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PelletsCompact 60-105 kW

Installation

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Contents

1 General

1.1 Preface

Dear customer,

Safe and satisfactory operation of the product depends, above all, on correct installation. In this user manual, you can find out all the important installation steps, information and instructions for this product beforehand. Please take the time to look through it.

Warranty and guarantee

You should also read the "Conditions for warranty, guarantee, liability" (see 1.3 "Warranty, guarantee and liability") carefully. As a rule, these conditions will be satisfied by a professional heating technician. Nevertheless, inform the technician of our warranty conditions. All of the requirements we impose are intended to prevent damage that neither you nor we wish to occur.

Training the customer

To avoid errors in operation, please explain to your customer exactly how his new product works and how it should be operated and maintained.

Remote control of the boiler via the internet

The remote control enables you to operate your ETA boiler remotely via your own network (VNC Viewer) or the internet <www.meinETA.at> using a PC, smartphone or tablet, as though you were standing right in front of the ETAtouch control system of your ETA boiler. A LAN cable is required for the connection from the ETAtouch control system to the internet modem.

Details for the remote control can be found in the manual "Communication platform meinETA". Details for the connection of the LAN cable, see 9.8 "Network connection".

Extended warranty

We grant an extended warranty if the product is commissioned by an authorised partner company or by our own customer service. In this regard, please note the warranty conditions applicable at the time of purchase.

Service agreement

You can ensure the best care for your heating system by taking out a service agreement with one of our certified contractors or our own customer service.

1.2 General information

Copyright

Subject to technical changes

We reserve the right to make technical modifications without notice. Printing and typesetting errors or changes of any kind made in the interim are not cause for claims. Individual configurations depicted or described here are only available optionally. In the event of contradictions between individual documents regarding delivery scope, the information in our current price list applies.

Explanation of symbols

Instructions and information

Layout of safety instructions

SIGNAL WORD!

Type and source of danger

Possible effects

- Measures for avoiding the danger

Types of safety instruction

CAUTION!

On non-compliance with this safety instruction, there is a risk of material damage.

WARNING!

On non-compliance with this safety instruction, there is a risk of physical injury.

DANGER!

On non-compliance with this safety instruction, there is a risk of major physical injury.

1.3 Warranty, guarantee and liability

Requirements

We can only accept liability for the function of our products if they are correctly installed and operated. This is only possible if the conditions below are complied with.

Maximum of 2,000 hours at full load per year

The boiler described in this user manual may only be used for heating and producing hot water, with no more than 2,000 full-load hours annually.

Installation in a dry room

For set-up, a dry room is required. In particular, only condensation dryers may be used as clothes dryers in the same room.

Observe local building and fire safety regulations

Local building and fire safety regulations must be observed.

Suitable fuel

The boiler is suitable for use with wood pellets according to EN ISO 17225-2:2014, quality class A1, ENplus-A1. Operation with unsuitable fuels, in particular those containing halogens (chlorine) or high-slag pellets such as from grain waste, is not permitted.

Ensure supply air is free from aggressive substances

The air supplied to the boiler must be free from aggressive substances such as chlorine and fluorine from solvents, cleaning agents, adhesives and propellants, or ammonia from cleaning agents, to prevent corrosion of the boiler and chimney.

Permissible water hardness

Water is the intended heat-transfer medium. For special anti-frost requirements, up to 30% glycol may be added. Softened water is required for the initial fill-up of the heating system and for refilling after repairs. Addition of hard water should be minimised to limit limescale build-up in the boiler.

In order to protect the boiler from calcification, the water hardness of the heating water must be taken into account. Observe the indications outlined in ÖNORM H 5195-1. Details can be found in chapter 7.3 "Water hardness".

pH value between 8 and 9

The pH value of water used to fill the heating system must be between 8 and 9.

Use a sufficient number of shut-off valves

Set enough shut-off valves to avoid bleeding large amounts of water during repairs. Any leaks in the system must be repaired at once.

Installing the thermal relief valve

A thermal relief valve (triggered at 97 °C) to protect against overheating must be installed on site.

Provide a sufficiently large expansion tank or a pressure maintaining device

To prevent air from being drawn in while the system is cooling, the heating system professional must provide a sufficiently large expansion tank or a pressure maintaining device.

Open expansion tanks must not be used.

Sufficient power

Continuous operation with heat consumption below the minimum specified on the type plate is only permitted with a buffer storage tank of sufficient size.

Expanding the control system

Only components provided by us may be used for expanding the control system, unless these are generally available standard devices, such as thermostats.

Regularly perform cleaning and maintenance

Cleaning and maintaining the product is essential. The required steps and intervals are either contained in this documentation or included as a separate document.

Repairs

Repairs are only permitted using spare parts provided by us. The only exceptions are common standardised parts such as electrical fuses or fastening materials, as long as they possess the required features and do not restrict the functionality of the system.

Proper installation

The installing contractor is liable for proper installation according to the corresponding installation instructions and the relevant rules and safety regulations. If you as customer have installed the heating system partly or entirely without relevant training and in particular without up-to-date practical experience, without having the installation checked by a trained and responsible

expert, we exclude defects in our delivery and consequential damages resulting from this cause from our warranty, guarantee and liability.

Repair of defects

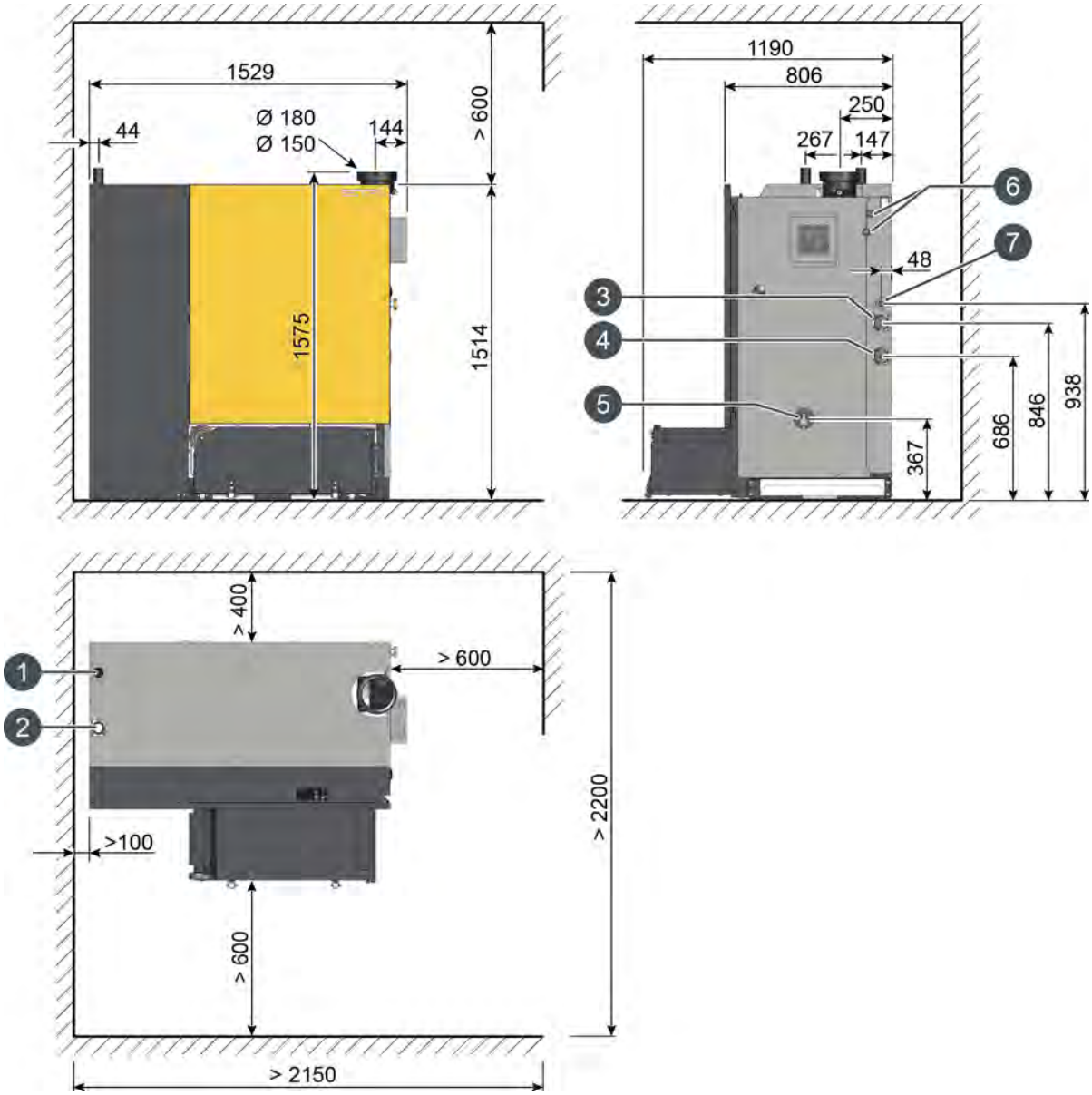
For repairs of defects carried out by the customer or by a third party, ETA shall only bear the costs or remain obligated by warranty if this work was approved in writing in advance by the customer service of ETA Heiztechnik GmbH.

No tampering with boiler safety devices

Boiler safety devices such as those mentioned below must not be tampered with: Temperature monitoring and control devices, safety temperature limiters, safety valves and thermal discharge valves.

2 Technical data

Data sheet for PelletsCompact 60 - 105 kW



1 Pellet suction hose DN50
2 Pellet back air DN50
3 Flow with ball valve R2"
4 Return with ball valve R2"
5 Discharge fitted with 3/4" filling and drainage valve
6 Safety heat exchanger R1/2"
7 Outlet pipe for the safety valve, coupling R6/4"

PelletsCompact	Unit	60	70	80	100	105
Rated capacity	kW	17.9 - 59.9	20.9 - 69.9	23.9 - 79.9	29.9 - 99.8	29.9 - 103
Efficiency at partial/full load	%	92/93	92/93	92/93	92/93	92/93
Transport dimensions W x D x H	mm	1528 x 806 x 1593				

PelletsCompact	**Unit**	**60**	**70**	**80**	**100**	**105**
Weight	kg	770				
Water content	Litres	147				
Available residual pump head (at ΔT = 20 K) for buffer operation	mws	4.5	3.4	2.4	3.8	3.5
	m³/h	2.6	3	3.4	4.3	4.5
Pellet bin on boiler (net)	kg	118 kg (578 kWh)				
Maximum distance to pellet store	m	20				
Ash box volume	Litres	100				
Flue gas mass flow rate at partial / full load	g/s	12.4/ .34.8	14/40.2	15.6/ 45.6	18.8/ 56.1	18.8/ 57.9
CO_2- content in dry flue gas at partial/full load	%	11/14	11/14	11/14	11/14	11/14
Exhaust temperature at partial / full load	°C	~80 / ~150				
Required flue draught	Pa	> 3 Pa a draught limiter is required above 15 Pa				
Carbon monoxide (CO) emissions at partial / full load	mg/MJ	17.3/ 4.7	18/4.5	18.8/ 4.4	20/< 4	20/< 4
	mg/m³ with 13%O_2	25.6/ 6.4	26.6/6	27.6/ 5.7	29/< 5	29/< 5
Dust emissions at partial/full load	mg/MJ	5.7/8	5.5/8	5.4/8	5/7	5/7
	mg/m³ with 13%O_2	8.7/ 12.4	8.3/ 12.1	7.8/ 11.9	7/10	7/10
Unburned hydrocarbon emissions (CxHy) at partial/full load	mg/MJ	1.3/1.3	1.5/1.5	1.6/1.6	2/< 2	2/< 2
	mg/m³ with 13%O_2	1.6/1.3	2/1.5	2.3/1.6	3/< 2	3/< 2
Electrical power consumption at partial/full load	W	68/160				
Electrical power consumption in ready mode	W	12				
Maximum permissible operating pressure	bar	3				
Temperature adjustment range	°C	70 - 90				
Maximum permissible operating temperature	°C	90				
Boiler class		5 acc. to EN 303-5:2012				
Suitable fuels		Pellets ISO 17225-2-A1, ENplus-A1				
Electrical connection		1 x 230 V / 50 Hz / 13 A				
Mode of operation		non-condensing				

3 Regulations, standards and guidelines

Regulations

- Local building regulations
- Industrial and fire safety ordinances and regulations
- State fire regulations
- In Germany, the EnEG (Energy Saving Act) with its enacted EnEV ordinances for energy-saving insulation and energy-saving building technologies
- In Germany, 1.BImSchV, initial ordinance for enforcement of the federal pollution control act for small-scale furnaces
- In Austria, Article 15 a, agreement on protective measures regarding small-scale furnaces
- In Austria, Article 15 a, "Agreement on saving energy"
- In Switzerland, VKF/AEAI fire safety regulations 25-03 and 106-03

Standards and guidelines

- ÖNORM H 5195-1 "Prevention of damage due to corrosion and scaling in closed hot-water heating systems".
  The permissible water hardness for the heating water can be determined from the table in Section 7.3 "Water hardness".
  The requirements of ÖNORM H 5195-1 apply as minimum requirements for the heating water. If stricter country-specific regulations exist, they are to be heeded.
- VDI 2035, "Prevention of damage due to corrosion and scaling in hot-water heating systems with feed temperatures up to 120 °C".
- EN 12828 "Heating systems in buildings – planning for hot-water heating systems".
  A safety valve (3 bar) and a safety temperature limiter (100 °C) are already installed in the boiler. A sufficiently large expansion tank (at least 10% of the system volume) and a thermal relief valve must be installed on site. The outlets for the safety valve and the thermal relief valve must be routed to a sewer connection.
- EN 12831 "Heating systems in buildings - method for calculating standard heating load"
- EN 13384 "Flue systems - thermal and fluid-dynamic calculation methods"
- EN 15287-1, flue systems for heating appliances dependent on ambient air - planning, installation and commissioning
- In Germany, DIN 18160 "Flue systems – planning and design"
- In Austria, ÖNORM H 5170 "Heating systems – construction and fire safety requirements"

4 CE-Conformity

Declaration of conformity

Product:	Pellet Heating Boiler
Types:	ETA PelletsCompact 20-105 kW

EU Directives:

2014/30/EU	Directive relating to electromagnetic compatibility (EMC Directive)
2006/42/EC	Machinery Directive
2014/35/EU	Directive relating to electrical equipment designed for use within certain voltage limits (Low Voltage Directive)
2011/65/EU	Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2 guideline)

Applied Standards:

EN 287-1:2011	Qualification test of welders - Fusion welding
EN-303-5:2012	Heating boilers - Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW - Terminology, requirements, testing and marking
EN 60335-1:2012	Household and similar electrical appliances - Safety Part 1: General requirements
EN 60335-2-102:2010	Household and similar electrical appliances - Safety Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections
IEC 61000-6 1/2:2005	Electromagnetic compatibility (EMC): Generic standards - Immunity for residential, commercial and light-industrial environments (1) and industrial environments (2)
IEC 61000-6 3/4:2011 + A1:2011	Electromagnetic compatibility (EMC): Generic standards - Emission standard for residential, commercial and light-industrial environments (3) and industrial environments (4)

Applied National Standards:

DIN 4702	Heating boilers, Part 1 and 4

We hereby declare that the product in its standard design as stated here corresponds to the above provisions.

Hofkirchen, 06.02.2018

Ing. Johann Eibelhuber
Quality assurance

DI Ferdinand Tischler
Management

5 Boiler room

Installation of the boiler

The boiler may only be installed in dry surroundings. The permitted ambient temperatures are between 5 and 30 °C.

The boiler may only be installed on a flat, non-combustible surface. The distance of flammable materials in the immediate vicinity of the boiler must be heeded in accordance with national regulations.

Requirements for the boiler room

Boiler rooms must be built with fire-resistant F90 (EI90) walls and ceilings; in Switzerland EI30 up to 70 kW and EI60 over 70 kW.

An escape door to a corridor or to the outside is required. The door F30 (EI30) must open in the direction of escape and be self-closing with a tight seal. Boiler room doors that open onto escape routes must be EI90 (F90).

The boiler room must feature air inlet and outlet vents with minimum diameters for the boiler.

To prevent flue gases from escaping, it must be ensured that underpressure does not occur in the boiler room. Building installations, such as suction for the ventilation system or installed compressors, for example, are thus not permissible.

Floor characteristics

The boiler may only be installed on a flat, non-combustible floor. The floor must be capable of supporting the boiler's weight. For more information see the chapter 2 "Technical data".

Sufficient lighting in boiler room

The boiler room must have lighting sufficient for the installation and commissioning of the boiler.

There must be no heating appliances in the vicinity of escape routes

Boilers may not be installed in stairwells, corridors or rooms through which escape routes lead to the outside.

Free minimum cross sections for the air intake openings

The boiler requires air for combustion. That is why free minimum cross sections are required in the boiler room for the air intake openings. In Austria, these are defined in ÖNORM H 5170, see the following table.

Boiler output [kW]	Free minimum cross sections in cm²		
	Austria (specification from ETA)	Germany	Switzerland
20	400	150	206
30	400	150	309
40	400	150	412
50	400	150	515
60	400	170	618
70	400	190	721
90	400	230	927
110	440	270	1133
130	520	310	1339
180	720	410	1854
200	800	450	2060
350	1400	750	3605
500	2000	1050	5150

Tab. 5-1: free minimum cross sections

A protection grille at the air intake opening also reduces the free cross section. Therefore, the air inlet opening must be larger depending on the protection grill. In air ducts through channels a calculation by a specialist is required.

The values listed may vary from country-specific and national regulations. Enquire about it at your authorities. If no rules exist, we recommend the Austrian minimum cross sections to use as a guide.

Too small-sized air inlet openings may result to low pressure in the boiler room. This can lead to a reduction of the boiler output, as well as to an exit of flue gas in the boiler room.

Boilers that are operated with an external air supply require no further supply air and outlet openings in the boiler room.

Fuel storage

In Germany, up to 10,000 litres (6.5 tons) of pellets or 15,000 kg (20 steres) of split logs can be stored in the room where the boiler is installed. For larger quantities, a separate fire-resistant EI90 (F90) storeroom is required.

In Austria, no more than a week's supply of wood may be stored next to the boiler. For pellets, a separate storeroom EI90 (F90) with a EI30 (T30) door is required. As a result of amendments to building laws, up to 10 tonnes of pellets may be stored in the boiler room in some states.

In Switzerland, up to 10 m³ of wood can be stored in separate boiler rooms (EI60); the clearance from the boiler must be 1 m. For larger quantities, a separate storeroom (EI60 separated from the building) is required; here wood may be stored together with straw or hay.

6 Safety

6.1 General information

Operation only by trained personnel

The product may be operated by trained adults only. Training may be provided by the heating technician or our customer service. Please read the associated documentation carefully in order to avoid errors during operation and maintenance.

Persons who lack experience and knowledge as well as children may not operate, clean, or maintain the product.

Keep children away from the pellet store

Children must be kept away from the pellet store. It is a good idea to lock the door to the pellet store. The door handle on the inside of the pellet store must not be removed. It must be possible to open the door from the inside in an emergency.

Keep fire extinguishers in a clearly visible location

In Austria, the minimum requirement is an ABC powder extinguisher with 6 kg. An AB foam extinguisher with 9 litres, which produces less damage when used, is preferable. The fire extinguisher should be kept outside the boiler room, visible and easily accessible.

Fig. 6-1: Fire extinguisher

In Germany and Switzerland, fire extinguishers are not required for heating systems in private residences. In spite of this, we recommend having one in the house.

Storage of ash

The ash must be kept in non-flammable containers with covers for cooling. Never put hot ash into the waste bin!

Emergency stop switch for the boiler

In Austria, heating systems installed in boiler rooms must be equipped with an emergency stop switch. The switch must be situated immediately outside the access door and clearly marked. For boiler rooms that are only accessible from outdoors, these switches may also be within the boiler rooms, immediately next to the access doors.

Fig. 6-2: Emergency stop switch

A single-pole emergency stop switch is integrated into the boiler's safety chain. When actuated, it interrupts the supply of combustion air and fuel. The pumps continue running to cool the boiler.

6.2 Safety devices

Pump safety run, automatic heat dissipation at overtemperature

If the boiler temperature exceeds 90°C (factory setting) for any reason, the pump safety run will start. All heating pumps and boiler pumps that are connected to the boiler control system are switched on to dissipate heat from the boiler.

This action prevents the boiler temperature from rising further and triggering further safety devices such as the safety temperature limiter.

Heat dissipation is limited by the selected maximum flow temperature in the heating circuits and the target hot water temperature.

Install thermal emergency cooling valve against overheating

The safety heat exchanger built into the boiler must be connected by the heating technician to the house's cold water supply via a thermal relief valve to protect the boiler against overheating if the pump fails. The minimum pressure in the cold water pipe must be 2 bar and the temperature must not exceed 15 °C.

Fig. 6-3: Thermal emergency cooling valve

Only thermal emergency cooling valves that correspond to the standard DIN EN 14597 (or comparable standards) may be installed. They must activate at 100 °C and have a flow rate of at least 2.0 m³/h. The clear width of the cold water supply and outlet may not fall below the nominal diameter of the safety heat exchanger.

The cold water supply must be connected to the upper connector of the safety heat exchanger; the lower connector serves as an outlet to the sewer. To prevent the supply line from being shut off accidentally, remove the levers from ball valves or the hand wheels from valves and hang them there with a piece of wire.

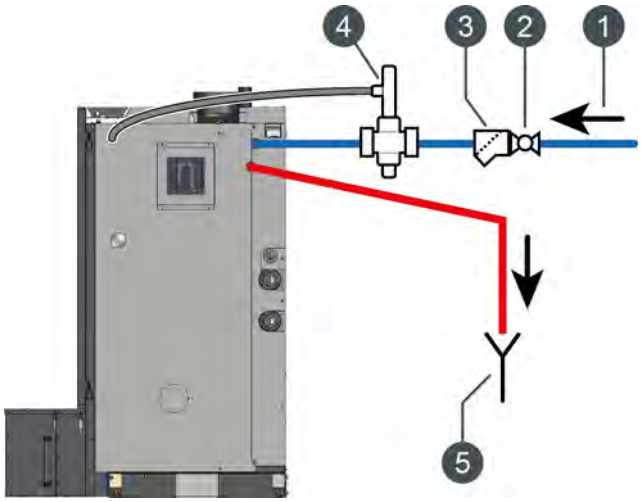


Fig. 6-4: Installation on the boiler

1 Cold water connection
2 Isolating valve; remove hand wheel
3 Strainer
4 Thermal emergency cooling valve
5 Visible outlet to sewer

The outlet must have an easily visible flow path so malfunctions can be recognised. Direct the discharged water to the sewer via a siphon funnel or at least with a pipe into the ground so that nobody can be scalded if the valve is activated.

Even for cold water coming from a domestic well with its own pump, a thermal emergency cooling valve must be installed on the boiler. With a generously dimensioned air vessel, enough water for cooling will come even if there is a power failure. If the power supply is very uncertain, a dedicated air vessel for the thermal emergency cooling valve is required.

Safety shutdown by safety temperature limiter

For additional safety against boiler overheating, a safety temperature limiter is built into the boiler. When a boiler temperature of 100 °C (tolerance +0°/-6 °C) is reached, the power supply to the draught fan and the fuel intake is interrupted. When the boiler temperature decreases back below 70°C, the safety temperature limiter can be manually released for a restart of the boiler.

Safety valve against overpressure

A safety valve with 3 bar opening pressure has already been installed on the boiler at the factory. If solar or other heat sources provide energy to the buffer

storage tank via a heat exchanger, a safety valve (3 bar maximum) is also required on the buffer storage tank.

Fig. 6-5: Safety valve

Normally an expansion tank that is too small or defective, or blocked heating lines are the cause of the safety valve activation.

DANGER!

Safety valve outlet

The safety valve outlet must be directed to the ground in a pipe so nobody is endangered by hot water or steam.

- The safety valve outlet must be directed to the sewer via a clearly visible, open route (siphon funnel), so that malfunctions, especially a failure of the safety valve to close, can be detected. If no sewer connection is available, the outlet must be directed to the ground in a pipe.

7 Information for installation

7.1 Chimney

7.1.1 Planning and layout

Required chimney diameter

Please note that in partial-load operation the exhaust temperature is lower and the large chimney diameters, normally used for solid fuel, are no longer ideal. If the cross section is too large, the flue gas no longer safely rises from the chimney opening and may flow along the roof and sink to the windows of the living quarters.

The flue has connection on the boiler has two different diameters (see table). The flue pipe from boiler to chimney must be executed as per the requirements in the table. A flue pipe with 2 m length and two 90° bends was assumed for the calculation. For some boilers a smaller chimney dimension can also be used. These values are listed in brackets. The "X" marks any diameters which may not be used.

Example: PC70 with 13 m chimney height and DN150 flue pipe => a chimney with 18 cm diameter is required. Alternatively, a chimney can be used with 16 cm diameter.

