


# Wood chip boiler 20 to 200 kW



## User Manual



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## Dear customer,

We are delighted to count you among our customers.

To ensure satisfactory operation of your new boiler, you need to know how to operate, clean and maintain it. This manual contains information and advice on much more than just the boiler itself.

## Warranty and guarantee

You should also read the "Conditions for warranty, guarantee, liability" on page 4 carefully. As a rule, these conditions will be satisfied by a professional heating technician. Nevertheless, inform the technician of our warranty conditions. All of the requirements we impose on the heating system are intended to prevent damage that neither you nor we wish to occur.

## Optimum use of the control systems installed in our boilers

There are two different access levels for the control system:

At the CUSTOMER level, you can adjust the control system to your wishes and needs without any risk of altering the system configuration set by the heating system expert.

Only your technician or a customer service employee should change settings at the SERVICE level. Before making any adjustments to these settings yourself, it is essential that you consult an expert.



## Please read this manual

carefully before starting up the system. This is the only way to ensure that you can operate your new boiler efficiently and with minimum environmental impact.

## Take advantage of the knowledge and skills of an expert

Only allow an expert to assemble, install and commission the system and make the basic settings. Insist on receiving an explanation and training on how your new boiler functions and how to operate and maintain it.

## Extended warranty for commissioning performed by an authorised partner company

If your newly installed boiler is commissioned by an authorised partner company or one of our customer service employees, we offer an extended warranty. Refer to our warranty conditions in effect at the time of purchase.

## Service agreement

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

# Conditions for warranty, guarantee, liability

We can only guarantee and accept liability for the function of our boiler if it is properly installed and operated.

Requirement for warranty, guarantee and liability is that this boiler be used in accordance with its intended purpose, **only for heating and hot water supply with no more than 2,000 full-load hours annually**, and, in particular, that the following general conditions be observed during installation and operation:

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

Local building and fire protection regulations must be observed.

The boiler is suitable for use with **wood chips G20 to G50 - W 35 maximum** (according to ÖNORM M 7133) P16 to P45 - M 35 maximum (EN 14961-4). With an optionally available **flue gas recirculation, wood pellets** according to ÖNORM M 7135, DIN 51731, EN 14961-2 class A1, EN plus class A1 or DINplus, **as well as Miscanthus, very dry carpentry waste and chipboard** (fuel class 7 according to German air pollution regulations, free of organohalogen compounds and wood preservatives) can be burned. Operation with unsuitable fuels, in particular with high-slag pellets such as from grain waste, or corrosive fuels such as Miscanthus fertilised with potassium chloride, is not permitted.

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

Water is the intended heat-transfer medium. For special anti-frost requirements, up to 30% glycol may be added. **Softened water** is required for the **initial fill-up** of the heating system and for **refilling** after repairs. For the initial fill-up of boilers up to 90 kW, the value of 20,000 lt°dH for the system volume in litres multiplied by the hardness (in degrees of German hardness) may not be exceeded. For boilers over 90 kW, the limit is 30,000 lt°dH.

The **pH value should be set between 8 and 9**. Addition of hard water should be minimised to limit limescale build-up in the boiler. Set enough shut-off valves to avoid bleeding large amounts of water during repairs. Any leaks in the system must be repaired at once.

A **safety valve (3 bar)** as protection against excess pressure and a **thermal relief valve (95 °C)** to protect against overheating must be installed by the contractor.

To protect against air suction if the system cools off, an expert must provide a **sufficiently large expansion tank** or a pressure maintenance system. Sufficient **air venting** must also be ensured. **Open expansion tanks** or **underfloor heating with permeable piping** also have a high air intake, resulting in above-average boiler corrosion. Corrosion damage to the boiler due to improper air venting or high air intake is excluded from warranty, guarantee and liability.

Operation at **lower power** than the lowest power specified on the type plate is **not permitted**. For design outputs that are considerably less than the boiler's rated output, either a reduction of the heating time slots or a buffer storage tank is required.

**Only components provided by us** may be used for expansion of the control system, except for commonly used units such as thermostats.

**Cleaning and maintenance** are required as specified in the user manual.

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

The installing contractor is liable for proper installation according to the boiler's installation instructions and the relevant rules and safety regulations. If you as customer have installed the heating system partly or entirely without relevant training and in particular without up-to-date practical experience, without **having the installation checked by a trained and responsible expert**, we exclude defects in our delivery and consequential damages resulting from this cause from our warranty, guarantee and liability.

For **repair of defects carried out by the customer or by third parties**, ETA only bears the costs or remains obligated by warranty if this work was **approved in advance** by the customer service of ETA Heiztechnik GmbH.

## Subject to technical alterations

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



Important **NOTICES** for operation.



**CAUTION:** Failure to observe these notices can result in **property damage**.




**STOP:** Failure to observe these notices can result in **personal injury**.

# How your new boiler works

## Spring arms adjust to load

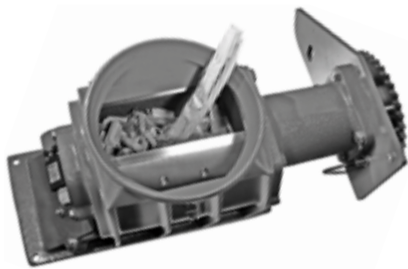
The wood chips are transported to the discharge screw (4) by the floor agitator. The spring arms (1) adjust themselves to the load above them. If the bunker is full, the agitator is subject to a heavy load and the spring arms are pressed against the agitator plate (2). That reduces the driving power and the electricity consumption. As the bunker empties, the spring arms extend toward the wall and clear out the bunker.

## Floor agitator must turn during filling

To prevent the spring arms from being stuck in an extended position under the pile of wood chips, the floor agitator must be turning during filling. To this end, press the "Emission measurement" button to force the boiler into operation. 

## Discharge screw torque control

The amount of electricity required by the motors is monitored so that any sluggishness in the discharge screws is immediately recognised, automatically reversing the screws and repeating up to three times if necessary. The floor agitator is simultaneously decoupled via the clutch (3) so the motor's power is exclusively available for unblocking the screw. Jammed pieces of wood or even stones can be easily loosened this way so fuel transport can resume.



## Maximum protection against burn-back

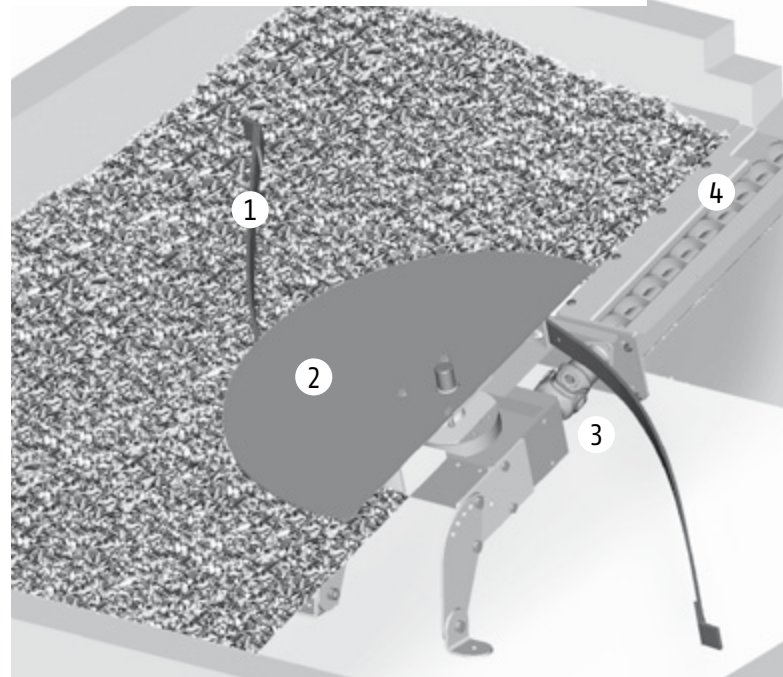
The airtight one-chamber rotary valve (5) keeps the combustion chamber safely separated from the fuel deposit in all operating states. No hot gas can enter the fuel conveying system and ignition of the wood chips is impossible. This is the most reliable protection against burn-back. The prTRVB H118 from the Austrian fire prevention bodies (often applied in Germany due to lack of national standards there) also demands a water sprinkler on the drop chute if the fuel deposit is in a barn or loft, if the store is larger than 200 m<sup>3</sup>, if the

boiler output is more than 400 kW, or if carpentry waste is burned.

Individual pieces of wood that are too long cannot bring the fuel conveying system to a halt. They are cut off by a hardened, replaceable blade on the edge of the rotary valve chamber.

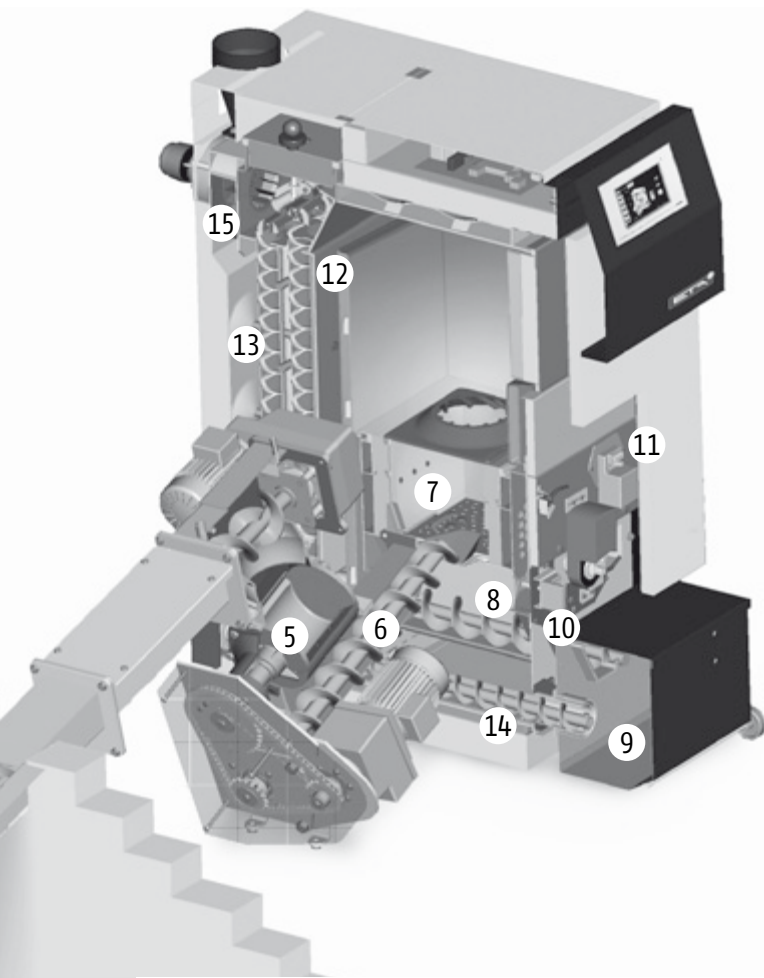
## Optimised ignition

After short breaks in combustion, the refractory-lined combustion chamber still remains hot enough that any new fuel which is fed in can be ignited by remaining embers. The ignition fan only needs to be activated after longer pauses. To save electricity, the ignition fan is deactivated immediately after successful ignition, recognised by the lambda probe and exhaust temperature.



## Hot combustion chamber with tilting grate

The wood chips are pushed onto the side of the grate by the stoker screw (6). A refractory-lined combustion chamber (7) ensures a clean fire with high burnout temperature. At intervals that depend on the output level, the grate is tilted by 90° after a controlled ember burnout in order to automatically remove ash and foreign bodies from the combustion chamber. Until the next time the grate is tipped, the ash remains under the grate and can burn out before it is transported by a screw (8) to the detachable ash box (9).



## Combustion breaks with minimal heat loss

The fire can be regulated between minimum and maximum output. In autumn and spring, when heating loads are smaller, the output is regulated by pauses in combustion. To avoid a build-up of smouldering tar in the boiler and chimney during these pauses, the fire undergoes a controlled burnout. Closing the primary (10) and secondary (11) air flaps ensures that no air can flow through the boiler in standby, thus preventing unused heat from being drawn into the flue.

## Optimum fuel efficiency with lambda control

Wood gasification (output) can be controlled via the primary airflow (10). Through use of the lambda-controlled secondary air (11), combustion is kept clean and highly efficient.

A lack of air means there is not enough oxygen for complete combustion. On the other hand, too much air also results in incomplete combustion as it cools the fire. Below 700 °C, not all of the wood gas is

burned. Excessive air also draws too much heat out of the boiler unused. The lambda probe ensures optimum combustion and maximum fuel utilisation in everyday operation.

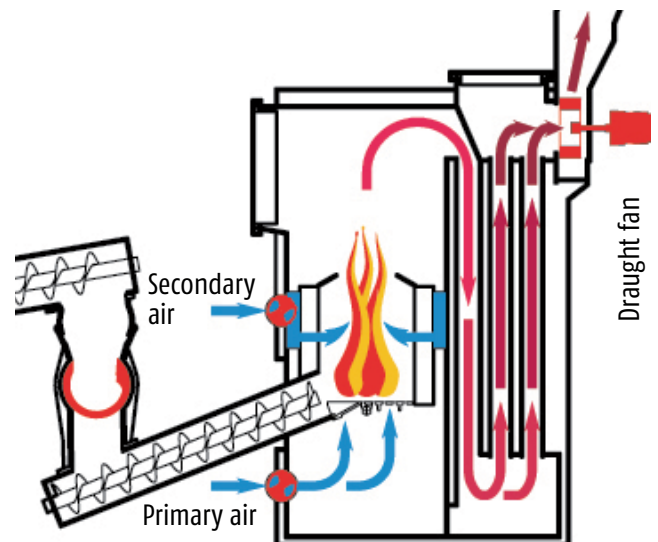
## Turbulent heat exchanger with cleaning

After complete combustion, the hot gas flows into the cold section of the boiler, where it transfers its heat to the boiler water. First it flows smoothly through a downdraft channel (12) for ash sedimentation and then turbulently through the heat exchanger tubes (13), which are equipped with turbulators. The more turbulent the flow, the more the gas comes into contact with the tube walls, thus ensuring maximum transfer of heat to the boiler water. This ensures low exhaust gas temperatures and high efficiency.

During cleaning (grate tipping) the turbulators (13) are also moved to scrape the flue ash from the heat exchanger tubes. The ash is transported to the ash box (9) by a screw (14).

## Highest safety with underpressure

A draught fan (15) at the boiler outlet causes underpressure throughout the boiler, thus ensuring high operational safety without risk of deflagration and burn-back. The airtight one-chamber rotary valve (5) makes the usual combustion air fan unnecessary. The required air is drawn into the combustion chamber through the regulated primary (10) and secondary (11) air flaps as a result of the underpressure within the boiler.



## Why measure emissions?

It is a requirement for the carbon monoxide (CO) emissions of every boiler to be measured periodically. In Germany, this periodical measurement must also include a dust measurement.

There are several aspects of this that could go wrong, resulting in incorrect measurements even though the boiler fully and consistently complies with these limits when operating in accordance with the relevant standards.

## 2 to 3 days before measurement, the boiler and boiler tube must be cleaned thoroughly

The chimney sweep will contact the owner of the boiler when the measurement is due to take place. The boiler and boiler tube must be cleaned thoroughly 2 to 3 days before the measurement takes place. Once this is complete, the heating can continue to be used as normal.




This delay between cleaning and measurement is necessary in order to allow dust disturbed during cleaning to settle again. If the chimney sweep measures unsettled dust, the dust reading will be higher than normal and thus inaccurate.




**Under no circumstances clean the boiler and flue tube on the day of the measurement!**

## If possible, switch the boiler off before measurement

If possible, **switch the boiler off 3 to 5 hours** before measurement using the on/off button .

## Ensure that there is sufficient heat consumption and then switch the boiler back on

Open all the radiator valves and turn the radiator thermostats to maximum.


Finally, switch the boiler back on using the on/off button ( button lights up green).

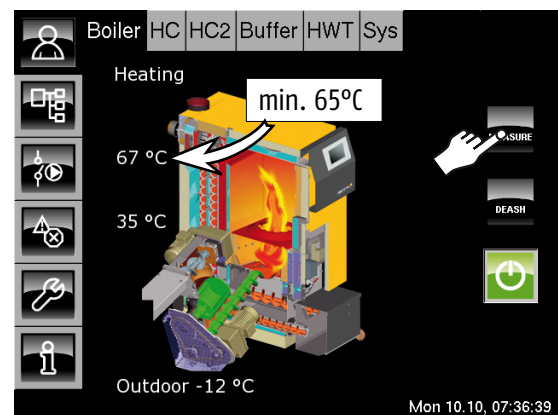
## Boiler temperature at least 65°C



Before emission measurement, the boiler must be **in operation for at least 30 minutes** and the **boiler temperature must be at least 65 °C**.

## Switching the boiler to emission measuring mode

Press  to switch the boiler to emission measuring mode. This button lights up green to confirm the change.




The boiler is now run at **full load for 30 minutes**. The control system ensures that sufficient heat is channelled to the heating circuits and the hot water tank.

## Wait for 5 to 10 minutes, then measure the emissions



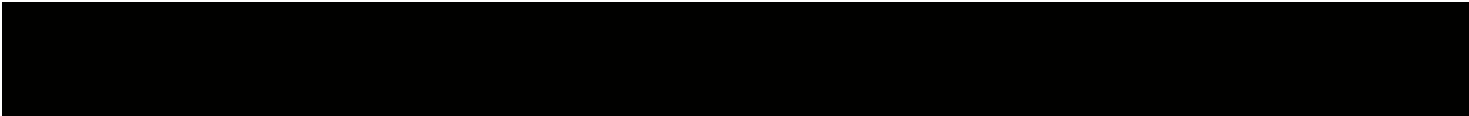
Once emission measuring mode has been activated, **wait for 5 to 10 minutes** until the boiler has reached the required operating temperature and stable combustion can be guaranteed. Then carry out the **emission measurement**.

