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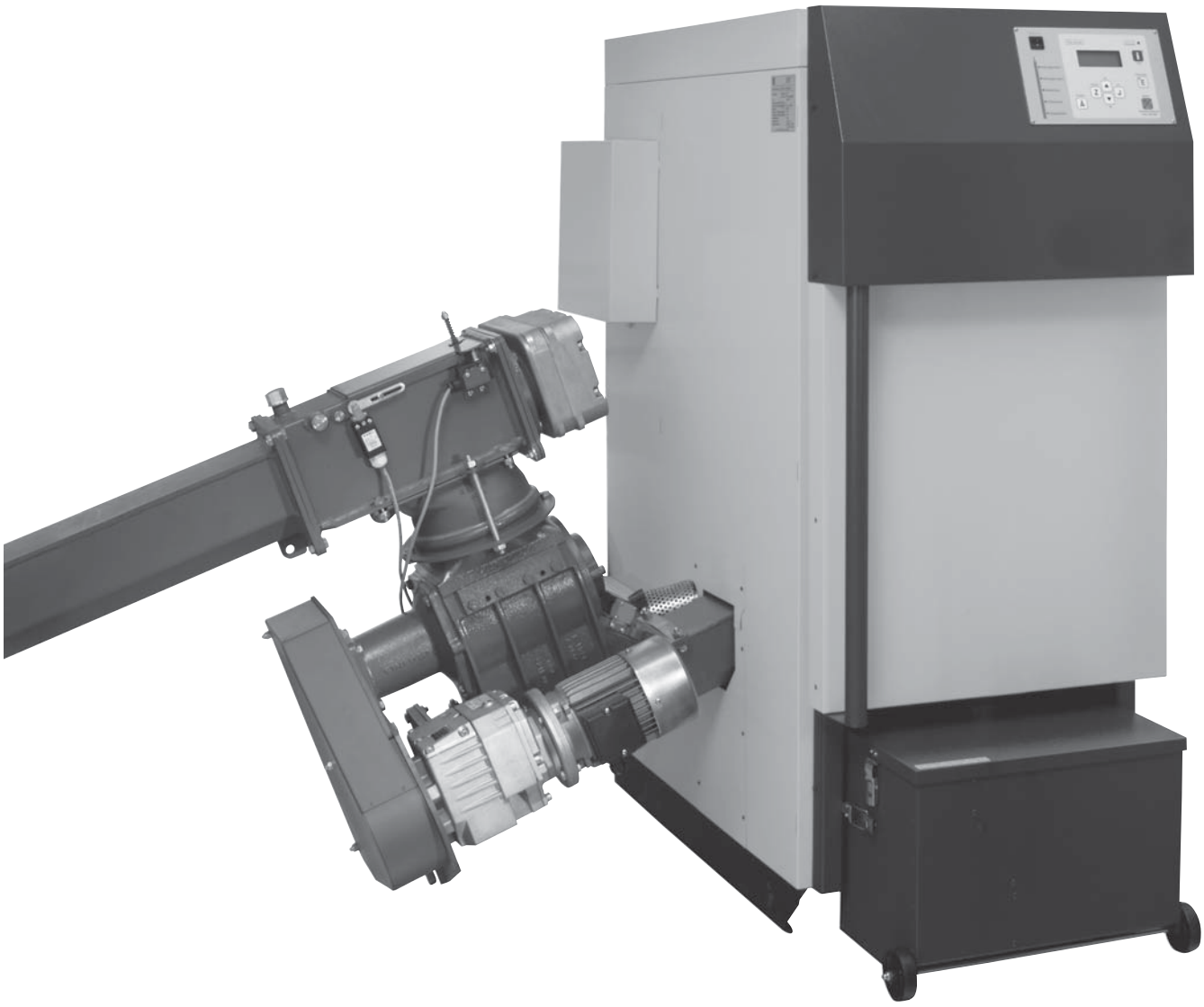
Woodchip Boiler
20 to 200 kW

User Manual



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Behaviour in case of errors

- If you notice any signs of damage to safety equipment (safety valves, compensator, etc.) or to the boiler itself – especially significant is a loss of water – you must not continue to operate the system.
  Shut down the system and have it repaired instantly!
- Every error message shown on the display is listed and explained in this user manual on page 48 ff.
- If errors that you cannot remedy yourself occur frequently, please contact a heating specialist, or call our customer service department.

Dear Customer,

we are delighted to count you among our customers.

In order to guarantee satisfactory functioning of your new boiler, you should first of all know how it is operated, cleaned and maintained. This manual will provide information and advice that reach far beyond the boiler itself. For example, why safety fittings are necessary and how they work.

Guarantee

Read "Conditions for guarantees and liability" on page 4 ff. As a rule, all these requirements will be met by a competent plumber. Nevertheless, we advise you to draw his attention to our guarantee conditions. All requirements we place on your heating system are designed to avoid damage, an undesirable occurrence for owner and manufacturer alike. Details on this subject can be found on page 4 ff and 23 ff.

Optimal use of the controls on your boiler.

If the boiler has been put into operation by a specialist, use the controls only for information about your heating.

Two setting levels of controls are accessible to you:

At CUSTOMER level you can set the controls according to your wishes and needs, without the risk of altering the configuration set up by the specialist. Help and examples can be found in section "Control panel" on page 34 ff.

At SERVICE level changes and adjustments should only be made by a specialist, your plumber or customer service. Before making any adjustments yourself, you should always consult a specialist.

Read the user manual carefully

before starting up the system. This is the only way to ensure energy-saving and environmentally friendly operation of your new boiler

Use the specialist's knowledge and skills

Leave the mounting, installation, commissioning and setting the basic controls to the specialist. Insist on an explanation and briefing on how your new heating system works, how it is operated and maintained

Extended guarantee period after commissioning by an authorized partner company

If the newly installed boiler is started up by an authorised partner company, we will extend your guarantee period. Please contact your dealer for the guarantee conditions valid at the time of purchase.

Service contract

The best service for your heating system is to be obtained by concluding a service contract with a heating specialist certified by us or our customer service.

Conditions for guarantee and liability

We can only provide guarantee and accept liability for the proper functioning of your boiler if it is correctly installed and operated.

The guarantee and liability conditions will only be effective if the woodchip boiler in question is used **only for space and water heating** with a maximum of 4,000 operating hours per year and in particular if the following conditions are observed for installation and operation:

The boiler must be installed in a **dry space** in compliance with local building and fire protection regulations in the respective country.

The boiler can be fuelled with **woodchips G 20 to G50 – maximum W 35 as per ÖNORM M 7133**. With an optional flue gas recirculation you can additionally use ÖNORM M 7135, DIN 51731 and DINplus compliant **pellets, elephant grass, very dry carpentry waste and chipboard** (compliant with BImSchV fuel class 7, free of halogen organic compounds and wood preservatives) as fuel. The use of unsuitable fuels, especially pellets with a high risk of cinder, such as cereal waste pellets, or highly corrosive fuels, such as miscanthus where potassium chloride fertiliser has been applied, is not permitted.

Water is intended as a heat transfer medium. If special frost protection is necessary, up to 30% glycol may be added. **Decalcified water** must be used when filling the heating system for the first time and when refilling after repairs. For the initial filling of the boiler **up to 90 kW** the value of **20,000 lt°dH** for the system volume (in litres) multiplied by the hardness (German degrees of hardness) may not be exceeded. For larger boilers of **130 and 200 kW** the maximum hardness is **30.000 lt°dH**. The **pH value** should be set to **between 8 and 9**. Refilling with calciferous fresh water should be kept to a minimum in order to limit the formation of boiler scale (see page 23). Sufficient **shut-off valves** should be installed in order to avoid draining large amounts of water in the event of repairs. Leaks in the system must be repaired immediately.

A **safety valve (max. 3 bar)** must be installed by a qualified plumber or heating installer as protection against excess pressure (see page 24).

An **adequately dimensioned** or pressure maintaining device (see page 25) is required as protection against air suction when the system cools down. Adequate **ventilation** must also be provided (see page 25). Operating the boiler with an open expansion tank will cause above-average boiler corrosion due to the high air intake. For this reason, if the **compensator is open** we exclude **corrosion** damage on the boiler from guarantee and liability.

Operating with a **smaller output** than that stated on the rating plate is **not permissible**. If heating requirements are significantly below the nominal output of the boiler, you will need to either define heating time limits, or deploy an accumulator (see page 26 ff).

Excepting standard devices such as thermostats, **only components supplied by us** may be used for extending the controls.

Cleaning and **maintenance** work must be carried out as described in this manual (see page 18).

Repairs are only permissible using **spare parts supplied by us**. Exceptions are standard parts such as electric fuses or fastening material, provided they have the required properties and do not impair the safety of the system.

The **specialist carrying out the work** shall be **responsible** for correct installation in accordance with the instructions accompanying the boiler, relevant rules and safety regulations. If you as a customer have installed the heating system in whole or in part without the necessary professional training and, in particular, without the relevant practical experience, and have not had your **work inspected by a (responsible) professional**, we must exclude defects in the supplied equipment and consequential damage resulting therefrom from our guarantee and liability.

We reserve the right to make technical changes

In order to pass on to you the benefits of our ongoing developmental work, we reserve the right to make technical changes without prior notice. Printing and typing errors or modifications of any kind do not entitle the customer to make a claim. Individual fitting variations shown or described here are only available on option. In the event of discrepancies between documents with regard to the scope of delivery, the particulars in our current price list shall prevail.

Measuring emissions

Testing carbon monoxide (CO) emission regularly is mandatory for all boilers. In Germany, dust measurements are mandatory in the scope of regular testing. A number of errors may occur and render the measurements incorrect, although the system optimally conforms to the standard values for long periods of time in normal operation.

The chimney sweep will make an appointment with the owner to carry out these measurements. The customer may and should demand this.

The boiler including flue liner should be cleaned a week, or at least three days prior to measurement.

Then operate the boiler normally. An interval of at least three days must be allowed between cleaning and measuring to allow the dust swirled up by cleaning to settle. If the chimney sweep measures the swirled up dust, his reading for the dust value will be unduly high.

Avoid – under all circumstances – cleaning on the day of measuring.

Ensure sufficient heat consumption

Open all radiator valves and set the radiator thermostats to maximum position.

Start of measurements a quarter of an hour after firing up.

Keep the **[⅟o]** button pressed for 5 seconds until "Emission measurement: duration 30 min." appears on the display and the LED in the **[⅟o]** button flashes. The boiler controls will ensure that the required amount of heat flows into the heating circuits and domestic water tank.

Measurement should be started 15 minutes after the boiler has reached operating temperature.

The boiler will revert to normal operation if the **[⅟o]** button is pressed again or automatically after 30 minutes.

Check if boiler has returned to automatic mode after measurement. This is confirmed by the lit green LED in the **[⅟o]** button.

Chimney renovation before it is too late

With the regulated induced draught fan and adjustable minimum gas temperature, your new boiler will for the most part fit existing flues without major adaptation. However, it is advisable to have the suitability of your flue verified by a chimney sweep or constructor.

If your boiler has a flue gas recirculation and the chimney draught is above 15 Pa due to a tall chimney (of over 12 m), a draught regulator is required. Instead of a draught regulator flap, a nozzle in the chimney top is an excellent solution, as this also achieves higher exit speeds and thus improves exhaust gas extraction.

Modern boilers have a higher level of efficiency than older models, together with smaller amounts of exhaust gas and significantly lower exhaust gas temperatures.

Especially flues with "too large a cross-section" (more than 20 cm) are no longer adequately heated. The water contained in the exhaust gas condenses in the chimney and slowly but surely destroys old masonry chimneys.

If the chimney diameter is too large, the discharge velocity and temperature are too low. The exhaust gas lacks the required energy to rise.

If your chimney is not lined with water resistant material or its diameter is too large, the usual solution is to fit a moisture-resistant flue liner. If the chimney diameter is not large enough, a stainless steel pipe can be fitted.

Please bear in mind that the lifespan of chimneys is limited. If undertaken in good time and the chimney wall is still in good condition, it can be quickly and easily renovated by inserting a new flue liner. However, if the exhaust gas condensate has penetrated the mortar joints, the chimney must be completely dismantled and reconstructed.

Air-tight and insulated connecting pipe to the chimney

The flue gas pipe must be air-tight. Insertion type and round joints can be sealed with heat-resistant silicon 300°C and/or pure aluminium adhesive tape to prevent dust and exhaust gas escaping.

Insulating the pipe improves the chimney draught, provides protection against burns in case of accidental touching, and reduces the danger of fire.

How does your new woodchip boiler works?

Spring arms adjust to load

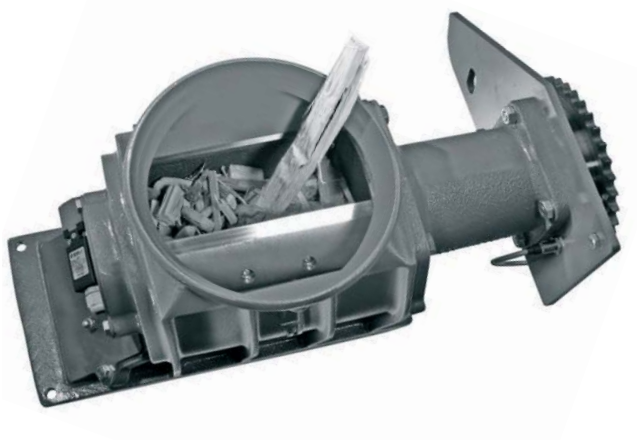
The floor agitator feeds the woodchips to the conveyor screw (4). The spring arms (1) adjust to handle the material covering them. If the bunker is full and the load above the agitator high, the spring arms move to touch the agitator plate (2). This reduces the force required to drive the agitator and also power consumption. If the bunker is emptying, the spring arms move out towards the side walls to empty the bunker.

The floor agitator must rotate during filling

To avoid the spring arms jamming underneath a pile of woodchips, the floor agitator must rotate during filling (press the **[i/o]** button for 5 seconds to switch to emission measurement mode).

Conveyor screw torque monitoring

Drive power monitoring immediately detects resistance built up in the screws. A backwards movement of the screws is automatically triggered and repeated up three times if needed. Because the floor agitator is uncoupled thanks to the freewheel assembly (3), the full drive power is available for freeing the screw. This means that any wood or even stones that are jammed are easily freed, and fuel transport can continue without any obstructions.



Maximum burn-back protection

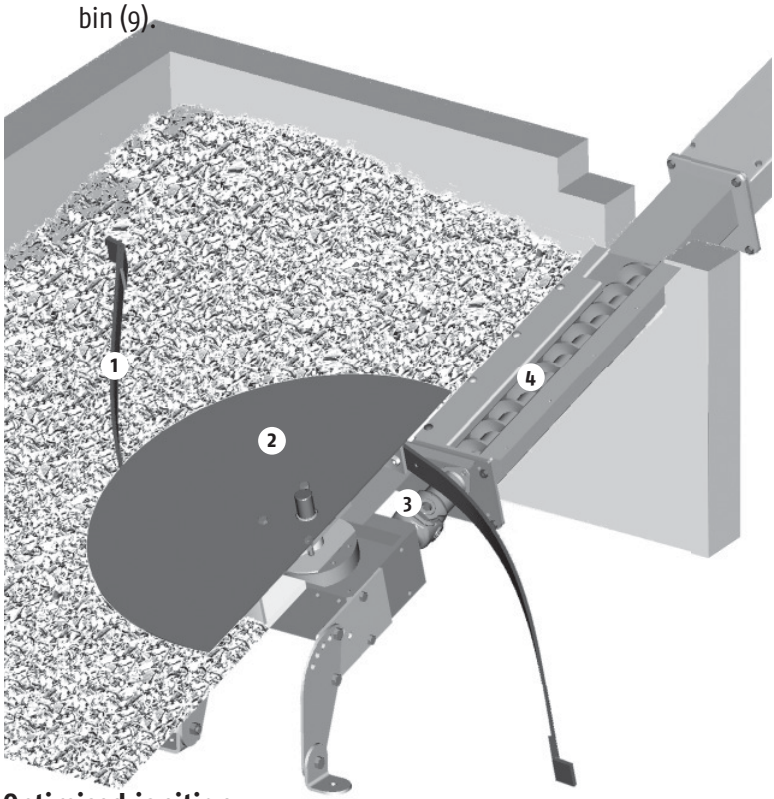
The air-tight one-chamber rotary valve (5) reliably isolates the combustion chamber from the fuel store in all operating modes. This prevents hot gas entering the fuel feeder and igniting the woodchips. This is the most reliable form of protection against burn-back. The Austrian fire protection authority's TRVB H118 regulations (which are often applied in Germany, too, due to the lack of a national standard) additionally requires a water sprinkler (which is available as an optional accessory) for fuel stores in storage rooms (barns), in case of boiler output of more than 150 kW, in case of a fuel storage volume above 200 m³, and for carpentry waste.

Excessively long pieces of wood cannot bring the fuel feeder to a standstill. They are cut off at the edge of the rotary valve chamber by a hardened and replaceable cutter.

Hot combustion chamber with tilting grate

The woodchips are pushed laterally onto the grate by the stoker screw (6). A refractory-lined combustion chamber (7) guarantees a clean fire with a high combustion temperature.

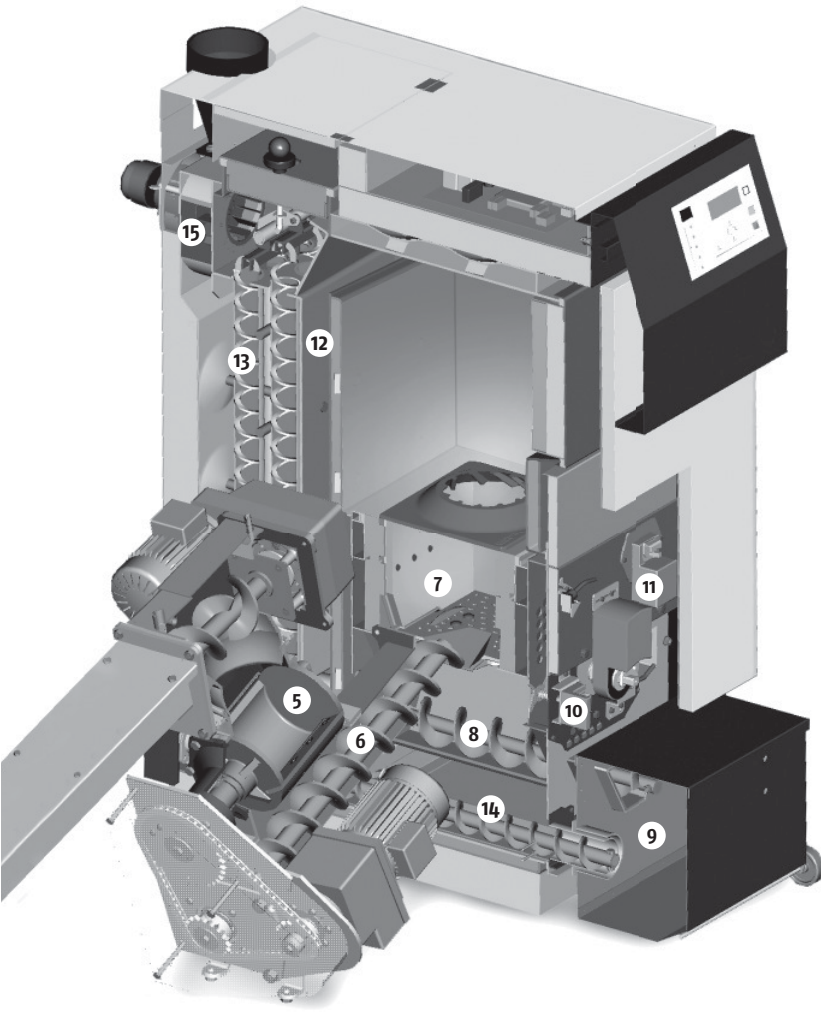
Periodically, depending on the heating output, the grate is rotated through 90° after a controlled burn-out phase to automatically remove ash and foreign bodies from the combustion chamber. The ash remains in the ash chamber below the grate until the grate is tilted again and can burn out before it is discharged by a screw (8) into the removable ash bin (9).



Optimised ignition

After short interruptions to the burning process, the refractory-lined chamber will remain hot enough for the remaining embers to ignite any fresh fuel fed into it. The ignition fan is only required after longer interruptions. After successful ignition, as detected by a Lambda probe and the exhaust gas temperature, the ignition fan is immediately switched off to save power.

Lambda probe and turbulent heat exchanger



Burning process interruptions with minimal heat loss

The fire is controlled between minimum and maximum output. In case of moderate heating in autumn or spring, the output is adjusted by means of burning process interruptions. To avoid smouldering with tar build up during the interruptions, the fire is allowed to burn down in a controlled way. Closing the primary (10) and secondary (11) air flaps avoids air flowing through the boiler when idle, thus avoiding heat escaping into the chimney without being used.

Best fuel utilisation with lambda control

The wood gasification rate can be regulated via the primary air intake (10). With the lambda controlled secondary air (11) the combustion is kept in the clean range with a high rate of efficiency.

If too little air is taken in, there is not enough oxygen for complete combustion. But too much air also causes incomplete combustion. Too much air cools the fire. At below 700°C not all parts of the wood gas are burnt. Furthermore, too much air transports too much heat out of the boiler.

The lambda probe also guarantees optimum combustion and best fuel utilisation in daily use, not only with selected wood on the test stand.

Turbulent heat exchanger with simple cleaning

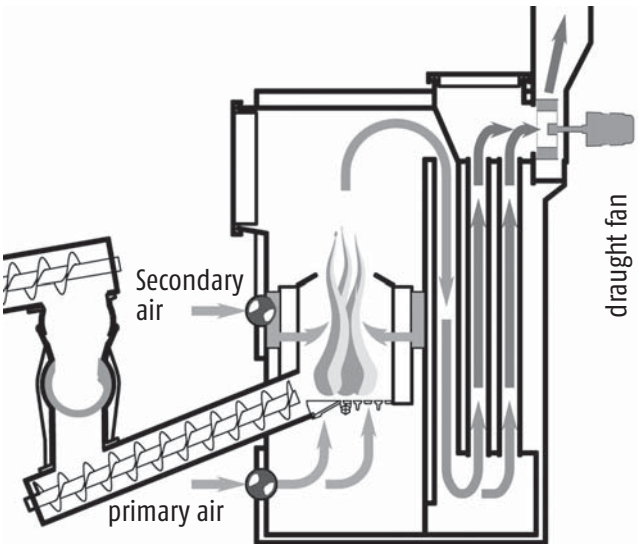
Only after complete combustion does the hot gas flow into the cold section of the boiler, where it passes its heat onto the boiler water. At first this takes place through a smooth down-swept flue (12) to remove the ash and then turbulently through the heat exchanger tubes fitted with turbulators.

The more turbulent, the better the gas particles come into contact with the tube wall, enabling maximum heat to be delivered to the heating water. Low exhaust gas temperatures and high levels of efficiency are thus achieved.

During cleaning (grate rotation) the turbulators (13) are moved to remove fly ash from the heat-exchanger tubes. A screw (14) discharges the ash into the ash bin (9).

Maximum safety thanks to low pressure

A draught fan (15) at the exit point of the boiler causes low pressure in the whole boiler, thus ensuring a high level of operating safety without the danger of detonation or burn-back. The air-tight one-chamber rotary valve (5) makes a typical combustion air fan unnecessary. The required air is taken in via the controlled primary (10) and secondary air flaps thanks to the low pressure in the combustion chamber.



Suitable Fuels

Use rough woodchips G30 – G50 with low fines fraction content

The length of the individual woodchips should be between 30 and 50 mm. This keeps stored woodchips well aired. Water may escape from the pile. The probability of rotting and mould is low.

A higher percentage of fines (sawdust, bark, needles, soil, sand) blocks the airflow. Water vaporising at the hot interior of the pile condenses at the top of the pile. This causes some woodchips to dry-rot rendering them useless as heating fuel (see page 26).

rough + dry = good performance

fine + dry = poor performance

Avoid green, moist woodchips

Woodchips need to be dry to the touch (water content below 25%) for trouble-free storage in a concrete bunker. Green, roughly cut woodchips stored in an open shed and exposed to wind will quickly achieve water content of below 35% and thus be usable as boiler fuel.

Finely chopped woodchips, or woodchips from green branches with a high percentage of bark and needles are impermeable to air and will not dry to any appreciable extent, but quickly rot, thus losing much of their value as fuel (see page 28).

rough + moist = poor performance
storage well ventilated only

fine + moist = no performance

Special precautions with scrap wood

When scrap wood is sold, it may be wood with dry rot that has no fuel value: for this reason you should buy scrap wood by weight only and with a limited water content of max. 25%. Also make sure that the wood is free of pollutants. Current legislation only allows the use of untreated wood without foreign bodies for heating purposes (see also page 32 for Germany).

Wood working enterprises are allowed to use chipboard for heating, if it is free of halogens and preservatives

Although this is not allowed by law, chipboards can contain high levels of chemicals (including „illegal" chlorines and fluorines) which cause corrosion and above average wear and tear on the boiler.