Diameter of the flue pipe from boiler to chimney	Chimney height above the boiler room floor	Required chimney diameter in cm			
		PC 60	PC 70	PC 80	PC 100 PC 105
DN 150 DN 180	6 m	X 18 [a]	X 20 [a]	X 20 [a]	X 25 [a]
DN 150 DN 180	7 m	18 [a] 18	X 18 [a]	X 18 [a]	X 20 [a]
DN 150 DN 180	8 m	18 [a] 18	22 [a] 18	X 18 [a]	X 20 [a]
DN 150 DN 180	9 m	18 18	20 18	X 18	X 20
DN 150 DN 180	10 m	16 X	18 18	X 18	X 20
DN 150 DN 180	11 m	16 X	18 X	18 [a] 18	X 20
DN 150 DN 180	12 m	16 (15) X	18 X	18 18	X 18
DN 150 DN 180	13 m	16 (15) X	18 (16) X	18 18	X 18
DN 150 DN 180	14 m	16 (15) X	18 (16) X	18 X	X 18

a. For boiler outputs over 30 kW and low chimney heights, a chimney joint tilted 45° can help achieve the required draught of 5 Pa at full load with acceptable cross-sections (a size smaller than indicated in the table).

Clarify with the chimney sweep

Always clarify the chimney's suitability with a chimney sweep.

Every boiler must have its own chimney

The better the boiler and the chimney are matched, the greater the energy with which the flue gas exits the chimney, and therefore the certainty that it will rise up into the air.

If the diameter is too large, the chimney will not be heated sufficiently, and the exit velocity and temperature will be too low. The flue gas then lacks the energy to rise and, in extreme cases, the smoke can sink down along the roof.

Chimneys with a diameter more than 50% greater than needed must be renovated to reduce the diameter. If a chimney is designed for use with two simultaneously operating boilers, it may prove to be oversized for the partial load from only one boiler. If there really is only one chimney available, a buffer storage tank can help avoid an overly small partial load.

DANGER!

Do not connect fan-assisted boilers and wood-burning stoves to the same chimney

Although not expressly prohibited, connecting a fan-assisted boiler and a wood-burning stove to the same chimney is a dangerous combination. For every wood-burning stove has an air intake. When the chimney is cold, any fan-assisted boiler, whether it burns oil or wood, will blow flue gas through this opening into the living area. If the wood-burning stove's firebox door is not closed and the boiler is defective at the same time, acute carbon monoxide poisoning is even possible.

Wood-burning stoves require a considerably larger chimney diameter, which cannot be heated by the fan-assisted boiler. Cold flue gas does not rise from the opening; it sinks and can reach living quarters through open windows. Moreover, it may be possible to hear the boiler's fan in the living quarters through the wood-burning stove.

DANGER!

Do not connect fan-assisted boilers and gas boilers to the same chimney

Most gas-fired boilers do not have a sealed air flap, and if the fan-assisted boiler is started when the chimney is cold, the flue gas is pushed through the gas boiler into the boiler room. This is not greatly helped by a flue gas damper in the flue pipe of the gas boiler, as these dampers are not certain to seal well on closing.

In the case of atmospheric gas boilers, old fireclay chimneys only stay dry due to the gas boiler's overflow opening. The water from the flue gas condenses in the chimney. During heating pauses, air flows through the overflow opening and dries the chimney. If this air flow is blocked by a flue gas damper, the moisture can destroy an old fireclay chimney.

Obsolete regulations stipulate the wrong chimney

Laws and regulations demand a moisture-resistant flue system for oil and gas and one that is resistant to soot fires for solid fuels.

Wood is a solid fuel. However, in the lower output range, the temperature of the flue gas can be below 100?, and condensates can be deposited in the chimney. The chimney must therefore be moisture-resistant, "contrary to regulations". Builders making a chimney resistant to soot fires in compliance with the law must then look on helplessly as the condensate destroys the chimney wall.

Soot fires are possible in natural-draught boilers or wood-burning stoves regulated by throttling the air supply. When the wood fire is at full intensity and the boiler temperature has been reached, a thermostat closes the air flap. This stops combustion. However, as the combustion chamber temperature doesn't fall, the wood continues to gasify. Unburned wood gas condenses to tar in the chimney, which can be ignited by sparks from the fire.

With modern, lambda-controlled wood boilers, soot fires of this kind are virtually impossible, as the control system restricts wood gasification, not the air. In modern,lambda-controlled wood boilers, the control system shuts down the fire by stopping the fuel supply, without closing off the supply of air to the fire. This way, there is no lack of air and no flammable tar in the chimney. In addition, the low flue gas temperatures of modern wood boilers also provide no ignition source for a soot fire. Modern and properly maintained wood boilers therefore pose no danger to chimneys from soot fires.

Moisture-resistant W3G flue systems

Since 2005, W3G chimneys (classified according to the German DIN 18160) exist that are resistant to both moisture and soot fires. These chimneys are approved for all fuels. Most of these W3G chimneys have ceramic inner pipes, which have a significantly longer service life than metal chimneys due to their acid resistance.

Connecting pipe to chimney preferably stainless steel

Due to the low exhaust temperatures, we recommend using a moisture-resistant stainless steel flue pipe as the connecting pipe to the chimney.

Provide a short, ascending flue pipe to the chimney

The flue pipe from the boiler to the chimney must be short, leakproof and ascending. "Attractive" right-angle flue offsets with two or more bends are bad in a flue

pipe. The optimum to strive for is the shortest pipe from the boiler to the chimney with a minimum of direction changes.

The flue pipe to the chimney must be leakproof. For unsealed sleeve pipes, use heat-resistant silicone as a sealant. Otherwise, you can expect smoke to escape into the boiler room as the boiler heats up. Ensure the flue pipe always ascends to the chimney

Long horizontal flue pipes to the chimney must have a narrow diameter and above-average insulation (>50 mm). Provide enough cleaning apertures in the flue pipe. A flue pipe to the chimney with a large diameter would reduce the necessary calculated chimney diameter. However, with low flow speeds ash deposits will form, and the theoretically calculated flue draught will be lost again.

If the chimney has a large diameter, the straight length of the connecting pipe can be at maximum half of the effective chimney height (calculation required).

Sewer connection for the chimney

A sewer connection (diameter 25 mm) via a trap is required for the condensation that accumulates in the chimney. The sewer pipe to which the condensation drain pipe is connected should be flushed once a year.

Fig. 7-1: Condensate drain

For chimneys on the outer walls (made of stainless steel, for example), frost-proof run-off must be provided for the condensate water.

Insulate the connecting pipe to the chimney

The connection between the boiler and the chimney should be insulated with at least 30 mm, preferably 50 mm, of mineral wool to avoid thermal losses, which can lead to a build-up of condensation.

Prevent structure-borne noise

To prevent structure-borne noise as far as possible, there should not be a fixed connection between the flue pipe and the chimney. Good flue systems are acoustically isolated. When steel pipes are connected to a fireclay chimney, ceramic fibre bandages have proven effective at preventing structure-borne noise as well as damage to the refractory sleeve.

Cleaning aperture in the connecting pipe

Easily accessible cleaning apertures must be available for cleaning the flue pipe.

Fig. 7-2: Cleaning aperture

Fit the chimney connection just under the ceiling

Even if the current boiler can be connected to the chimney at a low height, it is better if you fit the chimney connection just below the ceiling. The flue pipe is easier to install, and the vertical connecting pipe is long enough for an emission measurement.

A second chimney connection below the first one enables simple installation of a draught limiter, if this is required.

Opening for the emission measurement

A self-locking and sealing measurement opening must be provided in the flue pipe to facilitate emission measurements. The measurement opening must be designed in accordance with national directives.

Deflagration damper

The boiler is designed with safety routines in the control system to prevent deflagrations, so for boiler output up to 50 kW no deflagration damper (also often called a blowback flap) is required if the connecting pipe is short and ascends to the chimney.

For high points before descending sections or at the beginning of a long horizontal section (L > 20 x D), a deflagration damper is required regardless of the boiler output.

⚠ CAUTION!

▶ Position the deflagration damper so that no people are endangered.

7.1.2 Renovation

Chimney renovation before it's too late

Compared to older boilers, modern ones are more efficient and have lower amounts of flue gas and considerably lower temperatures.

Chimneys with a "too large diameter", in particular, can no longer be heated adequately. The moisture contained in the flue gas condenses in the chimney, resulting in the very slow but inexorable destruction of old masonry chimneys.

Furthermore, the exit velocity and temperature are too low if the diameter of the chimney is too large. The flue gas then lacks the energy to rise and, in extreme cases, the smoke can sink down along the roof.

If your chimney does not have a moisture-resistant liner or its diameter is too large, it will require renovation in the form of a new, moisture-resistant liner. Narrow chimneys can also be renovated by the addition of stainless steel pipes.

Also keep in mind that chimneys have a limited service life. Timely renovation before destruction of the chimney wall can be achieved quickly and easily by inserting a tube. But if the flue gas condensates have penetrated the mortar joints, the entire chimney must be dismantled and rebuilt.

Chimney renovation with a stainless steel pipe

Maybe the chimney has already been renovated for oil or gas with a stainless steel pipe, and now a conversion to wood or pellets is planned. Or the chimney is too narrow to install a ceramic pipe with a reliable seal. If a moisture-resistant inner pipe is installed in a sufficiently fire-resistant casing, the German Association of Chimney Sweeps has found the following solution to the standards and regulations dilemma: "in the certification of suitability and safe use for heating systems, it should be noted that after a soot fire the long-term durability cannot be ensured and penetration of the chimney by moisture cannot be ruled out so that it may be necessary to replace the inner pipe (Criteria for Determination of Suitability and Safe Use of Heating Systems - October 29th 2008, page 12).

Replace inner pipe after a soot fire

After a soot fire, the inner pipe is in all likelihood no longer sufficiently leakproof, making the chimney subject to damage by moisture. In this case, the inner pipe needs to be replaced without fail, regardless of whether its resistance to soot fires has been checked or not.

7.2 General information

Approval

All heating systems require approval. Enquire at your building authority and ask your chimney sweep.

Antifreeze

If the building is unoccupied for longer intervals in winter, up to 30% antifreeze can be added to the heating water. To compensate for the disadvantage of reduced heat capacity and increased flow resistance, only slightly higher flow temperatures are needed.

Insulate contact sensors

If the pipe in the vicinity of a contact temperature sensor is not insulated (e.g. in externally installed heating circuit assemblies), lower than actual temperatures will be measured. For this reason, the pipe insulation of heating circuit flow sensors must not be recessed or weakened. For uninsulated pipe systems, mineral wool insulation at least 20 mm thick is required for the measurement area over a pipe length of 20 cm minimum.

7.3 Water hardness

Determine permissible water hardness for the heating water according to ÖNORM H 5195-1

Specific water content in litre/kW		Table 1 Heat producer with large (> 0.3 l/kW) water content			Table 2 Heat producer with small (> 0.3 l/kW) water content		
		< 20 l/kW	≥ 20 /kW < 50 l/kW	≥ 50 l/kW	< 20 l/kW	≥ 20 l/kW < 50 l/kW	≥ 50 l/kW
Total output of the heat producer	≤ 50 kW	16.8 °dH	11.2 °dH	5.6 °dH	11.2 °dH	5.6 °dH	0.6 °dH
	> 50 kW ≤ 200 kW	11.2 °dH	5.6 °dH	2.8 °dH	5.6 °dH	2.8 °dH	0.6 °dH
	> 200 kW ≤ 600 kW	5.6 °dH	2.8 °dH	0.6 °dH	2.8 °dH	0.6 °dH	0.6 °dH
	> 600 kW	2.8 °dH	0.6 °dH	0.6 °dH	0.6 °dH	0.6 °dH	0.6 °dH

Instructions for determination:

1. Divide water content (litres) of the heat producer by its output in kW. If the result is larger than 0.3 l/kW, Table 1 applies. If the value is smaller or equal to 0.3 l/kW, Table 2 applies.
2. Divide the total heating water volume (in litres) by the output (in kW) of the smallest heat producer. The result is the specific water content and this determines the column within the previously calculated table.
3. Read the data for the permissible water hardness from the respective line using the total output of the heat producer.

Example: A heating system with a 45 kW boiler and 1500 litre total water volume.

1. The ratio of water content to output is more than 0.3 l/kW (117:45=2.6) => Table 1.
2. The specific water content is 33,3 l/kW (1500÷45 = 33.3) => middle column in Table 1.
3. The total output of the boiler is 45 kW; therefore, only the data from the first line (≤ 50 kW) are relevant.

The permissible water hardness in this example is 11.2 °dH.

Softening with a salt-regeneration ion exchanger

We recommend softening water with salt-regeneration ion exchangers, just as drinking water is softened. This method does not remove salt from the water. It replaces the calcium in the lime with sodium from the salt, and has considerable advantages. It is cheap and chemically stable against contamination. In addition, it produces a natural alkalinity that generally results in a sufficiently non-corroding pH value of around 8.

pH value between 8 and 9 may require dosing with trisodium phosphate

If the heating water's pH value has not itself changed to more than 8 after a week of operation, increase it by adding 10 g/m³ of trisodium phosphate (Na_3PO_4) or 25 g/m³ of trisodium phosphate dodecahydrate ($Na_3PO_4.12H_2O$). Wait another 2-4 weeks before making further corrections. The pH value must not exceed 9.

No hybrid installations

A disadvantage of salt-regeneration ion exchange is the salt content with its high electrical conductivity, which can lead to electrolytic corrosion, especially of aluminium or galvanized steel. If only steel, brass, gunmetal and copper are used in the heating system and the use of stainless steel is limited to small areas, then no corrosion problems should be expected, even with salty water.

Galvanized and aluminium parts in a heating system are always in danger of corrosion, especially in combination with copper tubing. In practice, this means no hot-galvanized fittings and no mixing of galvanized tubing with copper tubing. There is an illogical exception: galvanized steel tubing combined with boilers or buffer storage tanks made of steel. Presumably, the uniform zinc layer dissolves uniformly and is dispersed evenly throughout the system without localised corrosion.

Complete desalination not required

If there is no aluminium (heat exchanger in the gas boiler or aluminium radiator) in the system, then costly complete desalination with ion exchange cartridges or osmosis is not required.

Lime stabilisation can be dangerous

The addition of lime stabilising agents prevents limescale. However, we advise against doing this. These agents increase the salt content and result in an undefined pH value. If the system is filled with large amounts of water, exactly the same agent must be used again. Mixing with other water additives or with antifreeze can result in corrosion.

7.4 Corrosion

Initial protection with corrosion inhibitors

These agents line the new and still uncoated internal surfaces with a protective film. This is only possible in a new system. If corrosion has already begun, these agents can no longer be of help. Use corrosion inhibitors sparingly.

For systems with buffers with a large water volume relative to the internal surfaces, it is preferable to use half rather than double the quantity specified by the manufacturer.

7.5 Bleeding

Protection against atmospheric corrosion

To reliably protect the entire heating system against corrosion, air intrusion should be kept to a minimum and any air that does gain entry must be released as soon as possible.

Bleeding at highest point in flow

No system is completely airtight. Air that gets into the system is transported to the boiler with the return flow since water can take up more air as it gets colder and as the pressure increases. The air is released again at the point in the system with the highest temperature and the lowest pressure. The two typical points for releasing gas are the hot boiler and the highest point in the heating system flow.

Install a bleed valve at the upper end of the pipe from the boiler outlet (already installed in PelletsUnit and PelletsCompact boilers) and also at the highest point in the flow of the entire system.

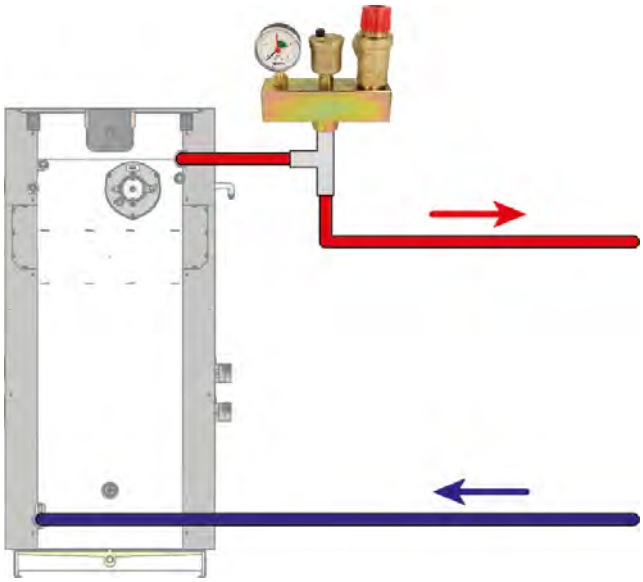


Fig. 7-3: correct positioning of the bleed valve

The T-piece of the bleed valve must be the same size as the boiler's flow connection, so that no air pocket may form. Likewise, the boiler body must be oriented horizontally, or ascending slightly toward the flow connection, so that air can escape.

For large, unseparated underfloor heating systems, an absorption filter for the entire water flow should be installed in the flow after the boiler (Spirovent, Flamco and Pneumatex are typical manufacturers).

Impermeable plastic tubing or physical separation

"Impermeable" plastic tubing simply undercuts a standard limiting value; there is no absolutely impermeable tubing. Even composite tubing with aluminium sheathing is not absolutely impermeable. As a rule of thumb: for up to 3,000 running metres of underfloor heating pipe, use impermeable composite tubing; for larger systems, physical separation with a heat exchanger is imperative. If a physical separation is present, then common single-wall tubing can also be used.

For older underfloor heating systems, always use physical separation because their tubing is not very airtight.

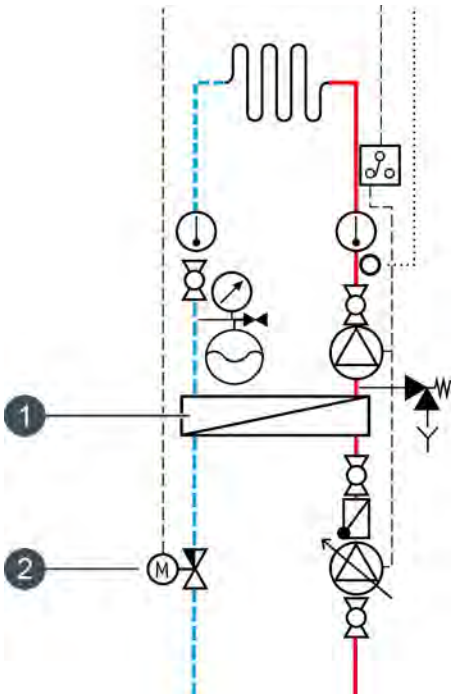


Fig. 7-4: Physical separation

1 Heat exchanger

2 Control valve

The hydraulically correct connection of the heat transfer station (regardless of whether for a physical separation or as a transfer station) must be adjusted on the primary side. In order to achieve optimal flow based on the flow temperature, the use of a two-way control valve (see graphic above) is recommended. Additionally, the primary pump should be designed with differential pressure control. A system separation module with these specifications is available from ETA.

Fig. 7-5: ETA system separation module

No open expansion tanks

Open expansion tanks improperly allow air into the system. Existing systems with open expansion tanks must be redesigned or physically separated from the boiler.

Pressureless buffer storage may not be attached directly to the boiler. If it is not possible to replace this buffer, there must be a physical separation between the boiler and the pressureless buffer.

7.6 Pressure equalisation

An expansion tank is needed

To equalise pressure in the system, a diaphragm expansion tank with a gross capacity of around 10% of the system volume is required.

If the pressure difference between cold and warm heating system (buffer fully loaded if installed) is greater than 1.0 bar for a single-storey system or 0.5 bar for a three-storey system, then the expansion tank is too small and absolutely must be replaced with a larger one. If the installed expansion tank is not large enough, the system sucks in air when cooling and the air is absorbed by the cold water and transported to the boiler. At the point of highest temperature, the air separates from the water again. This usually takes place in the boiler, and the inevitable result is that the boiler wall will rust through in these spots.

Protect the expansion tank against shut-off

All shut-off valves along the path from the expansion tank to the boiler and to the buffer storage tank must be capped valves, or the hand wheels or levers must be removed from the valves (hang on the valve with a wire), to ensure that they cannot be closed inadvertently.

7.7 Noise emission

Airborne noise emission

In normal operation, the airborne noise emissions from a pellet or wood chip boiler is between 40 and 50 dB(a) with individual peaks of up to 75 dB(a) (ignition fan and pellets vacuum motor).

To limit airborne noise emissions, the usual measures that are required for all boiler rooms are sufficient:

- Heavy doors such as the legally prescribed fire doors
- Restriction of the air intake openings to the required minimum
- Sound absorption insulation in the floors of the rooms above

Structure-borne noise

Noise problems with pellet or wood chip boilers are primarily caused by structure-borne noise emissions, that is from the noise energy that is introduced into the building. The main structure-borne noise emission sources and required damping measures are listed in the following.

- **Squeaking and creaking of the fuel conveyor screws:**
  Squeaking and creaking from the fuel conveyor screw depends on the fuel used, which is why the volume can have a wide range. Even if these noise sources are negligible in 90% of systems, without measures to counteract structure-borne noise transmission, the limit value of 30 dB(a) (for domestic technical systems) can be exceeded in the adjacent living rooms for 10% of systems. For this reason, cover the screw in the wall opening with mineral wool to prevent noise being introduced into the wall. In the same way the store room should be set up on a floating screed to acoustically decouple the conveyor from the building.
- **Chimney noises through the draught fan:**
  For chimney noises through the draught fan, a soft integration (for example with a ceramic cord) of the flue gas conduit is used in the chimney connector for soundproofing.
- **Natural resonance of the chimney:**
  The natural resonance of a chimney occurs if the chimney emits a certain frequency from the boiler (pipe organ effect). As soundproofing for brick-built chimneys, additional insulation and sealing of the cleaning aperture helps. For metal chimneys, additional wall consoles attached to the walls can help.
- **Noise emission through heat exchanger cleaning of the boiler:**
  For soundproofing, blocking de-ashing during night hours with the time programme available on the controller helps. So does a floating screed in the boiler room and setting up the boiler on the ETA sound-insulation set. Design the rigidly connected installation (flow and return, thermal emergency cooling valve) so that introduction of noise into the wall is minimised.

8 Buffer storage tank

8.1 General information

At low heating loads, either install a buffer or set short heating time slots

For very well-insulated brick walls (not for wooden construction), the house itself is an excellent thermal store. If the boiler output is too high, it can be adjusted to the house's heating requirements by limiting the heating time to three short time slots spread over the day.

If there is very low heat consumption during the transitional period in autumn/spring (e.g. heating only in the bathroom), then a buffer storage tank is needed for this low heating load.

Wooden houses need a buffer storage tank

For a wooden house with radiator heating, where there is not even the screed of an underfloor heating system to act as a thermal store, the installation of a buffer should be considered.

With a design output less than 70% of the boiler's rated output, an underfloor heating system operating only with time slots will cause large temperature variations in the rooms and a buffer storage tank is required. Heat produced by the boiler and not currently needed in the house can be stored in a buffer storage tank and returned to the heating system when needed.

When is a buffer storage tank necessary?

A buffer has to be installed for the boiler under the following conditions:

- if individual room temperature control is installed.
- for more than two heating circuits.
- especially in apartment buildings where the flats are individually controlled.
- in low-energy houses, when a substantial portion of the boiler's operating time is spent below its output range.
- during the transitional period in autumn/spring when there is very low heating demand, such as only for the bathroom.
- for wooden houses with low heat capacity and radiator heating.
- if above-average hot water demand or high spikes in hot water use are expected, e.g. in hotels, blocks of flats, showers in sports facilities. A pellet boiler needs up to 20 minutes (wood chip boiler up to 45 minutes) to reach its maximum output from standby.
- if an air heating system is to be started without warm-up time for the boiler.
- if a solar heating system is being integrated with a low-temperature heating system (underfloor heating).

Finely adjustable radiator valves and fresh water module

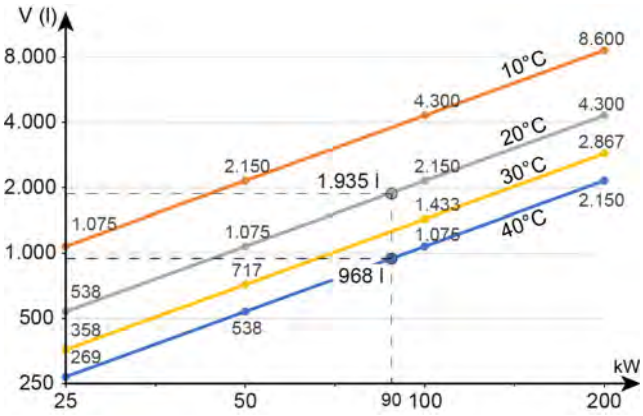
The lower the return temperature to the buffer, the greater its heat storage capacity. The buffer utilisation of radiators can be improved considerably with very finely adjustable thermostat valves (kvs less than 0.35).