## After the measurement

Switch the boiler back to normal mode by pressing  again.

If this button is not pressed, the boiler will automatically switch back to normal mode after 30 minutes.





## Give preference to coarse wood chips G30 - G50 or P32- P45 with low fine content

The length of the individual wood chips should be between 30 and 50 mm to ensure that air can circulate well among the stored chips, moisture can escape from them, and the tendency to decay and become mouldy is low.

If the fine content (sawdust, bark, needles, soil, sand) is too high, it can obstruct the airways. In the warm interior of the pile, water evaporates. If the vapour cannot escape, it will condense in the upper part of the pile. A portion of the chips will then suffer dry rot and turn to compost with no heating value.



coarse + dry = good output



fine + dry = less output

## Avoid green, moist wood chips

Only wood chips that are dry enough (water content under 25 %) can be stored without problems in a concrete bunker. Moist, coarsely chopped chips stored in an open hall exposed to the wind quickly reach a water content under 35 %, suitable for the boiler.

Finely chopped chips from fresh wood, or chips from green branches with a high fraction of bark and needles circulate air poorly and can hardly dry, so they decay quickly with great loss of heating value.

coarse + moist = lower output  
can only be stored with good ventilation



fine + moist = no output

## Be especially careful with waste wood

When waste wood is on offer, it may be rotten wood with no heating value; only buy waste wood by weight and with limited water content (25 % maximum). Also ensure that the wood contains no contaminants. The applicable laws only allow the use of untreated wood without foreign substances for heating purposes.

## Wood-processing businesses may burn chipboard if it contains no halogens or wood preservatives.

Even if it is allowed by law, high chemical content in the chipboard (often from "illegal" chlorine) can cause corrosion and above-average wear in the boiler.

## Nails and stones

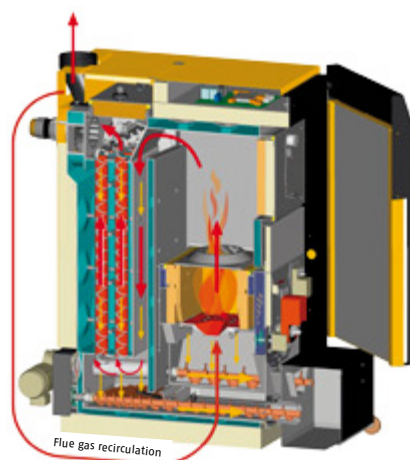
may not bring the boiler to a stop, but they cause increased wear on the conveyor screws and the blades in the rotary valve.

## Sand and soil, more ash and slag

Above a threshold that varies from one batch of chips to another, slag can build up on the grate and must be removed by hand. Avoid high sand and dirt content.


## Flue gas recirculation for pellets, miscanthus and very dry carpentry waste


For these fuels, a flue gas recirculator (available as an option) is required.




## What do you need to consider when changing fuel type?

The control system includes these fuels: wood chips, pellets and miscanthus.

 If the fuel is changed, **the control system must also be set to the new fuel type**. Depending on fuel type, different parameters for combustion and ash removal are stored and automatically adjusted. If the water content and density are known, these parameters must also be adjusted.

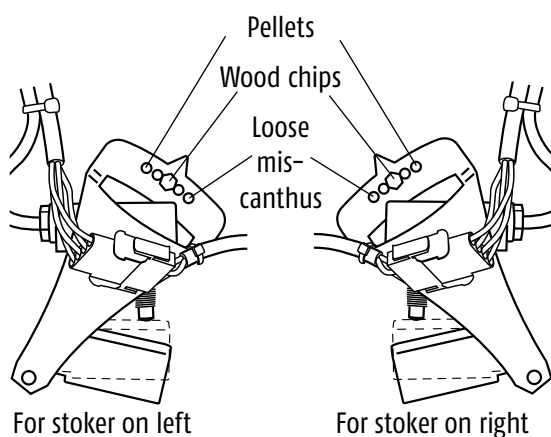
 **An adjustment of the firebed level sensor and the flue gas recirculation** is necessary. These steps are explained on the following pages.

 Changing the fuel, density and water content in the control system is described on page 52.

## Set the firebed level sensor to match the fuel

Simply put, the drier the fuel, the lower the amount of it that must be on the grate. The firebed level sensor must be adjusted to the type of fuel currently in use.

The firebed level sensor is behind the panel when you open the insulation door.



## The amount of ash depends on the fuel and the season

Ash is the non-flammable residue from the wood. It consists of minerals such as calcium and potassium without which life cannot exist, but also soil, sand and stones, i.e. dirt from the fuel.

A rule of thumb: the darker the fuel, the more bark, dirt or decayed material (and therefore ash) it contains.




In theory, both chips from pure wood and chips from wood with bark have the same ash content of around 0.5 %. In practice, there is always soil and sand stuck to the bark.


Stems and leaves need potassium for rigidity and their dirt-exposed surface is larger, so their ash content is in the range between 3 and 6 %.

Dark material from thin branches usually also has a high fraction of decayed material, meaning less combustible material and more ash.

## Check ash box

The fuel's ash content and quality determine how often the ash box must be emptied.

	 In summer	 Peak of heating season
	~5 weeks	weekly
Wood chips with bark	~2 weeks	~3 days
Miscanthus	~10 days	~2 days
Shrubbery cuttings, very thin branches, high leaf content	~5 days	daily



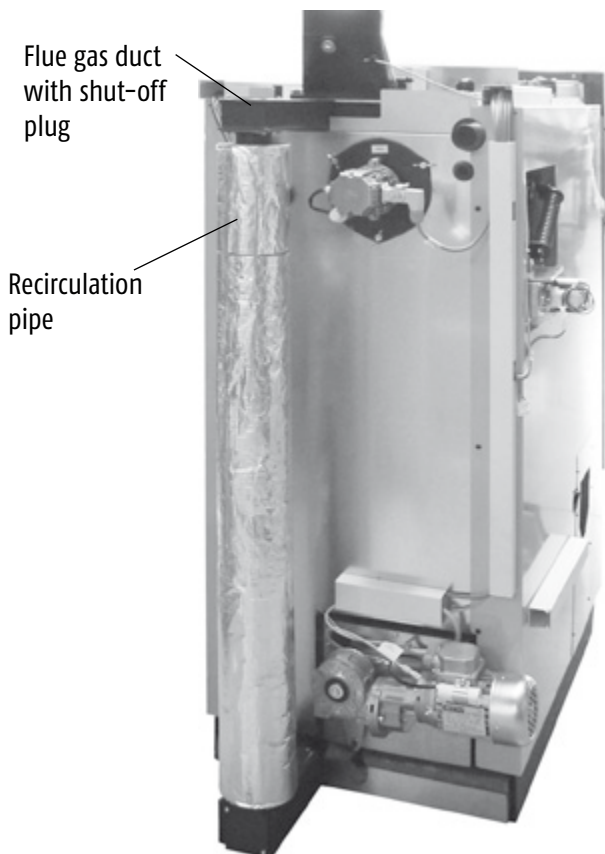
## Flue gas recirculation on the boiler

For very dry fuels such as pellets, carpentry waste, miscanthus), the optional flue gas recirculation is required in order to lower the combustion temperature.

Depending on the fuel, the flue gas recirculator must be blocked or opened with the shut-off plug. Then the **flue gas recirculation must be set to "yes" or "no"** in the control system; see page 12.

Fuel	Flue gas recirculation
Pellets	Yes
Dry carpentry waste	Yes
Miscanthus	Yes
Wood chips W > 15 %	No

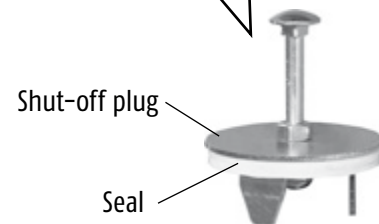
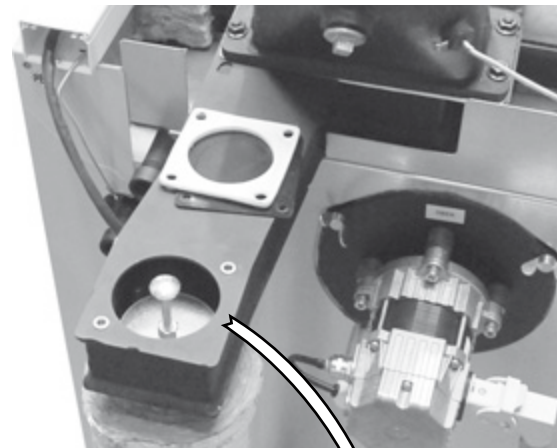
### Installed flue gas recirculation



### For wood chips, block flue gas recirculation

Remove the cover on the top side of the flue gas duct and insert the shut-off plug.

When inserting or removing the shut-off plug, inspect the seal and replace it if necessary.



If **flue gas recirculation has been blocked**, in the control system the option **[Flue gas recirculation] must be set to "no"**; see page 12.

### Open the flue gas recirculator for pellets and miscanthus

Remove the shut-off plug from the recirculation pipe and store it near the boiler so it can't get lost (tie on with wire).


Then set **[Flue gas recirculation] to "yes"** in the control system; see page 12.

If the fuel type was set to "Wood pellets" earlier, the "Flue gas recirculation" parameter is also automatically set to "yes".


## What does flue gas recirculation do?

For very dry fuels (e.g. pellets, joinery waste material, Miscanthus), optional flue gas recirculation is required in order to lower the combustion temperature.

If shut-off in the recirculation pipe of the flue gas recirculation system has been installed or removed, the flue gas recirculation function must likewise be switched either on or off in the control system.

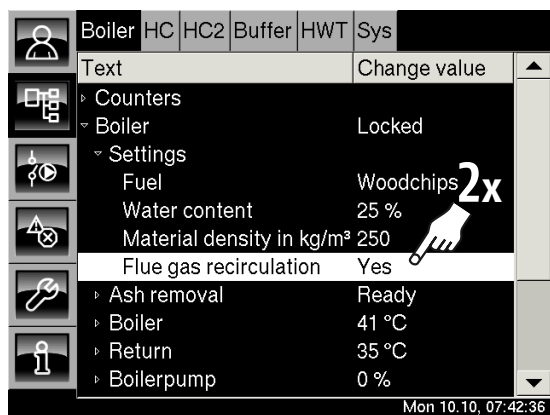
 If the fuel type is set to "Wood pellets", the "Flue gas recirculation" parameter is also automatically set to "Yes".

## Adjusting flue gas recirculation

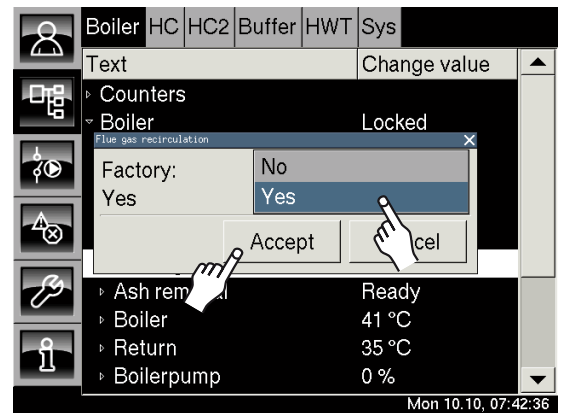
Press the buttons **Boiler** and  to open the text menu.

Tap the [Boiler] line and, in the submenu, tap [Settings].

Double-tap on the [Flue gas recirculation] line.



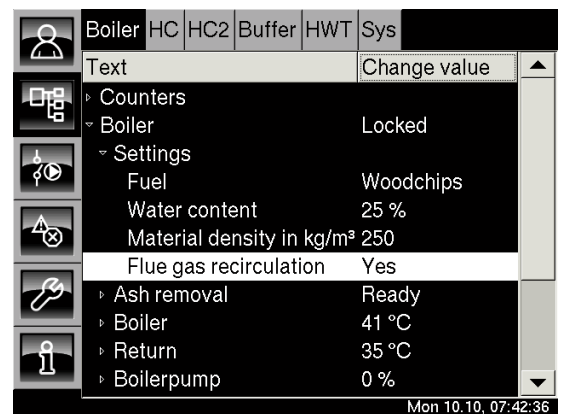
A selection window appears.




Set flue gas recirculation to [Yes] and press

**Accept**.

The text menu display appears again.



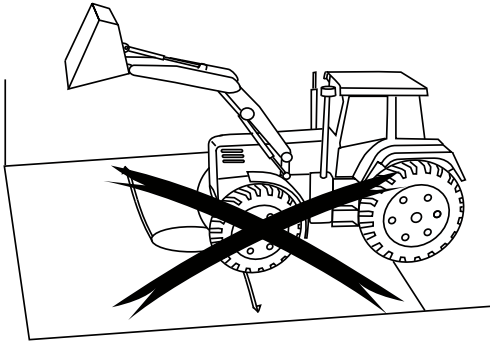
Press  to return to the boiler overview.

# Filling the bunker

Before filling a bunker with a floor agitator, the boiler must be completely connected.



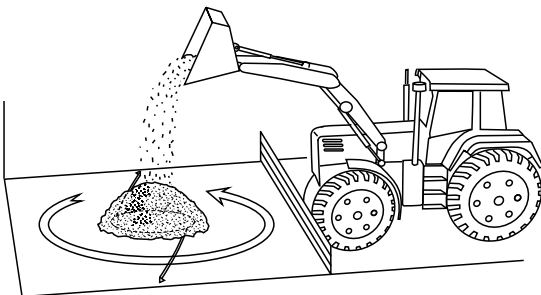
**Never drive over the floor agitator!**



**During filling the floor agitator must be turning**




If the bunker is empty, the floor agitator's arms are extended. If the arms are deeply covered in this position, they will be trapped and the agitator will no longer be able to turn.



**Start floor agitator with** 



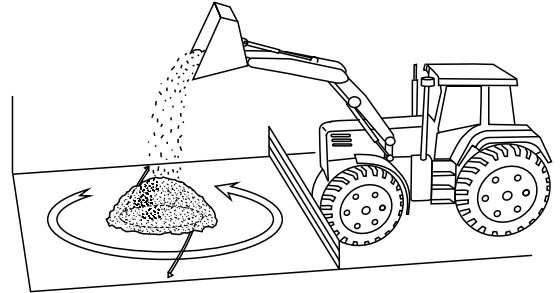
The boiler is forced into operation with the "Emission measurement"  button and material is transported to it.

Rotation of the floor agitator can be stopped by pressing  again. In any event, the boiler stops the emission measurement automatically after 30 minutes and the fuel conveying system is switched off.

**Start with a pile in the middle**

With the agitator turning, begin filling in the middle on the agitator.

If the agitator is fed from the side, the turning arms plough through the chips and throw them back into the still-empty bunker.



**Dump slowly into bunker**

If the bunker is filled through a hole from above, the material must be fed onto the turning floor agitator slowly.



An entire load emptied all at once onto the agitator from a height of 3 m or even 6 m can damage it.

**Maximum fill height on agitator**


The maximum fill height depends on the material or weight (density):

- Pellets up to 2.0 m
- Wood chips up to 5.0 m

**Bunker with charging screws**

**Filling bunkers with charging screw**



If the bunker is already almost empty, fill with 2 to 3 m<sup>3</sup> of chips or pellets and only then start the floor agitator with .

## Before starting the system

Before starting the system, check the following to ensure smooth and problem-free operation.

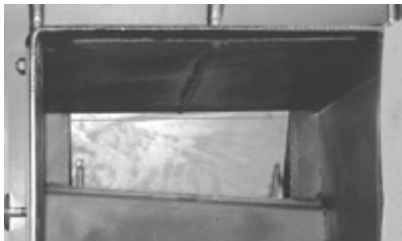
### No leak air

Verify that all doors and maintenance covers are tightly closed, especially before initial start-up and after any maintenance.

Leak air can reduce boiler output, but above all it shifts the lambda measurement to lower air supply, which makes the combustion chamber become hotter. This can cause slag to form and, in extreme cases, can cause rapid wear of the refractory lining. Insufficient air also results in incomplete combustion, which can result in tar deposits on the heat exchanger.

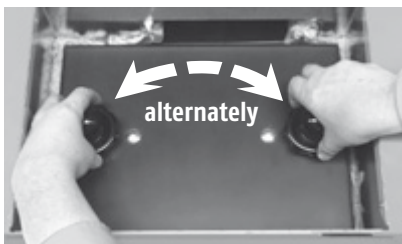
### Internal cover on heat exchanger inlet

Look through the combustion chamber door and verify that the internal cover is firmly seated in its frame.



### Heat exchanger cover closed?

First twist the ball knob half a turn clockwise to engage it. Pull on the ball knob to test whether it holds. Then tighten the knurled nuts alternately. If one side is tightened too much, the other side cannot be closed with a proper seal.



### Combustion chamber door

Close it firmly (forcefully).



### Ash box closed and tightly coupled

Both the connection seal and the lid seal must be clean and intact, and all four latches must be closed.



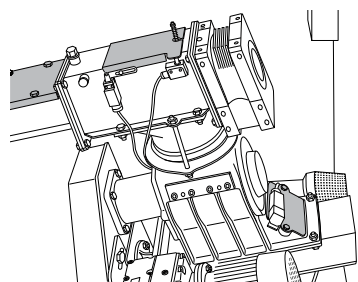
### Check lambda probe (only for commissioning)

The installation tube must be firmly tightened, with 20 kg and 20 cm lever arm (pipe wrench).




### Drop chute and maintenance cover closed?


An open drop chute cover or maintenance cover on the base of the rotary valve will stop boiler operation (safety switch).



## Malfunions in material transport

The entire transport of fuel to the boiler is monitored by the control system. If the discharge screw or the stoker screw is blocked, the control system tries to unblock the screw by reversing it.

 If the blockage persists after 3 attempts to remove it, an error message is displayed. The boiler then begins the burnout and can no longer be switched on. When burnout is complete, the boiler is in the "malfunction" state.