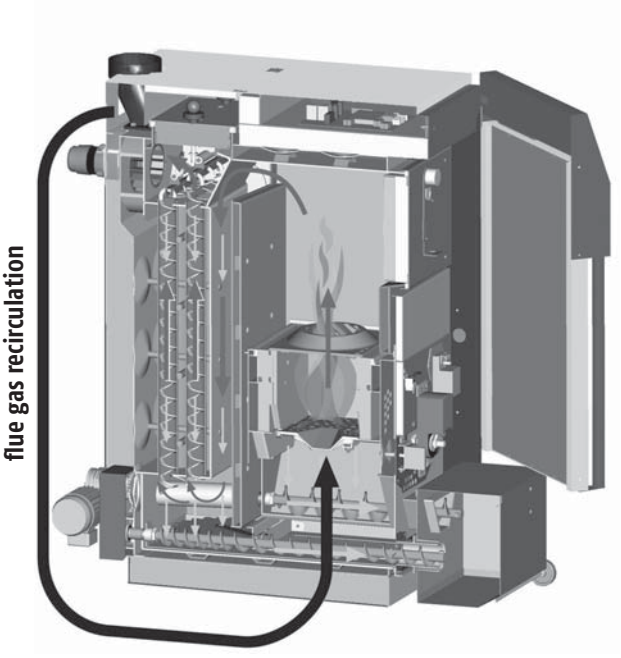
Nails and stones

will not stop the boiler running, but they will increase wear and tear on the screws and rotary valve blades.

Sand and soil, more ash and cinder

Above a certain threshold, which differs greatly depending on the woodchips, cinder deposits will build up on the grate, and need to be removed manually. Avoid excessive sand and soil content.

A flue gas recirculation is available as an option. It is required for pellets, elephant grass and very dry carpentry waste (see page 27).

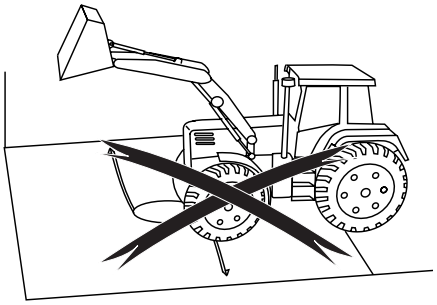


Do not drive over the floor agitator during filling

Before filling a bunker equipped with a floor agitator the boiler must be fully connected

The floor agitator must rotate during filling

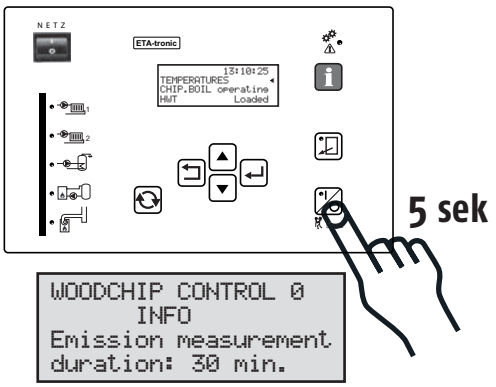
When the bunker is empty, the floor agitator arms stretch out to the sides. Covering the arms with fuel in this position will cause them to jam and make it impossible to start the agitator.



Press the [⅟₀] button on the boiler for 5 seconds to start the floor agitator

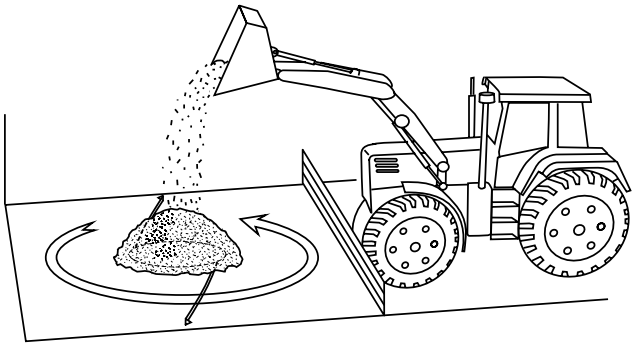
As it is impossible to rotate the agitator without feeding woodchips into the boiler, you need to start the same process as for emission measurement. The generated heat is fed into the boiler and the heating circuits.

Shortly pressing the **[⅟₀]** button stops the floor agitator. If you do not press the **[⅟₀]** button, the boiler will switch off automatically after 30 minutes.



Start your fuel pile in the middle

If agitators are loaded from the side, the rotating arms move through the woodchips, which deflects them towards the middle disc. When the rotating arms reach empty space, they lash back into original position. To avoid this effect, start your pile in the middle of the agitator using a front-end loader to deposit the woodchips while the agitator is moving.



Never drive over the agitator surface!

Bunkers with a filling screw

If the bunker is almost empty, pour in 2 to 3 m³ of woodchips or pellets before starting the floor agitator.

Tip slowly into the bunker!!!

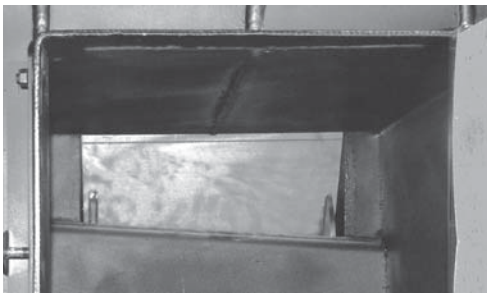
When tipping fuel into the bunker make sure that you dump slowly onto the stirring unit of the agitator. Dumping a full load into the bunker from a height of 3 m or more meters can damage the stirring unit.

Maximum height of dumping onto the agitator	
Wooden pellets and miscanthus pellets	up to 2,5 m
Woodchips	up to 5,0 m
Bulk chaffed miscanthus	up to 10 m

Make sure there is no leak air

To make sure there is no leak air check that all doors and service covers are closed and air-tight, before commissioning, but also after servicing.

Leak air, firstly, offsets the lambda measurement: Less air intake implies that the combustion chamber will become hotter. That way leak air causes cinder and precipitates refractory wear in the combustion chamber. The lack of air also leads to incomplete combustion, and this may cause tarring of the heat-exchanger.
Secondly leak air may reduce your boiler's performance.



Inside cover on the heat-exchanger outlet

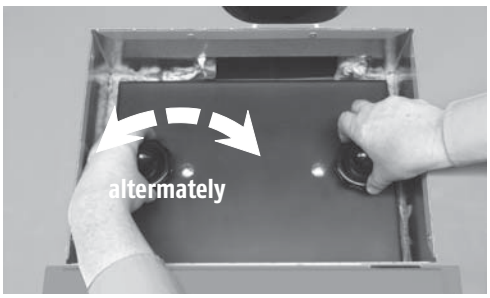
Reach from the front through the combustion chamber door to check if the interior cover is seated in its frame and air-tight.

Combustion chamber door

The handle of the combustion chamber door must close solidly (with some force) (see page 19).

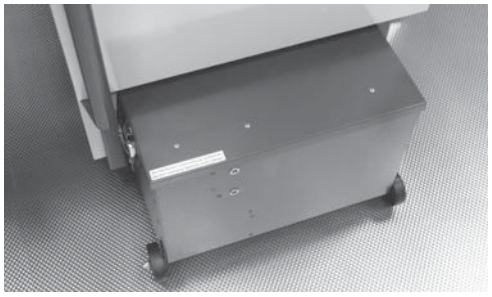
Is the heat-exchanger cover closed?

Firstly rotate the ball knob half a turn clockwise to engage and pull the ball knob to check if the catch holds.
Secondly, alternately tighten the two knurled nuts. You will not be able to seal one side air-tightly if the other side is closed too tightly, already. Therefore, please, turn the knurled nuts alternately.



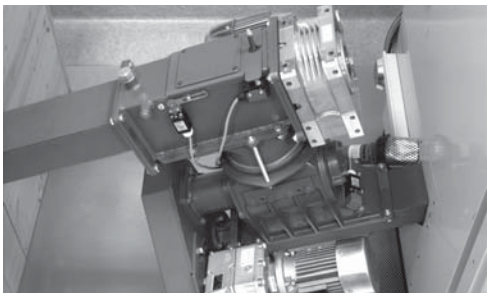
Is the ash bin closed, coupled and air-tight?

The seals on both the coupling and the cover must be clean and undamaged. All four clamps must be closed.



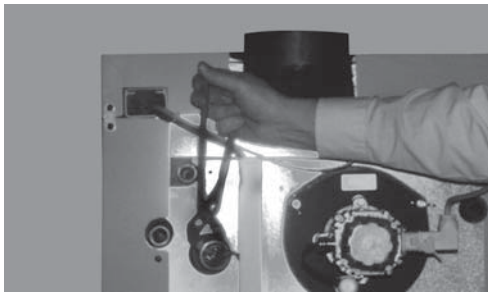
Are the drop shaft and the rotary valve closed?

An open drop shaft cover (two safety switches), or an open revision opening at the bottom of the rotary valve (one safety switch) will stop boiler operations.



Check the Lambda probe (for commissioning only)

The clamping pipe must be screwed tightly – 20 kg with a 20cm lever – (use a pipe wrench).



Fuel Intake Blocked, Excessive Temperature

„Excessive current consumption“
Too large a piece of wood, or a foreign body

If a single, large piece of wood or a foreign body blocks the conveyor screw, the control unit tries to free the blockage by turning back 3 x. If the current consumption of the motor is still too high after doing so, feeding is stopped to protect the screw.

„Overload“ – Woodchips too rough or too sharp

If the feed unit is overloaded for an extended period by excessively rough or sharp woodchips (many long pieces of wood), motor protection cuts in.

Firstly, switch off at the mains, open fuel intake, remove obstacle, and restart the boiler

After removing the obstacle and closing the fuel intake again, switch on the mains switch, press the[↵] button to acknowledge the error, and then press the **[I/O]** button to restart the boiler.

Thermal emergency valve or safety valve triggered – Are the pumps OK and the heating pipes open? You may need to top up with water

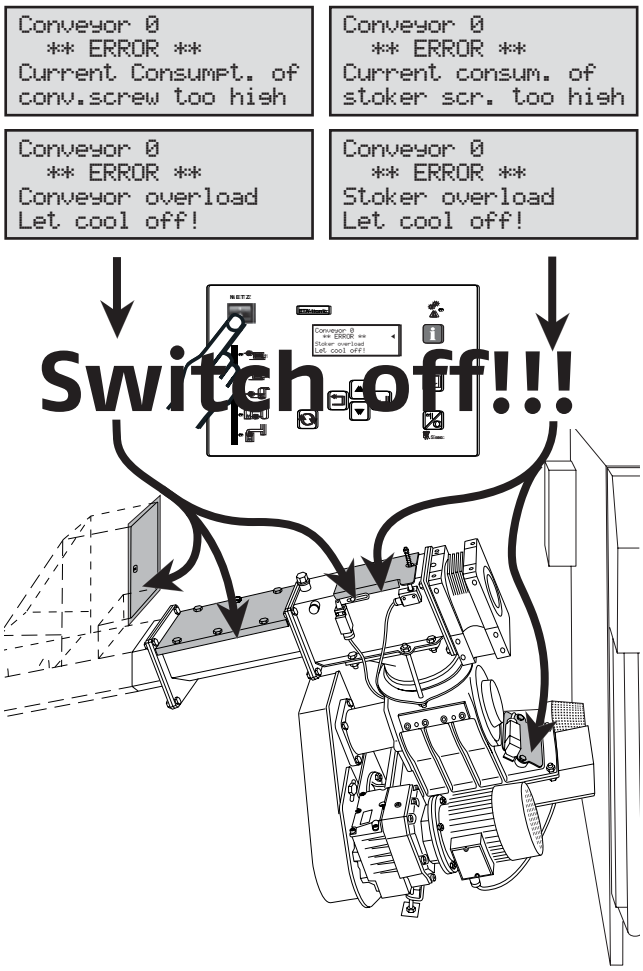
Check if the pumps are running. To do so, use a screwdriver as a „stethoscope“.

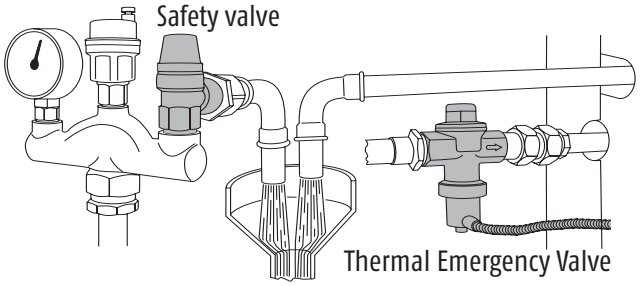
When the system is new or has not been in use for some time, check that the riser valve is at AUTO status (for ESBE mixing valve, that the hand-operated knob has engaged at AUTO function) and that all valves in the heating pipes are open (Always completely open ball valves as to prevent the seals from deteriorating. Valves open by turning anti-clockwise; to relieve the spindle from the fully-open position, rotate back a quarter turn.)

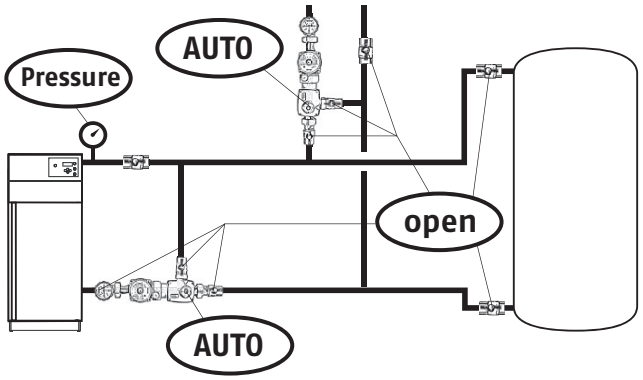
If the boiler temperature has dropped again, you may need to top up with water. In houses with up to three storeys, the pressure should be between 1 and 2 bar when the system is cold, and between 1.5 and 3 bar when warm.

Safety thermostat

The safety thermostat (ST) switches off the boiler when the temperature reaches 105°C (tolerance range between 99°C and 105°C). When the boiler temperature has fallen below 70°C the ST can be deactivated. The deactivating button is set in a drill hole in the door frame above the charging door. To deactivate, push the button deep into the hole, preferably with a match.





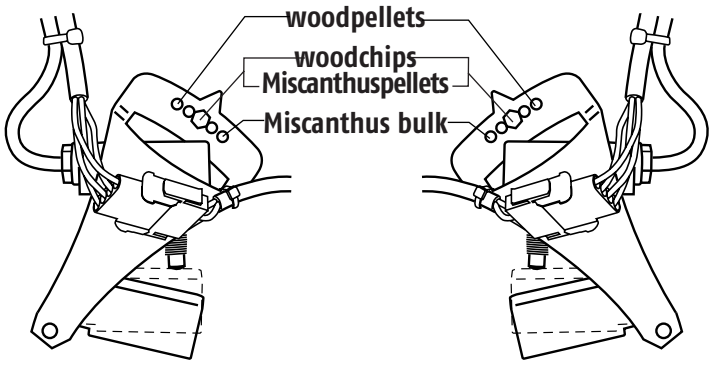


Setting up the boiler for fuel type

Adjusting the fire bed level sensor

To put it simply: the drier your fuel is, the faster it will gasify, and the less fuel is needed at the grate. It is therefore important to set the fire bed level sensor to match the fuel type.

To locate the fire bed level sensor, open the insulating door and look behind the lower sheet metal lagging.



Feed on the left side

Feed on the right side

If your boiler is equipped with a flue gas recirculation

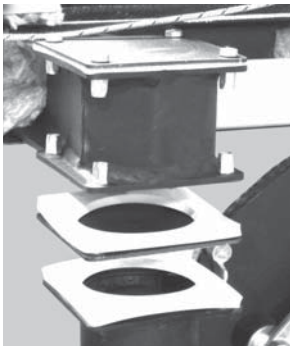
Switch off the return system for woodchips

Fit the intermediate cover below the junction box in the return line and set the „Flue gas rec." parameter in the „CHIP_BOIL" control menu to „NO" (password: 0135).

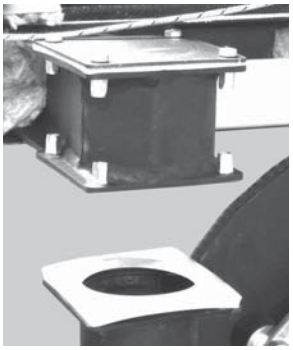
Switch on the return system for pellets and miscanthus

Remove the intermediate cover (see 9.7) and store at the rear of the boiler below the safety heat exchanger; fix with a (longer) casing screw. Set the „Flue gas rec." parameter in the „CHIP_BOIL" control menu to „YES" (password: 0135).

For woodchips – Block flue gas recirculation with intermediate cover.



For pellets / miscanthus – remove the intermediate cover from the flue gas recirculation.



The quantity of ash depends on the fuel and the season

Ash is the non-combustible fuel residue. It includes minerals such as calcium or potassium, without which no life forms can exist. But it also include soil, sand and stones, which are contaminants in the fuel.

As a rule of thumb: the darker the fuel, the more bark, soiling, or rotten material – and thus the more ash – it contains.

Theoretically, both, woodchips made of pure wood and woodchips with bark, should have the same ash content of 0.5%. In practical terms, soil and sand always sticks to the bark.

Stalks and leaves need potassium for rigidity. Their soiled surface is even larger. The ash content is thus between 3 and 6 %.

Dark material comprising thin branches typically also contains a high percentage of rotten material, which means less combustible material and more ash.

Checking the ash bin

in summer

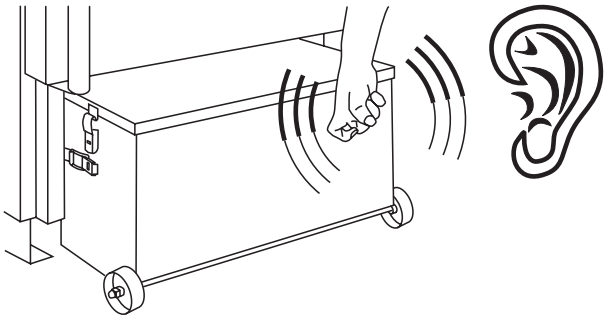
at the peak of heating season

woodchips without bark	approx. **5 weeks**	approx. **once a week**
woodchips with bark	approx. **2 weeks**	approx. **3 days**
miscanthus	approx. **10 days**	approx. **2 days**
bush cuttings thin branches high leaf content	approx. **5 days**	**every day**

How often you need to empty the ash bin, depends on ash content and fuel quality.

Is the ash bin full?

You can check the ash bin filling status without opening it by knocking on the vertical bin wall. A full bin sounds dull and short; an empty bin produces a lighter sound with more echo, like a drum.



Reminder option via display

You can define a woodchip quantity - in the „CHIP. BOIL“ -> „De-ashing“ -> „Empty ash bin at [kg]“ menu - after the consumation of which you will receive a reminder. This reminder is not enabled per default (the value is set to „0“), as it is only possible to achieve a satisfactory setting with very homogeneous woodchips.

Either the ash bin is full, or the ash screw is blocked by a foreign body

The current consumption of the ash screw is continually monitored; in case of excessive current consumption a warning „ Ash disposal: current exceeds“ is shown.

Usually, this is caused by a full ash bin; empty the bin as described on the following pages.

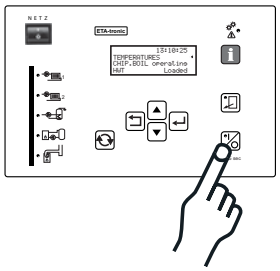
If the ash bin is not full, a foreign body jams the ash screw. Please, follow the instructions on page 15.

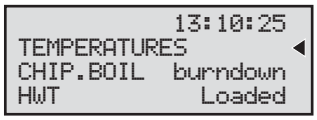
Do neither open nor remove the ash bin during boiler operation! (Identifiable by the fact that the induced draught fan is running.)

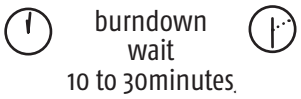
Due to the significant flow of leak air caused by the removal of the ash bin, too much ash would exit the boiler via the chimney into the environment (see the following pages).

Before emptying the ash bin, press the [I/O] button to stop the boiler.

Do not switch off at the mains power switch, to be able to perform the remaining steps.





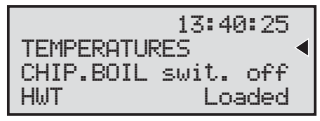


Wait until the embers have burnt down.

Depending on material, the embers can take between 10 and 30 minutes to burn down. During that time, please, perform the following checks:

Water pressure in the heating system
In houses with up to three storeys, the pressure should be between 1 and 2 bar when the system is cold, and between 1.5 and 3 bar when warm. Use only decalcified water in case of a large accumulator volume. If the water pressure is regularly too low, check the cause of the leakage.

Safety valve and thermal emergency valve
should not drip. Some dirt might be trapped in the seal seat; multiple opening could flush this out. Never open a safety valve or thermal drain device on a Friday evening in the middle of a cold winter; you might not be able to contact a heating contractor. If the sealing lip is torn, you must replace the valve immediately.

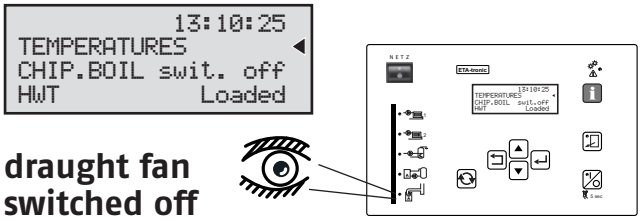


Removing ashes and regular inspection

Never store combustible material in the boiler room.

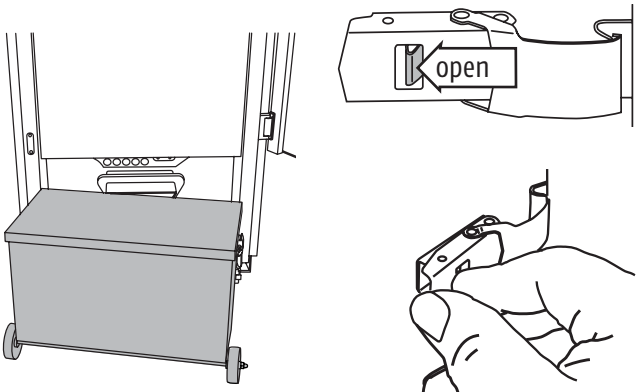
Do you have a **fire extinguisher** ready? You should always have a fire extinguisher available en route to the boiler room (but not in the boiler room itself).

The **fireproof door** in the boiler room must close automatically.



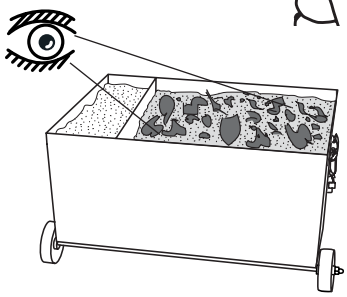
Remove the ash bin when the green „Draught fan" LED is unlit

Do not remove the ash bin until the embers have burnt down completely. 10 to 30 minutes after pressing the **[⏻]** button, the boiler is in „Switched off" mode, and the draught fan is idle (green LED bottom left on the control panel unlit). Failure to observe these precautions will mean that leakage air transports fly ash via the ash path into the chimney and thus into the atmosphere.



Removing and emptying the ash bin

The clamps open easily and without applying force by pressing the latch in the direction of the arrow.



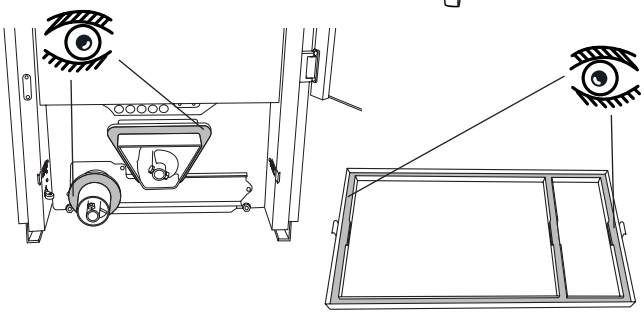
No large cinder pieces in the ash?

If the ash contains many and large cinder pieces, check the grate (see page 26) and shorten the de-ashing times (see page 17).

Do not fill embers into the dustbin

⚠ If embers are still present in the ash, fill the ash into a fireproof container and leave it to stand for at least 2 days. Do not place it into the dustbin until you are sure there are absolutely no embers left in the ash.

A second ash bin is available as an accessory, or alternatively garbage truck compatible 110 lt garbage containers which can be docked onto the boiler directly. Ask your heating specialist for details.

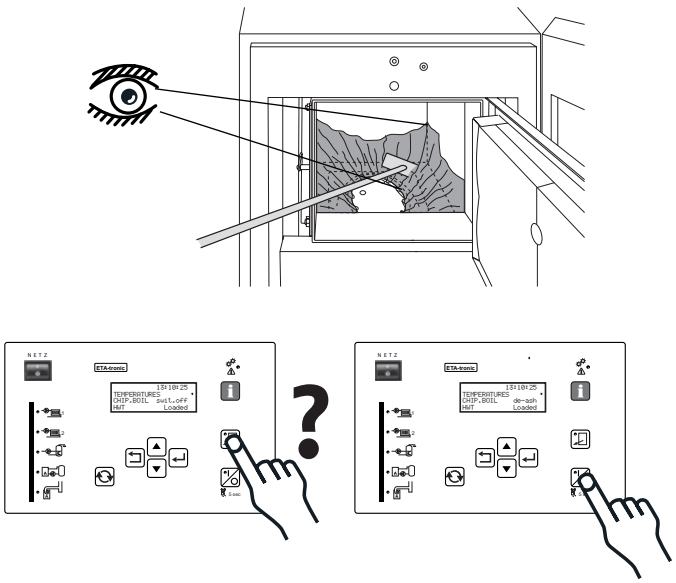


Check the seals

in the ash bin lid and the connecting channels on the boiler. The seals must not be damaged.