With a fresh water module, the hot water supply can be integrated in the buffer to save space, and a solar heating system can also be integrated with the buffer very simply and effectively.

Choosing buffer size for systems with automatic fuel supply

Even if some subsidy guidelines demand "litres per kilowatt" and thereby specify a minimum buffer size, one should arrange for a technically correct size. The storage capacity of a buffer essentially depends on the spread between the heating system's boiler flow temperature and return temperature.

Example: For a 90 kW boiler with 70°C flow temperature, 30 minutes of full-load operation with underfloor heating and 30°C return temperature (= 40°C spread) requires a buffer volume of 968 litres, but with radiator heating and 50°C return temperature (= 20°C spread), it requires 1,935 litres.



The minimum volume for the buffer can also be calculated with the following formula:

$$\text{Volume} = \frac{\text{operating time (h) x output (kW) x 860}}{\text{spread (°C)}}$$

Buffers for multi-boiler systems

For systems with several boilers and also for those with several very different heating circuits (especially different times of operation or air and underfloor heating in the same heating system), a bypass is needed between heat producers and consumers to ensure stable hydraulic conditions for the individual circuits. A hydraulic bypass is nothing more than a pipe connection between the flow and the return with the same diameter as both. The differential water quantities from heating and boiler circuits flow through this bypass, This results in a neutral pressure point that ensures that the heating circulation cannot influence the boiler water circulation and vice versa.

A bypass that can do more than just stabilise pressure conditions is the buffer. If a wood boiler for the base-load range and an oil/gas boiler for peak load or as emergency reserve are operated together in a heating system, a buffer storage tank reduces the operating time of the peak-load boiler by compensating for brief differences between production and consumption. The number of boiler starts/stops when consumption fluctuates around the rated output of a boiler is reduced, saving energy and easing stress on the boiler.

To work as an output compensator and bypass for several boilers, the buffer's storage capacity should be chosen to match 20 to 30 minutes of full-load operation for the largest automatic wood boiler in the system. In special cases, peak loads and non-continuously operated air heating systems must also be taken into account, or the morning peak if the start of an oil/gas boiler is to be avoided. Whereby "first", the morning peaks themselves should be minimised with staggered starting times for the heating circuits as well as reasonable set-back temperatures.

8.2 Hydraulic integration

Hydraulic integration of a buffer

For the largest possible buffer storage capacity and for maximum solar yield even in winter, low return temperatures from the consumers are the goal.

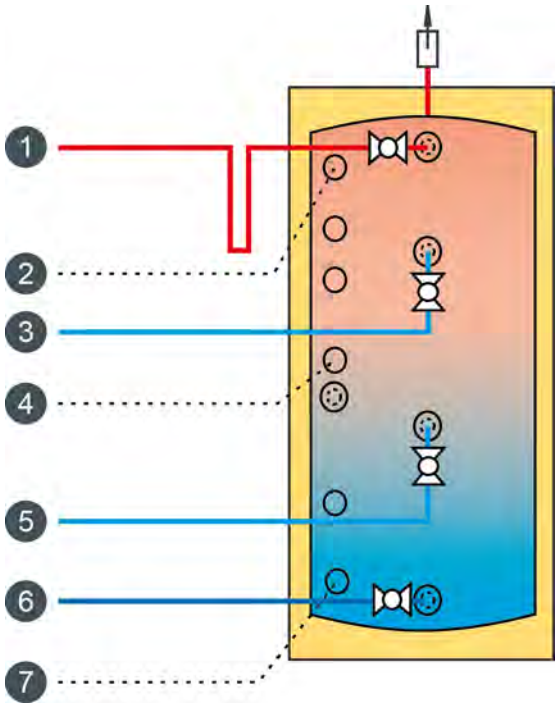
Even the best stratified buffer can't unmix what has been mixed by heat distributors. Particularly in houses where radiators and underfloor circuits are present, no mixing heat distributors should be installed; the returns should be connected directly to the buffer. An underfloor heating system can still be operated with the return from radiators.

If a solar heating system is connected, only the cold returns from an underfloor heating system or from a fresh water module may be fed into the solar-heated lower third of the buffer. This results in lower solar panel working temperatures with significantly higher efficiencies and also significantly higher solar yield.

In all cases, an oil or gas boiler should be connected at the top part of the buffer only.

Siphon loops downwards at all connections reduce heat losses in summer.

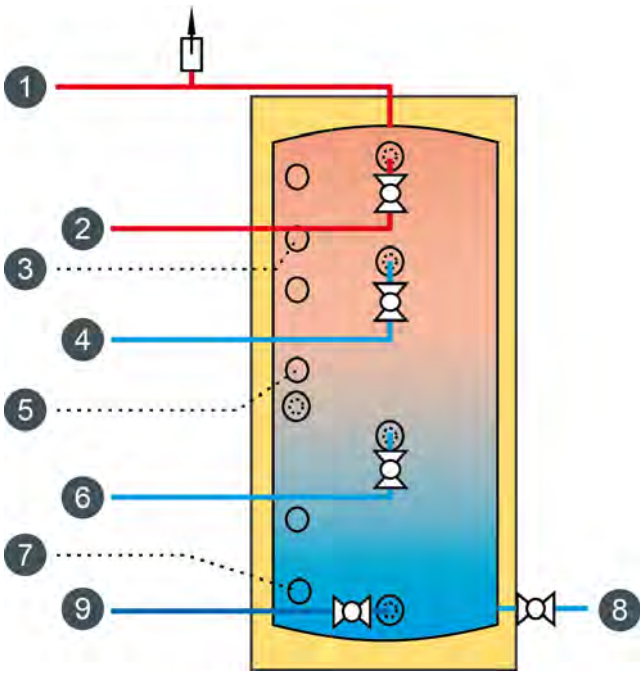
With hot water tank



1 Boiler flow, heating circuits, hot water tank, oil/gas boiler
2 Temperature sensor [Sensor 1 (upper)]
3 Oil/gas boiler return
4 Temperature sensor [Sensor 2]
5 Hot water tank return
6 Boiler, heating circuits return
7 Temperature sensor [Sensor 3]

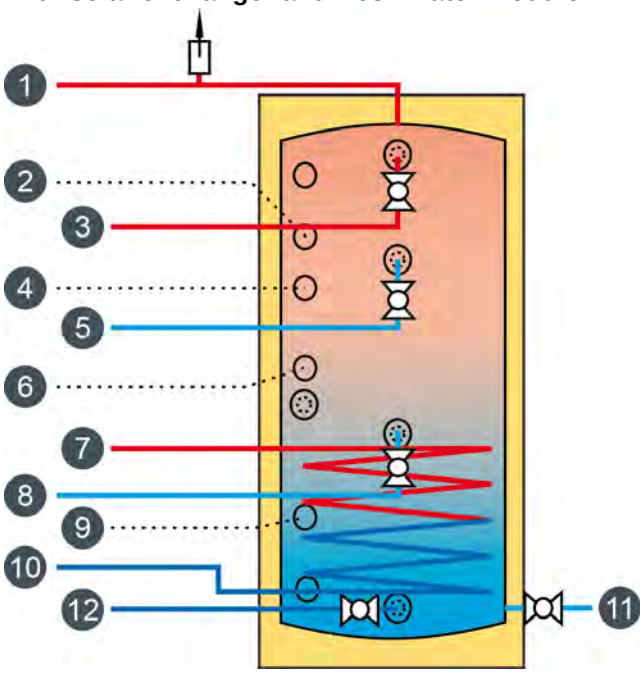
The temperature sensor [Sensor 3] must always be positioned just above the lowest return connection.
This is also important for buffers from third parties so that they are not positioned beneath the lowest return connection.

With fresh water module



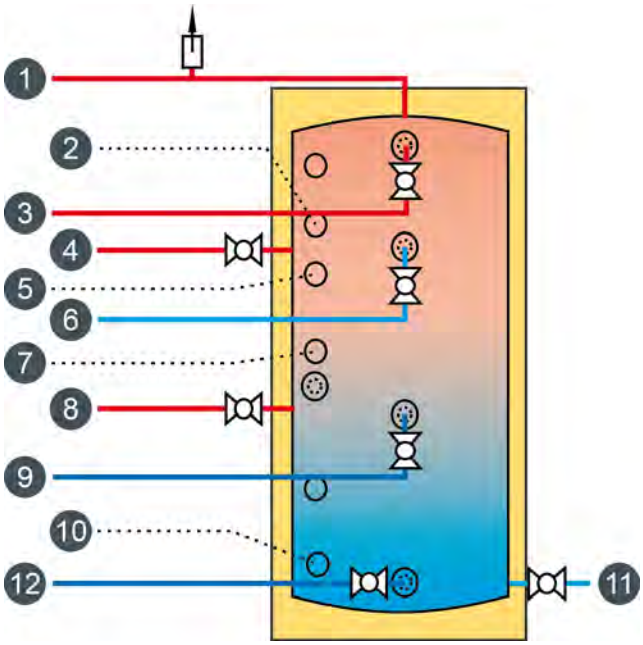
1 Fresh water module flow
2 Boiler, heating circuits, oil/gas boiler flow
3 Temperature sensor [Sensor 1 (upper)]
4 Oil/gas boiler return
5 Temperature sensor [Sensor 2]
6 High-temperature circuits return
7 Temperature sensor [Sensor 3]
8 Fresh water module return
9 Boiler, low-temperature circuit return

With solar exchanger and fresh water module



1 Fresh water module flow
2 Temperature sensor [Sensor 1 (upper)]
3 Boiler, heating circuits, oil/gas boiler flow
4 Temperature sensor [Sensor 2]
5 Oil/gas boiler return
6 Temperature sensor [Sensor 3]
7 Solar flow
8 Boiler, high-temperature circuit return
9 Temperature sensor [Sensor 4]
10 Solar return
11 Fresh water module return
12 Low-temperature circuits return

With stratified charging module and fresh water module



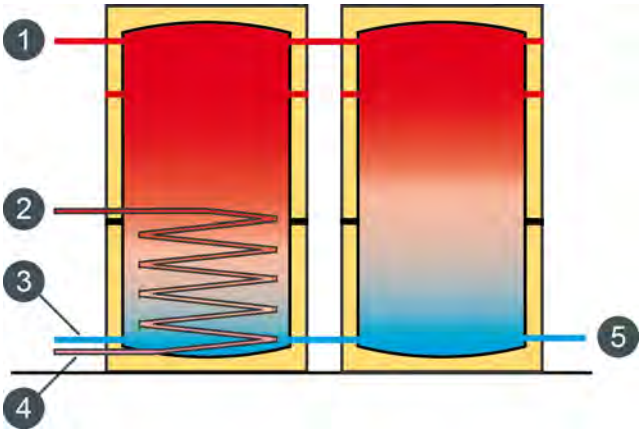
1 Fresh water module flow
2 Temperature sensor [Sensor 1 (upper)]
3 Boiler, heating circuits, oil/gas boiler flow
4 Solar flow, top
5 Temperature sensor [Sensor 2]
6 Oil/gas boiler return
7 Temperature sensor [Sensor 3]
8 Solar flow, lower
9 Boiler, high-temperature circuit return
10 Temperature sensor [Sensor 4]
11 Fresh water module return, solar
12 Low-temperature circuits return

8.3 Connection between multiple buffer storage tanks

Parallel connection

When there are several buffers, parallel connection (top with top and bottom with bottom) is usually the better solution. With a parallel connection, the entire buffer volume is available to installed heat exchangers such as solar heat exchangers or internal water heat exchangers and suspended hot water tanks.

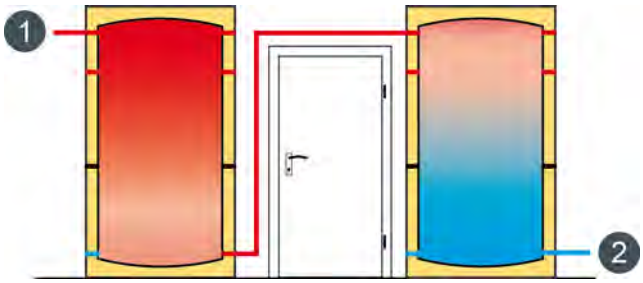
If two buffer storage tanks of different dimensions are connected in parallel, then the flow must be connected to the higher buffer or the lower buffer must be raised so that the upper connection can be horizontal.



1 Flow
2 Solar heating system flow
3 Return
4 Solar heating system return
5 Return

Serial connection

A serial connection between two buffers has no advantages over a parallel connection; but it does disadvantages. For example, a suspended hot water tank can get no heat from the second buffer or an internal heat exchanger cannot heat to both buffers. For this reason, with serial buffers one should connect the solar heating system using either heat exchangers in both buffers or (preferred) with an external heat exchanger.



1 Flow
2 Return

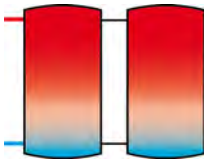
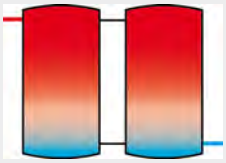
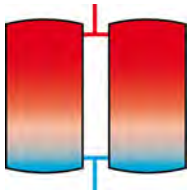
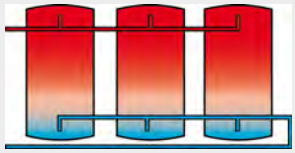
With rare exceptions, the use of the serial connection (buffer 2 top and buffer 1 bottom connected) is limited to overcoming spatial constraints of a particular installation. If passage to a door must be kept free or if there is a long distances between buffers, only a serial connection will be possible

Tichelmann connection for higher outputs

For parallel connection with one-sided connection, the volume of the second buffer is integrated using the thermosiphon principle. The exchange between the two tanks is driven only by gravity and limited by the hydraulic resistance of the junctions. Therefore, a Tichelmann connection is required for medium outputs.

With a 6/4" connection, a maximum of 5500 l/h at 0.25 mws pressure loss is possible (for flow and return connections together). This corresponds to 130 kW at a spread of 20 °C. Therefore, external piping (either symmetric or with Tichelmann connection), is needed for higher outputs.

With more than two tanks, external piping with Tichelmann connection is also needed to fill and drain all tanks uniformly.

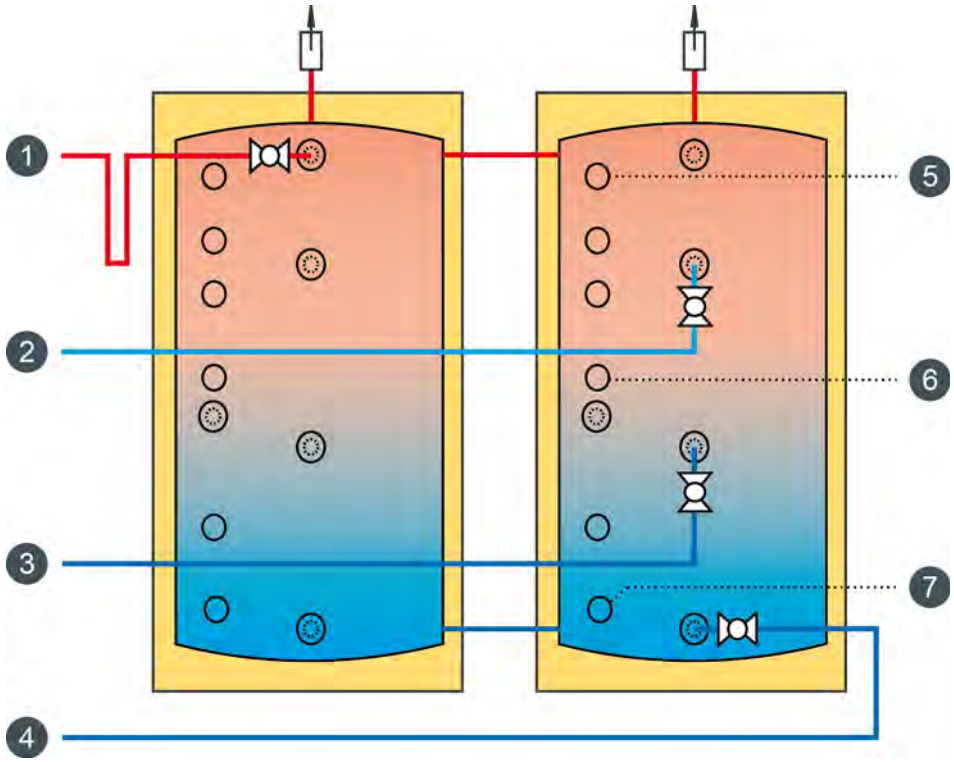
Parallel connection between buffer storage tanks	**Buffer connections 5/4" DN 32**	**Buffer connections 6/4" DN 40**
one-sided connection 	< 25 kW boiler output maximum 2 buffers	< 40 kW boiler output maximum 2 buffers
Internal Tichelmann connection 	< 80 kW boiler output maximum 2 buffers	< 130 kW boiler output maximum 2 buffers
Symmetrical connection 	> 80 kW boiler output maximum 2 buffers	> 130 kW boiler output maximum 2 buffers
external piping with Tichelmann connection 	> 80 kW boiler output, and/or more than 2 buffers	> 130 kW boiler output, and/or more than 2 buffers

8.4 Parallel buffer connection

Parallel buffer connection with internal Tichelmann

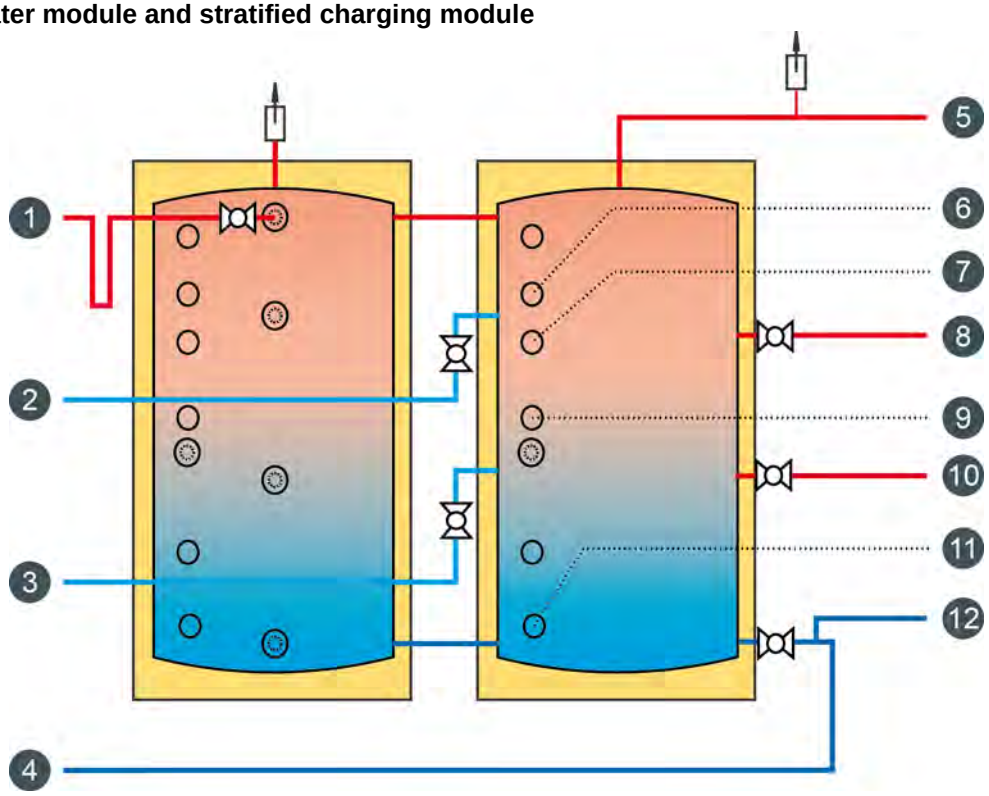
The basic principle of the internal Tichelmann is diagonal flow; Two buffers are connected together at the top and bottom (= parallel connection). For output up to 90 kW, a connection with DN 32 (ETA buffer connection set) is sufficient, for 30 kW use at least R1" or 28 mm copper. On one tank, the boiler outlet is connected at the top; on the other the boiler return is connected at the bottom. Return lines with greatly differing temperatures should be fed into the buffer storage tank separately. To minimize pipe circulation losses, it is helpful to make the connections with downward siphon loops.

With hot water tank



1 Boiler flow, heating circuits, hot water tank, oil/gas boiler flow
2 Oil/gas boiler return
3 Hot water tank return, high-temperature circuit return
4 Boiler, low-temperature circuit return
5 Temperature sensor [Sensor 1 (upper)]
6 Temperature sensor [Sensor 2]
7 Temperature sensor [Sensor 3]

With fresh water module and stratified charging module



1 Boiler, heating circuits, oil/gas boiler flow
2 Oil/gas boiler return
3 Boiler, high-temperature circuit return
4 Low-temperature circuits return
5 Fresh water module flow
6 Temperature sensor [Sensor 1 (upper)]
7 Temperature sensor [Sensor 2]
8 Solar flow, top
9 Temperature sensor [Sensor 3]
10 Solar flow, lower
11 Temperature sensor [Sensor 4]
12 Fresh water module return, solar

For a sufficient hot water reserve, the release temperatures of the heating circuits must be over 45 °C.

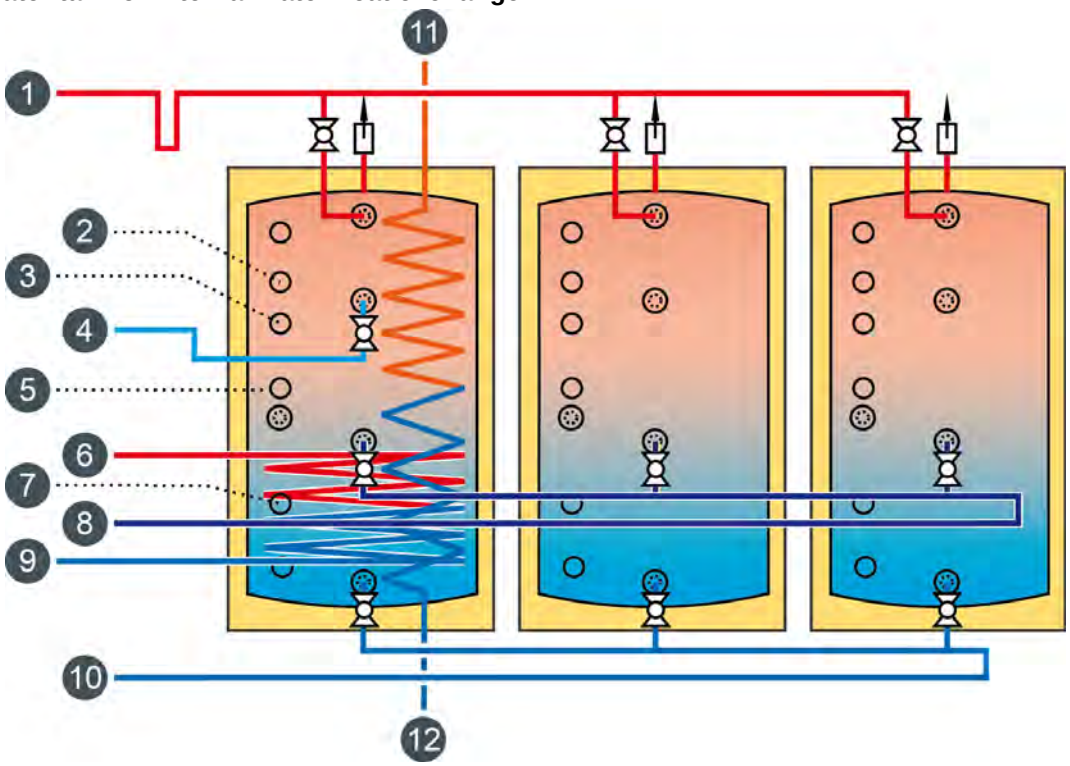
8.5 External Tichelmann

Parallel buffer connection with external Tichelmann

The basic principle of the external Tichelmann is parallel flow through several buffer storage tanks, which is achieved with diagonally opposed connection of the collectors. The last buffer on the flow collector is the first on the return collector. To achieve uniform charging and discharging, the connection pipes should be at least one or two sizes smaller than the collector. There is no output limit for this circuit. To minimize pipe circulation losses, it is helpful to make the connections with downward siphon loops.

For a small solar heating system, the total volume can be reduced in the summer by locking individual buffers.