 Alarm	
Functional block	Boiler
occurrence	TUE 4/4/2011 11:25:45
<b>Message</b>	
Stoker screw current consumption too high	
<b>Description</b>	
Drive unit for boiler feed is blocked	
<input type="button" value="Confirm later"/> <input type="button" value="Confirm"/>	

### Error: "Current draw too high" Oversized piece of wood or a foreign object

An single oversized piece of wood or a foreign object is blocking the screw, causing its motor to draw more current.

If the blockage cannot be removed after 3 tries, material transport is deactivated to protect the screw, and an error message is displayed on the screen.

### Error: "Overload" Wood chips too fine or too long

Wood chips that are too fine or too long interfere with the conveying system over time. That overloads the motor, which is switched off by the motor protection.

## Removing a blockage

### Switch off boiler with main switch

When a blockage or overload is recognised, the boiler begins the burnout and then switches to the "malfunction" state. This can take up to 30 minutes.



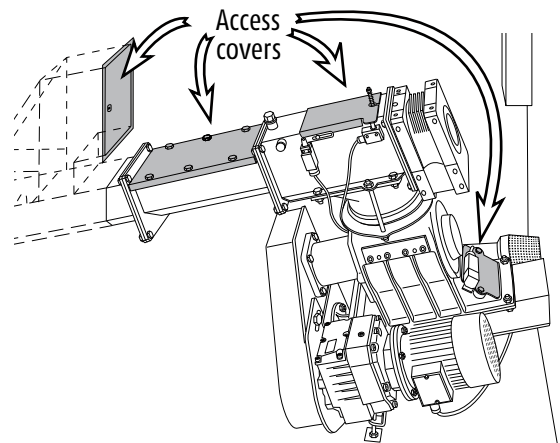
Only switch off the main switch when the "malfunction" state is displayed. This will keep the boiler from overheating.

### Open access covers, remove blockage

Access covers can be removed for access to the conveyor screws to eliminate blockages.




Before opening the access covers, ensure that the boiler has been switched off with the main switch!



### Restart boiler

When the blockage has been removed and the covers replaced, the boiler can be restarted with the main switch.

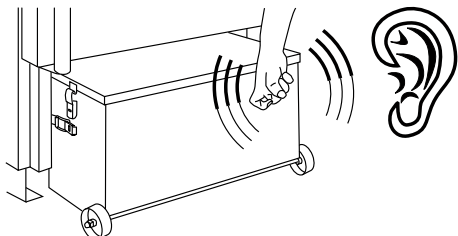
Heating operation can be resumed with .



## Ash screw blocked

If the ash screw is blocked, a warning will be displayed on the screen. The most common cause of a blockage is a full ash box.

Determine the ash level by knocking on the box. Acknowledge the warning and empty the ash box; see page 23.



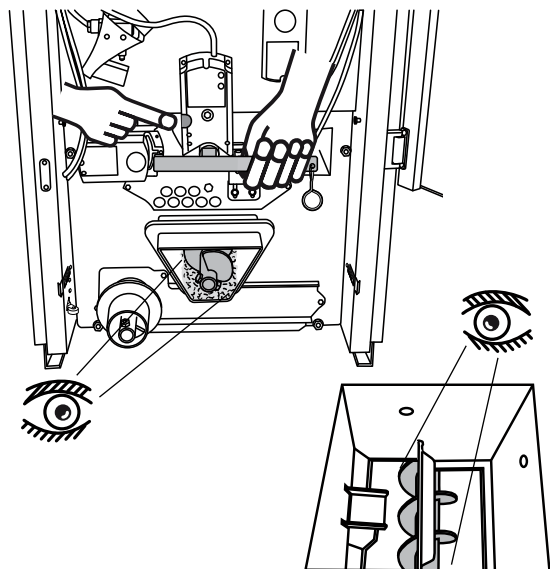
If the ash box is not full, then it can be assumed that a foreign object is blocking the ash screw.

## Foreign object blocking ash screw

Stop the heating by pressing  in the boiler overview. As soon as the boiler status is "Switched off", switch it off with the main switch.

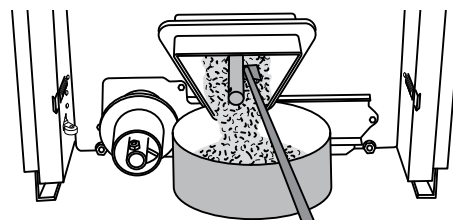
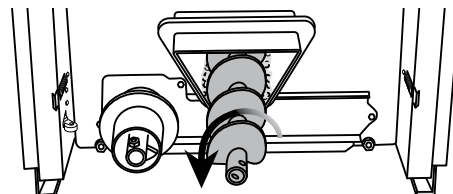
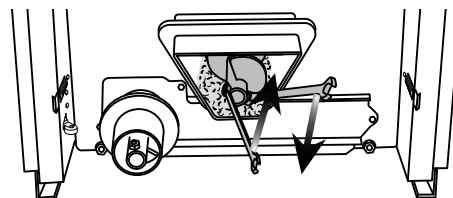
Remove the ash box. The foreign object may already be found stuck crosswise at the end of the ash screw.

Press the button to release the actuator. Now use the included spanner to orient the grate vertically. The ash screw becomes visible through the combustion chamber door and the foreign object can be removed.




## Remove ash screw under grate

The grate ash screw is positioned centrally under the grate. If it remains jammed, it must be removed. Release the screw from the shaft by unscrewing the M8 screw (spanner size 13) and then pull it out while turning it anticlockwise. Clean out the ash duct with suitable tools and reattach the screw.




## The heat exchanger ash screw seldom jams

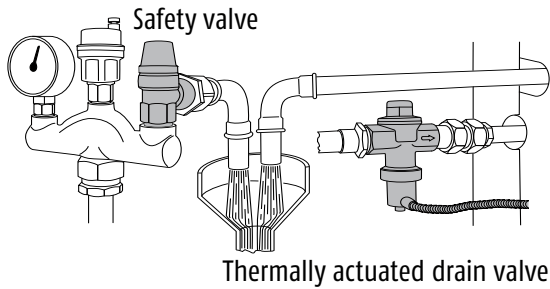
 If you are certain that the cause of the blockage is not the grate ash screw, contact ETA customer service for the next steps.

# Overtemperature protection

## Protection against boiler overheating

 The boiler is factory-equipped with safety features to prevent it from overheating.

During installation, additional equipment such as **thermal emergency cooling valve** and **safety valve** must be installed.



The following safety chain takes effect if the boiler exceeds the operating temperature for any reason:

- over 90 °C -> pump safety run
- over 95 °C -> thermal emergency cooling valve
- over 105 °C -> safety temperature limiter
- over 3 bar water pressure -> safety valve

### Pump safety run, Automatic heat dissipation at overtemperature

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

This action prevents the boiler temperature from rising further and triggering further safety devices such as: safety temperature limiter and thermal emergency cooling valve. This emergency cooling is shown on the monitor "**Emergency cooling**".

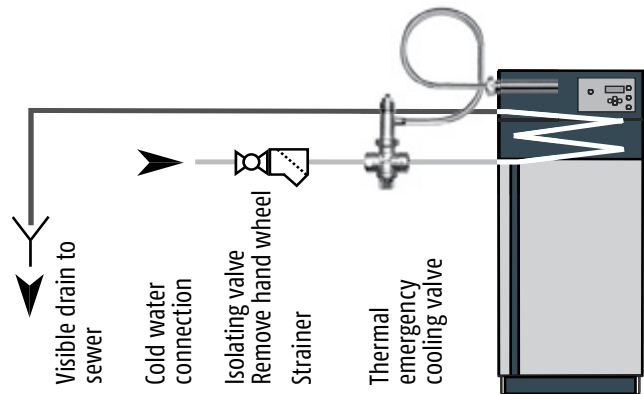
The **heat dissipation** is limited with the **maximum flow temperature set in the heating circuits** and the **hot water setpoint temperature**.

## Thermal emergency cooling valve against overheating



The safety heat exchanger built into the boiler must be connected by the heating technician to the house's cold water supply via a thermal relief valve (opening temperature 95 °C) to protect the boiler against overheating if the pump fails. The minimum pressure in the cold water pipe must be 2 bar (3 bar for HACK 130 kW).

Connect the supply line to the lower connector of the safety heat exchanger; the upper connector is for outlet to the sewer. To prevent the supply line from being shut off accidentally, remove the levers from shut-off valves or the hand wheels from valves and hang them there with a piece of wire.

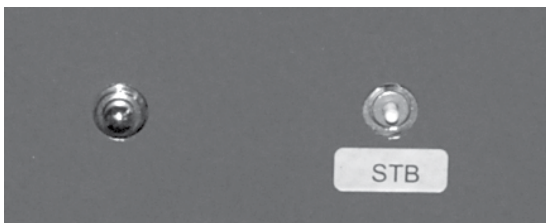


The discharge must have an easily visible, open flow path so malfunctions can be recognised. Direct the discharged water to the sewer via a siphon funnel or at least with a pipe into the ground so that nobody can be scalded if the valve is activated.

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


## Safety shutdown by safety temperature limiter


For additional safety against boiler overheating, a **safety temperature limiter** is built into the boiler. When a **boiler temperature of 105°C** (tolerance 100 to 106°C) is reached, the **power supply to the draught fan and the fuel intake is interrupted**. If the boiler temperature decreases **below 70 °C** again, the **safety temperature limiter** can be **manually released** for a restart of the boiler. The reset button is recessed into the door frame above the door of the secondary combustion chamber. It must be pushed in deeply (ideally with a match) to release it.



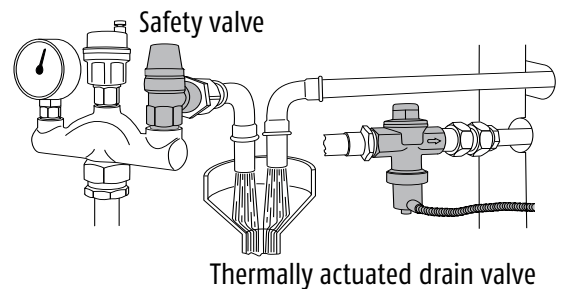
## Safety valve against overpressure

A safety valve with 3 bar opening pressure must be installed on the boiler. No shut-off valve may be installed between the boiler and the safety valve. If solar or other heat sources provide energy to the buffer storage tank via a heat exchanger, a safety valve (3 bar maximum) is also required on the buffer storage tank. Normally an expansion tank that is too small or defective, or blocked heating lines, are the cause for activation of the safety valve.

 The safety valve must be on top of the boiler or in the flow in order to also discharge heat in an emergency. Only this way can it discharge heat by blowing out hot water and steam.

 The discharge must be directed to the sewer via an easily visible, open flow path (siphon funnel) so malfunctions and, above all, a non-closing valve can be recognised. If no sewer is available, the discharge must be directed into the ground in a pipe so nobody is endangered by hot water or steam.

## Have the thermal emergency cooling valve or the safety valve activated?

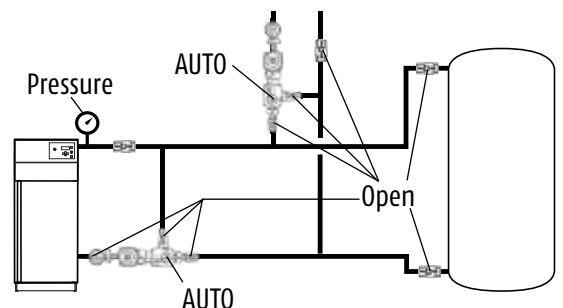


## Are the pumps OK and the heating lines open?

Verify whether the pumps are running by using a screwdriver as a "stethoscope".

If the system is new or has been out of operation for some time, verify whether the return riser mixing valve is in "AUTO" position and the manual knob has snapped into "AUTO" position.

Verify that all shut-off valves in the heating lines are open. (Always open ball valves completely to avoid ruining the seals. Open the valves by turning the handle anticlockwise, and then turn back a quarter of a turn from the fully open position to relieve pressure on the valve stem.)



## Add heating water if necessary

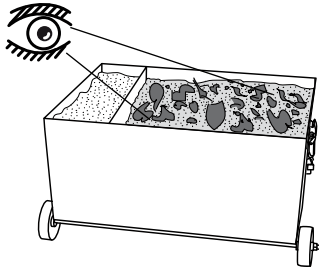
If the boiler temperature has decreased, it may be necessary to add heating water.

In houses with up to three storeys, the pressure in a cold system should be between 1 and 2 bar, for a warm system between 1.5 and 2.5 bar.

## When fuel causes slag formation

### Slag in the ash box

If large pieces of slag are found in the ash box, the cause usually lies in the fuel's ash content. The boiler must be deashed more often.



Basically, as long as the slag does not clog the air holes in the grate, there is no need to worry. If the grate needs cleaning weekly or even more often, then it is essential that you switch to a different fuel that causes less slag formation: less bark, less dirt, less decayed material.

### Adjust deashing interval

The deashing interval specifies how much fuel must be consumed before automatic ash removal begins. During this process the grate is tipped and the ash that falls off is transported to the ash box by the ash screws. The boiler's deashing interval is set with the parameters "Earliest ash removal after kg" and "Latest ash removal after kg".

The deashing interval depends on the type of fuel being used. The higher the ash content of the fuel (e.g. if there are large pieces of slag in the ash box), the shorter the deashing intervals must be.



The deashing interval should only be altered after consultation with an expert or ETA customer service.

### Check flue draught, flue gas recirculation

A too-high flue draught can also cause slag by reducing the effectiveness of the flue gas recirculation.

If the flue draught is over 15 Pa, a draught limiter is essential, or a nozzle on the chimney opening, with which higher exit velocities and better lift for the flue gas are achieved.

### Leak air caused by poor seals?

Verify that the boiler door, heat exchanger cover and ash box are tightly closed and their seals intact; see page 15.

### If shortening the deashing interval results in no improvement

If shortening the deashing interval does not yield satisfactory results, please contact our customer service.

Increasing the residual oxygen target value (around 1 to 2 %) or limiting the boiler output by reducing the maximum exhaust temperature can also help.

## The deashing interval depends on the fuel type

The deashing interval defines how much fuel must be consumed before automatic ash removal begins. During this process the grate tips up and the ash that falls off is transported to the ash box by the ash screws.

The deashing interval depends on the type of fuel being used. The higher the ash content of the fuel (e.g. if there are large pieces of slag in the ash box), the shorter the deashing intervals must be.

The parameters "Earliest ash removal after kg" and "Latest ash removal after kg" define the boiler's deashing interval.

## Before altering the interval

Check the following points before altering the deashing interval:

- Is the correct fuel type set? -> page 53
- Does the boiler have flue gas recirculation? -> page 12
- idletimes for ash removal -> page 54




The deashing interval should only be altered after consultation with an expert or ETA Customer Service.

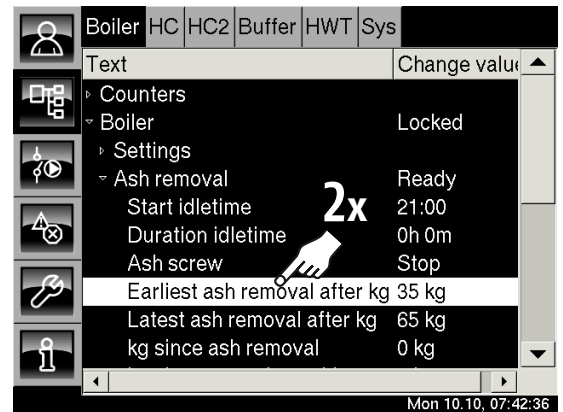
## Deashing interval factory settings

	Wood chips	Wood pellets	Miscanthus
20 - 49 kW:			
At earliest after:	25 kg	35 kg	5 kg
At latest after:	50 kg	60 kg	10 kg
63 - 90 kW:			
At earliest after:	35 kg	55 kg	9 kg
At latest after:	65 kg	90 kg	15 kg
130 kW:			
At earliest after:	45 kg	90 kg	11 kg
At latest after:	100 kg	150 kg	19 kg
200 kW:			
At earliest after:	70 kg	140 kg	17 kg
At latest after:	155 kg	230 kg	30 kg

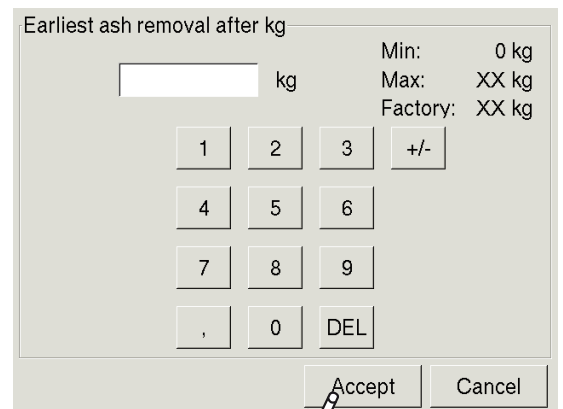
## Changing the "Earliest ash removal after kg" setting

Press the buttons **Boiler** and  to go to the text menu.

Tap the [Boiler] line and, in the submenu, tap the [Ash removal] line. Double-tap on the [Earliest ash removal after kg] line.




A settings screen opens:




Enter the new value and press **Accept**. The text menu display appears again.




Use the same method to alter the parameter "Latest ash removal after kg".

Press  to return to the boiler overview.

## Regular cleaning and servicing

 To ensure that the boiler operates reliably, it must be cleaned and serviced at regular intervals.

 However, maintenance and cleaning must be performed within the specified duration (once per year, every 3 years).

## Cleaning and maintenance overview

Below is a table with an overview of the activities to be performed for cleaning and maintenance.

The "to be done by" column indicates which activities you as customer can deal with and which must be performed by an expert.


