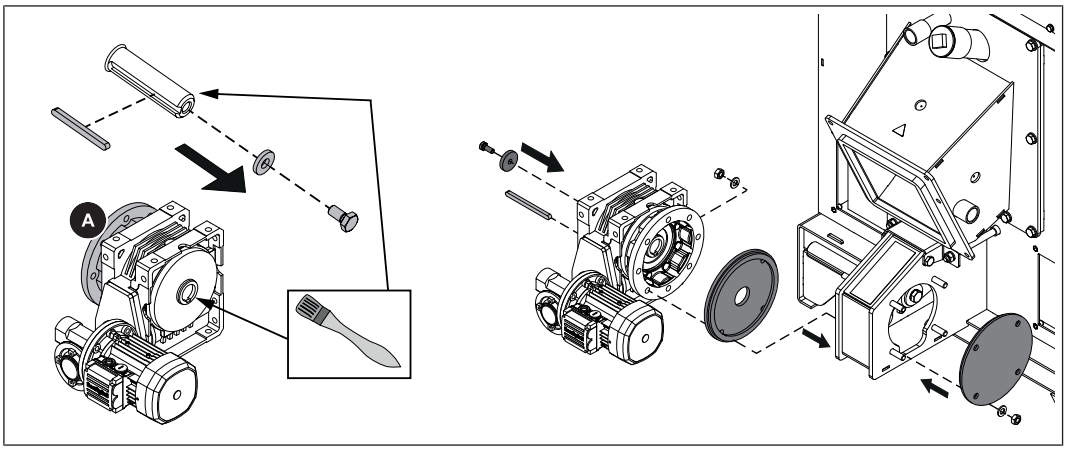
❒ Remove the locking screw, spacer washer and fitted key from the shaft stub

❒ Grease the shaft stub with copper paste and fit the geared motor
- 4x hexagonal nuts M12

↳ With the help of a suitable tool, position the crank shaft so that the slot is aligned with the slot of the gearbox

❒ Slide the fitted key into the slot and fit the shaft retainer
- hexagonal screw M10 x 25

Heat exchanger on the left:



❒ Remove the locking screw, spacer washer and fitted key from the shaft stub

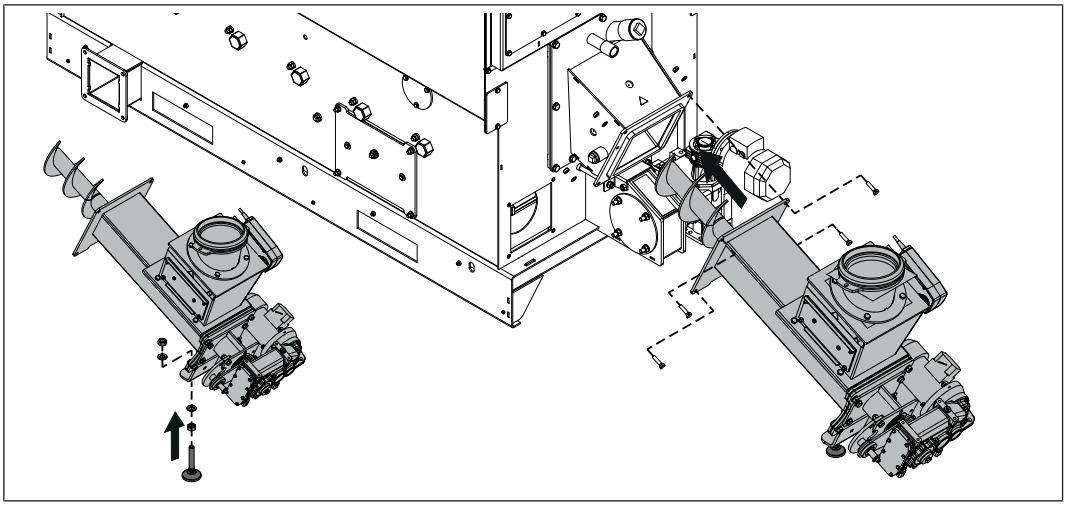
❒ Fit the flange coupling (A) to the opposite side of the gear assembly

❒ Grease the shaft stub with copper paste and fit the geared motor
- 4x hexagonal nuts M12

↳ With the help of a suitable tool, position the crank shaft so that the slot is aligned with the slot of the gearbox

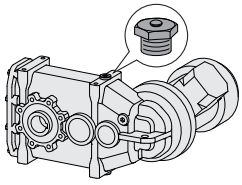
❒ Slide the fitted key into the slot and fit the shaft retainer
- hexagonal screw M10 x 25

5.5.3 Assembling the stoker unit



❒ Remove the pre-assembled adjustable foot, turn it and refit it

❒ Mount the stoker unit on to the slide-on duct and use the adjustable foot to align it
- 4x hexagonal screws M10 x 40

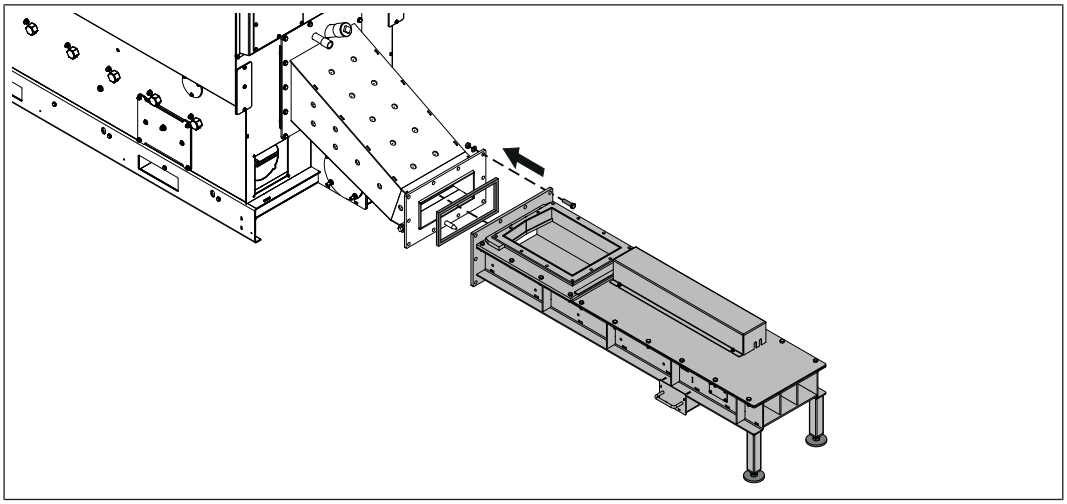


For the STM geared motor:

❒ Remove the blanking plug from the highest point of the geared motor and insert the vent screw that is supplied

❒ Fit the discharge system (feed screw, etc.) according to the installation instructions enclosed

5.5.4 Installing the hydraulic stoker unit (optional)

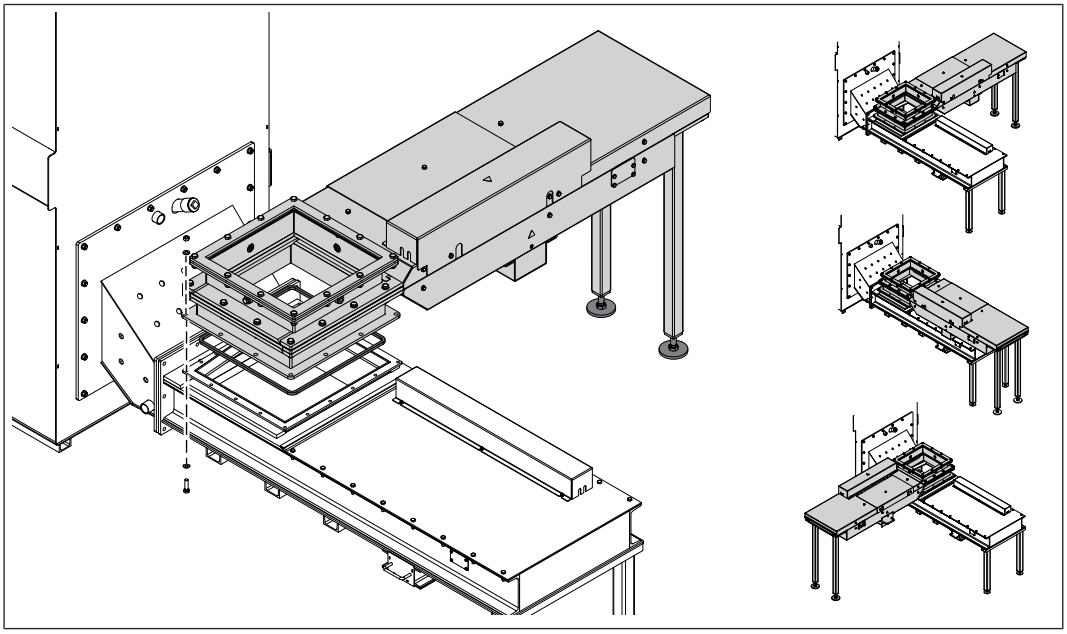


❒ Mount the hydraulic stoker unit on to the slide-on duct and align it with the adjustable feet
- 10x hexagonal screws M16 x 60

❒ Fit the discharge system (feed screw, etc.) according to the installation instructions enclosed

5.5.5 Fitting the burn back slide valve

The burn back slide valve can be positioned as shown below depending on the space available in the installation room – follow the installation diagram!

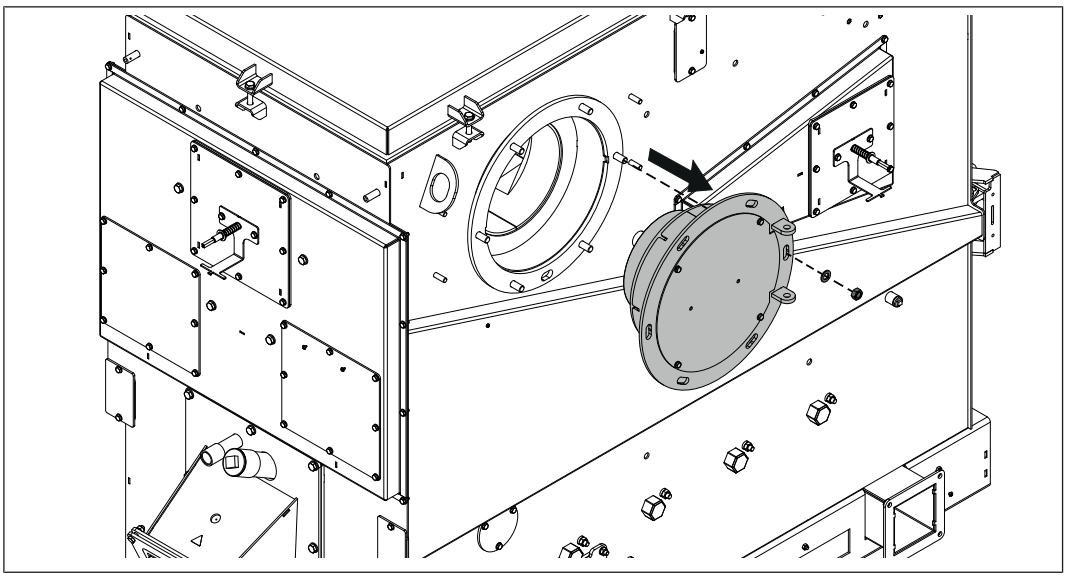


❒ Mount the burn back sliding valve including the gasket on to the hydraulic stoker, and use the adjustable foot to align it
- 12x hexagon screws M12 x 45

❒ Fit the discharge system (feed screw, etc.) according to the installation instructions enclosed

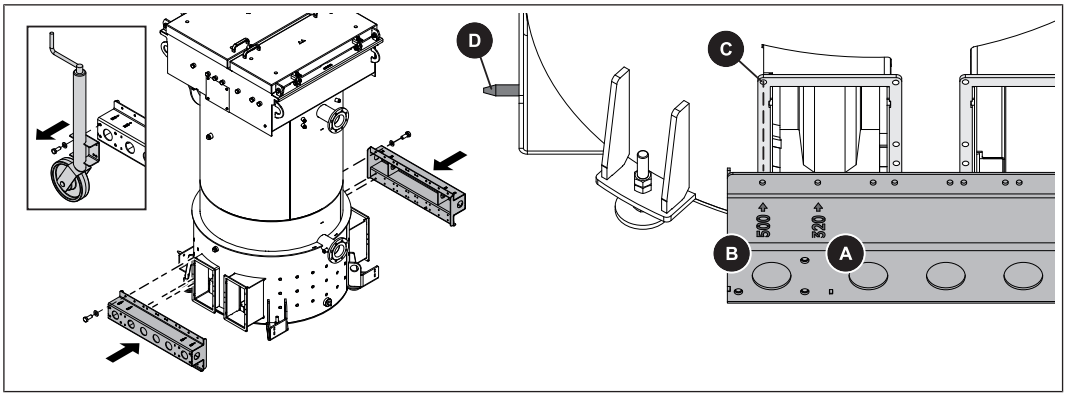
5.5.6 Bolting together the combustion chamber and heat exchanger

In the delivery configuration, the blanking plate is mounted on the left-hand flange on the combustion chamber, meaning the heat exchanger can be mounted on the right. If the heat exchanger is positioned on the left, change over the blanking plate as follows.



❒ Remove the blanking plate and mount it on the flange on the opposite side of the combustion chamber
- 6x hexagon nuts M16

TIP: Use lifting gear for positioning the heat exchanger (obtainable from Fröling GesmbH)

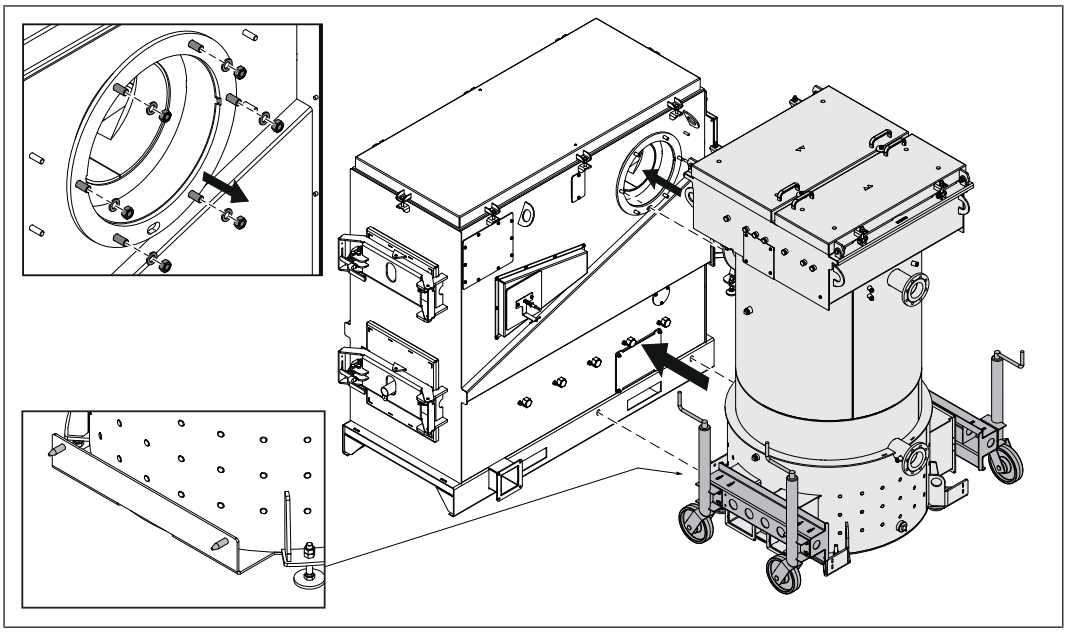


❒ Remove the support wheels from the lifting brackets
- 4 hexagonal screws M12 x 35

❒ Mount the lifting brackets on to the ash removal flanges of the heat exchanger
- 12x hexagon screws M8 x 20 per lifting bracket

  ↳ **Turbomat 320:** Marking “320” (A) points to the hole (C) on the ash removal flange which is nearest to the locking bolt (D)

  ↳ **Turbomat 400-550:** Marking “500” (B) points to the hole (C) on the ash removal flange which is nearest to the locking bolt (D)

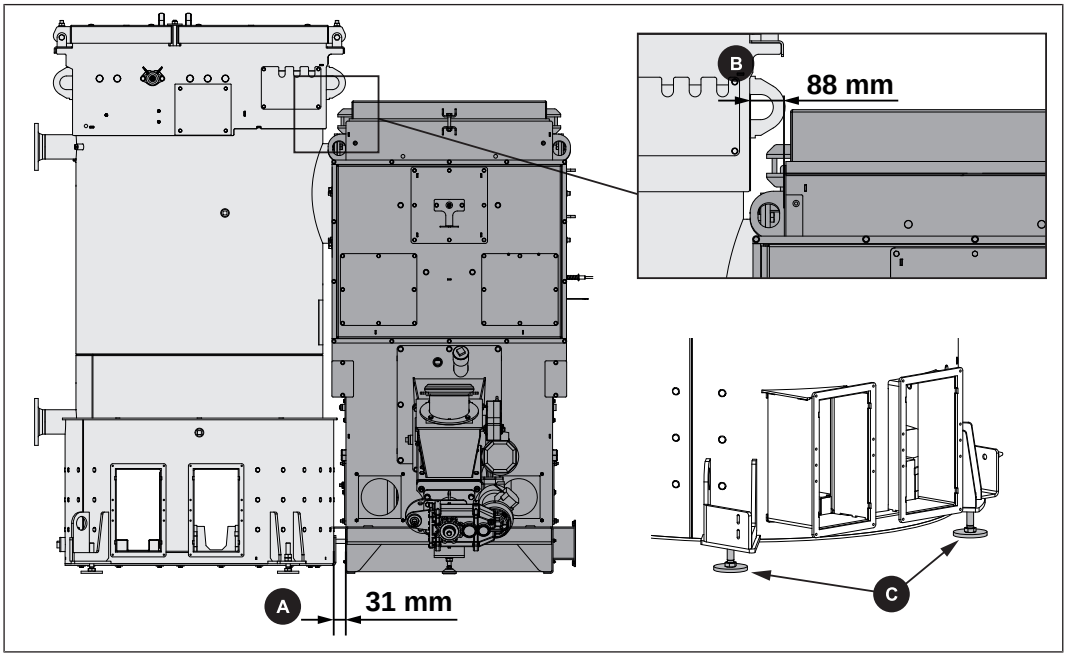


❒ Remove the bolts on the combustion chamber

❒ Check the seal on the heat exchanger flange

❒ Mount the heat exchanger on the combustion chamber
- 6x hexagon nuts M16

↳ Ensure that the locating pins are inserted correctly



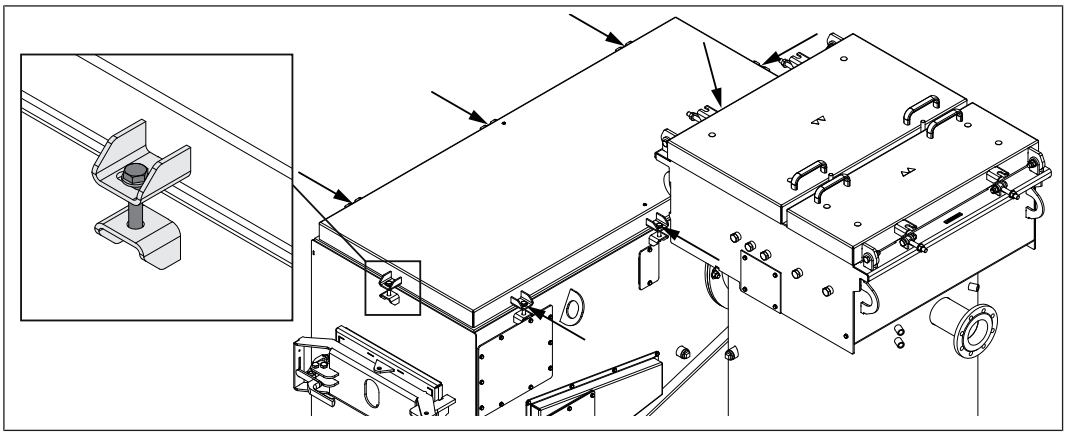
❒ Check the distance between the heat exchanger and the combustion chamber

↳ A – bottom: **31 mm**

↳ B – top: **88 mm**

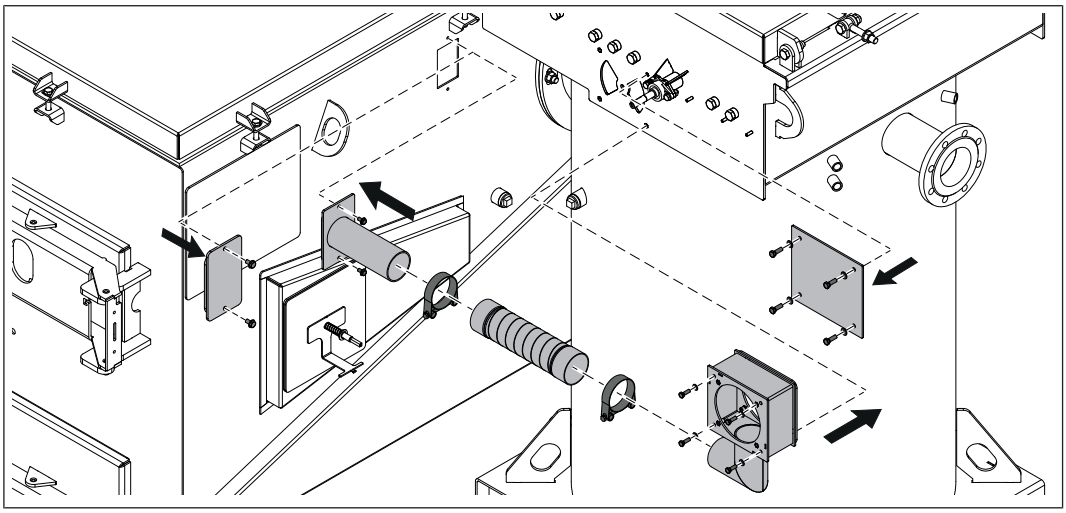
↳ Maximum permissible deviation: **+/- 6 mm**

❒ Ensure the entire system is level by adjusting the feet (C)



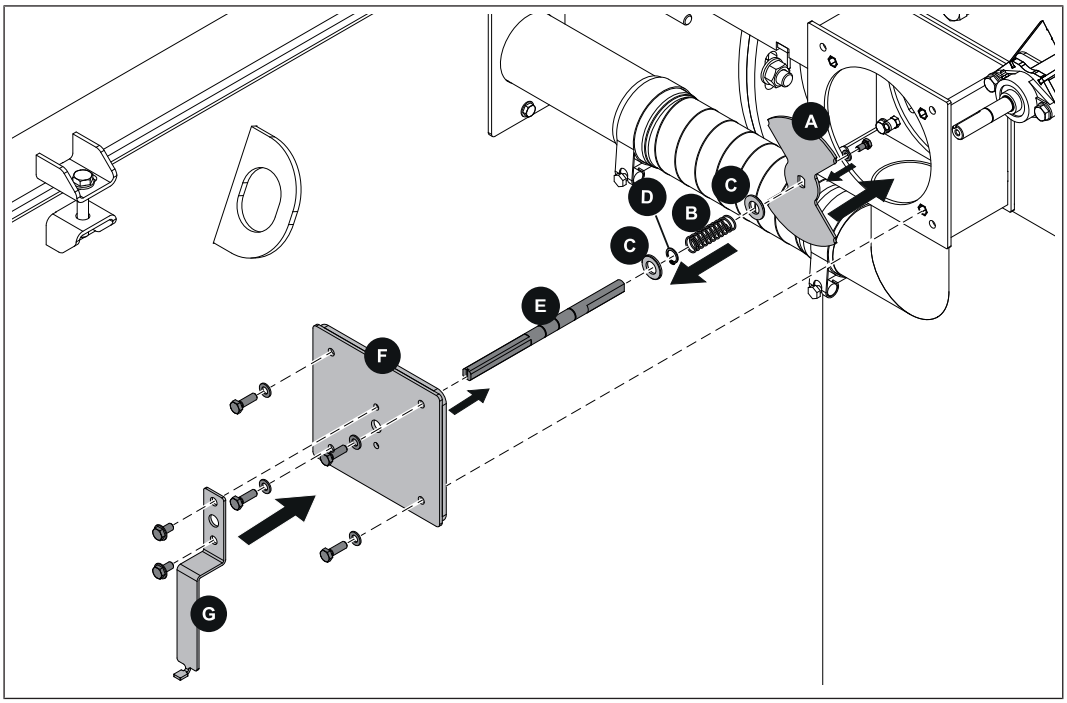
❒ Tighten the screw fastenings for the combustion chamber cover
- 8x hexagon screws M12 x 70

5.5.7 Assembling the case cooling duct (optional)



❒ Remove the blanking plates from the combustion chamber and the heat exchanger

❒ Install the case cooling duct to the high-temperature hose between the heat exchanger and the combustion chamber
- 4x hexagon screws M8 x 25 (heat exchanger)
- 2x hexagon screws M8 x 16 (combustion chamber)



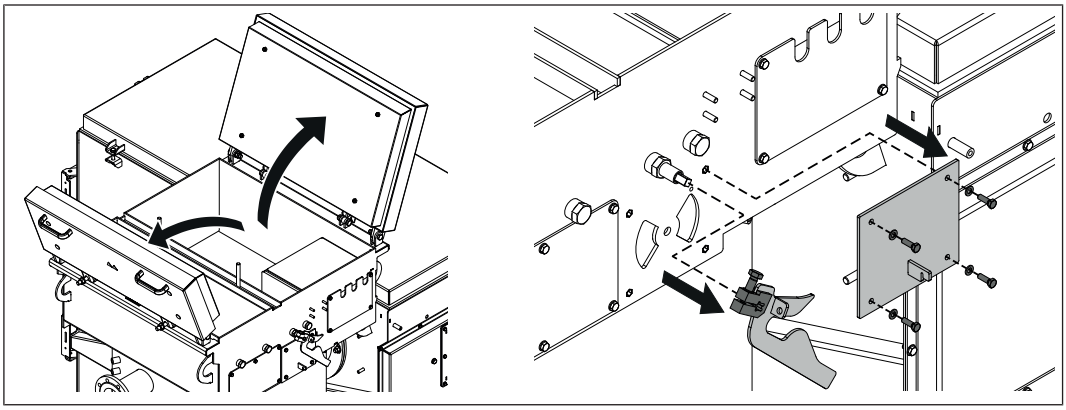
❒ Assemble the air flap (A) with the pressure spring (B), spacer washer (C) and circlip (D) to the air damper (E) and insert it into the duct
- 1x hexagonal screw M6 x 12

❒ Insert the cover plate (F) on to the air damper and attach it to the duct
- 4x hexagonal screws M8 x 25

❒ Mount the torque support (G) for the servo-motor on to the cover plate
- 2x hexagonal nuts M8 x 16

5.5.8 Change over the WOS rods to suit the heat exchanger on the left (Turbomat TM 320)

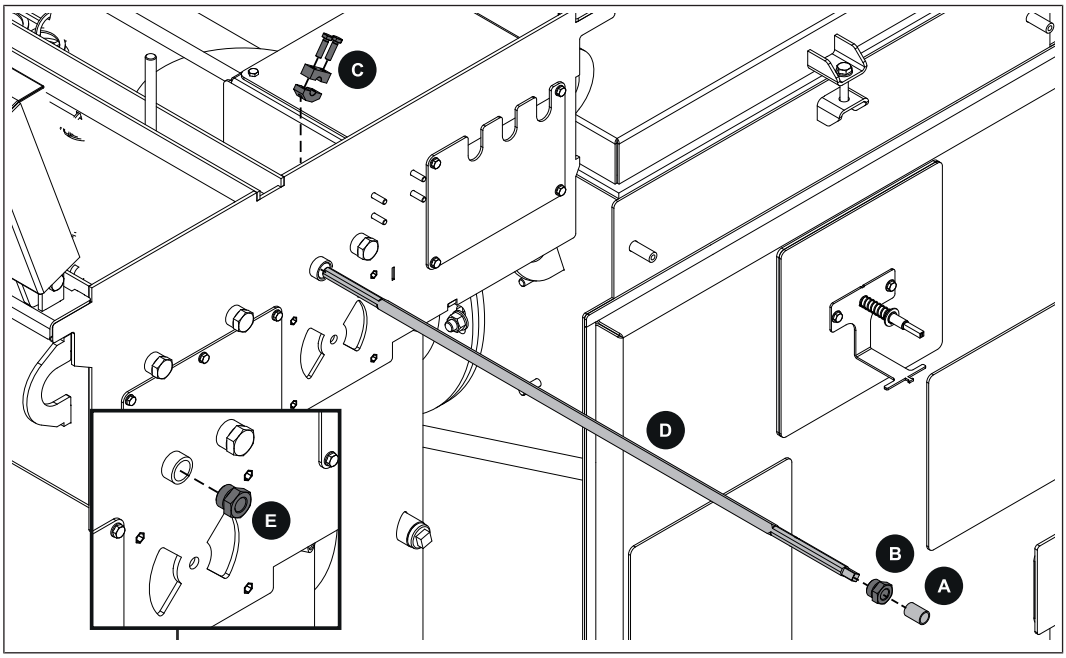
The WOS drive is always fitted at the back of the boiler. If the heat exchanger is installed on the left, you will need to change over the WOS rods as follows.



❒ Open the heat exchanger cover

❒ Loosen the clamping pad and pull the WOS lever off the shaft
- 1x hexagon screw M12 x 35

❒ Remove the cover plate together with the tension hook and mount it on the opposite side
- 4x hexagon screws M8 x 25



❒ Remove the spacer sleeve (A) and bearing bush (B) from the shaft

❒ Remove the clamping pad (C) and pull out the WOS shaft (D)
- 2x hexagonal screws M10 x 35

❒ Remove the blanking plug (E) from the opposite side

❒ Turn the WOS shaft 180°, reinsert it from the opposite side carrying the washer and push it through

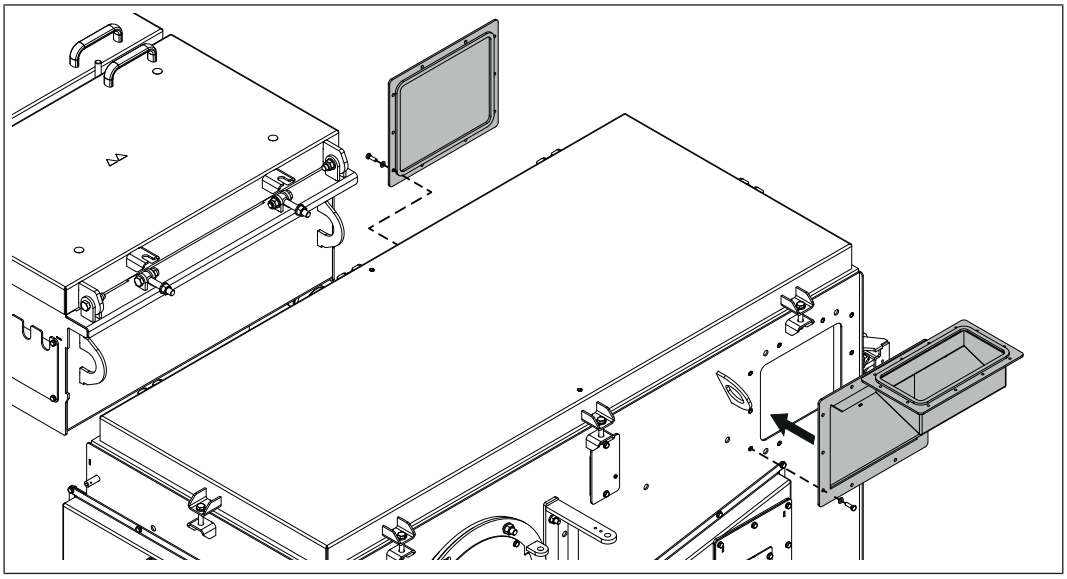
❒ Replace the bearing bush and blanking plug that you removed previously on the opposite side

❒ Fix the shaft in place with the help of the securing pin

❒ Slide the spacer sleeve and WOS lever on to the shaft on the opposite side and fix them in place using the clamping pad

↳ Axial clearance: 2 mm

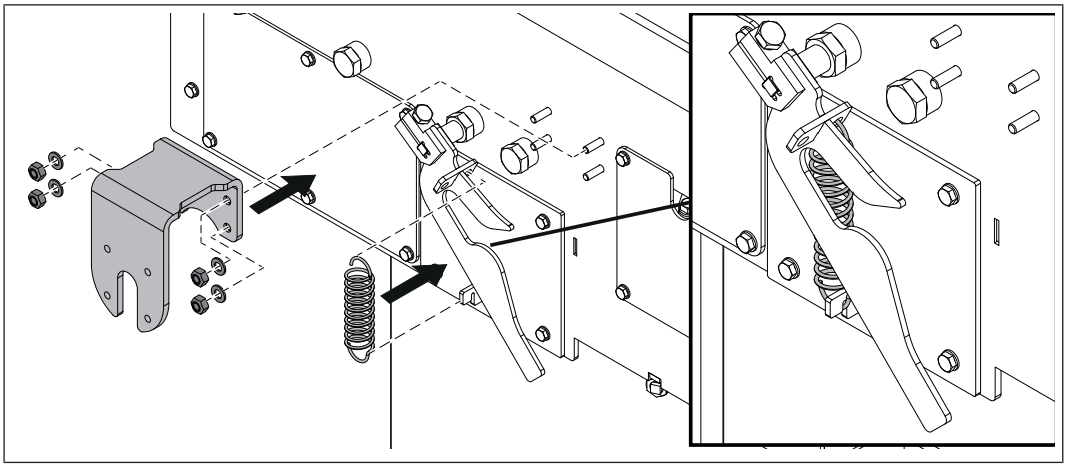
5.5.9 Fitting various attachment parts



❒ Mount the supply air duct for the combustion air fan on the combustion chamber opposite the heat exchanger
- 10x hexagon screws M8 x 25

↳ Version with heat exchanger on the left: Remove the blanking plate from the right and replace it on the left
- 10x hexagon screws M8 x 25

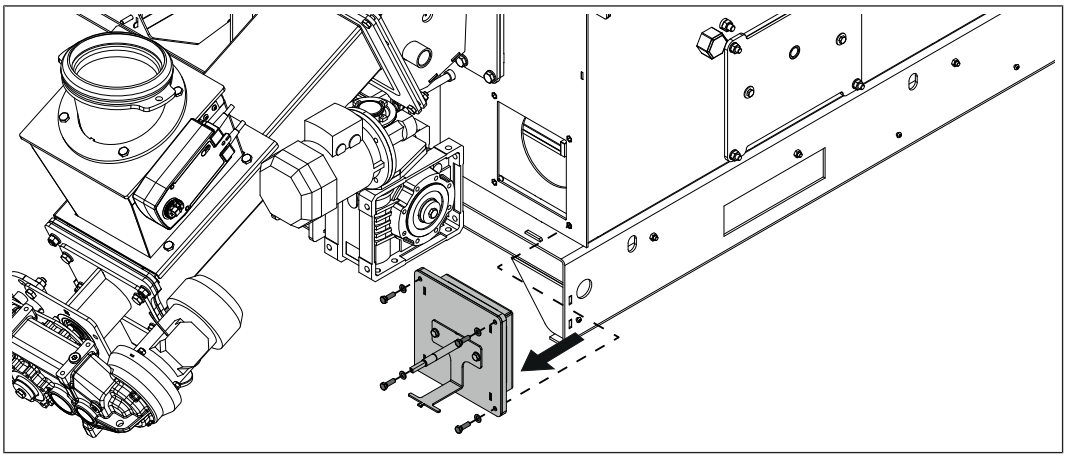
For the Turbomat TM 320:



❒ Attach the tension springs to the clamping hook and WOS lever

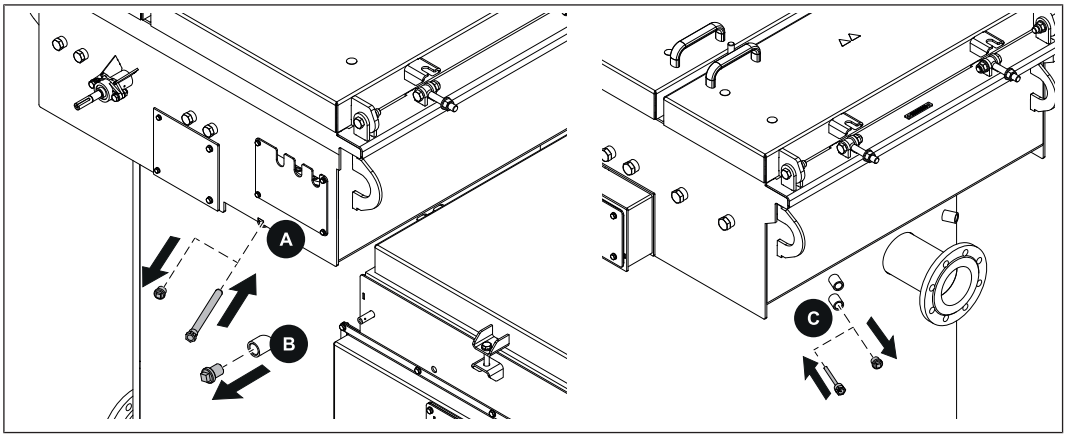
❒ Attach the motor mount for the WOS drive to the threaded studs on the heat exchanger
- 4x hexagonal nuts M8 yellow galvanised

Version with heat exchanger on the left:



❒ Remove the primary air controller and reinstall it on the opposite side of the stoker - 4x hexagon screws M8 x 25

5.5.10 Removing the different blanking plugs

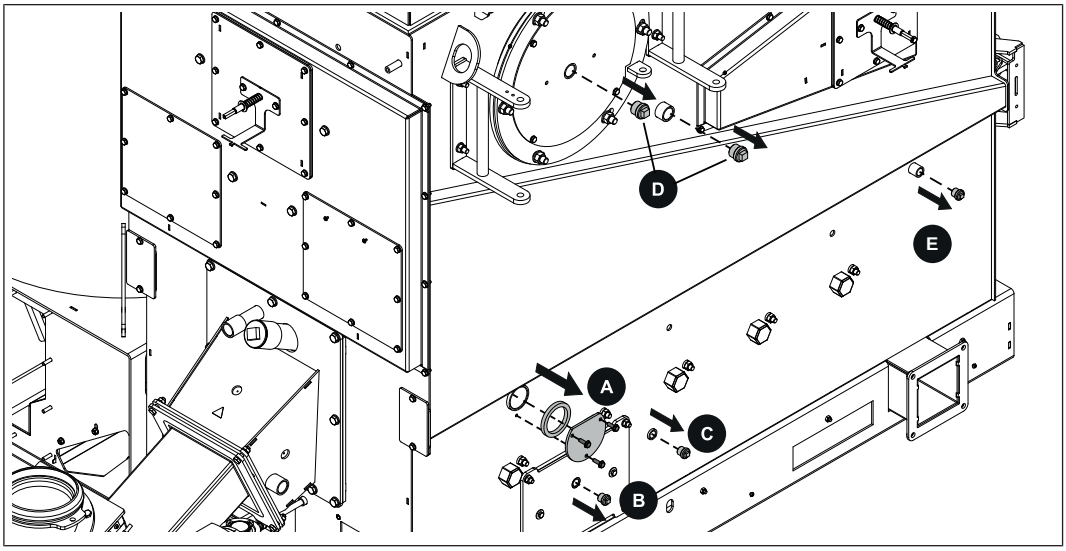


❒ Remove the thermal discharge valve blanking plug (A) and seal the immersion sleeve

❒ Remove the blanking plug for connecting the slide-on duct cooling (B) from the back of the heat exchanger

Where required:

❒ Remove the blanking plug and seal the additional immersion sleeve (C) under the flow temperature sensor on the outside of the heat exchanger

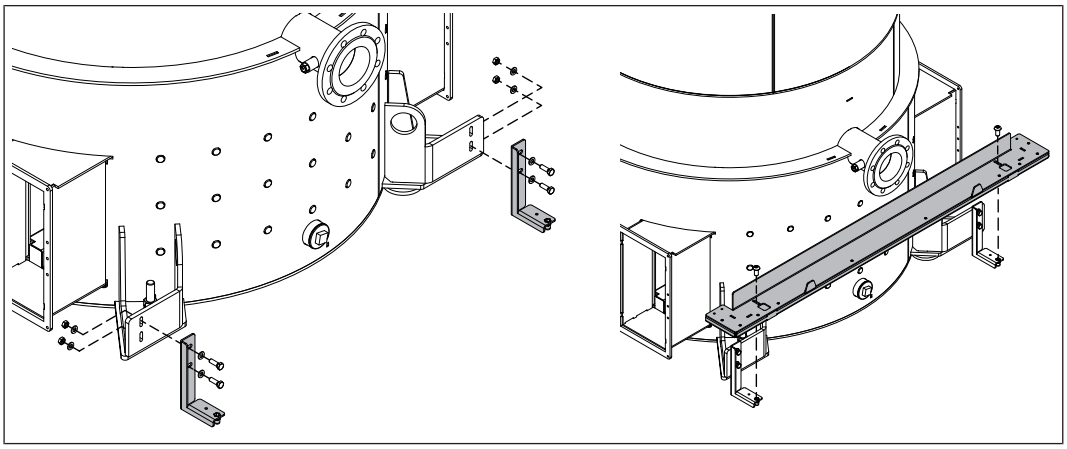


❒ Remove the blanking plate for automatic ignition (A) from the combustion chamber

❒ Remove the blanking plug for the temperature sensor under the moving grate (B) and under the under-pressure controller (C)

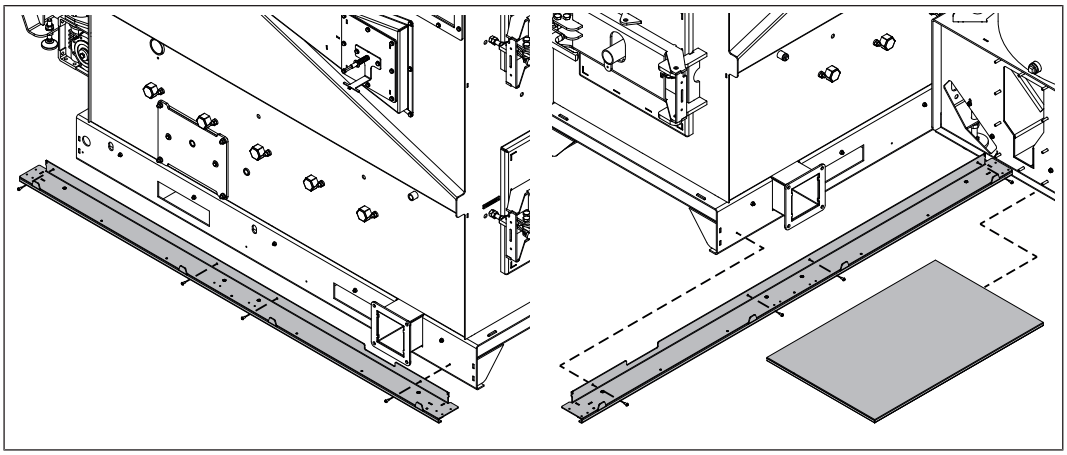
❒ Remove the blanking plug for the combustion chamber temperature sensor (D) and the combustion chamber overpressure monitor (E)

5.5.11 Assembling the insulation floor base frame



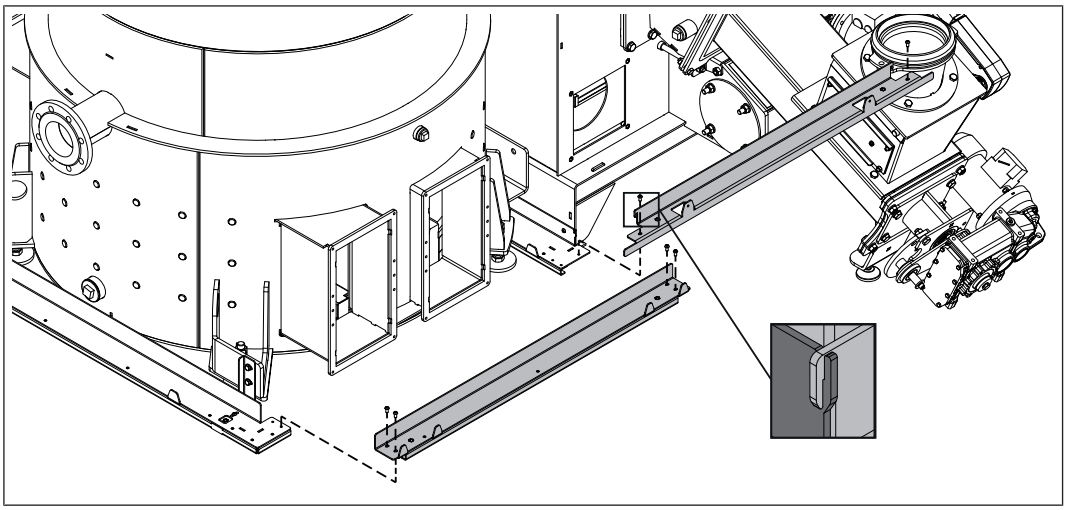
❒ Mount the angled elements on the heat exchanger
- 2x hexagon screws M8 x 30 for each angled element

❒ Attach a lengthways strut to the angled elements
- 2x raised head screws M6 x 12



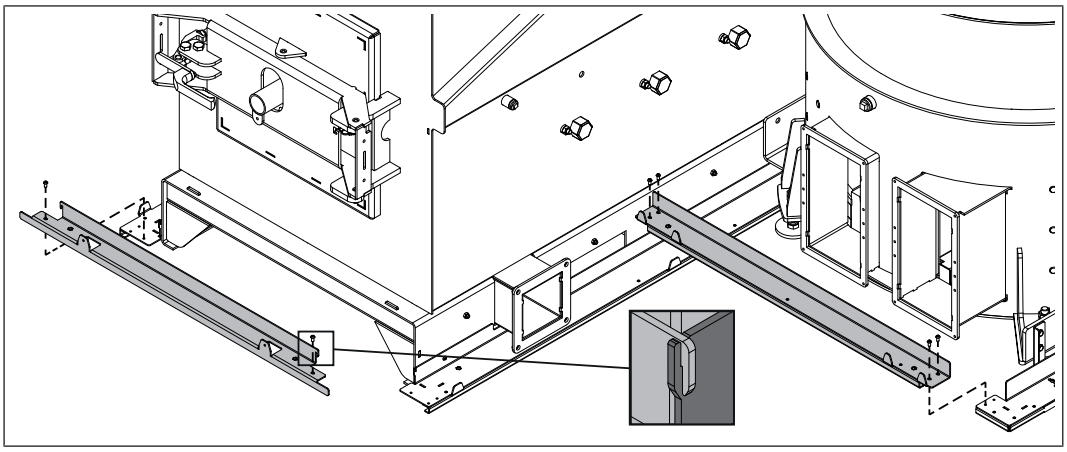
❒ Fit the lengthways struts to both sides of the combustion chamber
- 4x raised head screws M6 x 12 per lengthways strut

❒ Slide the floor insulation under the heat exchanger



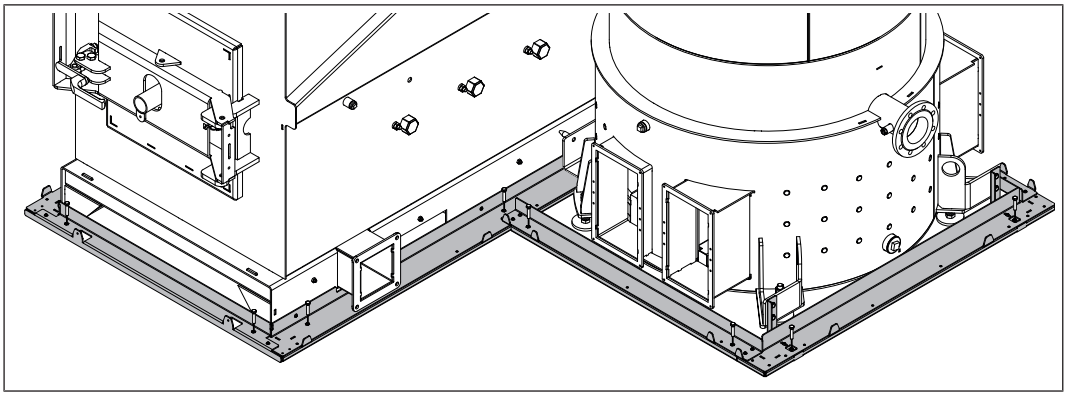
❒ Fit the rear cross pieces to the lengthways struts
- 4x raised head screws M6 x 12 (cross piece for the heat exchanger)
- 2x raised head screws M6 x 12 (cross piece for the combustion chamber)

↳ Ensure that the lugs on the cross-pieces and lengthways struts on the combustion chamber slot into each other correctly

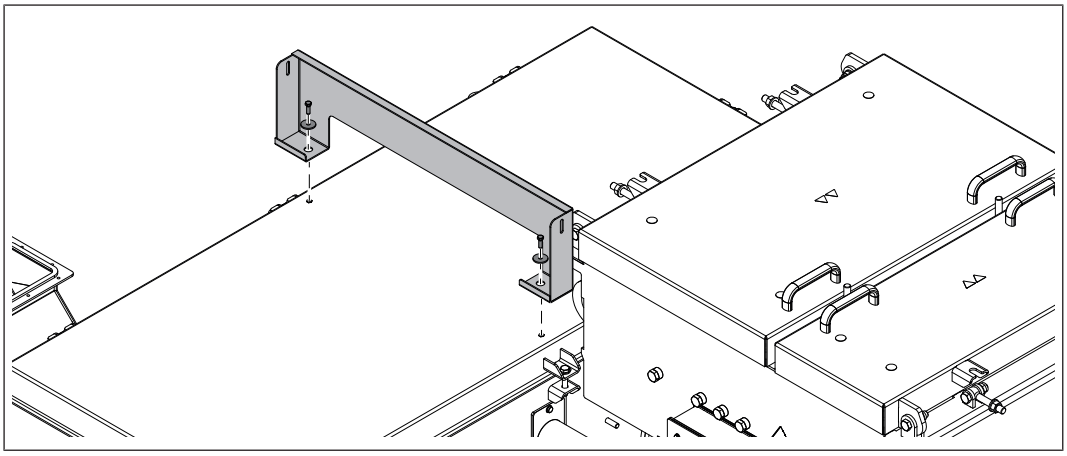


❒ Fit the front cross pieces to the lengthways struts
- 4x raised head screws M6 x 12 (cross piece for the heat exchanger)
- 2x raised head screws M6 x 12 (cross piece for the combustion chamber)

❒ Ensure that the lugs on the cross-pieces and lengthways struts on the combustion chamber slot into each other correctly

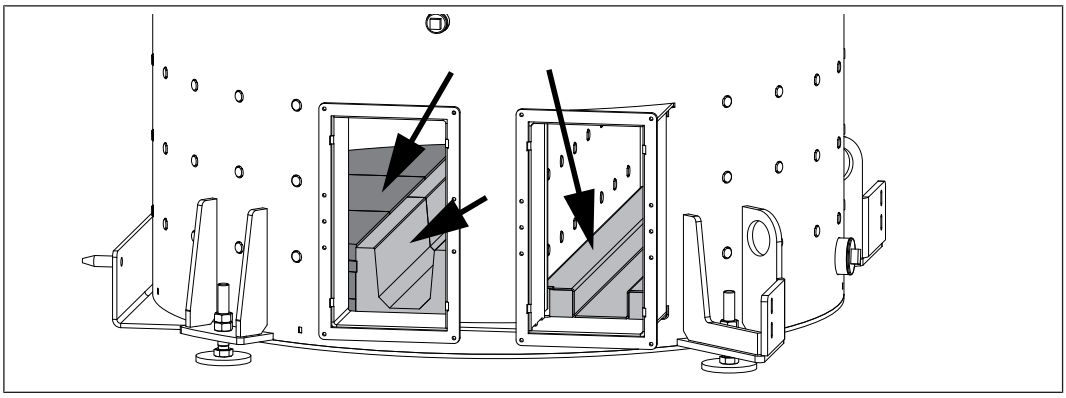


❒ Fit the hexagonal screws to the entire base frame to provide support- 18x hexagonal screws M8 x 40
- 18x hexagonal screws M8 x 40

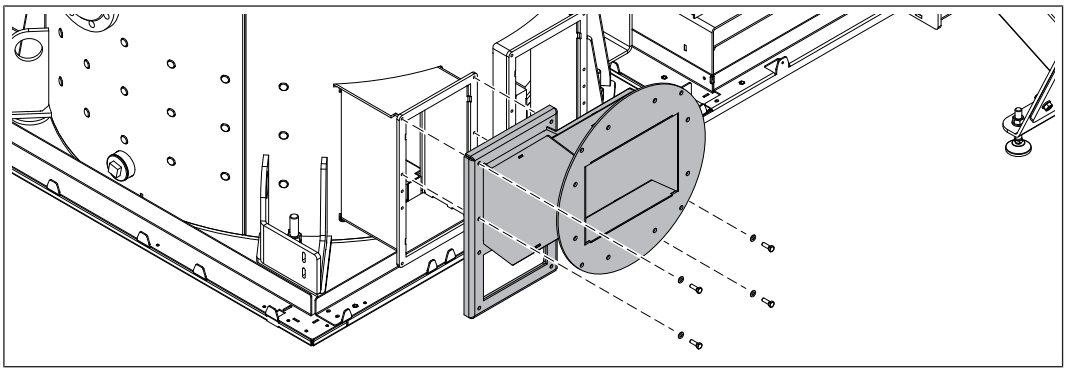


❒ Fit the upper frame element in the middle of the combustion chamber
- 2x hexagon screws M8 x 25

5.5.12 Assembling the flange for the heat exchanger ash removal system

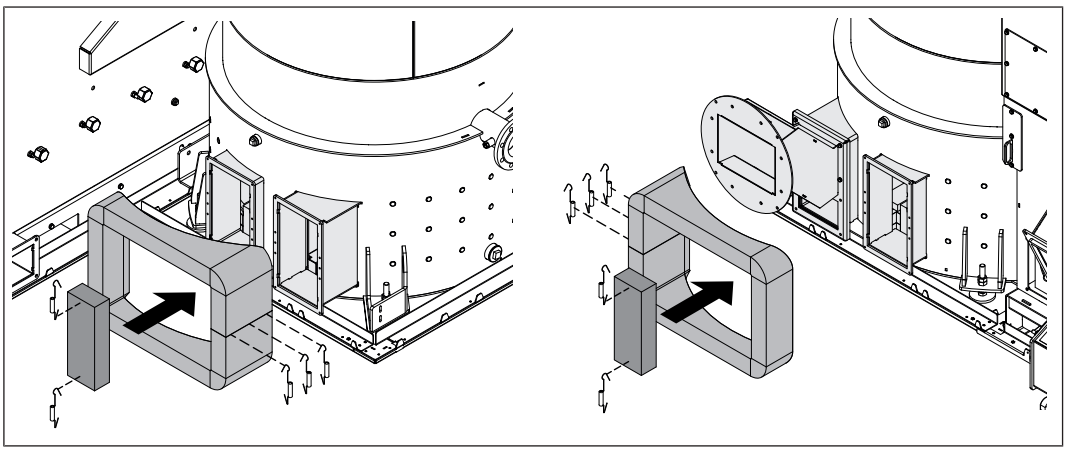


❒ Ensure that the firebricks on the floor of heat exchanger are positioned correctly



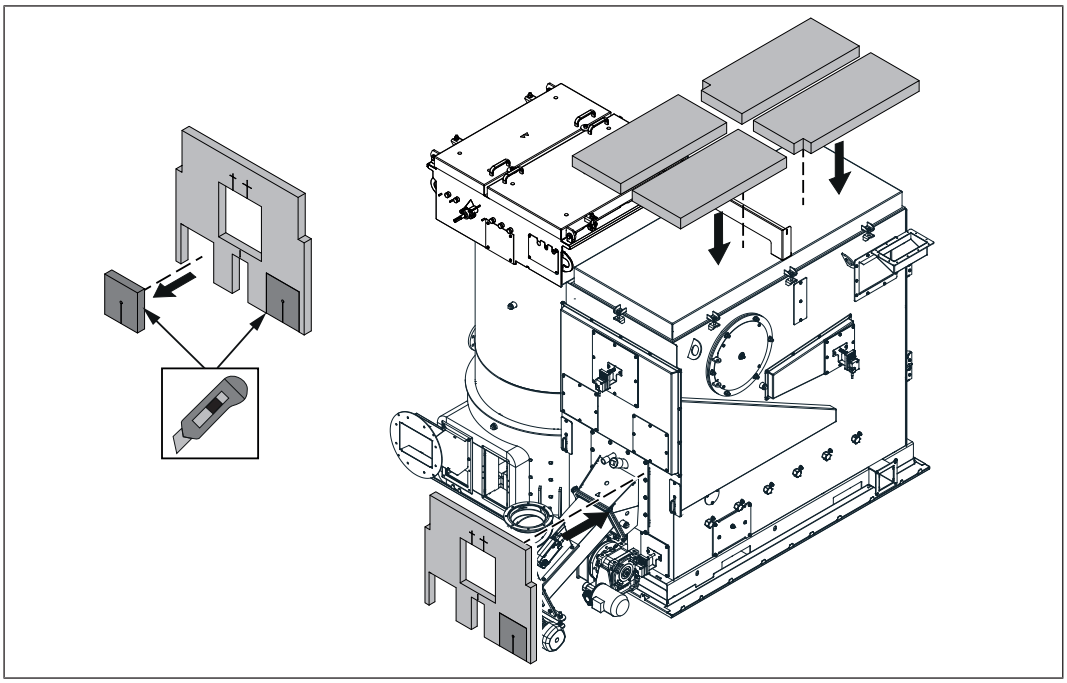
❒ Fit the flange for the induced draught to the heat exchanger
- 4x hexagon screws M8 x 40

5.5.13 Fitting thermal insulation to the boiler



❒ Wrap thermal insulation over ash removal flanges at the front and back and secure with three tension springs

❒ Secure rectangular thermal insulation between the ash removal flanges at the front and back with two tension springs

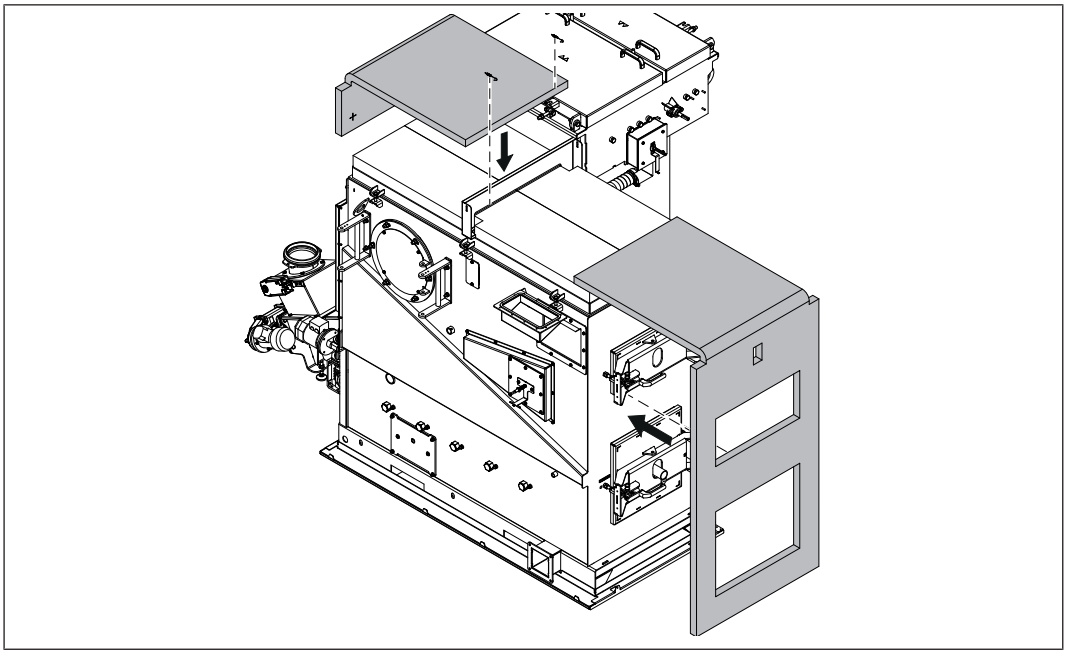


❒ Lay 4 insulating panels on top of the combustion chamber

❒ Cut into the thermal insulation around the air controller for primary air, but do not remove the insulating material

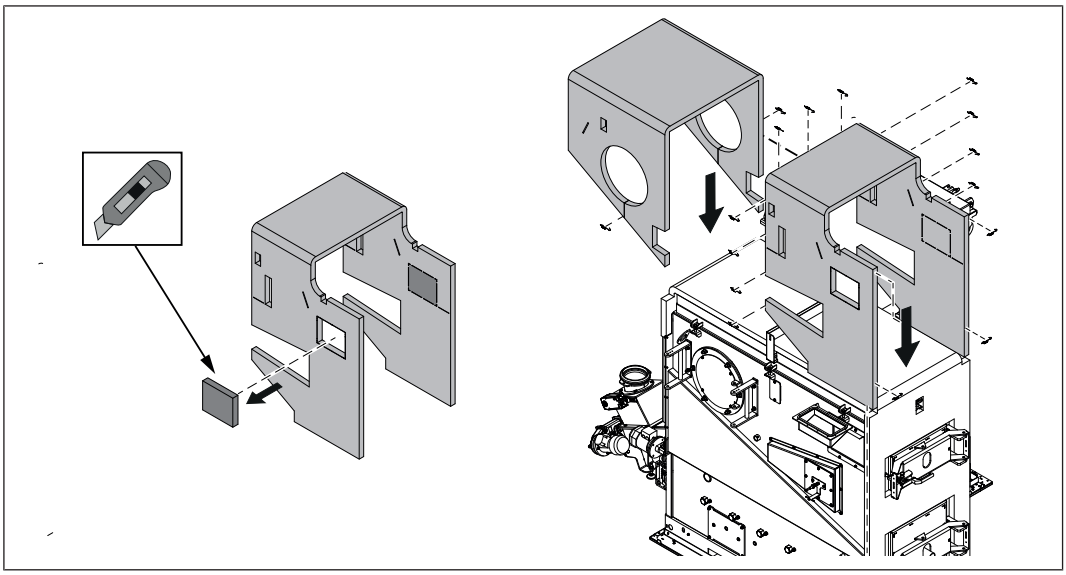
❒ Cut out the perforations from the thermal insulation mat around the FGR duct, and remove the insulating material

❒ Attach the thermal insulation mat to the back of the combustion chamber to the slide-on duct



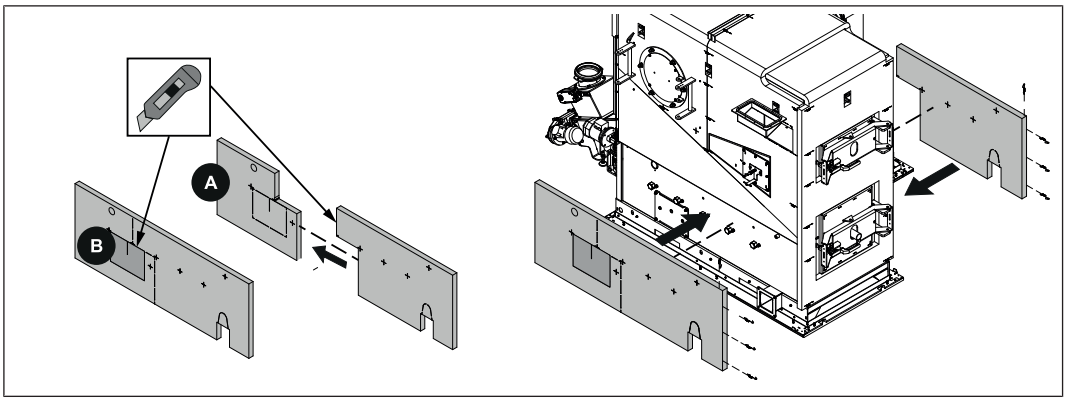
❒ Lay the thermal insulation mat over the combustion chamber from the front

❒ Lay the thermal insulation mat over the back of the combustion chamber and attach to the front thermal insulation mat using tension springs



❒ Cut out the perforations from the front thermal insulation mat around the supply air duct, and remove the insulating material

❒ Lay the thermal insulation mats on top of the combustion chamber and fix them in place using tension springs

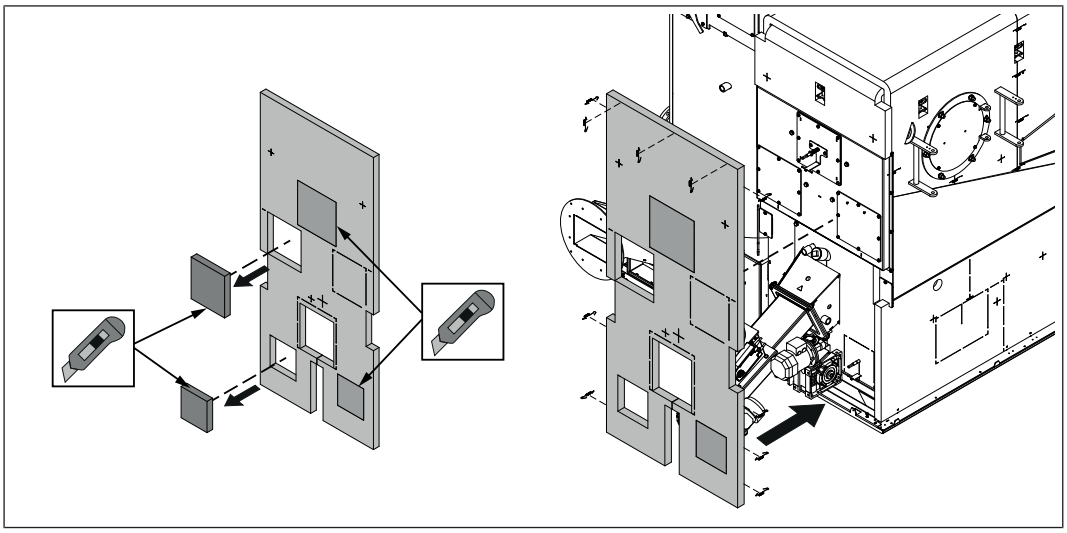


❒ Cut through and remove the rear part of the thermal insulation (A) from the thermal insulation mat to be attached to the side of the heat exchanger

❒ Cut out the material behind the perforations from the thermal insulation mat mounted on the combustion chamber opposite the heat exchanger, but do not remove the insulating material

↳ Maintenance area under the moving grate

❒ Position the thermal insulation mats on the side of the combustion chamber and fix them in place using tension springs

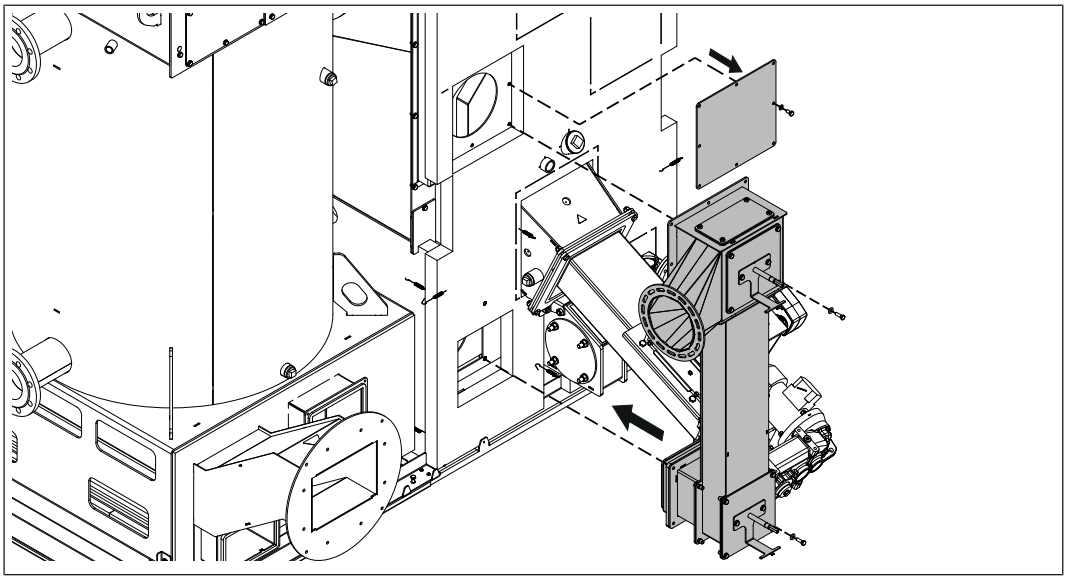


❒ Cut out the perforations from the thermal insulation mat around the FGR duct, and remove the insulating material

❒ Cut into the thermal insulation around the air controller for secondary air, but do not remove the insulating material

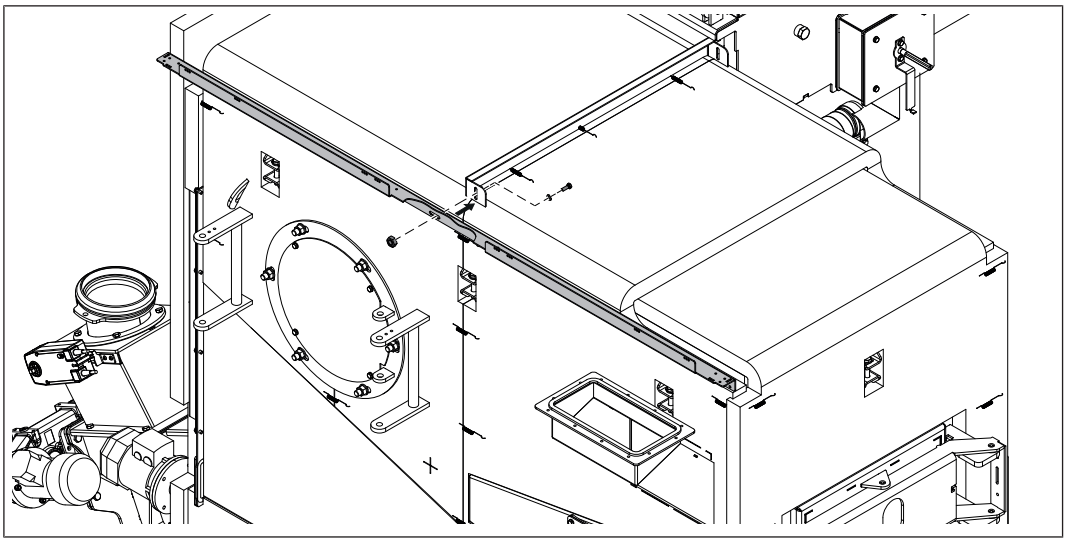
❒ Position the thermal insulation mat on the back of the combustion chamber and fix in place using tension springs

5.5.14 Assembling the FGR duct



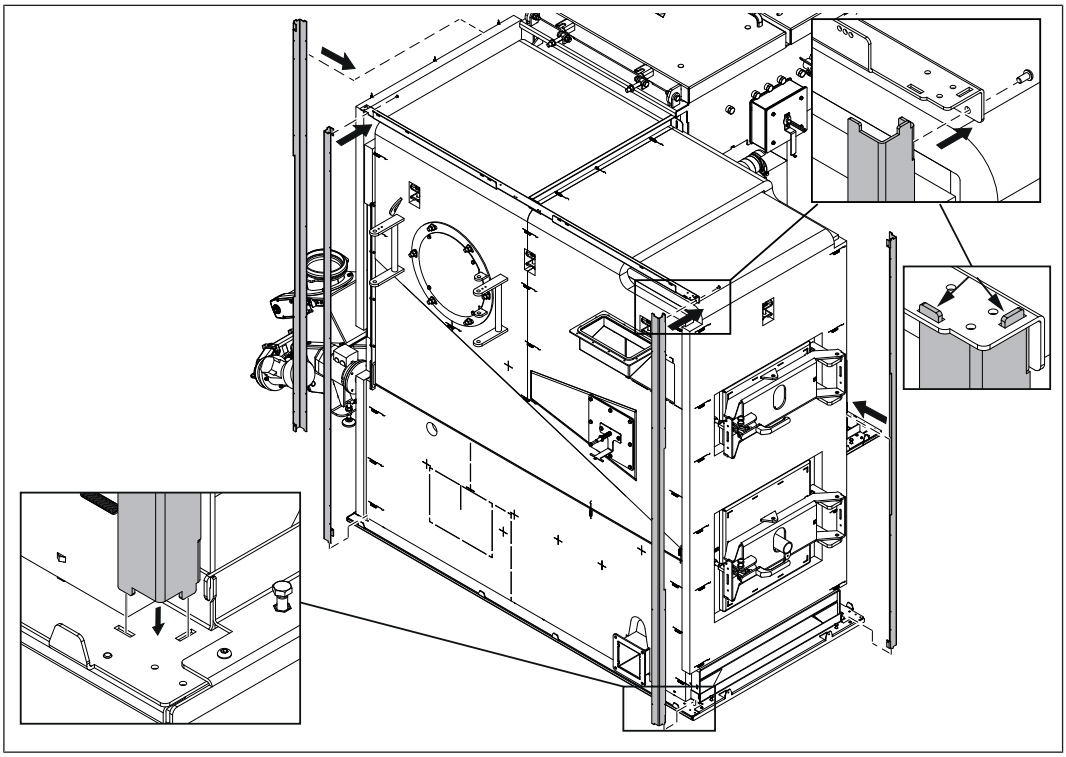
❒ Remove the blanking flange and install the FGR duct
- 12x hexagonal screws M8 x 25

5.5.15 Assembling the upper insulation base frame



❒ Mount the lengthways strut on to the frame element of the combustion chamber
- 1x hexagon screw M8 x 25

↳ Partially tighten the screws

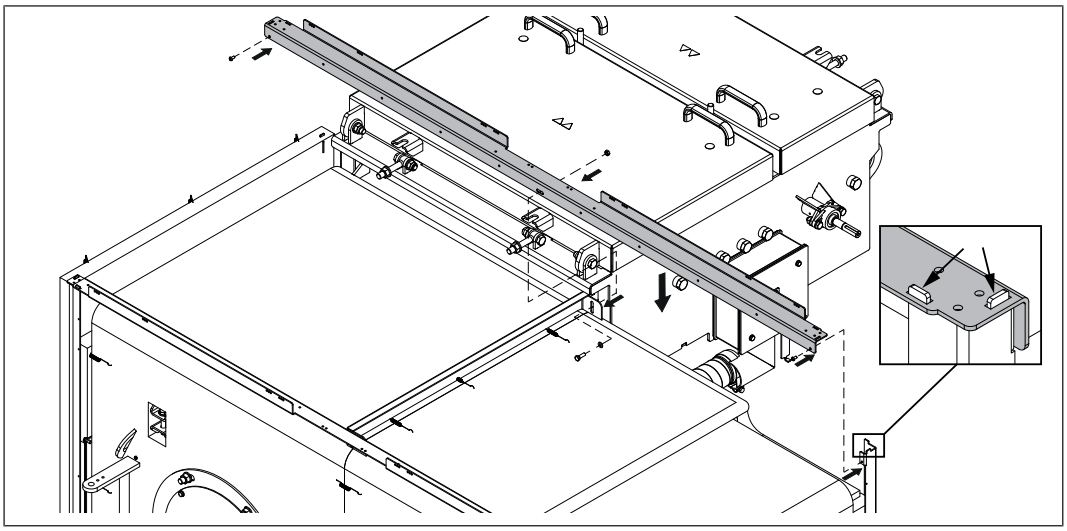


❒ Insert the combustion chamber support elements on both sides into the base frame at the front and back

❒ Mount the support elements on to the front and rear lengthways struts opposite the heat exchanger
- 2x raised head screws M6 x 12

↳ The lugs must be aligned properly!