With hot water tank or internal water heat exchanger

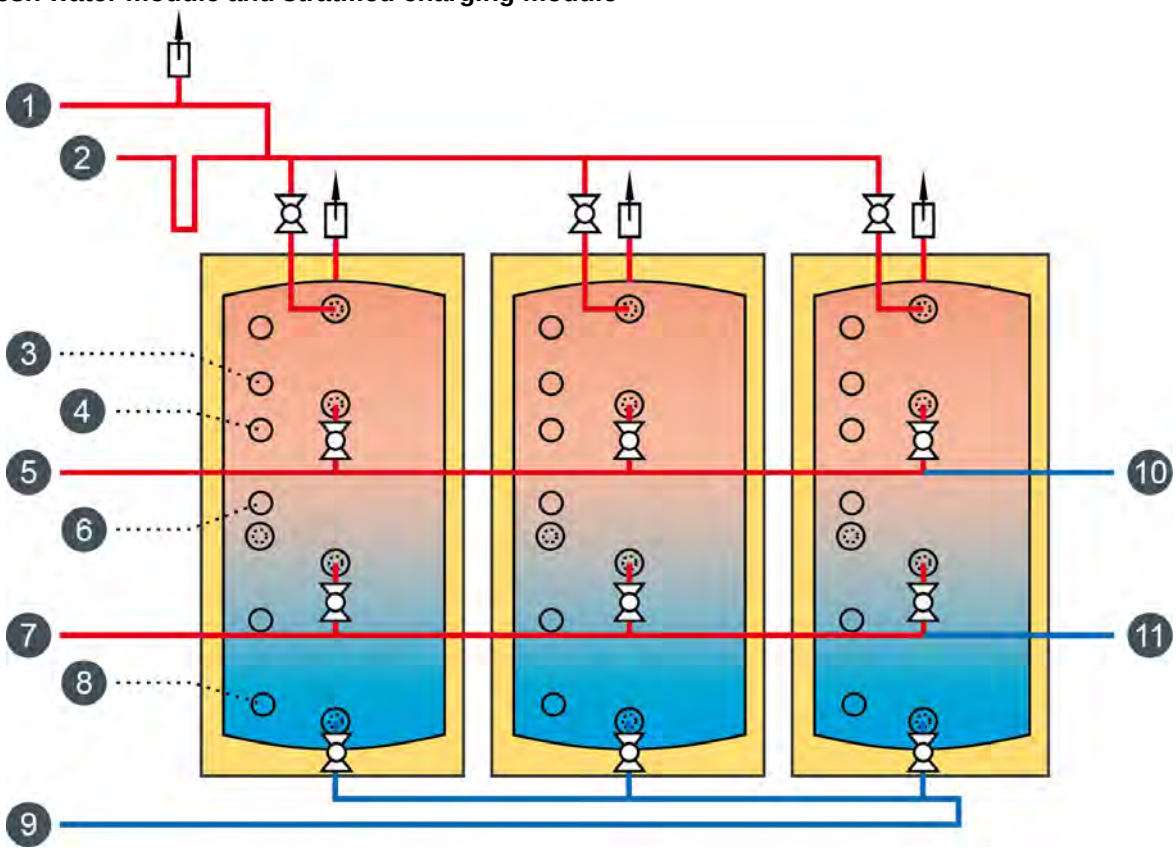


1 Boiler, heating circuits, oil/gas boiler flow
2 Temperature sensor [Sensor 1 (upper)]
3 Temperature sensor [Sensor 2]
4 Oil/gas boiler return
5 Temperature sensor [Sensor 3]
6 Solar flow
7 Temperature sensor [Sensor 4]
8 Boiler, high-temperature circuit return
9 Solar return
10 Low-temperature circuits return
11 Hot water
12 Cold water

maximum total output	Connecting ball valves on buffer	Collector line at least		
30 kW	DN 20	DN 25	R 1"	28 x 1.5
60 kW	DN 25	DN32	R 1¼"	35 x 1.5

maximum total output	Connecting ball valves on buffer	Collector line at least		
90 kW	DN 32	DN 40	R 1½"	42 x 1.5
160 kW	DN 32	DN 50	R 2"	54 x 1.5
300 kW	DN 40	DN 65	R 2½"	76 x 2
450 kW	DN 40	DN 80	R 3"	89 x 2

With fresh water module and stratified charging module



1 Fresh water module flow
2 Boiler, heating circuits, oil/gas boiler flow
3 Temperature sensor [Sensor 1 (upper)]
4 Temperature sensor [Sensor 2]
5 Solar flow, top
6 Temperature sensor [Sensor 3]
7 Solar flow, lower
8 Temperature sensor [Sensor 4]
9 Fresh water module return, solar and low temperature circuits
10 Oil/gas boiler return
11 Boiler, high-temperature circuit return

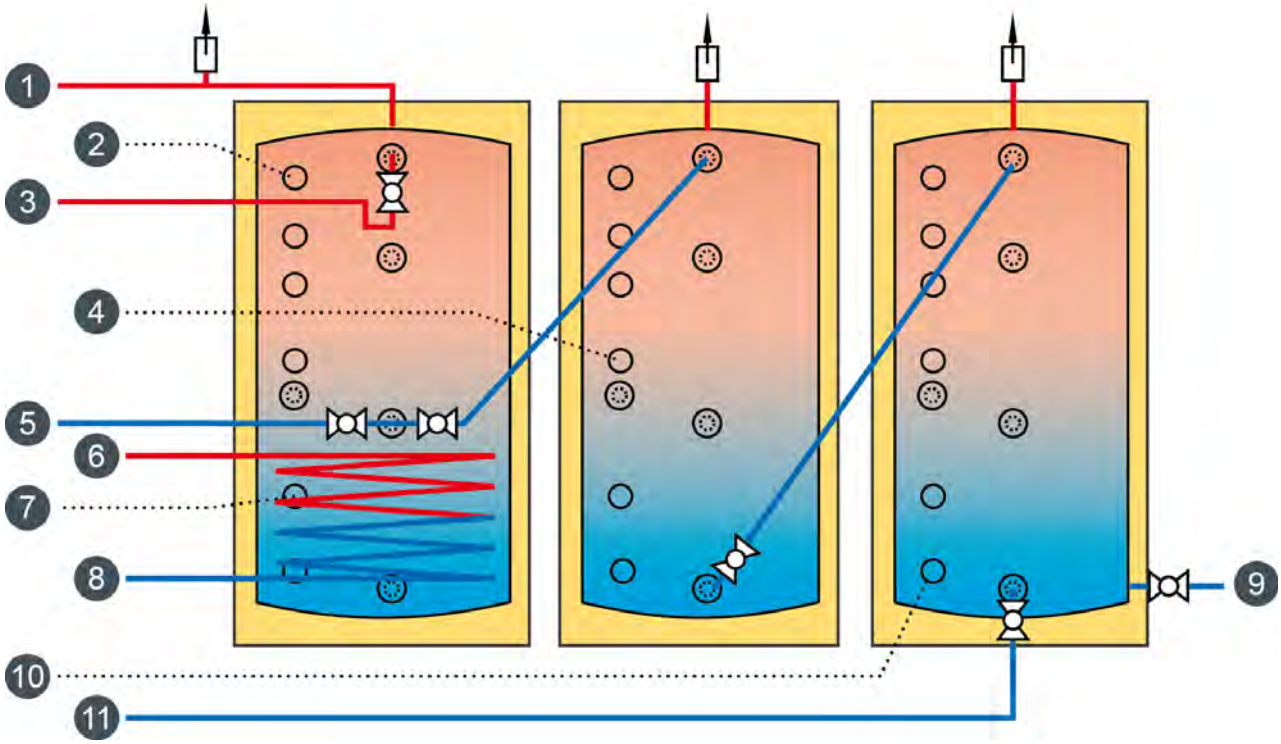
8.6 Serial buffer connection

Serial buffer connection

If there are different buffer types, or if not all buffers can be set up in one group, serial connection of the buffers will be necessary. Note that for serial buffer connection, integration of a solar heating system will work adequately only when a fresh water module is used for the hot water supply.

Solar tanks with internal solar exchangers are only of limited effectiveness. Combination tanks with immersed hot water tanks or internal water heat exchangers are unsuitable for a serial buffer connection. To minimize pipe circulation losses, it is helpful to make the connections with downward siphon loops.

With fresh water module

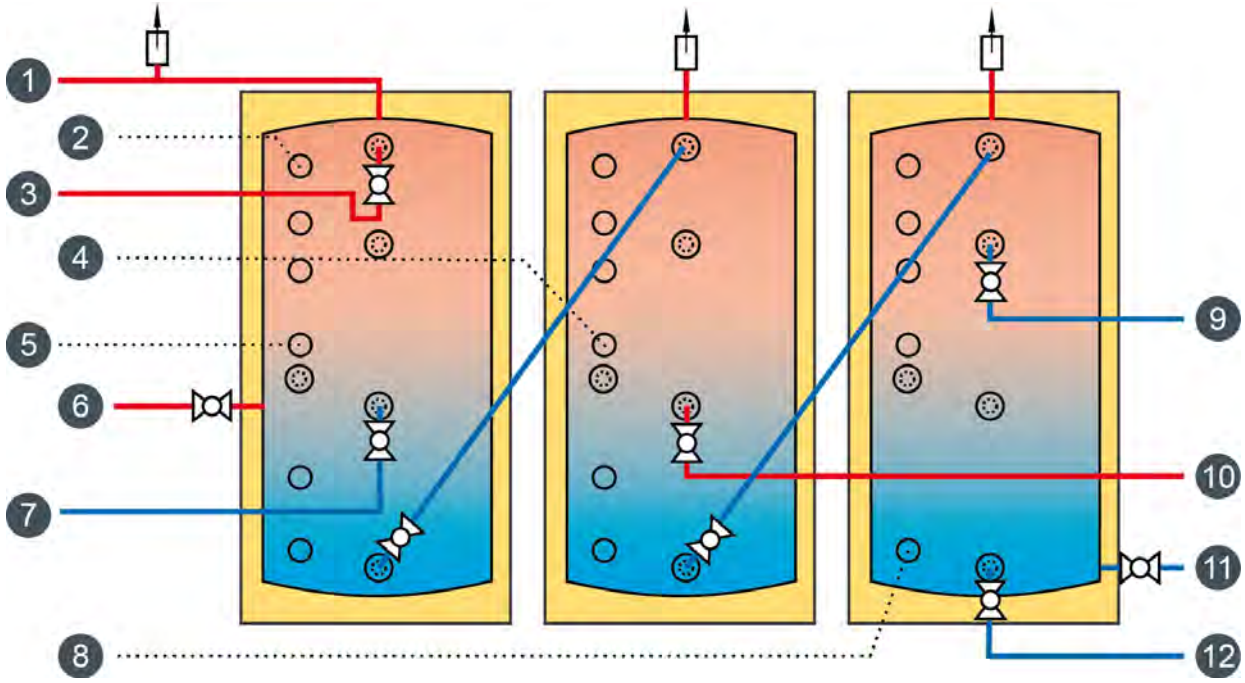


1 Fresh water module flow
2 Temperature sensor [Sensor 1 (upper)]
3 Boiler, heating circuits, oil/gas boiler flow
4 Temperature sensor [Sensor 2]
5 Oil/gas boiler return
6 Solar flow
7 Temperature sensor [Sensor 3]
8 Solar return
9 Fresh water module return
10 Temperature sensor [Sensor 4]
11 Boiler and heating circuits return

maximum total output	Number of buffers	Connecting line, minimum		
30 kW	4	DN 25	R 1"	28 x 1.5
50 kW	4	DN32	R 1¼"	35 x 1.5
65 kW	2	DN32	R1¼"	35 x 1.5
80 kW	4	DN 40	R1½"	42 x 1.5

maximum total output	Number of buffers	Connecting line, minimum		
100 kW	2	DN 40	R1½"	42 x 1.5
140 kW	4	DN 50	R2"	54 x 1.5
170 kW	2	DN 50	R2"	54 x 1.5

With fresh water module and stratified charging module



1 Fresh water module flow
2 Temperature sensor [Sensor 1 (upper)]
3 Boiler, heating circuits, oil/gas boiler flow
4 Temperature sensor [Sensor 2]
5 Temperature sensor [Sensor 3]
6 Solar flow, top
7 Oil/gas boiler return
8 Temperature sensor [Sensor 4]
9 High-temperature circuits return
10 Solar flow, lower
11 Fresh water module and solar return
12 Boiler and low-temperature circuit return

9 Installation

Assembly and installation only by qualified specialist personnel

The assembly and installation may be performed by specialist personnel with the corresponding qualifications only.

9.1 Placement of the boiler

Bringing the boiler into the boiler room

Transport the boiler into the boiler room. The required clearances for installation and maintenance must be maintained; see 2 "Technical data".

Lifting lugs for placement

If a lifting device is available, the boiler can be placed in the room where it is to be setup with the aid of welded lifting lugs.

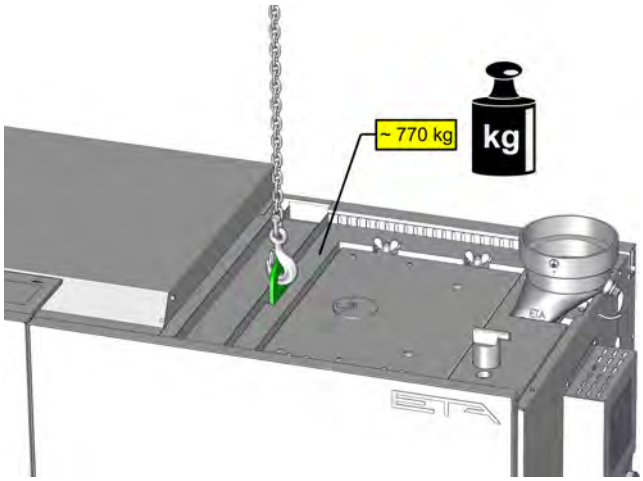
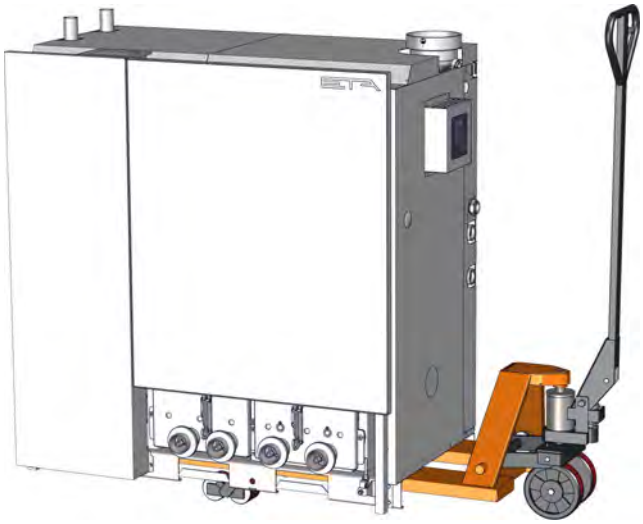


Fig. 9-1: Lifting lug

The boiler weighs approx. 770 kg. The boiler must be secured during lifting.

Placement with pallet jack

The boiler can be lifted on the underside with a pallet jack.



Aligning the boiler horizontally

Inspect the horizontal alignment of the boiler and shim if necessary. Compensating shims are included in the delivery scope.

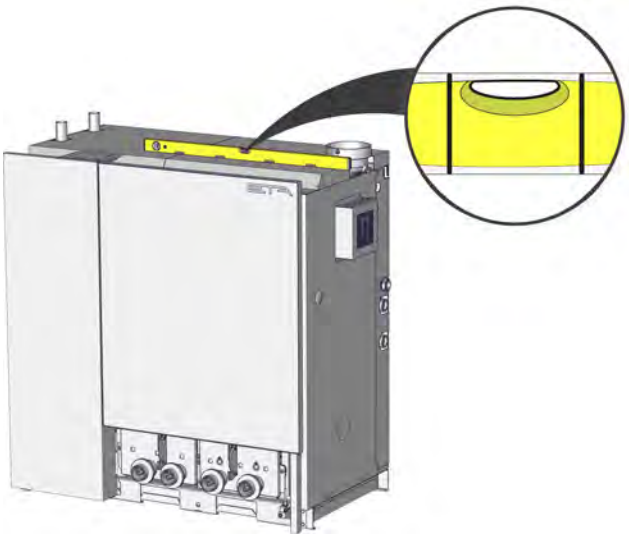


Fig. 9-2: Check the alignment

9.2 Removing panels

Remove the panelling

Remove the panel on the top of the boiler.

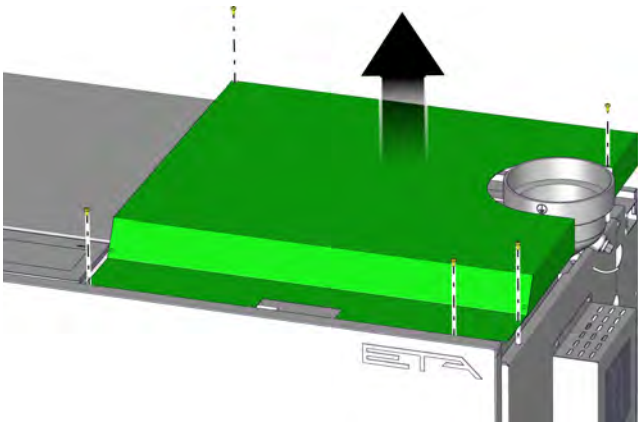


Fig. 9-3: Panel

Removing the side panel

Remove the side panel.

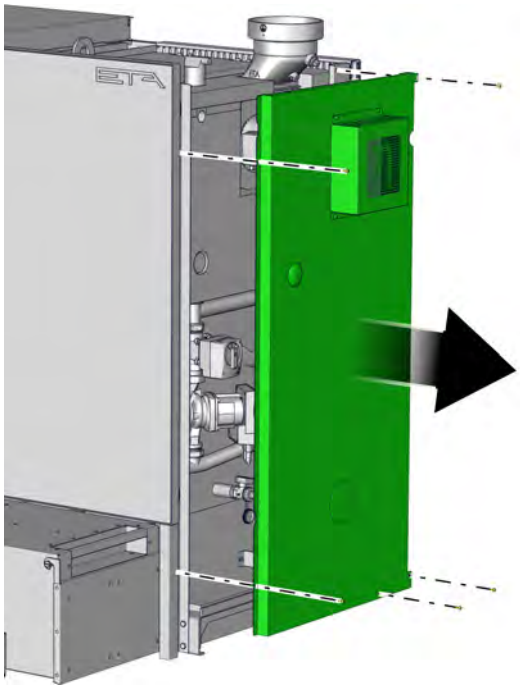


Fig. 9-4: Side panel

Remove the circuit board cover

Open the boiler door and remove the circuit board covers.

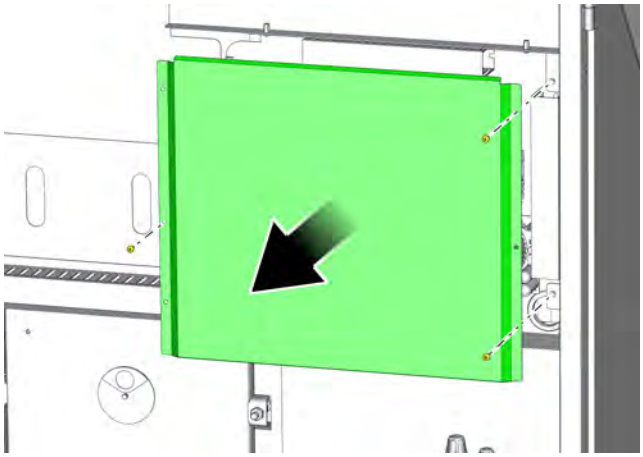


Fig. 9-5: Cover

The boiler circuit boards are located behind them.

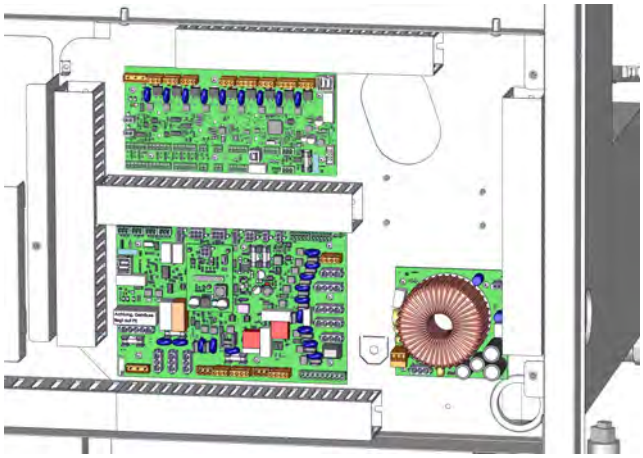


Fig. 9-6: Circuit boards

Push in the floor insulation

Push the floor insulation under the boiler.

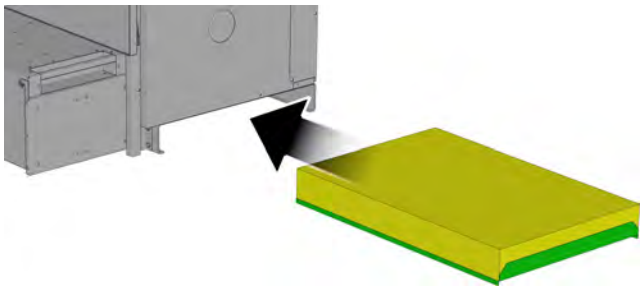


Fig. 9-7: Floor insulation

9.3 Dismantling the boiler (if required)

The boiler can be dismantled for placement

The boiler can be dismantled if the spatial conditions require it. Only in that case are the following steps necessary. Approx. 2 hours are needed for the dismantling and subsequent reassembly.

If the boiler is not dismantled, assembly continues with step 9.4 "Connecting piping" .

Removing the collector from the front

Unscrew the screws on the collector, lift and remove it.

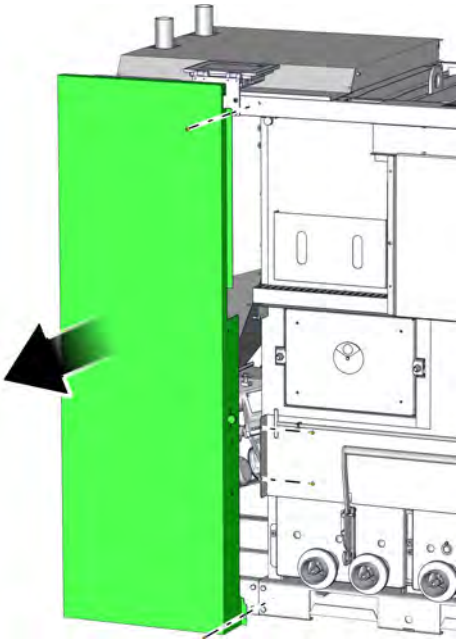


Fig. 9-8: Collector

Removing the collector above the pellet hopper

Remove the collector above the boiler's pellet hopper.

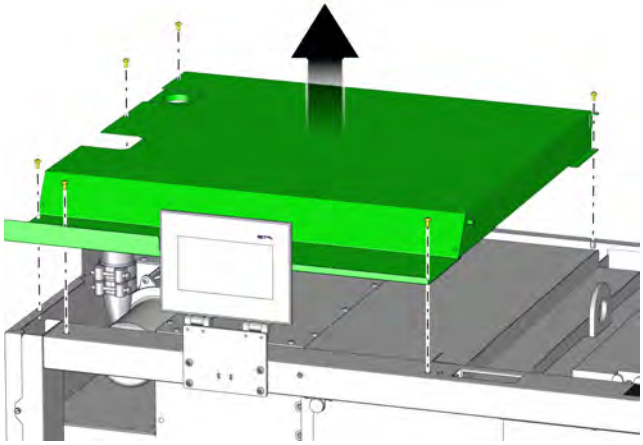


Fig. 9-9: Collector

Remove the boiler's panels

Remove the left panel from the boiler.

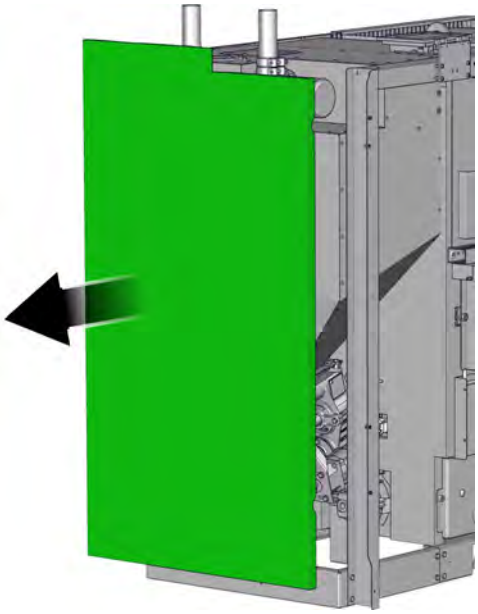


Fig. 9-10: Panel

Remove the rear panel from the boiler.