Activity	Frequency			to be done by
	Regularly	every 2,500 h or at least 1x yearly	every 5,000 h or at least 3 years	
Empty the ash box	X	X	X	Customer
Check seals on ash box and connection to boiler	X	X	X	Customer
Remove ash from secondary combustion chamber	X	X	X	Customer
Check water pressure	X	X	X	Customer
Check safety valve(s)	X	X	X	Customer
Inspect and clean grate		X	X	Customer
Check seal on combustion chamber door		X	X	Customer
Check firebed level sensor		X	X	Customer
Clean secondary air openings in secondary combustion chamber		X	X	Customer
Check refractory lining		X	X	Customer
Clean flue tube		X	X	Customer
Remove flue ash from chimney		X	X	Customer
Clean heat exchanger, remove flue ash		X	X	Customer
Inspect heat exchanger tubes for tar deposits		X	X	Customer
Vacuum out lambda probe (do not remove it)		X	X	Customer
Clean flue gas recirculator		X	X	Customer
Extinguishers, malfunction indicators or alarms		X	X	Customer
Trial heating and test residual oxygen / lambda probe		X	X	Customer
Clean control panel and casing		X	X	Customer
Inspect blades on rotary valve			X	Expert
Lubricate drive chains for stoker and ash screws			X	Expert
Perform and check ash removal process			X	Expert
Safety switches on drop chute and maintenance cover			X	Expert
Check closing of tilting grate			X	Expert
Clean draught fan and fan housing, replace seal			X	Expert
Inspect ash box position switch and seals			X	Expert
Perform emission measurement			X	Expert
Check safety temperature limiter			X	Expert
Reset maintenance counter			X	Expert

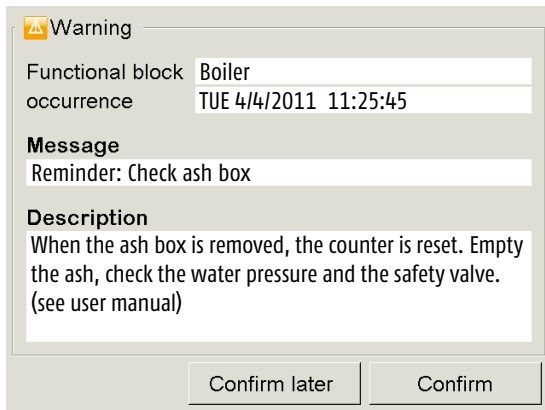
## Emptying the ash box

### On-screen reminder to empty ash box

The ash box must be emptied regularly. In the control system, you can enter a fuel consumption amount, so that a reminder to empty the ash box will appear on-screen once this amount of fuel has been consumed.

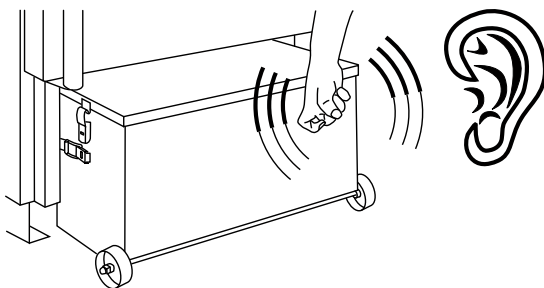
Since the ash content depends on the type of fuel being used, the default value is set to 0 kg. No reminders are given if the setting is 0 kg.

 However, the parameter can be changed at any time as soon as you have some experience of your fuel consumption rate; see page 25.




### Is the ash box full?

By knocking on the vertical wall of the ash box, you can also check the ash level without opening it. If it is full, it makes a dull thump. When empty it makes a hollow sound like a drum.



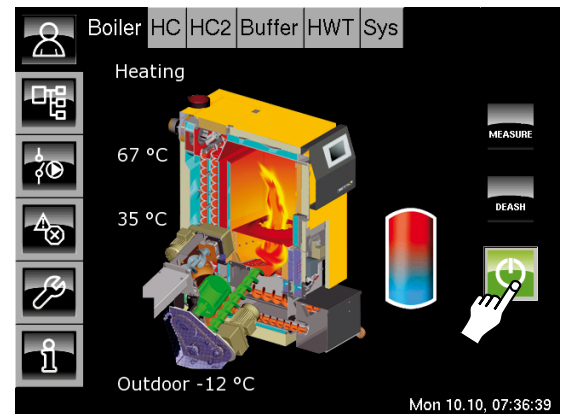
### Stop heating, draught fan switched off

Before emptying the ash box, switch off the boiler in the overview with the  button. The boiler performs a burnout. This can take up to 30 minutes.



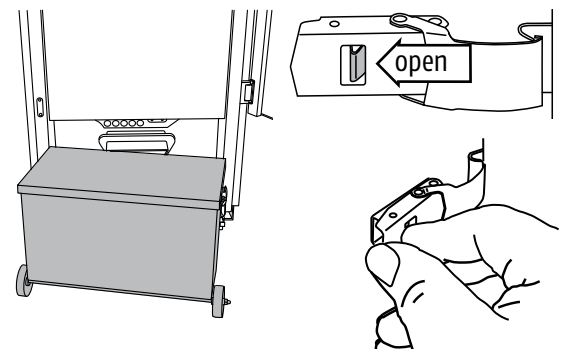
Only when the draught fan is switched off and the boiler status "Switched off" is displayed on the screen is the burnout complete; then the ash box can be removed.

If this is not done, leak air will transport flue ash into the chimney and into the surroundings.



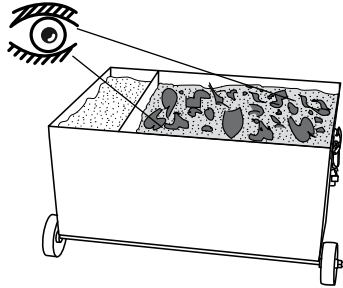
### Open the side latches

Open the side latches by pressing the safety catch in the direction of the arrow. Take the ash box out of the boiler.



## Check the ash – are there any large pieces of slag?

If there are many large pieces of slag in the ash, check the grate (see page 27) and, if necessary, shorten the deashing interval (see page 20).



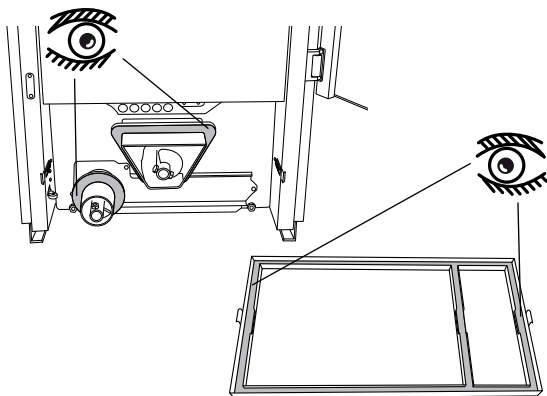
## No embers in the rubbish bin

If there are still embers in the ash, leave the ash in a closed, non-flammable container for at least 2 days. Only put it in the rubbish bin when there are really no more embers present.

Available accessories include a second ash box or a 110-litre rubbish bin compatible with refuse lorries, which can be attached directly to the boiler in a prone position. Ask your heating specialist.

## Inspect seals

Check the seals in the ash box's cover and on the boiler's ash outlet. These must be undamaged; otherwise leak air could be sucked in.



## Reattach ash box to boiler

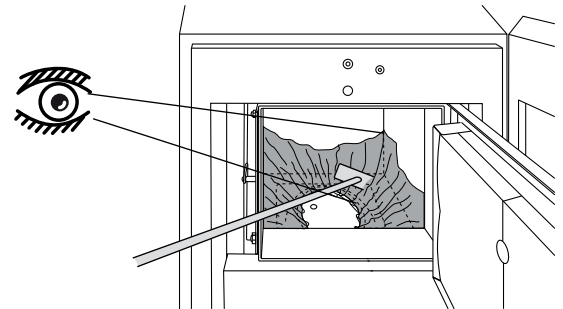
Reattach the ash box to the boiler with the side latches.

## Ash deposits in secondary combustion chamber steeper than 45 degrees

The ash in the secondary combustion chamber may not be steeper than 45 degrees. Use the scraper to push the excess ash into the combustion chamber and start to deash the boiler.

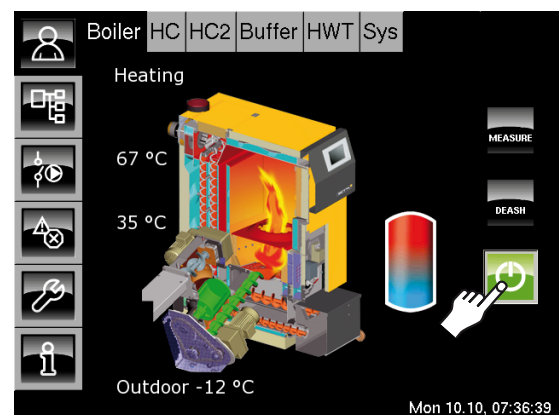
Tap **DEASH** on the screen. If necessary, start another deashing.

Take the opportunity to check the fit and seal of the internal cover over the heat exchanger inlet.



## Restart the boiler

The boiler can be restarted by tapping .




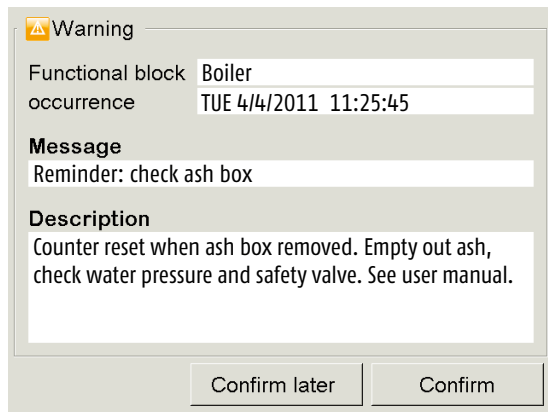


## "Empty ash box" reminder


The ash box must be emptied regularly. In the control system, you can enter a fuel consumption level, so that a reminder to empty the ash box will appear once this amount of fuel has been consumed.

Since the **ash content depends on the type of fuel being used**, the **default value** is set to **0 kg**. With this setting, **the reminder does not appear on the screen**, and the **ash box filling level** must be checked manually at regular intervals.

 However, the parameter can be changed at any time as soon as you have some experience of your fuel consumption rate.

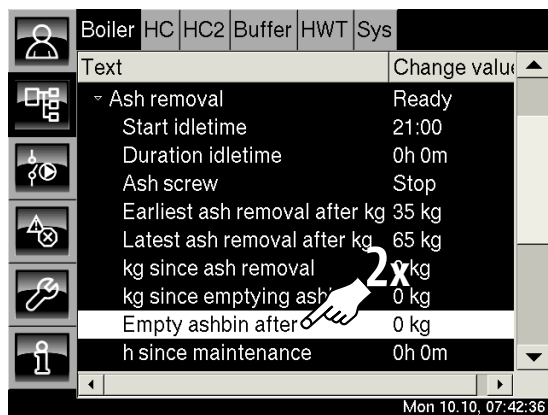


## Changing the "Empty ashbin after" setting

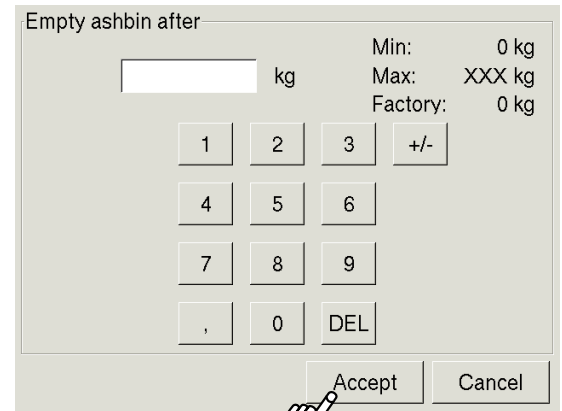
Press the buttons **Boiler** and  to go to the text menu.

Tap the [Boiler] line and, in the submenu, press the [Ash removal] line.

Double-tap the [Empty ashbin after] line.




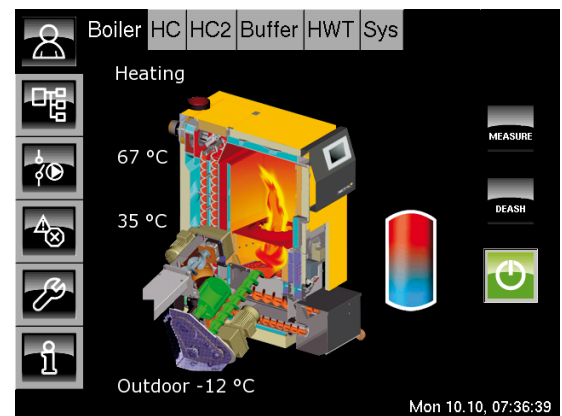
A settings screen opens:



Enter the new value. If the value is set to zero, this message will no longer appear.

Press **Accept** to confirm.

Press the  button to return to the overview.

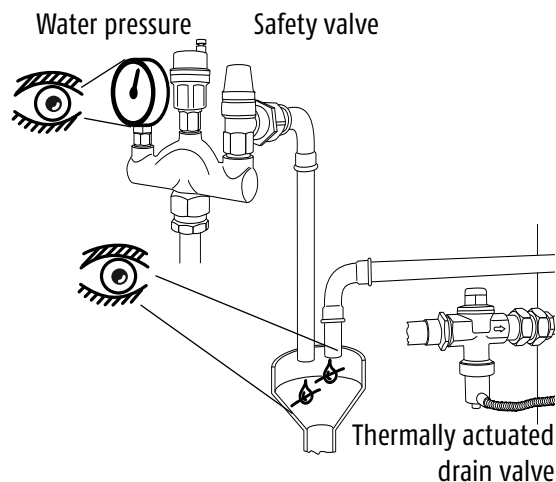


## Optimum water pressure 1.5 – 2.5 bar

In houses with up to three storeys, the pressure in a cold system should be between 1 and 2 bar, for a warm system between 1.5 and 2.5 bar.


If the boiler pressure is too low, fill the cold heating system to approx. 2.0 bar. Water expands with increasing temperature. When heating to full operating temperature, the safety cut-off pressure of 2.8 bar should not be exceeded.

Only refill with softened water after major repairs. If the heating water pressure is repeatedly too low, the cause of the leak must be found.



## Check safety valve and thermal emergency cooling valve

The safety valve and the thermal emergency cooling valve may not drip. Dirt may be stuck in the seal seat.

 Perform further steps only on weekdays, never on weekends in a cold winter as there will probably be no heating technician available if the seal is defective. If the safety valve drips, open it with a quarter turn of the red cap and rinse it out (danger of scalding).

If the safety valve still cannot be closed tightly after being rinsed several times, it must be cleaned by a plumber or replaced. If a solar buffer is equipped with a safety valve, check that as well.

The thermal emergency cooling valve is cleaned by pressing the red button.

## No combustible material in the boiler room

No combustible materials may be present in the boiler room.

## Fire extinguisher in the vicinity of the boiler

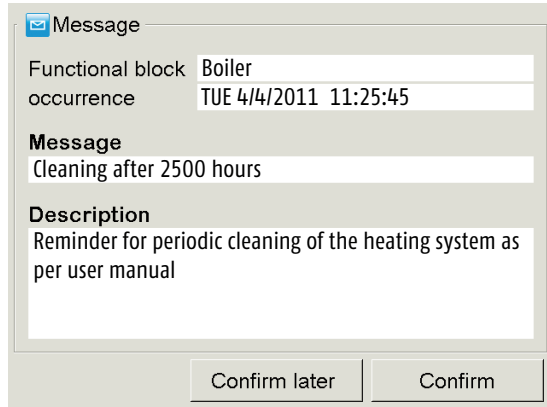
As a precaution, keep a fire extinguisher within reach in the passageway to the boiler, but not in the boiler room.

## Fire door for boiler room

The boiler room must be equipped with a self-closing fire door.


## Maintenance every 2,500 hours or yearly, for miscanthus after 1,250 h

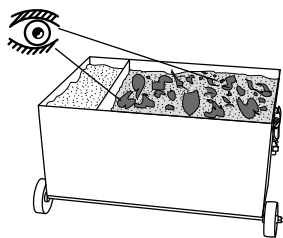
When this maintenance is due, a message appears on the screen.



### Check grate if ash has slag

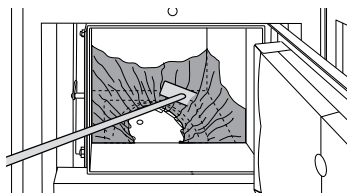
If there are large and very hard, glassy pieces of slag in the ash, the combustion chamber and grate must be inspected. Individual small pieces of slag are no cause for concern. The limit of acceptable slag formation is reached when it clogs the air holes in the grate.

 See also the section "When fuel causes slag formation" on page 20.



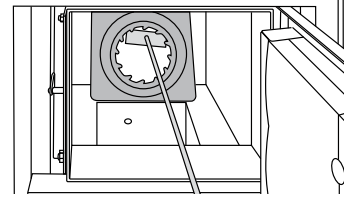
### Stop heating and start ash removal

Stop heating by tapping . When the boiler status is "Switched off", tap . Use the scraper to scrape the ash from the secondary combustion chamber into the primary combustion chamber.



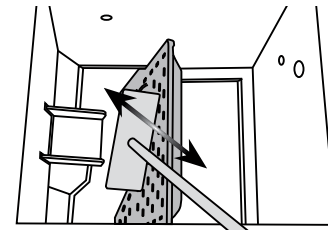
### Lift combustion chamber cover

Use the scraper to place the hot combustion chamber cover in the rear of the secondary combustion chamber to make the grate visible.



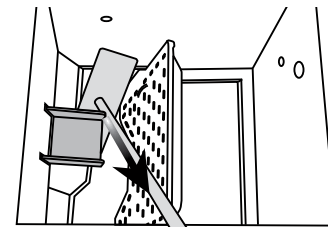
### Clean vertically oriented grate

Clean the vertical grate with the scraper.



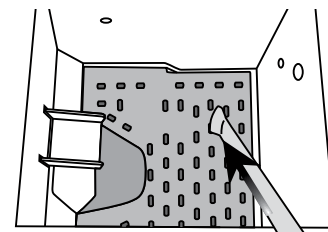
### Check movement of firebed level sensor.

Check the movement of the level sensor by repeated lifting with the scraper.