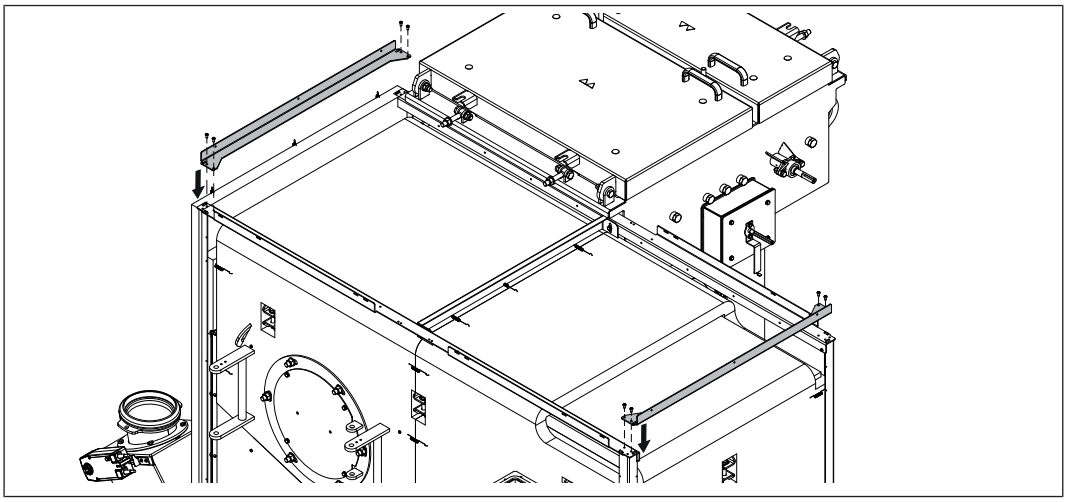
↳ Partially tighten the screws



❒ Mount the lengthways strut on the combustion chamber on the heat exchanger side to the support elements and upper frame element
- 2x raised head screws M6 x 12
- 1x hexagonal screw M8 x 25

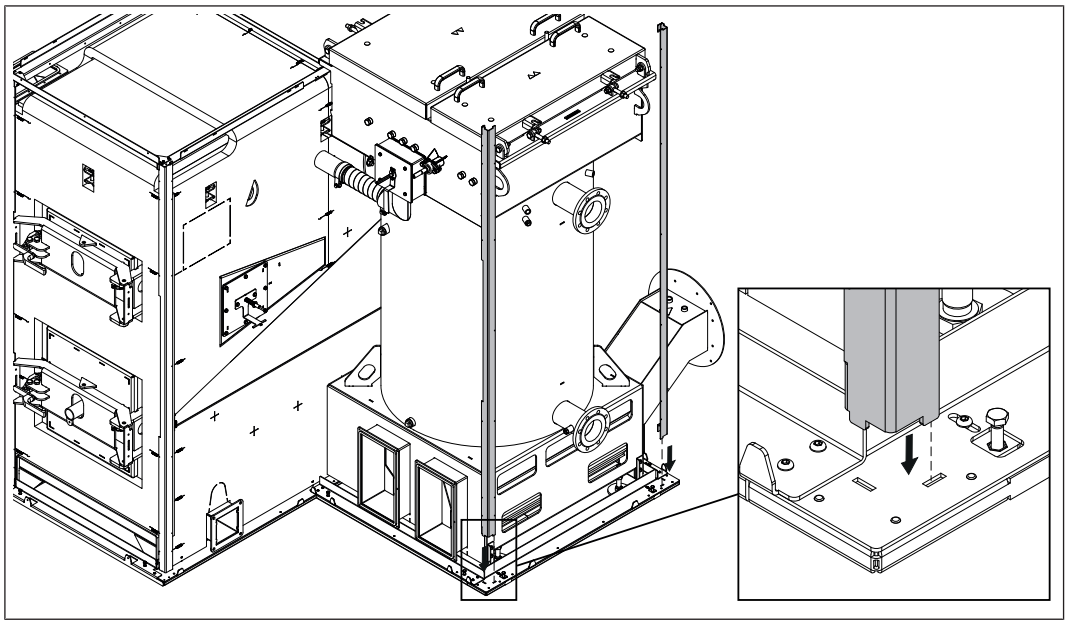
↳ The lugs must be aligned properly!

↳ Partially tighten the screws

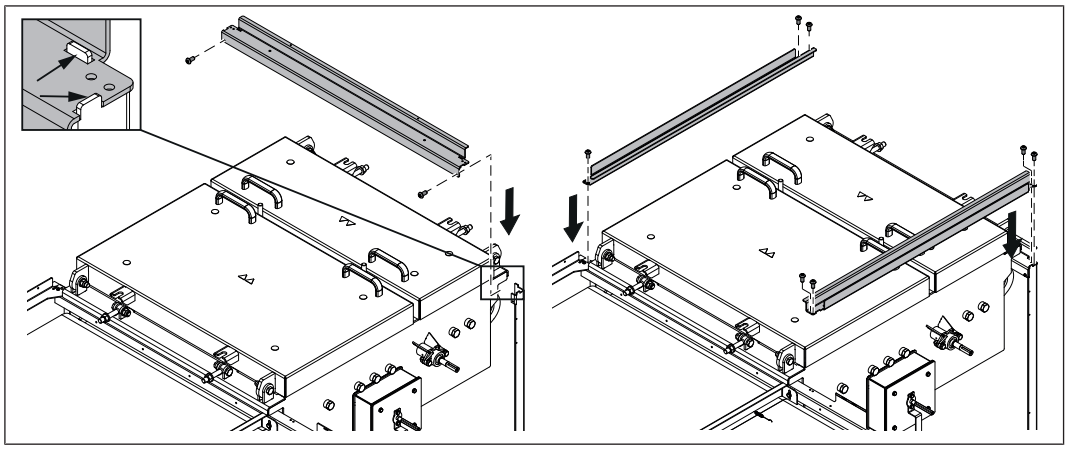


❒ Fit the cross-pieces at the front and back of the combustion chamber to the lengthways struts
- 4x raised head screws M6 x 12 to each cross-piece

↳ Partially tighten the screws



❒ Insert the heat exchanger support elements into the base frame



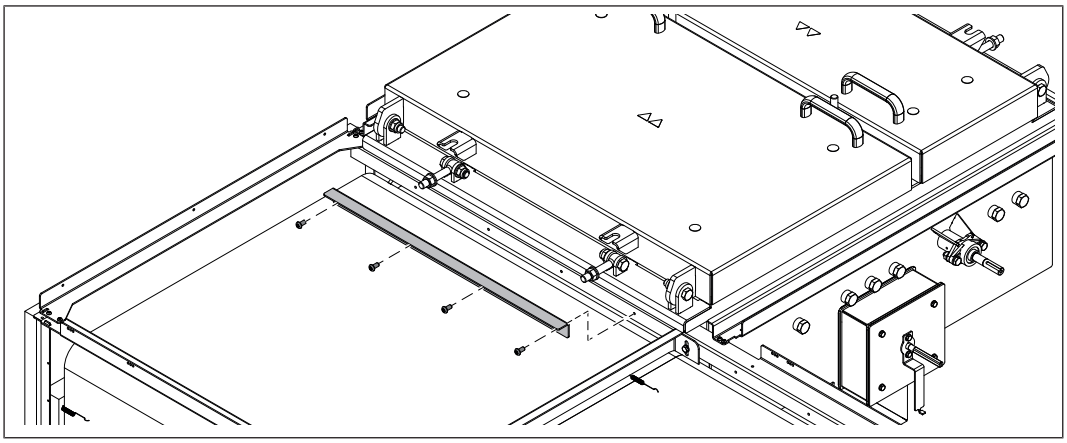
❒ Mount the lengthways strut at the side of the heat exchanger to the support elements
- 2x raised head screws M6 x 12

↳ The lugs must be aligned properly!

↳ Partially tighten the screws

❒ Mount the cross-pieces at the back and front of the heat exchanger to the lengthways strut of the combustion chamber
- 7x raised head screws M6 x 12

↳ Partially tighten the screws



❒ Mount the support plate on the combustion chamber lengthways strut
- 4x raised head screws M6 x 12

❒ Align the frame and tighten all the screws on the frame element

5.5.16 Installing the insulating side panels

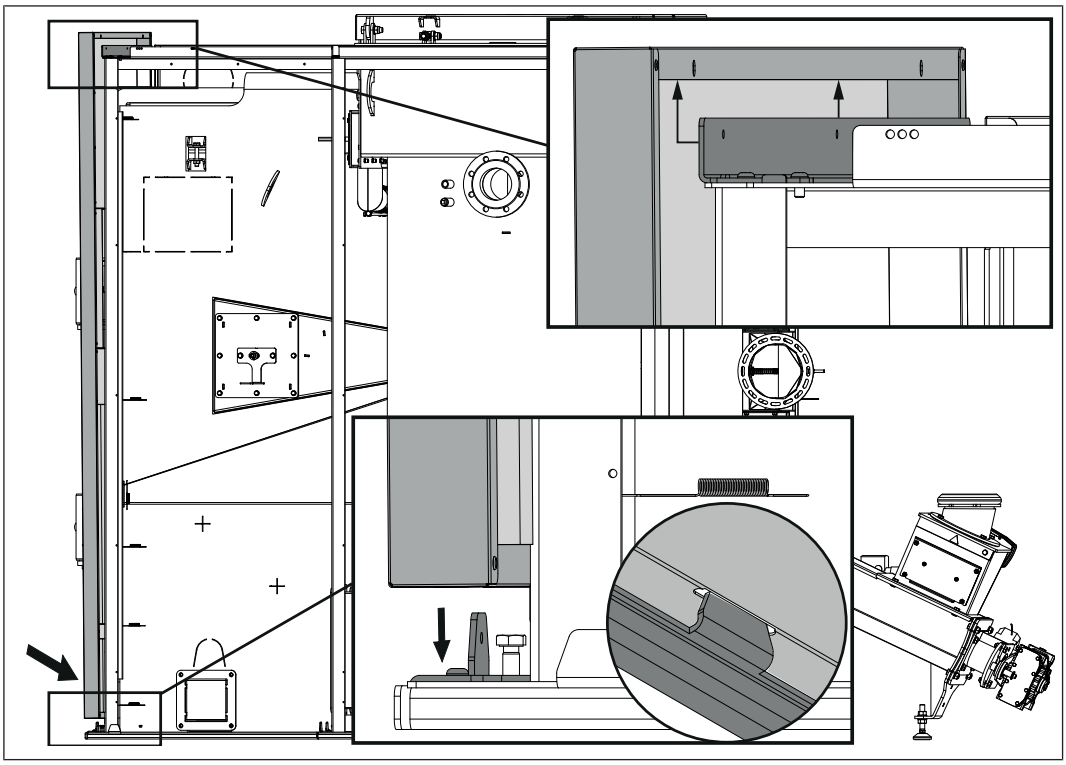
The procedures for assembling the insulating side panels on the Turbomat TM 320 and TM 400/500/550 are different.

➲ "Turbomat TM 320" [▸ 51]
➲ "Turbomat TM 400-550" [▸ 56]

The assembly steps are then the same for all boiler sizes from the following chapters.

General procedure for mounting the insulating side panels:

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



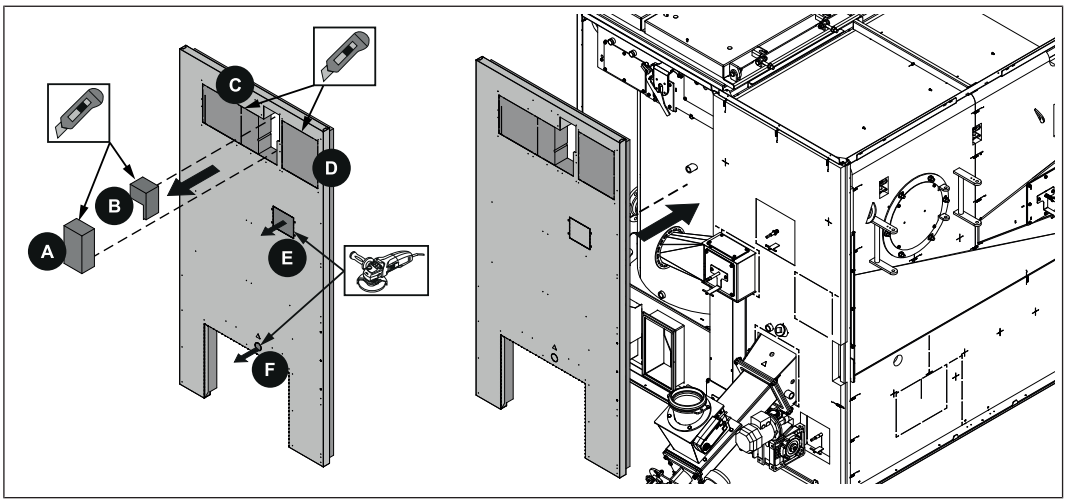
❒ Hang the insulating side panels at the bottom at the bracket on the base frame

❒ Tip the insulating side panels towards the boiler body and hang at the top brackets on the base frame

NOTICE! Fit all the other side panels in the same way.

Turbomat TM 320

Installing the side panels TM 400/500/550 ➲ "Turbomat TM 400-550" [▸ 56]

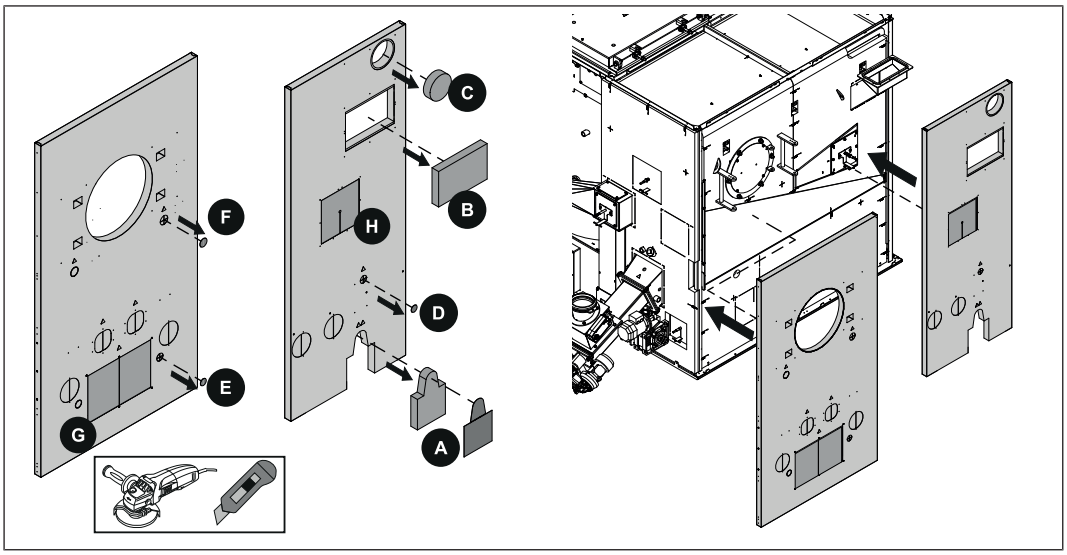


❒ Cut out and remove half of the thermal insulation for the heat-exchanger drive (A) and the thermal insulation for the WOS bracket (B)

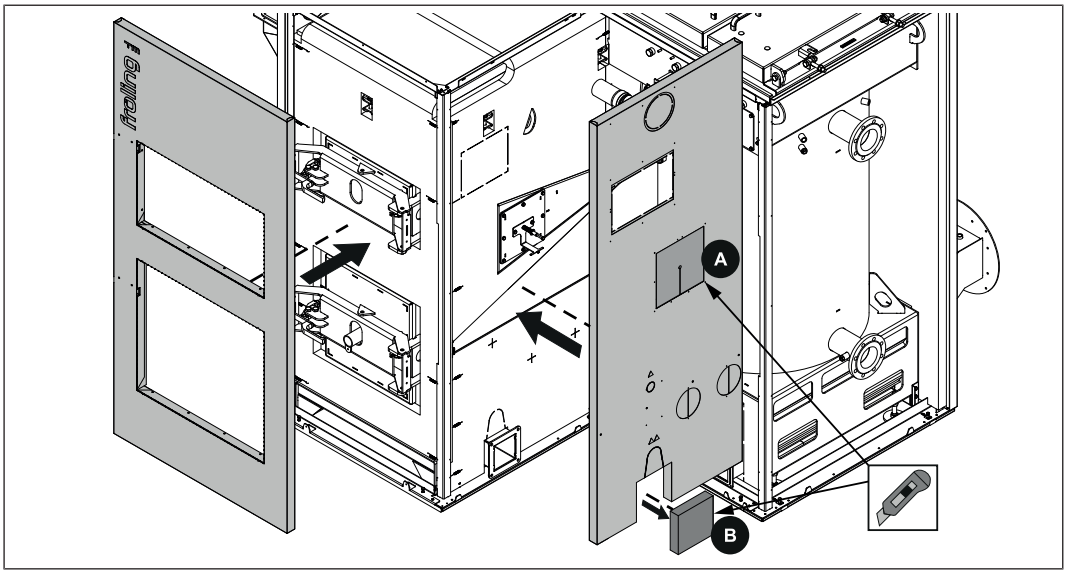
❒ Cut into the rest of the insulating material around the heat-exchanger drive, FGR console (C) and thermal discharge valve (D) but do not remove.

❒ Cut the pre-punched blanking around the connection to the slide-on duct cooling (E) and drainage (F) from the insulation

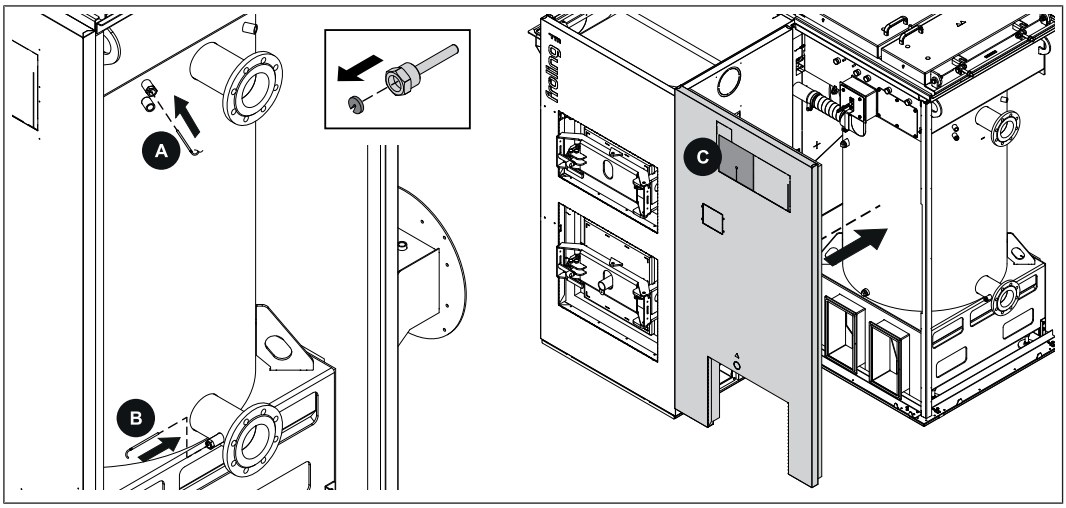
❒ Hang the insulating side panel on the back of the heat exchanger



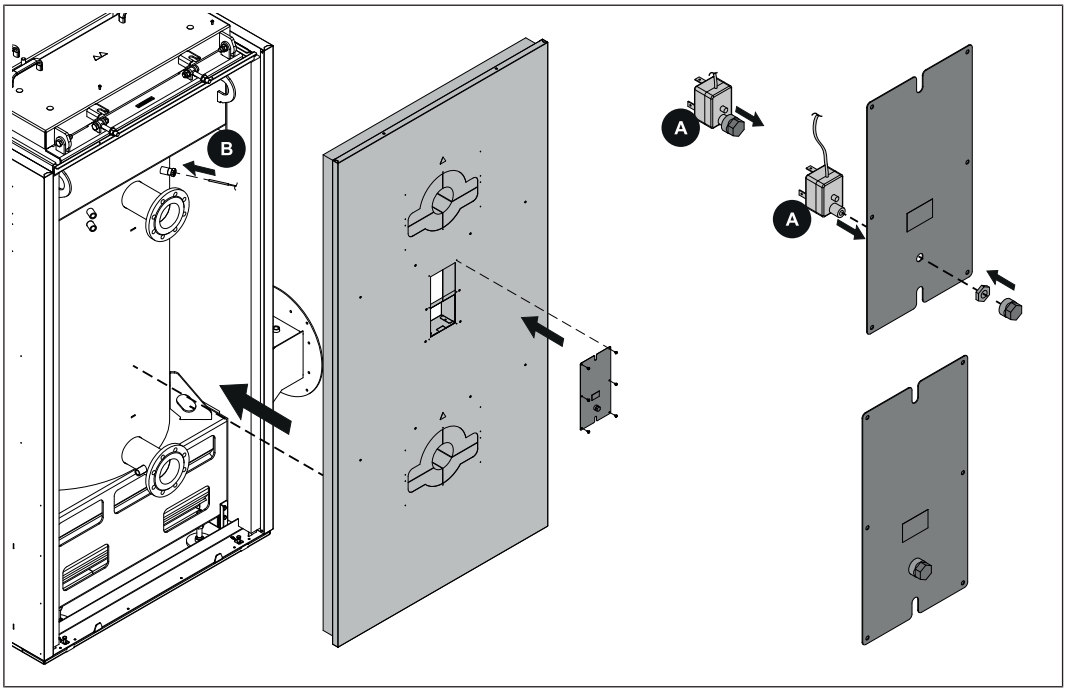
- ❒ Optional: Cut out the pre-punched blanking around the combustion chamber ash removal (A) insulation and cut out and remove the thermal insulation beneath
- ❒ Cut out and remove the thermal insulation around the supply air duct (B) and combustion air fan (C)
- ❒ Cut the pre-punched blanking around the overpressure monitor (D), under-pressure measurement (E) and combustion chamber temperature sensor (F) from the insulation
- ❒ Cut into the thermal insulation around the moving grate maintenance opening (G) and tertiary air controller (H) but do not remove the insulating material
- ❒ Hang the insulating side panels on the outside of the combustion chamber



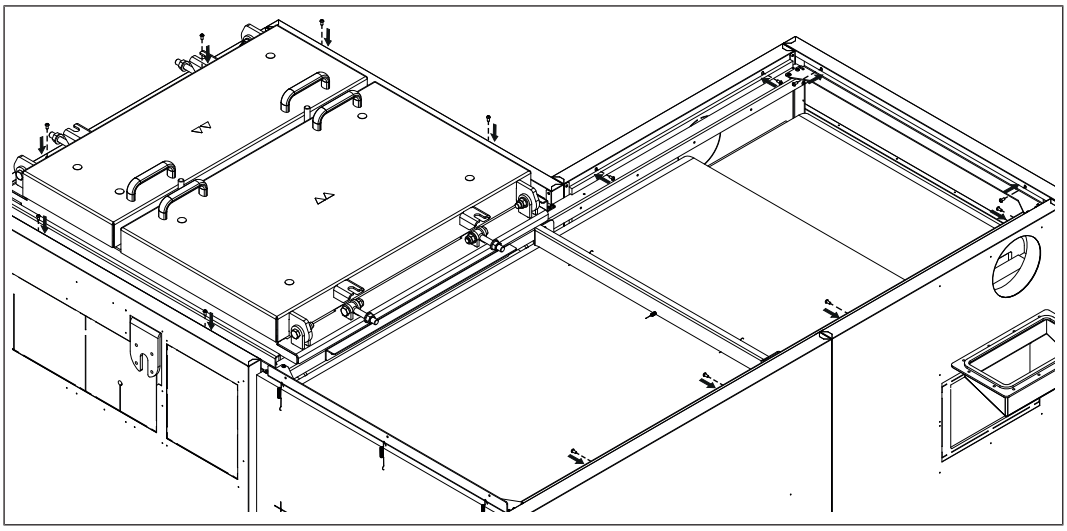
- ❒ Cut into the thermal insulation around the tertiary air controller (A) but do not remove the insulating material
- ❒ Optional: Cut out and remove the thermal insulation around the combustion chamber ash removal (B)
- ❒ Hang the insulating side panels on the front outside of the combustion chamber



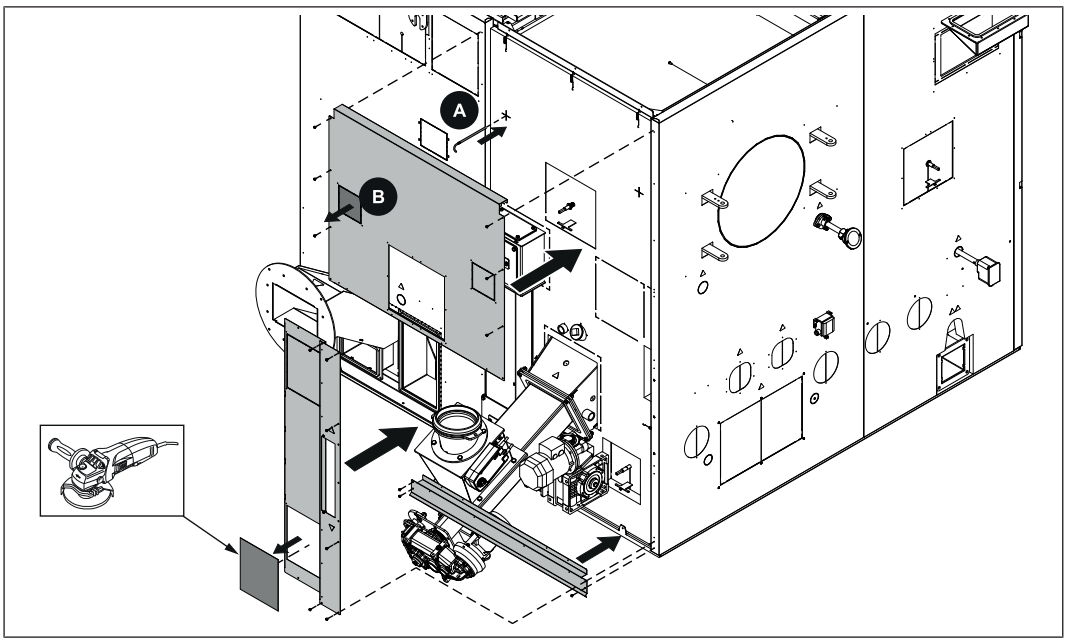
- ❒ Remove the PVC plug from the immersion sleeve
- ❒ Insert the flow temperature sensor (A) and return feed sensor (B) into the appropriate immersion sleeve
- ❒ Optional: Cut into the thermal insulation around the jacket cooling air controller (C) but do not remove the insulating material
- ❒ Hang the insulating side panel at the front of the heat exchanger



- ❒ Remove the cap and fixing bolt of the high-limit thermostat (STL) (A)
- ❒ Push the STL (A) from the back and through the cover plate
- ❒ Refit the lock nut to the front of the STL. Refit the cap
- ❒ Pass the STL capillary (B) through the opening in the frame element and push it into the immersion sleeve
- ❒ Install the cover plate with STL on the insulating side panel
  - 6x raised head screws M4 x 10
- ❒ Run all the cables from the sensors out through the insulation
- ❒ Hang the insulating side panel on the heat exchanger



❒ Check that the side panels are in the correct position and secure them to the base frame
- raised head screws M6 x 12



❒ Optional: Push the sensor for the jacket cooling (A) into the immersion sleeve on the heat exchanger side and cut out the pre-punched blanking (B) on the cover plate

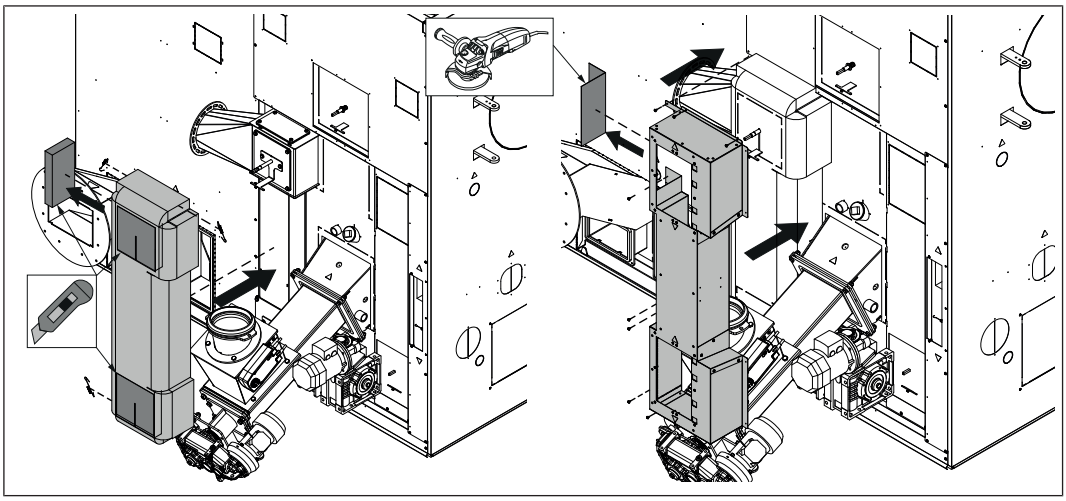
❒ Fit the upper cover plate to the back of the combustion chamber
- 6x raised head screws M4 x 10

❒ Remove the covers from the side of the slide-on duct
- 4x raised head screw M4 x 10

❒ Cut out the angled long cover plate at the lower pre-punched blanking next to the primary air controller and fit on the outside next to the slide-on duct
- 6x raised head screws M4 x 10

↳ The angled part must be on the outside of the combustion chamber

↳ Turn the plate 180° when installing the heat exchanger on the left



❒ Cut into the insulating material around the upper FGR duct and at the bottom around the primary and secondary air servo-motor but do not remove it

❒ Cut out and remove the insulating material on the side of the flange

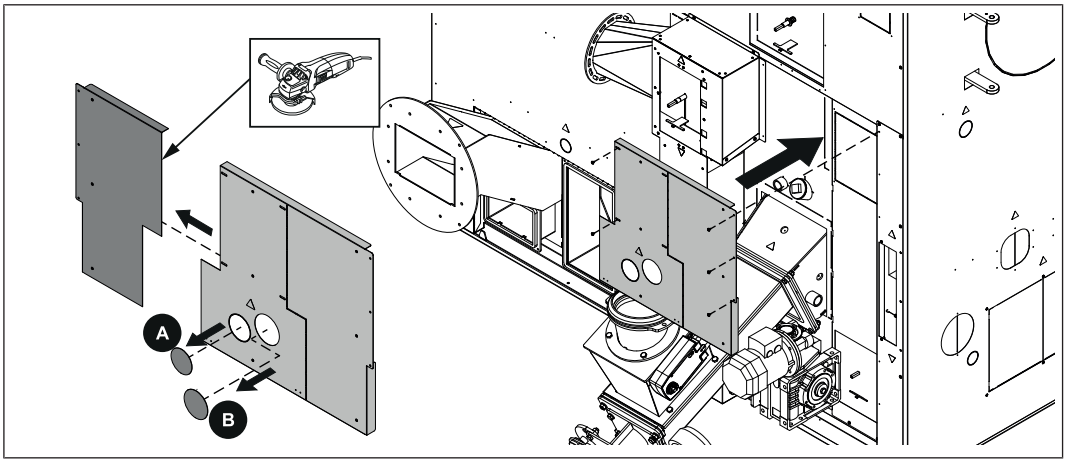
↳ Turn the insulating material 180° when installing the heat exchanger on the left

❒ Place the thermal insulation around the FGR duct

❒ Cut out the pre-punched blanking around the FGR flange insulation

↳ Turn the FGR duct insulation 180° when installing the heat exchanger on the left

❒ Install the insulation for the FGR duct
- 13x raised head screws M4 x 10

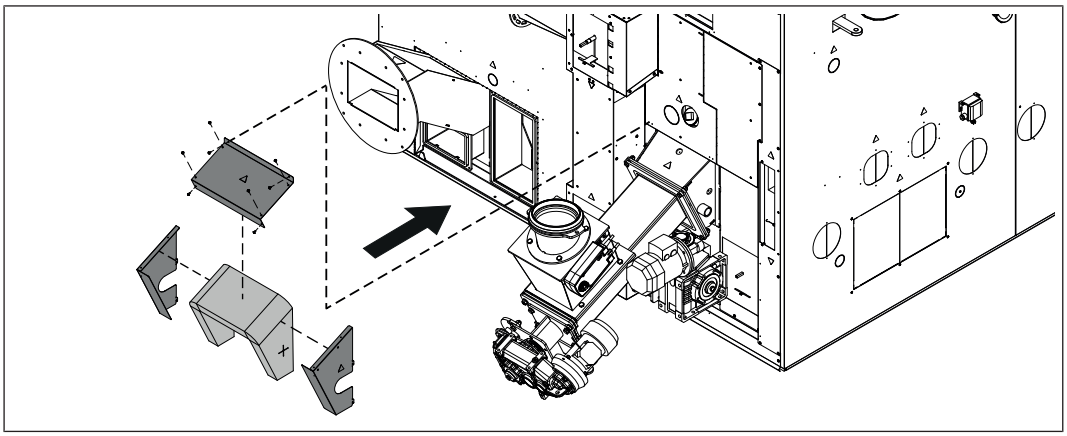


❒ Cut off the insulating side panel along the perforations on the FGR duct

❒ Cut out the pre-punched blanking around the slide-on duct flow (A) insulation

❒ Optional: Cut out the pre-punched blanking around the slide-on duct automatic ignition (B) insulation