If the ash deposit in the combustion chamber is steeper than 45 degrees,

press the yellow **[🧹]** button to start de-ashing and use the rake immediately to eject the ash into the combustion chamber. If de-ashing does not achieve the desired results, repeat. Take this opportunity to make ure that the **interior cover** above the **heat exchanger inlet** is air-tight



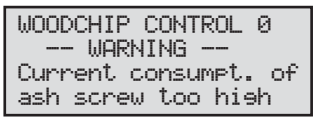
Press the [⏻] button for restart

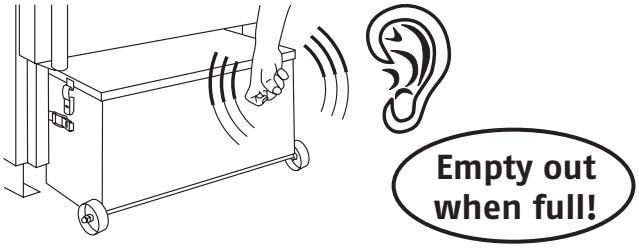
Ash disposal is blocked by foreign body

The power consumption of the ash disposal is continually monitored; in case of excessive power consumption a warning „Ash disposal: current exceeds“ is displayed.

Before taking further steps, tap on the ash bin to check the fill level. Under normal circumstances, you will find the ash bin full; empty the bin as described on pages 13 f.

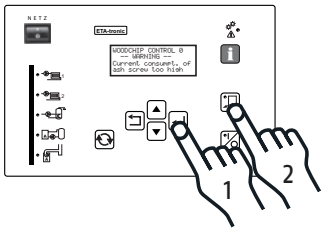
If the ash bin is not full, you can assume that a foreign body jams the ash screw of the ash disposal.





Press the [↵] button to acknowledge the error and then press [🖷] to repeat de-ashing.

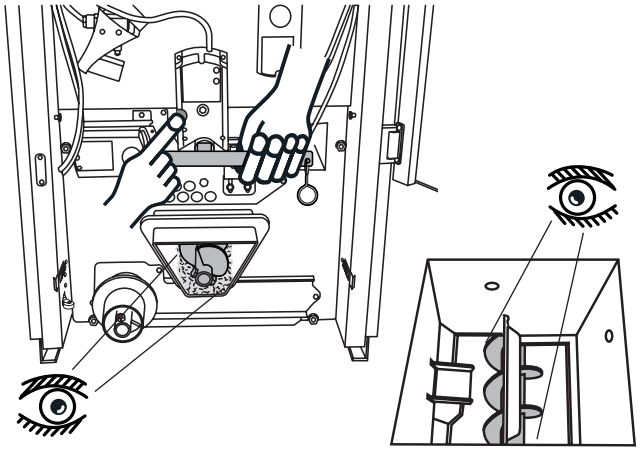
In many cases, a normal de-ashing cycle, which moves the screw backwards and forwards three times, is sufficient to dislodge small foreign bodies.



Switch off at mains switch
Set the grate to vertical position (using key)
Remove the ash bin
Look for the foreign body and remove by hand

The foreign body may be jammed crosswise at the point where the screw exits the ash chamber. Switch off at the mains switch and attempt to remove the foreign body using pliers.

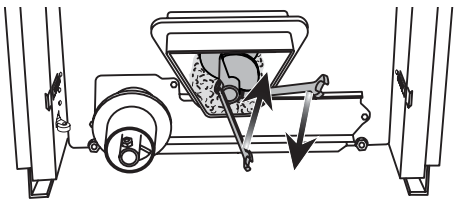
The figure shows the model for up to 90 kW. As of 130 kW you must use the control unit to tilt the grate. In the „CHIP-BOIL“ -> „De-ashing“ menu press the **[⟳]** button to switch the „TILTGRATE“ to manual mode and then press **[▼]** to tilt the grate.

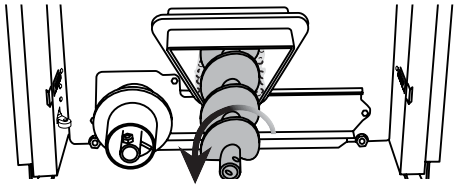


Before you reach into the boiler, switch off at the mains switch.

Removing the grate ash screw

The grate ash screw is located below the grate at the centre of the boiler If this screw jams, and you cannot remove the blockage, you must remove the screw. To do so, loosen the M8 bolt (size 13 spanner) to that holds the screw to the axis, and turn the screw anti-clockwise to pull it out of the screw channel. Use a suitable tool to clean the ash channel, and then refit the screw.





The heat exchanger ash screw does not jam very often

If you are sure that it is not the grate ash screw that causes the jam, please contact customer service to discuss further steps.

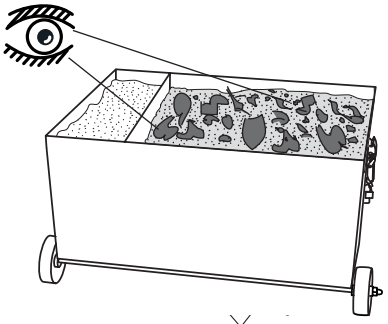
Fuel Causing Cinder

What if you find „suspicious“ cinder in the ash Check and clean the grate

If you find „suspiciously“ large and very hard, glassy cinder pieces in the ash, and only then, you will need to check the combustion chamber and grate. Small, isolated pieces of cinder are nothing to worry about. The threshold for permissible cinder size is when it clogs the air vents of the grate.

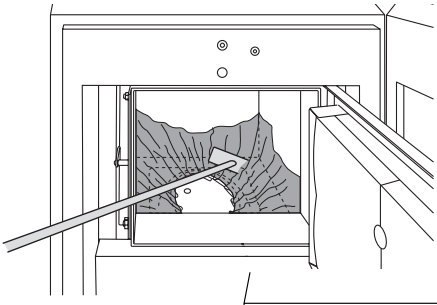
Often a fuel change is the cause; please check the fuel-related settings (page 17).

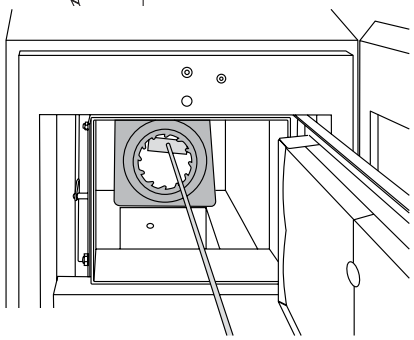
For fuels that do not clog the air vents on the grate, you only need to perform this check once a year.



Press [⏻] button to switch off, wait until embers have burnt down, and then start de-ashing

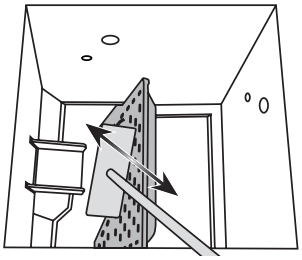
Please wait until the green LED on the draught fan is unlit and the display reads „Switched off“ before you start de-ashing. Then press the yellow **[⏏]** button for de-ashing. This tilts the grate, cleans the heat exchanger and ash screws transport ash from the boiler into the ash bin.





Raise the combustion chamber lid while the grate tilts

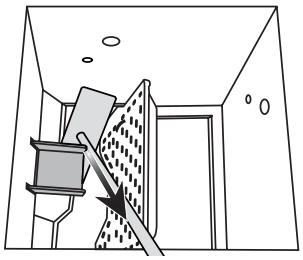
First, use the rake to scrape the ash from the combustion chamber lid into the combustion chamber. Then use the rake to raise the (hot) lid at the back of the combustion chamber so you can see the grate.



Use the rake to clean the standing grate

This is easier when the grate is lowered.

The ash and cinder is transported by the rotating ash screw while the grate tilts.

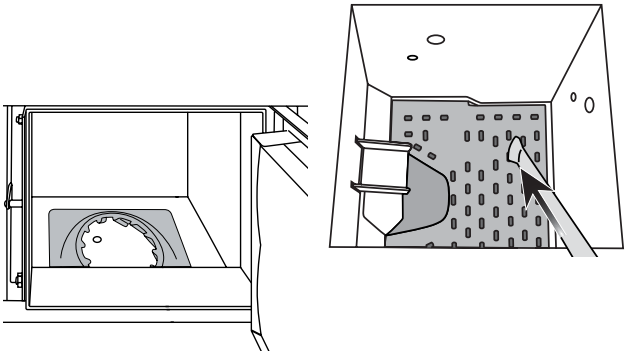


Check the lever on the fire-bed level sensor

Check that the level sensor lever can move freely by pulling it several times with the rake

When the grate is horizontal, check and clean the air vents

As the combustion chamber is still hot, a mirror and a torch are very useful. Use the poker for cleaning.



Repeat de-ashing by pressing the yellow [⏏] button, reinsert the combustion chamber lid, close the combustion chamber door.

If the fuel causes cinder

If you discover large cinder pieces in the ash bin, the cause is typically an excessive ash content in the fuel. You need to de-ash more frequently in this case. Before you reduce the interval between de-ashing, check if the following parameters are set correctly:

Is the right fuel (woodchips, wooden pellets, miscanthus bulk or miscanthus pellets) set in the „CHIP.BOIL" menu? See page 35 for the changing the settings.

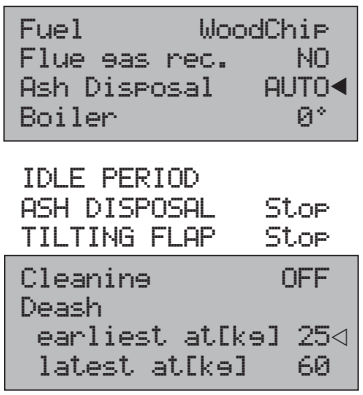
Is the flue gas recirculation set correctly?

Either „YES" and the intermediate cover is removed (flue gas recirculation at rear of boiler below the junction box, see also page 12), or „NO" and intermediate cover fitted.

Are the set de-ashing idle periods longer than the maximum permitted intervals (page 45)?

Are the boiler door, heat-exchanger cover and ash bin (screw connection heat-exchanger side) closed and air-tight (leakage air falsifies the Lambda value)?

If the fuel, flue gas recirculation and idle periods are set correctly, you must reduce the de-ashing intervals. You must reduce both values „earliest at [kg]" and „latest at [kg]". Never reduce by more than one quarter; this will allow you to approximate the optimum value.



If reducing the de-ashing times does not achieve the desired result, please call our customer services. Increasing the residual oxygen set value (by 1 to 2%), or limiting the boiler output by reducing the maximum exhaust gas temperature may help.

As a rule: as long as the cinder does not clog the air vents on the grate, there is no need to worry. If you need to clean the grate more or less every week, or even more frequently, you should definitely choose a different fuel that causes less cinder: with less bark, less soiling and less rotten material.

A draught regulator may be required for the flue gas recirculation to work

Too high a chimney draught can also cause cinder, as it impacts the efficiency of the flue gas recirculation. For the flue gas recirculation to work satisfactorily, a draught regulator is imperative for a chimney draught of more than 15 Pa (as of approx. 12 m chimney height). Instead of a draught regulator flap, a nozzle in the chimney top is an excellent solution, as this also achieves higher exit speeds and thus improves exhaust gas extraction.

Factory defaults for de-ashing
Values are set in the „Fuel" parameter in the „CHIP.BOIL" menu

	woodchips	wooden pellets	miscanthus bulk	miscanthus pellets
Number of times to tilt grate for de-ashing	1	1	2	2
Automatic de-ashing at end of each heating phase	No	No	Yes	Yes
Deash for boiler 20 to 49 kW earliest at	25 kg	35 kg	5 kg	5 kg
Deash for boiler 20 to 49 kW latest at	50 kg	60 kg	10 kg	10 kg
Deash for boiler 63 to 90 kW earliest at	35 kg	55 kg	9 kg	9 kg
Deash for boiler 63 to 90 kW latest at	65 kg	90 kg	15 kg	15 kg
Deash for boiler 130 kW earliest at	45 kg	90 kg	11 kg	11 kg
Deash for boiler 130 kW latest at	100 kg	150 kg	19 kg	19 kg
Deash for boiler 200 kW earliest at	70 kg	140 kg	17 kg	17 kg
Deash for boiler 200 kW latest at	155 kg	230 kg	30 kg	30 kg

Cleaning and maintenance

Each time you empty the ash bin

check the following points and remedy any defects (for more details, see page 13):

- Check (from the combustion chamber side) that the **interior cover** above the **heat-exchanger outlet** is air-tight.
- No large, hard **pieces of cinder** in the ash? If the ash contains many large pieces of cinder, see „Fuel causing cinder" on pages 16 ff.
- Check the **seals on the ash bin**.
- The **ash deposit in the combustion chamber** must not be steeper than 45 degrees.
- **Water pressure**: Only use decalcified water in case of a large accumulator volume. If the water pressure is regularly too low, check the cause of the leakage.
- The **safety valve** and **thermal emergency valve** must not leak (see page 26).
- **No combustible material** in the boiler room.
- Do you have a **fire extinguisher** at hand? You should always have a fire extinguisher available en route to the boiler room (but not in the boiler room itself).
- The **fireproof door** in the boiler room must close automatically.

When prompted to do so by the control unit, or at least once a year,

check the following items and remedy any defects (see pages 19 ff. for more details):

- **Air-tightness** of **combustion chamber doors**
- **Seals on ash bin lid** and **ash couplings** on boiler
- Check and clean the **grate**
- **Fire-bed level sensor**
- **Secondary air vents** in the combustion chamber
- **Fireproof refractory lining** in combustion chamber
- Sweep the **flue gas pipe** to the chimney
- Sweep **fly ash** from the chimney
- Clean the **condensate line** in the chimney
- Sweep **fly ash** from the reversing chamber
- Vacuum the **Lambda probe**
- Check the **turbulators** for tarring
- Sweep the **flue gas recirculation** (if installed)
- **Safety valve** on boiler, and also on solar-heated accumulator if fitted
- Check **extinguishers** (if installed)
- Check **error display/warning devices** (if installed)
- Check **test heating** and **residual oxygen value**

Perform professional maintenance when prompted to do so by the control unit, or at least every 3 years

The minimum scope of this work is described on page 22. Maintenance should be performed by an authorised heating contractor, or by our customer service department, both of whom have full access to information detailing the components that require special testing.

Service contract

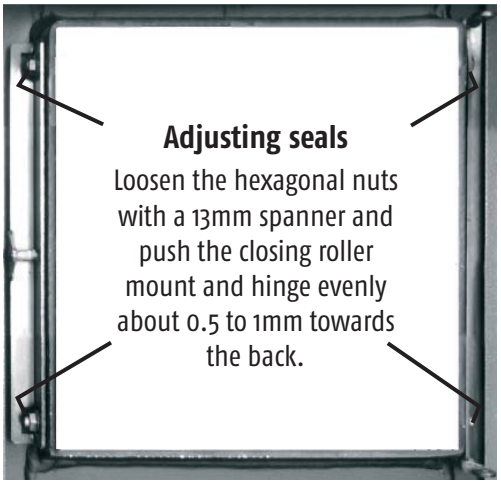
The best service for your heating system is to be obtained by concluding a service contract with a heating specialist certified by us or our customer service.

If prompted by the controls or at least once a year:

for woodchips and wooden pellets after 3,000 working hours, for miscanthus after 1,500 working hours

Check that the **combustion chamber doors are air-tight.** The boiler handle must engage tightly (apply some pressure), the sealing edges of the doors must close evenly and leave a visible impression on the sealing cord. Leaky sections can be identified by variations in the colouring on the sealing cord or with a cigarette lighter while the induced draught is running. The flame will be drawn through the leak.

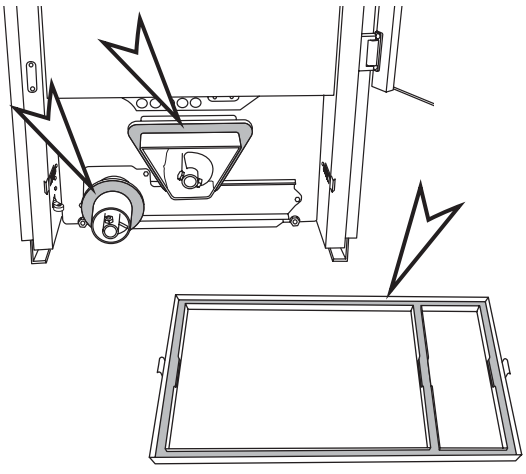
If leaks are found, it usually suffices to adjust the hinges and the closing roller mount (see picture). It is not always necessary to replace the sealing cords.



Adjusting seals

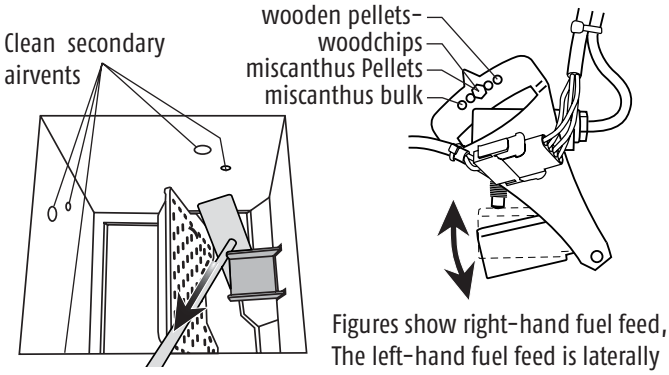
Loosen the hexagonal nuts with a 13mm spanner and push the closing roller mount and hinge evenly about 0.5 to 1mm towards the back.

Are the **seals on ash bin lid** and **ash couplings** on boiler intact?



Check and clean grate as described on page 17.

Check the **fire-bed level sensor** (overfill safeguard) in the combustion chamber for ease of movement, and also make sure the limit switch below the bottom cover behind the insulating door is set correctly and is actuated by the lever.



Figures show right-hand fuel feed, The left-hand fuel feed is laterally reversed.

Are the **secondary air vents** in the refractory lining clean?

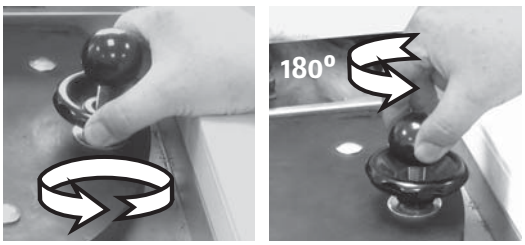
Fire-proof refractory lining okay?

Flue pipe to chimney, if the horizontal length is less than 50cm, sweep, or check (**switch off at mains** switch first).

Remove **fly ash** from chimney, blow out **condensate line** with compressor.

The chimney is the chimney sweep's responsibility. Ask if he will also clean the boiler.

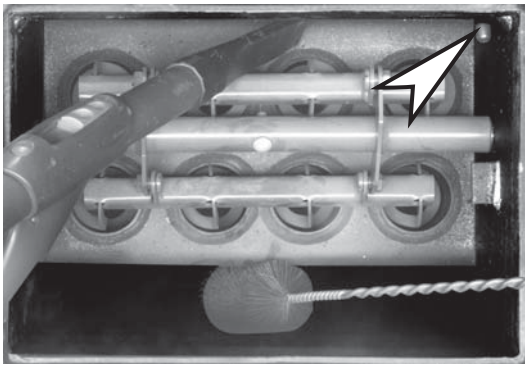
Open the **lid above the heat-exchanger** (**switch off at mains** switch first)



Open the heat-exchanger lid

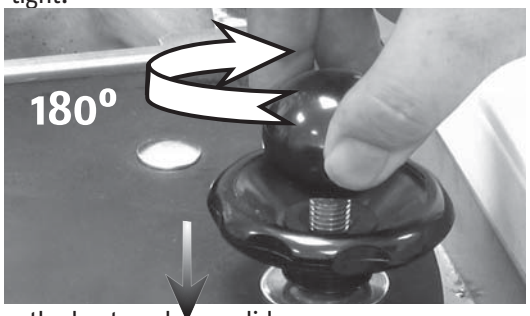
Turn the knurled nuts to open the cover fastening, then rotate the ball knob anti-clockwise through 180° and lift the lid.

Risk of fire
Either wait with vacuuming until no embers are left in the boiler, or use a vacuum cleaner with a heat-resistant ash trap.



Sweep the fly ash in the **reversing chamber**.
Clean the **second flue**; to do so, remove the interior cover, and replace correctly when done!
Check the induced draught fan; remove and clean if needed. Take extra care when vacuuming the **Lambda probe** (arrow).
Do not remove and clean the **turbulators, unless** they are **tarred**. And only clean the heat-exchanger tubes if they are tarred, too.

Check from the combustion chamber side that the **interior cover** above the **heat-exchanger** outlet is air-tight.



Close the heat-exchanger lid.

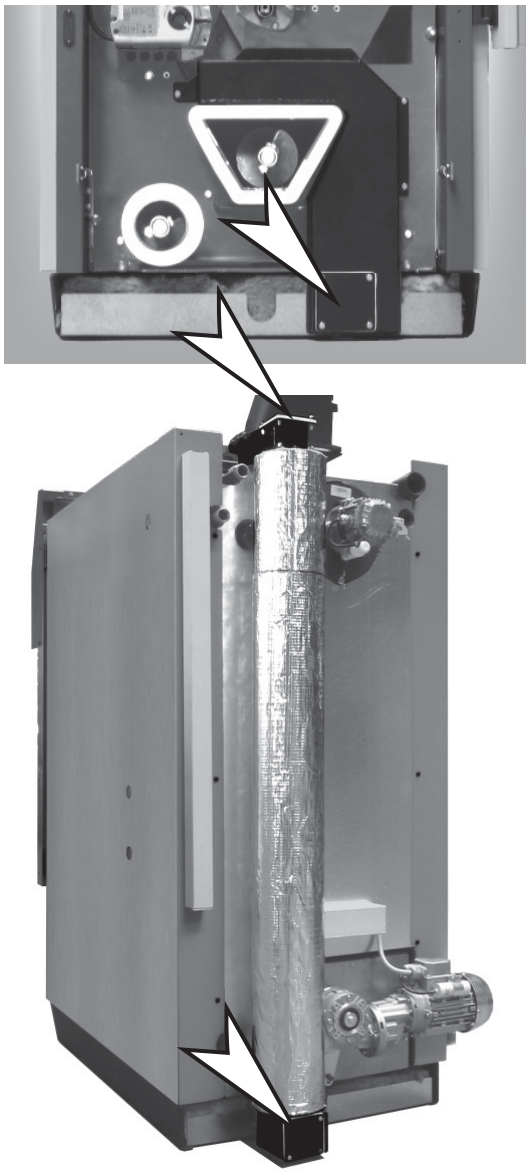
Turn the ball knob half a turn clockwise first to engage,

then tighten the knurled wheels alternately.

If one side is closed too tighty, you will not be able to close the other side tightly.

Sweep the flue gas recirculation

If your boiler has a flue gas recirculation (for pellets or miscanthus), you must also clean the pipes of the recirculation.



Open the lid, **sweep** with a brush, and **vacuum** the ash.

Check the boiler safety valves

by turning the knob on top of the valve to open it. (in the case of solar feed to the accumulator, also check the accumulator safety valve). The membranes of the safety valve may stick to the sealing seat, if the valve is not opened. Never check on a Friday during a cold winter, for a plumber will not be available on weekends. If the sealing lip is defective, the valve must be replaced immediately.

Check extinguishing devices

Extinguishing devices must be ready for operations, including the water supply (only if installed).

Check error display/warning devices,

if messages from the boiler room are displayed elsewhere, or if a temperature monitoring device is fitted in the fuel storage room/storage bin (in line with TRVB H 118).

Heating test

Start the boiler and press the **[⅟₀]** button for 5 seconds to switch to emissions measuring mode; this transfers the heat to the hot water tank and heating circuits for safe consumption. A residual oxygen value of 7 to 10% should be achieved within 10 minutes. Irregularities in the fuel may cause this to take longer than 10 minutes. If the residual oxygen value does not drop below 12%, your boiler is drawing leakage air. Troubleshoot the cause (boiler door or heat exchanger lid not air-tight, Lambda sensor probe seating ...) and repair.

Cleaning of cover panels and operating panel

The boiler cover panels and the operating panel should be wiped off with a moist cloth and (if necessary) a standard household cleaning agent (no scouring agent).

Professional maintenance

Arrange professional maintenance when prompted by the control unit or at least every 3 years

(after 6,000 to 9,000 working hours in 6 month summer season)

In Germany the inspection and servicing of heating systems is prescribed by EnEV (Energy Conservation Ordinance). Maintenance should be performed by an authorised plumber, or by our customer service department, both of whom have full access to information detailing the components that require special testing.

Check the **rotary valve blade** for notches. If it is already very notchy, replace.

Oil the **drive chains** of the fuel feed and the ash screw with oil spray (use copper grease if oil spray is not available) through the lubrication apertures (rubber caps). If necessary, tension the fuel feed drive chain ensuring that the chain can be displaced by 1–2 cm by pushing without applying force.