### Check and clean air holes in grate

The combustion chamber is still hot, so a mirror and a torch can be helpful. Use the poker to clean the air holes.



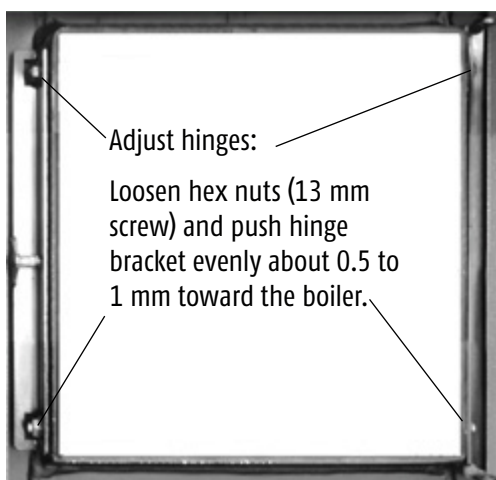
### Replace combustion chamber cover

Replace the combustion chamber cover and then start another ash removal with .

## Check seal on combustion chamber door

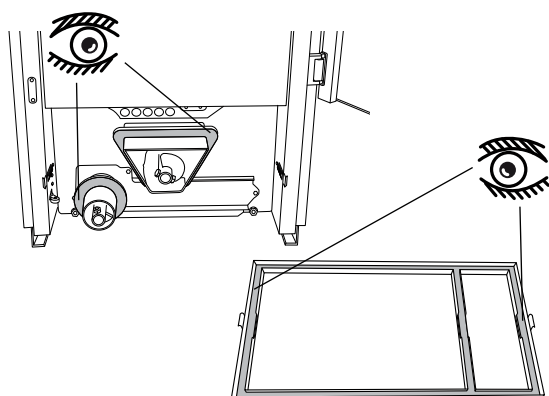
Check the seal on the combustion chamber door. The door handle must close firmly (with force), and the sealing edges of the door frame must leave a clear impression on the rope seal. Leaky sections can be identified by variations in the colouring on the rope seal or by using a cigarette lighter while the induced draught fan is running. The flame will be drawn through the leak.

If leaks are found, it is usually sufficient to adjust the hinges and the closing roller mount (see picture). If the hinges cannot be adjusted further, then the seals must be replaced.



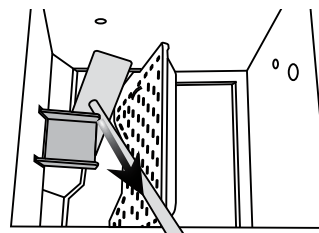
## Check ash box seals

Check the integrity of the seals in the ash box's cover and on the boiler's ash outlet.

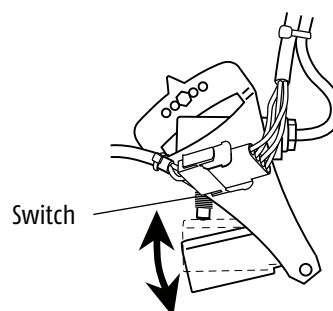


## Check firebed level sensor

Check the movement of the level sensor by repeated lifting with the scraper.



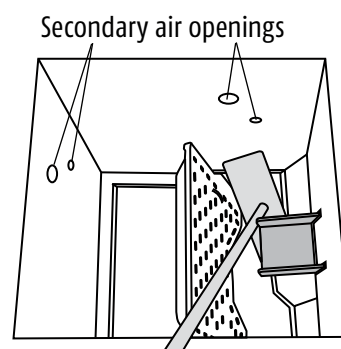
Check whether the switch for the firebed level sensor (under the cover on the insulation door) is activated when the sensor is lifted.



Pictures for stoker on right, mirror image for stoker on left

## Clean secondary air openings

Check whether all secondary air openings in the secondary combustion chamber are clean.



## Inspect lining of secondary combustion chamber

Check the refractory lining of the secondary combustion chamber for damage and cracks.

## Clean flue tube

Brush out the connection pipe from the flue outlet to the chimney if it is longer than 0.5 m.


## Remove flue ash from chimney

Use a vacuum cleaner to remove the flue ash from the chimney.

Also clean the condensate drain.

## Cleaning the heat exchanger



Before cleaning, stop heating with . Only begin cleaning when the boiler status is "Switched off".

## Open heat exchanger cover

Open the heat exchanger cover by turning the nuts. Then turn the ball knob 180° anticlockwise and lift the cover away.



For Hack 130 kW and 200 kW, there are 2 heat exchanger covers.

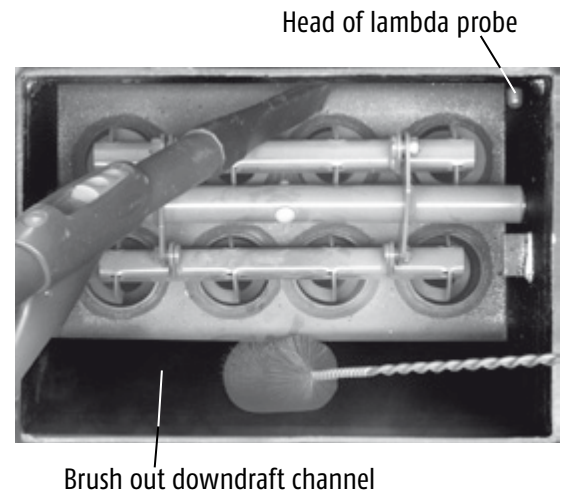


## Remove flue ash

Remove the internal cover, brush out the downdraft channel, and vacuum out the flue ash.



Wait to vacuum until certain that there are no more embers, or use a vacuum cleaner with a heat-resistant dust separator.



## Clean the lambda probe

The head of the lambda probe is accessible. Vacuum it with a vacuum cleaner.



Do not remove the lambda probe.

## Replace internal cover

After cleaning, carefully replace the internal cover. Verify that it is seated tightly.



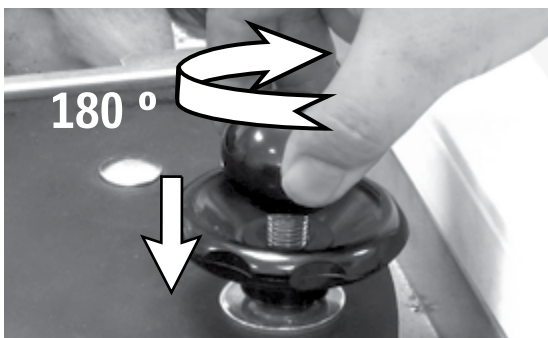
## Check heat exchanger for tar deposits

Inspect the heat exchanger tubes for tar deposits. If it is present, the turbulators must be removed and cleaned.



## Close heat exchanger cover

Re-engage the heat exchanger cover by turning the ball knob 180° clockwise.



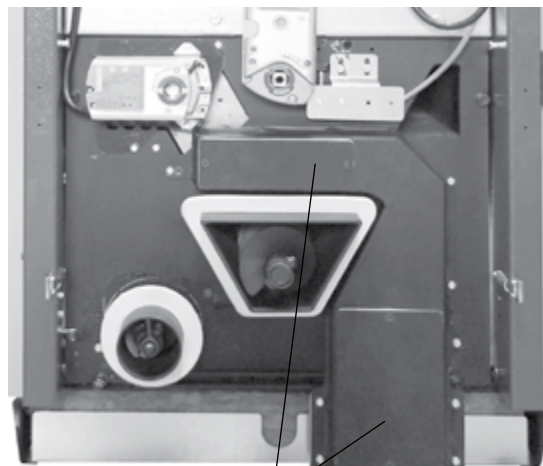
Then tighten the nuts alternately. If one side is tightened too much, the other side cannot be closed with a proper seal.



## Clean flue gas recirculator

The flue gas recirculation tubes must be cleaned to ensure satisfactory function.


Remove the covers, brush the tubes and then vacuum them.



Remove maintenance cover



Maintenance cover

Finally, start ash removal for the boiler with 

**Readiness of extinguishers**

If an extinguisher is installed, check it and its water supply.

**Malfunction messages and alarms**


Check malfunction indicators and alarms, for example if messages from the boiler room are displayed elsewhere, or if a temperature-monitoring system (corresponding to TRVB H 118) is installed in the fuel store.

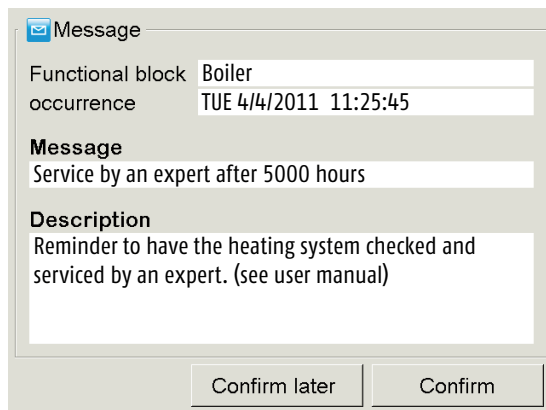
**Clean casing**

Clean the boiler casing with a damp cloth and (if necessary) a commonly available household cleaner (no scouring agents).

## Servicing by an expert every 5,000 hours or 3 years

If the boiler has reached 5,000 hours of operating time, a message will appear to indicate that expert maintenance is needed.

 This maintenance must be performed by an expert no later than every 3 years.



## In preparation, perform "regular" and "2,500 hours" maintenance

For the 5,000-hour maintenance, the individual steps for "regular" and "2,500 hours" maintenance must be performed.

### Inspect blades on rotary valve

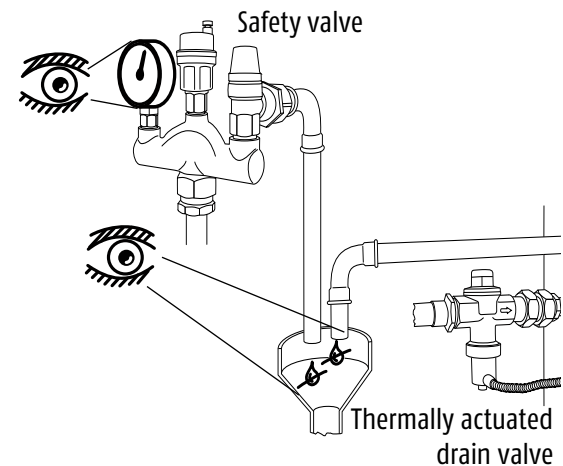
Check the blade on the rotary valve. If there is visible damage such as notches, replace the blade.


### Check safety switches on drop chute and maintenance cover

Check the safety switches on the drop chute and the maintenance cover of the rotary valve.

## Check safety valve and thermal emergency cooling valve

The safety valve and the thermal emergency cooling valve may not drip. Dirt may be stuck in the seal seat.




 Perform further steps only on weekdays, never on weekends in a cold winter as there will probably be no heating technician available if the seal is defective. If the safety valve drips, open it with a quarter turn of the red cap and rinse it out (danger of scalding).

If the safety valve still cannot be closed tightly after being rinsed several times, it must be cleaned by a plumber or replaced. If a solar buffer is equipped with a safety valve, check that as well.

The thermal emergency cooling valve is cleaned by pressing the red button.

## Lubricate drive chains for stoker and ash screw

Lubricate the drive chain for the stoker with spray oil and check the chain tension. The chain may sag by 1 – 2 cm without effort. The chain can be tensioned by shifting the motor.

Lubricate the drive chain for the ash screws with spray oil. To do so, start ash removal by tapping  to start the chain moving so that it can be completely lubricated.



**Test automatic ash removal**

Verify the function of the boiler's automatic ash removal.

**Firebed level sensor**

Check the movement of the firebed level sensor (overflow protection).

**Complete closing of tilting grate**

Ensure that the tilting grate in the combustion chamber closes completely.

**Draught fan and fan housing**

Remove the draught fan and clean it. Also clean ash from the fan housing.

If necessary, replace the draught fan seal.

**Ash box position switch and seals**

Verify the function of the position switch for the ash box. Inspect both of the ash box seals and replace if necessary.

**Check heat exchanger tubes**


Remove the heat exchanger cover.

Check the heat exchanger tubes for tar deposits. If tar deposits are present, contact our customer service.

**Check seal,  
close heat exchanger cover**

Check the seal on the heat exchanger cover, replace it if necessary, and close the heat exchanger cover.

**Perform emission measurement**

Perform the emission measurement with a measuring device on the boiler; see page 8. Switch the boiler into emission measurement mode with the  button. The consumers are activated to ensure that the heat is dissipated.

If no measuring device is available, at least the lambda probe must be calibrated.

**Safety temperature limiter**

Check the function of the safety temperature limiter.

**Reset maintenance counter**

After expert maintenance, the maintenance counter must be reset to zero. The "Service" access level is required to do this.

## Automatic calibration of the lambda probe

The boiler's built-in lambda probe checks the residual oxygen content of the flue gas and uses this to control the combustion. In order to ensure that this works correctly, the boiler automatically calibrates the lambda probe at regular intervals (factory setting: every 500 h).


## Calibrating the lambda probe with the "Additional calibration" software function

 The access level "Service" is required for calibration.

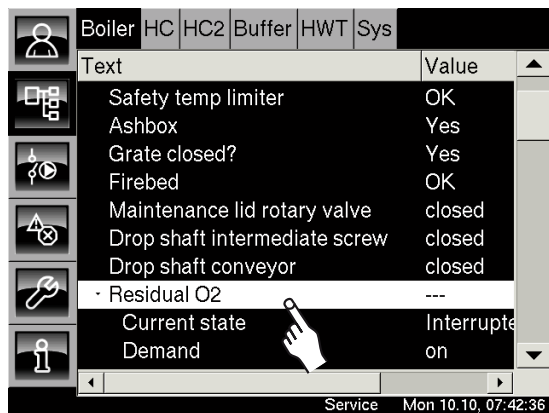
If you wish to perform an additional calibration between the automatic intervals, you can start the calibration using the software function "Additional calibration". When this is activated, the boiler automatically stops heating, de-ashes and rinses the boiler with fresh air using the draught fan. The residual oxygen content is then measured and the lambda probe is automatically calibrated to the set value.

The calibration process takes approx. 1.5 – 2 hours.

## Opening the boiler text menu

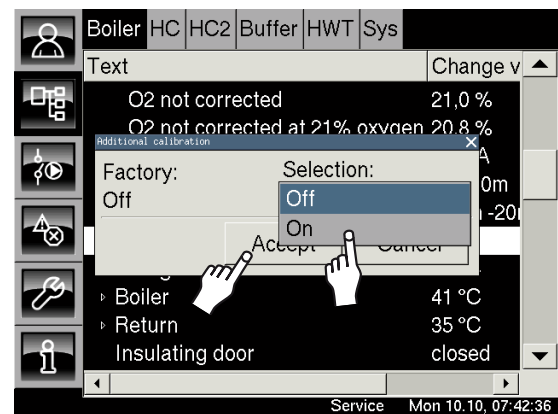
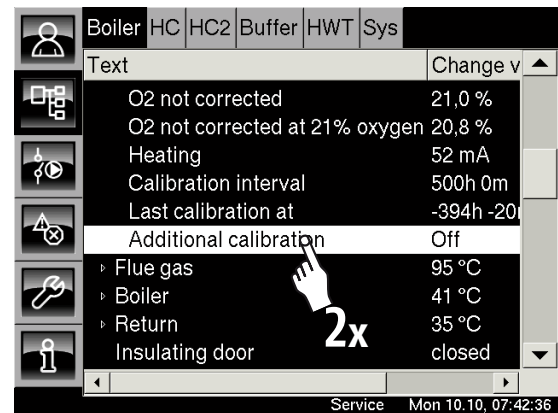
Using the access level "Service", open the text menu by pressing **Boiler** and .

Tap the [Inputs] line. In the submenu, tap the [Residual O2] line.



## Starting the "Additional calibration" function


In the submenu, scroll down and double-tap on the [Additional calibration] line.




In the selection window that appears, press the [On] button and confirm with **Accept**.

## The lambda probe is calibrated automatically

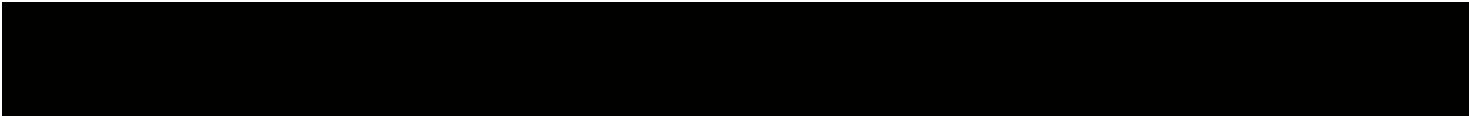
The control system will now automatically calibrate the lambda probe.

 After 100 hours, the control system will automatically re-calibrate the probe.

## In the overview

Press  to return to the boiler overview. The boiler is now in **Calibrating lambda probe** mode.

Once calibration is complete, the boiler automatically returns to operation and begins heating as required.



# Approval, antifreeze, pressure equalisation, venting

## Approval

Every heating system must be approved.

Inquire at your building authority and ask your chimney sweep.

## Operation only by trained personnel

The system may be operated only by trained personnel. Instruction can be given by the heating installer or our customer service. Please read this user manual to be assured of avoiding errors in operation and maintenance of the boiler.

## Fire extinguisher

In Austria at least a powder extinguisher ABC 6 kg is required. Better is a foam extinguisher AB 9 litre, which causes less damage when extinguishing.

The fire extinguisher should be kept outside the boiler room, easily visible and easily accessible.

In Germany and Switzerland, no fire extinguishers are required for heating systems in private residences. In spite of this, we recommend having one in the house.

## Keep children away from boiler room and pellet store



A special danger in the fuel store is the formation of a hollow above the agitator. Children playing on the pile of wood chips, or also careless adults, could fall in and get buried or caught up in the discharge screw.

## Antifreeze



If a house with average insulation is unoccupied in winter at low temperatures for more than five days, check once a week (twice a week for very low temperatures) to make certain that the boiler is operating properly.