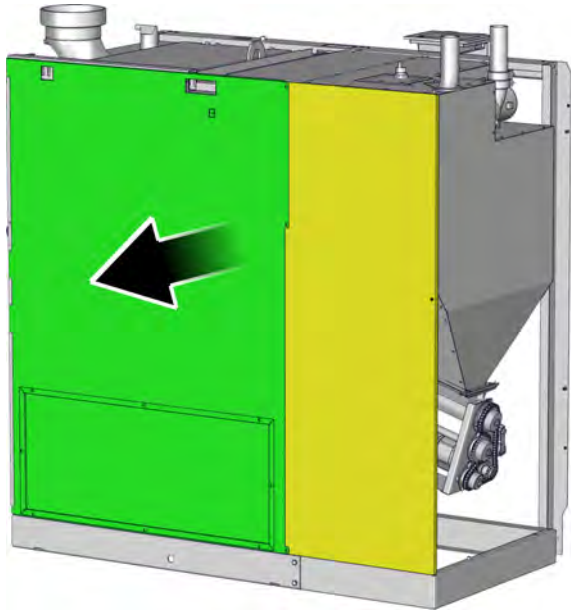


Fig. 9-11: Panel

Removing the screen for the ETAtouch control system

Disconnect the data cable for the screen from the circuit board [GM-C] at terminal [S510]. Unthread the network cable from the cable ducts. The cables can stay connected to the screen.

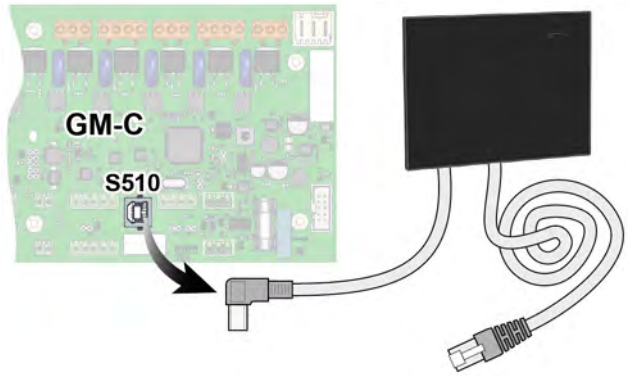


Fig. 9-12: Disconnecting the cables

Loosen the screws on the screen bracket and store them in a safe location along with the cables.

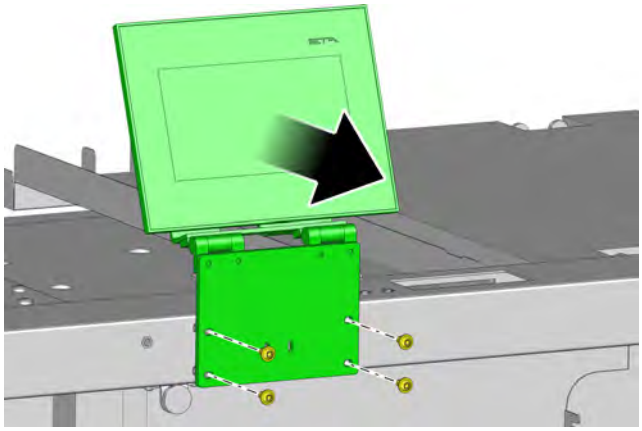


Fig. 9-13: Remove the screen

Disconnecting the cables from the mains switch and maintenance switch

Disconnect the cables of the mains switch and maintenance switch from the circuit board [PE-C] at terminals [S21] and [S25].

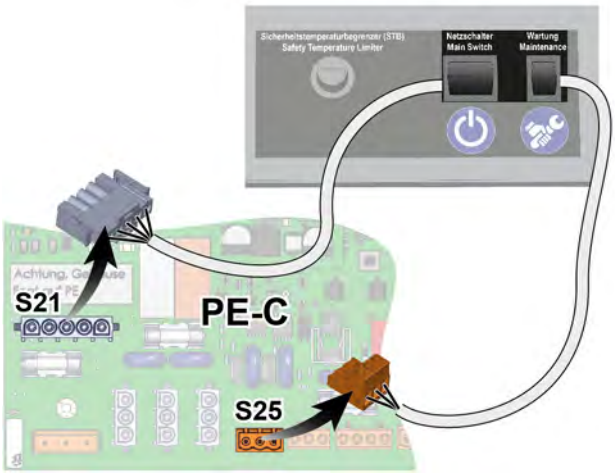


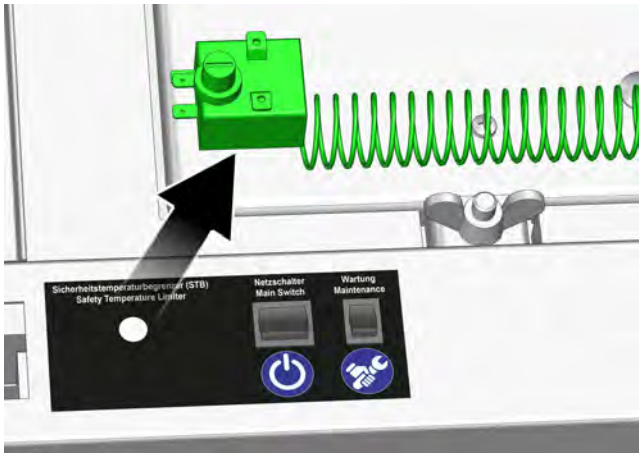
Fig. 9-14: Disconnecting the cables from the mains switch and maintenance switch

Removing the safety temperature limiter

Loosen the fastening screw of the safety temperature limiter and carefully unthread it from the bracket.

Fig. 9-15: Safety temperature limiter

Do not bend the temperature sensor's capillary tube.



Remove the internal cover

Remove the cover behind the boiler door.

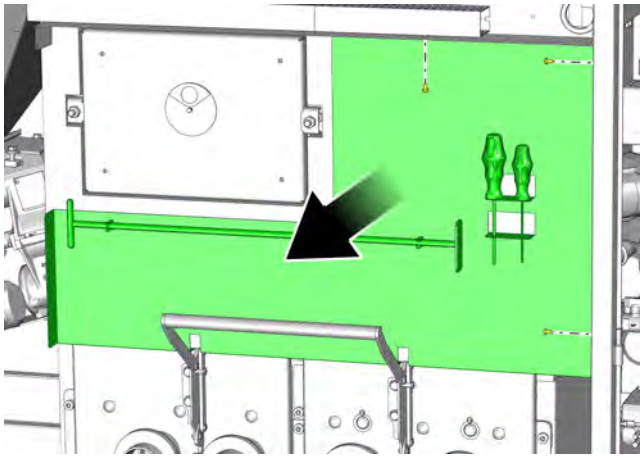


Fig. 9-16: Cover

Removing the frame

Secure the electronics carrier against falling. Loosen the fastening screw of the electronics carrier on the frame.

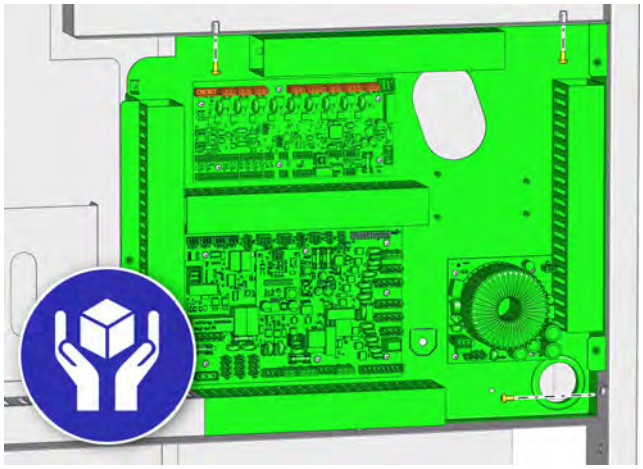


Fig. 9-17: Electronics panel

Loosen the screws of the frame and completely remove the frame. Make sure that no cables are damaged while doing this.

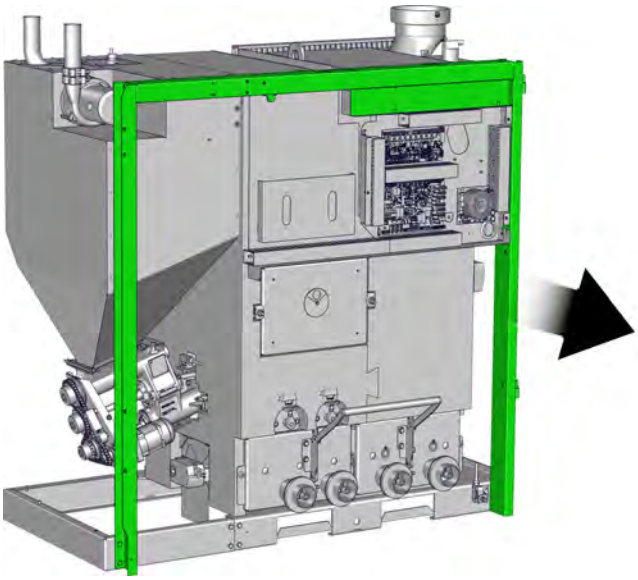


Fig. 9-18: Frame

Disconnecting the power supply from the stoker drive and the vacuum turbine

Disconnect the power supply cables for the stoker drive and the vacuum turbine.

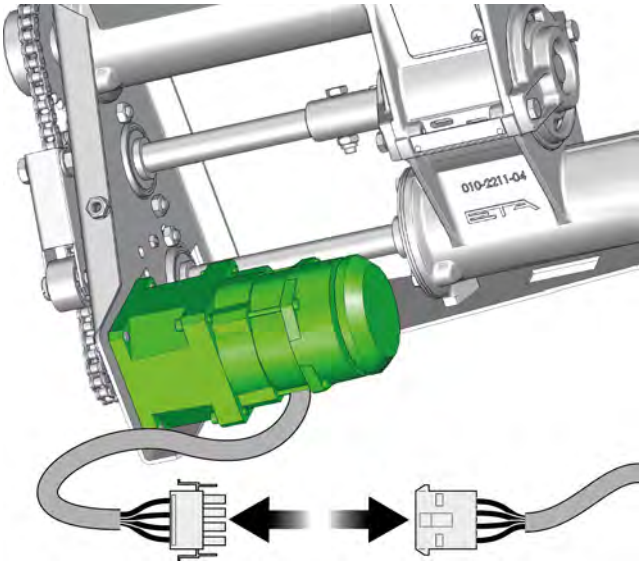


Fig. 9-19: Stoker drive

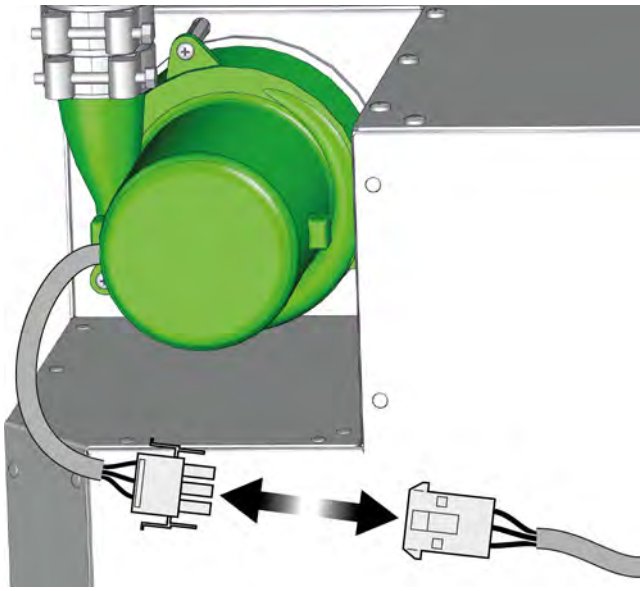


Fig. 9-20: Vacuum turbine

Detaching the pellet hopper

Loosen the screws for fastening to the stoker and heat exchanger and remove the pellet hopper.

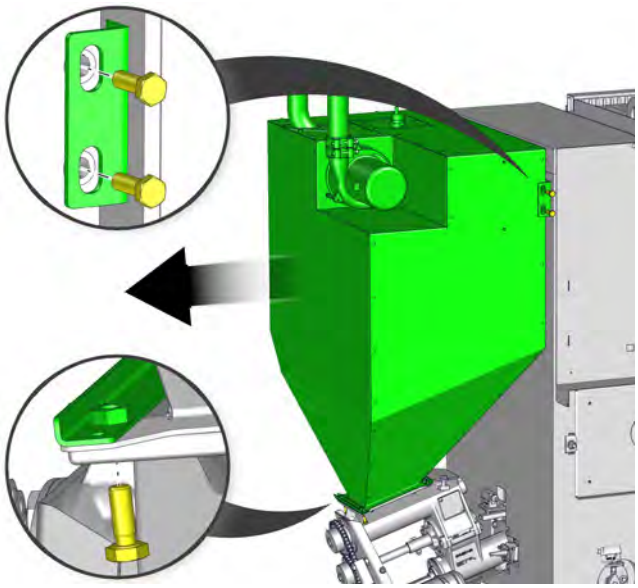


Fig. 9-21: Pellet hopper

Make sure that the seal between the pellet hopper and the stoker is not damaged.

Unplugging the fill level sensor

Disconnect the cable for the fill level sensor from the circuit board [PE-C] at terminal [S528]. Unthread the cable from the cable ducts and fasten it to the pellet hopper.

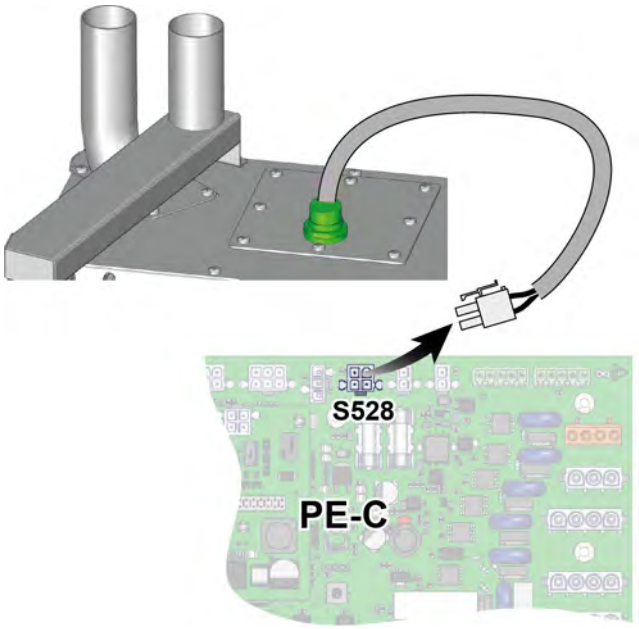


Fig. 9-22: Fill level sensor

Remove stoker

Loosen the 4 M8 screws fastening the stoker to the boiler. Then take the stoker out of the boiler.

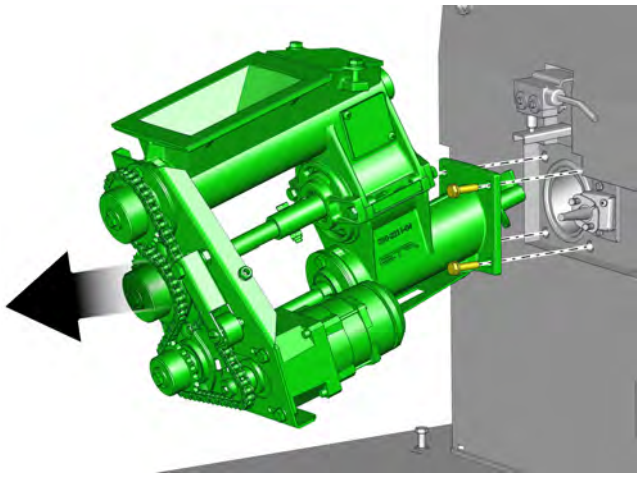


Fig. 9-23: Stoker

Avoid damaging the seal between the boiler and the stoker.

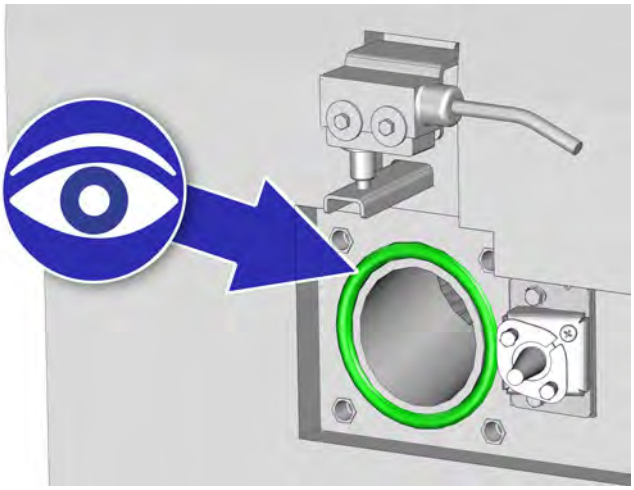


Fig. 9-24: Seal

Placing the boiler

Remove the extension frame from the bottom.

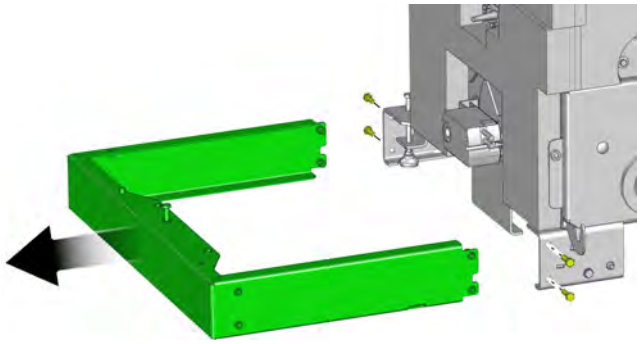
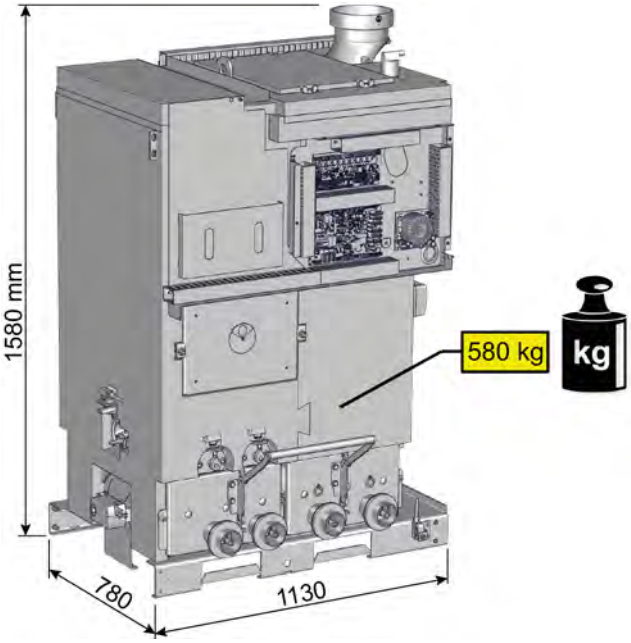


Fig. 9-25: Frame

Place the boiler body into the boiler room.

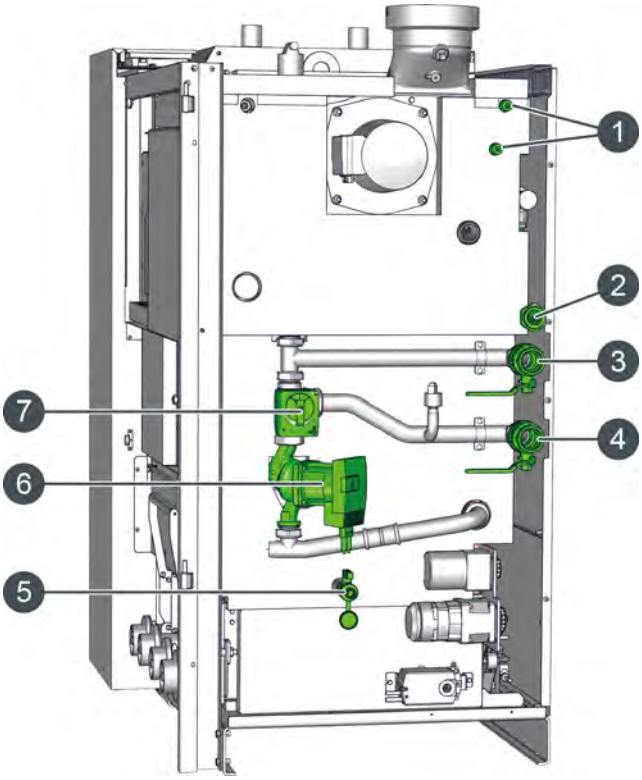


After positioning, reassemble boiler

Reassembly takes place in reverse order. The panel on the side with the connections has not yet been mounted. Then continue the installation with chapter 9.4 "Connecting piping".

9.4 Connecting piping

Connecting the piping to the boiler



1 Safety heat exchanger
2 Outlet for the safety valve
3 Flow
4 Return
5 Discharge
6 Boiler pump
7 Return riser mixing valve

Installing the thermal emergency cooling valve

Install the thermal emergency cooling valve on the boiler. The connection for the capillary sensor of the safety valve is located on the side of the boiler.

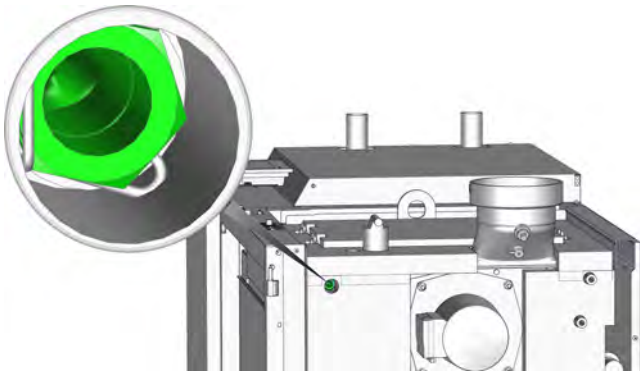


Fig. 9-26: Connection for capillary sensor

Connecting the piping for the safety valve outlet

A safety valve is already installed on the boiler and its discharge pipe extends out of the boiler (6/4" coupling).

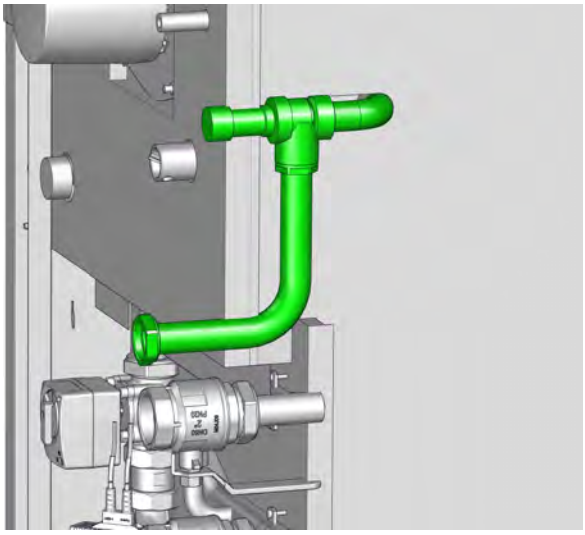


Fig. 9-27: Boiler safety valve

On site further piping is to be connected to this coupling for the discharge pipe of the safety valve. The end of this discharge pipe must be routed into the duct trap.

9.5 Cables

Connecting the boiler to potential equalisation

The boiler must be connected to the potential equalization of the boiler room or the building. Country-specific regulations must be observed while doing this.

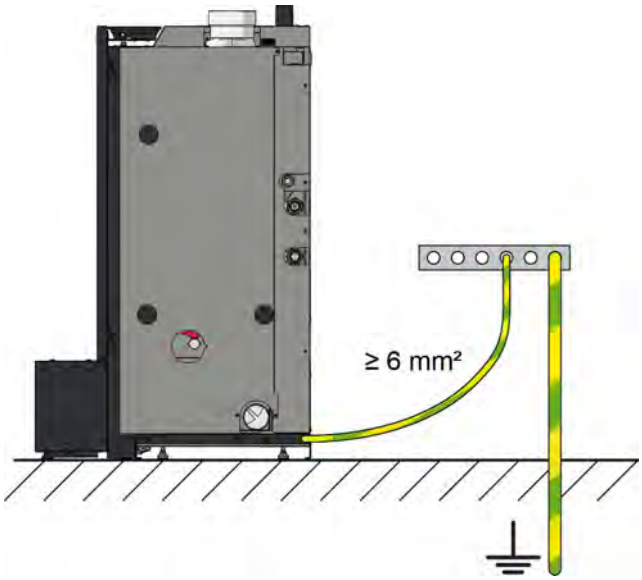


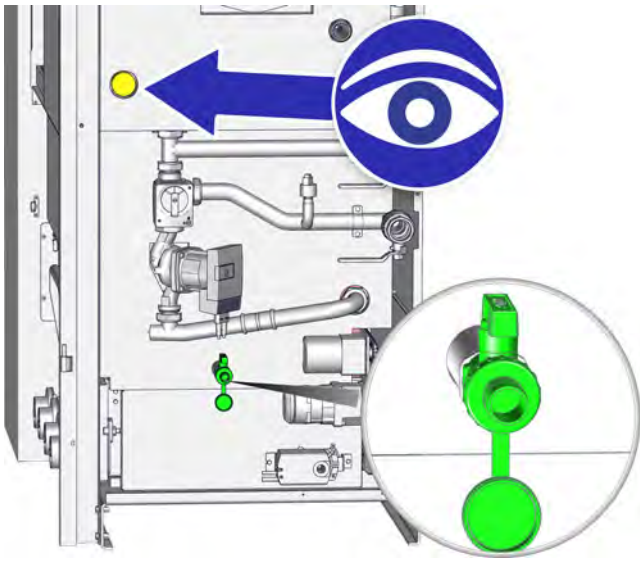
Fig. 9-28: Connecting the potential equalisation

The bottom of the boiler features holes to connect the potential equalisation (minimum cross-section 6 mm²).