❒ Install the insulating side panel above the slide-on duct
- 5x raised head screws M4 x 10



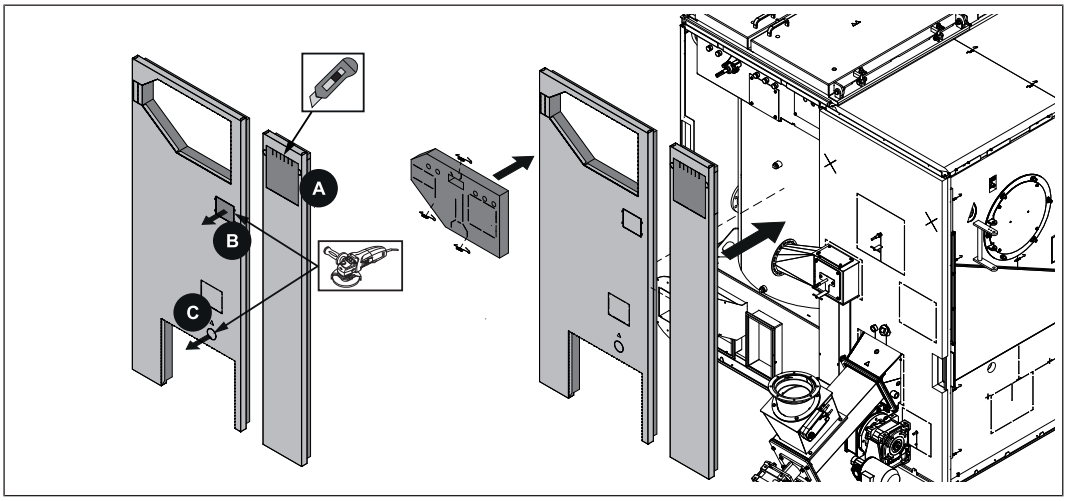
❒ Wrap the thermal insulation mat around the slide-on duct

❒ Using the hooks, attach the side cover plates to the back of the boiler

❒ Fit the upper cover plate and screw it to the back wall of the boiler and the side cover plates
- 6x raised head screws M4 x 10

Turbomat TM 400-550

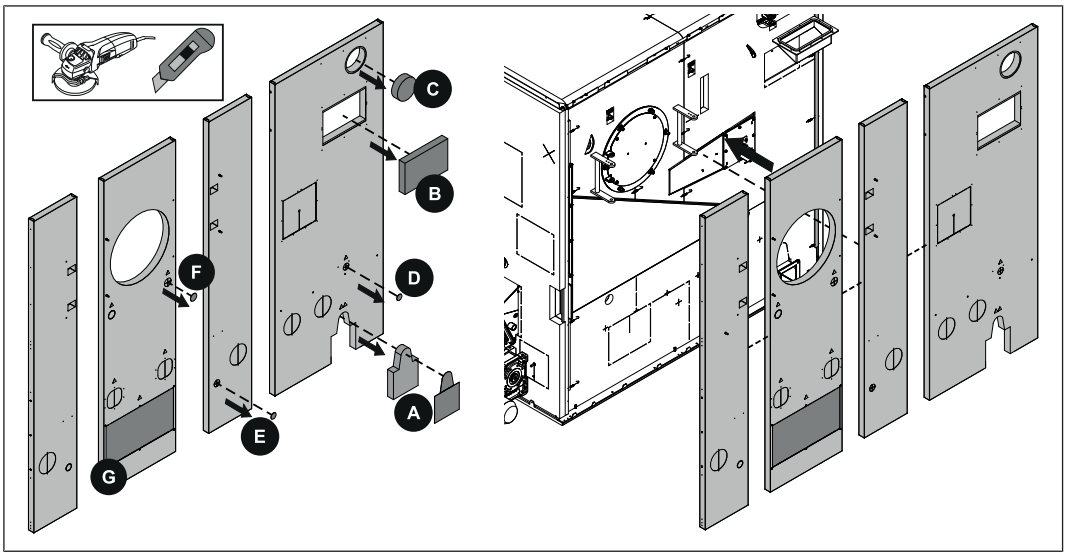
Mounting the side panels TM 320 ➲ "Turbomat TM 320" [▸ 51]



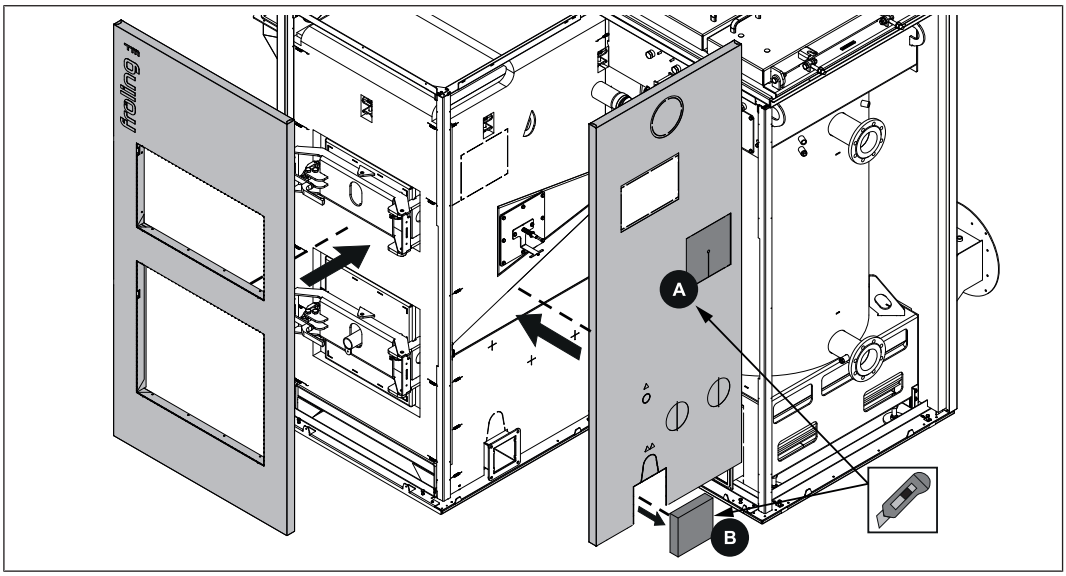
❒ Cut in a space for the thermal discharge safety device (A) but do not remove the insulating material

❒ Cut the pre-punched blanking around the connection to the slide-on duct cooling (B) and drainage (C) from the insulation

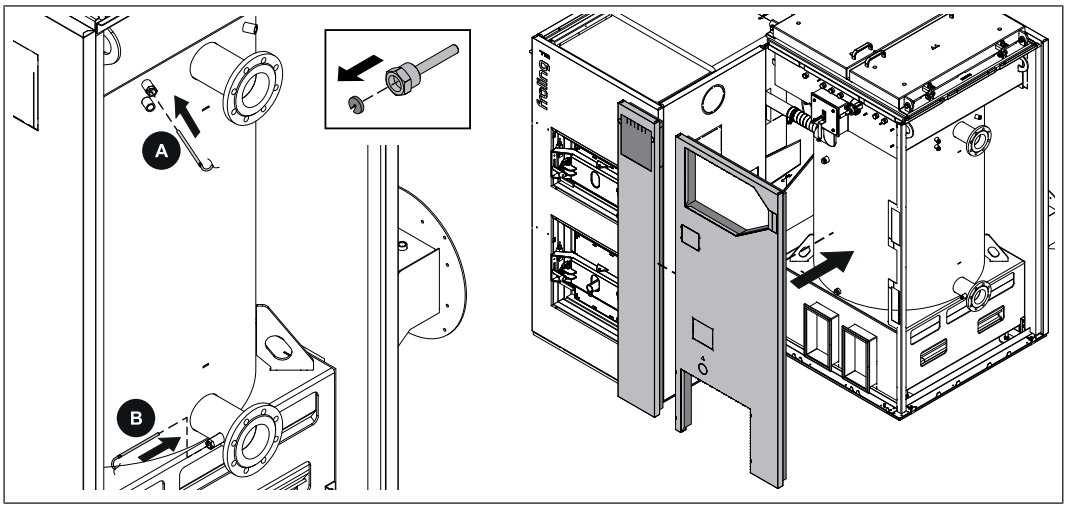
❒ Hang the insulating side panels on the back of the heat exchanger



- ❒ Optional: Cut out the pre-punched blanking around the combustion chamber ash removal (A) insulation and cut out and remove the thermal insulation beneath
- ❒ Cut out and remove the thermal insulation around the supply air duct (B) and combustion air fan (C)
- ❒ Cut the pre-punched blanking around the overpressure monitor (D), under-pressure measurement (E) and combustion chamber temperature sensor (F) from the insulation
- ❒ Cut into the thermal insulation around the moving grate maintenance opening (G) and tertiary air controller (H) but do not remove the insulating material
- ❒ Hang the insulating side panels on the outside of the combustion chamber



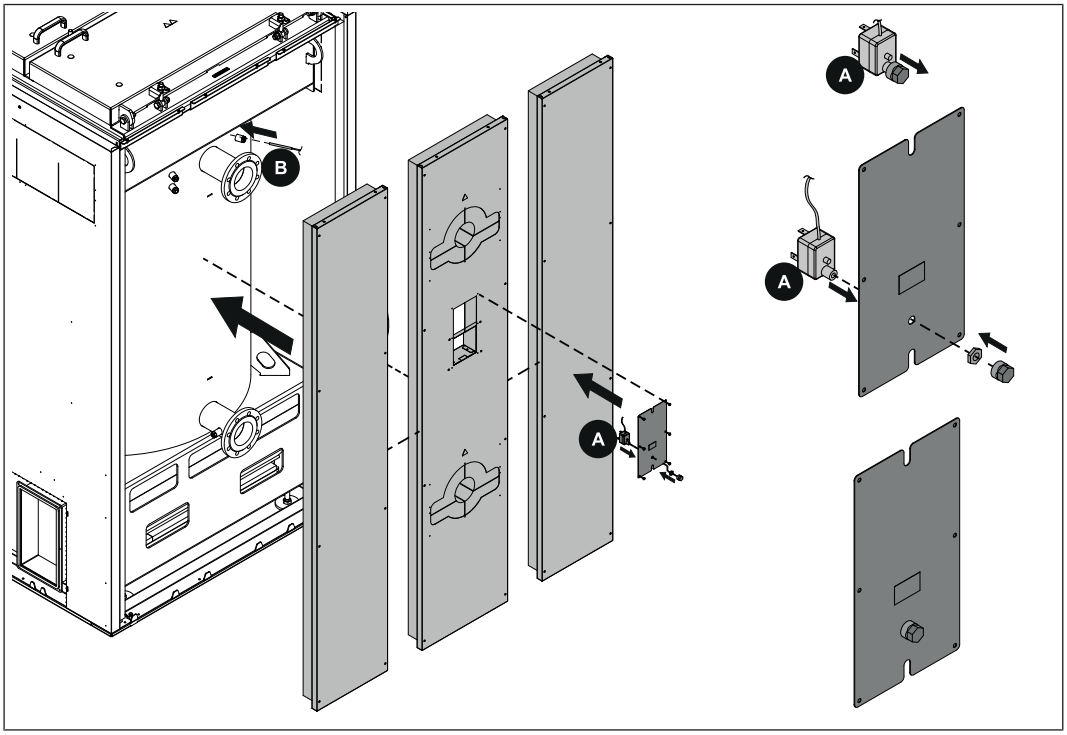
- ❒ Cut into the thermal insulation around the tertiary air controller (A) but do not remove the insulating material
- ❒ Optional: Cut out and remove the thermal insulation around the combustion chamber ash removal (B)
- ❒ Hang the insulating side panels on the front outside of the combustion chamber



❒ Remove the PVC plug from the immersion sleeve

❒ Insert the flow temperature sensor (A) and return feed sensor (B) into the appropriate immersion sleeve

❒ Hang the insulating side panels at the front of the heat exchanger



❒ Remove the cap and fixing bolt of the high-limit thermostat (STL) (A)

❒ Push the STL (A) from the back and through the cover plate

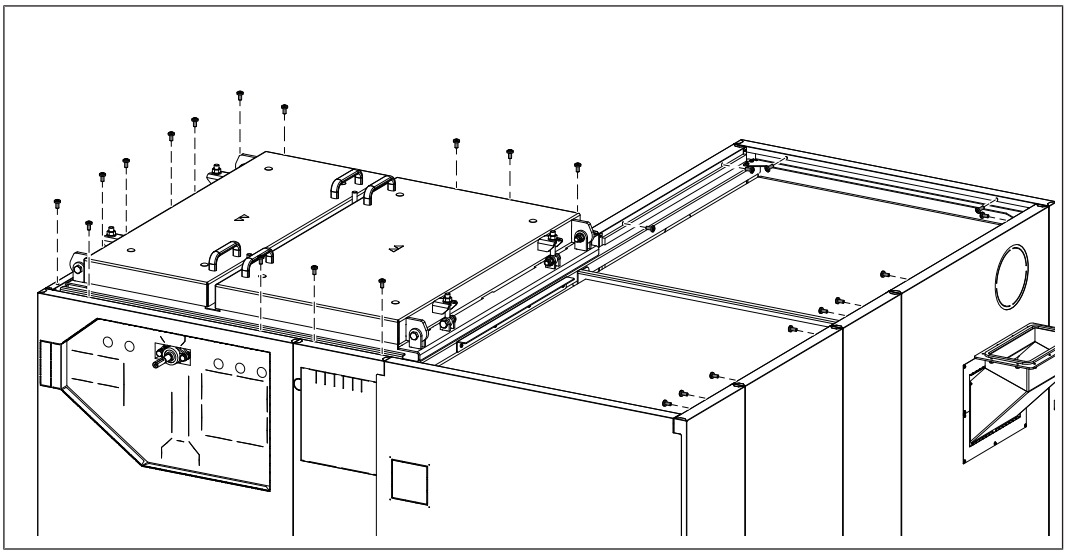
❒ Refit the lock nut to the front of the STL. Refit the cap

❒ Pass the STL capillary (B) through the opening in the frame element and push it into the immersion sleeve

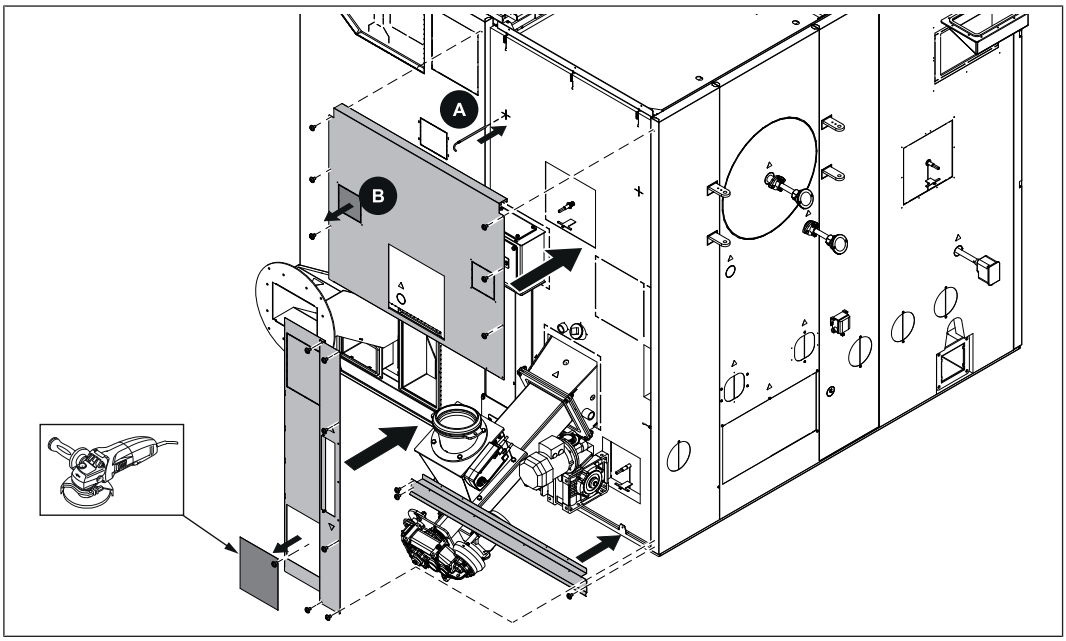
❒ Install the cover plate with STL on the insulating side panel
- 6x raised head screws M4 x 10

❒ Run all the cables from the sensors out through the insulation

❒ Hang the insulating side panels on the heat exchanger



❒ Check that the side panels are in the correct position and secure them to the base frame
- raised head screws M6 x 12



❒ Optional: Push the sensor for the jacket cooling (A) into the immersion sleeve on the heat exchanger side and cut out the pre-punched blanking (B) on the cover plate

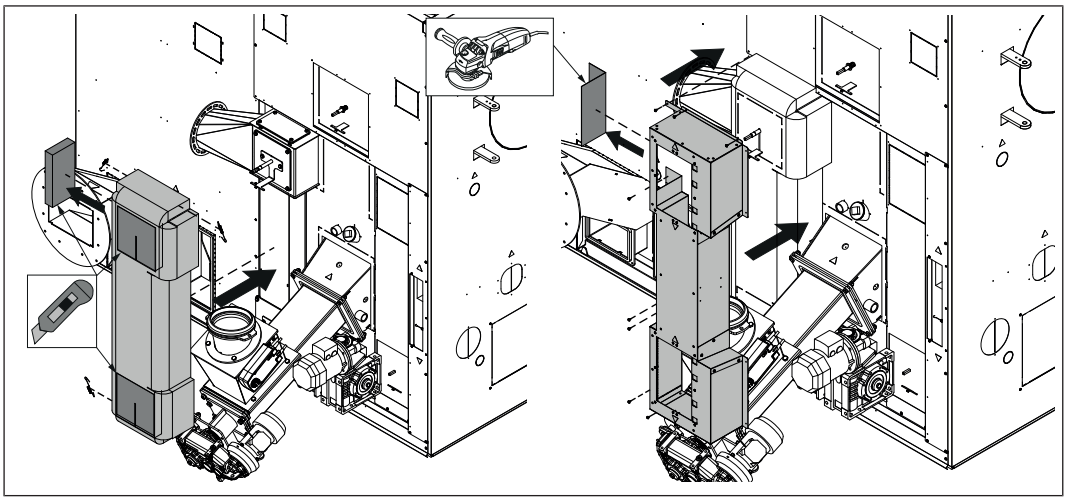
❒ Fit the upper cover plate to the back of the combustion chamber
- 6x raised head screws M4 x 10

❒ Remove the covers from the side of the slide-on duct
- 4x raised head screw M4 x 10

❒ Cut out the angled long cover plate at the lower pre-punched blanking next to the primary air controller and fit on the outside next to the slide-on duct
- 6x raised head screws M4 x 10

↳ The angled part must be on the outside of the combustion chamber

↳ Turn the plate 180° when installing the heat exchanger on the left



❒ Cut into the insulating material around the upper FGR duct and at the bottom around the primary and secondary air servo-motor but do not remove it

❒ Cut out and remove the insulating material on the side of the flange

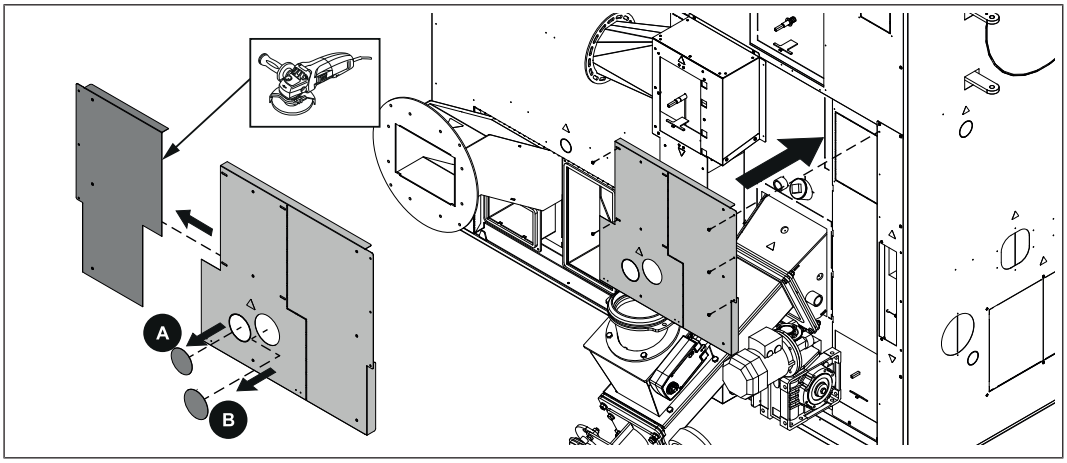
↳ Turn the insulating material 180° when installing the heat exchanger on the left

❒ Place the thermal insulation around the FGR duct

❒ Cut out the pre-punched blanking around the FGR flange insulation

↳ Turn the FGR duct insulation 180° when installing the heat exchanger on the left

❒ Install the insulation for the FGR duct
- 13x raised head screws M4 x 10

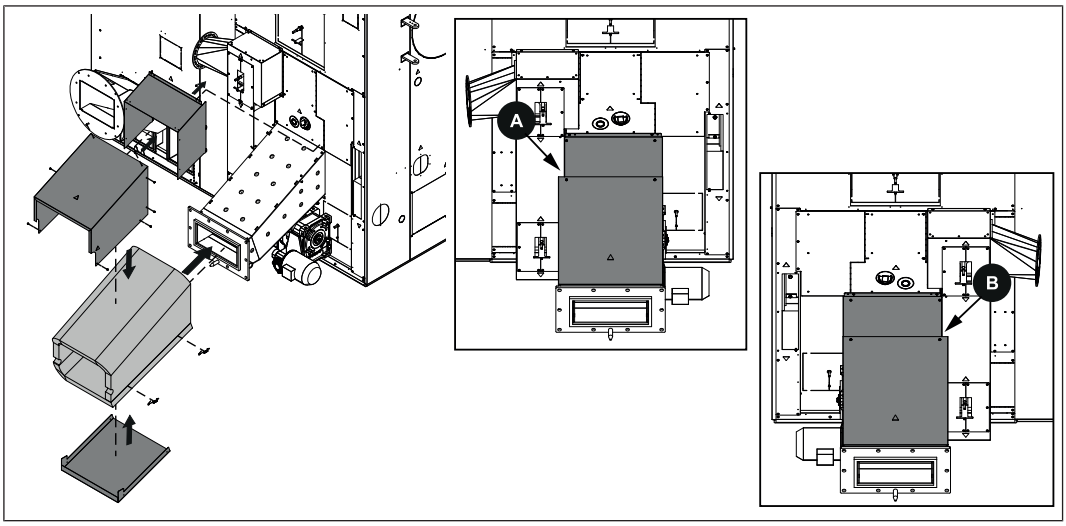


❒ Cut off the insulating side panel along the perforations on the FGR duct

❒ Cut out the pre-punched blanking around the slide-on duct flow (A) insulation

❒ Optional: Cut out the pre-punched blanking around the slide-on duct automatic ignition (B) insulation

❒ Install the insulating side panel above the slide-on duct
- 5x raised head screws M4 x 10



❒ Wrap the thermal insulation mat around the slide-on duct

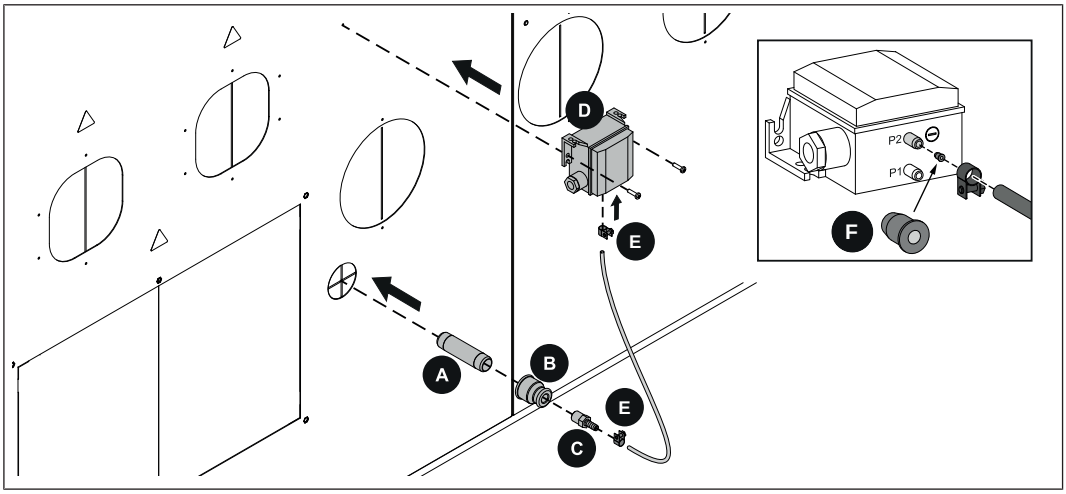
❒ Assemble the upper cover plates; hang the front cover plate to the back of the boiler using the studs and then fix it using the screws
- 6x raised head screws M4 x 10

↳ **Heat exchanger on the right**: fit the cover plates so that the front cover plate is offset to the left (A)

↳ **Heat exchanger on the left**: Fit the cover plates so that the front cover plate is offset to the right (B)

❒ Mount the lower cover plate to the upper cover plate
- 4x raised head screws M4 x 10

5.5.17 Installing the underpressure controller



❒ Assemble the double-ended threaded nipple (A), reduction union (B) and hose nipple (C) and screw them in alongside the maintenance opening

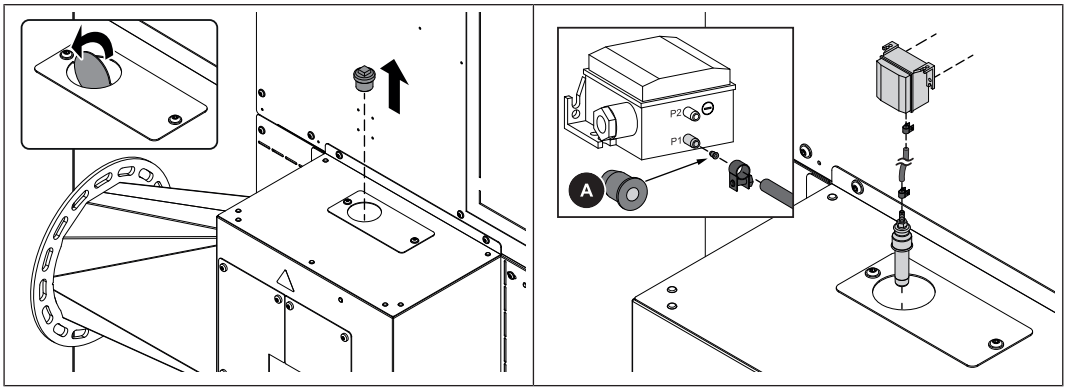
❒ Attach the under-pressure transmitter (D) to the insulating side panel
- 2x raised head screws Ø4.2 x 19

❒ Attach a silicone hose with a hose clamp (E) to the hose nipple (C) and attach the underpressure transmitter (D)

↳ Use port “P2” of the underpressure transmitter

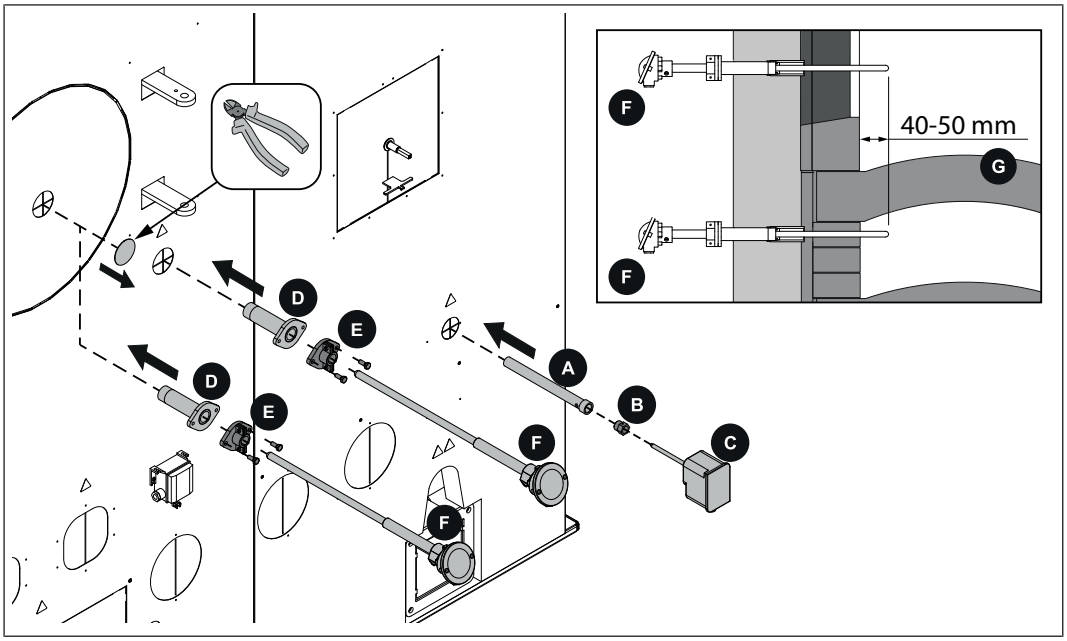
↳ Do not remove the red reducer (F) plug!

5.5.18 Mount the FGR underpressure controller (at the FGR branch before the induced draught fan)



- ❒ Remove the pre-punched blanking from the cover plate
  - ↳ Remove the burrs with a half-round file
- ❒ Remove the blanking plug from the FGR duct behind it
- ❒ Mount the differential pressure transmitter on the boiler insulation
  - 2x raised head screws Ø4.2 x 19
- ❒ Screw in the measuring nipple on the sleeve of the FGR duct
- ❒ Insert the reducing plug (A) at connection “P1” and fit the hose with the hose clamp
- ❒ Attach the measuring hose with hose clamp to the measuring nipple

5.5.19 Installing the combustion chamber overpressure monitor and temperature sensor



- ❒ Screw in the spacer tube (A)
- ❒ Screw the brass bushing (B) into the spacer tube (A)
- ❒ Insert the combustion chamber overpressure monitor (C) and fix loosely with fixing screws
- ❒ Screw in the flanged pipe (D)
- ❒ Mount the mating flange (E)
  - 2x hexagon screws M8 x 20 for each mating flange

❒ Insert the combustion chamber temperature sensor (F) so that it projects by approx. 40 - 50 mm into the combustion chamber (G)

❒ Fix in position on the counter flange with the clamping screws by hand

Combustion chamber temperature sensor (F):

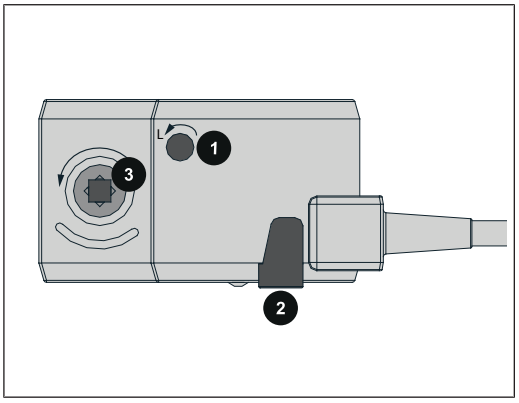
❒ Unscrew the connector box cover and connect the compensating line
- green wire to the terminal with the green dot
- white wire to the unmarked terminal
- shield not connected

5.5.20 Installing the air flap actuators

❒ Check that the air flaps are at the left stop

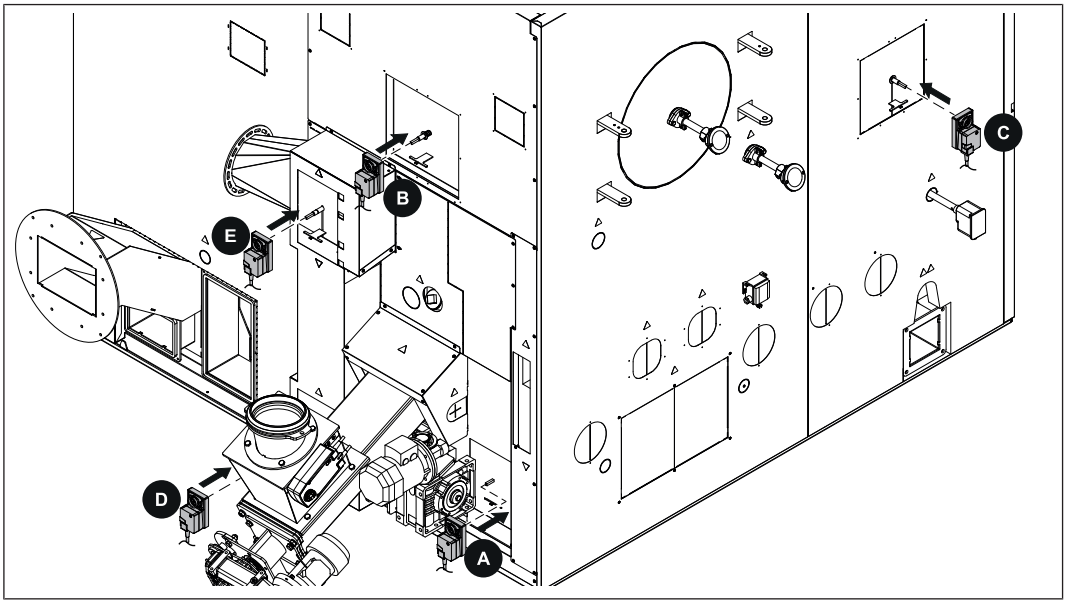
↳ All air flaps should be closed

↳ If necessary, use pliers to turn the air flaps to the left stop



❒ Set the direction of rotation of the servo-motor (1) to anticlockwise (L)

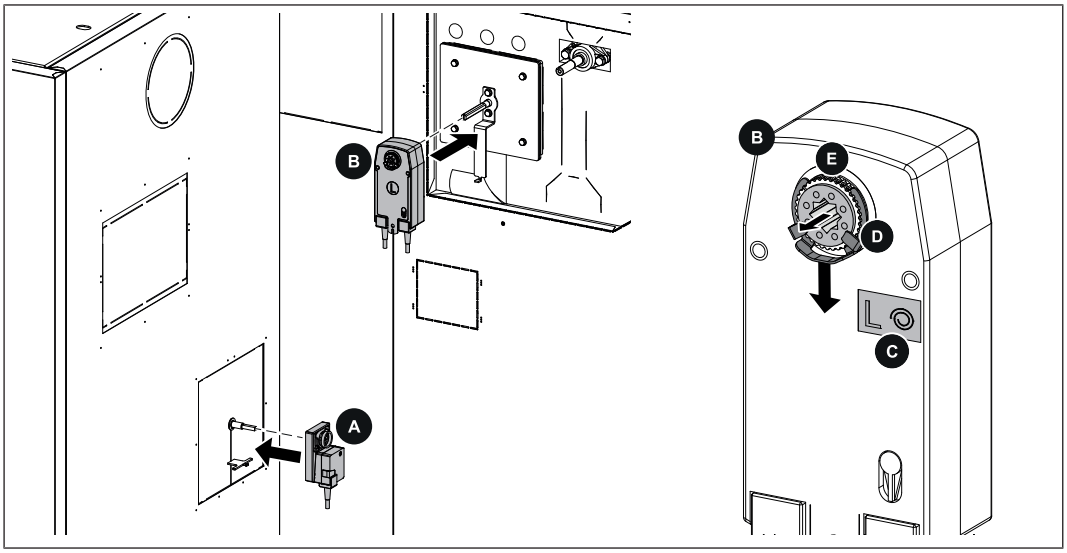
❒ Press the unlock fitted key (2) and turn the drive for the shaft to the air duct (3) in the anti-clockwise direction as far as the stop



❒ Fit the servo-motor for primary air (A) and secondary air (B)

❒ Fit the servo-motor for tertiary air (C)

❒ Fit the servo-motor for primary air (D) and secondary air (E) for the flue gas recirculation (FGR)



❒ Fit the servo-motor II for tertiary air (A)

Optional: Fit the servo-motor for jacket cooling (B):

❒ Remove the shaft retainer (D) on the motor side “L” (C) and pull out the positive-locking insert (E)