Check the automatic **de-ashing process**.

Check the **fire-bed level sensor** (overfill safeguard) in the combustion chamber for ease of movement, and also make sure the limit switch below the bottom cover behind the insulating door is set correctly and is actuated by the lever.

Are the **secondary air vents** in the refractory lining clean?

Fire-proof refractory lining okay?

Check that the **tilting grate closes fully**.

Remove the **draught fan** and clean the blade wheel with a brush. Make sure you do not dislodge or dislocate any balancing weights.

Check the **safety switch** at the **drop shaft** and on the **rotary valve maintenance lid**.

Check the **position sensor** of the ash bin.

Check the **seals** on the **combustion chamber door** and the **ash bin**, replace if necessary.

Remove the **lid on the heat-exchanger**:
Check the **turbulators** for tarring. If you cannot perform an emission measurement, calibrate the lambdasignal: Open the heat-exchanger lid, switch on the heating of the lambda probe and go to CHIP.BOIL --> Residual O2 --> Probe --> Lam. sig.corr. After 15 minutes check the value for „Lam. sig. corr.“. It must be -10mV.

Test heating
Press the [⅟○] button for 5 seconds to switch the boiler to emissions measuring mode; this transfers the heat to the hot water tank and heating circuits for safe consumption.

Check the Lambda probe by performing an **emission measurement**.If this is impossible, check the Lambda signal while the heat-exchanger lid is open (fresh air).

A **residual oxygen value** of 7 to 10% should be achieved within 10 minutes of heating. Irregularities in the fuel may cause this to take longer than 10 minutes. If the residual oxygen value does not drop below 12%, your boiler is drawing leakage air. Troubleshoot the cause (boiler door or heat exchanger lid not air-tight , Lambda probe seating ...) and repair.

Check the function of the **boiler** and **heating control** systems.

Check the **safety thermostat** (ST) for functionality.

Reset the **„Maintenance“ counter** in the „COUNTERS“ menu by pressing the **[↻]** button twice.

Approval

Every heating system must be approved!

In Austria the mayor's or municipal office must be notified of installation and conversion;

In Germany the district chimney sweep or the building authority must be notified.

Operation only by trained people

The system may only be operated by people who have been properly trained The training may be performed by the plumber, heating engineer or our customer service. Please read the User Manual carefully in order to avoid errors in the operation and maintenance of the boiler.

Keep children out of the boiler room and fuel store!

Children must be kept out of the boiler room or the fuel store! It is especially dangerous in the fuel store because of the hollow heap forming above the agitator. Children playing with the heap of woodchips, but also careless adults, can break through and become trapped, or be dragged in by the screw feed.

For heating systems with an accumulator First-time: Fill with decalcified water and supply sufficient stopcocks

ÖNORM H 5195-1 "Prevention of damage by corrosion and scale formation in closed warm-water-heating systems at operating temperatures of up to 100°C" and VDI 2035 "Guidelines for the prevention of damage by corrosion and scale formation in warm water heating systems" require decalcified water for heating systems with larger water volumes.

For woodchip boilers 20 to 90 kW at least the value of 20,000 lt °dH for system volumes (in litres), multiplied by the hardness (in German degrees of hardness) should not be exceeded. For larger boilers 130 to 200 kW the threshold is 30,000 lt °dH.

For a system volume of 500 litres (boiler and heating elements) with very hard water of 30°dH results in a value of 15,000 lt°dH. In this case you can fill the system with unsoftened water.

A heating system with, for example, a 2,000 lt accumulator results in a system volume of 2,500 litres. Even if the filling water is not too hard, 15°dH for example, a value of 37,500 lt°dH is reached – this is too much. The filling water must be decalcified to 8°dH for a volume of 2,500 litres (20,000 divided by 2,500).

One cubic metre of water at 15°dH contains approx. 0.25 kg of boiler scale. On half a square metre of boiler heat exchanger wall (scaling concentrates on this small surface area) it would form a 0.2mm thick boiler scale crust. This does not sound very serious, but with 2 m³ accumulator and 1 m³ system volume this would mean a thickness of 0.6 mm. With thicker layers, the flow of heat through the boiler wall is already so restricted that the boiler wall is no longer adequately cooled and cracks may occur due to thermal stress.

In practical terms this means that the boiler will survive one filling t with water that has not been decalcified, assuming there is no need to repair the heating system and that there are no leaks during its service lifetime (defective bleeders or safety valve failing to close) forcing you to top the system up with water.

To make sure you have a sufficient safety margin for topping up, you must fill up the new system with decalcified water. Make sure you fill the system entirely with decalcified water before first boiler commissioning. It is too late to change this after you have used the boiler as the scales from the non-decalcified filling will already have spread through the boiler.

To reduce the need to change the water in case of repairs to the system at a later time, your ETA heating system has the ability to shut off all large volume components, such as accumulator, the boiler and the heating circuits to avoid introducing lime on topping up.

To keep corrosion to a minimum the pH value must be set to between 8 and 9 using suitable inhibitors (trisodium phosphate or caustic soda).

Frost protection

If a house with average insulation is left unheated at low winter temperatures for longer than five days, you will need some kind of active frost protection – at least a heating element in the accumulator or check at least once a week for troublefree boiler operation.

If the building is unoccupied for longer periods of time in winter, you can add up to 30% anti-freeze to the water. To compensate for the disadvantage of lower heating capacity and greater flow resistance,

you will typically need slightly higher flow temperatures.

Insulating the strap-on thermostat

If a pipe is not insulated in the vicinity of a temperature measuring point, the measured temperature will be lower than the actual temperature. For this reason it is important not to do without or skimp the pipe insulation for boiler return line temperature sensors or heating circuit flow sensors. In case of uninsulated pipes, you need at least 20 mm of rock wool as insulating material for 20 cm of the pipe length to insulate the measuring point.

Return temperature rise control

Wood contains water. If the temperature in the boiler is too low, water vapour from the smoke gas will condensate on heat-exchanger surfaces. This can lead to corrosion and a leaky heat-exchanger. To prevent this, the water temperature at the boiler inlet must be at least 60°C. At the return line temperatures are typically lower, return temperature rise control is required – preferably with a mixing valve that adds hot water to the boiler return line within a controlled system.

An intelligent heating circuit control system provides protection against overheating the boiler

If the boiler is running at full power, and the remote control is used to switch a large heating circuit, or several heating circuits at the same time, from day to night temperature, the boiler control unit can prevent more fuel being fed in, but it cannot extinguish the burning wood in the combustion chamber. Even if the air intake is shut off immediately, the hot wood will continue to gasify. The wood gas tar caused by the lack of air would clog the boiler and chimney.

It is thus easier on the boiler, chimney and environment to burn down the wood left in the combustion chamber in a controlled manner. The boiler water temperature would continue to rise if no heating output was used. To avoid excessive temperature, all heating and boiler pumps are switched on when the temperature reaches more than 90°C (factory default) to dissipate the heat that occurs during a controlled boiler shut down into the house.

This prevents the boiler temperature from increasing further and triggering the safety devices.

This protection function is not available if the heating circuits are controlled by a control unit separate from the boiler.

For a heating system without an accumulator a time window on any day in the weekly program should be set to „00:00-00:00 60°C“ in the hot water tank menu to allow heat from the boiler to dissipate.

Automatic deactivation by the ST:

As an additional safety precaution against boiler overheating, the boiler is fitted with a safety thermostat (ST) that switches off the exhaust gas fan when the boiler temperature reaches 105°C (tolerance range 99°C to 105°C). When the boiler temperature has fallen below 70°C the ST can be deactivated. The deactivating button is set into a drill hole in the door frame above the charging door. To deactivate it, it must be pushed deep into the hole, preferably with a match.

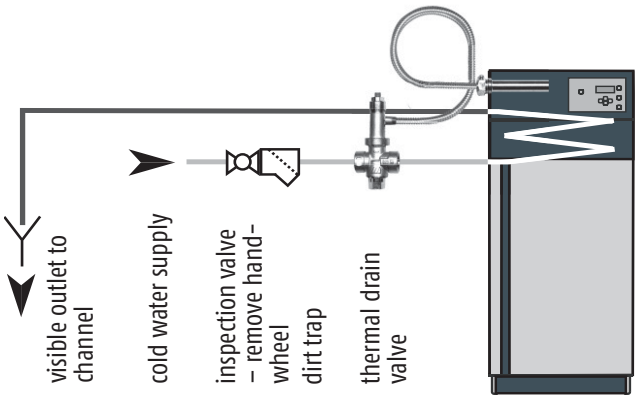
Safety valve (to be supplied by the plumber)

The heating system contractor must install a safety valve with a maximum opening pressure of 3 bar in the boiler flow line. Shut-off valves must not be fitted between the boiler and the safety valve. If solar energy or other sources of heat are fed to the accumulator by means of a heat exchanger, the accumulator must also be fitted with a safety valve (max. 3 bar).

To be able to dissipate heat in case of emergency, the safety valve must be fitted in the boiler flow line. This is the only way to dissipate heat by blowing out hot water and steam.

The outflow must be routed via a clearly visible, open channel (siphon funnel) to the canal for a clear view of malfunctions, and above all to allow valve closing failure to be detected. If there is no canal connection available, the blow out side of the valve must at least be routed through a pipe to the ground to avoid danger to life and limb when blowing out hot water or steam.

Drain Valve, Pressure Compensation, Ventilation, Aeration



Thermal drain safety device (to be supplied by the plumber)

The safety heat-exchanger fitted in the boiler must be connected to the building's cold water supply via a thermal drain valve (opening temperature 95°C) to protect the boiler against overheating in case of pump failure. The inlet must be fitted to the lower connector on the safety heat-exchanger, the upper connector acts as an outlet to the canal. To avoid inadvertent shutting off of the inflow, remove the lever on ball valves, or the hand wheel on valves and use a piece of wire to hang it on the fitting in question.

To be able to detect malfunctions visible routing of the discharge flow is required. The water exiting the system either reaches the canal via a siphon funnel, or is at least routed through a pipe to the floor to avoid danger of scalding if the valve is triggered.

If cold water is drawn from a well with a separate pump, a thermal drain valve still must be fitted to the wood gasification boiler. If you have a generously dimensioned air tank, water will still be available in case of power failure. If the power supply is erratic, an air tank is required for the thermal drain valve.

Pressure compensation

A membrane compensator with a gross content of approximately 10% of the system volume, or a constant pressure system must be fitted to the system's return line between the boiler and the accumulator (see the clause on voiding the warranty on page 4). All shut-off elements in the path from the compensator to the boiler and in the path to the accumulator must be implemented either as capped valves or the hand wheel or lever must be removed from the element (and hung on the valve with a piece of wire) to prevent inadvertent closing.

If the pressure difference between cold and hot heating (accumulator fully loaded) is above 1.5 bar for a single storey heating system, or more than 1 bar for a three-storey heating system, the compensator is too small and must be enlarged.

If you fail to install a sufficiently large compensator, the system will take in air on cooling; this air will be absorbed by the cold water and transported to the boiler. The air escapes from the water again at the point with the highest temperature. This is typically inside the boiler. This inevitably leads to the boiler wall rusting at the place where air escapes.

Ventilation

Automatic ventilation valves in the boiler inlet line at the highest point in the distribution network, and at the top of the accumulator not only mitigate the danger of corrosion but also reduce the need to bleed radiators.

Aeration and ventilation of the boiler room

A boiler requires air for combustion.

In Austria (ÖN H 5170) the legal aeration requirement is 2.2 cm² per kW of boiler output, however, at least 200 cm² of free cross section, and the legal ventilation requirements for systems up to 100 kW boiler output is at least 180 cm² free cross section, and an additional 1 cm² for each additional kW.

In Germany (Muster-Feuerungsverordnung) the legal minimum aeration requirement is 150 cm² for up to 50 kW and as of 50 kW at least 150 cm² free aeration and ventilation cross section + 2 cm² per kW above 50 kW.

If air intake is via channels with a length of more than 1 m calculations by a heating professional are required.

Accumulator

Our heating circuit control system normally does not need an accumulator

When the heating circuit control unit is integrated in the boiler, and the hot water tank is big enough to store the heat of the minimum boiler operating time, an accumulator is not normally required in a normal, solid brick building.

A controlled transition from the heating to the idle phase is guaranteed. As long as gasifying wood remains in the combustion chamber, the supply of air will be maintained, and the residual heat produced will be delivered to the heating circuits. How does the control unit know if there is still some wood left in the combustion chamber? This is detected by reference to the temperature and the residual oxygen content of the exhaust gas in the combustion chamber.

A sufficiently large domestic hot water tank

To be able to use the woodchip boiler without an accumulator in summer, the domestic hot water tank must be large enough to be able to store the heat from a full heating cycle.

Boiler Output	Stancby Volume	Loading Volume	Total Volume-Hot Water Tank	Cooling Surface
up to 50 kW	150 lt	350 lt	500 lt	2,5 m²
up to 90 kW	200 lt	600 lt	800 lt	4 m²
up to 130 kW	300 lt	800 lt	1.100 lt	5,5 m²
up to 200 kW	400 lt	1.100 lt	1.500 lt	8 m²

In case of low heating requirements either install an accumulator or set short heating times

A house with well insulated brick walls (not wooden constructions) is a perfect accumulator itself. The excessive boiler output can be modified to the house's heating requirement by restricting the heating times to three short time windows distributed throughout the day.

If the heating requirements in the transitional seasons autumn/spring are very low, because e.g. only the bathroom is heated, again a restriction of heating times is recommended.

For a wooden house with radiator heating, you should consider installing an accumulator. Even more so, when you do not even have the screed of a floor heating system as storage. If the rated heating requirement is less than 70% of the boiler output, the room temperature changes considerably during the day, even if you do have floor heating, and an accumulator will be necessary. Heat produced by the boiler, which cannot be used in the house at the time, can then be transferred to an accumulator. When needed, i.e. while the boiler is not running, this heat is then returned to the heating system.

When is an accumulator absolutely necessary

An accumulator is absolutely necessary, when the domestic hot water tank is too small to store the heat from the boiler's minimal cycle (see also the table in the section „A sufficiently large domestic hot water tank" on this page) in summer.

An accumulator is absolutely necessary, when the heating circuit control unit is external (separate) from boiler control and the boiler thus does not have access to the heating circuits for its minimal cycle.

An accumulator is absolutely necessary if timers/ thermostats are installed.

An accumulator is absolutely necessary if the rated heating requirement is below 70% of the boiler output in wooden houses with a low thermal storage capacity.

An accumulator is absolutely necessary for hot water requirement that is above the average or hot water peaks, for example in hotels, large apartment buildings, showers near sports centres. (a woodchip boiler needs up to 20 minutes from idle to maximum output. An accumulator makes it possible to bridge this gap).

An accumulator is absolutely necessary for air heating or single hot-air fans which are started without allowing a boiler ramp-up time.

An accumulator is absolutely necessary when integrating a solar collector with a low temperature heating system.

Systems with an accumulator must be filled with decalcified water!

See page 23.

Miscanthus in the woodchip boiler

Miscanthus needs a larger combustion chamber. This is why the maximum possible output of the individual boiler sizes is 70% for miscanthus compared to woodchips.

20 kW woodchip boiler – > 20 kW miscanthus

25 kW woodchip boiler – > 25 kW miscanthus

35 kW woodchip boiler – > 35 kW miscanthus

50 kW woodchip boiler – > 35 kW miscanthus

70 kW woodchip boiler – > 63 kW miscanthus

90 kW woodchip boiler – > 63 kW miscanthus

130 kW woodchip boiler – > 95 kW miscanthus

200 kW woodchip boiler – > 140 kW miscanthus

Miscanthus ash starts to cinder at around 860° and thus at a much lower temperature than wood ash. To avoid cinder in the combustion chamber, lower firing temperatures are required for miscanthus than for wood. This can be achieved by using a flue gas recirculation.

A flue gas recirculation (from the exit point of the boiler to the combustion chamber) increases the gas flow through the grate and the fire and thus cools the grate is more effectively. Distributing the heat from the fire to a larger gas volume helps to create a narrower and more stable temperature range. The temperature range remains reliably over 700°C for complete, clean combustion and reliably below 860°C – far below the cindering point of miscanthus ashes. For wood pellets less oxygen (less air) is used to achieve a higher temperature range between 750° and 950 °C.

Less „fire" in a combustion chamber of the same size also leads to lower combustion temperatures and reduces the danger of cinder. Chaffed miscanthus (but not pellets) can thus be used as fuel in the „oversized" combustion chambers of the 20 and 25 kW boilers without a flue gas recirculation. To allow this, set the general parameter „Fuel" in the „CHIP. BOIL" menu to „Bulk miscanthus" and then correct the „flue gas rec." setting to „NO". Again note that soiled miscanthus can necessitate a flue gas recirculation despite a smaller combustion chamber load.

Theoretically, larger boilers (as of 35 kW nominal output) could be adapted for using miscanthus by restricting their output, but under normal circumstances you will need the higher performance and this makes a flue gas recirculation for miscanthus a must for these boilers.

Very dry carpentry waste

achieves a very high combustion temperature. Glue and coating can also shift the ash cindering threshold downward. Both can cause cinder in the combustion chamber. As an initial measure against cinder, reduce the de-ashing times (see page 17).

If this does not lead to an improvement, you will need to upgrade with a flue gas recirculation, which is available as an optional accessory.

Rotting and mould

Up to a moisture content of approx. 25% the water is bound in the wood fibres. Water above 25% lodges in empty spaces and capillaries between the fibre cells. This unbound water is habitat, and above all a perfect breeding ground for microbes and fungi, which can enter the tree through anomalies in the wood and particularly easily through cuts or breaks.

These microbes convert cellulose and lignin into their basic components carbon dioxide and water. The wood rots, and becomes hollow and soft, totally compromising the heat value in some cases.

When a tree is felled, a race between drying and rotting starts. As the water content drops, the conditions become harder for the microbes until they finally die off at a moisture content of less than 25%. The faster the drying process, the more heating value the wood retains.

In the case of thin branches, microbes have a very large attack surface compared to the volume of the wood. No matter how neatly you stack the branches, heating value losses of more than 25% are typical (even more in wet weather). This is why forestry workers do not collect branches of below 3 to 5 cm, but leaves them as fertiliser for the forest.

It is easy to identify moist or dry wood

Although experts who handle woodchips every day require a furnace test to ascertain the exact moisture content, there is still a very simple way to tell moist and dry woodchips apart. Woodchips that feel dry to the touch will have a moisture content of less than 25% and can thus be stored without any problem. If the woodchips feel wet, the moisture content will definitely be above 35%.

⚠ If the woodchips are dark brown, light and flaky, you have rotten wood which has already lost most of its fuel value. This kind of „compost" will cause all kinds of trouble, but it won't give you good boiler performance.

Do not store green woodchips without ventilation

Woodchips with a maximum moisture content of up to 30% can be stored in a concrete cellar without ventilation.

⚠ If you intend to use green woodchips from a sawmill, never store the woodchips in unventilated bunkers for more than three weeks. An aeration aperture and an extractor fan can evacuate the water vapour that escapes and at least keep mould down.

Woodchips - Quality Charts
The „dream" woodchip would be a finely chopped (G30) hard wood without bark and with low dust content and a water content of less than 20%. It has maximum fuel value, occupies the least storage space and is the perfect fuel for any boiler.
Fine woodchips (G30 or smaller) can be made of dry wood, thus achieving a **higher storage density**.
Woodchips with a **moisture content below 30%** can be stored.
Woodchips from a sawmill with a water content of 40% and **rough composition** are still useful if they are used within a short time or **stored in a well ventilated place**. The boiler performance is not greatly impacted due to the hot, refractory-lined combustion chamber.
Wood that has been **stored for an extended period** (10 years) will have lost about 10% of its fuel value.
Woodchips composed of dry branches and bush cuttings have a higher bark content and a high percentage of fine sawdust, soiling and rotted material. This causes more ash. If the wood used to make the chips was dry, storage problems are unlikely, and the boiler performance impact will be bearable.
Forestry woodchips composed of **green branches cannot be stored** and will considerably impact the maximum boiler performance.
Wood that has been stored in **moist conditions for an extended period** (10 years) will have lost about 50% of its fuel value. Woodchips made of this kind of wood will considerably impact the boiler performance.
The final product of moist wood is **compost,** which can be disposed of in a garbage incinerator but not in a normal boiler. Bear in mind to store in a **well-ventilated place**. The **high**er the **wood water content**, the **rough**er the **cut** has to be. **Never store more than a year's requirement** of woodchips (logs are easier to store and can be more tightly packed).
Be extremely cautious when offered **woodchips composed of waste wood** at a low price, they may contain a high percentage of **rotten material** or **foreign bodies** (nails, pesticides, sand, stones).

Store green woodchips in an open shed

Due to the rotting process, green woodchips develop heat which drives out the water. Wet deposits collect on the surface and you may see water vapour rising. If you expose the pile to wind, it can blow off the excess water, thus allowing roughly chopped woodchips to dry and keeping rot and fungi down to acceptable levels.

The perfect solution is a shed roof well away from living and working accommodation that keeps off

the rain, but lets the wind do its work. At least one side wall of the shed should be fully open. Additionally ventilation apertures in all the other walls improve storage conditions.

Roughly chopped woodchips with a low fine material content dry quickest

Roughly chopped woodchips (make sure you use sharp cutter blades !!!) dry faster and lose less substance due to their superior permeability to air. Best practices indicate dump heights of between 4 and 6 m. This height is also safe with regard to self-ignition, which occurs as of approx. 8 m dump height.

⚠ Very moist material, green material (leaves and needles), bark, a high fine particle content (characteristics that are inevitable for bush cuttings and delimbing material) are not very permeable to air and very active biologically even if chopped roughly. Despite a higher level of self-warming, the drying process is slower due to lack of air permeation and the loss of substance is thus drastically higher.

Dry like hay on a solid surface

Moist woodchips for your own use can best be spread out in a layer of about 10cm on a tarmac or concrete surface on a hot summer's day. Good results are typically obtained on fine, sunny days in autumn after turning the woodchips multiple times. Typically a moisture content of less than 30% is achieved after just two days and the woodchips can be stored in unfavourable conditions if they are this dry.

Drying in a skeleton box with roof

If you are thinking of building a new woodchip store, a roofed skeleton box is a good choice as it allows green woodchips to dry in the air. A windy location is important. The store should also face south to improve the drying process even in winter. The container height depends on the height of the front-end loader required for filling. The lower wall element must be removable so that you can unload the woodchips. The depth can be up to 2 m. The drying time is between 4 and 8 months. A moisture content of less than 20% can be achieved.

Artificial ventilation

Despite a number of pilot projects with solar power, drying with hot air – which is typically blown in through ducts in the floor of the storage bunker – is not really economical. The cost of power for drying is often higher than the fuel value gained.

Dry wood before chopping; fell in winter and chop in summer.

⚠ It is much easier to dry wood before chopping. Intermediate storage before chopping in summer reduces the moisture content to below 30% and makes for easy storage.

Whether you dry whole trees, or trunks and branches separately, depends very much on the accessibility of the forest and on the harvesting methods. A few tips for orientation:

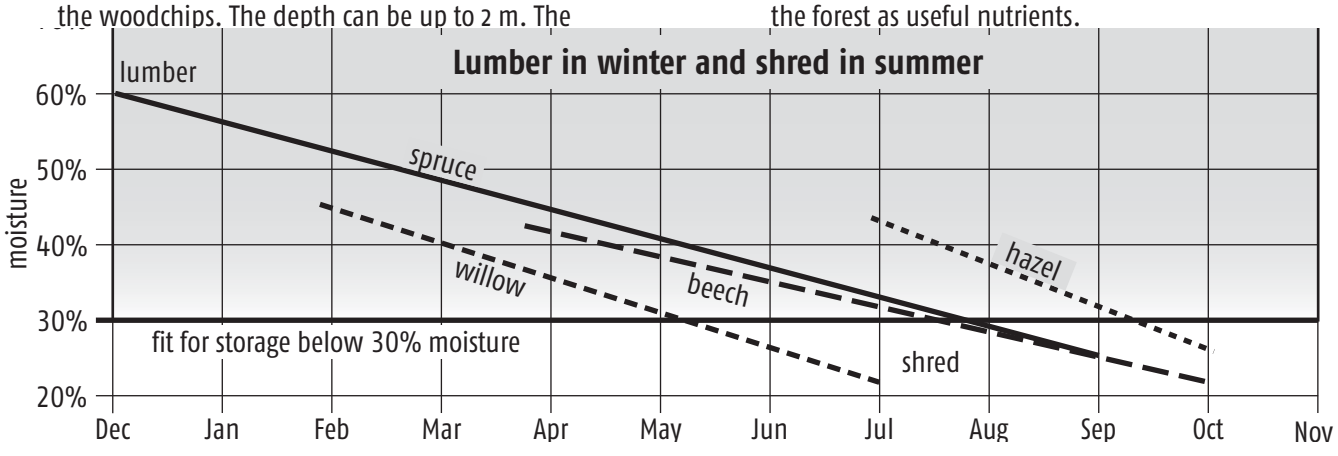
Airy piles, trunks with broken bark, or whole trees dry more quickly and easily. The sun helps the drying process, but wind is absolutely essential.

Softwood should be felled in December at the latest, and stored at least 50 m from the forest due to the danger of pests.