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

## Insulate contact sensors

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

## Pressure equalisation

For pressure equalisation in the system, a diaphragm expansion tank with a gross capacity of around 10% of the system volume is needed (see conditions for guarantee and warranty).

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

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

## Venting

Automatic venting valves in the boiler outlet, at the highest point in the distribution network and at the top of the buffer significantly reduce the danger of rust and also the frequency of radiator venting.

## Initial fill-up with softened water and enough shut-off valves

All relevant standards demand softened water for heating systems with larger water volumes.

For boilers up to 90 kW, a value of 20,000 lt°dH for system volume in litres multiplied by the hardness (in degrees of German hardness) should not be exceeded. For boilers over 90 kW, the limit is 30,000 lt°dH.

A system volume of 500 litres (boiler and heating elements) and very hard water with 30°dH yields a value of 15,000 lt°dH. In this case, the system can still be filled with unsoftened water.

For a heating system with a 2,000-litre buffer, a system volume of 2,500 litres results. Even with water that is not very hard, such as 15°dH, a value of 37,500 lt°dH results; that is too high. The filling water must be softened to 8°dH for a volume of 2,500 litres (20,000 divided by 2,500).

Around 0.25 kg of limescale will precipitate from a cubic metre of water with 15°dH, resulting in a limescale layer 0.2 mm thick on a quarter of a square metre of the boiler's heat exchanger surface; this small area in the boiler is where the lime build-up is concentrated. This may not seem serious, but with 2 m<sup>3</sup> of buffer storage and a system volume of 0.5 m<sup>3</sup>, a thickness of 0.5 mm is reached. Thicker layers hinder the heat flow through the boiler wall to the extent that it is no longer cooled sufficiently and heat stress cracks can form.

In practice, that means the boiler can tolerate a buffer filled with unsoftened water as long as no repairs and no leaks in the system (defective air valves or safety valves that fail to close) force water to be refilled during the further course of the system's service life.

To have a sufficient safety reserve for additions, the new system must be filled with softened water, meaning that the empty system must really be filled exclusively with softened water before starting the boiler for the first time. Changing the water after the boiler has already been in operation is too late since the limescale from the unsoftened water has already precipitated in the boiler.

To reduce the amount of water replacement for later repairs, it must be possible to shut off all large volumes such as buffers, boiler and heating circuits

to keep the lime content to a minimum during water additions.

## Protection against corrosion

To limit corrosion with softened water, the pH value should be adjusted to between 8 and 9 using suitable inhibitors (trisodium phosphate).

## Safety valve against overpressure

Install a safety valve with 3 bar opening pressure on the boiler (is already installed for PU and PC boilers). No shut-off valve may be installed between the boiler and the safety valve. If solar or other heat sources provide energy to the buffer storage tank via a heat exchanger, a safety valve (3 bar maximum) is also required on the buffer storage tank. Normally an expansion tank that is too small or defective, or blocked heating lines, are the cause for activation of the safety valve.

The safety valve must be on top of the boiler in the flow in order to also discharge heat in an emergency. Only this way can it discharge heat when it blows out hot water and also steam.



The discharge must be directed to the sewer via an easily visible, open flow path (siphon funnel) so malfunctions and, above all, a non-closing valve can be recognised. If no sewer is available, the discharge must be directed into the ground in a pipe so nobody is endangered by hot water or steam.

# Return riser, safety devices

## Return riser

Wood contains water. If the temperature in the boiler is too low, steam condenses from the flue gas onto the heat exchanger surfaces. Corrosion and a leaky heat exchanger are the result. To prevent this, the water temperature at the boiler inlet must be at least 60°C. Since the return temperatures are usually lower, a return riser is needed – preferably with a mixer that provides controlled, heated flow to the boiler return.

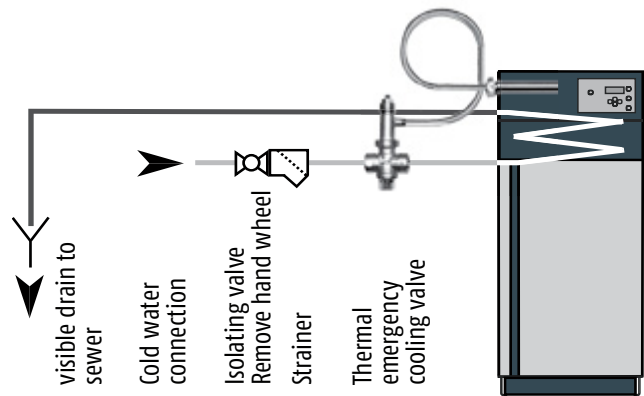
The mixer also allows the exploitation of residual heat. After the fire is extinguished, if the buffer is colder than the boiler, the boiler control opens the mixer again and switches on the boiler pump to exploit the residual heat.

The return riser mixing valve controls the buffer charging output. To reduce the output, the return temperature is raised over 60°C to reduce the spread compared to the boiler's setpoint temperature. With the spread the output that can be consumed from the boiler is limited.

## Thermal emergency cooling valve against overheating



The safety heat exchanger built into the boiler must be connected by the heating technician to the house's cold water supply via a thermal outlet valve (opening temperature 95 °C) to protect the boiler against overheating if the pump fails. The minimum pressure in the cold water line must be 2 bar. Connect the supply line to the lower connector of the safety heat exchanger; the upper connector is for outlet to the sewer. To prevent the supply line from being shut off accidentally, remove the levers from shut-off valves or the hand wheels from valves and hang them there with a piece of wire.



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

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

## Pump safety run, Automatic heat dissipation at overtemperature

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

This action prevents the boiler temperature from rising further and triggering further safety devices such as: safety temperature limiter and thermal emergency cooling valve. This emergency cooling is shown on the monitor "**Emergency cooling**".

The **heat dissipation** is limited with the **maximum flow temperature set in the heating circuits** and the **hot water setpoint temperature**.

## Safety shutdown by safety temperature limiter

For additional safety against boiler overheating, a **safety temperature limiter** is built into the boiler. When a **boiler temperature of 105°C** (tolerance 100 to 106°C) is reached, the **power supply to the draught fan and the fuel intake is interrupted**. If the boiler temperature decreases **below 70 °C** again, the **safety temperature limiter** can be **manually released** for a restart of the boiler.

The reset button is recessed into the door frame above the door of the secondary combustion chamber. It must be pushed in deeply (ideally with a match) to release it.



## Chimney renovation before it's too late

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

In particular, chimneys with "too large a cross-section" (over 20 cm) are no longer heated adequately. The moisture contained in the flue gases condenses in the flue, leading to the very slow but inexorable destruction of old masonry chimneys.

Furthermore, if the diameter of the flue is too large, the exit velocity and temperature are too low. The exhaust gas does not have enough energy to rise and, in extreme cases, the smoke can flow down the roof.

If your flue does not have a moisture-resistant lining or its diameter is too large, it will need to be renovated with the addition of a moisture-resistant inner lining. Narrow flues can also be renovated with stainless steel pipes.

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

## Sealed and insulated connection pipe to chimney

A sealed flue pipe is an absolute necessity. Joints and bends can be sealed with heat-resistant silicone (300 °C) and/or pure aluminium tape to prevent the escape of dust or flue gas. Insulating the pipe improves the flue draught, protects against burns on accidental contact, and reduces the fire hazard.

## Technical requirements for the flue

can be found in the installation instructions (a separate document from this user manual).

# Buffer storage tanks

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

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

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

## A wooden house requires a buffer

For a wooden house with radiator heating, where there is not even the screed of an underfloor heating system to act as a thermal store, the installation of a buffer should be considered. With a design output less than 70% of the boiler's rated output, an underfloor heating system operating only with time slots will cause large temperature variations in the rooms and a buffer storage tank is required. Heat produced by the boiler and not currently needed in the house can be stored in a buffer storage tank and returned to the heating system when needed.

## A sufficiently large hot water tank

To operate the boiler without a buffer storage tank, a hot water tank of sufficient size (see table) to take up the heat from an entire firing cycle is needed. A sufficiently large tank should also be chosen for increased convenience.

Boiler output	Supply volume	Charging volume	Total hot watervolume	Exchanger surface
up to 11 kW	100 l	100 l	200 l	0.8 m <sup>2</sup>
up to 25 kW	100 l	200 l	300 l	1.5 m <sup>2</sup>
up to 50 kW	150 l	350 l	500 l	2.5 m <sup>2</sup>
up to 90 kW	200 l	600 l	800 l	4.0 m <sup>2</sup>
up to 130 kW	300 l	800 l	1,100 l	5.5 m <sup>2</sup>
up to 200 kW	400 l	1,100 l	1,500 l	8.0 m <sup>2</sup>

## No buffer storage tank is needed if

no more than two heating circuits (without individual room temperature control) are installed.

## A buffer storage tank is needed

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

## Finely adjustable radiator valves and fresh water module

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

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



## Miscanthus in wood chip boilers

Miscanthus needs a larger combustion chamber. That reduces the maximum possible output of the individual sizes of boiler; for miscanthus, it is about 30 % less than for wood chips.

20 kW wood chip boiler	-> 20 kW miscanthus
25 kW wood chip boiler	-> 25 kW miscanthus
35 kW wood chip boiler	-> 35 kW miscanthus
50 kW wood chip boiler	-> 35 kW miscanthus
70 kW wood chip boiler	-> 63 kW miscanthus
90 kW wood chip boiler	-> 63 kW miscanthus
130 kW wood chip boiler	-> 95 kW miscanthus
200 kW wood chip boiler	-> 140 kW miscanthus

The sintering point for miscanthus ash is around 860°, much lower than for wood ash. To prevent slag formation in the combustion chamber, lower combustion temperatures than those typical for wood are needed. This can be achieved with flue gas recirculation.

Recirculating the flue gas from the boiler outlet back into the combustion chamber increases the gas flow through the grate as well as through the fire, cooling the grate better. The distribution of the fire's heat over a larger gas volume helps to achieve a narrower and more stable temperature window. Temperatures are held safely above 700 °C for complete, clean combustion and safely below 860 °C, the sintering point for miscanthus ash. For pellets, a somewhat higher temperature window between 750 °C and 950 °C is used with less oxygen (less air).

Less "fire" in the same size of combustion chamber also results in lower combustion temperatures and prevents slag formation. So in the "oversized" combustion chambers of the 20 and 25 kW boilers, chopped miscanthus (no pellets) can be burned without flue gas recirculation. The fuel must be changed to "Miscanthus" (see page 53) and the "Flue gas recirculation" parameter to "No" (see page 12). Here too, however, it should be noted that dirty miscanthus can require flue gas recirculation even with small combustion chambers.

Theoretically, the larger boilers (from 35 kW rated output) could also be made miscanthus-capable by limiting their output, but normally their output is needed, so from 35 kW flue gas recirculation is indispensable for miscanthus.

## Very dry carpentry waste

reaches very high combustion temperatures. Glue and coatings can reduce the sintering point of the ash. Both factors can lead to slag formation in the combustion chamber.

The first action to take against slag is to shorten the deashing intervals; see page 54 ff.

If that achieves no reduction, then a flue gas recirculator (optional accessory) must be added.

Dear customer,



Your new boiler is labelled with the "Blue Angel" to indicate its environmental friendliness.

With this in mind, please note the following for efficient and low-emission operation of your heating system:

1. The installation and adjustment of the heating system must be performed only by qualified and trained personnel.
2. Use only the fuels specified by us in the user manual (in the warranty conditions). Only in this way can low-emission, economical and fault-free operation of your heating system be ensured.
3. Perform the maintenance and cleaning procedures recommended by us on your heating system at regular intervals. See your user manual for information about these. In this way, you can ensure that your heating system and its safety features will work effectively to provide efficient and low-emission operation. You can get the best care for your heating system by concluding a service contract.
4. Your boiler is adjustable within an output range between 30% and 100% of its rated output. To avoid unnecessary emissions in low-output operation, the systems should be operated as much as possible in the mid- to high-output range (adjusted to the heating needs).

Please do not use any heating controller separate from the boiler control. Use the heating circuit control integrated in the boiler control in combination with a room sensor.

5. From an energy perspective, a buffer storage tank and a combination with a solar heating system are recommended. That ensures efficient and low-emission operation of your heating system.

## The Clean Air Act 1993 and Smoke Control Areas

Under the Clean Air Act local authorities may declare the whole or part of the district of the authority to be a smoke control area. It is an offence to emit smoke from a chimney of a building, from a furnace or from any fixed boiler if located in a designated smoke control area. It is also an offence to acquire an „unauthorised fuel“ for use within a smoke control area unless it is used in an „exempt“ appliance („exempted“ from the controls which generally apply in the smoke control area).

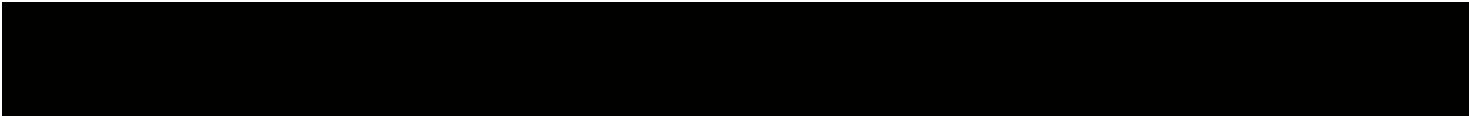
The Secretary of State for Environment, Food and Rural Affairs has powers under the Act to authorise smokeless fuels or exempt appliances for use in smoke control areas in England. In Scotland and Wales this power rests with Ministers in the devolved administrations for those countries. Separate legislation, the Clean Air (Northern Ireland) Order 1981, applies in Northern Ireland. Therefore it is a requirement that fuels burnt or obtained for use in smoke control areas have been „authorised“ in Regulations and that appliances used to burn solid fuel in those areas (other than „authorised“ fuels) have been exempted by an Order made and signed by the Secretary of State or Minister in the devolved administrations.

The boiler is suitable for use in smoke control areas when burning **wood chips G20 to G50 - W 35 maximum** (according to ÖNORM M 7133) P16 to P45 - M 35 maximum (EN 14961-4) and with an optionally available **flue gas recirculation, wood pellets** according to ÖNORM M 7135, DIN 51731, EN 14961-2 class A1, EN plus class A1 or DINplus.


Further information on the requirements of the Clean Air Act can be found here:

<http://smokecontrol.defra.gov.uk>

Your local authority is responsible for implementing the Clean Air Act 1993 including designation and supervision of smoke control areas and you can contact them for details of Clean Air Act requirements.




## Getting to know the control system

Instead of buttons, the touchscreen is operated using icons directly on the screen. In order to familiarise yourself with how to operate the system, tap once on the  icon on the left of the screen.

The touchscreen only displays those function blocks that are required and configured to work with your heating system.

You can use the horizontal buttons **Boiler**, **Buffer**, **HC**, **HWT** ... to flick between the individual function blocks (FUBs).

## Description of function blocks

 This document only describes the boiler, heating circuit and special conveyor function blocks. The other function blocks are described in the accompanying document "ETAtouch function blocks - operation".

## Moving on the touchscreen

Use the **horizontal buttons** to select the individual **function blocks (FUBs)** of the heating system.



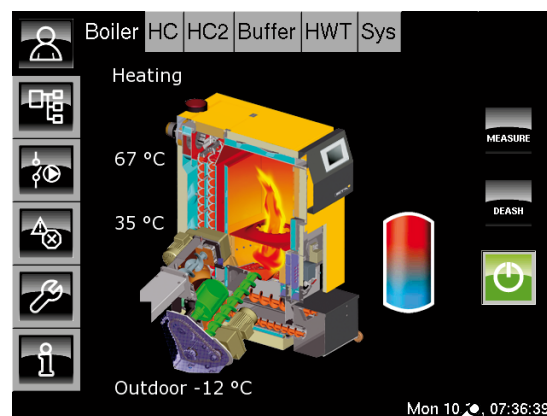
The **vertical buttons** are used to open the **different views** for the selected function block (FUB):



- Overview** of the selected function block.
- Text menu** for adjusting the parameters of the selected function block
- I/O list** allowing experts to assign inputs and outputs
- Error messages** for the selected function block
- Toolbox** for experts
- INFO Help**

## Adjusting the date and time

Tap on the date or time at the bottom right-hand corner of the touchscreen.



A screen appears for adjusting the date and time:



Tap on the [Day], [Month], [Year] or [Time] fields to alter the settings.

Once a field has been filled in by entering numbers, the cursor automatically moves to the next field.

**DEL** deletes the number to the left of the cursor.


**Cancel** closes the screen without saving the changes.

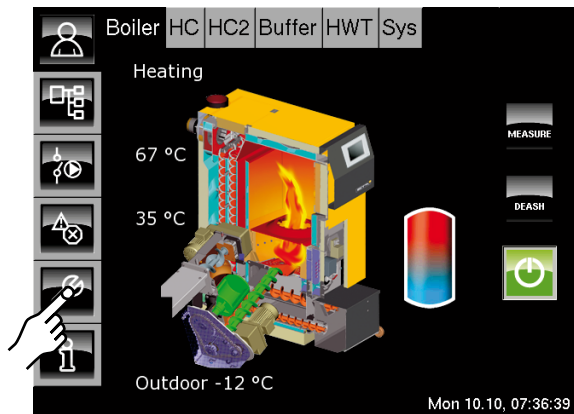
**Accept** saves changes and closes the screen.

## Changing the language

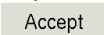
It is possible to change the language on the screen.

### Switching to the toolbox

Press the  button to switch to the toolbox.



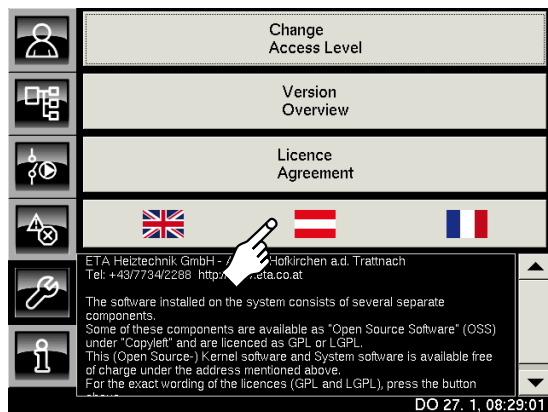
### Selecting a language

Select the language you require and confirm by pressing the  button.