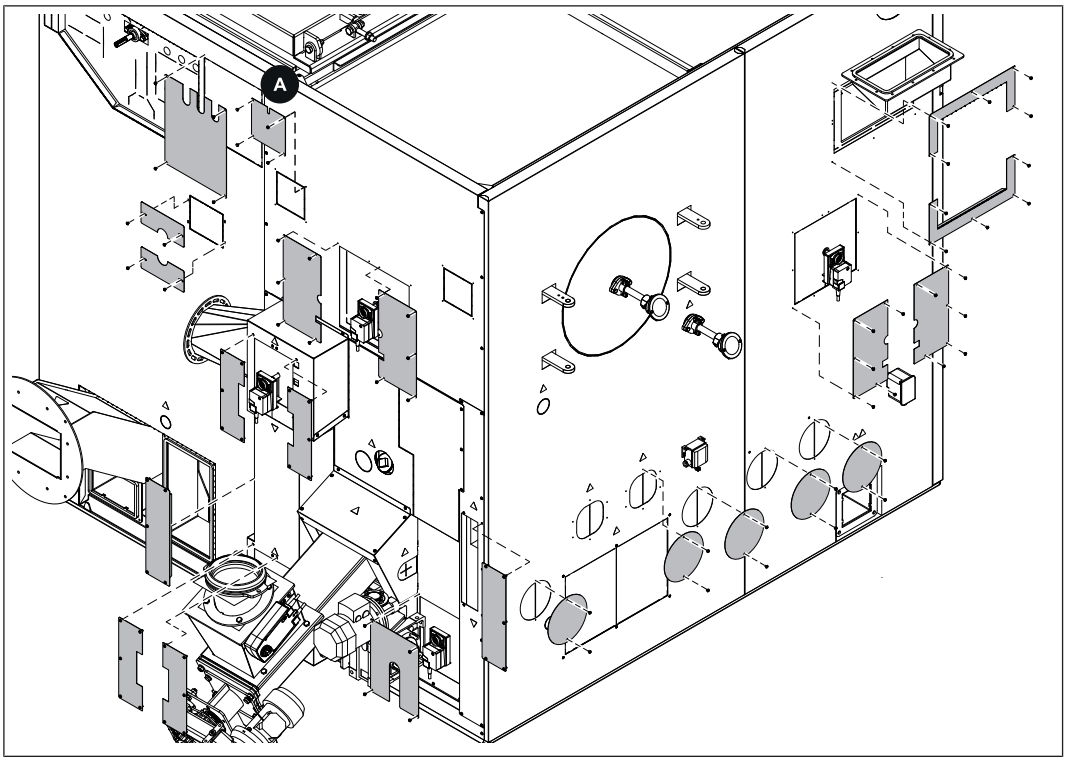
❒ Slide in the positive-locking insert (E) on the opposite side (motor side “R”) and secure with a shaft retainer (D)

❒ Close the air flaps by turning anti-clockwise

❒ Slide the servo-motor on the shaft of the air flap and secure with torque support

↳ Caution: Fit the servo-motor with the “L” (C) motor side at the front

5.5.21 Assembling different cover plates

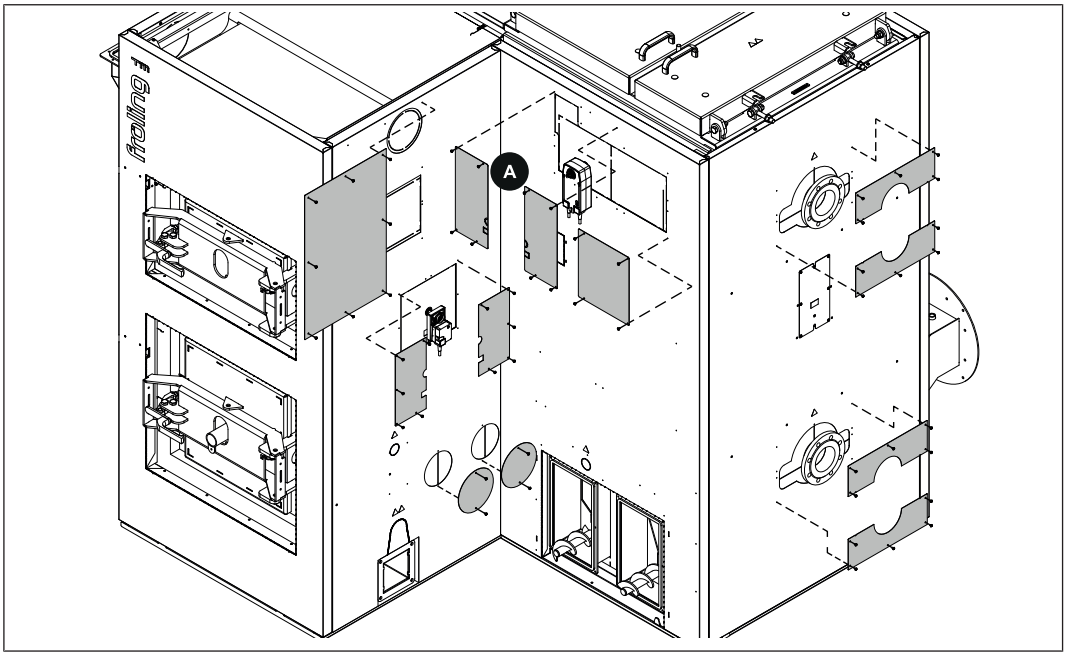


❒ Mount the cover plates as shown
- raised head screws M4 x 10

❒ Cover plate (A) optional for jacket cooling

↳ Gently bend the thermocouple jacket down to protect the cable

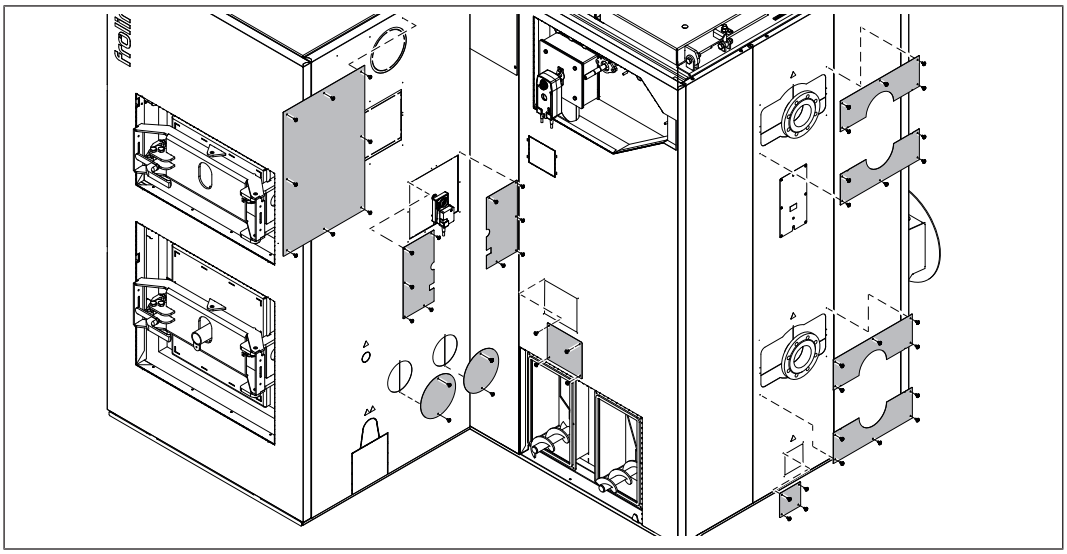
For the Turbomat TM 320:



❒ Mount the cover plates as shown
- raised head screws M4 x 10

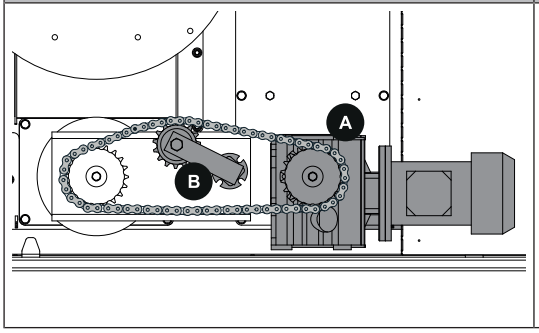
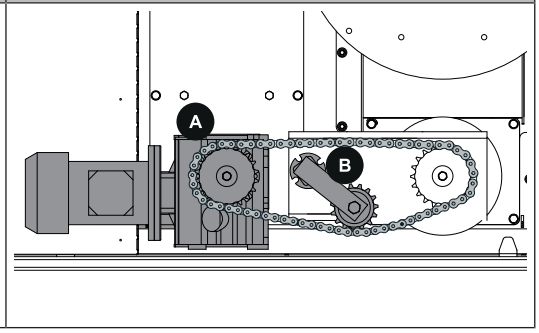
↳ If an (optional) jacket cooling is installed, the pre-punched blanking for the jacket cooling servo-motor must be cut out at the two-part cover plate (A)

For the Turbomat TM 400-550:

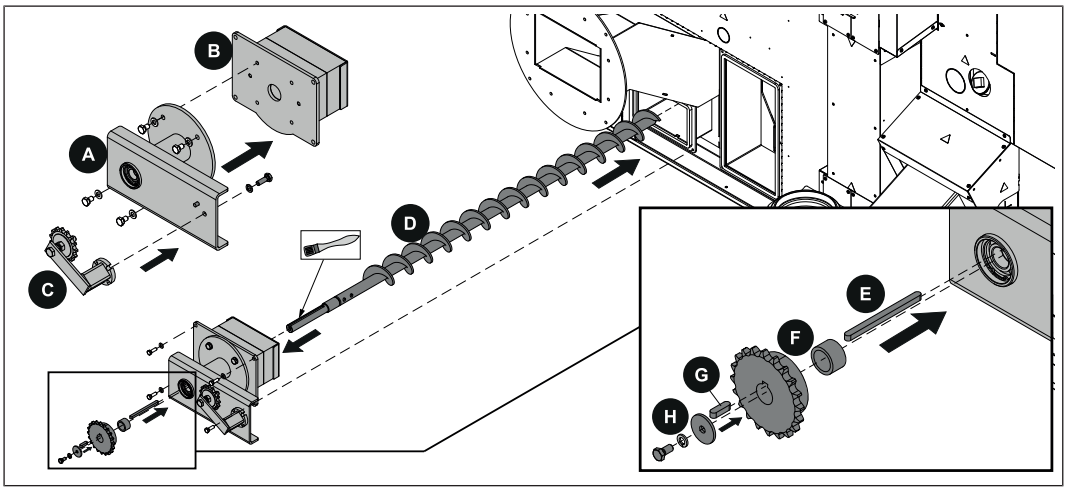


❒ Mount the cover plates as shown
- raised head screws M4 x 10

5.5.22 Installing the heat exchanger ash removal unit

Heat exchanger on the right	Heat exchanger on the left
	

The following instructions are for fitting the automatic heat exchanger ash removal screw unit to a boiler with the heat exchanger mounted on the right. The instructions also apply to boilers with the heat exchanger mounted on the left. It is important to note that the geared motor (A) must always be mounted on the combustion chamber side. This is to ensure that in the event of defect in the roller chain ash removal will take place during the first stroke. If the heat exchanger on the right, the chain tensioner (B) faces upwards. If the heat exchanger on the left, the chain tensioner faces downwards.



❒ Mount the bearing block (A) on the flange plate (B)
- 4x hexagon screws M10 x 16

❒ Mount the chain tensioner (C) on the bearing block
- 1x hexagon screw M10 x 30

↳ Engage the chain tensioner (C) with the bolts on the bearing block so that the chain can be tensioned correctly

❒ Lubricate the shaft stub with copper paste

❒ Insert the ash screw (D) through the flange plate and bearing block

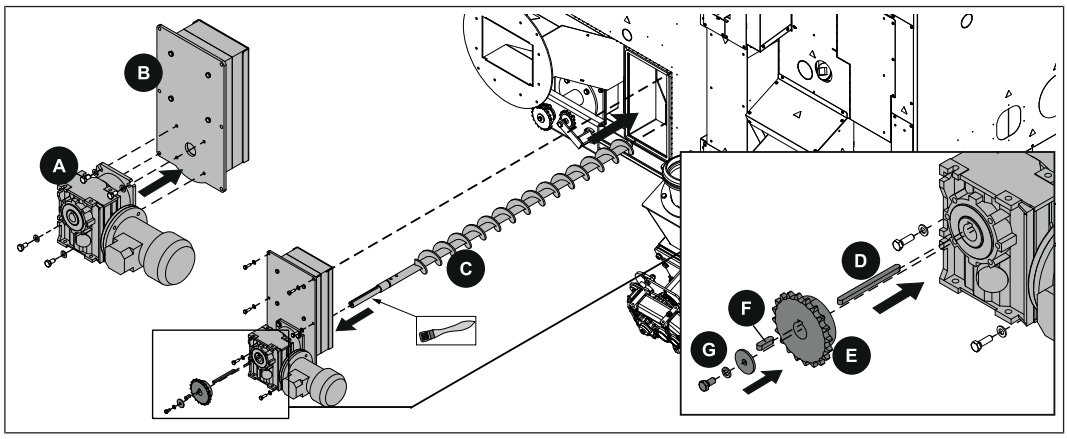
↳ The slot in the ash screw must be aligned with the slot in the bearing block

❒ Push the fitted key (E) into the slot

❒ Attach the chain wheel to the spacer sleeve (F)

❒ Slide the fitted key (G) into the slot and fit the shaft retainer (H)
- 1x hexagon screw M8 x 16

❒ Insert the flange plate with the ash screw into the heat exchanger on the back of the boiler and fix it in place with screws
- 4x hexagon screws M8 x 40



❒ Mount the geared motor (A) on the flange plate (B)
- 4x hexagon screws M10 x 20

❒ Lubricate the shaft stub with copper paste

❒ Insert the ash screw (C) through the flange plate and into the geared motor

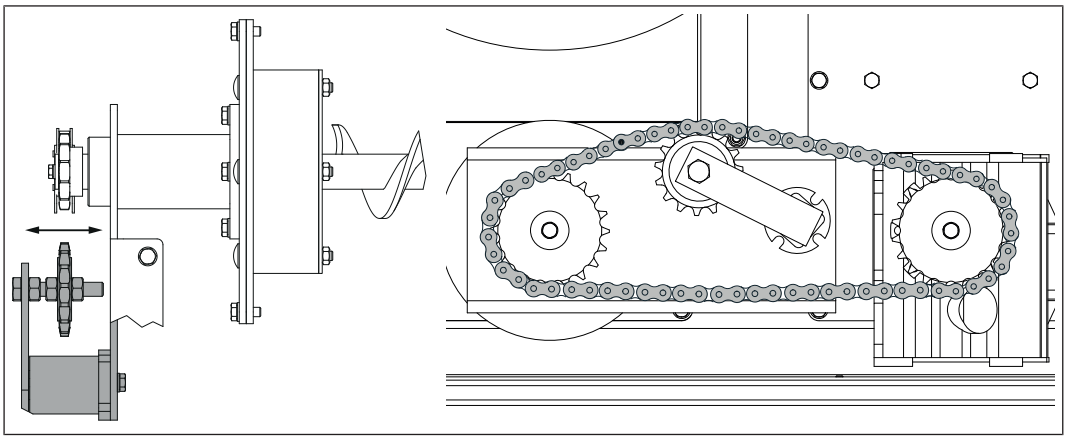
↳ The slot in the ash screw must be aligned with the slot in the geared motor

❒ Slide the motor fitted key (D) into the slot

❒ Fit the chain wheel (E)

❒ Slide the fitted key for the chain wheel (F) into the slot and fit the shaft retainer (G)
- 4x hexagon screws M8 x 16

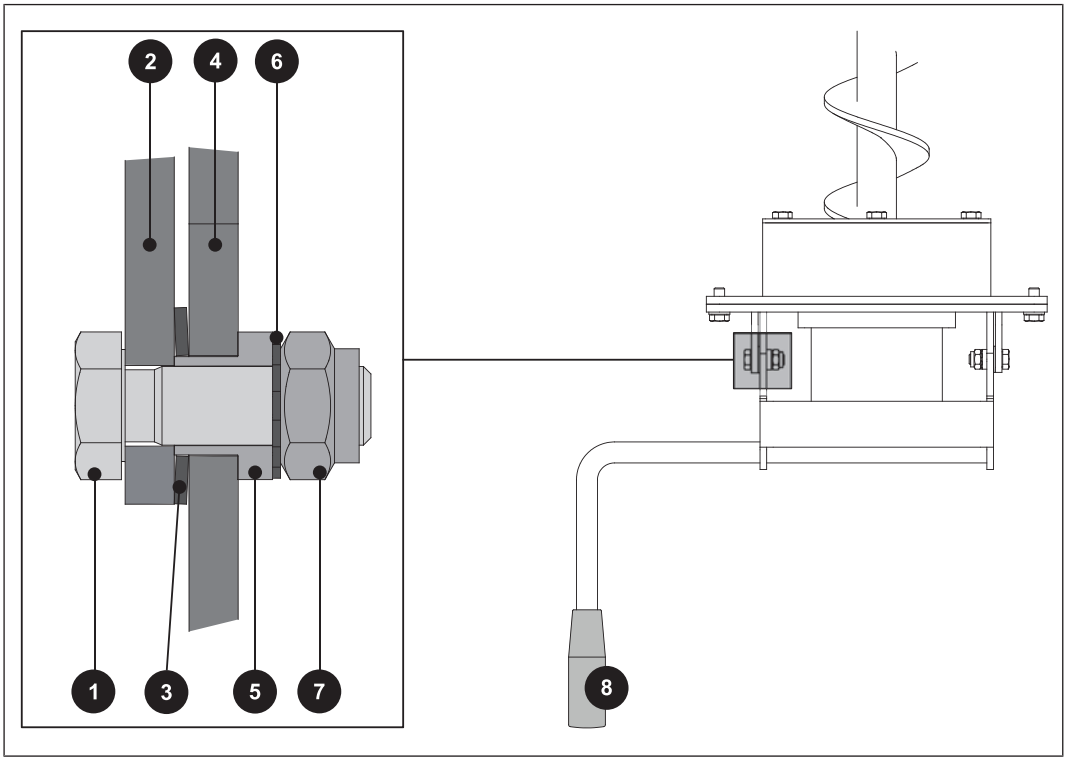
❒ Insert the flange plate with the ash screw into the heat exchanger on the back of the boiler and fix it in place with screws
- 4x hexagon screws M8 x 25



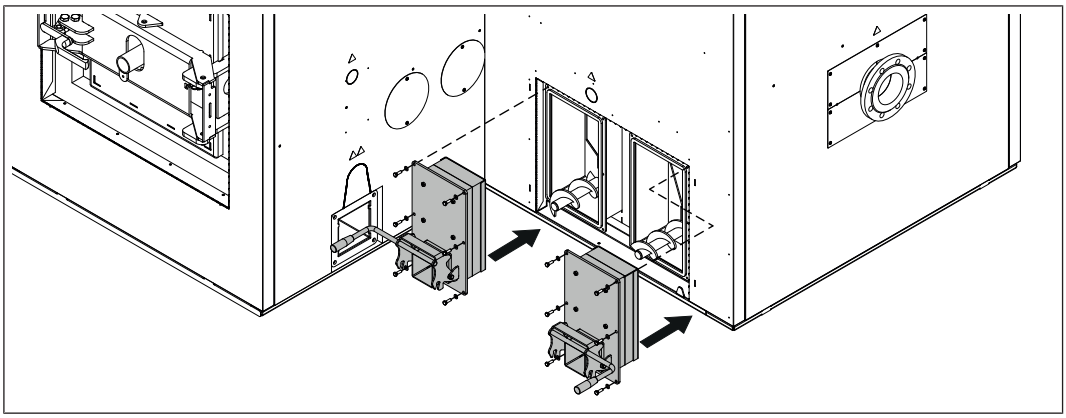
❒ Set the chain wheel on the chain tensioner so that all the three chain wheels are aligned with each other

❒ Wind the roller chain on to the motor and bearing block chain wheels. Tension the chain and fix it in place with a chain lock

❒ Assemble the ash removal unit flange as shown in the figure below:

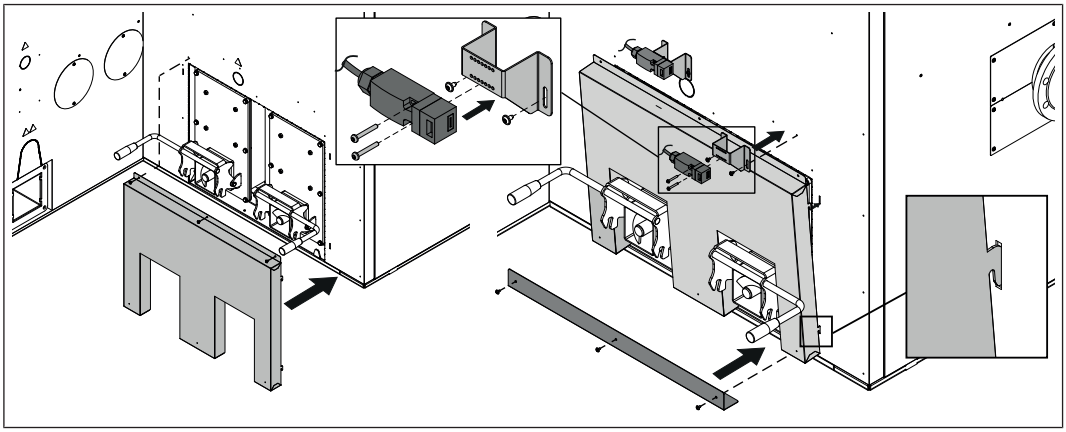


1	M8x25 hexagonal screw	2	Ash removal unit flange
3	Spring washer	4	Locking lever
5	Bushing	6	M8 toothed washer
7	M8 nut	8	Plastic grip



❒ Mount the mating flange (E)
- 6x hexagon screws M8 x 25 for each mating flange

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



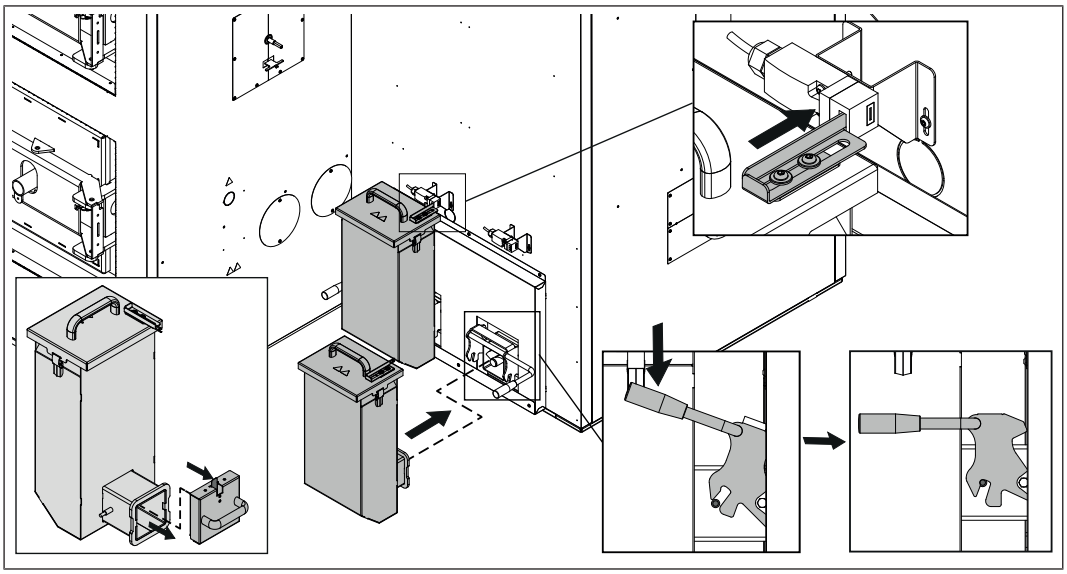
❒ Mount the insulation on the ash removal unit flange
- 3x raised head screws M4 x 10

❒ Mount the cover plate under the ash removal unit flanges
- 3x raised head screws M4 x 10

❒ Mount the safety switches on the brackets
- 2x raised head screws M4 x 30 per safety switch

❒ Fit both safety switches complete with brackets to the insulating side panel, and align them
- 2x raised head screws M4 x 10 per bracket

↳ Do not fully tighten the screws yet



❒ Press the clamp forwards and remove the ash container coupling caps

↳ Store the closure cover in a suitable location where you can find it later. It will be needed when disposing of the ash.

❒ Position both ash containers on the ash removal unit flanges

❒ Push the side lever on the ash removal unit flange downwards to fix the ash container in place

❒ Push the key plates into the safety switches

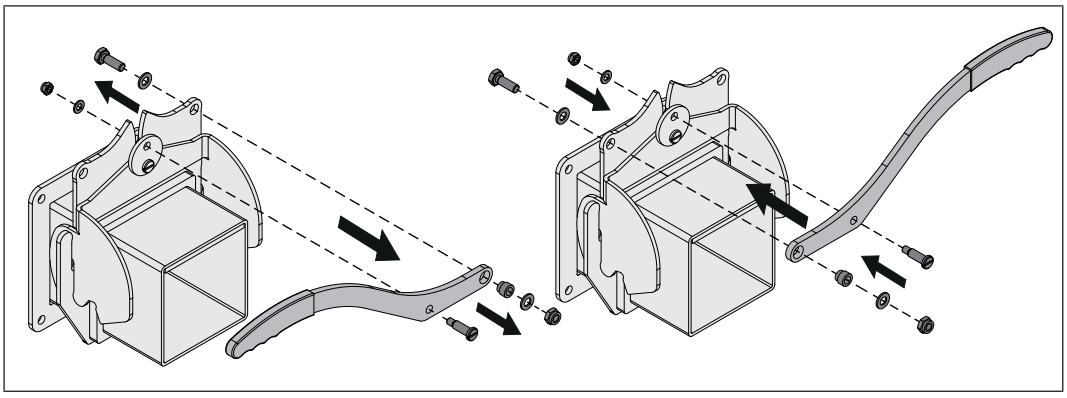
❒ Set the safety switch so that the key plates engage correctly

❒ Tighten the safety switch screws

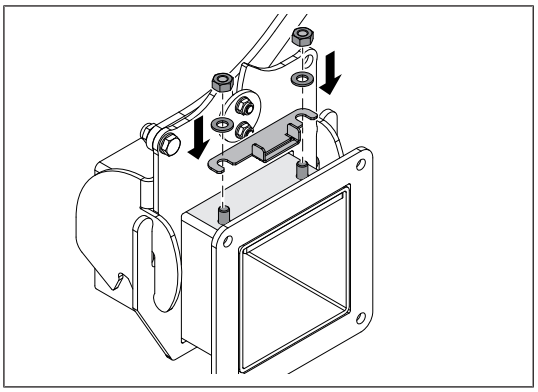
5.5.23 Fitting the combustion chamber ash removal unit (optional)

If the heat exchanger is mounted on the left, before you start assembly modify the ash removal unit flange as follows:

Version with heat exchanger on the left:

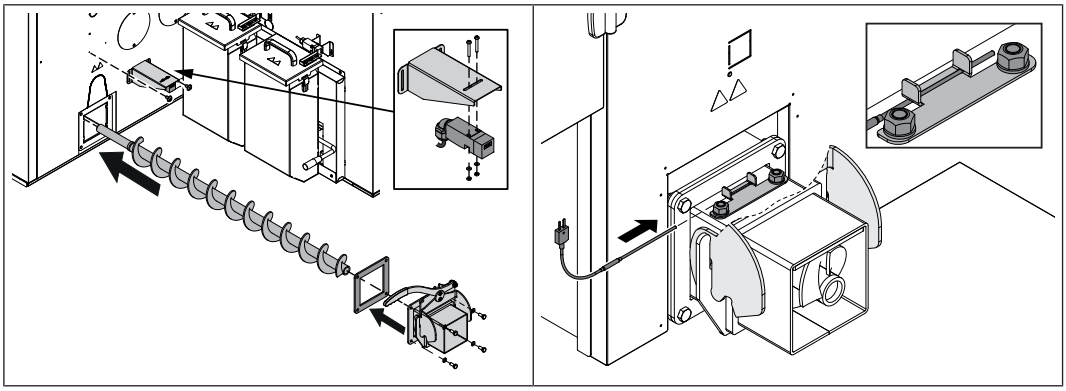


❒ Remove the lever from the ash removal unit flange, turn it over and then refit it



❒ Undo the screws on the ash removal flange and fit the clamping plate
- 2x hexagonal nuts M10

On the heat exchanger side:



❒ Push the ash screw into the combustion chamber

❒ Fit the ash removal unit flange with a gasket on to the combustion chamber on the heat exchanger side
- 4x hexagonal screws M10 x 25

❒ Mount the safety switch
- 2x raised head screws M4 x 30

❒ Install bracket on the insulation side panel
- 2x raised head screws M4 x 10

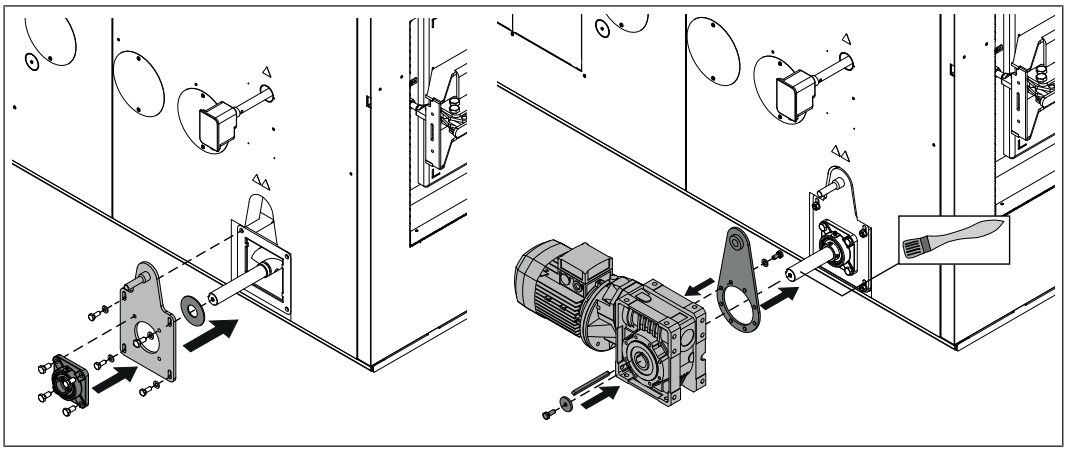
↳ Do not fully tighten the screws yet

❒ Slide the sensors into the clamping plate

Prepare the geared motor:

❒ Remove the shipping clamp from the geared motor

❒ Fit the vent screw (supplied) to the highest point



❒ Fix the washer to the shaft stub

❒ Fit the flange plate and flange bearing to the combustion chamber
- 4 hexagonal screws M10 x 30 (flange plate)
- 4x hexagonal screws M12 x 15 (flange bearing)

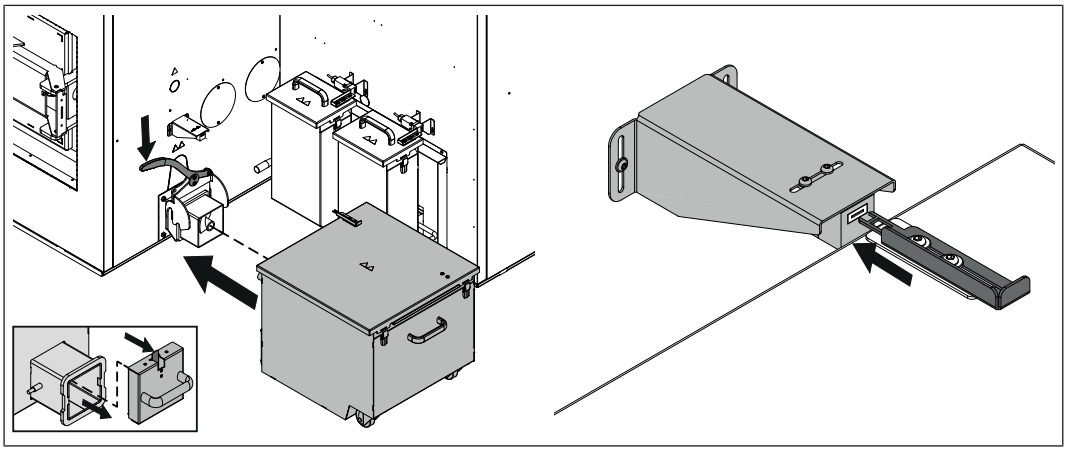
❒ Lubricate the shaft stub with copper paste

❒ Mount the torque support on the geared motor
- 8x hexagonal screws M10 x 20

❒ Fit the geared motor on to the shaft stub

↳ Ensure that the fitted key slot on the shaft stub is aligned with the fitted key slot in the geared motor

❒ Slide the fitted key into the slot and fit the shaft retainer
- 1x hexagonal screw M10 x 25



❒ Press the clamp forwards and remove the ash container coupling caps

↳ Store the closure cover in a suitable location where you can find it later. It will be needed when disposing of the ash.