If first thinning of softwood takes place in September, the wood will not attract beetles in spring. You can leave it in the forest without delimbing and chop the whole trees in summer.

Leave green branches in the forest as fertiliser

Leave green branches and tips in the forest; they have no fuel value. However, they should stay in the forest as useful nutrients.



General quality requirements for woodchips	
Criteria	**Grade**
Dustcontent	Dust does not burn as well and is often indicative of rotten or soiled woodchips; for this reason, ÖNORM M 7133 „Woodchips for energy purposes“ defines maximum dust content of 4%.
Large pieces	The fuel contains large pieces of up to 12 cm length. The blade in the rotary valve will cut single large strips. The bulk of the woodchips, yet, should be no longer than 5 cm to avoid fuel feeder blocking.
Dirt	Soil and sand cause the grate to cinder, and necessitate more cleaning.
Green Leaves Green Needles	A layer of woodchips composed of green twigs with leaves or needles in the woodchip dump can cause a barrier that causes rising moisture to condense and thus leads to rotting and mould.
Metal Stones	Although nails and smaller stones will not bring the boiler to a standstill, foreign bodies in the woodchips should be avoided as they cause more wear and tear on the fuel feeder.

Assessing woodchip quality when buying by per cubic meter (bulk volume)					
Criteria	**Grade**			**Impact on Fuel Value**	
Moisture Content	The lower the moisture content, the higher the fuel value. Additionally, the wood shrinks at below 25% moisture content; for this reason, a cubic metre of W20 contains approx. 3% more wood than a cubic metre of W30. For compliance with ÖNORM M 7133 the moisture content is given as a percentage of the total weight (see „Assessing moisture content“ on page 33).			W20 (<20%) W30 (20-30%) W35 (30-35%)	+6% 0% -2,5%
Storage	**Woodchips can be easily stored up to a moisture content of 30%. As of 35% the woodchips will start to mould and rot in case of extended storage (loss of fuel value).**			W40 (35-40%) W50 (40-50%)	-4% -7%
Chipsize	The finer the material is chopped, the more material a cubic metre contains. The size classification in line with ÖNORM M 7133 specifies the average length of a piece in mm (see „woodchip standard size classes“ on page 32).			(G20) G30 G50	+10% 0% -16%
Woodtype	Hardwood is more dense and heavy and thus has a higher fuel value per cubic metre.	Hornbeam, Robinia Copper beech Oak, Ash Birch, Maple	+53% +44% +40% +25%	Pine, Larch Spruce, Alder Fir, Willow Poplar	+19% 0% -6% -19%
Bark Content	The lighter the woodchips are, the less bark they contain. Woodchips from thin branches, or „woodchips with bark“ from sawmills have a high bark content with high ash content and typically also heavier soiling. This means more cleaning. Woodchips composed of fine branches are typically also more prone to rot. High bark content means a higher ash content and thus more cleaning. .			no bark 10% bark 30% bark fine branches	+5% 0% -10% appr.-25%

Assessing quality when buying per kilogram			
Criteria	**Grade**	**impact on fuel value**	
Moisture content	The lower the moisture content, the higher the fuel value. For compliance with ÖNORM M 7133 the moisture content is given as a percentage of the total weight (see „Assessing moisture content“ on page 33).	W20 (<20%) W30 (20-30%) W35 (30-35%)	+12% 0% -12%
Storage	**Woodchips can be easily stored up to a moisture content of 30%. As of 35% the woodchips will start to mould and rot in case of extended storage (loss of fuel value).**	W40 (35-40%) W50 (40-50%)	-20% -32%
Chipsize	The chip size has no influence on the fuel value per kilogram..		
Wood type	Heavy hardwood has a 5% lower fuel value than softwood when dry, and 6% less when green; light hardwood has a 6% lower fuel value when dry, and 7 % when green.	Softwood Hardwood	0% -5 bis -7%
Bark Content	Bark content has virtually no influence on the fuel value per kilogram, however, a high bark content means a **higher ash content and thus more cleaning.**		

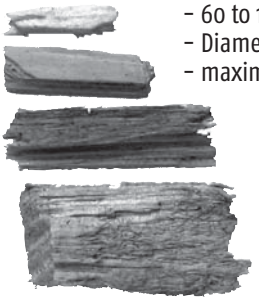
Other fuels	
Pellets	Pellets have a higher fuel density and thus necessitate a flue gas recirculation (available as an optional extra). Pellets are always sold by weight; the fuel value of hardwood pellets (4.60 kWh/kg) is about 6% less than that of softwood pellets (4.9 kWh/kg).
Miscanthus	The fuel value is the same as air-dry softwood; buy by weight if possible. As the ash cinder threshold is very low, you will need a flue gas recirculation to prevent cinder (available on option) (see page 27). To keep boiler corrosion to a minimum, pay attention to non-chlorinated fertilizers (potassium sulphate instead of potassium chloride). No matter whether chaffed or pelletised, miscanthus needs a very large combustion chamber; for this reason, the 35/50 range achieves a maximum heating output of 35 kW, the 70/90 range achieves max. 63 kW, the 130 range max. 95 kW, and the 200 range max. 140 kW.
Old Holz	Wood stored in a dry place loses only the volatile components (approx. 10% of its fuel value). Wood stored in damp conditions will rot (cold oxidation process) entirely compromising its fuel value
Planing chips	The heating value per cubic metre varies greatly and is about 30 to 60% lower than G30-W30 woodchips of the same wood. As woodchips are typically air-dry (15 to 20% moisture content), buy by weight if possible. Planing chips of some hardwood types will cause excessive wear and tear on the refractory-lining in the combustion chamber. Using planing chips, you will not be able to achieve the full nominal boiler output.
Sawdust	The fuel value per cubic meter (bulk volume) is between 25 and 50% lower than G30-W30 woodchips of the same wood. It is best to buy sawdust by weight after measuring the moisture content. The boiler described here is not designed for use with sawdust only. You can expect a drastic performance cut and more cleaning.
Chipboard	From a technological point of view, the boiler is suitable for burning chipboard waste, if fitted with an optional flue gas recirculation, assuming that this waste is free of formaldehyde, pesticides and not PVC coated. Despite this, you will need individual approval from the authorities, and this is typically only granted to wood-working enterprises.
Waste wood	Use only wood that is free of halogens and pesticides for heating purposes. The percentage of rotten wood is typically high, and the fuel value thus low; this type of wood is often contaminated with dust, metal and stones.

	based on weight		Piled meters (pm)				Bulk volume (bm)r **Woodchips G30**				Bulk volume (bm)r **Woodchips G50**			
			Round logs 1 m		**Split logs 1 m**									
	calorific value		**calorific value**		**calorific value**		**Weight**		**calorific value**		**Weight**		**calorific value**	
Moisture %	w=15%	w=30%	w=15%	w=30%	w=15%	w=30%	w=15%	w=30%	w=15%	w=30%	w=15%	w=30%	w=15%	w=30%
Unit	kWh/kg	kWh/kg	kg/pm	kg/pm	kWh/pm	kWh/pm	kg/bm	kg/bm	kWh/bm	kWh/bm	kg/bm	kg/bm	kWh/bm	kWh/bm
Softwood			0,65 sm per pm		0,56 sm per pm		1 bm contains 0,40 sm				1 pm enthält 0,33 sm			
Fir	4,40	3,51	**1.270**	**1.170**	**1.100**	**1.010**	178	205	**780**	**720**	148	171	**650**	**600**
Spruce	4,49	3,58	**1.380**	**1.260**	**1.190**	**1.090**	189	218	**850**	**780**	157	181	**710**	**650**
Douglas fir	4,43	3,53	**1.480**	**1.360**	**1.280**	**1.170**	206	237	**910**	**840**	172	198	**760**	**700**
Pine	4,32	3,44	**1.630**	**1.490**	**1.400**	**1.290**	232	267	**1.000**	**920**	193	223	**830**	**770**
Larch	4,27	3,39	**1.660**	**1.520**	**1.430**	**1.310**	239	275	**1.020**	**930**	199	229	**850**	**780**
Hardwood			0,59 fm je rm		0,50 fm je rm		1 srm enthält 0,40 fm				1 rm enthält 0,33 fm			
Poplar	3,99	3,16	**1.020**	**930**	**870**	**790**	174	200	**690**	**630**	145	167	**580**	**530**
Willow	3,76	2,97	**1.200**	**1.100**	**1.020**	**930**	217	250	**810**	**740**	181	208	**680**	**620**
Alder	4,06	3,23	**1.270**	**1.160**	**1.080**	**990**	212	245	**860**	**790**	177	204	**720**	**660**
Maple	4,04	3,21	**1.550**	**1.420**	**1.310**	**1.200**	260	300	**1.050**	**960**	217	250	**880**	**800**
Birch	4,01	3,18	**1.570**	**1.430**	**1.330**	**1.210**	265	305	**1.060**	**970**	221	254	**890**	**810**
Ash	4,10	3,25	**1.760**	**1.610**	**1.490**	**1.360**	291	335	**1.190**	**1.090**	242	279	**990**	**910**
Oak	4,10	3,25	**1.760**	**1.610**	**1.490**	**1.360**	291	335	**1.190**	**1.090**	242	279	**990**	**910**
Copperbeech	4,13	3,28	**1.800**	**1.640**	**1.520**	**1.390**	295	340	**1.220**	**1.110**	246	283	**1.020**	**930**
Hornbeam	4,06	3,23	**1.920**	**1.760**	**1.630**	**1.490**	321	369	**1.300**	**1.190**	267	308	**1.090**	**990**
Robinia	4,11	3,27	**1.920**	**1.760**	**1.630**	**1.490**	317	365	**1.300**	**1.190**	264	304	**1.090**	**990**

Conversion factors from solid meters (sm) to piled meters (pm) and bulk volume (bm) acc. A. Höldrich, H. Hartmann, M. Schardt (2006): „Rationelle Scheitholzbereitstellungsverfahren" (rational approaches split wood preparation) Report 11 TFZ Straubing Hackgut Andere Brennstoffe Heizwert

Woodchips G30

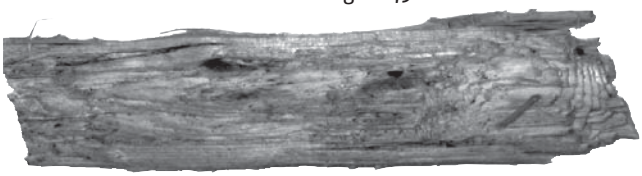
according to ÖNORM M 7133



- 60 to 100% **main component**
- Diameter between 2,8 and 16 mm
- maximum length (nominal length) 30 mm

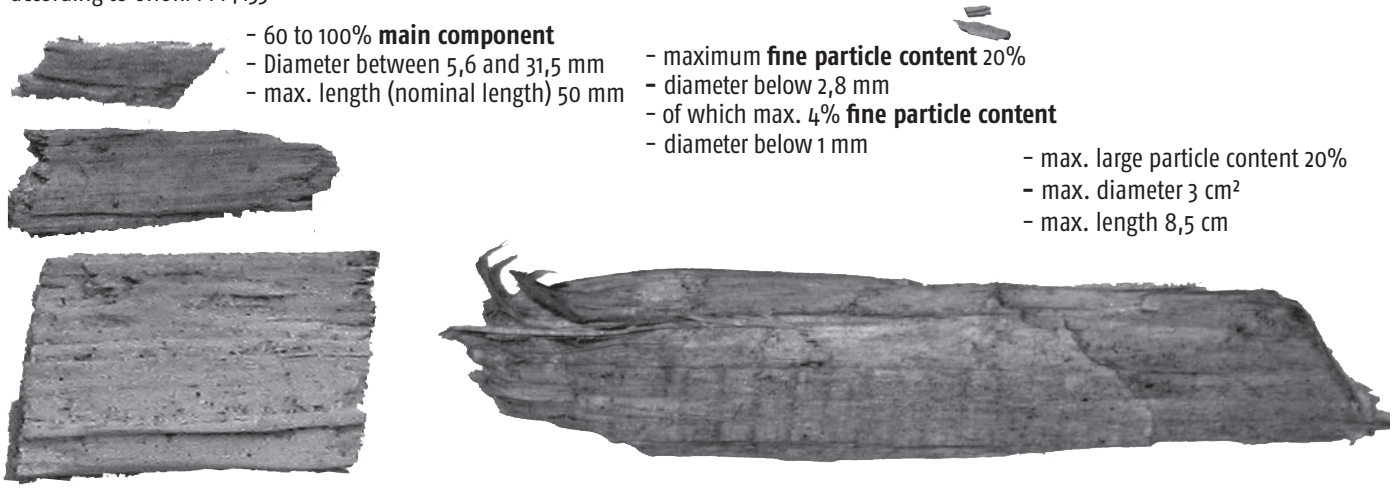
- maximum **fine particle content** 20%
- diameter below 2,8 mm
- of which max. 4% **fine particle content**
- diameter below 1 mm

- max. large particle content 20%
- max. diameter 3 cm²
- max. length 8,5 cm



Woodchips G50

according to ÖNORM M 7133



- 60 to 100% **main component**
- Diameter between 5,6 and 31,5 mm
- max. length (nominal length) 50 mm

- maximum **fine particle content** 20%
- diameter below 2,8 mm
- of which max. 4% **fine particle content**
- diameter below 1 mm

- max. large particle content 20%
- max. diameter 3 cm²
- max. length 8,5 cm

Size classes according to ÖNORM M 7133

Total mass 100%			G 30 fine	G 50 medium	G 100 large
large particle content max. 20%	max. Diameter	cm²	3	5	10
	max. length	cm	8,5	12	25
	Wide mesh – nominal width	mm	16	31,5	63
main component 60 to 100%	Medium mesh – nominal width	mm	2,8	5,6	11,2
Fine component max. 20 %	Fine mesh – nominal width	mm	1	1	1
Finest particles (dust) contained in fine content max 4%					

In the boilers described here, up to maximum P63

Size classes according to prCEN TS 14961

		P16	P45	P63	P100
Large fraction max 1%	mm	>45	>63	>100	>200
Main fraction min 80%	mm	3 - 16	3 - 45	3 - 63	3 - 100
Fine fraction max 5%	mm	< 1	< 1	< 1	< 1

Waste wood class A1 to A4 (Germany)

A1 untreated wood without non-wood content.

Can be used for heating without restrictions.

When A1 waste wood is sold, it may be wood with dry rot that has no fuel value: for this reason you should buy scrap wood by weight only and with a limited water content of 20 or max. 30%.

A2 glued, painted, coated, lacquered waste wood without halogens or pesticides.

Can be used for heating in wood working companies (in Germany as of 50 kW as fuel Cl.7 in line with BImSchV)

A3 waste wood with halogen-organic compounds in the coating, without pesticides.

Can be used for heating by wood working companies with a suitable and approved boiler.

A4 waste wood with pesticide treatment.

Thermal treatment in hazardous waste disposal plants.

Price corrections based on moisture content

Price corrections based on the moisture content are necessary to be able to buy and sell woodchips by weight.
It is typical to agree a basic price for 30 or 20% moisture content and to adjust the kilogram price for a delivery based on the moisture content measurement by deducting a percentage of the price for a greater moisture content or adding a percentage for a lower moisture content.

Softwood				Hardwood		
Surcharges and discounts at **30%** moisture content	Surcharges and discounts at **20%** moisture content	**Fuel value** in kWh / kg	Moistrue content in % of total mas	**Fuel value** in kWh / kg	Surcharges and discounts at **30%** moisture content	Surcharges and discounts at **20%** moisture content
-51,2%	-58,3%	1,71	60%	1,59	-51,7%	-58,8%
-47,8%	-55,4%	1,82	58%	1,71	-48,2%	-55,8%
-44,4%	-52,5%	1,94	56%	1,82	-44,8%	-52,9%
-40,9%	-49,6%	2,06	54%	1,93	-41,3%	-50,0%
-37,5%	-46,6%	2,18	52%	2,05	-37,9%	-47,0%
-34,1%	-43,7%	2,30	50%	2,16	-34,5%	-44,1%
-30,7%	-40,8%	2,42	48%	2,27	-31,0%	-41,1%
-27,3%	-37,9%	2,54	46%	2,39	-27,6%	-38,2%
-23,9%	-35,0%	2,66	44%	2,50	-24,1%	-35,3%
-20,5%	-32,1%	2,78	42%	2,62	-20,7%	-32,3%
-17,1%	-29,1%	2,90	40%	2,73	-17,2%	-29,4%
-13,6%	-26,2%	3,02	38%	2,84	-13,8%	-26,4%
-10,2%	-23,3%	3,14	36%	2,96	-10,3%	-23,5%
-6,8%	-20,4%	3,25	34%	3,07	-6,9%	-20,6%
-3,4%	-17,5%	3,37	32%	3,18	-3,4%	-17,6%
0,0%	-14,6%	3,49	**30%**	3,30	**0,0%**	-14,7%
3,4%	-11,7%	3,61	28%	3,41	3,4%	-11,8%
6,8%	-8,7%	3,73	26%	3,52	6,9%	-8,8%
10,2%	-5,8%	3,85	24%	3,64	10,3%	-5,9%
13,6%	-2,9%	3,97	22%	3,75	13,8%	-2,9%
17,1%	**0,0%**	4,09	**20%**	3,86	17,2%	**0,0%**
20,5%	2,9%	4,21	18%	3,98	20,7%	2,9%
23,9%	5,8%	4,33	16%	4,09	24,1%	5,9%
27,3%	8,7%	4,45	14%	4,21	27,6%	8,8%
30,7%	11,7%	4,57	12%	4,32	31,0%	11,8%
34,1%	14,6%	4,68	10%	4,43	34,5%	14,7%
37,5%	17,5%	4,80	8%	4,55	37,9%	17,6%
40,9%	20,4%	4,92	6%	4,66	41,3%	20,6%
44,4%	23,3%	5,04	4%	4,77	44,8%	23,5%
47,8%	26,2%	5,16	2%	4,89	48,2%	26,4%
51,2%	29,1%	5,28	0%	5,00	51,7%	29,4%

Oven method of ascertaining moisture content

One kilogram of woodchips is spread over an oven tray and dried in the oven for 6 to 12 hours at a temperature of 101 to 104°C. To make sure that the temperature is above 100° C in a normal electric oven, you can set the temperature to 110°C, but no more: a slight raise in temperature will cause the wood to start gasifying. Fine and very wet chips need to be turned several times. The difference in weight between the wet and dry samples corresponds to the moisture content.

Longer intermediate storage of the sample can falsify the results of the moisture content test.

Take samples after transportation

The upper layers of a woodchip dump contain 10% to 30% more moisture than the core. Loading and unloading in the course of transportation mixes the material. If you take a sample of about 1 litre at 5 different places which are at least 20 cm below the surface (but never on the surface) from each batch you should have a good average.

Taking a test sample from the total sample

Multiple loads will yield more than 1 kg of sample material. To reduce the amount, mix the material by shoveling onto a new heap taking care to empty the shove above the top of the heap, thus allowing the material to spread over the full surface of the heap. Then flatten the tip and take two opposite quarters from the heap. Repeat the mixing and removing process until you have two test samples of 1 kg each. 1 kg for the buyer, who will typically ascertain the water content using an oven, and 1 kg for the seller as a counter-sample. The volume of one kilo is approx. 3 litres for moist, heavy woodchips and up to 5 litres for very dry, light material.

Moisture content and humidity

The moisture content has established itself as the typical criterion for fuel wood, whereas lumber traders will typically state the humidity of the wood.

$$\text{moisture content [\%]} = \frac{\text{moisture in wood [kg]}}{\text{Total mass of wood[kg]}} \times 100$$

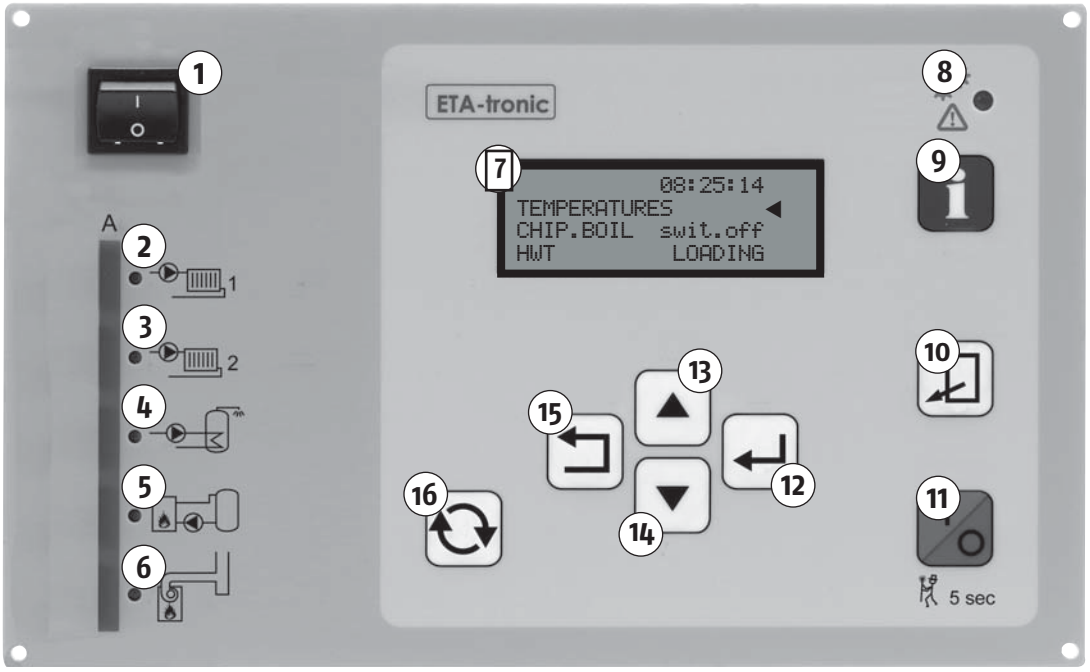
$$\text{moisture content [\%]} = \frac{0{,}25\ \text{kg}}{1{,}0\ \text{kg}} \times 100 = 25\%$$

$$\text{humidity [\%]} = \frac{\text{moisture in wood [kg]}}{\text{dry mass of wood [kg]}} \times 100$$

$$\text{Feuchte [\%]} = \frac{0{,}25\ \text{kg}}{0{,}75\ \text{kg}} \times 100 = 33{,}3\%$$

Converting humidity to moisture content

$$\text{Moisture content[\%]} = \frac{\text{Humidity [\%]}}{100\% + \text{humidity [\%]}} \times 100$$



1 **Mains switch**

2 **Heating pump 1**
Status LED (green = operational)

3 **Heating pump 2**
Status LED (green = operational)

4 **Boiler pump**
Status LED (green = operational)

5 **Accumulator pump**
Status LED (green = operational)

6 **exhaust fan**
Status LED (green = operational)

7 **Display**

8 **Status-LED**
green = operational, red = malfunction

9 **[INFO]** key for help texts, explains setup and display values, provides help for troubleshooting and error messages.

At SERVICE permission level, press the **[INFO]** key twice to display the connection points (plugs) for the inputs and outputs, and to allow you to move the standard assignment to other pins.

10 **[De-ashing]**-key for the manual start of ash-removal.

11 **[I/O]**-key for start of manual operations.
After remedying an error, press this key to restart boiler operation. The green LED on this key is lit if the boiler is in firing mode or ready to operate.The LED goes out, when the boiler is switched off or if an error exists.

12 **[Yes]**-key: Entering sub menues,
Confirm/save input values
Acknowledge error messages

13 **[Up]**-key: Cursor up, increase values.

14 **[Down]**-key: Cursor down, decrease values.

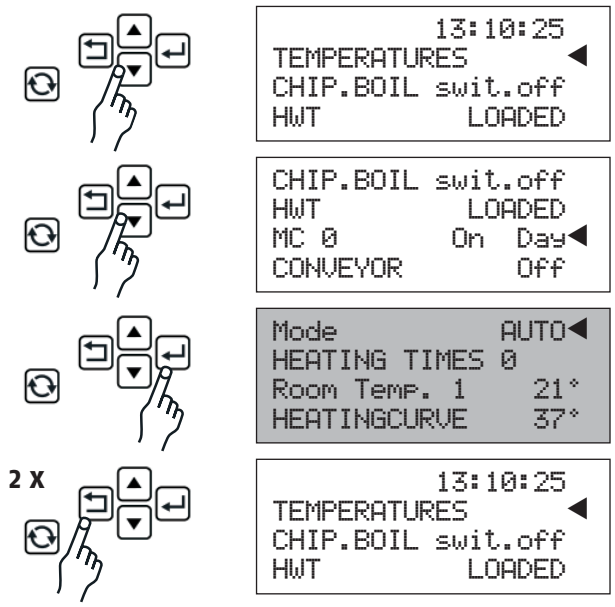
15 **[Back]**-key: Back to parent menu or quit without saving.

16 **[Modify]**-key: release setting for modification, Press twice to return to factory defaults.