9.6 Filling the heating system

Filling the heating system

Fill the boiler via the fill/drain valve. The current system pressure is shown on the pressure gauge.



CAUTION!

Boiler shutdown due to excessive water pressure

During operation the pressure limiter switch shuts down the boiler at a water pressure of 2.8 bar. From a water pressure of 3 bar the safety valve drains the water.

▶ When filling, exceed the required system pressure by no more than 0.2 bar (for bleeding).

Bleed the heating system

Open the ball valves on the heating circuits and vent the heating system completely. After bleeding, check the water pressure and adjust if required.

Check watertightness of piping

Check the watertightness of the installed piping. If there is any water leakage, its cause must be found and eliminated.

9.7 Attaching pellet hoses

Note instructions about laying pellet hoses

When laying the pellet hoses, take note of the comments; see 12.8 "Information about pellet hoses".

Mount fire-resistant collars (if required)

If the pellet hoses from the storeroom feed over a fire section (for example a room in-between) to the boiler room, fire-resistant collars must be fitted over both pellet hoses.
In wall ducts, a fire protection sleeve must be mounted on each side, with ceiling ducts only positioned on the ceiling side.

Fig. 9-29: Fire-resistant collar

In the event of a fire, the internal material of the fire-resistant collar expands and thus closes the pellet hoses. So burn-back is prevented in rooms through which the pellet hoses are fed.

⚠ CAUTION!

The copper wires must have good contact with the connections for the pellet hoses.

Otherwise the hoses will not be earthed with the boiler and there is a risk of electrostatic charge build-up.

▶ Remove the paint or the coating from both pellet hose connections.

Attaching the pellet hoses to the boiler

On the ends of both pellet hoses, free around 10 cm of the copper wire strands from the hoses.

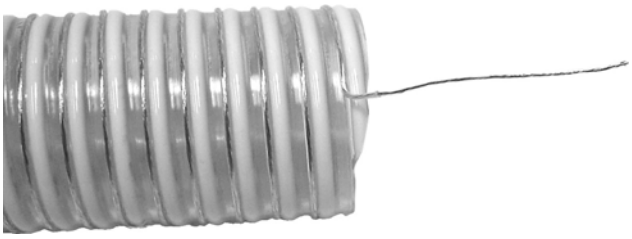


Fig. 9-30: Exposing the copper wire

Push both pellet hoses onto the nozzles on the boiler and fasten them with the hose clamps. Connect the copper wires from both pellet hoses to the yellow-green earthing cable (next to the nozzles).

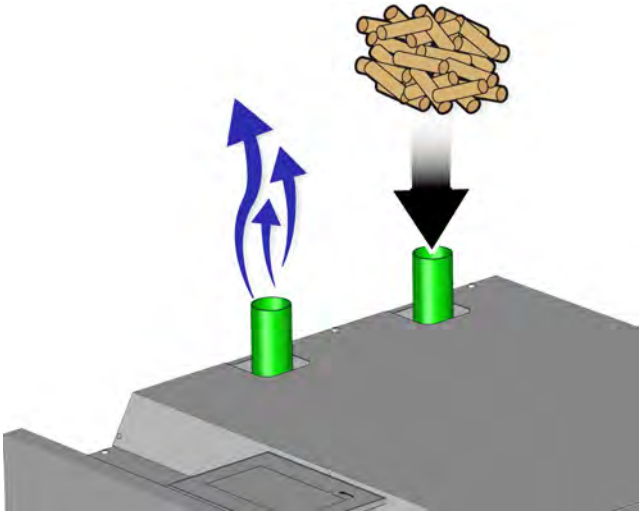


Fig. 9-31: Boiler connections

Attach pellet hoses to conveyor

On the ends of both pellet hoses, free around 5 cm of copper litz wire from the hose and bend it inwards into the hose.

Push the two pellet hoses onto the nozzles and secure them with hose clamps.

9.8 Network connection

Connecting the network adapter for the boiler

From factory, a network cable is already connected to the control panel which extends out of the cable duct.

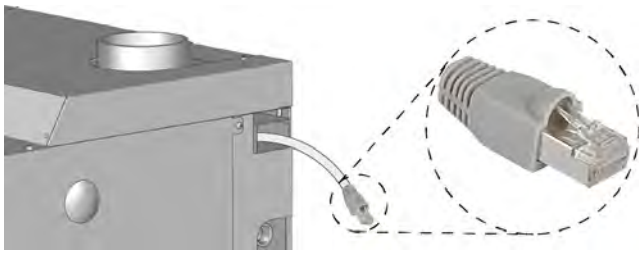


Fig. 9-32: Network cable

If the network cable is long enough, connect the plug directly into the router or the ETA PowerLine. If it is not long enough, use a network extension (1x plug / 1x socket) to connect to the router or ETA PowerLine.

10 Electrical connections

10.1 Requirements

Electrical connection must only be made by qualified specialist personnel

The electrical installation must only be performed by specialist personnel with the corresponding qualifications.

Potential equalization is needed for the boiler

The boiler must be connected to the potential equalization of the boiler room or the building. Country-specific regulations must be observed.

Requirements

Observe the standard and special regulations of local power supply companies.

For full separation according to the setup requirements, a separating device of overvoltage category III must be installed in the permanent electrical installation. In most cases, these requirements are fulfilled with a circuit breaker, for example.

Mains protection	C 13
Mains connection	3 x 1.5²
Type of supply cable	H05VV-F 3G 1.5
230 VAC components:	1.0²
Temperature sensors:	0.5² - 1.0²

For speed-controlled pumps (controled via PWM-signal), the maximum cable lengths of the pump manufacturer must be observed.

DANGER!

Electric shock

There are live parts on the circuit boards. If touched, they can cause injury and property damage.

▶ Before beginning any work, isolate the system completely from all power sources, ensure that it cannot be switched back on, and verify that it is safely isolated from supply.

CAUTION!

Flexible stranded conductors

If flexible stranded conductors are not used for the wiring, the contacts in the plug connections will be subjected to excessive mechanical strain. In this case, the warranty for the electronics would become null and void.

▶ Only flexible stranded conductors may be used for the wiring.

Maximum outputs

230 V output	Maximum power
A single output	250 W
Sum of all outputs	700 W

Potential-free output (special function)	Maximum switching capacity
A single relay output	500 W

Maximum line length for temperature sensor

The maximum line length for the electrical connection of the temperature sensor is 20 m.

Connection diagrams

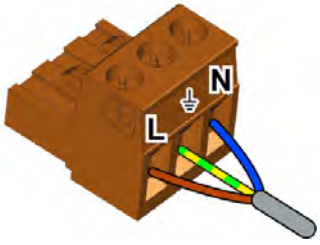


Fig. 10-1: Mains power input

Fig. 10-2: Analogue input

Fig. 10-3: Digital switch

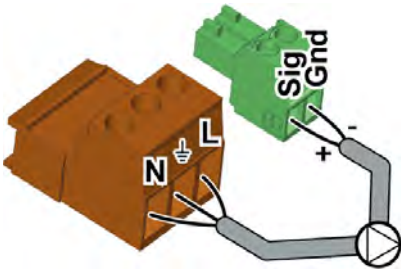


Fig. 10-4: Speed-controlled pump

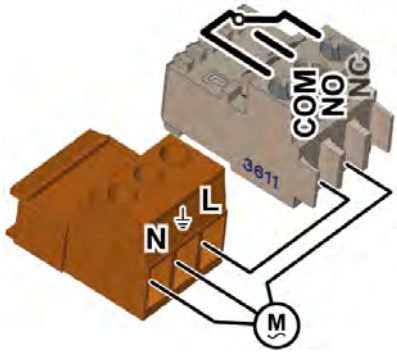


Fig. 10-5: Special function - pump (with supply extension 230 V)

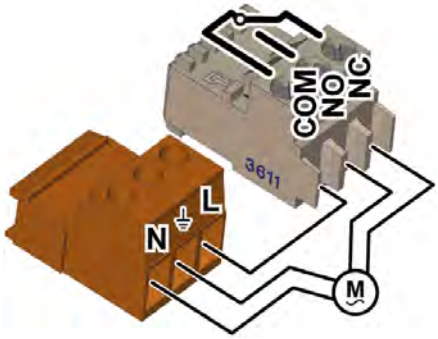


Fig. 10-6: Special function - changeover valve with three-point controlling

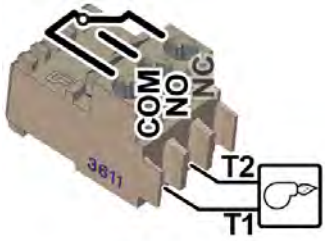
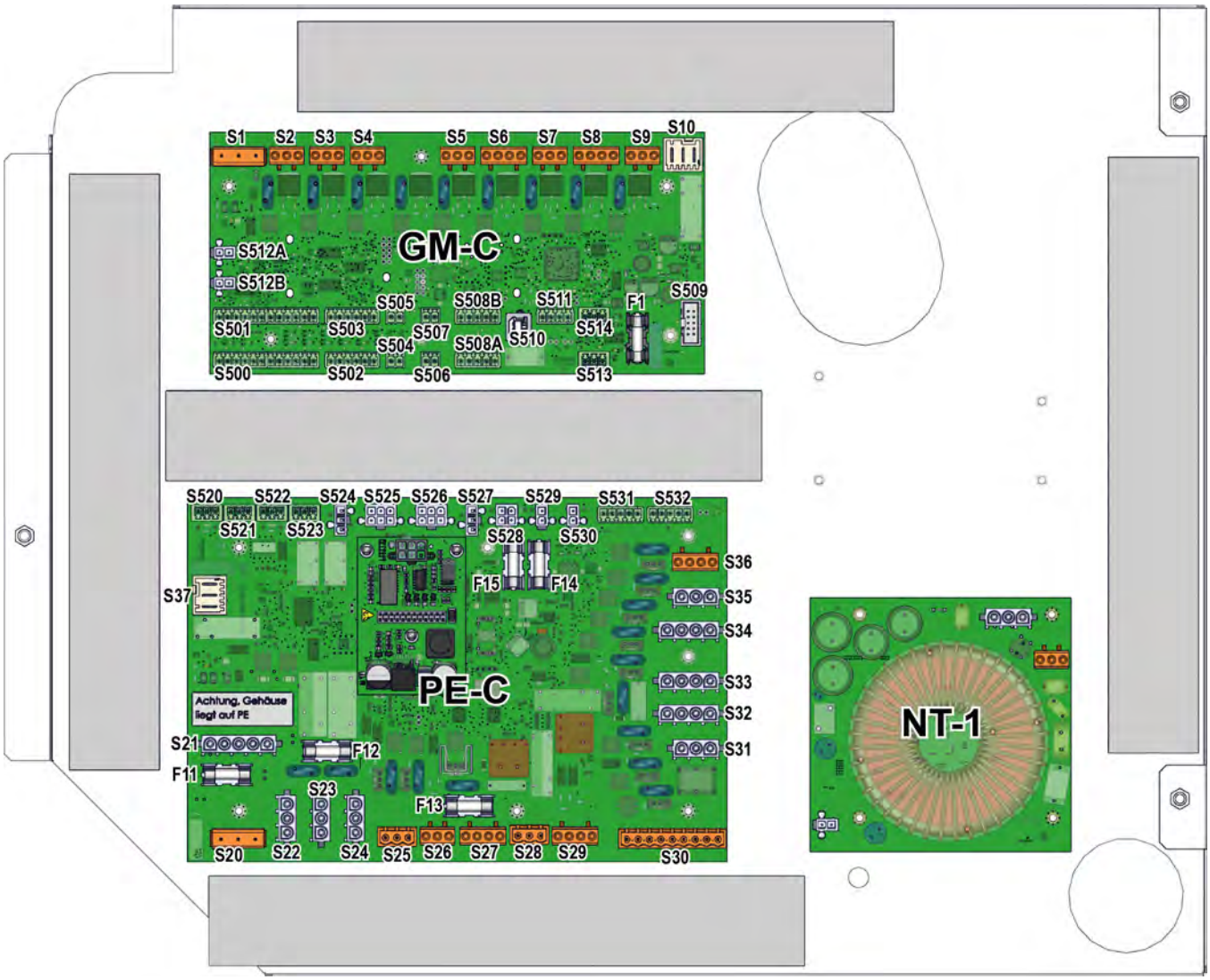


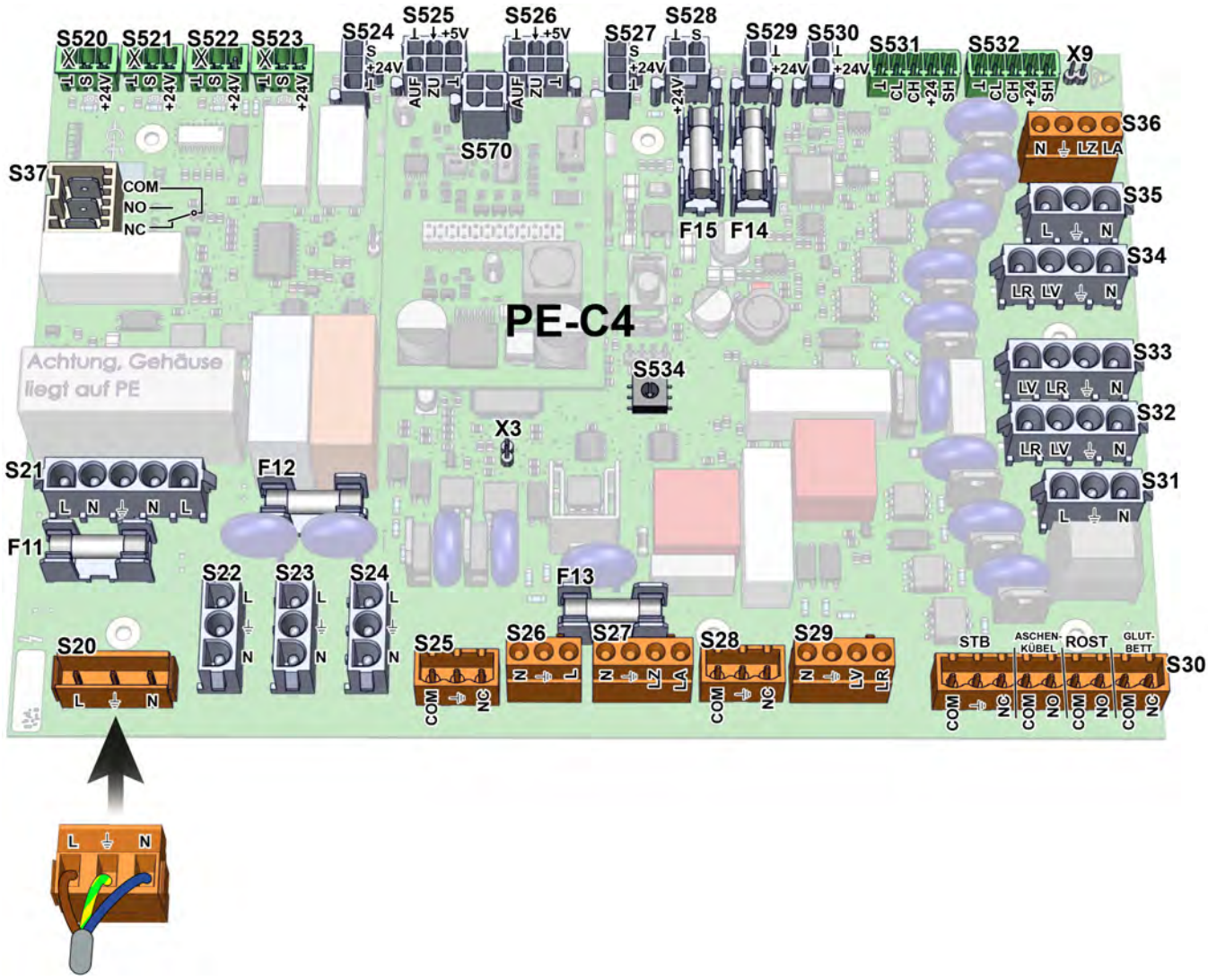
Fig. 10-7: Special function - burner

10.2 Overview of circuit boards

Overview of boiler circuit boards



10.3 PE-C4 circuit board

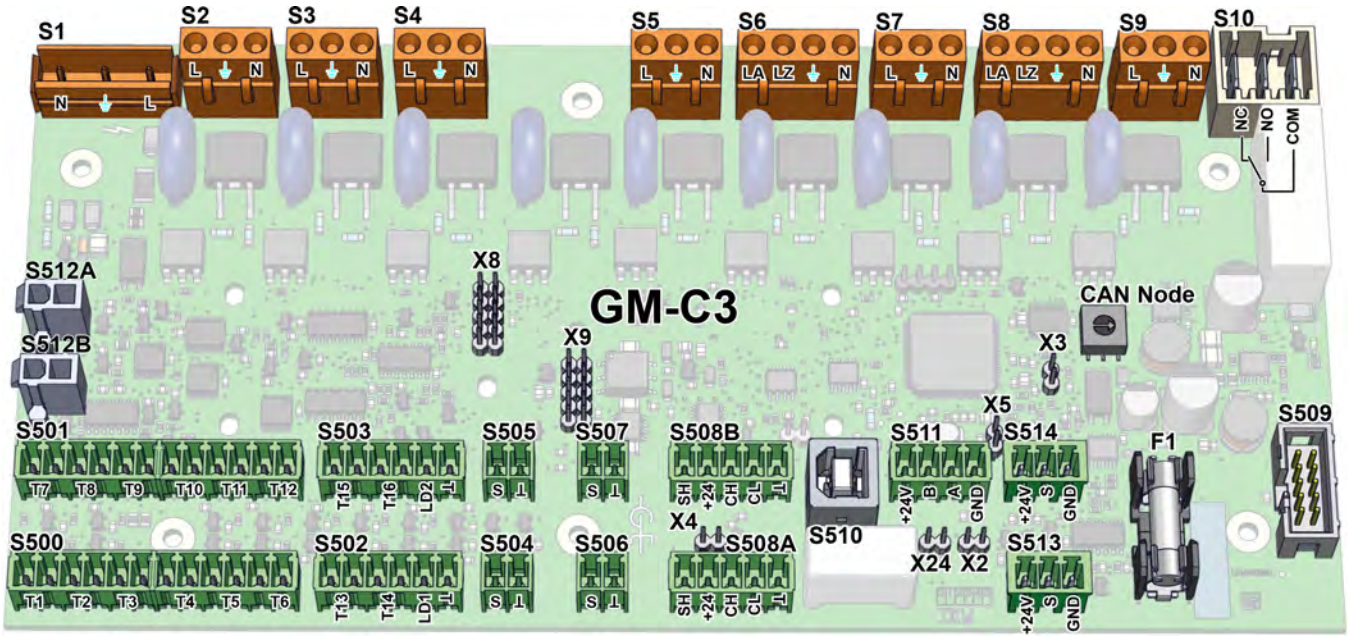


Contacts marked with an [X] (example) may not be connected. Terminals marked with the symbol are not pre-wired from factory.

Terminal	Function	Default assignment
F11	Fuse 230 V, T 6,3 A (electronics)	
F12	Fuse 230 V, T 8 A (vacuum turbine / ignition)	
F13	Fuse 230 V, MT 5 A (conveying system)	
F14	Fuse T 500 mA (CAN-Bus)	
F15	Fuse T 500 mA (24 V supply)	
S20	230 V supply	**Mains power input**
S21	230 V input	Mains switch
S22	Supply extension 230 V	to mains adapter
S23	230 V output	Ignition
S24	230 V output	Vacuum turbine

Terminal	Function	Default assignment
S25	230 V input	Maintenance switch of the boiler An additional water shortage switch (on site) can be connected to this terminal in serial connection.
S26	Supply extension 230 V	to circuit board [GM-C]: terminal [S1]
S27	230 V output	Return riser mixing valve
S28	230 V input	Emergency stop switch
S29	230 V output	Conveying system
S30 STB	230 V input	Safety temperature limiter (Safety temperature limiter (STB))
S30 ASCHENKÜBEL	230 V input	Ash box switch (2x)
S30 ROST	230 V input	Grate switch (2x)
S30 GLUTBETT	230 V input	switch firebed
S31	230 V output	Draught fan
S32	230 V output	De-ashing drive
S33	230 V output	Stoker screw
S34	230 V output	Grate drive
S35	230 V output	unassigned
S36	230 V output	Free
S37	Potential-free output (special function)	Malfunction message / changeover valve solar heating system
S520	24 V input	Switching unit: reference-point switch (terminal [S10])
S521	24 V input	switching unit: position switch (terminal [S11])
S522	24 V input	Switch de-ashing
S523	24 V input	unassigned
S524	Pulse input	Feedback of the speed draught fan
S525	24 V AC/DC output / Analogue input	actuator air valve: primary air
S526	24 V AC/DC output / Analogue input	actuator air valve: secondary air
S527	Analogue input	Boiler pressure sensor
S528	24 V input	Fill level sensor hopper
S529	24 V supply	from mains adapter
S530	Supply extension 24 V	to circuit board [GM-C]: terminal [S512A]
S531	CAN-Bus	to circuit board [GM-C]: terminal [S508A]
S532	CAN-Bus	Free
S534	CAN-Bus node switch	
S570	Analogue input	Lambda probe
X3	Boot jumper	
X9	CAN-Bus terminator resistor	

10.4 Circuit board GM-C3



Terminals marked with the symbol are not pre-wired from factory.

Terminal	Function	Standard assignment
CAN node	CAN-Bus node switch	
F1	T 500 mA fuse (24 V supply)	
S1	230 V supply	from circuit board [PE-C]: terminal [S26]
S2	230 V output	Boiler pump
S3	230 V output	Hot water charging pump
S4	230 V output	External pump / solar pump
S5	230 V output	heating circuit 2: heating circuit pump
S6	230 V output	heating circuit 2: heating circuit mixing valve
S7	230 V output	heating circuit 1: heating circuit pump
S8	230 V output	heating circuit 1: heating circuit mixing valve
S9	Supply extension 230 V	to circuit board [MK-E]: terminal [S15]
S10	Potential-free output (special function)	Circulation pump / burner
S500 T1	Temperature input	Boiler
S500 T2	Temperature input	Unassigned
S500 T3	Temperature input	Boiler return
S500 T4	Temperature input	Flue gas
S500 T5	Temperature input	Outside temperature sensor
S500 T6	Temperature input	Collector
S501 T7	Temperature input	Hot water
S501 T8	Temperature input	Buffer middle
S501 T9	Temperature input	Buffer top
S501 T10	Temperature input	Buffer bottom
S501 T11	Temperature input	Buffer bottom solar

Terminal	Function		Standard assignment
S501 T12	Temperature input		Buffer top solar
S502 T13	Temperature input		Heating circuit 1: flow
S502 T14	Temperature input		Unassigned
S502 LD1	LED output		Unassigned
S503 T15	Temperature input		Heating circuit 2: flow
S503 T16	Temperature input		Unassigned
S503 LD2	LED output		Unassigned
S504	PWM output		Speed for pump on terminal [S2]
S505	PWM output		Specification of the speed draught fan
S506	PWM output		Speed for pump on terminal [S4]
S507	PWM output		Speed for pump on terminal [S5]
S508A	CAN-Bus		to circuit board [PE-C]: terminal [S531]
S508B	CAN-Bus		Unassigned
S509	Signal line		to circuit board [MK-E]: terminal [S517]
S510	Data line		to ETAtouch control panel
S511	RS-485 bus		Digital room sensor
S512A	24 V supply		from circuit board [PE-C]: terminal [S530]
S512B	24 V supply		Unassigned
S513	Analogue or digital input		Unassigned
S514	Analogue or digital input		Unassigned
X2	CAN-Bus supply GND (for stand-alone operation)		
X3	Boot jumper		
X4	CAN-Bus terminal resistor		
X5	RS-485 terminal resistor		
X8	Terminal for plug-in circuit board		
X9	Terminal for plug-in circuit board		
X24	CAN-Bus supply +24 V (for stand-alone operation)		

11 Concluding activities

Reinstall boiler casing

Reinstall the boiler casing components that were removed during the installation.