❒ Position the ash container at the ash removal unit flange

❒ Push the lever on the side of the ash removal unit flange downwards to lock the ash container in place

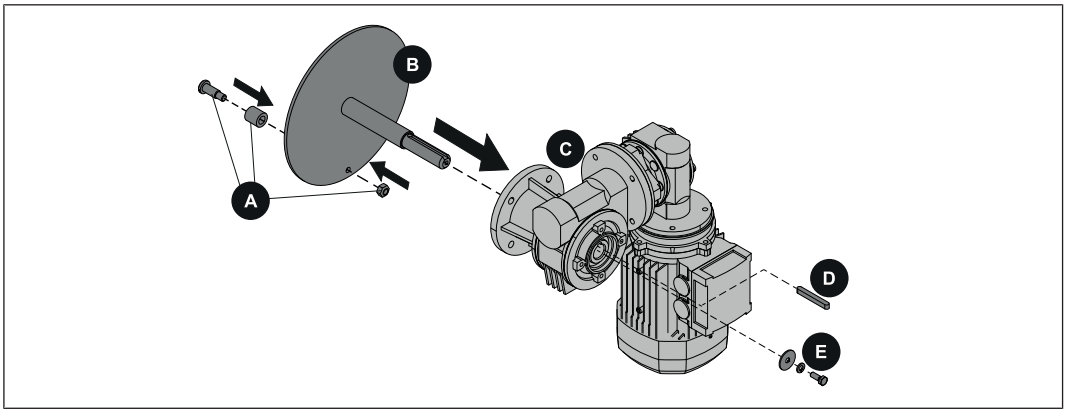
❒ Push the key plate into the safety switch

❒ Set the safety switch so that the key plate engages correctly

❒ Tighten the screws on the safety switch

5.5.24 Fitting the WOS drive

Turbomat TM 320

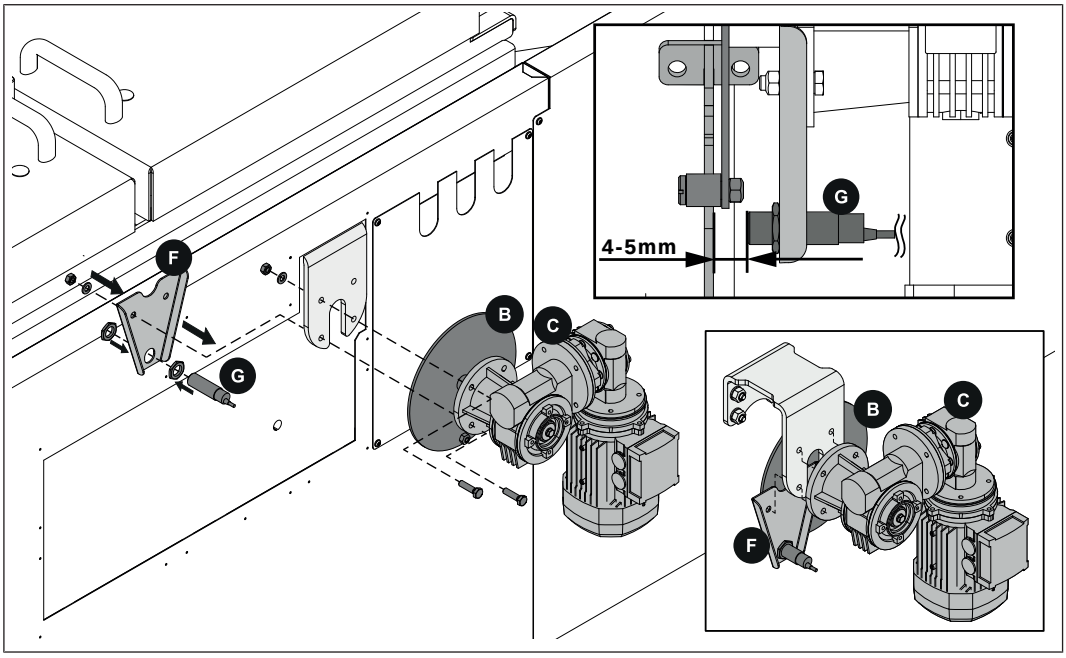


❒ Fit the flat head screw, bore bush and nut (A) to the WOS disc (B)

❒ Insert the WOS disc (B) into the geared motor (C)

↳ The slot in the WOS disc must be aligned with the slot in the geared motor

❒ Slide the fitted key (D) into the slot and fit the shaft retainer (E)
- 1x hexagon screw M6 x 16



❒ Fit the geared motor (C) complete with the WOS disc (B) to the motor mounting bracket with the two upper screws
- 2x hexagon screws M8 x 30

↳ The motor must face downwards

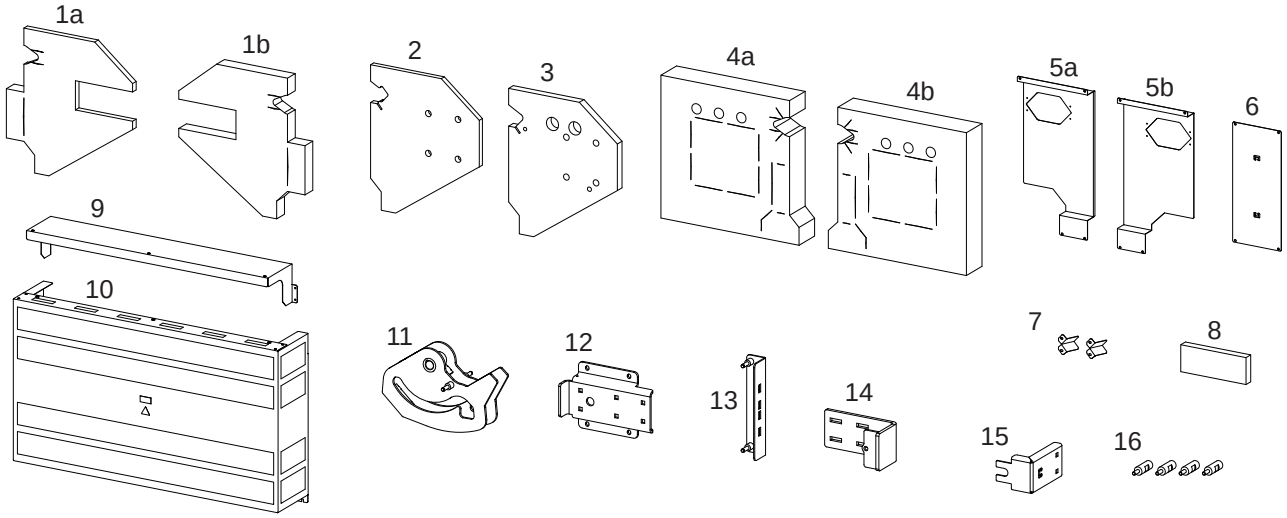
❒ Position the bracket (F) for the function monitoring behind the motor mounting bracket and fix it in place together with geared motor (C) with the two lower screws
- 2x hexagon screws M8 x 30

❒ Fix the sensor (G) for the function monitoring to the bracket (F)

❒ Set the sensor (G) for the function monitoring as follows:

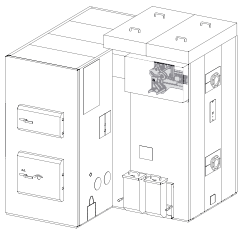
↳ Distance between sensor (G) and WOS lever: 4-5mm

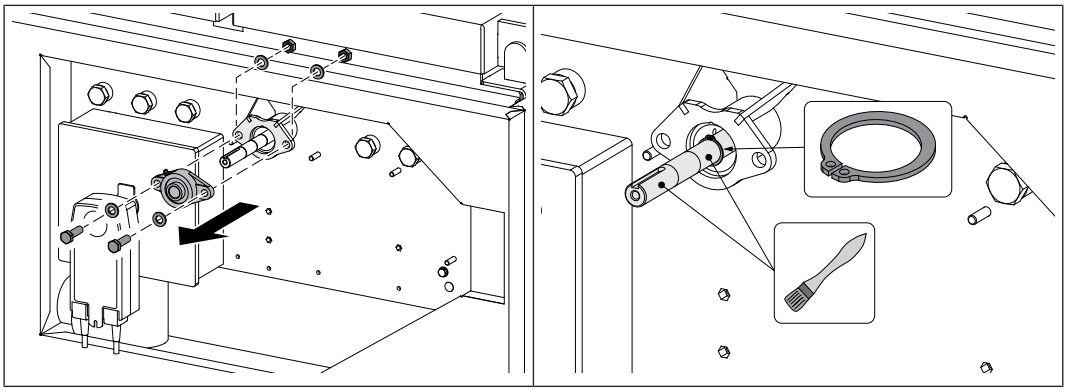
Turbomat TM 400-550



1	Thermal insulation 468 x 488 x 50	**9**	Upper cover
2	Thermal insulation 403 x 490 x 20	**10**	Front cover
3	Thermal insulation 403 x 490 x 30	**11**	Drive lever
4	Thermal insulation 488 x 512 x 100	**12**	Securing plate
5	Cover plate	**13**	Suspension plate
6	Cover plate	**14**	Bearing bracket
7	Air deflection plate	**15**	Sensor retaining plate
8	Insulating plate 92 x 242 x 30	**16**	Spacer pin
a ... for heat exchanger on the right			
b ... for heat exchanger on the left			

Front panel of the heat exchanger



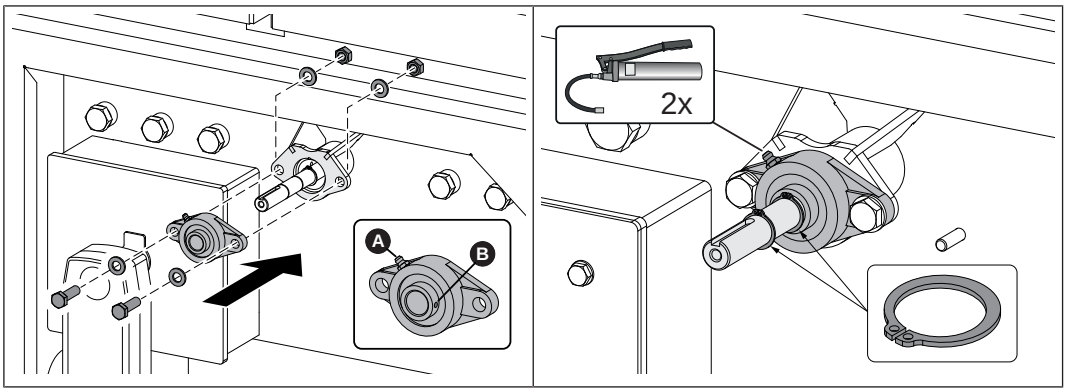


❒ Dismantle the flange bearing unit at the bearing flange

❒ Insert the retainer ring into the rear shaft slot at the front of the heat exchanger

❒ Smear the front of the drive shaft up to the Circlip with copper paste

IMPORTANT! Use Circlips only on the front face of the heat exchanger



❒ Mount the flange bearing unit on the bearing flange
- 2x M12 x 40 hexagon head screws

↳ Position it so that the grease nipple (A) is on the upper side

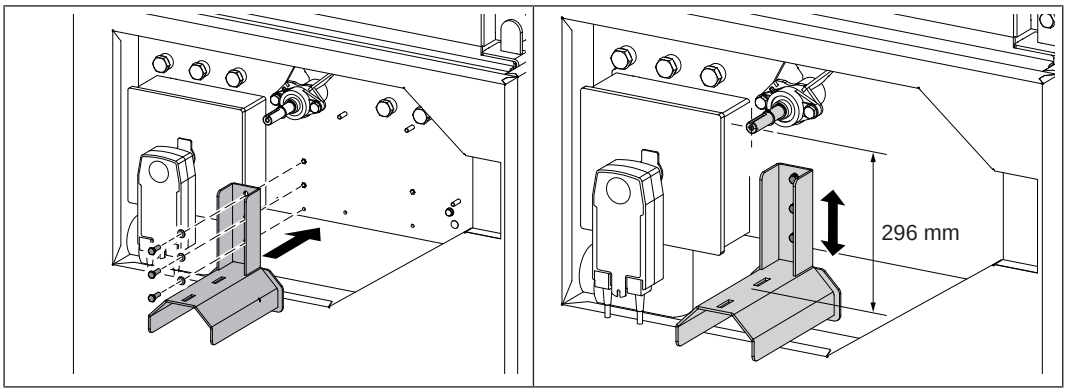
❒ Secure the retaining screw (B) on the flange bearing unit

❒ Smear the flange bearing with high-temperature grease such as Blasolube 306 (Fröling part no. 68982)

↳ Perform two strokes of the manual grease press

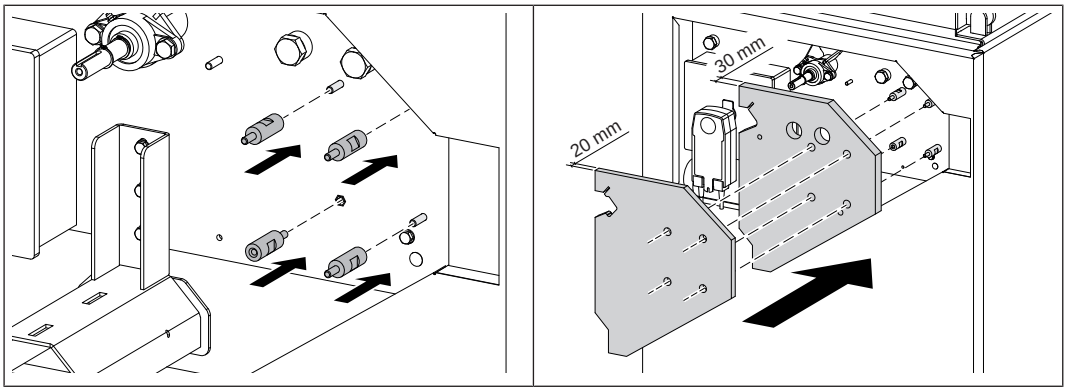
❒ Insert the two retaining rings into the shaft slots

IMPORTANT! Use Circlips only on the front face of the heat exchanger



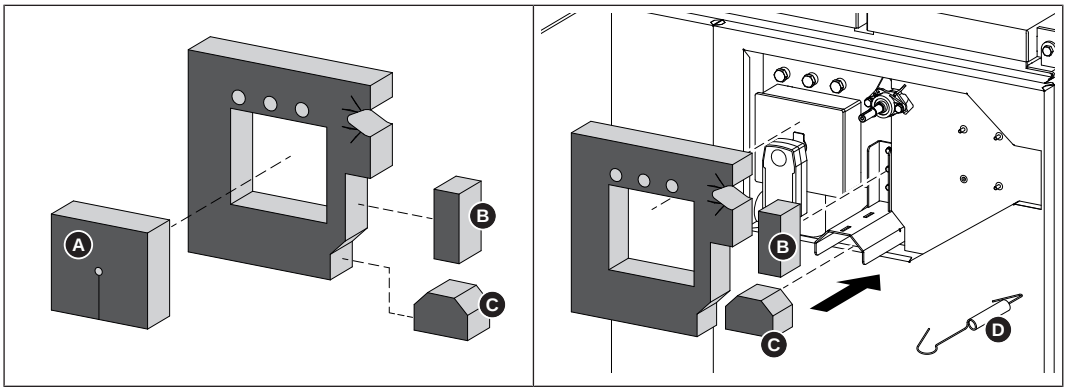
❒ Mount the bracket on the bearing flange
- 3x M8 x 25 hexagon head screws

↳ Distance of the shaft centreline from the bracket: 296 mm



❒ Mount the spacer pins on the heat exchanger
- 3x welded studs
- 1x insert nut

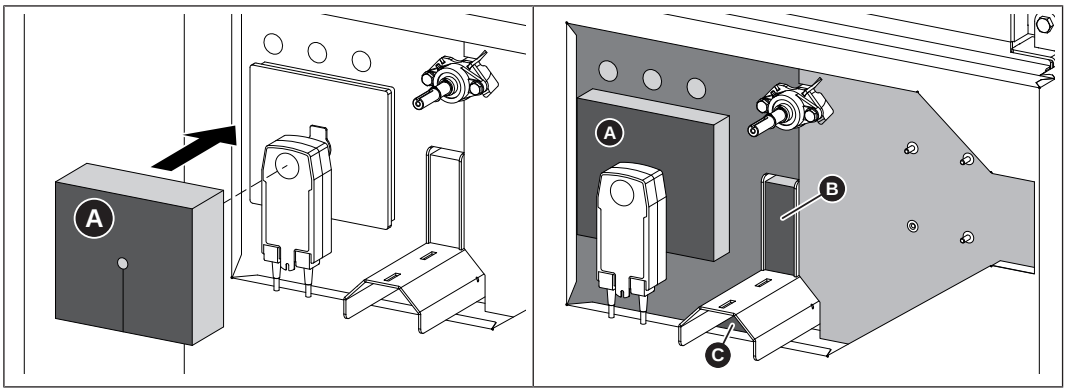
❒ Position the insulating plates on the heat exchanger as shown



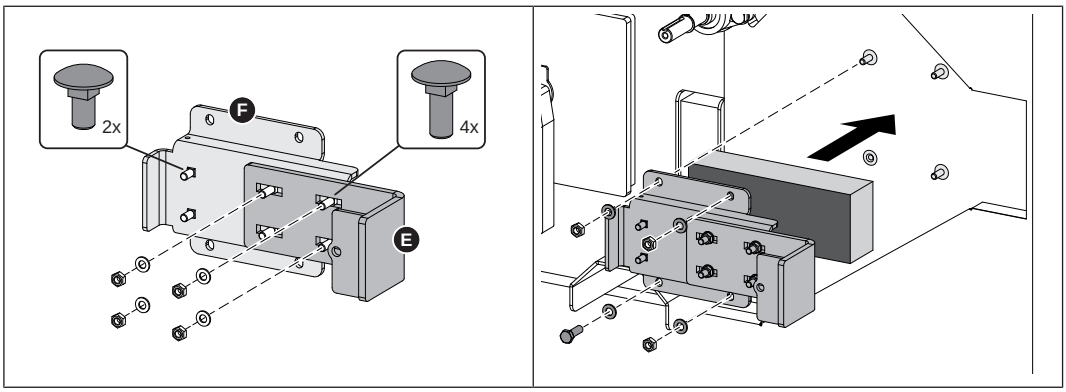
❒ Cut out the pre-punched areas (B and C) on the thermal insulation

↳ If the optional jacket cooling is fitted, also cut out the pre-punched area (A)

❒ Position the thermal insulation on the heat exchanger and fix it in place using tension springs (D)



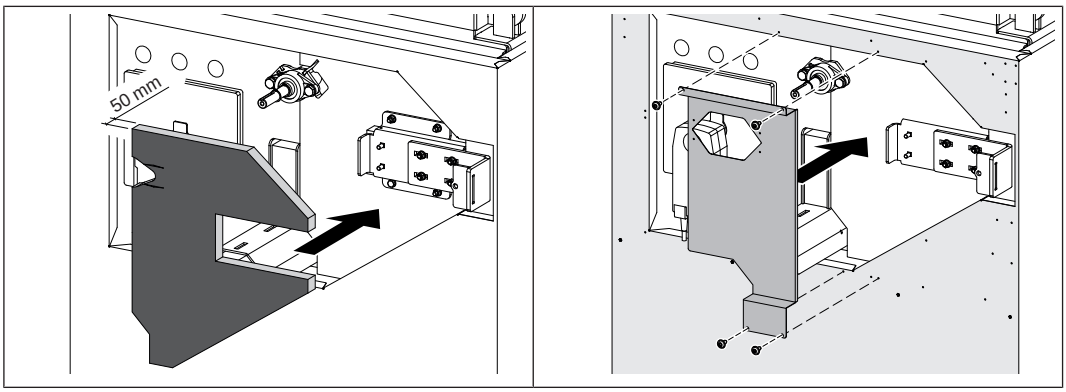
❒ If the optional jacket cooling is fitted:
position the thermal insulation (A) behind the servo-motor



❒ Mount the bearing bracket (E) on the securing plate (F)
- 4x M8 x 25 round head screws

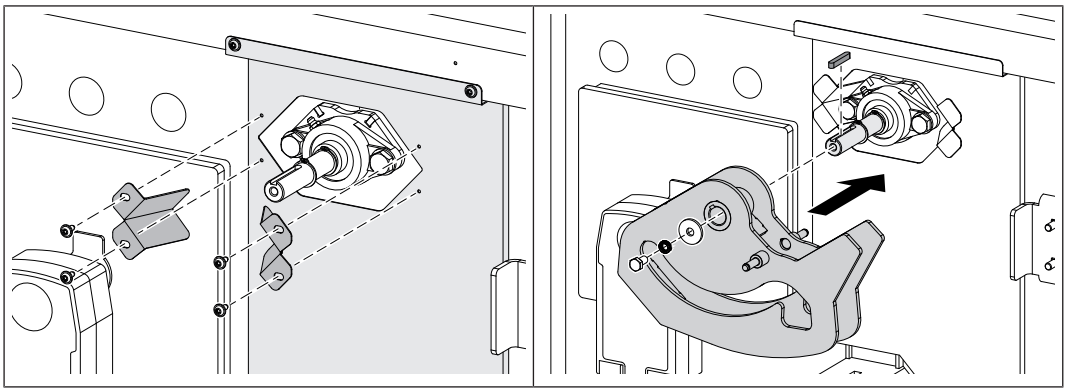
❒ Insert the round head screws into the securing plate (F)
- 2x M8 x 20 round head screws

❒ Insert the insulation plate on the back to the retaining plate and mount the unit on the heat exchanger
- 3x M8 hexagon nuts
- 1x M8 x 25 hexagon head screw



❒ Position the thermal insulation and fix it in place using tension springs

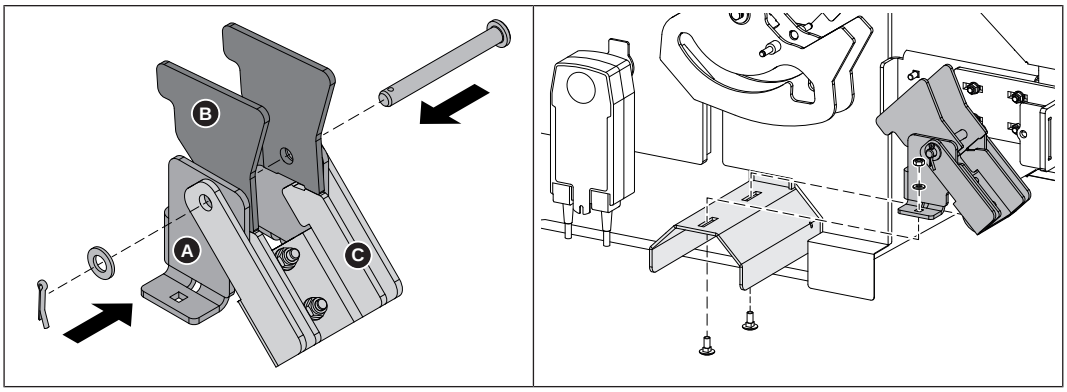
❒ Mount the cover plate on the cladding
- 4x M4 x 10 raised-head screws



❒ Mount the air deflection plates on the cover plate
- 2x M4 x 10 raised-head screws for each air deflection plate

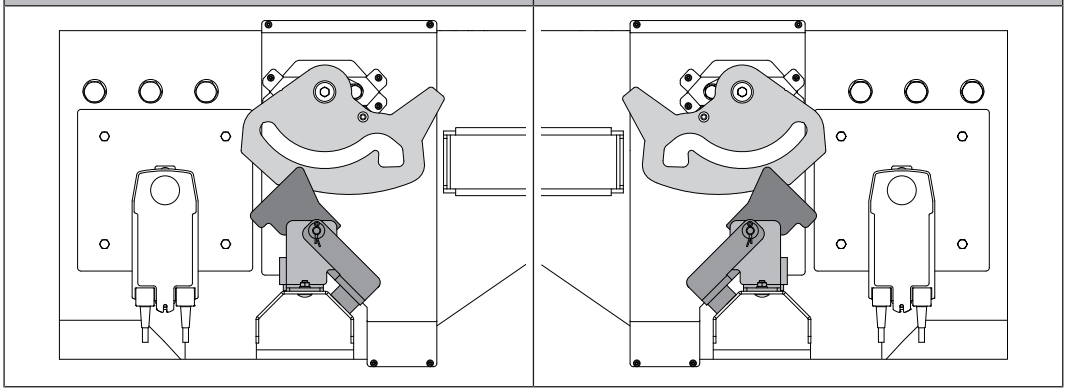
❒ Insert the fitted key into shaft slot of the drive shaft

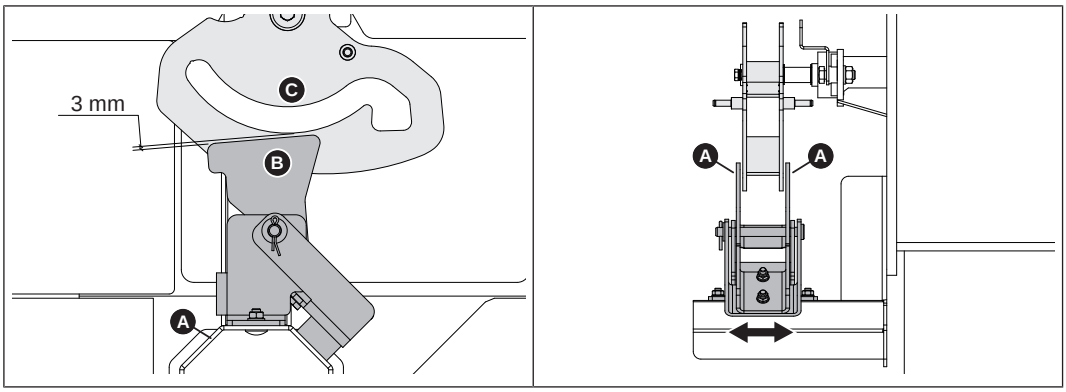
❒ Push the drive lever on to the drive shaft and use the shaft lock to fasten it
- 1x M8 x 16 hexagon head screw
- 1x M8 wedge lock washer



❒ Connect bracket (A), guide plate (B) and stop (C) as shown
- 1x Ø 20 x 116 split pin and cotter pin

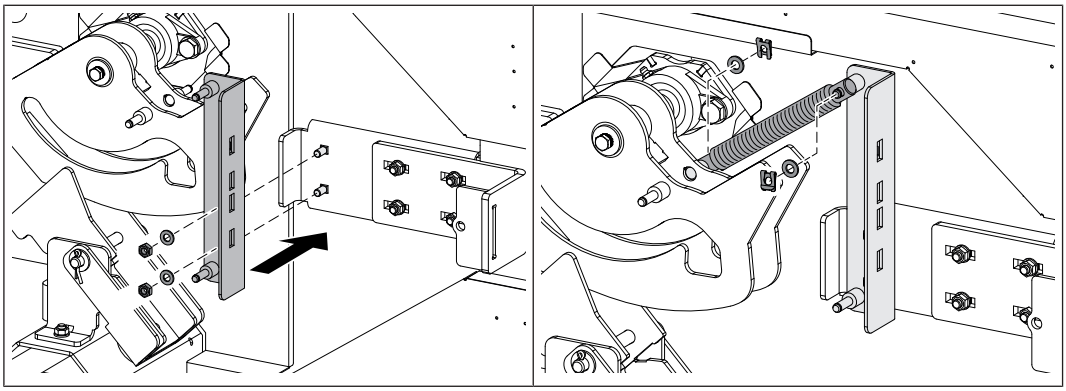
❒ Mount the unit on the bracket
- 2x M8 x 20 round head screws

Heat exchanger on the right	Heat exchanger on the left
	



❒ Check the distance between the deflector plate (B) and the recess in the drive lever (D)

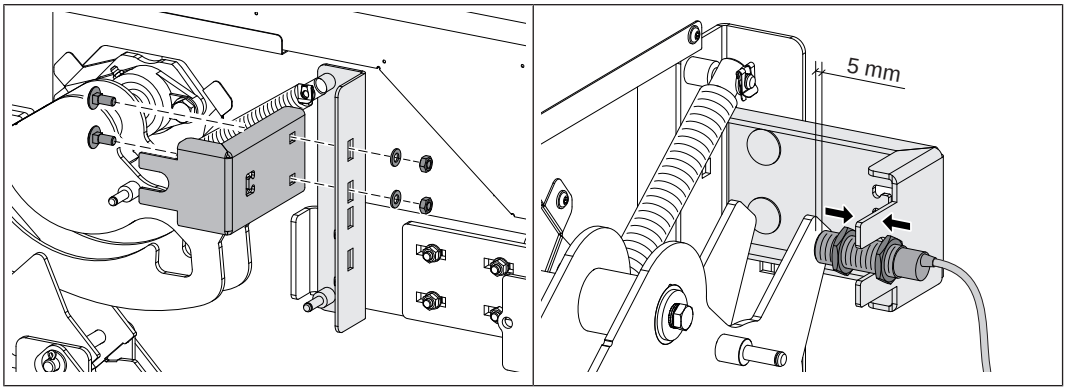
❒ Align the unit on the bracket so that there is an even gap (A) to the drive lever



❒ Attach the suspension plate to the securing plate
- 2x M8 hexagon nuts

❒ Slide the tension spring on to the pin of the drive lever and on to the suspension plate

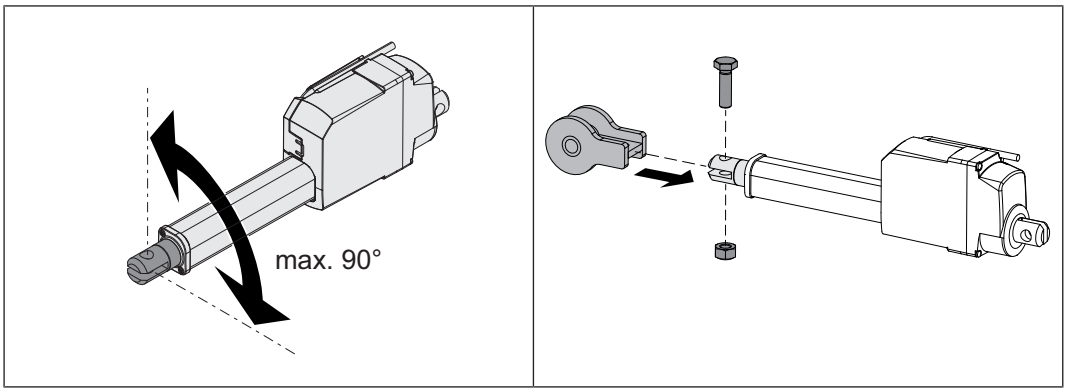
❒ Secure both ends of the tension spring with M8 clips and washers



❒ Mount the sensor retaining plate on to the suspension plate
- 2x M8 x 20 round-head screws

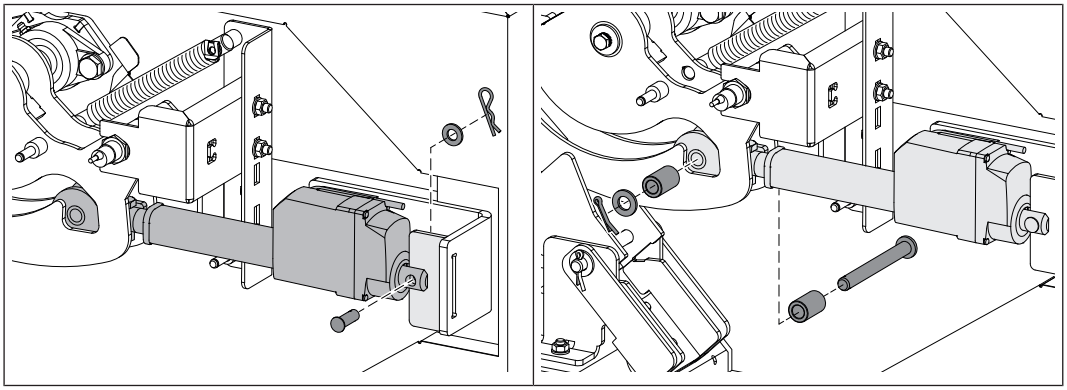
❒ Mount the proximity switch on the sensor retaining plate

❒ Gap between proximity sensor and drive lever: approx. 5 mm



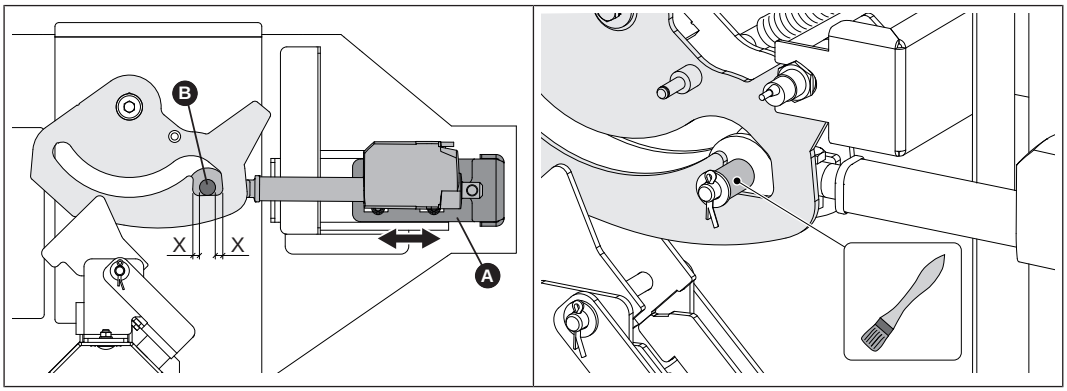
NOTICE! Turn the spindle of the linear drive by a maximum of 90° - risk of damage

❒ Attach the extension to the linear drive
- 1x M10 x 35 hexagon head screw
- 1x M10 self-locking nut



❒ Mount the linear drive on to the bearing bracket
- 1x Ø 10 x 29 split pin
- 1x Ø 2.5 x 44 spring cotter

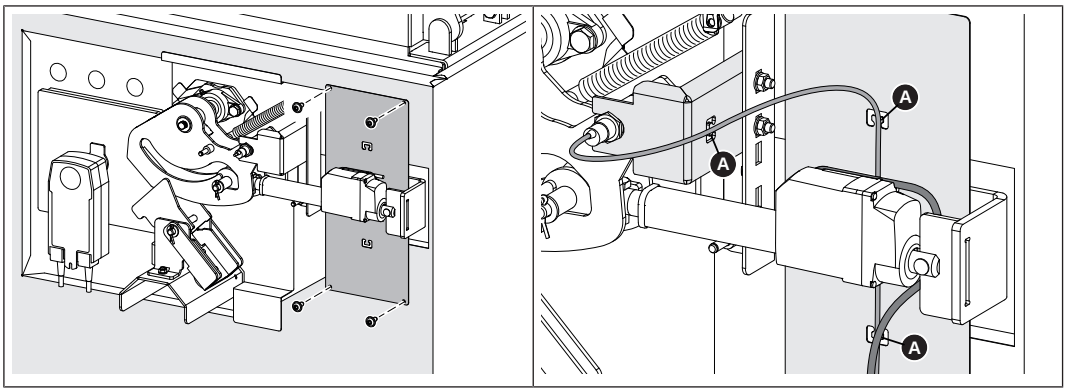
❒ Position the linear drive on the drive lever
- 1 split pin Ø 20 x 116
- 2 drill bush Ø 20 x 32
- 1 split pin Ø 4 x 25



❒ Align the bearing bracket (A) so that the follower pin (B) of the linear drive is positioned in the centre of the cut-out on the drive lever

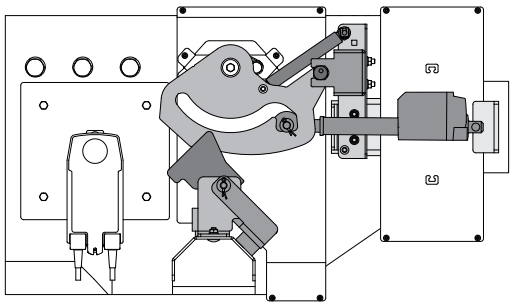
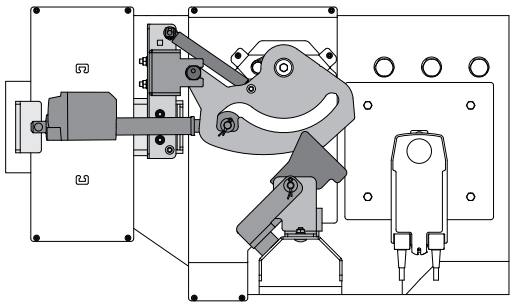
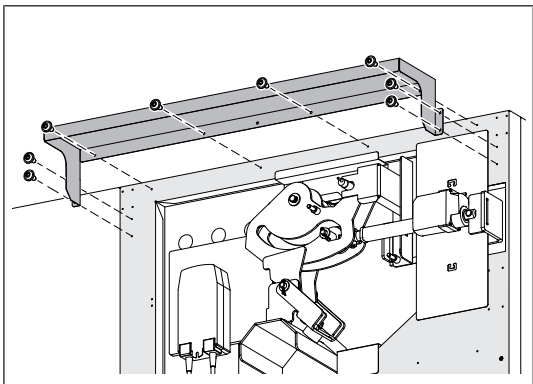
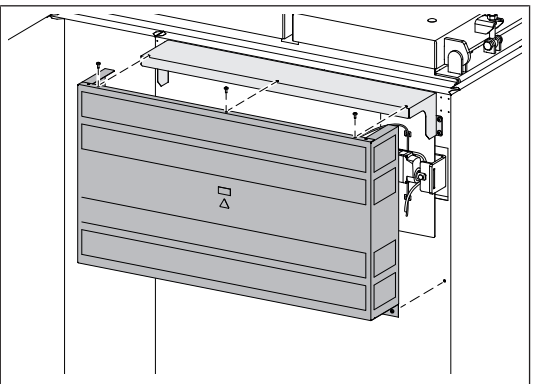
IMPORTANT! For alignment purposes, the linear drive must be fully retracted

❒ Smear the drilled bush with copper paste



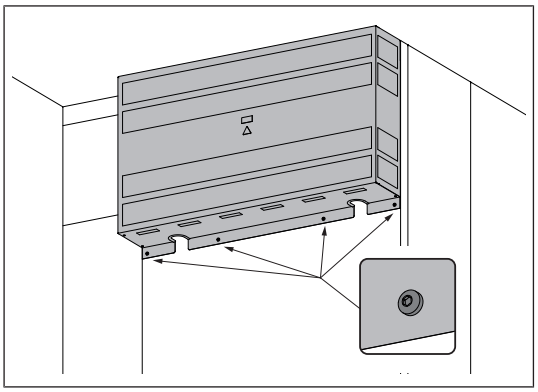
❒ Position the cover plate behind the linear drive and mount it on the cladding
- 4x M4 x 10 raised-head screws

❒ Use cable ties to secure the cables of the proximity sensor and the linear drives at the positions (A) intended, route them for boiler control and connect them as shown in the circuit diagram

Heat exchanger on the right	Heat exchanger on the left
	
	

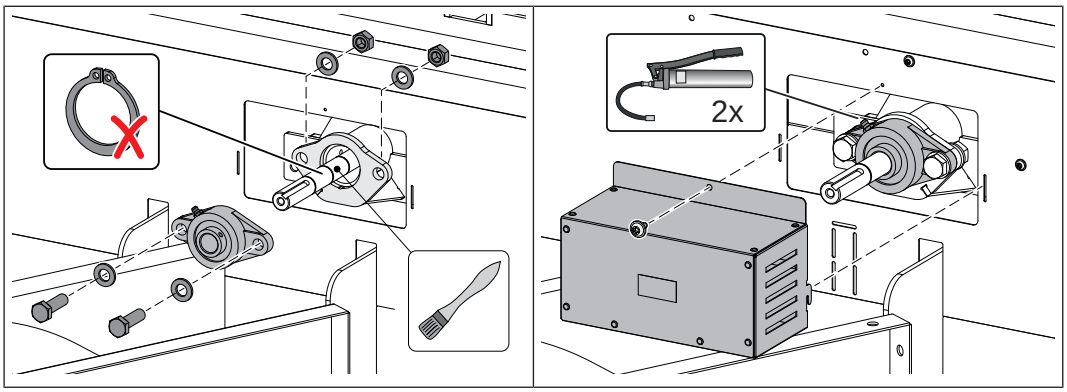
❒ Mount the upper cover on the cladding
- 8x M4 x 10 raised-head screws