Measuring emissions

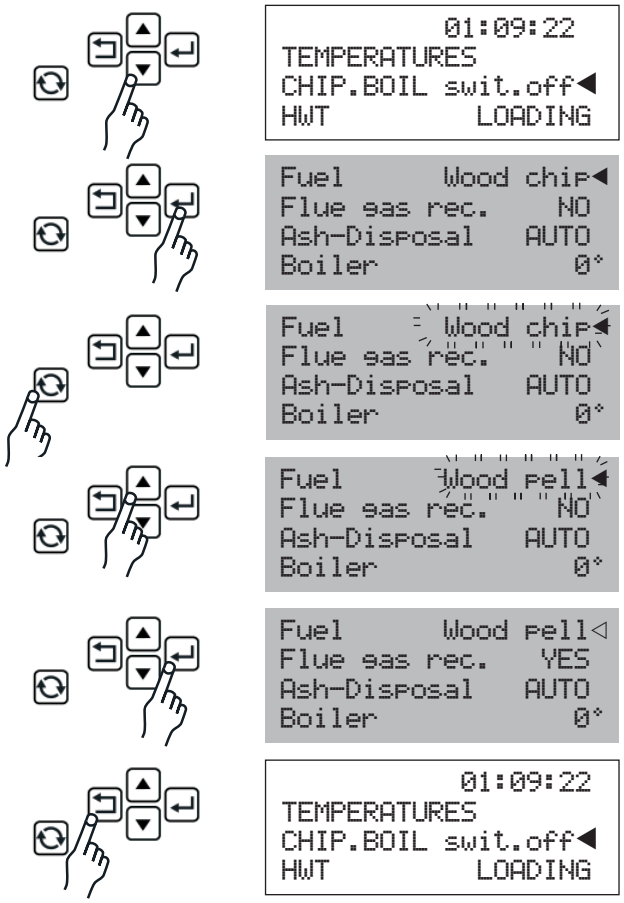
Keep the **[I/O]** key (11) pressed (for about 5 seconds) until "Emission measurement length 30 min." appears on the display (LED in the **[I/O]** key flashes). The boiler will revert to normal operations if the **[I/O]** key is pressed again or automatically after 30 minutes.

Observe the instructions on page 5 for performing emission measurements.



For this manual the following applies:
white display = main menu
gray display = sub menu

Pressing the **[⮌]** button repeatedly always takes you back to the main menu. From the main menu press **[↵]** once to enter the Temperature display.



Accessing and exiting submenus

1. Press the [▼] or the [▲]buttons to select the desired line,

A solid black cursor
◀ indicates a submenu.

An outlined cursor
◁ indicates that there is no submenu.

2. Press the [↵] key to select the submenu.

3. Press the [⮌] key to exit a submenu.

Changing Settings (parameters)

Using the general parameter "Fuel", for example, all fuel-dependent values can be modified.

In the main menu (repeatedly [⮌]),
use the [▼] to scroll down to line CHIP.BOIL ,
press [↵] to enter the submenu,

1. Press the [⟳] to release for modifications. The cursor changes to a questionmark and the value starts flashing.

2. Use the [▼] or [▲] keys to alter the parameter.

(For settings where a factory default is available, press the **[⟳]** button twice to return to factory default; this is not the case for the „Fuel" parameter)

3. Press the [↵] key to save modifications, the cursor changes back to its initial shape, the arrow cursor.

   or
   press the [⮌] key to cancel without saving the cursor changes back to its initial shape and the old value is being displayed.

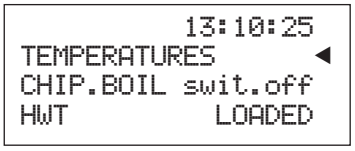
When you change the general parameter „Fuel" from „Woodchips" to „Wood Pellets" the „Flue gas rec." parameter automatically changes from „No" to „Yes". (Of course, the optional flue gas recirculation accessory must be fitted for orderly operations).

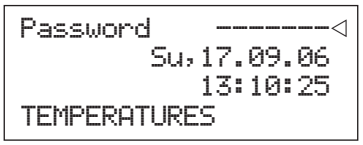
Setting permissions

To change settings such as heating times, heating curves and hot water tank charging, you need a permission level of at least CUSTOMER. You can set this in the main menu.

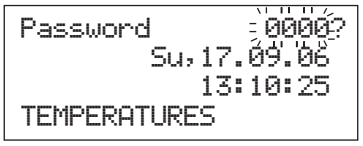
First go back to the main menu by pressing the **[⮌]** button multiple times.

Press [▲] or [▼] to move the cursor to the Password line at the right of the display. This should read CUSTOMER .

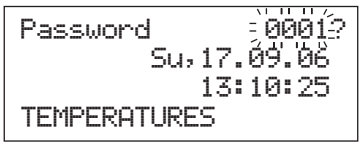




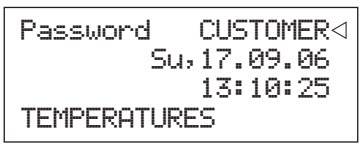
If not, press **[⟳]** to change. The cursor changes to a question mark and four zeros start flashing.



Press [▲] to set to 0001 and then **[↵]** to save.



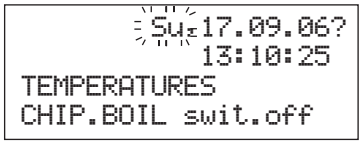
The CUSTOMER permission level appears, where you can set heating times, heating curves, room temperatures,the hot water tank charging, the date, time and similar items without endangering the system configuration specified by your heating professional.
If you delete the password by pressing 0000 , you can only view the operating status, but not change any values (child protection)



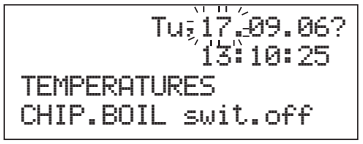
Setting the date

In the main menu press [▼] or [▲] to move the arrow cursor to the date line, and then press **[⟳]** to change the setting. The weekday starts flashing.

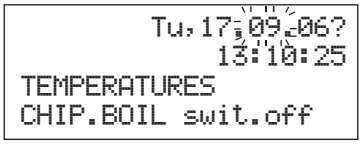
Press [▼] to set the weekday and then **[↵]** to save.



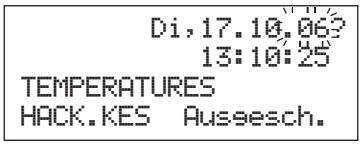
The day starts flashing. Press [▼] or [▲] to set the day and then **[↵]** to save.



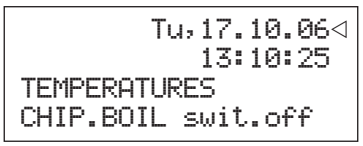
The month starts flashing. Press [▼] or [▲] to set the month and then **[↵]** to save.



The year starts flashing. Press [▼] or [▲] to set the year and then **[↵]** to save.

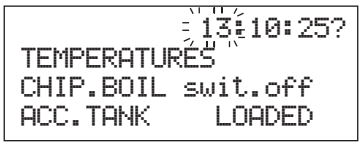


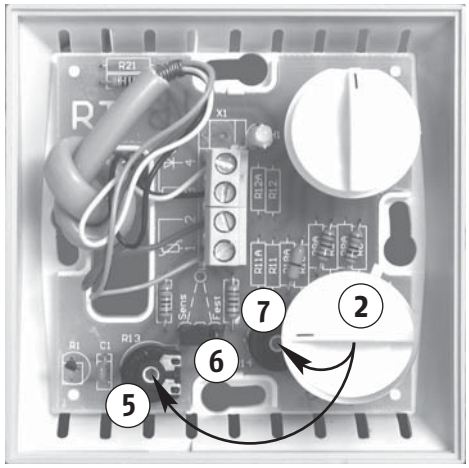
The question mark cursor turns back into an arrow, and the new date is saved.

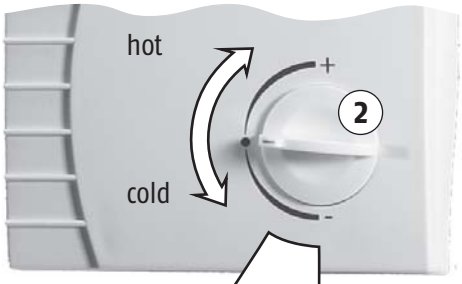


Setting the time

In the main menu press [▼] or [▲] to move the arrow cursor to the time line, and then press **[⟳]** to change the setting. The hour starts flashing. Press [▼] or [▲] to set the hour and then **[↵]** to save. The minutes start flashing; set and store, and then go on to set and store the seconds.







If the room sensor is disabled, the heating pump is switched off in this range!

Night-Clock-Day

Use the operating mode switch (1) to toggle the following operating modes:

- =NIGHT and/or night set-back (Temperature setting in „MC .. -> Room ..“)
- = AUTOmatic switchover between DAY and NIGHT (time setting in „MC .. -> HEATING TIMES..“) “)
- = DAY and or heating operations despite higher outside temperatures,above the preset heating thresholds. (Temperature setting in „MC .. -> Room ..“)

Disabling heating operations

In transitional periods you can set the operating mode switch (1) to the position to switch off the heating, and conversely switch on via or

Room temperature adjustment

You can use the setup button (2) to increase the desired room temperature by up to 5°C, or reduce the value by up to 5°C.

The desired room temperature increase is subtracted from the measured room temperature by the room unit, whereas a room temperature decrease is added to the measured room temperature . Thus, the room temperature shown by the boiler controls only accurately reflects the room temperature if the room temperature adjustment is set to middle position.

Display LED “Malfunction“

LED (3) flashing red = WARNING, ERROR or ALARM.
LED (3) shows red = add logs requested.

Adjusting the room sensor

Press down the handle (4) to open the cover; set temperature adjustment (2) to middle position, use the potentiometers R13 (5) to adjust the measured room temperature. Use the temperature setup button (2) as a tool to adjust the temperature. The room temperature is shown in the „TEMPERATURES“ menu as „Room MC ..“.

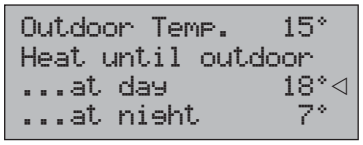
Switching off the room sensor function

If a room sensor is fitted in a room with an impairing factor such as a tiled stove, or in a room such as the kitchen, it is necessary to disable the room sensor function. If the room sensor is disabled, the temperature adjustment (2) value is applied directly to the flow temperature and the heating circulation pump is switched off at 3°C (factory default) temperature reduction at the adjustment button.

Press down the handle (4) to open the cover, and move the jumper (6) from the left-hand position (sensor) to the right „Fixed“. You need to set the parameters „PRESET Night“ and „PRESET Day“ in „MC -> Room“ on the control unit to the same value of 21°C. You may need to adjust the fixed temperature value in the room unit to 21° C using potentiometer R14 (7).

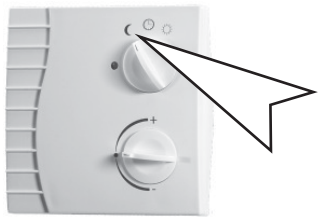
Eíther use the controls to switch off the heating automatically:

The factory default for the control unit of heating systems with external temperature sensor in „AUTO (timer)" operations is to stop heating at outside temperatures above 18°C in the daytime, and 7°C in the night time. Correct the threshold temperatures in the MC .. menu -> Heat until outdoor to set the automatic summertime heating systems switch off and to adapt to your requirements (see section "Outdoor temperature dependent heating threshold" on page 40).



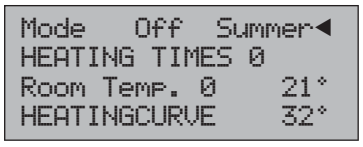
Or use the room sensor to switch off the heating in summer:

If a room sensor with remote control is installed, you can use ☾ to switch the heating off irrespective of the outside temperature driven heating threshold and you can use ☼ to switch it on (permanent operations even if the outside temperature is above the heating threshold).



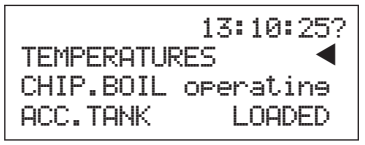
Or switch off manually at the control unit:

If you do not have a room sensor with remote control, and the room temperature is not influenced by short periods of cold weather as the building walls are very thick, you can typically set each heating circuit in the „MC .." -> „Mode" menu to Off Summer (see the following description).

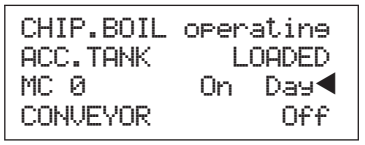


Operating mode „Off Summer" or „AUTO"
without room sensor/remote control „DAY" and „NIGHT" settings

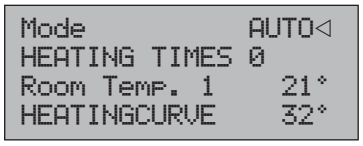
Press **[⮌]** multiple times in the main menu, then press [▼] or [▲] to move the arrow cursor to the right of the display to the MC .. line; then press **[↵]** to confirm. A submenu starting with Mode appears. The following values may be shown in this line:



AUTO for automatic heating operations controlled by the week timer. You can use the remote control on the room sensor, or text-SMS, to change this operating mode to DAY or NIGHT without this being shown here. This setting also activates automatic, outside temperature driven summer switch-off.

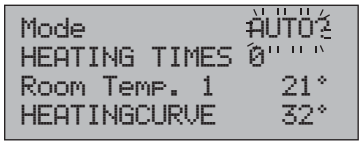


Off Summer switched off for heating operations



JOURN for night time set-back up to end of preset holiday (see page 47..

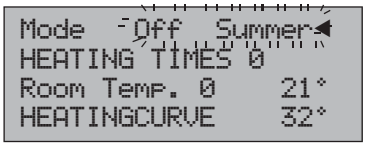
If you do not have a room sensor with remote control, you can also set the following operating modes here



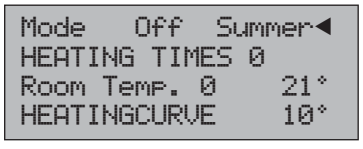
DAY for permanent heating to day temperatures and

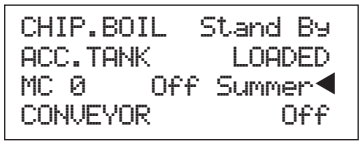
NIGHT for night setback operations.

In our example, the current operating mode is MODE AUTO . Press **[⟲]** to change.
The arrow at the right changes into a question mark and AUTO starts flashing.



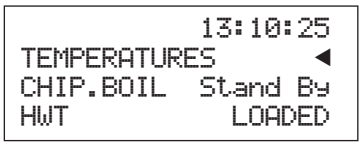
Press [▼] to set to Off Summer and then **[↵]** to save. The question mark cursor becomes an arrow, and Off Summer is shown (non-flashing).
Press **[⮌]** once to go back. Now you can see the MC .. line. The text should now read Off Summer , and the heating should switch off. If the MC .. shows a different text, refer to page 39 of this User Manual to find out what the display means.





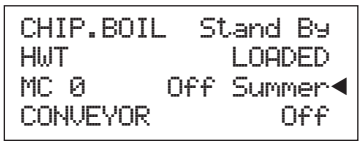
Using the room unit to change from summer to winter:

If you have installed room sensor, set the operating mode switch to position. If a GSM connector (mobile phone based remote control) is installed, set the operating mode switch to another position for a short time, and then back to the desired operating mode to delete the text remote command. Check if heating operations have been enabled using the **[⅛]** button on the boiler (green LED in the button must be lit).



You may need to correct automatic summer switch.

If `Off out>day` is displayed for the heating circuit, you may need to correct the heating threshold for the automitic change between summer and winter (see section „Outside temperature dependent heating thresholds“ on page 40)



For systems without a room sensor, switching via boiler controls:

If you do not have a room sensor, switch from `Off Summer` to `AUTO` in the „MC (HP)“ -> „Mode“ menu (see also page 38).

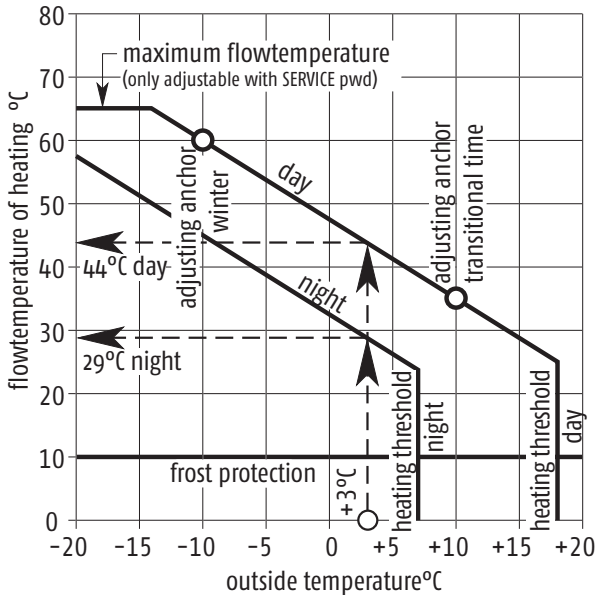
If your heating will still not start:

Firstly, press the **[⮌]** button multiple times to go to the main menu, then press [▼] or [▲] to access the heating circuits. These circuits are referred to as a `MC` (mixing circuit) for short; even if without mixer but with pump. The mixing circuits are numbered „0“ or „1“ boiler side, and „1“ through „4“ for heating circuit extensions (a second heating circuit was retrofitted to the woodchip boiler. Unfortunately, the number „1“ was assigned twice).

Press [▼] or [▲]to go to line MC .. , if this line reads:

`Off Summer`	Heating circuit off for summer operations - to switch to winter operations see section„Off Summer“ or „AUTO“ operating mode on page 38.
`Off out>day`	Heating circuit off for the outside temperature is higher than the preset heating threshold for heating operations; you may need to correct the heating threshold – see section „Outside temperature dependent heating thresholds“ on page 40.
`Off out>night`	Heating circuit off as the outside temperature is higher than the preset heating threshold for heating operations; you may need to correct the heating threshold – see section „Outside temperature dependent heating thresholds“ on page 40..
`Off SP day<R`	Heating circuit off as the preset room temperature is lower than „room .. SET day“ (with remote control), you may need to correct the temperature on the room sensor or increase in the menu „MC.. -> Room ..“ -> Room ..“ SET day“ – page 42.
`OffSPnight<R`	Heating circuit off as the preset room temperature is higher than „room .. SET night“ (with remote control), you may need to correct the temperature on the room sensor or increase in the menu „MC.. -> Room ..“ “Room .. SET night“ – page 42.
`Off SPday<`	Mixing circuit off as set flow temperature is below 18°C (without remote control).You may need to increase the heating curve „Flow at +10° outside temp.“ – page 41.
`Off SP Night`	Mixing circuit off as set flow temperature is below 18°C (without remote control). You may need to increase the heating curve „Flow at +10° outside temp.“ – page 41.
`Off Bo Temp.<`	Heating circuit off as the boiler temperature is lower than the release temperature; heat the boiler, or wait for the boiler to reach the release temperature of the heating circuit.
`Off AccTemp.<`	Heating circuit off as the accumulator temperature is lower than the release temperature (menu „MC ..“ -> „ReleaseTemp.“).
`On Day`	Heating circuit in heating mode (remote control set to „Timer AUTO“). Without a room sensor you can select in the menu “MC..“ -> „Mode“ between “DAY“, “NIGHT“ and “AUTO“.
`On Night`	Heating circuit in night time set-back mode (remote control set to „Timer AUTO“). Without a room sensor you can select in the menu “MC..“ -> „MODE“ the operating mode.
`on ext. day`	Heating circuit set to heating mode via remote control (operating mode switch or text message).
`on ext.night`	Heating circuit set to night time set-back mode via remote control (operating mode switch or text message).
`HW Prio.`	Heating circuit off as hot water charging is active.
`Frostprot.`	Heating curcuit on as frost protection function is active (minimum running time typically 1/2 hour).
`On OverTemp`	Heating circuit activated due to boiler over temperature.
`ScreedDry`	The heating circuit is in automatic „Screed Drying“ mode
`Fault`	See the “ERROR DISPLAY“ menu

Heating Curve



This diagram shows the **factory default settings**.
If the control unit settings for your system have been modified, the settings may use a lower heating curve for under-floor heating, and a higher heating curve for radiator heating.

Day: Adjust the heating curve for daytime operations by setting two reference points. The control unit uses these points and the current outside temperature to calculate the required flow temperature (for example at +3°C outside temperature and 44°C flow, or for -5°C outside and 54°C flow). If a room sensor is installed, this temperature is adjusted and the actual flow temperature can be higher or lower.

Heating threshold day: The heating system is switched off when an adjustable outside temperature (18°C in our example) is reached.

Night: During the night the heating curve drops by the adjustable "night time temperature drop" value compared to daytime.

Heating threshold night: The heating system will switch of during the night when the adjustable outside temperature value (7°C in our example) is exceeded.

Maximum flow temperature: This threshold value protects your heating system. Underfloor heatings are typically limited to 40°C, up to 85°C are possible for radiators with metal piping (SERVICE permission level required to adjust).

Frost protection: If the flow temperature or the temperature measured by the room sensor is below 10°C (not adjustable), the heating circuit pump is switched on. If an average brick house remains unheated for more than 5 days in winter, check at weekly intervals to make sure the boiler is working properly.

Outside temperature-dependent heating threshold (automatic switch off)

Press **[⮌]** multiple times in the main menu, then press [▼] or [▲] to move the arrow cursor to the right of the display to the `MC 0` line; then press **[↵]** to confirm.

A submenu starting with `MODE` appears.

Press [▼] or [▲] to access the . `...at day` line, and then press **[⟳]** to modify.

The arrow cursor at the right changes into a question mark and the temperature value starts flashing.

Press [▼] or [▲] to set the new temperature value for `...at day` , and then press **[↵]** to save. The question mark cursor becomes an arrow, and the new temperature value is shown (non-flashing).

```
CHIP.BOIL operating
HWT              LOADED
MC 0             On Day◄
CONVEYOR            Off
```

```
MODE               AUTO◄
HEATING TIMES 0
Room Temp. 0        22°
HEATINGCURVE        44°
```

```
Outdoor Temp.      17°
Heat until outdoor
...at day          18°◁
...at Night         7°
```

```
Outdoor Temp.      17°
Heat until outdoor
...at day          18°?
...at Night         7°
```

```
Outdoor Temp.      17°
Heat until outdoor
...at day          16°◁
...at Night         7°
```

The heating threshold for . `...at night` is also the frost protection temperature

⚠ For outside temperatures below 0°C you should at least switch on the pumps of your heating system to warm the cold parts of the heating system (pipes on outer walls) using the residual heat in the house. To ensure frost protection never set the night time threshold `...at night` below 3° for normal heating systems.

Adjusting the flow temperature

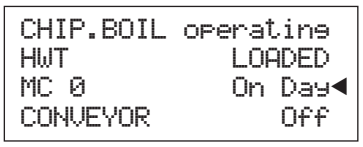
If the house is constantly too warm, or too cold, you will need to adjust the flow temperature. Press **[⮌]** multiple times in the main menu, then press [▼] or [▲] to move the arrow cursor to the right of the display to the heating circuit you wish to adjust, this is `MC 0` in our example; then press **[↵]** to confirm.

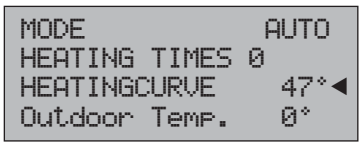
A submenu starting with `MODE` appears. Press [▼] or [▲] to place the cursor in the `HEATINGCURVE` line, and then press **[↵]** to select it.

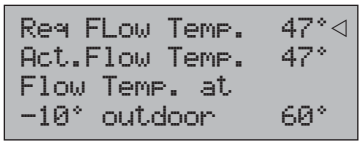
A submenu starting with `Req Flow Temp.` . appears. In the first two lines you can compare the rated flow temperature (first line) calculated by the control unit with the current flow temperature (second line).

`Req Flow Temp.` is a set of values calculated by the control unit by reference to the heating characteristic, heating times/night time temperature drop, room sensors adjustment, outside temperature driven heating thresholds,frost protection and maximum flow temperature.

Press [▼] three times to view the settings for the heating curve. The curve is displayed in the form of two reference points, one for an outdoor temperature of -10º, and the second for an outdoor temperature of +10º.







If the above zero outdoor temperature

is too hot or too cold, you can adjust the flow for `+10° outdoor` and leave the temperature settings for -10°C unchanged.

If the below zero outdoor temperature

is too high or too low, you can adjust the flow for `-10° outdoor` temperature and leave the temperature settings for +10°C unchanged. Was the flow temperature correct at the start of the heating season, or was it adjusted?

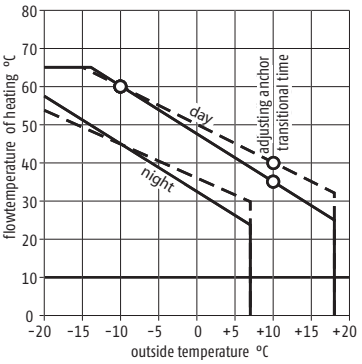
The control unit uses these two temperature reference points to calculate a heating curve and based on this the flow temperature required for the current outside temperature. The night curve is linked via the night time temperature drop value to the day time curve, and is thus automatically adjusted.

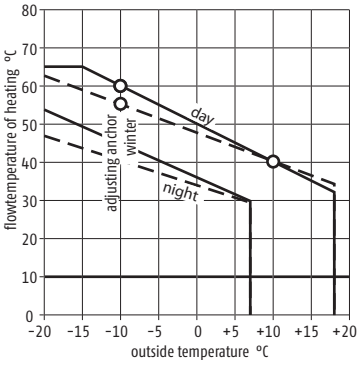
Thus move the cursor to the `-10° outdoor` temp. line in winter, and to the `+10° outdoor` temp. line in transition periods. . Press [🔄] to change. The arrow at the right changes into a question mark and the temperature value starts flashing.