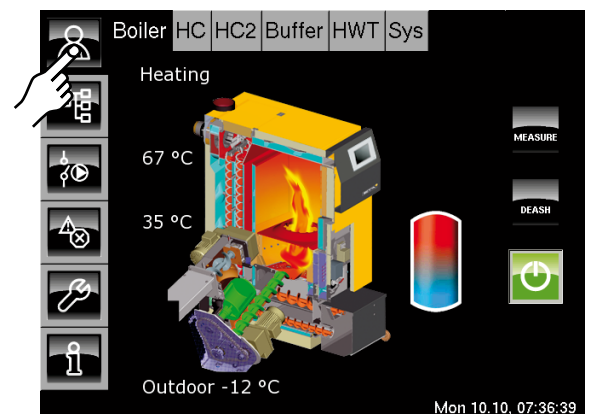
### Tapping the button with the flag symbols

Tap the button with the flag symbols to go to the language selection screen.



### Back to overview

Press  to return to the boiler overview screen.



## Changing the names of the function blocks

The names of the function blocks can be changed at any time in order to make them clearer to you.

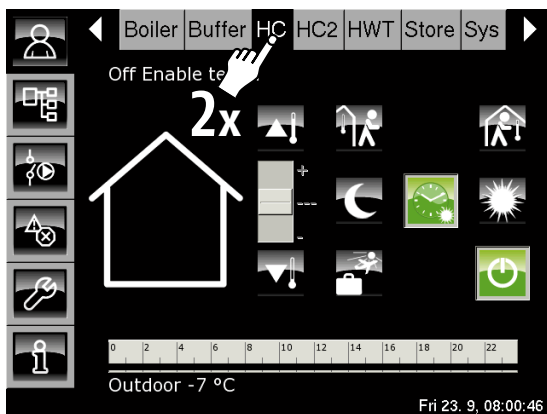
For example, the names of the heating circuits HC, HC2 etc. can be changed to ground floor, upper floor, parents, living room or similar.

### Example: Renaming HC1 "Ground floor"

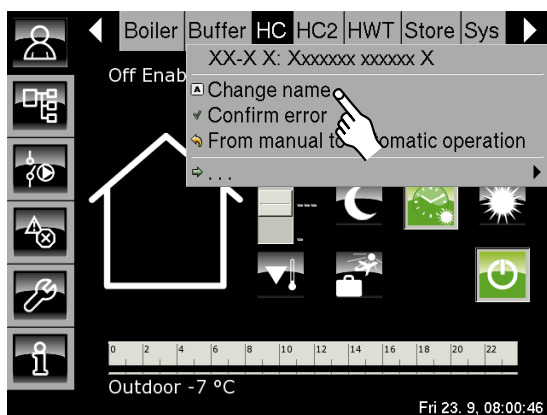
Even though this example uses a long name, it is best to choose short names so that you can reach all the function blocks without having to use the arrow buttons.

### Selecting heating circuit 1

Double-tap **HC** to rename this function block.

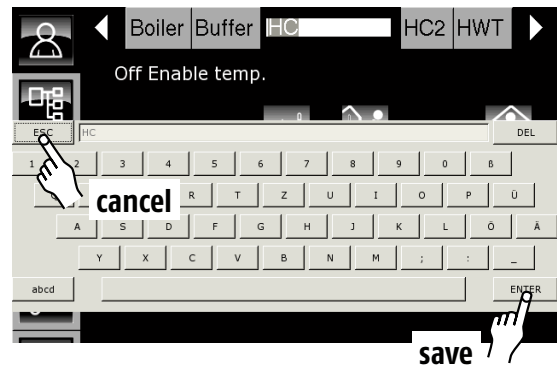


A small screen appears for this function block.



Tap the [Change Name] button. An on-screen keyboard appears.

### Changing the name using the keyboard



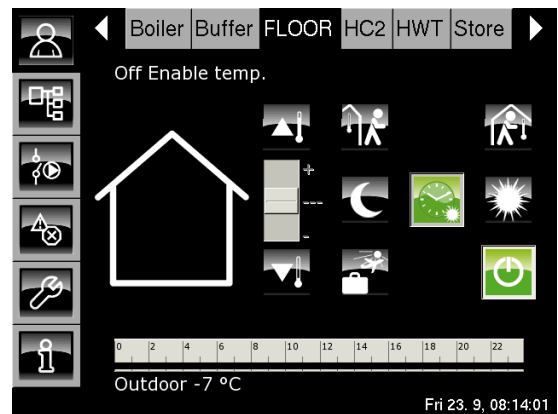
Use the keyboard to enter the new name for heating circuit 1, in this example: FLOOR.

Then press the **ENTER** button to save the new name.

The **ESC** button cancels the renaming process and changes back to the previous name.

HC has now been renamed "FLOOR".

The names of all the function blocks can be changed at any time.



## Message

This icon in the function block buttons indicates a message. Messages do not interrupt operation of the boiler, nor must they be confirmed.

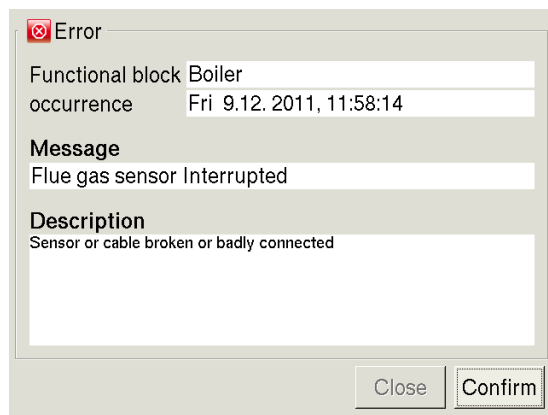
For example, they may indicate that the ash box needs emptying or inform the user of events outside normal operation, e.g. in summer, the pump anti-blocking protection begins every Saturday at 12 pm.

## Warning



This icon indicates a warning. Warnings are issued when a function that is not essential to active operation fails. A warning can be confirmed before the error is resolved. However, it will continue to be shown until the cause of the error has actually been dealt with.


## Error, Alarm

This icon indicates an alarm. Alarms are issued for errors that halt operation. Some alarms can be confirmed before the error is resolved. However, they will continue to be shown until the cause of the error has actually been dealt with. Some alarms cannot be confirmed until the error has been successfully resolved. The display windows for such alarms can be removed using the [Confirm later] button.






## !!! Restart after an alarm !!!

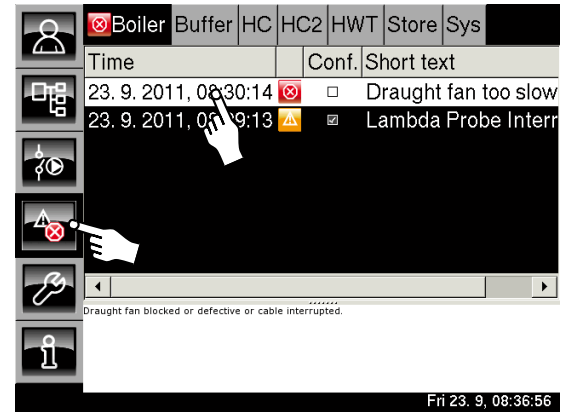
 Once the error has been resolved and the alarm has been confirmed, the boiler or the affected heating circuit must be switched back on using the on/off button .

Once they are switched on, the  button lights up green.

## Displaying an error

Press the  button to go to the list of errors for the current function block.

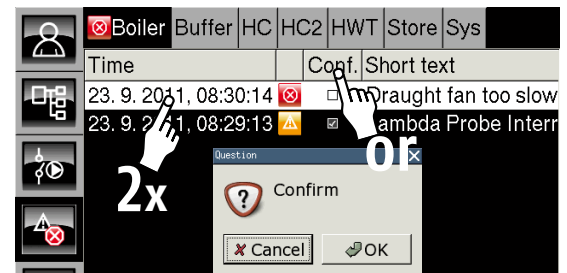
If an **alarm or warning** occurs in **any function block**, this button changes the icon to  (Alarm) or  (Warning).



By **selecting a line**, you can view a **help text** at the bottom of the screen.

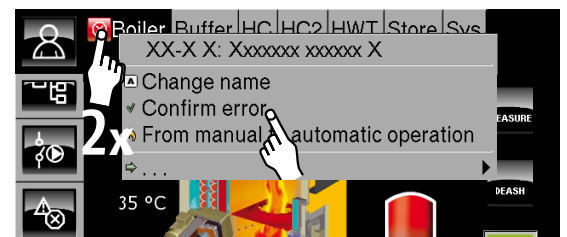
## Confirming an error

Select the line and **double-tap** or press the **Quit** button. A confirmation window appears. Press **"OK"** to **confirm** the message and delete it from the list. Press [Cancel] to close the window without confirming the error.



## Confirming all errors


**Double-tap** on a function block to bring up a menu where you can confirm all errors by tapping **[Confirm errors]**.



## Function block text menus

There is a "text menu" for each function block. This view shows the current parameter settings. It also allows the user to make changes.

### Opening the text menu

Select the desired function block, e.g. by tapping **Boiler**. Next, change the view to "text menu" by pressing the  button.

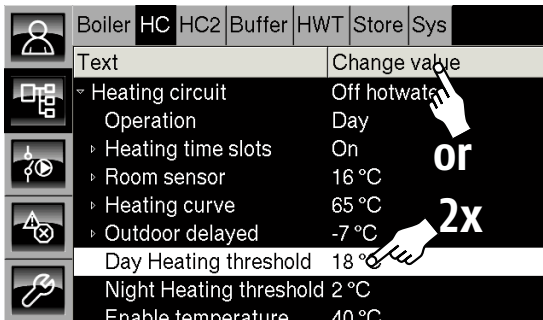
The text menu for the selected function block appears. The individual parameters for the selected function block are displayed.

Lines preceded by ▷ have a submenu, which can be opened by tapping the line. The submenu can be closed again by tapping the upper-level line that is marked with ▾.


### Modifying parameters

It is possible to modify certain parameters in order to adapt the heating to your needs. Tap these parameters to select them. The **Value** field changes and the **Change value** button appears.

**Change** the parameters by **double-tapping** on the line, or **select the line and press the Change value button**.




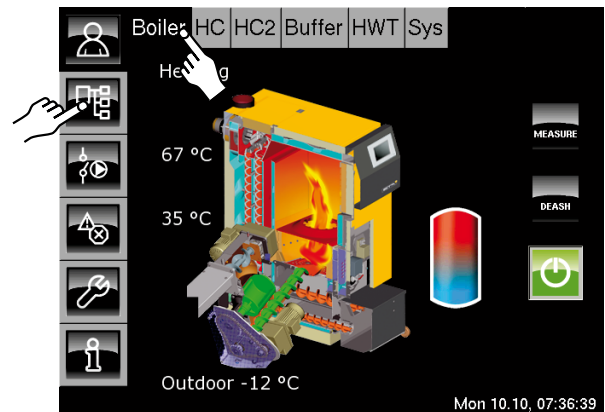
**In case of doubt, consult an expert before making any changes.**

 Only modify parameters if you know what their function is. Read through the corresponding section of the user manual before making changes. If the explanation of the relevant function given in the manual is not sufficient for your purposes, confer with an expert.

### Example: Displaying the boiler counters

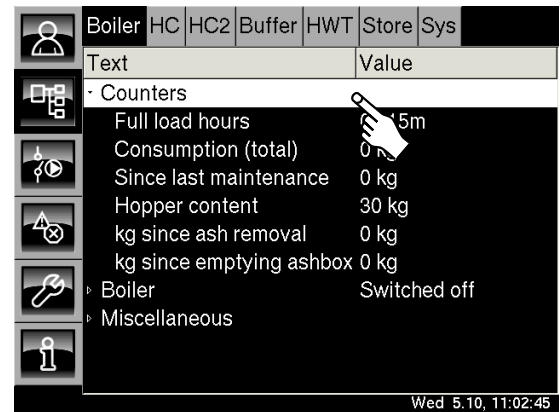
Tap the **Boiler** button to open the "Boiler" function block.


From the overview screen, press the  button to go to the text menu.

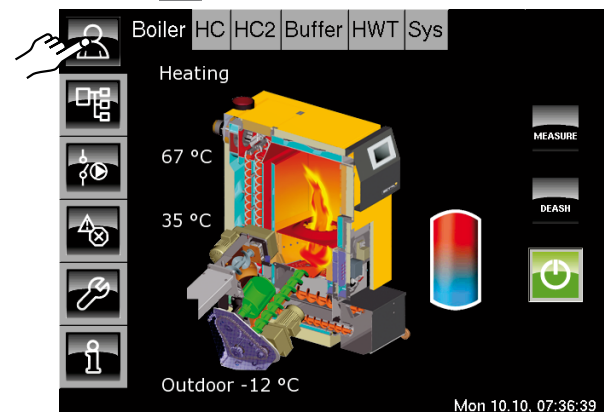


The boiler text menu appears.

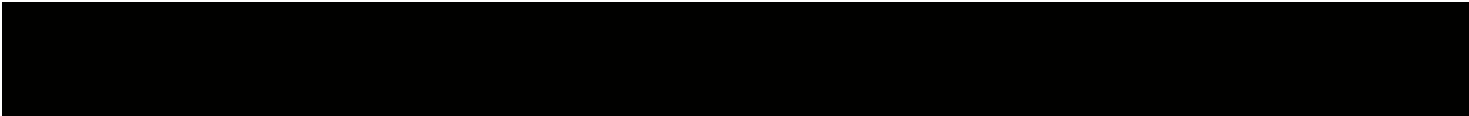
Tap the **[Counters]** line. The submenu opens and the boiler counters are displayed.




Press the  button to return to the overview.





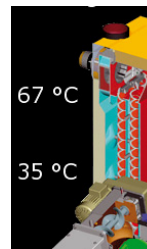


## "Boiler" overview

Tap  and **Boiler** to open the "Boiler" overview screen.

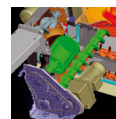
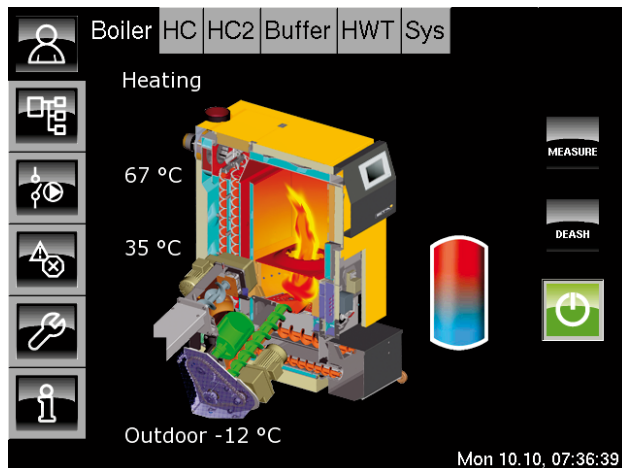
The overview screen shows you at a glance the current operating state of the boiler and your heating system.

You can switch the unit on and off, de-ash, and measure emissions from this overview screen.



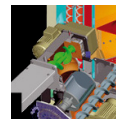
**Current boiler flow temperature**

**Current boiler return temperature**



**Stoker screw in operation**

The stoker screw and rotary valve are displayed in green when they are turning in the discharge direction.




**Metering screw in operation**

The metering screw is displayed in green when it is turning in the discharge direction.



**On/off button**

This button is used to switch the boiler on and off.

 Green = On

 Red = Off



**Buffer storage tank**

Displayed when the boiler is channelling heat into the buffer storage tank.



**Deash button**

This button is used to begin the removal of ash from the boiler.



**Emission measurement**

This button switches the boiler to full load mode for a period of 30 minutes. The boiler will then begin to run at full load. The heat will be channelled into the hot water tank and the heating circuits. After 30 minutes, the boiler automatically returns to the original mode.

This button is also used to start **the floor agitator turning in order to fill the store.**

**Outdoor -12°C**

**Current outside temperature**

The current outside temperature is measured by the built-in outside temperature sensor.

**Heating**

**Current operating mode**

This line shows the current operating mode of the boiler. Below is a list of the possible modes:

**Switched off**

The boiler is switched off.  
The on/off button  is lit up red.

**Warm Start**

The boiler is attempting to start a new heating cycle using only the embers remaining in the combustion chamber. The electrical ignition is not used.

**Igniting**

The fuel is ignited using the electrical ignition.

**Heating**

The boiler is in heating mode and is channelling heat to the consumers.

**Ember burnout**

At the end of a firing phase, the fuel that is still on the grate is burnt off. No more fuel is conveyed into the boiler.

**Ash box missing**

The ash box is not connected. The position switch for the ash box is not pressed.

**Ready**

After burnout, the boiler is switched on and standing by for a heating demand.

**Ash removal**



The grate tips up and the turbulators move to clean the heat exchanger. The ash screws transport the ash from the boiler to the ash box.

**Failure**

A malfunction has occurred, preventing the boiler from heating. The cause can be found in the list of error messages.

**Failure during ash-removal**

The ash screw has been switched off due to excessive current consumption. This may be due to the ash box being full or the ash screw being blocked by foreign objects.

Empty the full ash box, then start a new deashing sequence by pressing  or . If the ash box was not full or the malfunction recurs, the foreign object blocking the ash screw must be found and removed.

**Ember burnout - Error**

Due to a malfunction, the current firing phase has ended with a burnout.

**Ember burnout - External Stop**

Due to an external lock-out (Stop command), the current firing phase has ended with a burnout.

**Locked**

Heating not possible, as the boiler has been locked externally (Stop command).

**Calibrating lambda probe**

The lambda probe is calibrated automatically. Whilst in this mode, heating is not possible.