Removing protective film

Remove protective film from all panels. After longer periods of operation of the boiler, the film can no longer be removed without damaging the paint.

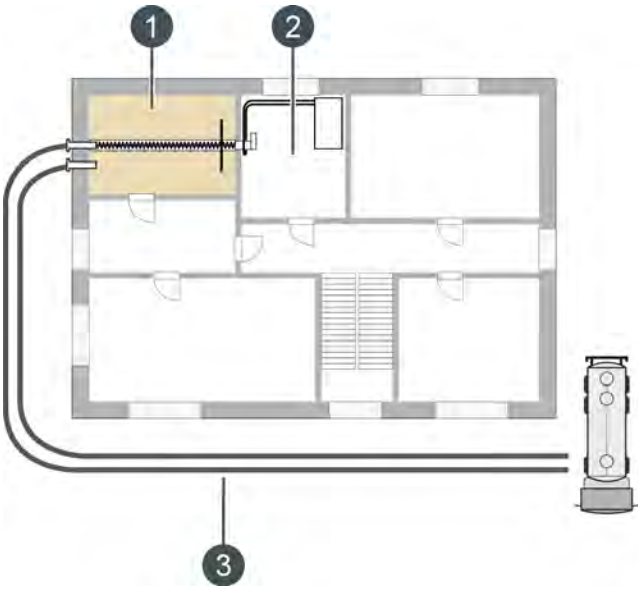
12 Pellet store

12.1 General information

Delivery of pellets

The pellets are delivered by a tank truck and blown into the storage room. The tank trucks usually have a pump hose with a length of up to 20 m. If you expect to need a longer pump hose, ask about your pellet supplier's technical capabilities.

Vehicle access should be at least 3 m wide and 4 m high. The truck can only back up if the street and gate are wide enough.



1 Pellet store
2 Boiler room
3 Filling hoses from tank truck

Correct placement of the pellet store

Placement of the storeroom is crucial for satisfactory operation. For this reason, do not place the pellet store underneath or in the immediate vicinity of bedrooms. Because the noises that occur during operation could be transferred into these rooms.

Position of pellet store and boiler room

If possible, the pellet store should adjoin an outer wall since the filling nozzle should be accessible from outside. For an interior pellet store, the blower and back air pipes should be extended to the outer wall.

The boiler room should adjoin an outer wall to ensure direct supply of combustion air to the pellet boiler. For an interior boiler room, an air supply duct must lead from the boiler room to the outer wall.

Testing before initial fill-up

Before filling the pellet store, test the functionality of the entire heating system and the pellet conveying system. For this purpose, deposit some pellets (bagged product) in the storage room near the discharge conveyor.

Only fill up the pellet store after this test has been completed successfully.

Burn-back protection also when filling

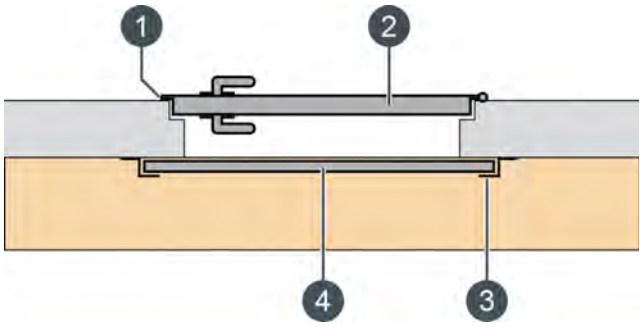
The authorities or the chimney sweep often require that a notice saying "CAUTION! Switch off boiler before filling" must be affixed, easily visible, to the filling nozzle covers. Burn-back flaps and sliders at the boiler's combustion chamber are open during operation, so during boiler operation, hot gases can be sucked into the path of the pellets (due to underpressure in the fuel deposit) or air can be blown through the fuel path (due to overpressure in the fuel deposit). Both effects can cause a fire. Strictly speaking, the boiler should already be switched off two hours before filling the pellet store, because the burn-back flaps and sliders do not always close completely. So there should be no more fire in the boiler when filling pellets.

Since we at ETA don't want to leave the burn-back protection of our boilers to chance, we equip all ETA pellet boilers with a rotary valve so that even during operation there is no open connection between the combustion chamber and the pellet store. Though it is not required that an ETA pellet boiler be switched off while filling the pellet store, you should do so anyway if the driver of the delivery truck requests it.

Dust-tight doors to pellet store

Doors and other openings must open outward and be furnished with a circumferential dust-tight seal. For doors or other openings to the pellet store, wooden

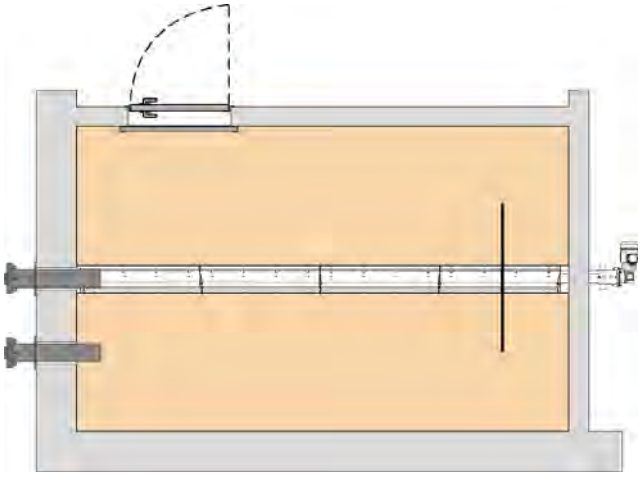
boards must be mounted on the inner wall (30 mm thick with tongue and groove) so the pellets cannot push against the door, or so that it can be opened.



1 Seal between door and frame
2 Fire-resistant door
3 Z profile for boards
4 Boards

The door's lock must be sealed against dust on the inner side. In spite of a widely circulated construction document, the door handle on the inner side may not be removed. It must be possible to open the door from the inside in an emergency.

For screw conveyors, the store room door should be positioned on the opposite side to the screw drive. Because this area of the store empties first and, if required, facilitates quick access to the store.



Electrical socket for pellet supplier's blower

For the pellet supplier's suction blower, a 230 V electrical socket (C-13A fuse) in the vicinity of the filling nozzle is useful.

12.2 Requirements for pellet store

Structural requirements

The pellet store's walls must withstand the load caused by the weight of the pellets (bulk weight 650 kg/m³). The plasterwork should also be durable enough that it cannot rub or flake off and contaminate the pellets.

If the forces from the tilted floor construction are directed into the floor and not the wall, then the following wall thicknesses have proven effective in practice given proper anchoring in the enclosing masonry:

- Concrete 100 mm thick.
- Common brick 170 mm thick and plastered on both sides.
- Post-and-beam walls with 120 mm beams, clearance 625 mm, with wooden panelling 15-20 mm thick on both sides.

Dry storage for pellets

Pellets are very hygroscopic; they absorb moisture from the environment. On contact with water or moist walls, they swell up and break apart, becoming unusable.

The pellet store must stay dry throughout the year. The normal humidity encountered in normal residential construction throughout the year is not harmful to the pellets.

If there is a danger of moist walls from time to time, such as in older buildings, we recommend installing rear-ventilated wood facing on the walls or storing the pellets in a fabric silo.

Regularly remove the dust from the pellet store

The pellet store must be regularly "emptied", so that the dust can be removed from the pellet store. Because the pellets "crumble" after a few years and produce dust. In combination with increased air humidity, this dust can lead to blockages of the suction probes or prevent the pellets from sliding on the slanted floor in the storeroom.

An increased amount of dust often occurs in oversized storerooms that are only filled every 2 - 3 years, because the high bulk weight of the pellets slowly crushes the pellets below. Even in storerooms with suction probes without inclined floor, "old" pellets often remain between the suction probes and then crumble slowly.

Therefore, the pellet store must be "emptied" at the latest every three years, so that the dust can be removed before refilling. Shovel "old" pellets either to the discharge screw or the suction probe, so that they are quickly used up.

12.3 Calculating pellet supply and store size

Heating value and bulk weight of pellets

Heating value	4.9 kWh/kg
Bulk weight	650 kg/m³

The energy density of 2 kg of pellets corresponds to that of 1 litre of extra-light heating oil.

Calculating the pellet supply

Rule of thumb for determining the pellet supply in tons: divide the heating load of the building by 3.
For the pellet supply in cubic metres (m³), divide the heating load by 2.

Example for the pellet supply for a single-family house with average insulation and 12 kW heating load:

- 12 kW / 3 -> 4 tons of pellets per year
- 12 kW / 2 -> 6 m³ of pellets per year

The pellet supply can also be calculated from the current fuel consumption using the appropriate conversion factors:

Fuel consumption	Factor	Pellet supply
1960 l heating oil	x 2.04	4000 kg
2060 m³ natural gas	x 1.94	4000 kg
2960 l LPG	x 1.35	4000 kg
1560 kg LPG	x 2.56	4000 kg
2660 kg coke	x 1.50	4000 kg
5700 kWh electricity from a geothermal energy heat pump with COP 3.4	x 0.70	4000 kg
9500 kWh electricity from a ground source heat pump with COP 2.1	x 0.42	4000 kg

Required pellet store size

The required store size is based on the heating load. Use the rule of thumb "heat load divided by 2" to find the minimum required store volume in m³.

Example for the pellet supply for a single-family house with average insulation and 12 kW heating load:

- 12 kW / 2 -> 6 m³ of pellets per year

To be prepared for colder winters, the store should hold around 20% more than a year's supply. For this example, that means a store volume of 7.2 m³ is needed.
Using this volume, we can determine the necessary room dimensions and the length of the conveyor screw.

The length of the conveyor screw needed for the store volume can be determined using Tab. 12-1: "Useful cross section of store in m²". That length also determines the minimum length of the pellet store.

Example: Room width 2.0 m and height 2.4 m:

- The table yields a usable cross section of 2.9 m². The volume of pellets to be stored in the example above is 7.2 m³:

  => 7.2 m³ / 2.9 m² = 2.5 m length

  A discharge screw with a length of 2,5 m is required.

Example: Room width 2.8 m and height 2.4 m:

- The table yields a usable cross section of 3.59 m². The volume of pellets to be stored in the example above is 7.2 m³:

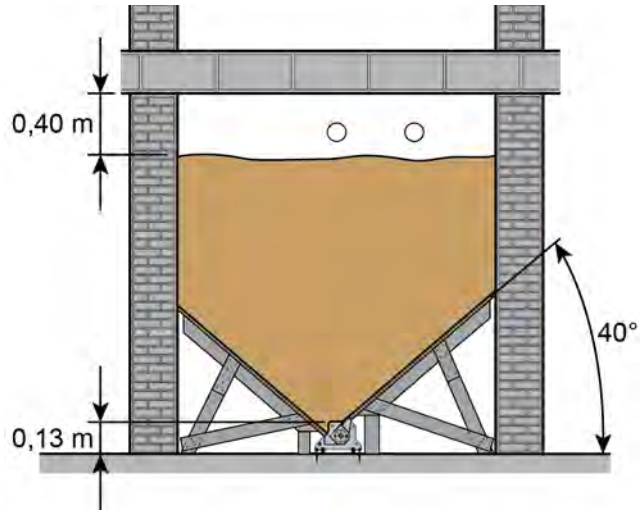
  => 7.2 m³ / 3.59 m² = 2.0 m length

  A discharge screw with a length of 2,0 m is required.

The conveyor screw should preferably be oriented along the room's long axis. The narrower the room, the less space is lost under the 40° tilted floor. The unobstructed room length of the pellet store should be at least 100 mm longer than that of the conveyor screw.
The conveyor screw can be as much as 0.6 m shorter than the room without any problems. If the store is also faced with tilted panels at the end, the conveyor screw can even be up to 1.5 m shorter. For a maximum screw length of 5 m, the maximum accessible room length is 6.0 m.

Determining usable storage volume

Due to the 40° tilted floor required in the store, room widths greater than 3 m offer little or no additional useful volume for rooms of normal height (also applies for conveyors with suction heads).



The table below can be used to determine the useful cross section of a store in m² under the following conditions:

- 40° tilted floor
- Free space above 0.40 m
- Free space for conveyor screw 0.13 m

		Height of store (m)							
		2.0	**2.2**	**2.4**	**2.6**	**2.8**	**3.0**	**3.2**	**3.4**
Width of store (m)	2.0	2.10	2.50	2.90	3.30	3.70	4.10	4.50	4.90
	2.2	2.22	2.66	3.10	3.54	3.98	4.42	4.86	5.30
	2.4	2.32	2.80	3.28	3.76	4.24	4.72	5.20	5.68
	2.6	2.40	2.92	3.44	3.96	4.48	5.00	5.52	6.04
	2.8	2.47	3.03	3.59	4.15	4.71	5.27	5.83	6.39
	3.0	2.52	3.12	3.72	4.32	4.92	5.52	6.12	6.72
	3.2		3.20	3.84	4.48	5.12	5.76	6.40	7.04
	3.4			3.93	4.61	5.29	5.97	6.65	7.33
	3.6				4.73	5.45	6.17	6.89	7.61
	3.8					5.60	6.36	7.12	7.88
	4.0						6.52	7.32	8.12

Tab. 12-1: Useful cross section of store in m²

With the useful cross section of the store, its volume and the amount of pellets can be calculated:

- Store volume (in m³) = useful cross section x room length
- Amount (in tons) = store volume (m³) x 0.65

12.4 Filling nozzles

Installing the filling nozzles in the short side of the pellet store

Two nozzles are installed in the shorter wall (preferably) of the pellet store, One for blowing in the pellets (filling nozzle) in the middle and the other for back air (back air nozzle) to the side.

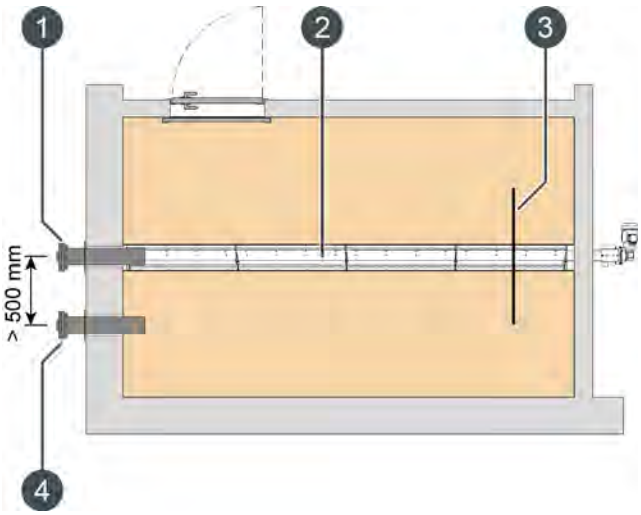
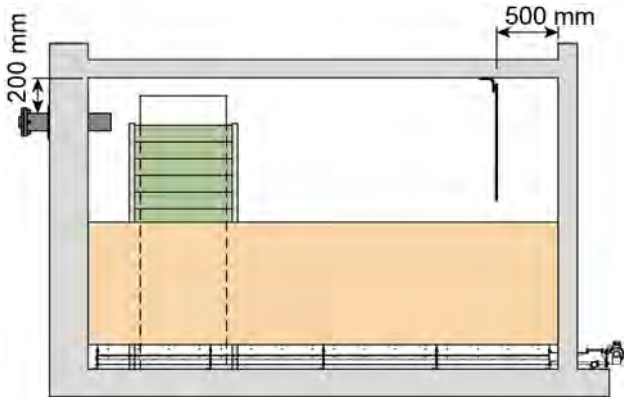


Fig. 12-1: Filling nozzles on the short side

1 Filling nozzle
2 Conveyor screw
3 Impact protection mat
4 Back air nozzle

Opposite the central nozzle, an impact protection mat is installed 500 mm from the wall to prevent damage to both pellets and the plasterwork on the wall.

The filling nozzles must be installed 200 mm below the ceiling to keep the pellets from scraping on the ceiling during injection.



Only in exceptional cases, when no short wall of the pellet store is accessible from the outside, can the filling nozzles be positioned on the longer wall.

Each half of the room needs its own nozzle with impact protection mat opposite. The disadvantage is that halfway through the filling process, the hoses must be exchanged.

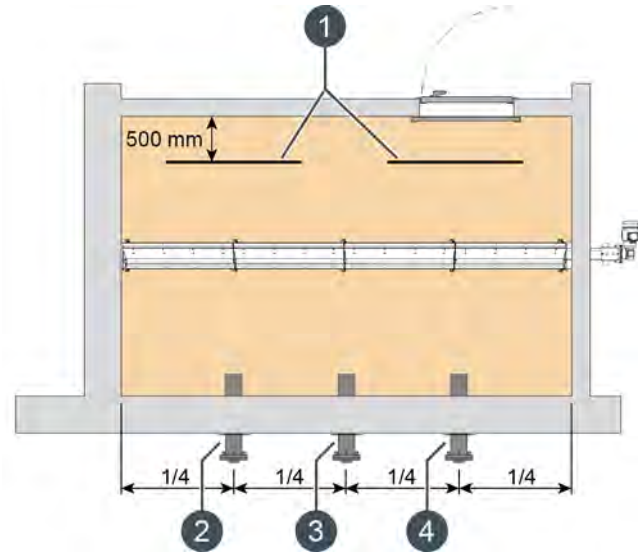
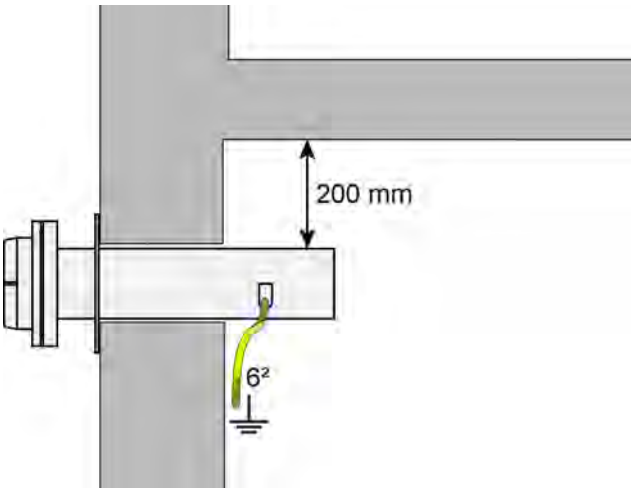


Fig. 12-2: Filling nozzles on the longer side

1 Two impact protection mats
2 Filling nozzle
3 Back air nozzle
4 Filling nozzle

Anchoring the filling nozzles

The filling nozzles must be firmly anchored in the wall so they can withstand the movements of the hoses from the delivery vehicle and cannot rotate when the hoses are attached. Mount the filling nozzles horizontally 200 mm under the ceiling of the pellet store so that the pellets are not blown against the ceiling.



To install the filling nozzles in smooth holes or sewer pipe cut-outs so they cannot twist, the ETA filling nozzles are equipped with a flange that transfers the forces directly into the wall via 4 screws.

ETA filling nozzles with 100 mm diameter fit exactly in the cut-outs made for fitting a sewer pipe with 110 mm outside diameter. The small gap between nozzle and wall can be sealed with silicone; for larger gaps, foam is used.

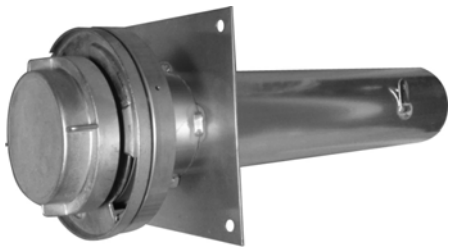
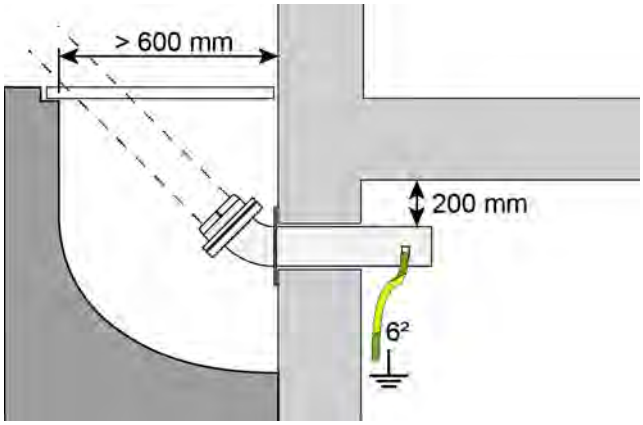


Fig. 12-3: Filling nozzle

If the filling nozzles are installed below ground in an area, ensure that the hose can be led out of the area in a straight line. Angled filling nozzles are available for this situation.



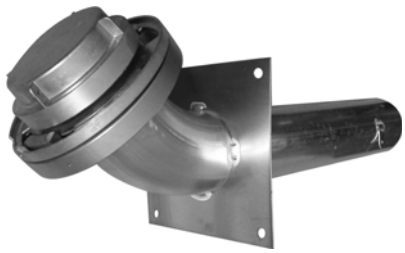


Fig. 12-4: Angled filling nozzle

If an extension of the fill line is required, keep it as short as possible to prevent friction loss while filling.

The lever for tightening the coupling, around 300 mm long, needs a working range of 120°.

Conversion to ventilated sealing cover

For filling nozzles and sealing caps available from ETA, the interior of the sealing caps contain a cover for sealing. If this cover is removed, air gets into the pellet store via the sealing cover. Thus the sealing cover is ventilated.

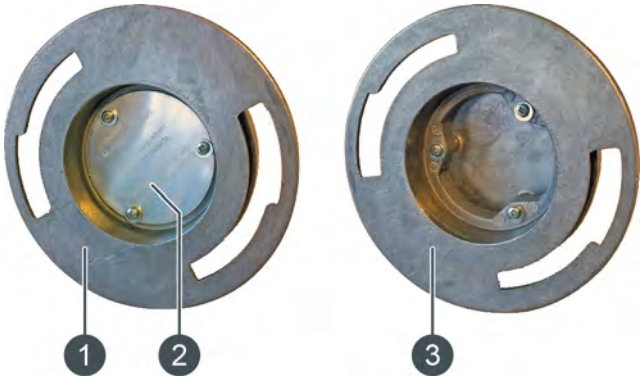


Fig. 12-5: Sealing cover

1 unventilated sealing cover (with cover mounted)
2 dismantled cover
3 ventilated sealing cover

If the filling nozzles are mounted inside the building, they must be tight. The cover in sealing cap may not be removed (see ÖNORM M 7137). This prevents a possible escape of gases into the interior of the building.

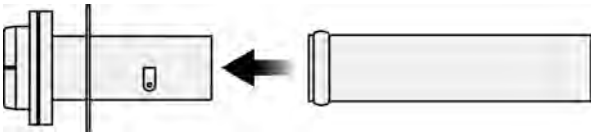
For unfavourable positioning of the filling nozzles (for example, installation on the weather side of the house), water can also penetrate into the pellet store via the ventilated sealing cover. This is to be avoided to prevent a swelling of the pellets.

Earthing the filling nozzles

Connect the filling nozzles to the earthing of the house's electrical system with a 6 mm² earthing cable.

Extension of the filling pipes

The ETA filling nozzles are made of aluminium piping (100 x 2 mm) and can be extended if needed. If the tank truck can approach close to the filling nozzle so that its filling distance (30 m) is not already exceeded outside the building, then filling lines up to 20 m in length pose no problem. Height differences of one floor, or even two for short lines, can also be overcome without problems.



Extension with aluminium piping only

- Only aluminium piping may be used for the filling system. Do not use plastic piping (danger due to electrostatic charge build-up).
- The filling system must be earthed against electrostatic charges.
- The filling system must be smooth on the inside throughout its length; do not use spiral ventilation ducting.
- If bends are used, their radius of curvature should be at least five times the pipe's radius. As an alternative, you can make 90° bends by using two 45° bends with a straight piece between them.
- The filling system should not end in a bend. To ensure that the pellets are blown out straight, a straight length of pipe at least 50 cm long must come after a bend.

12.5 No cables/pipes in the pellet store

No water pipes or electrical cables in the pellet store

In the pellet store, there should be no water pipes or electrical cables. Water from a broken pipe would cause the pellets to swell up. Uninsulated electrical parts could ignite a dust explosion.

Existing cold water pipes that can only be removed with unreasonable effort must be insulated against condensation to ensure that the pellets cannot be damaged by dripping condensation.

Pipes and cables in the path of pellets being injected, especially those on the ceiling, must be shielded. Ensure that the pellets are gently deflected by a protective plate.