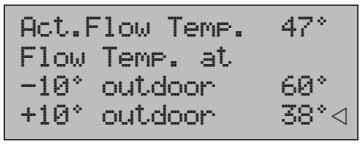
Press [▼] or [▲] to set the temperature and then [↵] to save. The question mark cursor becomes an arrow, and the new temperature value is shown (non-flashing).

For underfloor heating with plastic pipes, never set a temperature of more than 40°C.

Always make gradual adjustments. Never more than 3° for under-floor heating and never more than 6° for radiators. You may need to readjust after one or two days. But gradual adjustments are more precise and ensure an economic use of energy.







Night setback

Excessive use of night setback is not recommended. Walls cooling down excessively over night mean that far higher air temperatures are required in the morning. This compromises the energy savings made during the night while at the same time impacting user comfort.

reference values:	radiator			floor
-10° outdoor	40°C	60°C	80°C	30 - 40°C
Night Set-back	5 - 8°C	10 - 15 °C	15 - 22°C	3- 5°C

Room temperature rated value (only with room sensor)

Adjust the room temperature rated values at the control unit, if you frequently reach the maximum or minimum settings on the room sensor while adjusting the room temperature, or if you wish to modify the night time temperature drop values.
Press [⮌] multiple times to get to the main menu. In the main menu press [▼] or [▲] to move the arrow cursor (on the right of the display) to the heating circuit you wish to adjust. In this example this is `MC 0`. Then press [↵] to confirm.

A submenu starting with `Mode` appears. Press [▼] or [▲] to select `Room Temp. 0`, and then press [↵] to go to the submenu.

The `Room Temp. 0` temperature displayed is not the actually measured room temperature. The preselected room temperature increase is subtracted from the measured room temperature (by the room unit), whereas a room temperature decrease is added to the measured room temperature. Only if the temperature adjustment indicator at the room unit is in neutral/ middle position, the the boiler control unit displays the actual, current room temperature.

Press [▼] or [▲] to select the rated value `...at day` or `...at night`, and then press [⟳] to change.

The arrow cursor at the right changes into a question mark and the temperature value starts flashing. Press [▼] or [▲] to set the temperature and then [↵] to save. The question mark cursor becomes an arrow again, and the new temperature value is shown (non-flashing).

Adjusting the length of heating periods

To extend the daytime temperature period to 11.00 pm on Friday and Saturday:

Press [⮌] multiple times to get to the main menu, then press [▼] or [▲] to move the arrow cursor to the heating circuit you wish to adjust. In this example, this is `MC 0`. Press [↵] to confirm.

A submenu starting with `Mode` appears. Press [▼] or [▲] to select the `HEATINGCURVE` item, and then press [↵] to enter the submenu.

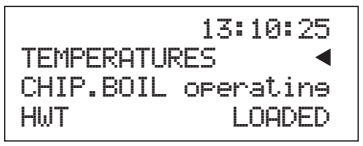
In the submenu, press [▼] or [▲] to select Fr (Friday), and then press [↵] to enter the 4th level menu.

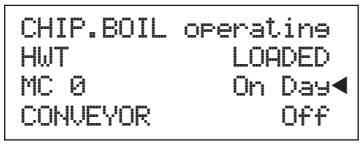
In the 4th level menu, press [▼] or [▲] to select the last line, 16:00-20:00. Then press [↵] to change the value.

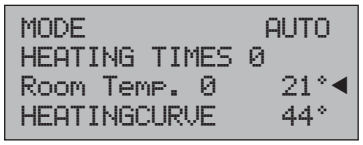
The first 2 digits starts flashing. As you do not wish to adjust the starting time, press [↵] twice to move to the hour value of the end time.

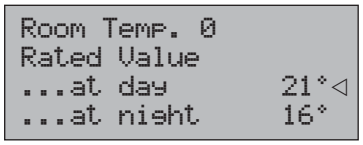
When the first 2 digits of the end time start flashing, press [▼] or [▲] to adjust and then press [↵] to store the value.Press [↵] again to go to the next 2 digits , or store your changes at the end of the line.

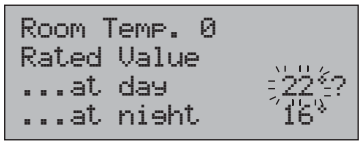
To copy the time, you have just set, to Saturday, press [▲] to access the top line `Fr ,copy to:---`, and then press [⟳]. When you access this item, the word `ALL` for all days start flashing. Press [▼] or [▲] to move the cursor to Sa for Saturday, and then press [↵] to select. To show that the copy operation has been completed, `Sa ?` changes to `--- ◁`

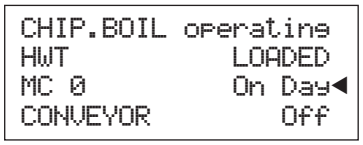


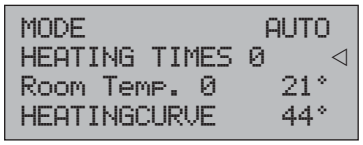


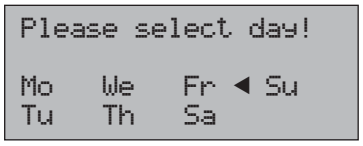


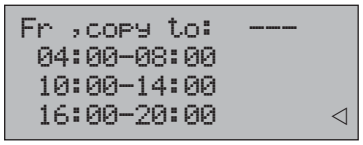


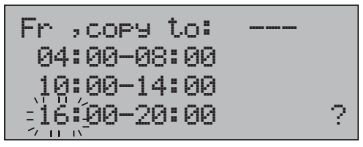


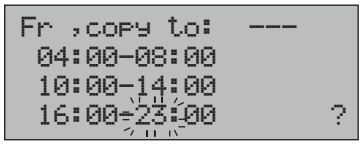


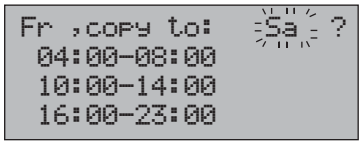












Hot water supply outside of the programmed charging times

If hot water tank loading is temporarily blocked by time windows, it is still possible to start hot water heating between loading times.

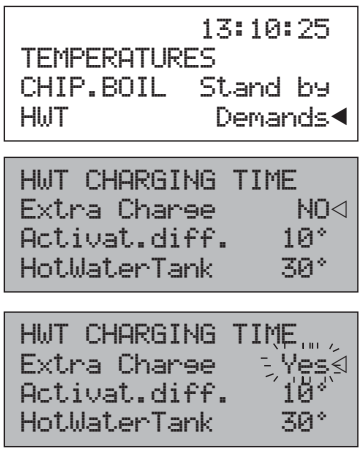
Press [▼] or [▲] in the main menu to access the `HWT` line, press [↵] to select,

Press [▼] to go to the `Extra Charge` line, and then [⟳] to access.

`NO` starts flashing.

Press [▲] to change to `YES`, and then press [↵] to confirm.

Once the accumulator has reached a sufficient temperature to charge the hot water tank, the hot water tank will be charged outside of the normal heating period.



Hot water tank loading times and temperatures

You can set the hot water tank loading times to charge the accumulator around the clock without any time limits.

In the main menu (press [⮌] multiple times), use [▼] or [▲] to move the arrow cursor to the `HWT` line at right edge of the display, and then press [↵] to enter the submenu; press [↵] again to access the first line of the submenu `HWT CHARGING TIME`.

A screen with a list of days appears. You can press [▼] or [▲] to select a day. Press [↵] to access Monday. A screen with three time windows appears.

Press [▼] or [▲] to access the first time window, and then press [⟳] to modify.

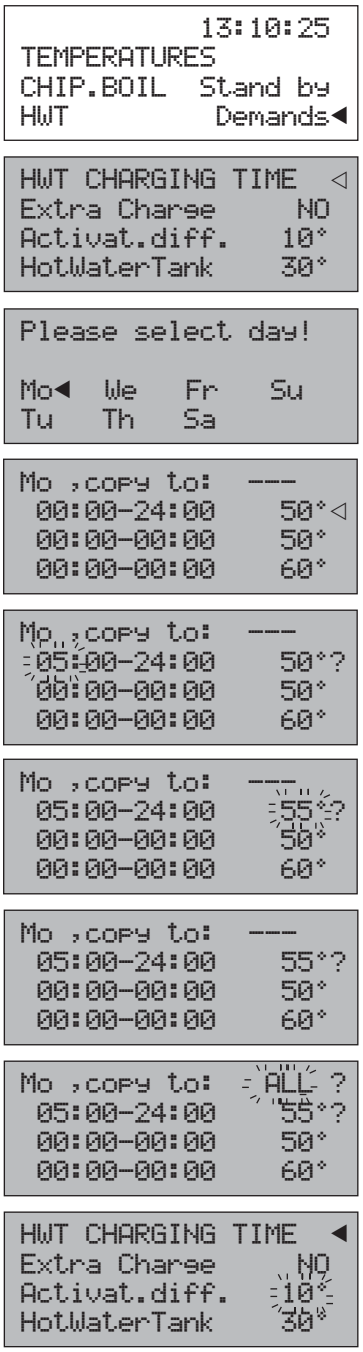
The hour of the start value of the time window starts flashing; press [▼] or [▲] to set the time

The minutes and the time window remain unchanged, so press [↵] four times to skip. The temperature value of the hot water tank starts flashing; and then press [▼] or [▲] to set it.

Press [↵] a final time to store the time window along with the selected temperature.

Set the time for the second and third time window accordingly. Make sure you avoid overlapping times, and set all windows you do not require to 00:00-00:00. Set the temperature of the third window to 60°C at least one time during the week or at least to a temperature that is 5°C above normal temperature (a time period is not required for this "over-temperature window"). This temperature is at the same time the maximum threshold for heat removal in the case of boiler overtemperature.

To copy, go to the first line, `Mo ,copy to:---` and then press [⟳] to access. You can press[▼] or [▲] to select individual days, or alternatively select all days. In this example, select `ALL`, for all days, and then press [↵] to copy. To show that the copy operation has been completed, flashing `ALL?` changes to `--- ◁`



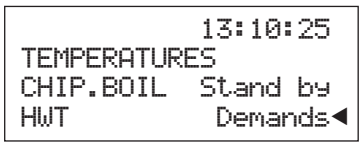
Adjusting the activation temperature vector for the hot water tank

When the actual temperature drops by the switch on vector to the rated temperature, loading the hot water tank will be facilitated within the time window.

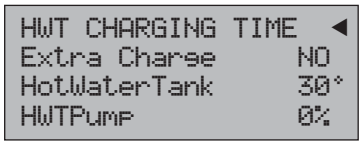
The factory default is a 10°C `Activat. diff.` activation difference for sensors located near the top of the hot water tank. If the temperature sensor is fitted at a lower position, you can use a value of up to 30°C to significantly reduce the number of boiler commissionings for hot water preparation.

Circulation pump

The circulation pump times should be used sparingly (only for times when you use the bathroom) to avoid mixing the water in the hot water tank, and thus save energy



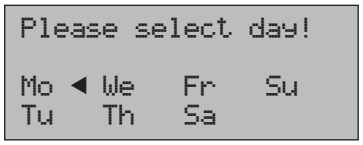
Press [▼] or [▲] in the main menu to select HWT , then press [↵] to enter the submenue.



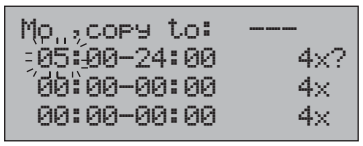
A menu starting with HWT CHARGING TIME appears,

Press [▼] to select CIRCULATION TIMES , and then [↻] to enter the 3rd level submenu,

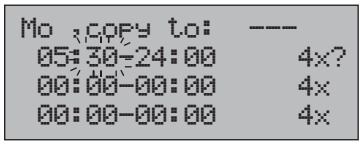
Press [↵] to select Monday or [▼] or [▲]to select another day. A time schedule with circulation times appears.



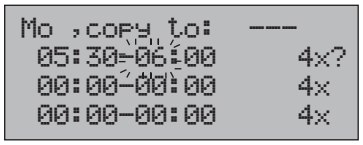
Press [↻] to access the first time window for editing, the time window start hour value starts flashing; press [▼] or [▲] to set the hour, and then press [↵] to store to go to minutes.



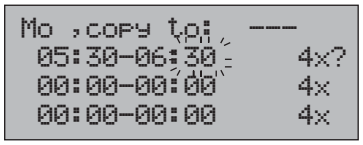
The minutes start flashing and can be adjusted by pressing [▼] or [▲] ; then press [↵] to go to the time window end hour value;



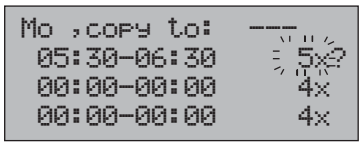
Press[▼] or [▲] to set the hours, and then [↵] to move on to the minutes.



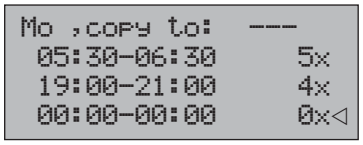
Press [▼] or [▲] to set the minutes , and then [↵] to set the number of circulation pump runs per hour.



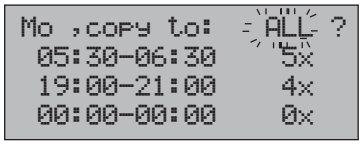
Do not use more than four starts per hour for the first setting. If you notice that the hot water pipes are cooling out too quickly, increase the number of starts per hour.For comparison: test with 4 starts per hour in one time window, and 5 starts in the other. Press [↵] a final time to store the time window along with the selected number of starts per hour.



Set the second and third time window accordingly. Make sure you avoid overlaps, and set the final window to 00:00-00:00 if you do not need it.



To copy, select the first line, Mo, copy to: ---.. , then press [↻] to access. You can press [▼] or [▲] to select individual days, or alternatively select all days.In this example, select ALL , and then press [↵] to copy. To show that the copy operation has been completed, flashing ALL? changes to ---..



Press [⮌] twice to quit setting circulation times, and then press [▼] to select the last line of the menu, OPERATING TIME . Press [↻] to change; then press [▼] or [▲] to adjust, and [↵] to save. Select a pump running time of max. 90 seconds as the initial setting. In case you notice that the running time is too short, increase this value.

Idle period for ash disposal

The noise of automatic ash disposal can be annoying,especially in the middle of the night when the whole building is quiet (the noise is caused by the turbulators dropping during heat-exchanger cleaning). To avoid this, ash-disposal can be blocked during the night.

Press [⮌] multiple times to go to the main menu and then press [▼] to select CHIP.BOIL and press [↵] to enter the submenu.

You will see a menu that starts with Fuel. Press [▼] to select Ash Disposal. Press [↵] to enter the submenu

Press [↵] in the first line called IDLE PERIOD.

Press [↵] to select Monday or [▼] or [▲] to select any other day

Press [⟳] to enter the time line for editing. The time window starts flashing. Now press [▼] or [▲] to set the hour, and [↵] to move on to minutes. Finally set the idle time duration and press [↵] to store (in this example, ash disposal is blocked for 8 hours between 22.00 and 6:00 hrs).

Do not set excessively long idle periods:

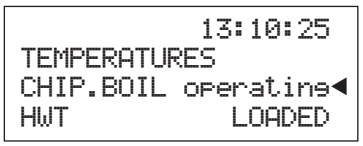
Note section „Fuel causing cinder“ on page 17. If the fuel necessitates very short intervals between ash disposal, it is recommended to set short idle periods.

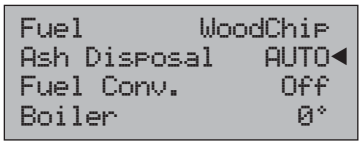
Idle periods for all kinds of fuel:

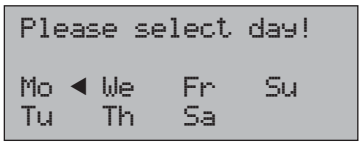
Woodchip boiler between 20 and 50 kW:
- for pellets no longer than 10 hours
- for woodchips no longer than 8 hours
- for miscanthus no longer than 1.5 hours

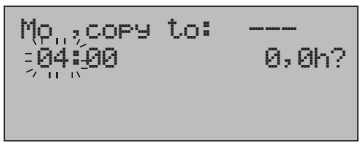
For woodchip boilers 63 kW or larger:
- for pellets no longer than 8 hours
- for woodchips no longer than 6 hours
- for miscanthus no longer than 1.2 hours,

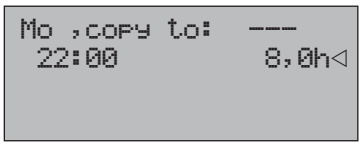
You can define individual settings for each day of the week. In a similar way to heating times, accumulator loading times and circulation pump the settings of a single day can be copied to another day, or to the whole week. To do so, press [▲] to access the first line, and then [⟳] to change; then press [▼] or [▲]to select ALL or select an individual day, and save by pressing [↵].

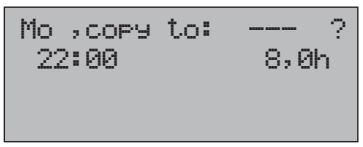


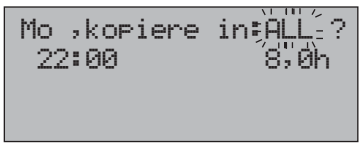


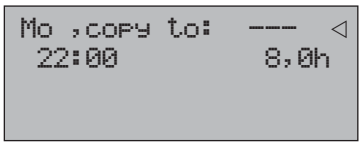












Weekly timer for boiler operations (only for systems with an accumulator)

In the ACC. TANK menu under TIME CONTROL you find a weekly timer for the boiler operations. Within the time windows the accumulator is kept at a certain temperature. Restricted accumulator loading times must at least cover the hot water tank loading times to avoid reducing the required hot water tank loading times.

Press [⮌] multiple times to access the main menu and then press [▼] to go to ACC.TANK. Press [↵] to enter the submenu. Press [↵] to enter TIME CONTROL.

Press [↵] to select Monday or press [▼] or [▲] to select another day

A screen with three time windows appears.

Press [⟳] to access the first time window for editing, the hour value of the time window starts flashing and the cursor changes to a question mark.

Press [▼] or [▲] to set the hours, and then [↵] to move on to the minutes... (press [⮌] to end the setup mode without modifying)

After pressing [↵] to confirm the minute value of the end time, the time window is stored the question mark changes back to the cursor.

To copy the time windows, go to the first line, 'Mo, copy to:', and then press [⟳] to access. Press [▼] or [▲] to select individual days, or alternatively select ALL days. In this example, select ALL, and then press [↵] to copy. To show that the copy operation has been completed, ALL? changes to --- ◁

```
TEMPERATURES
CHIP.BOIL operating
HWT              LOADED
ACC.TANK      Demands◀
```

```
TIME CONTROL          ◀
Pump     ON OverTemp
Acc.T.top          0°
Acc.T.bot          0°
```

```
Please select day!

Mo ◀ We   Fr   Su
Tu   Th   Sa
```

```
Mo,,,copy to:  ---
 00:00-24:00       ?
 00:00-00:00
 00:00-00:00
```

```
Mo,,,copy to:  ---
 05:00-24:00       ?
 00:00-00:00
 00:00-00:00
```

```
Mo ,copy to:   ---
 05:00-24:00     ◁
 00:00-00:00
 00:00-00:00
```

```
Mo ,copy to:  ALL?
 05:00-24:00
 00:00-00:00
 00:00-00:00
```

There are three different strategies for accumulator charging

In the ACC. TANK menu, you can modify the accumulator loading process using the ACC.T. top ON. and ACC.T. bot OFF settings.

If both values are set to a low value (10°C), **the boiler will only start when a consumer requests heat**. Excess output is only swapped to the accumulator if the heating requirement is low.

If you set a high value (50 to maximum 65°C) for ACC.T. top ON and a low value (10°C) for ACC.T. bot OFF, only the **top of the accumulator is kept hot**. The lower area of the accumulator is reserved for solar panels for example. The boiler starts when the temperature drops below ACC.T. top ON and keeps running until the temperature at the top has increased by a hysteresis value (factory default 10°C).

In case of **larger hot water requirements**, for a **process water heat exchanger**, for an **air heater**, or to avoid starting a second boiler in a **multiple boiler system**, the accumulator must be loaded. To do so, set the minimum temperature level (max 75°C) at the top, and **reduce the switch off temperature** by 15 to 30°C to **reserve storage capacity for the heat produced during shut-down**. The boiler starts when the accumulator temperature drops below ACC.T. top ON, and shuts down when the accumulator exceeds the ACC.T. bot OFF value.

```
TEMPERATURES
CHIP.BOIL operating
HWT              LOADED
ACC.TANK      Demands◀
```

```
Acc.T.bot          0°
Req. Acc. Temp     0°
Acc.T. top ON     10°◁
Acc.T. bot.OFF    10°
```

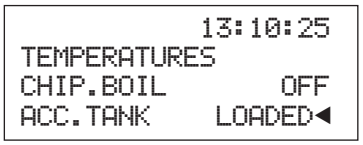
```
Acc.T.bot          0°
Req. Acc. Temp     0°
Acc.T. top ON     60°◁
Acc.T. bot.OFF    10°
```

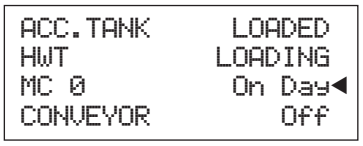
```
Acc.T.bot          0°
Req. Acc. Temp     0°
Acc.T. top ON     60°
Acc.T. bot.OFF45°◁
```

Holiday function; drops the heating temperature until a specific date!

You can drop the heating temperature for the duration of your holiday, and automatically restart at the end of your holiday. You can also drop the temperature for one of several heating circuits until a specified date.

Note that the temperature correction value (+/- 5°C) at the room sensor influences both the NIGHT temperature and the DAY temperature (=temperature to heat up to at end of holiday); for this reason, you should not adjust the temperature correction value under normal circumstances. If you wish to reduce the temperature by a large amount, you can adjust the temperature drop temperature in the „ MC 0 -> Room Temp. -> Rated Value ...at night “ menu (see page 42).

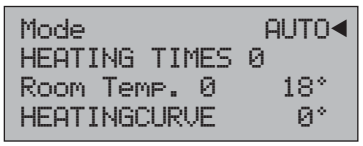




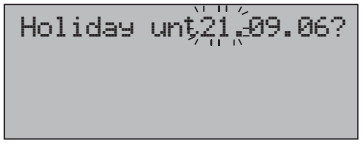
1st Step: Entering the end of your holiday

First go back to the top menu by pressing the [⮌] button multiple times.

In the main menu press [▼] or [▲], move the arrow cursor to the MC 0 item, and then press [↵] to access the submenu.

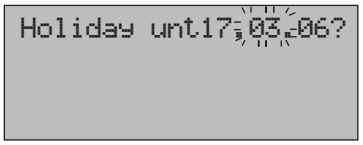


Press [↵] to access the MODE submenu.



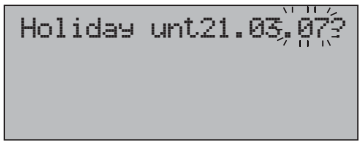
⚠ Set the end date of your holiday to one day before the end of your holiday if the outside temperature is cold, or if you will return in the morning.

Press [⟳] to change the date. The cursor changes to a question mark and the day starts flashing. Press [▼] or [▲] to set the day and then [↵] to save.

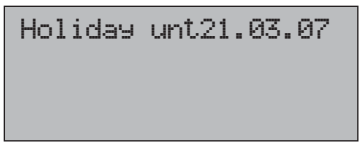


The month starts flashing. Press [▼] or [▲] to set the month and then [↵] to save.

The year starts flashing. Press [▼] or [▲] to set the year and then [↵] to save.

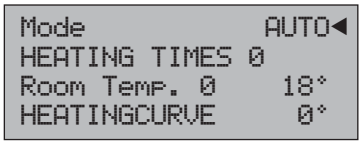


The question mark turns into an arrow cursor, and the new date is saved for the end of holiday.



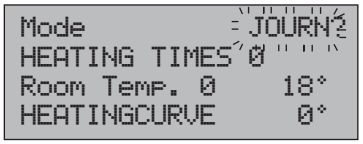
Press [⮌] to return to the parent menu level.

2nd Step Activating holiday temperature drop



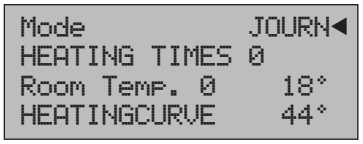
⚠ Before going on holiday, you need to activate the holiday function (also in the „MC ..“ menu).

Press [⟳] in the MODE line to change values.

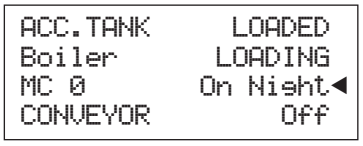


Press [▼] or [▲] to set JOURN and then [↵] to save.

The question mark cursor turns back into an arrow and the heating enters temperature drop or night time mode.