❒ Mount the front cover on the top face
- 3x M5 x 12 captive screws



❒ Install the cover on the bottom
- 4x captive screws M5 x 12

Rear face of the heat exchanger



❒ Remove the flange bearing
- 2x M12 x 40 hexagon head screws

↳ Inspection: No Circlips may be mounted in front of or behind the flange bearing

❒ Smear the front of the drive shaft with copper paste

❒ Mount the flange bearing
- 2x M12 x 40 hexagon head screws

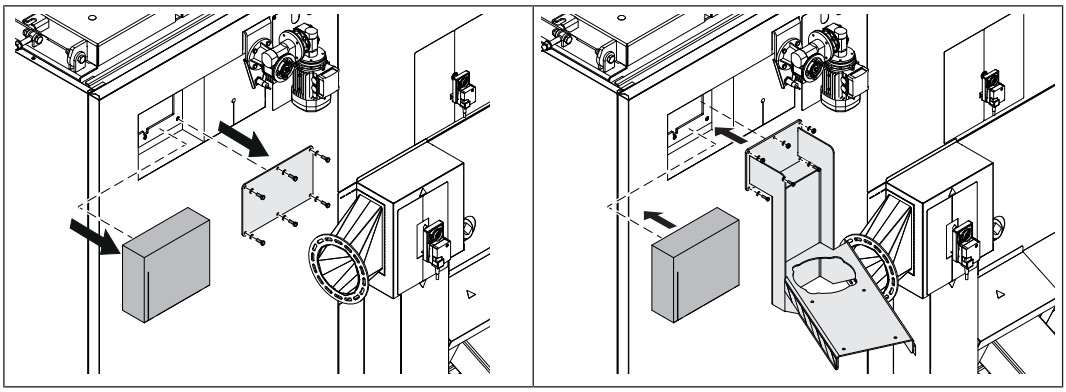
❒ Smear the flange bearing with high-temperature grease such as Blasolube 306 (Fröling part no. 68982)

↳ Perform two strokes of the manual grease press

❒ Install the cover
- 1x M4 x 10 raised-head screw

5.5.25 Fitting the FGR blower fan

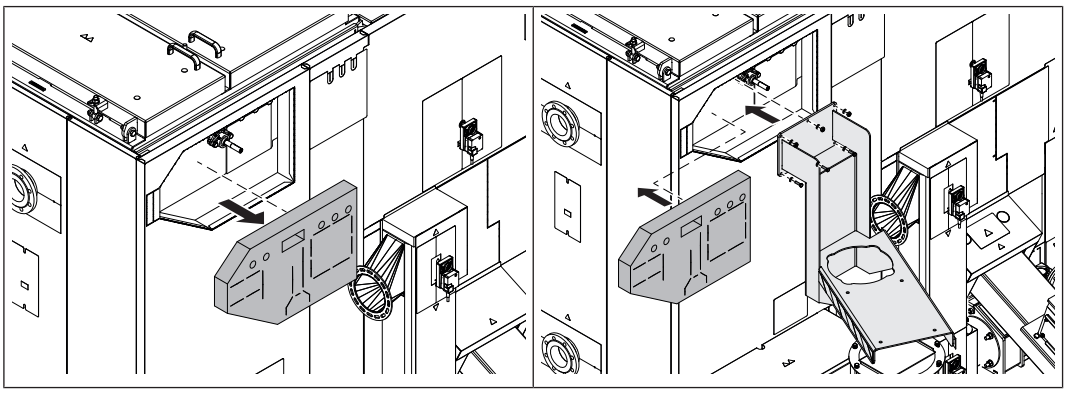
For the Turbomat TM 320:



❒ Remove the thermal insulation and cover plate from the FGR bracket on the back of the heat exchanger

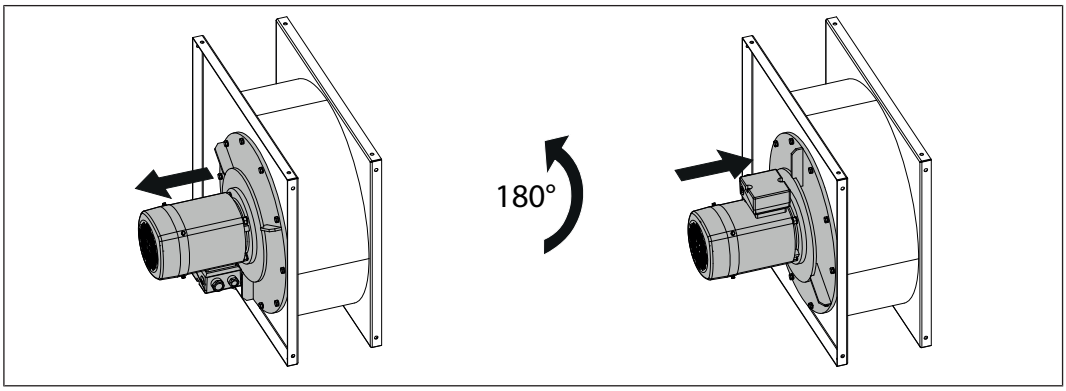
❒ Mount the FGR bracket and reinstall the thermal insulation
- 3x M8 hexagonal nuts
- 3x hexagonal screws M8 x 30

For the Turbomat TM 400-550:



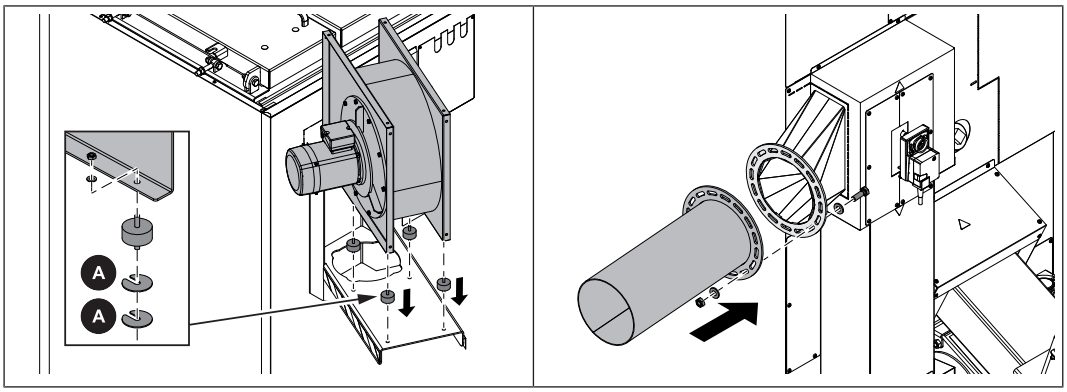
❒ Remove the thermal insulation

❒ Mount the FGR bracket and reinstall the thermal insulation
- 3x M8 hexagonal nuts
- 3x hexagonal screws M8 x 35



❒ Remove the drive assembly from the FGR blower fan, rotate 180° and re-fit

↳ Makes the connection easier

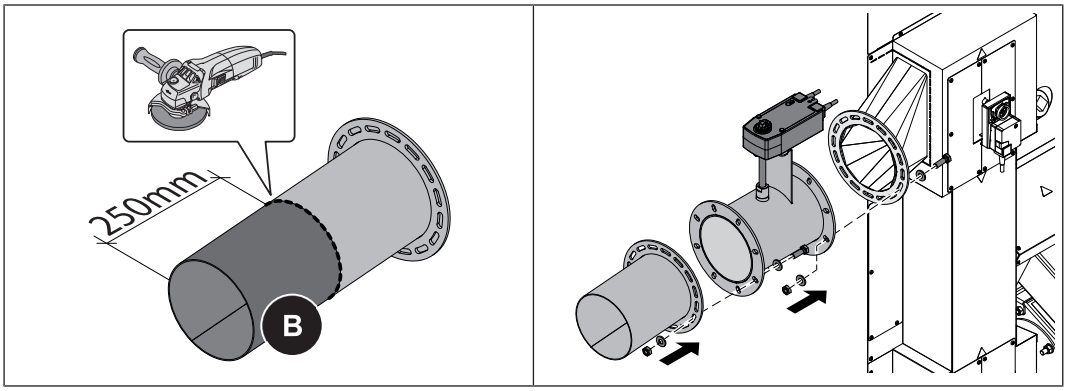


❒ Fit the FGR blower fan with the rubber buffers on the bracket and align it to horizontal
- 8x M8 hexagonal nuts

↳ **TIP:** Use the spacers (A) provided to align the FGR blower fan.

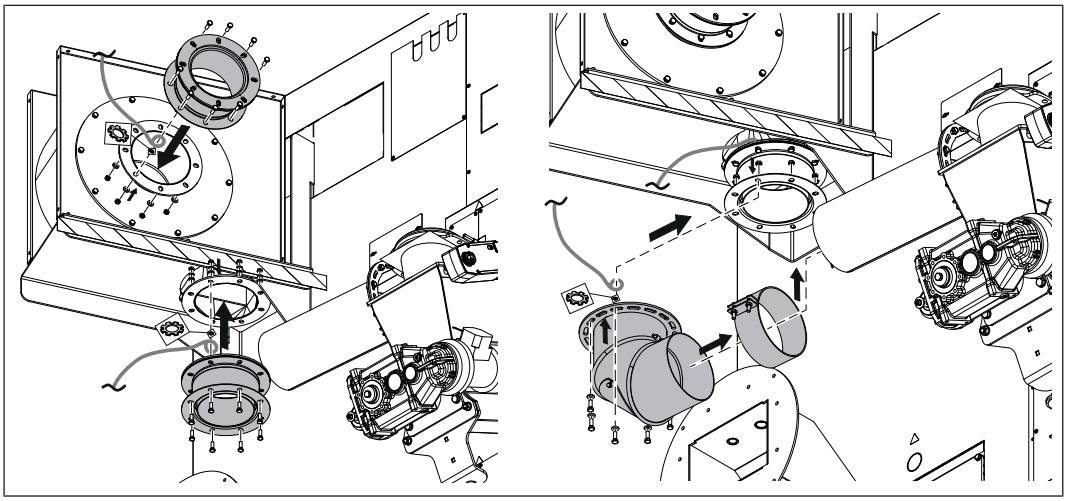
❒ **For boilers without electrostatic precipitators:** Fit the flanged pipe to the FGR duct
- 8x hexagonal screws M10 x 30

For boilers with electrostatic precipitators:



❒ Shorten the flange pipe by 250 mm (B)

❒ Fit the flue gas damper and the previously shortened flange pipe to FGR duct
- 8x hexagonal screws M10 x 30



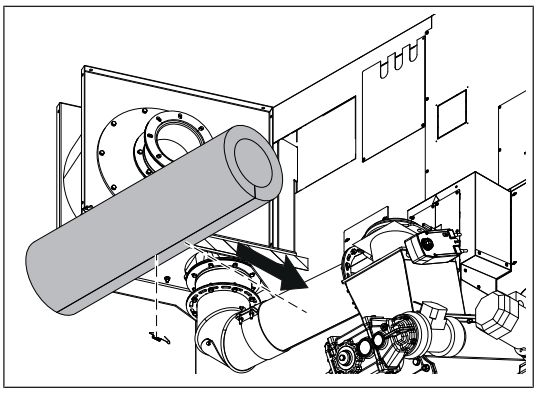
❒ Fit 1x flue pipe compensator to each of the side and underside of the FGR blower fan
- 8x hexagonal screws M10 x 30 per compensator

↳ Also screw on the earthing wire (supplied) with the toothed washer as potential equalisation

❒ Fit the pipe bend on the upper side of the flange on the flue pipe compensator and on the side to the flange pipe using a clamp
- 8x hexagonal screws M10 x 30

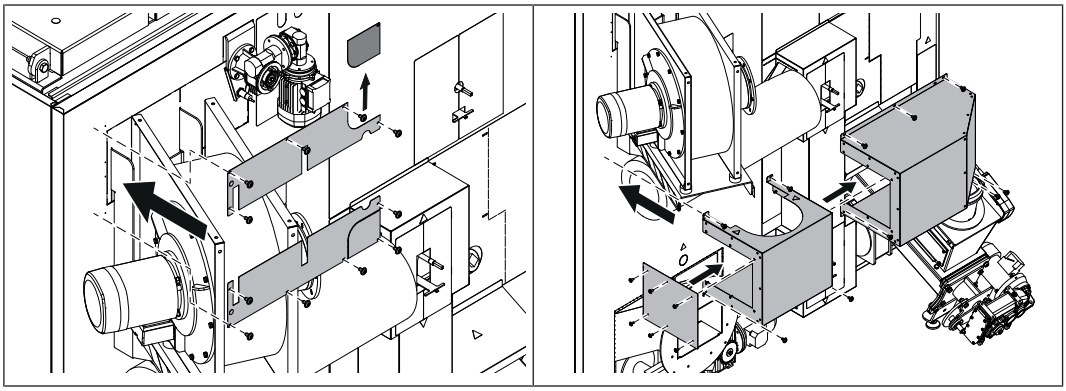
↳ Also screw on the earthing wire (supplied) with the toothed washer as potential equalisation

↳ Seal the connection



❒ Wrap thermal insulation around the FGR pipe and fix it in place using tension springs

For the Turbomat TM 320:



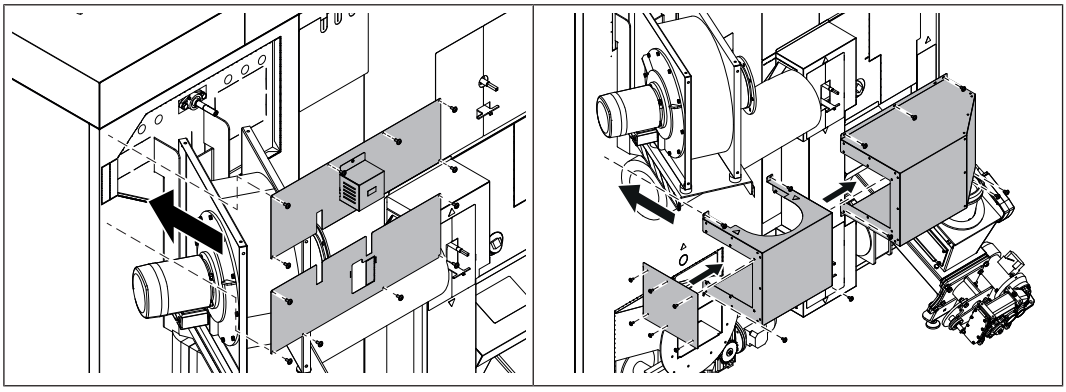
❒ Install the cover plates for the FGR blower fan
- 11x raised head screws M4 x 10

↳ Cut out the pre-punched openings on the cover plate for the WOS drive

❒ Fit the cover to the FGR pipe and pipe bend
- 10x raised head screws M4 x 10

❒ Fit the cover plate on the inspection plate on the side of the pipe bend cover
- 6x raised head screws M5 x 12

For the Turbomat TM 400-550:



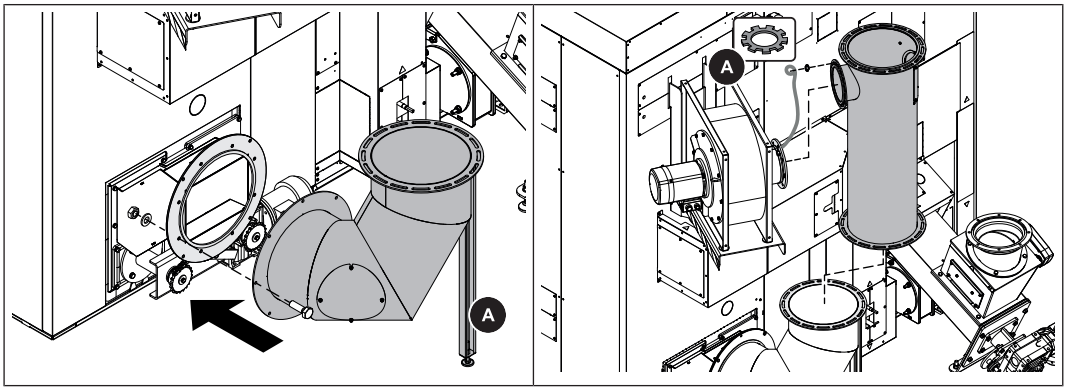
❒ Fit the cover plates for the FGR blower fan
- 12x raised head screws M4 x 10

❒ Fit the cover to the FGR pipe and pipe bend
- 10x raised head screws M4 x 10

❒ Fit the cover plate on the inspection plate on the side of the pipe bend cover
- 6x raised head screws M5 x 12

NOTICE! Insulate the FGR blower fan using materials supplied by the customer, making sure the drive set can still be removed.

5.5.26 Fitting the intermediate piece (when using an electrostatic precipitator)



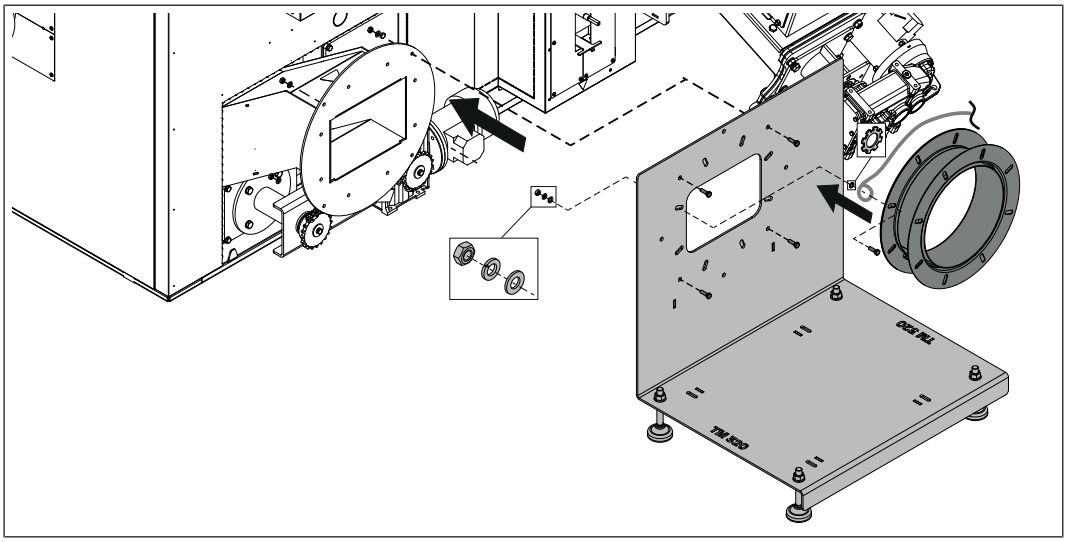
❒ Install the intermediate piece on the flange
- 8x hexagonal screws M10 x 30

↳ Align support (A) with the floor

❒ Install the T-piece between the FGR blower fan and intermediate piece
- 8x hexagon screws M10 x 30 per connection

NOTICE! Insulate pipework on site!

5.5.27 Installing the induced draught fan

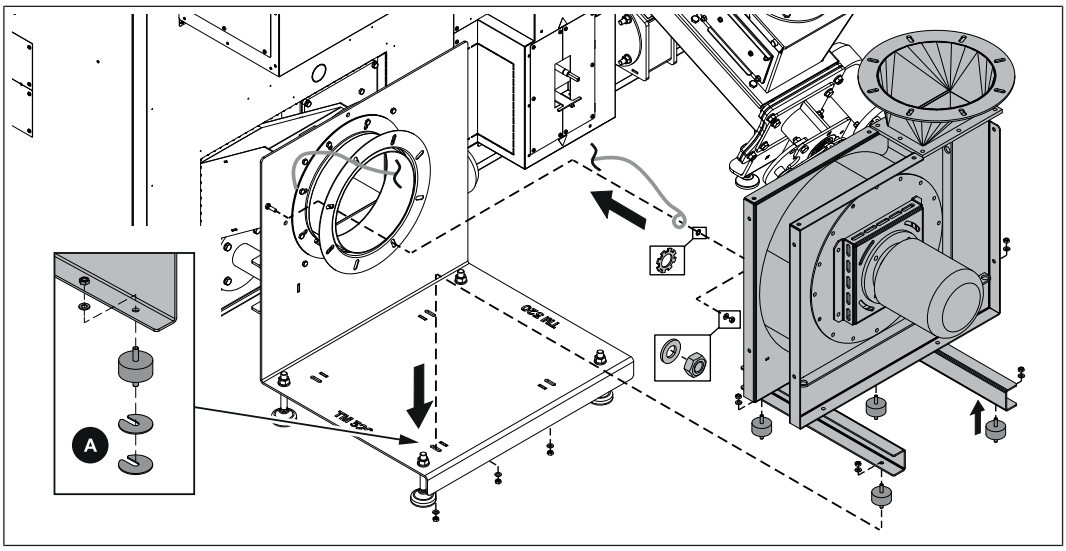


❒ Install the induced draught fan
- 4x hexagonal screws M8 x 25

↳ Align correctly using the adjustable feet and fix in place using the spacer washer and hexagon bolt

❒ Mount the flue pipe compensator on the ID fan bracket
- 8x hexagon screws M10 x 30

↳ Also screw on the earthing wire (supplied) with the toothed washer as potential equalisation

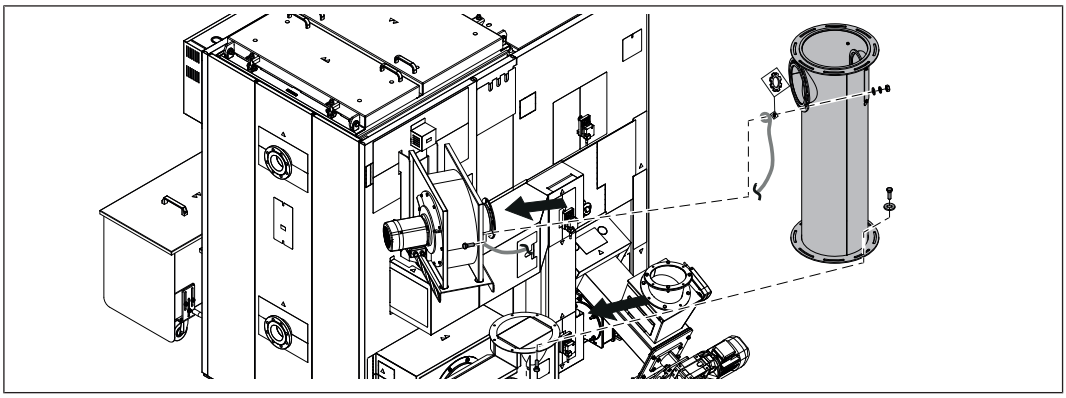


❒ Align the induced draught fan horizontally using the rubber buffers on the underside of the induced draught bracket and fit it
- 8x M8 hexagonal nuts

↳ **TIP:** Use the spacers (A) provided to align the ID fan.

❒ Install the induced draught fan on the flue pipe compensator
- 8x hexagonal screws M10 x 30

↳ Also screw on the earthing wire (supplied) with the toothed washer as potential equalisation

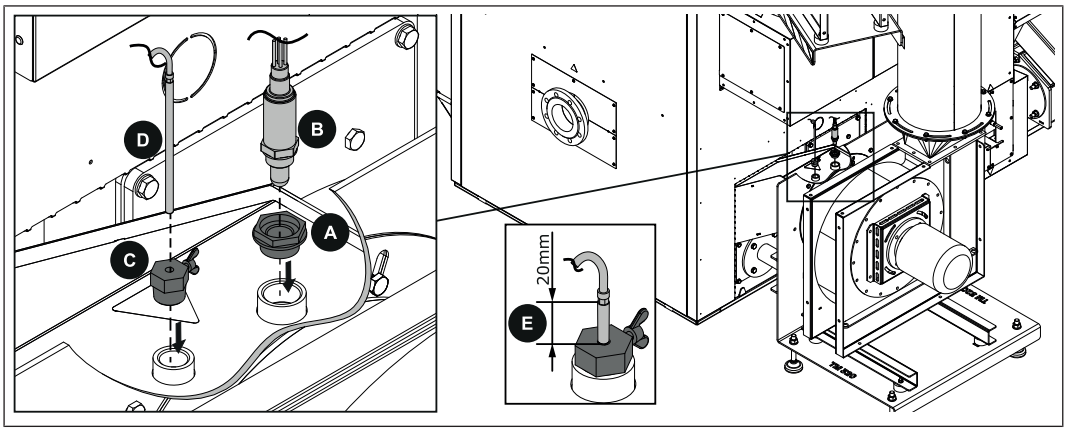


❒ Install the T-piece between the induced draught fan and the FGR blower fan
- 8x hexagon screws M10 x 30 per connection

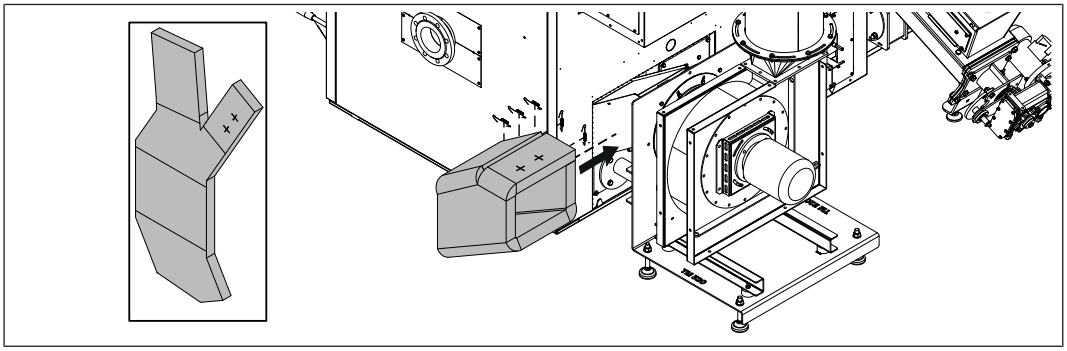
↳ Use spacers to align the induced draught fan and FGR blower fan if necessary

↳ Also screw on the earthing wire (supplied) with the toothed washer as potential equalisation

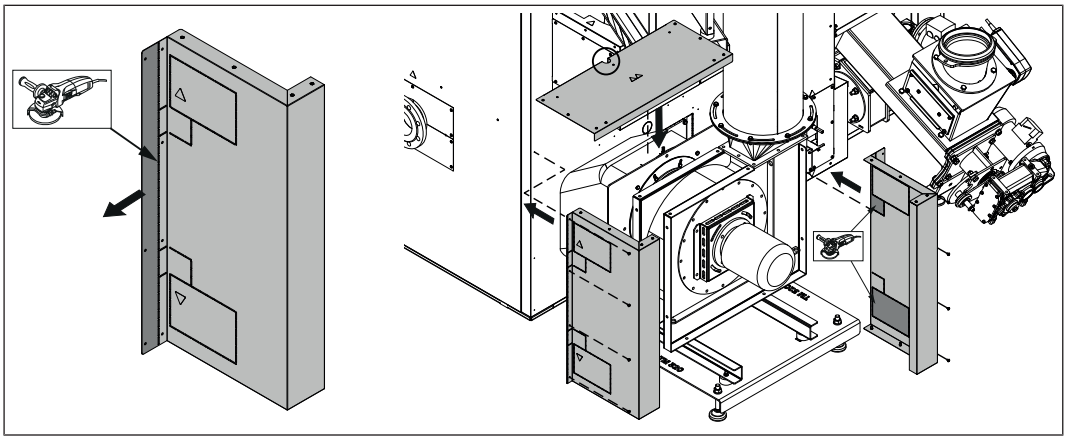
NOTICE! The connection between the ID fan and FGR blower fan (T-piece) must be insulated by the customer!



- ❒ Screw the bushing (A) into the induced draught fan flange and gently tighten
- ❒ Screw the broadband probe (B) into the bushing (A) and gently tighten it using a hexagon L-wrench (22 mm)
- ❒ Screw in the brass bushing (C) for the flue gas temperature sensor
- ❒ Push the flue gas temperature sensor (D) in so that it protrudes approx. 20 mm from the housing (E) and secure it in position with the wing screw



- ❒ Wrap the thermal insulation mat around the induced draught fan flange and fix in place using tension springs
  - ↳ Run the cable from the broadband probe and flue gas temperature sensor out from the thermal insulation



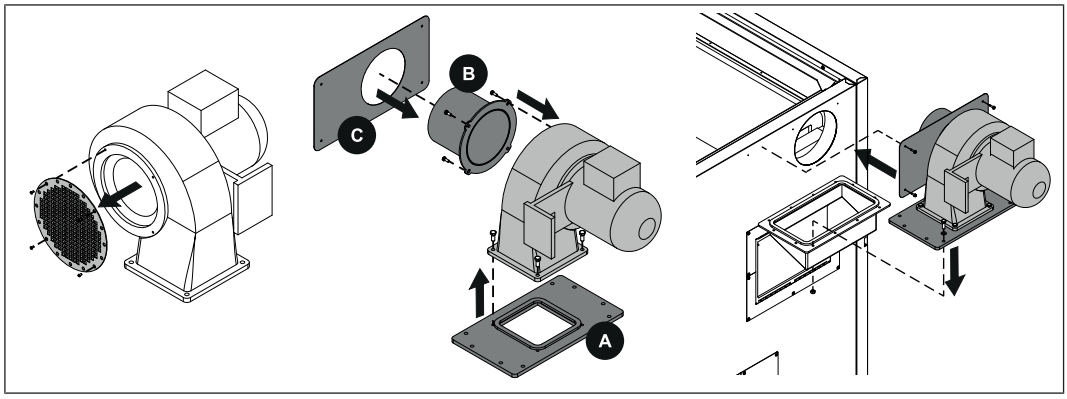
- ❒ Cut out the upper cover plate from the perforation
- ❒ Cut out the pre-punched blanking for the ash removal and motor on the cover plate on the side of the combustion chamber
- ❒ Fit the cover plates on each side of the induced draught fan flange to the insulation - 4x raised head screws M4 x 10

❒ Fit the upper cover plate for the induced draught fan flange
- 8x raised head screws M5 x 12

↳ Run the cable from the broadband probe and flue gas temperature sensor out from the provided opening in the upper cover plate

NOTICE! The ID fan must be insulated by the customer! Make sure the drive assembly of the induced draught fan can be removed.

5.5.28 Installing the combustion air fan



❒ Remove the grill from the combustion air fan

❒ Fit the connecting plate (A) and connector support (B) to the combustion air fan
- 4x hexagonal screws M8 x 20

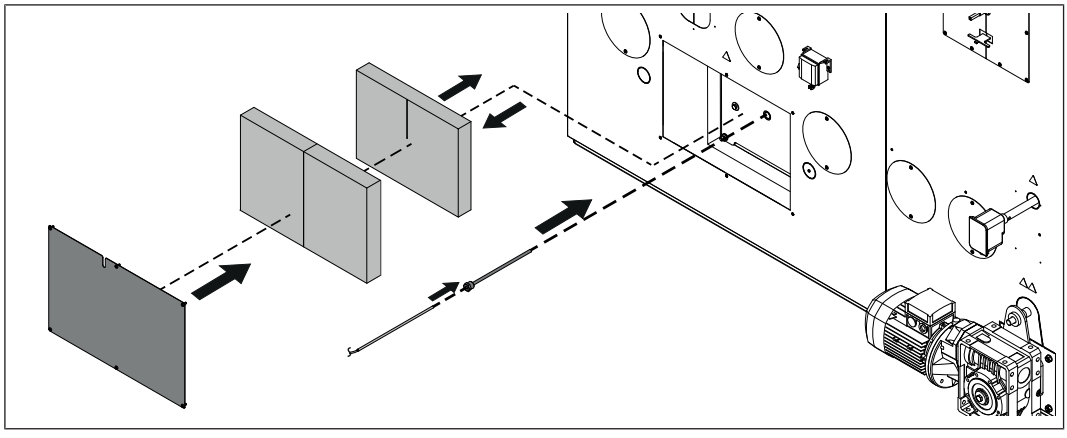
❒ Slide the cover plate (C) over the connector support (B)

❒ Insert the connector support (B) into the hole in the insulation

❒ Fit the connecting plate (A) on to the supply air duct
- 4x hexagonal screws M8 x 25

❒ Fit the cover plate (C) to the insulation
- 4x hexagon screws Ø4.2 x 19

5.5.29 Fitting the temperature sensor under the moving grate



❒ Remove the heat insulation mats

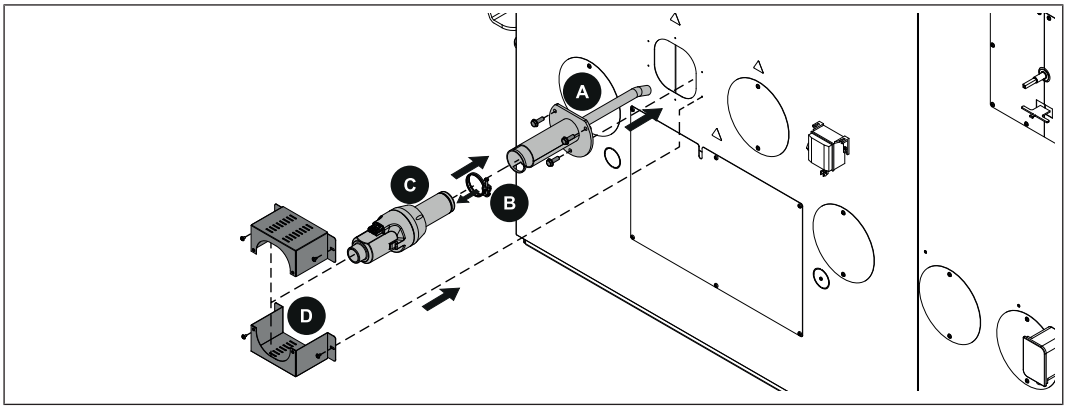
❒ Insert the immersion sleeve

❒ Slide the sensor (length: 200 mm) into the immersion sleeve and fix in place with screws

❒ Re-attach the heat insulation mat and fit the cover plate

❒ Run the sensor compensating line out through the hole in the cover plate and to the control cabinet

5.5.30 Assembling the automatic ignition



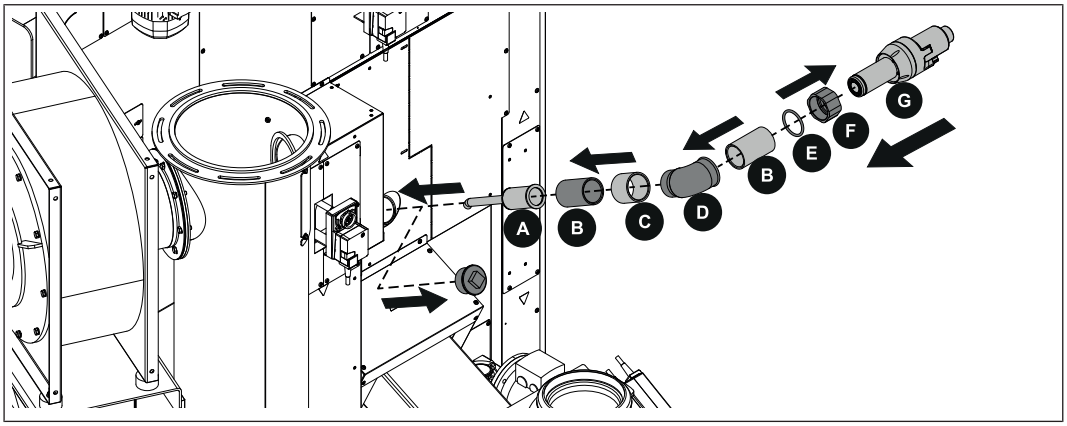
❒ Install the igniter tube (A)
- 3x hexagonal screws M8 x 25

❒ Place the double screw clip (B) on to the igniter tube (A)

❒ Insert the ignition fan (C) into the igniter tube (A) and fix in place using the double screw clip (B)

❒ Install the cover plate (D)
- 4x raised head screws M4 x 10

Fitting the automatic ignition to the slide-on duct (optional):