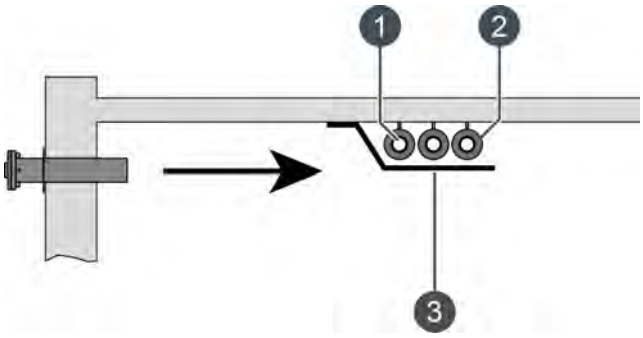
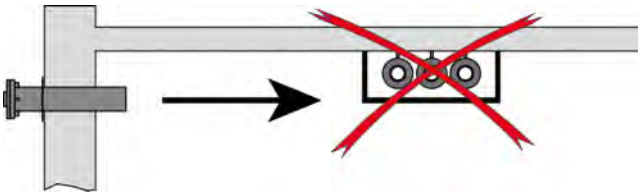


Fig. 12-6: Protective plate for pipes/cables that cannot be removed

1 Pipes/cables
2 Insulation for pipes
3 Protective plate



Only explosion-proof electrical installations

DANGER!

No electrical equipment such as switches, lights, junction boxes, etc. may be present in the pellet store.

- Unavoidable installations must be airtight and moisture-proof to protect against explosions, and in the flight path of pellets they must be protected against damage. Existing junction boxes that cannot be installed elsewhere should at least be filled in with foam to seal all exposed live parts.

12.6 Tilted floor

A tilted floor is needed

The pellet store must have a floor with 40° tilt to ensure that all pellets in the store can be extracted. This applies for systems with conveyor screws as well as for suction heads.

Construction of tilted floor for pellet store

For the tilted floor, three-ply concrete formwork panels 27 mm thick have proven effective. Unplaned wooden boards 25 mm thick with a smooth plastic-laminated surface can also be used.

The tilted floor should be flush with the enclosing walls so that no pellets can fall into the empty space. However, the support frame itself may not lean against the walls since they may not have the strength to resist the forces involved.

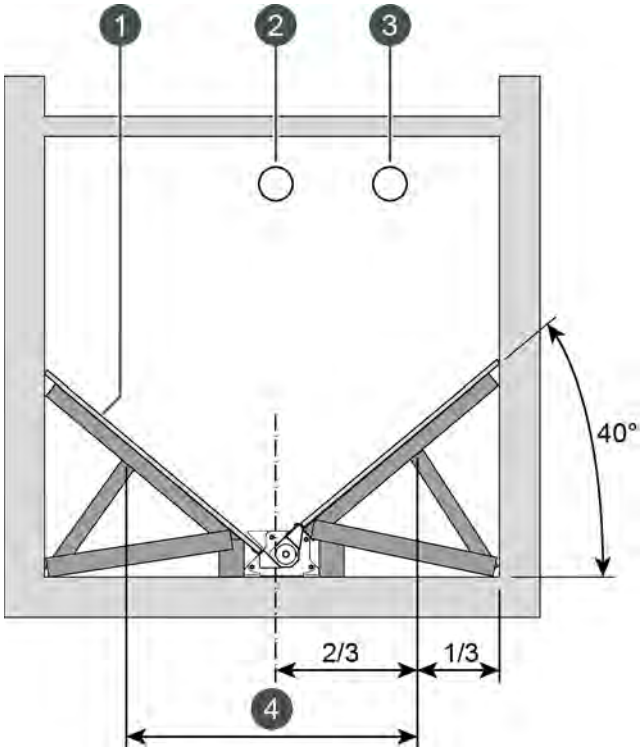


Fig. 12-7: Tilted floor design for discharge screw

1 Formwork panel
2 Filling nozzle
3 Back air nozzle
4 Support span

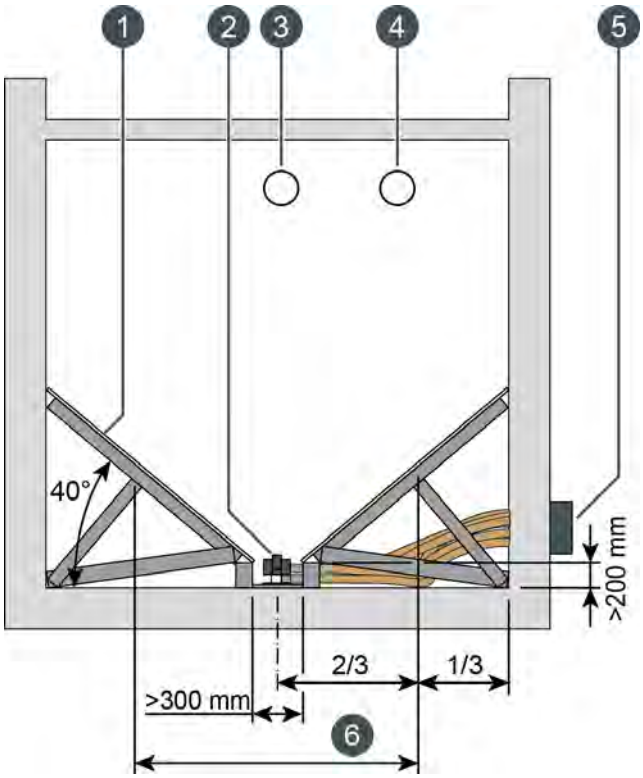


Fig. 12-8: Tilted floor design for suction heads

1 Formwork panel
2 Suction head
3 Filling nozzle
4 Back air nozzle
5 Switch unit
6 Support span

The tilted floor must withstand the weight of the pellets (bulk weight 650 kg/m³). Assuming the usual commercially available formwork panels with a width of 100 cm, members of the support frame should have a separation of 50 or 100 cm. For these separations, the following tables show the required beam thicknesses depending on the room width.

Beams for support frame, beam separation 100 cm, room height 2.5 m		
Cross section (cm)	**Support span (m)**	**Room width (m)**
10 x 5	1.50	2.25
12 x 6	2.00	3.00
10 x 10	2.20	3.30
15 x 5	2.35	3.50

Beams for support frame, beam separation 50 cm, room height 2.5 m		
Cross section (cm)	**Support span (m)**	**Room width (m)**
8 x 4	1.50	2.25

Beams for support frame, beam separation 50 cm, room height 2.5 m		
Cross section (cm)	**Support span (m)**	**Room width (m)**
10 x 5	2.20	3.30
12 x 6	3.00	4.50
10 x 10	3.40	5.10

Tilted floors may not touch the wall

The tilted floor may not touch the wall, otherwise noise emissions will be transferred. For this reason, a small gap is to be left between the tilted floor and wall, and sealed with silicon.

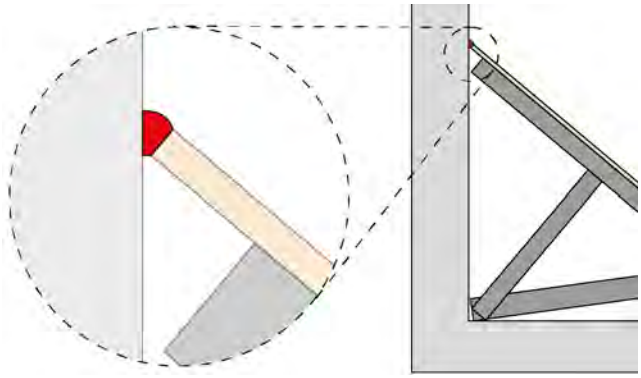


Fig. 12-9: Seal gap with silicon

Mount suction heads on a board

If the suction heads sit directly on a cold concrete floor, water from the circulating air can condense on them. The condensation can cause pellets and, in particular, pellet dust to form clumps that can clog the pneumatic conveyor. To avoid this, always mount the suction heads on a wooden board (25 or 27 mm thick) and fasten it to the floor.

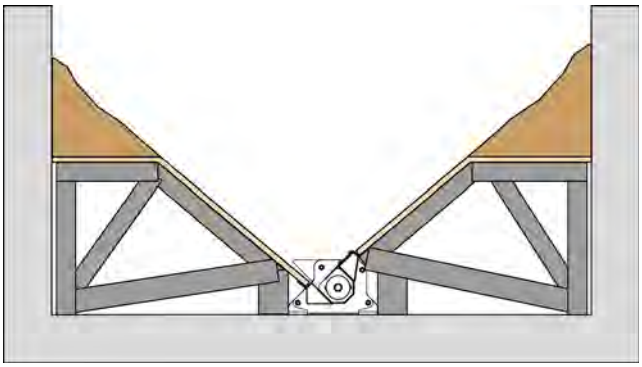
Pad wall opening for conveyor screw trough

Sound from the screw can be transmitted through the pellet store walls into the house. To avoid that, pad the wall opening for the troughs with soft material (mineral wool).

Under no circumstances should the conveyor screw trough be cemented into a concrete wall without acoustic insulation.

Small store rooms with reserve

For small pellet stores, the tilted floor can be truncated. A reserve of pellets will remain on the resulting flat surfaces; when the main store is empty, the reserve pellets can be swept into the main store manually.



The disadvantage of this method is that the reserve space must be cleared at least every 3 years so that dust and broken or moist pellets cannot gather.

12.7 Ventilation

Requirements for ventilating the pellet store

Pellet stores must have ventilation to prevent dangerous CO concentrations. In Austria ÖNORM M 7137 applies, and in Germany VDI 3464.

Requirements of ÖNORM M 7137 for storage of up to 30 tonnes of pellets:

- If the filling nozzles flow into the open and "ventilated" sealing covers are used (see 3 "ventilated sealing cover").
- If the minimum diameter of the filling lines is 90 mm.
- If the filling lines or ventilation lines up to a length of 2 m the free ventilation cross-section is at least 40 cm². Over 2 m length the free ventilation cross-section must be at least 60 cm².

Refer to the standards for details for larger store rooms. For questions about details, consult an expert or the building inspectorate or the regional fire prevention agency.

Requirements of VDI 3464 for ventilating the pellet store can be taken from the table (Tab. 12-2: "Requirements of VDI 3464").

Length of the ventilation line	Store size ≤ 10 tonnes	Store size > 10 tonnes
≤ 2 m	Ventilation via sealing cover with the following requirements: • Two ventilated sealing caps on two Storz A couplings • Ventilation to the outside or in ventilated installation room of the heating system	Ventilation via sealing cap only in stores up uo 40 t with the following requirements: • minimum 2 ventilated sealing caps on two Storz A couplings • Cross-section minimum 4 cm²/t capacity • Ventilation to the outside or in ventilated installation room of the heating system
2 - 5 m	a ventilation opening with the following requirements: • Ventilation into open air • Air line opening minimum 100 cm² • clear opening minimum 80 cm²	separate ventilation opening(s) with the following requirements: • Ventilation into open air • Opening per air line minimum 100 cm² • Total ventilation cross-section minimum 10 cm²/t capacity • clear opening minimum 8 cm²/t capacity
5 - 20 m	mechanical ventilation with the following requirements: • Ventilation of the store via an air line with a fan • Fan with three-times air exchange rate per hour related to the gross volume of the store • The function of the fan is to be coupled with the opening of the store room door	

Tab. 12-2: Requirements of VDI 3464

Example for ventilating the pellet store

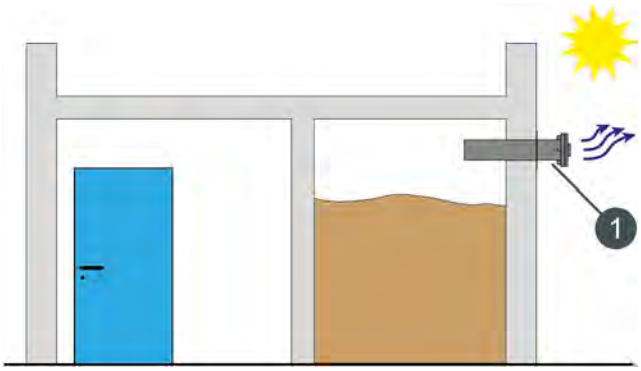


Fig. 12-10: Filling nozzle in open air

1 ventilated sealing caps

If the filling nozzles lead inside a building, a separate air line is to be set up from the pellet store into the open. This must be designed so that no dust escapes during filling and also no water can penetrate from outside into the pellet store.

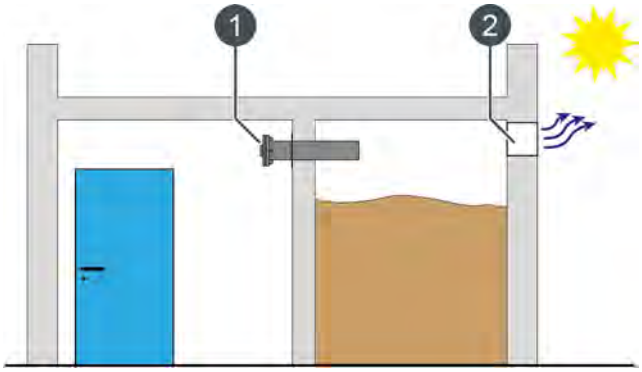


Fig. 12-11: Filling nozzle inside building

1 Sealed, unventilated sealing cover

2 Ventilation opening outside

Even if the filling nozzles protrude into a room in which ventilation is available, ÖNORM M 7137 recommends using only sealed, unventilated sealing covers.

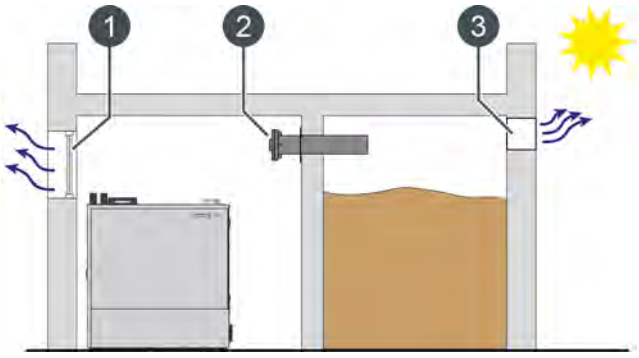


Fig. 12-12: Filling nozzles in the boiler room

1 Ventilating the room

2 Sealed, unventilated sealing cover

3 Ventilation opening outside

If the pellets are stored in a bag that positioned in the same room as the boiler, ventilation must be available in this room. Operation of the boiler with external air supply (as long as this is supported) is then not possible.

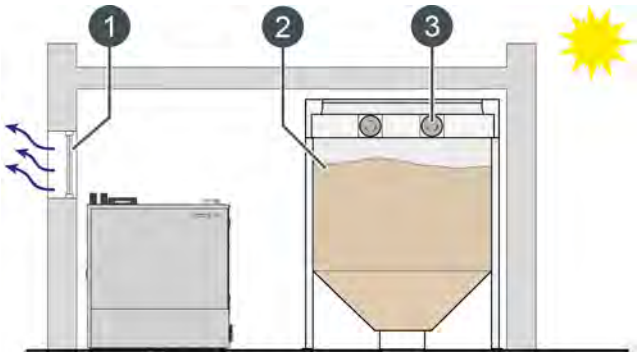


Fig. 12-13: Bag in boiler room

1 Ventilating the room

2 Bag

3 Filling nozzle

12.8 Information about pellet hoses

Suitable pellet hose

DN50 pellet hoses with copper litz wire (for earthing) are required for the suction and return air.

Maximum length: 20 m

The maximum length of the pellet hose is 20 m.

For a conveyor system with a switch unit, the distance is measured from the boiler through the switch unit to the most remote suction head.

Minimum bending radius: 250 mm

The minimum bending radius for pellet hoses is 250 mm.

If the radius is below this value, the cross section of the pellet hose is reduced and the friction on the inner walls increases. As a result, the pellets are damaged, blockages can occur and the service life of the pellet hose is reduced.

Installation tips for pellet hoses

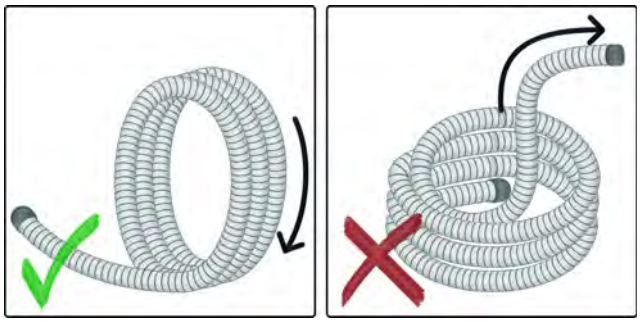


Fig. 12-14: Unroll pellet hoses instead of pulling them out

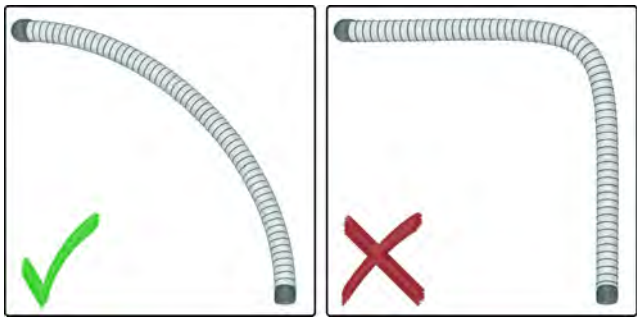


Fig. 12-15: Note bending radius

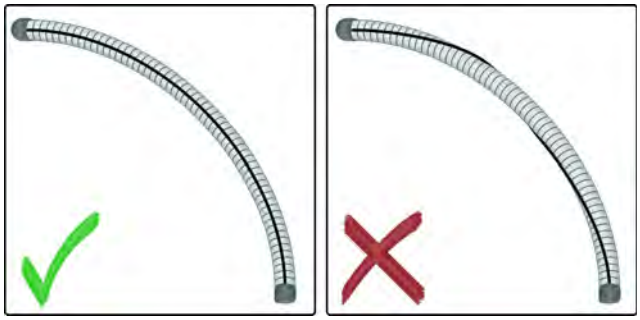


Fig. 12-16: Avoid twisting pellet hoses

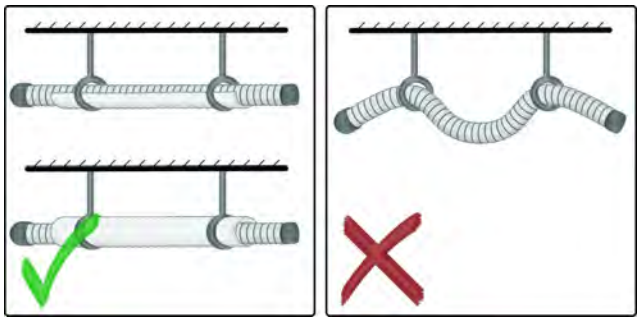


Fig. 12-17: Use pipe guides or pipe supports

Single-piece suction hose

The suction hose for the pellets must always consist of a single piece.

Suction hoses made from several parts have higher friction on the inner walls, which can result in damage to the pellets.

Only the pellet hose for the back air may be made of multiple parts.

Straight paths

Lay out the pellet hoses as straight as possible.

Suction hoses laid out in loops have higher friction on the inner walls, which can result in damage to the pellets.

Do not attach pellet hoses to the tilted floor structure

In the store room, do not attach pellet hoses to the tilted floor structure or guide them to it. In this way, noise transmission is prevented from the pellet hoses to the tilted floor structure and noise lelvels are reduced.

Earthing

The pellet hoses must be earthed as they acquire an electrostatic charge during pellet transport. A copper litz wire is moulded into the pellet hoses for earthing.

On the ends of the pellet hoses, free around 5 cm of copper litz wire from the hose and bend it inwards into the hose.

This establishes a contact between conveyor and the boiler. At the boiler, the copper litz wires are clamped to the earthing cable near the pellet hose attachment nozzles.

No contact with uninsulated heating pipes

The pellet hoses are designed for a temperature range of -15°C to +60°C, so they may not come into contact with uninsulated heating pipes.

UV protection outdoors

When pellet hoses are installed outdoors, they must be enclosed in a protective conduit to protect them from ultraviolet radiation. If the pellet hoses are not protected, they can become brittle, leading to a reduced service life.

Mount fire-resistant collars (if required)

If the pellet hoses from the storeroom feed over a fire section (for example a room in-between) to the boiler room, fire-resistant collars must be fitted over both pellet hoses.
In wall ducts, a fire protection sleeve must be mounted on each side, with ceiling ducts only positioned on the ceiling side.

Fig. 12-18: Fire-resistant collar

In the event of a fire, the internal material of the fire-resistant collar expands and thus closes the pellet hoses. So burn-back is prevented in rooms through which the pellet hoses are fed.

12.9 Fire safety regulations

Fire safety regulations in Austria

Legally, fire safety is regulated in the various building codes of the states, though all state legislation is based on the TRVB H 118 "Technische Richtlinien vorbeugender Brandschutz - automatische Holzfeuerungsanlagen" (technical directives for preventive fire safety for automated wood combustion systems).

For questions about details, consult an expert or the building inspectorate or the regional fire prevention agency.

Wood and fuel storage rooms within a building:

- All walls and ceilings REI90 (F90).
- Doors between boiler room and fuel store, and doors and windows to the outside EI30 (T30) or E30 (G30).
- Self-closing doors to rooms with increased fire danger (tank rooms, garages), to escape routes and to rooms above them (staircase), either 2x EI30 (T30) or EI90 (T90).
- Windows that cannot be opened
- Ventilation openings in the outer wall barred, with mesh less than 5 mm
- Air inlet and outlet pipes and pellet store filling lines that are routed through other fire compartments are to be implemented as EI90 (K90 or L90).
- For pellet-conveying hoses through rooms outside the boiler room (fire compartment), fire-resistant collars must be installed in the wall openings facing the boiler room.

Free-standing wood and fuel storage rooms:

- All walls, ceilings and doors to the outside fireproof
- Doors between boiler room and fuel store must be EI30 (T30)
- Maintain clearances from buildings and property boundaries according to state building legislation.
- Otherwise no special requirements

Pellet storage container in boiler room or outdoors directly next to building:

- Currently only allowed in Austria if the boiler output is less than 50 kW and the container is smaller than 15 m³ (9.5 tons) (Bulletin MVB 29/2005 from Upper Austrian fire prevention agency).

Minimum clearances for outdoor fuel stores:

- When setting up a pellet storage container in open air, maintain clearances from buildings and property boundaries according to state building legislation.

Temperature monitoring system in fuel store/pellet bin:

- In accordance with TRVB H 118, an alarm thermostat must be installed above the conveying hose where it exits the fuel store, or the pellet bin.

  This alarm thermostat is not required for an ETA pellet system since the ETA rotary valve with pressure equalisation ensures that no gas can flow in either direction between the combustion chamber and the fuel store. This has been confirmed by tests at the Institut für Brandschutz-technik und Sicherheitsforschung (institute for fire protection engineering and safety research) in Linz.

Fire safety regulations in Germany

In Germany, the specimen ordinance on combustion equipment (Muster-Feuerungsverordnung MFeuVO, version dated September 2005) is the basis for fire safety regulations. Below are the most important rules from these regulations. Since there are minor variations among the states, get information from specialists such as the local master chimney sweep.

Pellet stores up to 10,000 litres / 6.5 tons:

- Here there are no requirements for walls, ceilings and doors and no usage restrictions are stipulated.

Pellet stores over 10,000 litres / 6.5 tons:

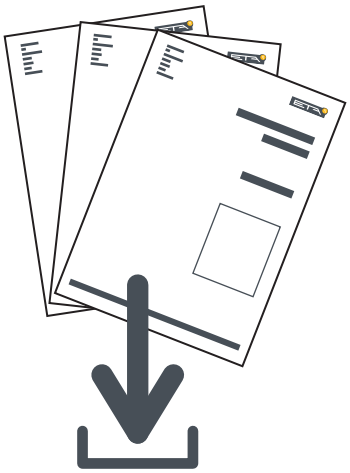
- Walls and ceilings REI90 (F90).
- no lines through walls,
- No other use.
- Doors self-closing and fire-resistant EI30 (T30).
- Pellet filling lines through other rooms EI90 (F90).

Rated heat output of boiler less than 50 kW (boiler room):

- No requirements for the room.
- Not permitted: installation in required stairwells, in rooms between required stairwells and exits to the outside, and in required hallways (escape routes).
- Boilers with external air supply (PelletsUnit and PelletsCompact 20-32 kW) may be installed in garages (does not apply for Baden-Württemberg, Saarland and Rhineland-Palatinate).
- Up to 10,000 litres of pellets may be stored in boiler room; clearance between heating appliance and fuel store 1 m or sheet metal heat deflector

Rated heat output of boiler over 50 kW (boiler room)

- Headroom at least 2 m and room volume at least 8 m^3.
- Walls and ceilings REI90 (F90).
- Self-closing, fire-resistant doors EI30 (T30) that open in direction of escape.
- Up to 10,000 litres of pellets may be stored in boiler room; clearance between heating appliance and fuel store 1 m or sheet metal heat deflector.
- No other use.
- For pellet-conveying hoses through rooms outside the boiler room (fire compartment), fire-resistant collars must be installed in the wall openings facing the boiler room.
- Ventilation lines through other rooms EI90 (F90).
- Fire extinguishers as initial firefighting aids are only legally regulated for commercial and public buildings.



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