Press [⮌] to return to the parent menu level. Night mode is displayed for the heating circuit MC 0. The heating circuit automatically restarts AUTO mode at 00:00 on the end date of your holiday.



To acknowledge (delete from display) an „Alarm/Error/Warning/Info“ message, press any button. Press the „INFO“ button to display additional information. For any message, press the „INFO“ button a second time to obtain the exact time when the event occurred.

Messages with a grey background typically occur during commissioning and service work on the control unit.

Type of message: Alarm, Error, Warning, Info	alphabetically after the 3rd message	B for boiler control C for conveyor control H for heating control	
Boiler control without voltage; display blank!		B,H	Check mains and glass tube fuse (6.3 A slow-blow) on boiler control PCB.
ALARM	SafetyThermost. activated!	B	Wait for boiler temperature to drop to below 90 °C. Then unlock the safety thermostat (located behind front insulating door). If this error occurs more than twice a year, call customer service!
ALARM	Water shortage Alert!	B	Allow boiler to cool down, and top up with heating water (this alarm is only possible if a low water level sensor is installed). If this error occurs more than twice a year, there may be a leak in your heating system.
ERROR	..... Sensor Broken!	B,H	Temperature sensor at the measuring point, which is quoted in the message, is defective, not connected, or the wiring is broken. If a temperature of 0° is displayed without an error message, no terminals have been assigned to the corresponding analogue input.
ERROR	..... Sensor shorted!	B,H	Temperature sensor at the measuring point, which is quoted in the message, is defective, wiring is shorted.
ERROR	230V supply Voltage not found	H	230 V mains power for the heating extensions has failed, or the fuse in the housing is defective.
ERROR	Change Supply L2 and L3 !	C	Wrong rotary field, changes supply line phases!
ERROR	Conveyor 2 current exceeds!	C	Conveyor 2 jammed or defective! Before opening the revision lids to the screw, switch off the system, using the MAINS SWITCH. Find mechanical cause, before switching on again.
ERROR	Conveyor 2 overload! Let cool off!	C	Conveyor drive 2 motor protection has triggered. Could have been caused by too large and sharp fuel. Allow cool off below 80% (menu “CONVEYOR-> CONVEYOR 2-> heating), before pressing [I/O] button to restart.
ERROR	Conveyor 2: Missing neutral conductor	C	Conveyor 2 neutral connector is not connected. Connect to neutral point!
ERROR	Conveyor 2: Missing Phase ..	C	Wrong conveyor motor 2 connection, cable break or plug not connected to PCB, or PCB defective. This message can only acknowledged by pressing the mains switch or pressing the [I/O]-button.
ERROR	Conveyor current exceeds	C	Conveyor screw locked or defective! Find the mechanical cause for the blocking before switching on again. Before opening the screw revision lids, switch off the system using the MAINS SWITCH.
ERROR	Conveyor: Missing neutral conductor	C	Neutral conductor of conveyor screw motor not connected, must be connected with neutral terminal!
ERROR	Conveyor: Missing Phase ..	C	Conveyor screw motor connected incorrectly, cable break or plug on PCB not connected or PCB defective. This message can only be deleted with the mains switch or the [I/O] key.
ERROR	Current consum. of stoker scr. too high	B	Press [I/O] button to restart ash disposal. Foreign body blocks ash disposal or ash bin full.
ERROR	Draught fan blocked!	B	Exhaust fan blocked by foreign body; fan or speed sensor defective; or line interrupted.
ERROR	Emergency stop button pressed!	B	The emergency stop button has been pressed and needs to be released manually.
ERROR	Exhaust Fan MAX Current exceeded	B	Exhaust fan blocked, defective or phase interruption.
ERROR	Fire extinguished check fuel!	B	The fire extinguished during heating operations, possibly no more fuel left.

Press the [I/O] button to restart the boiler after removing the cause of the boiler control errormessage/alarmmessage (B).

ERROR	Firebed level switch activated!	B	Level switch has been activated for longer than 50 minutes, clean level switch, level switch is blocked or grate flap is dirty.
	Frequency Converter Communication error	B	Check the bus connection and the power supply to the frequency converter.
	Frequency Converter Current too low	B	Check exhaust fan power supply.
	Frequency Converter Motor error	B	Exhaust fan, frequency converter or cabling defective, see error code number in the boiler control menu "Fan".
	Frequency Converter Overtemperature	B	Ambient temperature too high, cooling fins dirty or frequency converter cooling fan defective.
	Fuse 24VAC broken!	B	Replace glass tube fuse F3-24V~ (250 mA slow-blow) on boiler control PCB.
	Fuse F10 broken!	C	Replace glass tube fuse F10 for conveyor motor output on the conveyor PCB.
	Fuse F11 broken!	C	Replace glass tube fuse F11 for conveyor motor output on the conveyor PCB.
	Fuse F12 broken!	C	Replace glass tube fuse F12 for conveyor 2 motor output on the conveyor PCB.
ERROR	Fuse F13 broken!	C	Replace glass tube fuse F13 for conveyor 2 motor output on the conveyor PCB.
	Fuse F14 broken!	C	Replace glass tube fuse F14 for conveyor 2 motor output on the conveyor PCB.
	Fuse F3 broken!	C	Replace glass tube fuse F3 for supply line phase 1 on the conveyor PCB.
	Fuse F6 broken!	C	Replace glass tube fuse F6 for stoker motor output on the conveyor PCB.
	Fuse F7 broken!	C	Replace glass tube fuse F7 for stoker motor output on the conveyor PCB.
	Fuse F8 broken!	C	Replace glass tube fuse F8 for stoker motor output on the conveyor PCB.
	Fuse F9 broken!	C	Replace glass tube fuse F9 for conveyor motor output on the conveyor PCB.
	Grate Flap does not reach CLOSE position	B	Grate flap blocked by foreign body or cinder during closing.
	Grate Flap does not reach OPEN position!	B	Grate flap blocked by foreign body or cinder during opening.
	Ignit. failed! Check Combustible!	B	The ignition fan is not able to ignite the fuel before "Ignition time MAX" has elapsed. There may be no fuel at all or the fuel is too humid or too large, or the ignition fan is defective.
ERROR	Plug S99 missing or wrong version	B	Coding plug S99 for safety chain is missing or does not correspond with software. Replace and then switch off mains switch and back on again.
	Revision opening rotary valve is open	C	Switch on the maintenance lid of the rotary valve (space below the rotary valve) interrupts the woodchip feed. Boiler must be switched on again after closing the lid.
	Revision opening cap (2) is open	C	Switch on revision opening lid of second conveyor interrupts woodchip feed. Boiler must be switched on again after closing the lid.
	Revision opening cap is open	C	Switch on revision opening lid interrupts woodchip feed. Switch on boiler againafter closing the lid.
	ScrewConv. Overload cool down necess.!	B	Ash disposal blocked! The conveyor screw is released by switching off and on with the [I/O] key provided the temperature has dropped to 80% . If the error message appears again, find the mechanical cause for the blocking (switch off MAINS SWITCH before opening the screw).
	Stoker current exceeds	C	Stoker or rotary valve jammed or defective! Find mechanical cause before switching on again (switch off MAINS SWITCH before opening the screw).
ERROR	Stoker overload ! Let cool off!	C	Stoker motor protection and rotary valve drive have triggered. Allow cool off below 80% ("CONVEYOR-> STOKER-> heating), before pressing the [I/O]-button to restart.
	Stoker position not defined!!	B	The parameter <stoker position> in the menu point SYSTEM CONFIGURATION, WOODCHIP CONTROL must be set! (Stoker screw installation side seen from the front).
	Stoker: Missing neutral conductor	C	Neutral conductor not connected. Connect neutral conductor with neutral terminal!

ERROR	Stoker: Missing Phase ..	C	Motor not connected, cable break or plug not connected to PCB, or PCB defective. This message can only acknowledged by using the mains switch or pressing the [I/O]-button.
	Supply Voltage L2 missing or Fuse F4	C	Check supply line or glass tube fuse F4 on conveyor PCB.
	Supply Voltage L3 missing or Fuse F5	C	Check supply line or glass tube fuse F5 on conveyor PCB.
WARNING	Boiler Return Temp. too low!	B	Return line temperature has been too low for a longer period of time: Inform plumber and check functionality of return temperature rise and if sensor is insulated.
	Bus-Connection to AEK interr.	B	The CAN bus cable from the boiler PCB to the conveyor PCB is defective or disconnected.
	Can-bus node number has been changed!	B,C,H	The switch for the CAN bus node number is on the PCB, for multiple boiler systems the switch positions must be different, standard: „0“ .
	Cannot read Error Log!	B,C,H	System error when reading EEPROM. The error event history is no longer available.
	Check: Lambda probe wired correctly?	B	Unacceptable Lambda probe signal. Either incorrect Lambda probe wiring or Lambda probe defective or combustion chamber was not cold during commissioning test!
	Conf. changed!Check Input assignment!	B,C,H	The standard assignment of at least one input has been changed. This warning can be ignored for initial commissioning. For a software update you need to check all inputs and assign them manually if necessary.
	Conf. changed!Check Output assignment!	B,C,H	The standard assignment of at least one output has been changed. This warning can be ignored for initial commissioning, however, for a software update you need to check all outputs and assign them manually if necessary.
WARNING	Config. requires additional Hardware!	H	The hardware required for this configuration is not registered on the bus. Bus, power supply or PCB defective.
	Conveyor 2 wrong voltage -> Selftest!	C	Voltage at switched off output of conveyor 2, self test enabled.
	Conveyor 2 wrong voltage -> Selftest!	C	Current consumption drops below minimum value when the conveyor drive 2 is switched on, a self test is enabled.
	Conveyor current too low -> Selftest !	C	Current drops below minimum value when the conveyor drive is switched on, a self test is enabled.
	Conveyor wrong voltage -> Selftest!	C	Voltage at switched off outlet of conveyor. Self test enabled.
	Current consum. of stoker scr. too high	K	Press the [I/O] button to restart ash disposal. Foreign body blocks ash disposal or ash bin is full.
	Deash: overfill counter MAX exceeded	B	Deashing required as overfill counter has reached the maximum value. The boiler starts automatic deashing as ash deposit on the grate was too high for too long.
WARNING	Draught Fan does not reach req. Speed!	K	The draugth fan has not reached the required speed during the ignition phase. Check the draught fan.
	EE_SW_VERSION_ERROR	B,C	System error when reading EEPROM..
	EEPROM set to factory default	B,C,H	The system has been reset to the factory defaults, e.g. after installing a lower software version. You need to re-enter all settings!
	EE-read fault Input reference list	B,C,H	System error when reading EEPROM. Manually changed inputs must be reasigned.
	EE-read fault Output ref. List	B,C,H	System error when reading EEPROM. Manually changed outputs must be reasigned.
	EE-read fault Parameter list	B,C,H	System error when reading EEPROM. Manually changed parameters have been reset to factory default.
WARNING	Empty ash bin	K	Unless the woodchip quantity has been set in the menu "CHIP.BOIL“ -> "De-ashing“ -> "Empty ash bin at [kg]“, this message will not appear. This message is a reminder after the fuel has been consumed. The reminder is not enabled as a factory default (the value is set to 0), as it is only possible to achieve a satisfactory setting with very homogeneous woodchips.

WARNING	EPROM has been changed	B,C,H	An EPROM from another control unit has been inserted. All settings have been deleted!
	External interlock actuated	C	An additionally installed safety device (level switch, light barrier) has stopped fuel feed.
	Failed to read EE EE_SYSTEM_ERROR	B,C,H	System error when reading EEPROM. You need to re-enter all settings.
	Ignore Selftest Only for Testing!	C	Use a parameter in the configuration menu to ignore the self test to allow conveyor operations during troubleshooting even if there was a negative self test result.
WARNING	Lambda Probe not connected	B	Lambda probe not connected or lambda probe power supply lines (2 white wires) interrupted, or Lambda probe defective.
	Lambda Probe doesnt reach req. Temp.	B	Lambda probe does not reach the required temperature, excessive probe heating current.
	Lambda probe high variance!!	B	The lambda probe measurement uncertainty is too high, it must be replaced. After having installed the new probe set the "DeltaLam.Sig" parameter to zero.
	Lambda Probe shorted!	B	Lambda probe defective or line short-circuited.
	Low. AirValve doesnt reach end position!	B	Primary air valve is blocked mechanically, is defective or installed incorrectly (if error occurs during commissioning).
	Low. AirValve doesnt reach req.Position!	B	Primary air valve is blocked mechanically, is defective or installed incorrectly (if error occurs during commissioning).
	Neutral current exceeds -> Selftest!	C	A neutral conductor current is measured despite switched off outputs. Self test enabled.
WARNING	New Software Version	B,C,H	An EEPROM with a higher program version is used.
	Remove Jumper...	H	For the current configuration you need to remove the jumper on the heating circuit control PCB for mutual control of outputs in mixing mode. Jumper MI1_U for L1 and L2 to plug S7 Jumper MI2_U for L3 and L4 to plug S8 Jumper VEN_U for L5 and L6 to plug S9 Jumper J6-MIX2U for L7 and L8 to plug S60 Jumper J7-MIX1U for L9 and L10 to plug S59 Jumper J8-PUX_L for L11 and L12 to plug S58 For the current configuration you need to remove the jumper on the heating circuit control PCB to deactivate the mutual control of the outputs.
	Set Jumper...	H	
WARNING	Revers Circulation	H	The difference between the collector temperatures and the outside temperature exceeded the warning threshold between 00:00 and 05:00 (configurable in the „Collector" menu). Non-return valves may be leaking.
	Revision opening cap (2) is open	C	The revision lid above the drop shaft is pressed open (small limit switch). Three reverse movements are started to remove the obstacle in the drop shaft. If this does not help, the conveyor is stopped and the boiler is blocked.
	Revision opening cap is open	C	
	Room sensor MC.. Broken	B,H	Mixing circuit room sensor is defective.
	Screed MC.. doesnt reach req. Temp.!	B,H	System was unable to reach screed rated temperature for a longer period of time in screed drying mode. Heating load too high.
WARNING	Sensor Rotary Valve malfunction	C	Rotary valve sensor defective, not connected or wrong setting (the distance between sensor and screw is to be set to 4 mm).
	Stoker current too low -> Selftest !	C	Current consumption drops below minimum value when the drive is switched on, self test enabled.
	Stoker wrong voltage -> Selftest !	C	Voltage at switched off output, self test enabled.

WARNING	Upp. AirValve doesnt reach end position!	B	Secondary air valve is blocked mechanically, is defective or installed incorrectly (if error occurs during commissioning).
	Upp. AirValve doesnt reach req.Position!	B	econdary air valve is blocked mechanically, is defective or installed incorrectly (if error occurs during commissioning).
	Ash bin not mounted!	B	Ash bin mounted incorrectly.
INFO	Blocking protection	B,H	To prevent jamming in the quoted part of the heating system, the pumps run for 10 seconds, and the mixer for 3 minutes. This procedure takes place once a week on Saturday afternoon, if pumps and/or mixer were idle in the preceding week.
INFO	Boiler switched off via SMS	B,H	The boiler was switched off by SMS command via a mobile phone (equivalent to switching off pressing the [I/O] button on the control panel).
INFO	Boiler switched on via SMS	B,H	The boiler was switched on by SMS command via a mobile phone (equivalent to switching off pressing the [I/O] button on the control panel).
INFO	Clean. after ....h see Manual	B	This message will be displayed after 3,000 working hours for wooden chips and wooden pellets, after 1,500 working hours for miscanthus (counter „maintenance“ in COUNTERS). It is a reminder to clean the heat exhanger, the Lambda probe and the flue gas recirculation if installed. If you cleaned recently, there is no need to clean again. Also refer to the User Manual page 19, section “Annual cleaning“.
INFO	Emission measurement duration: 30 min.	B	If you press the [I/O] button for 5 seconds, all heat consumers generate full heat output for 30 minutes to allow for emission measurement.
INFO	Heating circuits reset by SMS	B,H	The „Day/Timer/Night“ operating mode was reset to the operating mode set at the remote control/room sensor (to „Day/Auto/Night“ setting in the „MC“ => „Operation“ menu, if there is no remote control/room sensor fitted).
INFO	Heating circuits switched by SMS	B,H	“Day/Timer/Night” operating mode was changed by SMS command via a mobile phone. The operating mode set at the remote control unit/room sensor is disabled. You can change mode at the remote control unit/room sensor to cancel the SMS command, and reinstall the setting at the remote control unit/room sensor.
INFO	Heating Curve set to floor heating?	B,H	In order to ensure a correct calculation of the final temperature for the drying program end, the heating curve for floor heating must be set in „MC..“ , „HEATING CURVE“ => „Inlet at -10°C outside temp.“ and „+10°C outside temp.“
INFO	HWT charge started by SMS	B,H	Charging the hot water tank was started by SMS command via a mobile phone outside of the specified loading times.
INFO	Lambda Probe calib in progr.->deashing	B	In order to ensure a proper Lambda probe calibration the embers need to be removed from the combustion chamber completely.
INFO	Maintenence by Pro-fessional recom.	B	This information is a reminder for “Maintenance by a professional“. This message is limited to 6 month summer season and appears after approx. 6,000 to 9,000 working hours of pellets consumption (counter”Maintenance“ in COUNTERS). If maintenance was carried out recently, there is no need to carry out maintenance or cleaning again. Also refer to the User Manual page 22, section “Professional maintenance“.
INFO	Selftest successful!	C	Automatic self test was successful, supply line and drives are okay.
INFO	Selftest waiting for closed safety chain!	C	Check which safety device has triggered (fire-bed level sensor, ash bin not in position or tilt grate not closed) and remedy cause.
INFO	SolarP.Temp.>128\ meas. range exceeded	H	Collector temperature outside of (measuring) range or sensor broken.

Notes

Possible operating states **BOILER**

CHIP.BOIL	swit. off
CHIP.BOIL	WarmStart
CHIP.BOIL	Ignits
CHIP.BOIL	operating
CHIP.BOIL	burndown
CHIP.BOIL	Stand By
CHIP.BOIL	ash disp.
CHIP.BOIL	Locked
CHIP.BOIL	Ext.Heat
CHIP.BOIL	Calibr.
CHIP.BOIL	fault

The boiler has been switched off using the [I/O] button.
Boiler attempts to start without automatic ignition.
Boiler starts with automatic ignition.
Boiler is operating.
Boiler is in switching off cycle.
Boiler is ready to operate, however it is currently not operating.
Automatic ash disposal active.
If external ON/OFF is configured which locks the boiler, or in case of conveyor malfunction.
External heat switching valve has switched to external boiler.
Automatic Lambda probe calibration active.
Woodchip boiler malfunction.

Possible operating states **HOT WATER TANK**

HWT	Loading
HWT	Loaded
HWT	Demands
HWT	Decant
HWT	fault
HWT	SolarPrio
HWT	Off-Delay

Hot water tank is being loaded
Hot water tank is loaded.
The hot water tank is demanding heat.
After the heating phase has been finished, surplus heat is loaded into the boiler.
Hot water tank malfunction.
Hot water tank is demanding heat, however the sun still has priority over the boiler.
Delay time, after boiler switch-off, in which the HWT still receives heat.

Possible operating states **ACCUMULATOR**

ACC.TANK	Loading
ACC.TANK	Loaded
ACC.TANK	Demands
ACC.TANK	OFF Timer
ACC.TANK	SolarPrio
ACC.TANK	fault

Accumulator is being loaded.
Accumulator is loaded.
Accumulator is demanding heat.
Woodchip boiler is not enabled by the weekly timer.
Accumulator is demanding heat, however the sun still has priority over the boiler.
Accumulator malfunction

Possible operating states **ACCUMULATOR PUMP**

Acc.Tank Pump	ON
Acc.Tank Pump	OFF
Pump	overtemp.
Pump	Off timer
Pump	Off Therm

Accumulator loading pump switched on.
Accumulator loading pump switched off.
Loading accumulator, because the maximum boiler temperature has been exceeded.
Accumulator off, because outside accumulator loading times.
(200kw only) Pump switched off due to accentuated thermostat relay.

Possible operating states **BOILER PUMP**

BOIL.PUMP	ON
BOIL.PUMP	OFF
BOIL.PUMP	overtemp.

Boiler pump switched on.
Boiler pump switched off.
Boiler pump switched on because the maximum boiler temperature has been exceeded.

Possible operating states **EXTERNAL HEAT**

3WV EXT.H.	Ext.Heat
3WV EXT.H.	Woodchips

External heat supply switched on.
External heat supply switched off.

Possible operating states **AUXILIARY BOILER**

AUX. BOILER	ON
AUX. BOILER	OFF

External additional boiler with oil, gas or current is demanded.
External additional boiler with oil, gas or current is not demanded.

MC ..	on day
MC ..	on night
MC ..	on ext. day
MC ..	on ext. night
MC ..	Off SPday<R
MC ..	OffSPnight<R
MC ..	Off SP day<
MC ..	Off SPnight<
MC ..	Off out>day
MC ..	Off out>night
MC ..	Off Summer
MC ..	Off BoTemp.<
MC ..	Off AccTemp.<
MC ..	HW Prio.
MC ..	frost prot.
MC ..	On overTemp
MC ..	ScreedDry
MC ..	Fault

Possible operating states **MIXING CIRCUIT**
Mixing circuit .. in heating mode (remote control set to „Timer AUTO“).
Mixing circuit .. in night set back mode (remote control set to „Timer AUTO“).
MC .. set to heating mode via remote control (operating mode switch or SMS).
MC .. set to night set back via remote control (operating mode switch or SMS).
MC .. off, as room temperature higher than day preset temperature (with remote control).
MC .. off, as room temperature higher than night set back (with remote control).
MC .. off as calculated rated inlet temperature is below 18°C (without remote control).
MC .. off as calculated rated inlet temperature is below 18°C (without remote control).
MC .. off as outside temperature is higher than preset heating threshold in heating mode.
MC .. off as outside temperature is higher than preset heating threshold in night set back mode.
Mixing circuit .. off for summer operations.
Mixing circuit .. off, as boiler temperature lower than release temperature.
Mixing circuit .. off, as accumulator temperature lower than release temperature.
Mixing circuit .. off, as domestic water is currently loaded.
Mixing circuit .. switched on due to frost protection.
Mixing circuit .. switched on due to boiler over temperature.
Automatisc screed drying on mixing circuit ...
Mixing circuit malfunction.

EXT.DEMAND	YES
EXT.DEMAND	NO

Possible operating states **EXTERNAL DEMAND**
External demand for boiler temperature and start of associated pump, if installed.
No external demand for boiler temperature and stop of associated pump, if installed.

CONVEYOR	OFF
CONVEYOR	ON
CONVEYOR	Fault
CONVEYOR	Empty
CONVEYOR	Selftest
CONVEYOR	Back

Possible operating states **CONVEYOR and FLOOR AGITATOR**
Conveyor stopped.
Conveyor running.
Conveyor malfunction.
Stoker screw will be emptied.
A test program is started after switching on the system or because an error has occured.
Conveyor running reverse.

HWT	ON
HWT	OFF
HWT	Overtemp.
HWT	Fault

Possible operating states **DOMESTIC WATER HEAT EXCHANGER**
Pump for domestic water heat exchanger switched on .
Pump for domestic water heat exchanger switched off.
Pump for service water switched on due to boiler overtemperature.
Domestic water malfunction.

Support pump	ON
Support pump	OFF

Possible operating states **SUPPORT PUMP**
Support pump (for local heating network) switched on.
Support pump (for local heating network) switched off.

SOLAR PANEL	OFF
SOLAR PANEL	ON
SOLAR PANEL	OFFTemp>
SOLAR PANEL	PanelHot
SOLAR PANEL	Fault

Possible operating states **SOLAR HEATING SYSTEM**
Solar pump off due to low temperature difference between collector and accumulator.
Solar pump is switched on, accumulator is being charged.
Solar pump off, because accumulator temperature exceeds maximum value.
Solar pump off, because collector temperature is above maximum value.
Solar heating system malfunction.

Possible operating states **THERMOSTAT**

Settings of Heating Circuits

In case of major changes to settings, fill in the new settings in a new column, and also add the date of change!																	
	Heating circ. / Date																
Room	Temp. rated value ...at day 21°																
	...at night 16°																
HEATING CURVE	Flow temp. at -10° outdoor																
	+10° outdoor																
	Flow temp. Night Set back 15°																
	Solar influence 0°																
heat until outdoor	...at day 18°																
	...at night 7°																
Enable Temp.	25°																

Heating Times		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
MC 0	Monday																									
MC 1	Tuesday																									
MC 1	Wednesday																									
MC 2	Thursday																									
MC 3	Friday																									
MC 4	Saturday																									
Hot Water Tank	Sunday																									
MC 0	Monday																									
MC 1	Tuesday																									
MC 1	Wednesday																									
MC 2	Thursday																									
MC 3	Friday																									
MC 4	Saturday																									
Hot Water Tank	Sunday																									
MC 0	Monday																									
MC 1	Tuesday																									
MC 1	Wednesday																									
MC 2	Thursday																									
MC 3	Friday																									
MC 4	Saturday																									
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MC 0	Monday																									
MC 1	Tuesday																									
MC 1	Wednesday																									
MC 2	Thursday																									
MC 3	Friday																									
MC 4	Saturday																									
Hot Water Tank	Sunday																									

Entries made with a soft pencil can easily be corrected!