❒ Remove the blanking plug

❒ Insert the igniter tube (A)

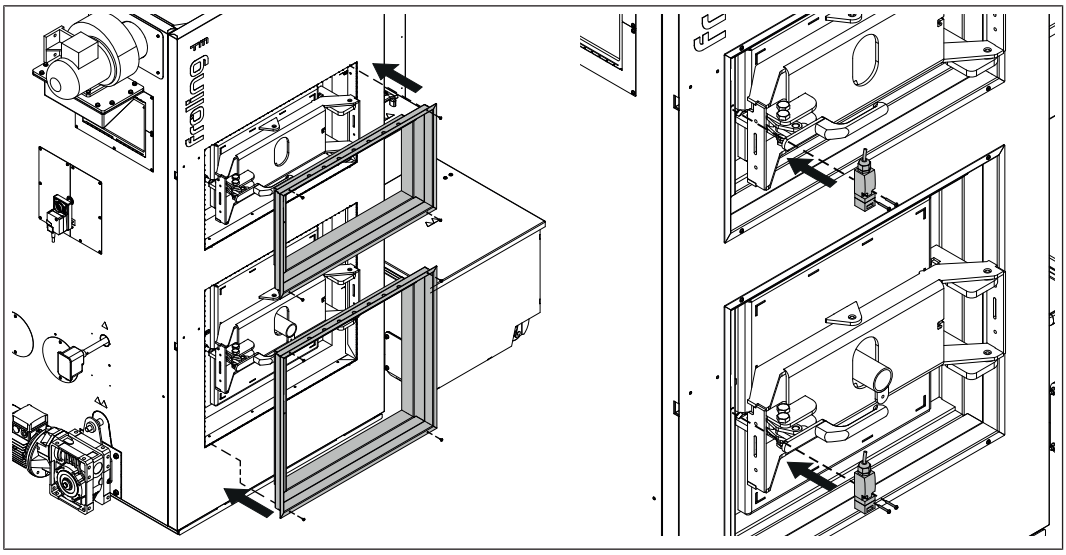
❒ Attach the double nipple (B), sleeve (C) and elbow (D) to the igniter tube (A)

❒ Fit further double nipples (B) to the elbow (D)

❒ Insert the fibreglass braid (E) and cap (F) into the ignition fan (G)

❒ Insert the ignition fan (G) into the double nipple (B) and fix in place with the cap (F)

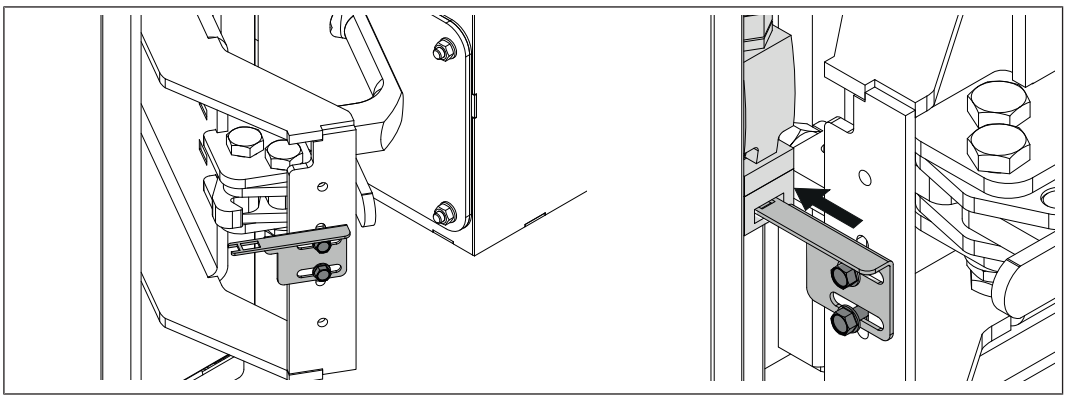
5.5.31 Assembling the insulated doors and covers



❒ Fit the door frames to the burning chamber and combustion chamber doors
- 4x raised head screws M4 x 10 for each door frame

❒ Install a door contact switch on both the burning chamber and combustion chamber door frames
- 2x raised head screws M4 x 30 for each door frame

↳ Thread the cable through the door frame and insulation

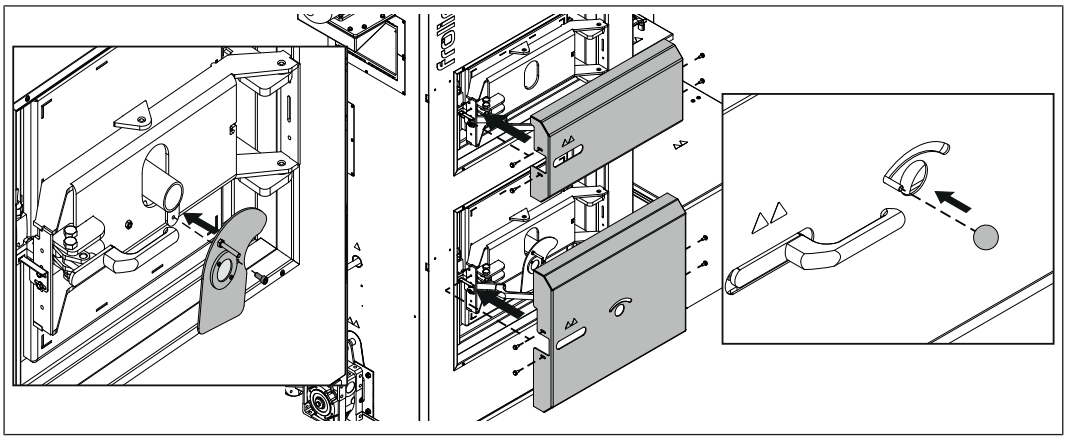


❒ Fit the burning chamber and combustion chamber door key plate
- 2 hexagonal screws M6 x 16

↳ Do not fully tighten the screws yet

❒ Close the doors and as you do so slide the key plates so that they engage smoothly with the door contact switch

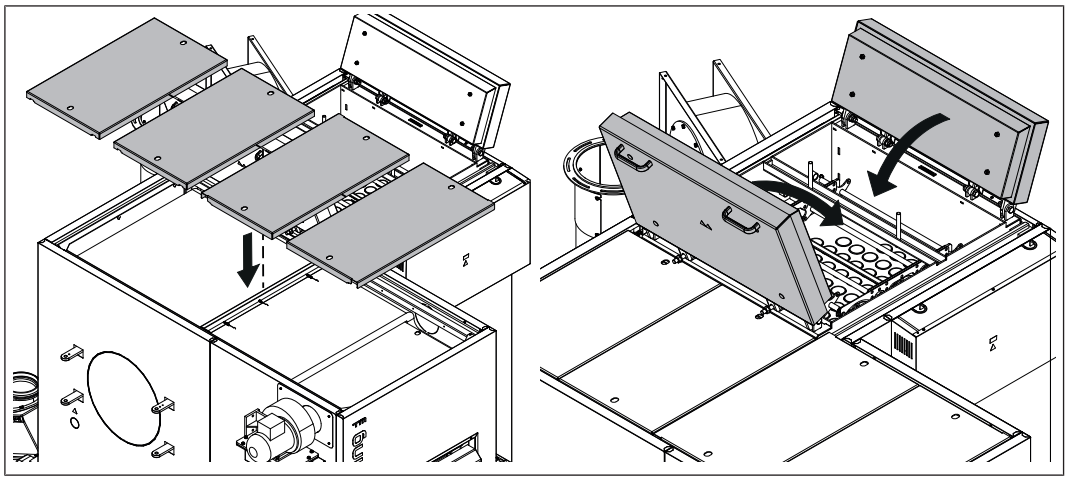
❒ Fix the key plates in position. Open and close the door several times and check that the door contact switch has properly engaged



❒ Fit the inspection glass to the combustion chamber door
- 1 cylinder head screw M8 x 20

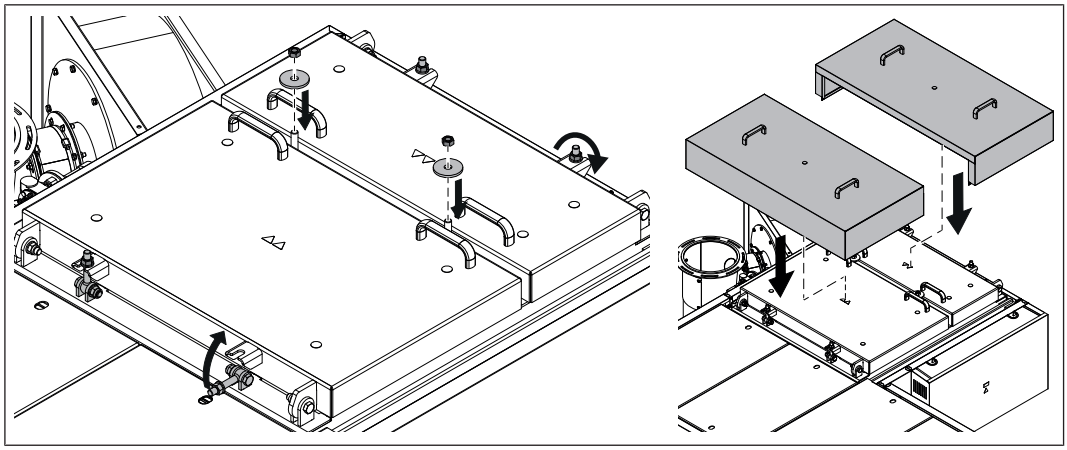
❒ Fit the covers to the combustion space and combustion chamber doors and align them
- 4x hexagonal screws M8 x 16 for each cover

❒ Attach the spherical handle to the combustion chamber inspection glass



❒ Place the insulating covers on top of the combustion chamber

❒ Close the heat exchanger cover

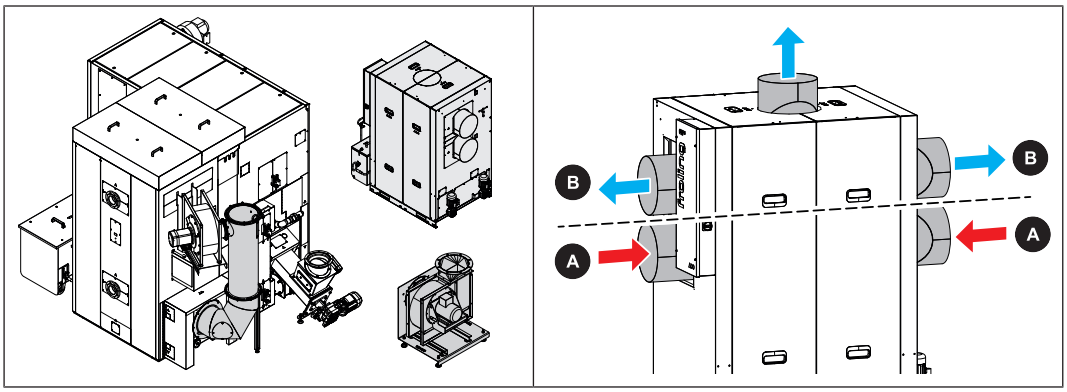


❒ Swing the four screws on the heat exchanger cover upwards and tighten them using M16 hexagonal washers

❒ Place a washer on each of the two central threaded studs and secure each of them with a M16 hexagonal nut

❒ Place both insulating covers on the heat exchanger

5.6 Connect the electrostatic precipitator (optional)



The electrostatic precipitator system is placed between the boiler and the induced draught. The piping must be provided by the customer in compliance with the recommended distances and the installation plan. The pipeline must be as short as possible and insulated with suitable thermal insulation.

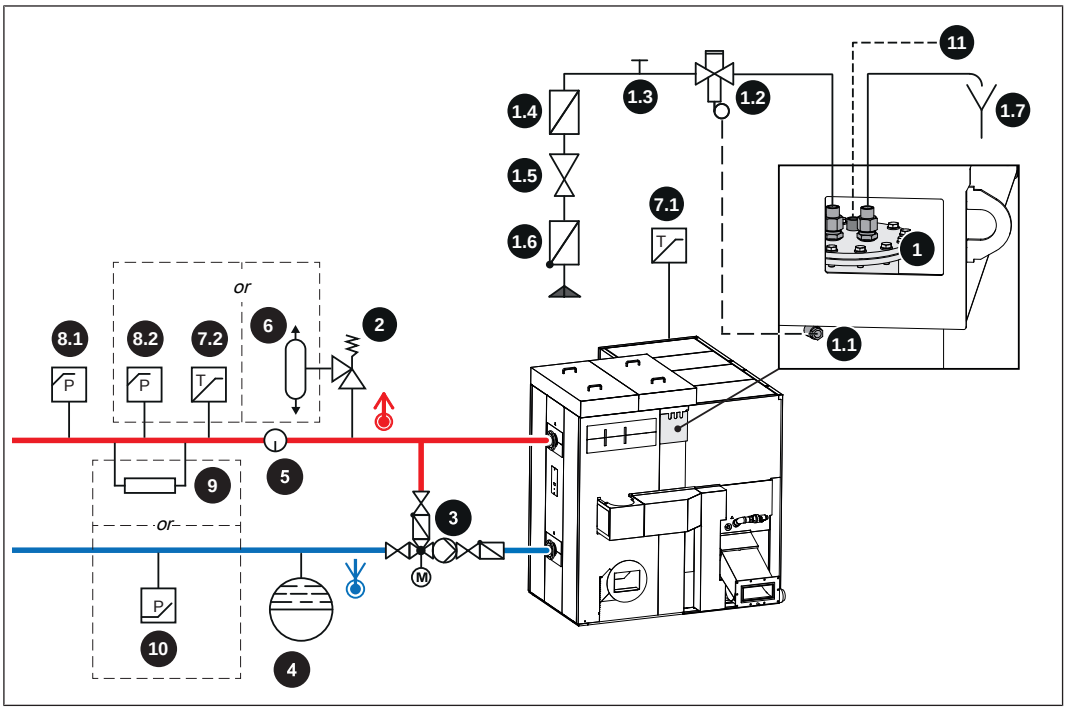
Connections:

- A – Lower flue gas connection: Raw gas inlet (pipe from boiler)
- B – Upper flue gas connection: Clean gas outlet (pipe to the induced draught)

❒ Refer to the enclosed instructions for the electrostatic precipitator for all steps pertaining to installation and operation

5.7 Hydraulic connection

5.7.1 Connections for the safety devices



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 ≤ 15°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 **Expansion trap**

- Its dimensions must comply with the design information in EN 12828 - Appendix E
- Installation in blow-out line immediately next to the safety valve
- At the bottom of the expansion trap, water must be discharged into an unobstructed outlet without counterpressure where the flow path can be observed (e.g., discharge funnel)
- At the top of the expansion trap, steam must be discharged safely into the atmosphere

NOTICE! The expansion trap can be omitted when an additional high-limit thermostat (7.2) and an additional maximum pressure limiter (8.2) are integrated into the installation

7.1 **High-limit thermostat**

- Integrated into the boiler at the factory

7.2 **Additional high-limit thermostat**

NOTICE! Omitted if an expansion trap (6) is integrated in the installation

8.1 **Maximum pressure limiter**

- The system is switched off when the maximum pressure in the boiler flow connection is exceeded. As soon as the system has dropped to the specified working pressure, the system is unlocked by activating the reset button manually.

8.2 **Additional maximum pressure limiter**

- The system is switched off when the maximum pressure in the boiler flow connection is exceeded. As soon as the system has dropped to the specified working pressure, the system is unlocked by activating the reset button manually.

NOTICE! Omitted if an expansion trap (6) is integrated in the installation

9 **Water shortage safety device**

- When the water level in the boiler is too low, the system is switched off; thus, overheating of the boiler is prevented

NOTICE! Omitted if a minimum pressure limiter (10) is used in the installation

10 **Minimum pressure limiter**

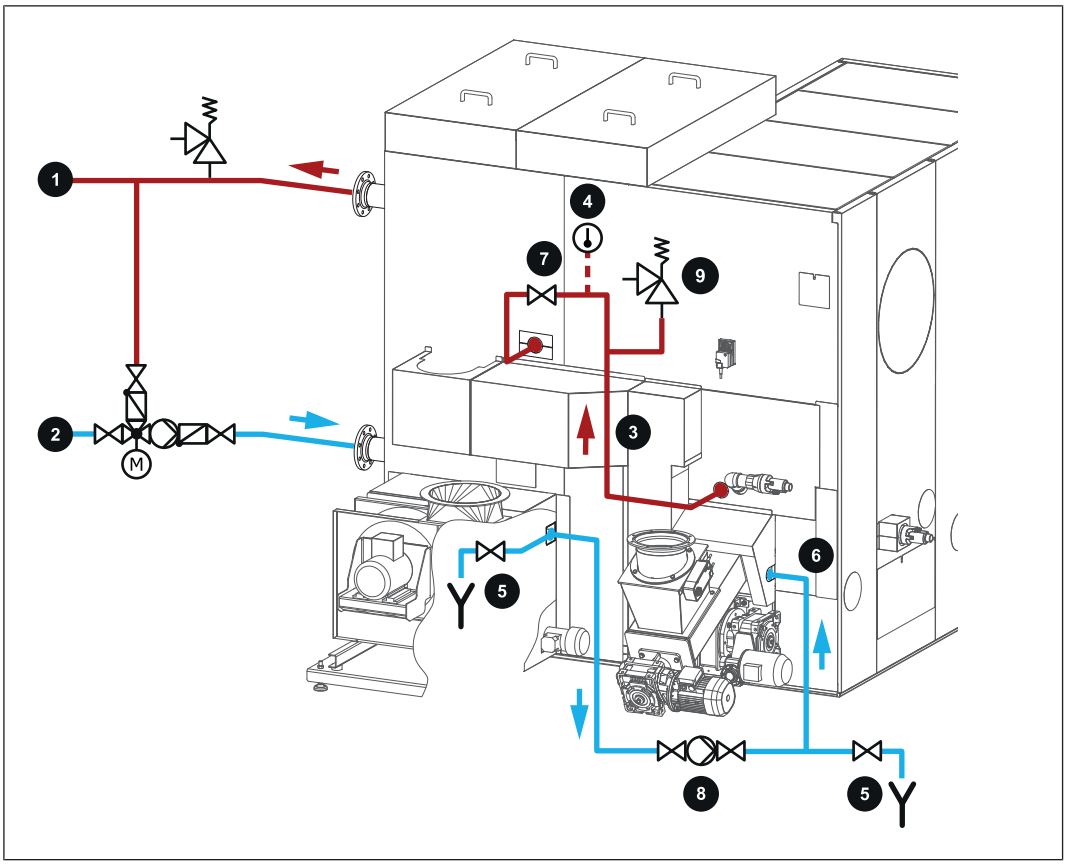
- The system is switched off when the minimum pressure in the boiler's return flow connection drops below its preset value. As soon as the system has reached the specified working pressure, the system is unlocked by activating the reset button manually.

NOTICE! Omitted if a water shortage safety device (9) is integrated in the installation

11 **Heat exchanger air vent**

- Connection of the connection line to the external air vent system (e.g. quick vent valve)

5.7.2 Connecting up the slide-on duct cooling



1	Boiler flow	**2**	Boiler return
3	Slide-on duct for the flow	**4**	Thermometer (recommended)
5	Drain cock	**6**	Slide-on duct for the return
7	Gate valve / ball valve Caution: close this valve only for working on the slide-on duct. Tip: With the valve in the open position, remove the lever and keep it in a safe place	**8**	Slide-on duct for the loading pump: ▪ no gravitational brake ▪ up to 500 kW rated heat output: flow rate approx. 2 m^3/h ▪ 500 - 1500 kW rated heat output: flow rate approx. 2.5 m^3/h
9	Safety valve DN15		

General requirement: All pipe connections must be capable of being shut off and disassembled for maintenance work. Do not employ any press-fit connections.

5.8 Power connection and wiring

⚠ DANGER

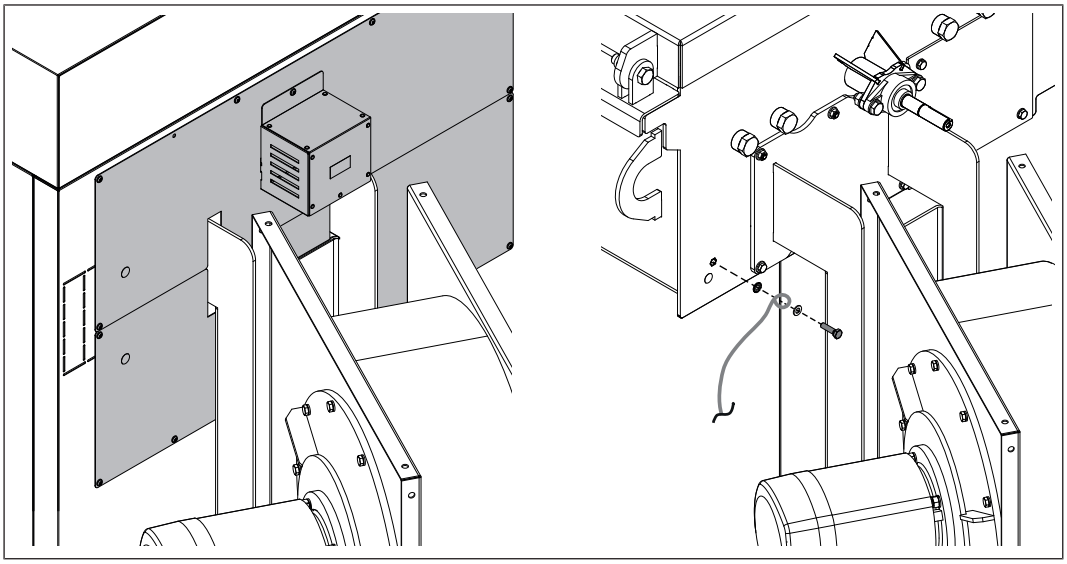
When working on electrical components:

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 Potential equalisation



- ❒ Remove the cover plates from the bracket of the FGR blower fan and connect the potential equalisation to the heat exchanger
  - 1x hexagonal screw M8 x 25 incl. toothed washer
- ❒ Establish potential equalisation to all boiler components
  - ↳ Chamber discharge system, ash removal, induced draught fan, FGR blower fan, flue gas pipe, pipes, control cabinet etc. …

IMPORTANT: The potential equalisation must comply with current directives, regulations and standards

5.8.2 Laying of cables

- ❒ Lay the cables from the components through the cable ducts to the control cabinet

NOTICE! Ensure stability of detached control cabinet as well as a dry and stable ground!

- ❒ Wire the connections according to the wiring diagram.
- ❒ Ensure that there is strain relief for all cables in the control cabinet.
- ❒ Tie any loose hanging cables to the drive motors using cable ties. The cables must not come into contact with the stoker duct!

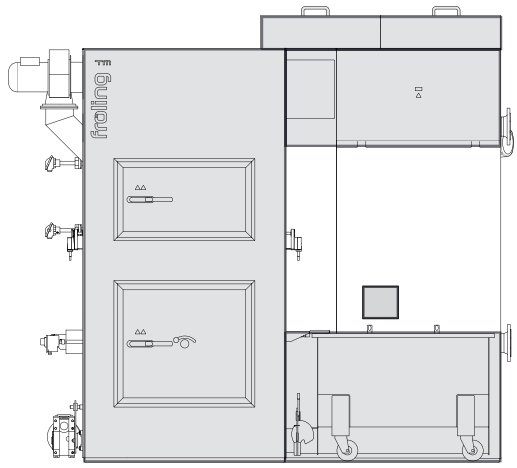
CAUTION! Lay the cables from components without risk of stumbling!

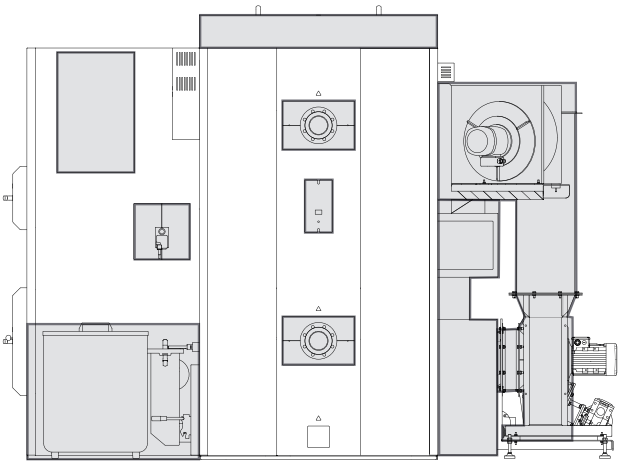
NOTICE! To save from damage use cable ducts or conduits for laying!

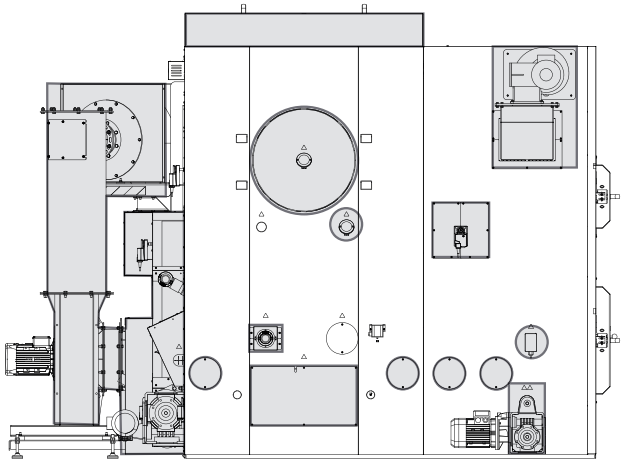
ATTENTION:

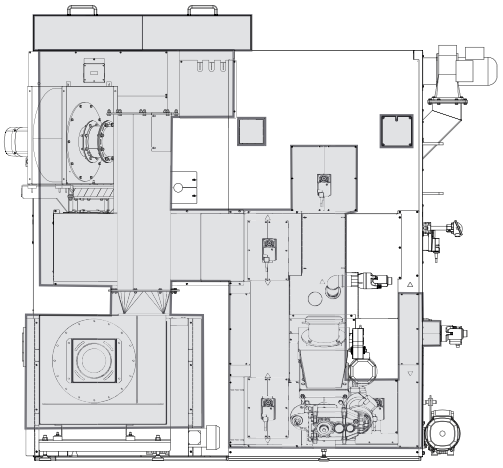
At following areas no electric installations are allowed:

- Entire top of boiler (heat exchanger and combustion chamber)
- Entire front of boiler
- Minimum distance of 150 mm to insulation of the FGR duct
- All areas of the following graphics which are marked grey:









5.9 Final installation steps

5.9.1 Setting and checking the seal on the doors

Setting and checking the seal are shown using the example of the combustion chamber doors. The procedure is the same for checking the seal on the combustion chamber door.

NOTICE! The seals must be replaced if they have turned black!

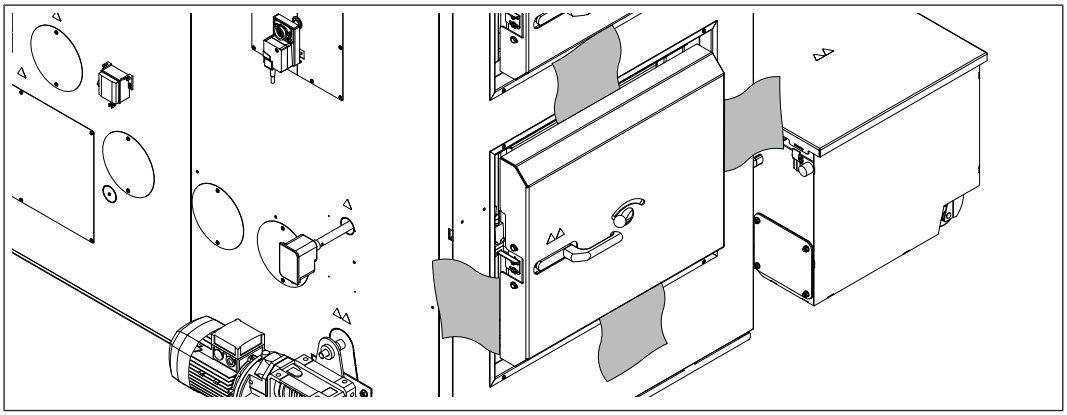
Checking the setting

❒ Close the door

↳ If the door can be opened with the usual force:
correct setting

↳ If the door cannot be opened with the usual force or must be forced open:
unscrew the locking hook
➲ "Adjusting the doors" [▶ 101]

Checking the seal



❒ Open the door

❒ Insert a sheet of paper at both the top and the bottom between the door and the boiler

❒ Close the door

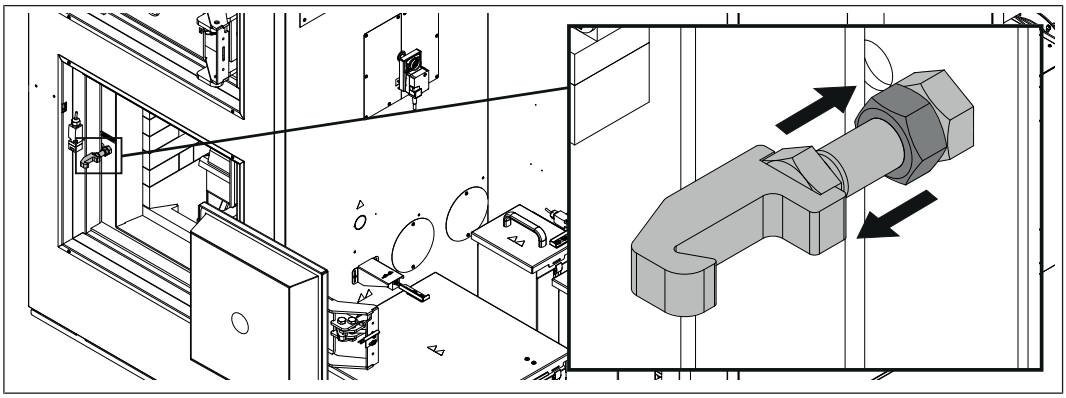
❒ Try to pull out the sheets of paper.

↳ If the paper cannot be removed:
the door is sealed.

↳ If the paper can be removed:
the door is not sealed properly - tighten the locking hook!
➲ "Adjusting the doors" [▶ 101]

5.9.2 Adjusting the doors

The example below shows how to position the combustion chamber door. The procedure is the same for checking the seal on the combustion chamber door.



❒ Loosen the nut on the locking hook

❒ Tighten or loosen the locking hook as required

❒ Fix in place using lock-nuts

6 Commissioning

6.1 Before commissioning / configuring the boiler

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

NOTICE

Optimum efficiency and efficient, low-emission operation can only be guaranteed if the system is set up by trained professionals and the standard factory settings are observed.

Take the following precautions:

❒ Initial startup should be carried out with an authorised installer or with Froling customer services

NOTICE

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

As a result:

❒ The whole system should be rinsed out before initial start-up in accordance with EN 14336.

❒ Recommendation: Make sure the hose diameter of the flush nozzles in the flow and return complies with ÖNORM H 5195 and is the same as the hose diameter in the heating system, however not more than DN 50.

❒ Turn on the main switch

❒ Set the boiler controller to the system type.

❒ Load the boiler default values.

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

❒ Check the system pressure of the heating system.

❒ Check that the heating system is fully ventilated

❒ Check all quick vent valves of the entire heating system for leaks

❒ Check that all water connections are tightly sealed

↳ Pay particular attention to those connections from which plugs were removed during assembly.

❒ Check that all necessary safety devices are in place

❒ Check that there is sufficient ventilation in the boiler room.

❒ Check the seal of the boiler.

↳ All doors and inspection openings must be tightly sealed.

❒ Check all blanking plugs (e.g. drainage) for tightness

❒ Check that the drives and servo motors are working and turning in the right direction

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

6.2 Initial startup

6.2.1 Permitted fuels

Wood chips

Description to EN ISO 17225-4	Description
M20	Water content max. 20%
M30	Water content max. 30%
M35	Water content max. 35%
M40[1)]	Water content max. 40%
M50[1)]	Water content max. 50%
P16S	Main proportion (at least 60% by mass): 3.15 – 16 mm, max. length of 45 mm, previously referred to as fine wood chips G30
P31S	Main proportion (at least 60% by mass): 3.15 – 31.5 mm, max. length of 150 mm, previously referred to as medium-sized wood chips G50
from 400 kW: **P45S**	Main proportion (at least 60% by mass): 3.15-45 mm, max. length of 200 mm, previously referred to as medium-sized wood chips G50
for hydraulic feeders: **P63**	Main proportion (at least 60% by mass): 3.15–63 mm, max. length 350 mm, previously referred to as coarse wood chips G100

1. partial load conditions only to a limited extent

NOTICE! When using fuels with a water content of more than 35%, a power reduction below 65% of the nominal heat output is not permissible in part-load operation!

Note on standards

EU:	Fuel according to EN ISO 17225 – Part 4: Wood chips class A2 / P16S-P63
Additional for Germany:	Fuel class 4 (§3 of the 1st Federal Emissions Protection Ordinance (BimSchV) in the last amended version)

Wood pellets

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

Note on standards

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

General note:

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

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

Wood shavings

Wood shavings generally cause problems with combustion. Therefore their use is permitted only with authorisation from Froling. The following additional points also apply:

- Sawdust and carpentry waste should only be used with systems with a rotary valve.
- The store should be fitted with a pressure release device in accordance with regional regulations.
- The same limits apply for the permitted water content of sawdust as for wood chips.

NOTICE

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

Miscanthus

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

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

Changing the fuel

⚠ CAUTION

Incorrect fuel parameter settings:

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

Therefore:

❒ If the fuel is changed (e.g. from wood chips to pellets), the system must be reset by Froling customer services.

6.2.2 Non-permitted fuels

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

NOTICE

In case of use of non-permitted fuels:

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

For this reason, when operating the boiler:

❒ Use only the permitted fuels

6.3 Heating up for the first time

NOTICE

Optimum efficiency and efficient, low-emission operation can only be guaranteed if the system is set up by trained professionals and the standard factory settings are observed.

Take the following precautions:

❒ Initial startup should be carried out with an authorised installer or with Froling customer services

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

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

The operator must ensure the following conditions are met for initial start-up:

❒ The network can take at least 50% of the boiler's nominal output.

❒ The discharge system must be empty – "dry run" of system.

↳ Fuel must be available, however, so that the discharge system can be filled once the system is released.

❒ It is essential that the electrician who has carried out the installation work is available when starting up the system for the first time to make any changes to the wiring which may become necessary.

❒ Ensure that those responsible for operating the system are present.

↳ During initial start-up, operating staff are shown how to use the boiler. It is imperative for proper handover of the product that those involved are present as this is a one-off opportunity.

If the fireclay in the combustion chamber needs to be screed dried:

❒ Provide the following quantities of dry firewood:

↳ Systems up to 250 kW: ¼ m³

↳ Systems up to 500 kW: ½ m³

↳ Systems up to 1500 kW: 1 m³

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

NOTICE! See operating instructions for the SPS 4000

NOTICE! Fissures in the fireclay are normal and do not indicate a fault.

NOTICE

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

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

6.3.1 Screed drying

The combustion chamber must be slowly screed dried as described below when heating up for the first time to dry out the fireclay.

⚠ CAUTION

If the boiler heats up too quickly on initial start-up:

If the output during the heating-up process is too great, the combustion chamber may be damaged as a result of drying out too rapidly!

For this reason the following applies the first time you heat up the boiler:

❒ Screed dry the boiler in accordance with the following points:

❒ Set the boiler to user level “Service technician” and activate “Baking mode” in the quick selection menu.

❒ Fill combustion chamber with approx. 1/3 of the firewood provided.

❒ Ignite firewood and allow to burn away with the combustion chamber door half open.

Once the first load has burned out, add another approx. 1/3 of the firewood provided.

NOTICE! The combustion chamber temperature should continuously rise but must not exceed 500°C. REMEDY: Only keep the combustion chamber door open a fraction!

After adding the last batch of firewood:

❒ Allow the fire on the grate to burn out.

❒ Close the combustion chamber door.

❒ Leave the boiler in this state for a few hours (ideally overnight).

The boiler can then be used in accordance with the operating instructions ("Operating the system" section).

7 Decommissioning

7.1 Out of service for long periods

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

❒ Clean the boiler thoroughly and close the doors fully.

❒ Place approx. 5 kg of loose lime in the combustion chamber.

↳ This absorbs moisture and thereby prevents corrosion when the boiler is out of service.

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

❒ Have the system completely drained by a qualified technician.

↳ Protection against frost

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.

❒ 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.

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Installer's address

Stamp

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