**Emptying stoker**

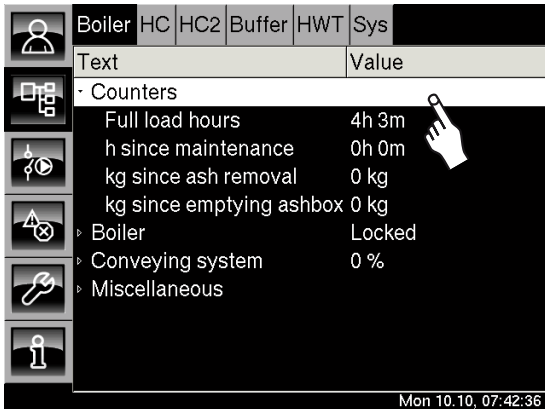
At the end of a firing phase, the fuel slot runs empty in order to empty the stoker.


## Displaying counters

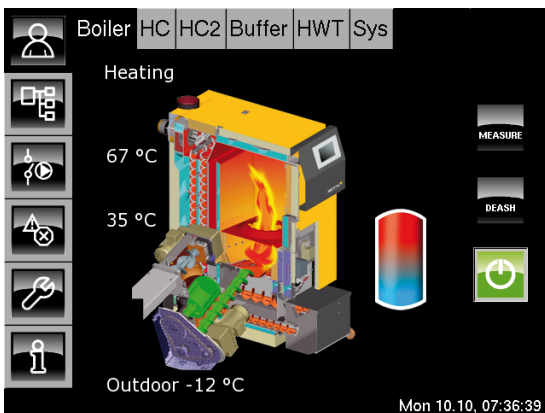
Press the **Boiler** and  buttons to go to the boiler text menu.

Tap the [Counters] line.

The submenu opens, displaying a list of the current counters.



Press the  button to return to the overview.



## What do you need to consider when changing fuel type?

The control system displays a choice of fuels: wood chips, wood pellets and Miscanthus (see also Terms and Conditions of Warranty).



If the fuel is changed, the control system must also be set to the new fuel type. **Depending on fuel type, different parameters** are saved and automatically adjusted **for combustion and ash removal**.

It is also necessary to **set the firebed level sensor** and the **flue gas recirculation function**. See page 11 and page 12.

## Flue gas recirculation

Very dry fuels (e.g. pellets, joinery waste material, Miscanthus) require the optional **flue gas recirculation**. The **"Flue gas recirculation" parameter must be set to "Yes"** for the control system to be able to use such fuels (for more information, see page 12).



If the fuel type is set to "Wood pellets", the "Flue gas recirculation" parameter is also automatically set to "Yes".

## Water content and density of fuel


Average water content and density values for each fuel type are already stored in the system. If the fuel is changed, these parameters are also changed at the same time.



If you know the water content and density of the fuel you are using, you must adjust these values (for more information, see page 53).

With the aid of the lambda probe this enables optimum control of combustion right from the start. Otherwise, it may take several days for the control system to make the necessary adjustments and reach optimum combustion control.

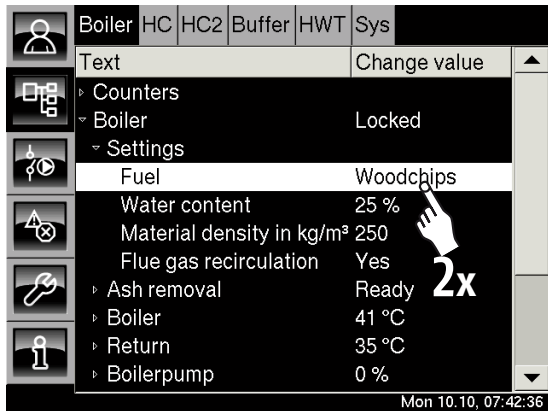
## Changing fuel

Press the buttons **Boiler** and  to go to the text menu.

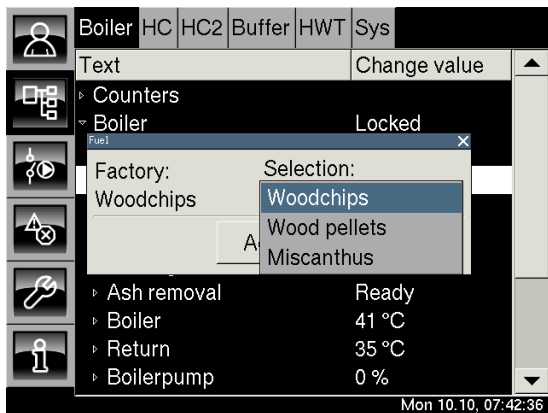
Tap the [Boiler] line and, in the submenu, tap [Settings].

The display shows the current fuel type and the settings for water content and density.

Double-tap on the [Fuel] line.




A fuel selection window appears.




Select the new fuel type and press **Accept**.

The water content and density are changed to the average values stored for the selected fuel type.

Press  to return to the boiler overview.

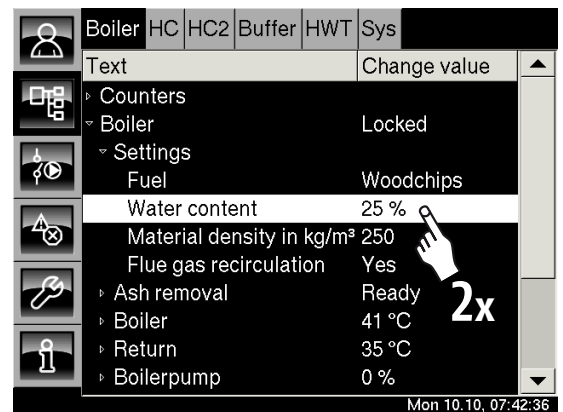
## Adjusting water content and density

If you know the water content and density of the new fuel type, you must adjust the corresponding parameters in the text menu.

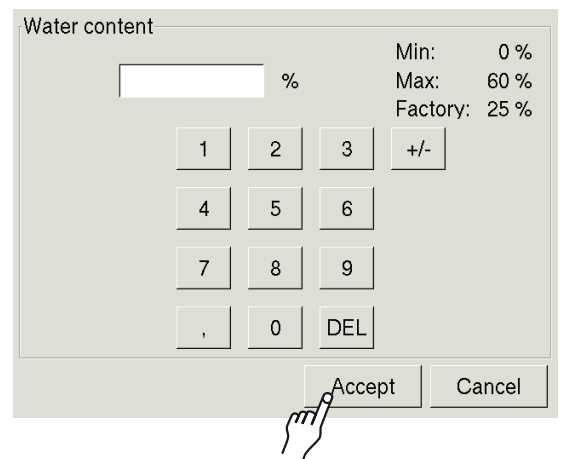
Tap the buttons **Boiler** and  to go to the text menu.

Tap the [Boiler] line and, in the submenu, tap [Settings]. The display shows the current water content and density settings.

Double-tap on the [Water content] line.




A selection window appears.



Enter the water content of the new fuel and press **Accept**.

Follow the same procedure to adjust the density.

Press  to return to the boiler overview.

## Deashing the boiler

When the heat exchanger is being cleaned, the stroke mechanism of the turbulators is tensioned against a spring and then released. The noise generated by the beating of the turbulators and the creaking of the ash screws can be transferred into the house as structure-borne noise via the floors and walls.

## The purpose of ash removal idletime

It is possible to select a time after which the boiler should not be de-ashed. This prevents potential noise pollution during the night. The duration of this idletime can be altered using the "Duration idletime" parameter.

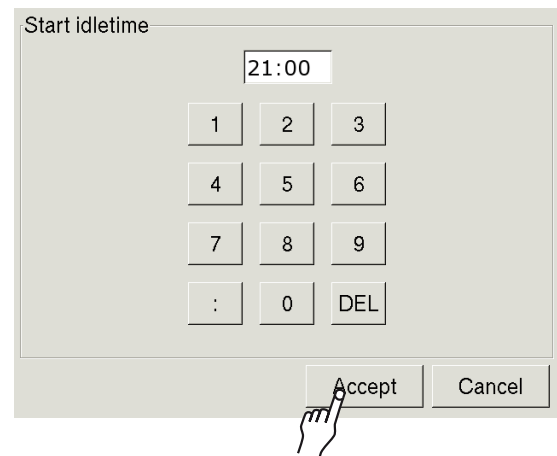


The latest possible time should be chosen to begin the idletime. Likewise, the duration of the idletime should be as short as possible, otherwise the combustion chamber may become excessively soiled, thus reducing the efficiency of the boiler.



The factory setting for the start of idletime is 21:00.

A settings screen opens:




Enter the new time to start the idletime. After this time, the boiler will not perform ash removal for the length of time specified by the "Duration idletime" parameter.

Press **Accept** to save.

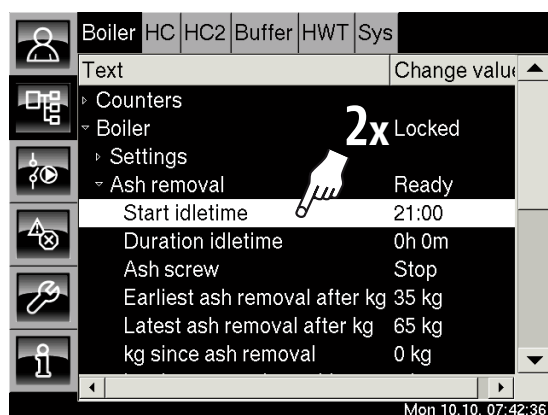
The boiler text menu display appears again.


## Adjusting the ash removal idletime

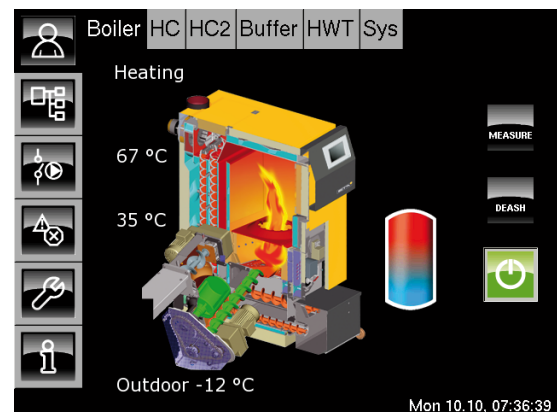
Press the buttons **Boiler** and  to go to the text menu.

Tap the [Boiler] line and, in the submenu, tap the [Ash removal] line.

Double-tap the [Start idletime] line.




Press  to return to the boiler overview.



### Duration of ash removal idletime

From the **start of the idletime** (= "Start idletime" parameter), **boiler ash removal is locked**. This period of time is defined by the "Duration idletime" parameter.

Make the duration of the idletime as short as possible, otherwise the combustion chamber may become excessively soiled, thus reducing the efficiency of the boiler.

 For this reason, the factory setting for the idletime is zero.



### Do not set excessively long idletimes

The **maximum idletime depends on the fuel being used and the intervals between ash removal operations**. If the fuel type requires that ash removal be performed at very short intervals, it is only possible to set similarly short idletimes.

#### Values for normal fuel:

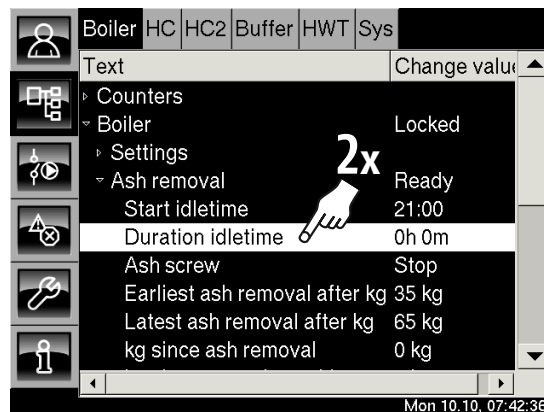
Maximum Duration idletime	Fuel		
	Wood chips	Wood pellets	Miscanthus
20 - 49 kW: Not longer than:	8 h	10 h	1.5 h
63 - 200 kW: Not longer than:	6 h	8 h	1.2 h

### Adjusting the duration of the idletime

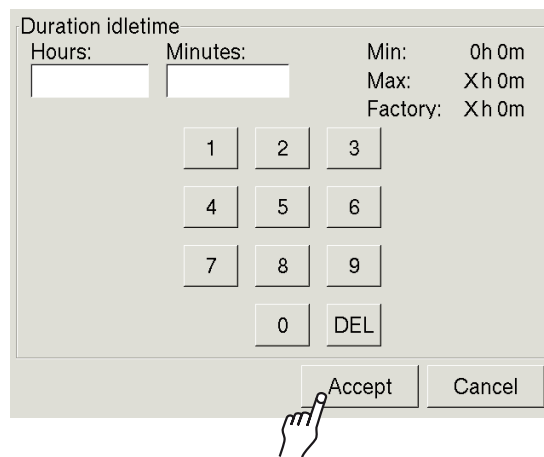
Press the buttons  and  to go to the text menu.


Tap the [Boiler] line and, in the submenu, tap the [Ash removal] line.

Double-tap on the [Duration idletime] line.




A settings screen opens:



Enter the idletime duration and press .

The boiler text menu display appears again.

Press  to return to the boiler overview.

## "Heating circuit" overview

Press and **HC** to open the "Heating circuit 1" overview screen.

Each heating circuit has its own function block (HC2, HC3...).

In the overview of the selected heating circuit, the on/off button can be used to switch the heating circuit on and off.

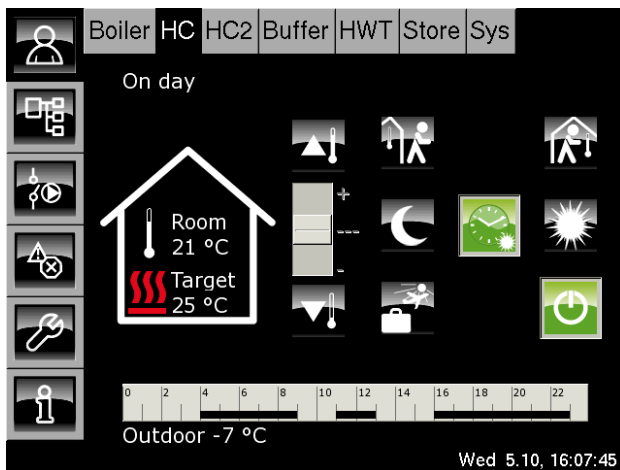
The timer can be used to set 3 different time slots for each day of the week. If there is a room sensor installed, you can also adjust the desired room temperature.

If not, a slider on the overview screen allows you to adjust the room temperature.

## "Day" and "Night" mode

During the time slots, the heating circuit is in "Day" mode.

Outside the time slots, the heating circuit is in "Night" mode.



## Heating circuit on/off

This button is used to switch the heating circuit on and off.

The boiler has a separate on/off button.



Green = Heating circuit on



Red = Heating circuit off

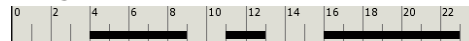


## Slider

The slider is **only shown if there is no room temperature sensor installed**. The slider can be used to change the room temperature by approx. +/- 5°C.

Please bear in mind that this substitute function cannot replace the precision of a room sensor.

## Timer



The timer shows the set **heating time slots for the current day of the week**. Tapping this timer brings up a screen where it is possible to set **3 time slots for each day of the week**.

If a **room sensor is installed**, the desired **room temperature** can be set for each time slot. Likewise, the reduced room temperature (set-back temperature) between the heating time slots can also be adjusted.

Within a set time slot, the heating circuit will be in "Day" mode. Outside of the time slots, it will be in "Night" mode.

If the heating circuit is operated in **"Auto" mode** ( button), **this button changes the icon** depending on whether the heating circuit is running at **"Day"** or **"Night"** temperature.



## Current room temperature (room sensor only)

**Only displayed if a room sensor is installed for this heating circuit.** This displays the current room temperature as measured by the room sensor.



## Current flow temperature

The current target flow temperature for the heating circuit is only displayed if the heating circuit is switched on and in operation.



## Outdoor -13°C Current outside temperature

The current outside temperature is measured by the built-in outside temperature sensor.



### Constant "Day" mode

This button can be used to switch the heating circuit to constant "Day" mode (button lights up ).

If a room sensor is installed, the temperature will be regulated to the **highest room temperature** set for that day in the timer. If there is no room sensor, the heating circuit runs using the **heating curve "Day"**.

"Auto" and "Night" modes can be ended by pressing the button.



### Constant "Night" mode

This switches the heating circuit to constant "Night" mode so that it runs at the set-back temperature (button lights up ).

If there is a built-in room sensor, the temperature is regulated to the set-back temperature that is set in the timer. If the unit does not have a room sensor, the heating circuit runs using the **heating curve "Night"**.

"Auto" and "Day" modes can be ended by pressing the button.



### "Auto" mode

"Auto" mode automatically switches between "Day" and "Night" mode.

Within a set time slot, the heating circuit will be in "Day" mode. Outside of the time slots, it will be in "Night" mode.

The **"Auto" display changes the icon** depending on whether the heating circuit is currently in "Day" or "Night" mode.



"Day" mode



"Night" mode

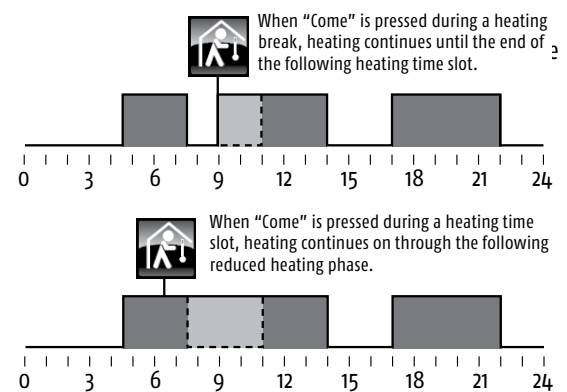


### Come

This function is **only available in "Auto" mode**.

Regardless of the current time slot, pressing the button (when you come home) **switches the heating circuit to "Day" mode** (button lights up ) until the next set time slot.

If the unit has a built-in room sensor, the heating circuit is regulated to the set room temperature. If there is no room sensor, the heating circuit runs using the heating curve "Day".

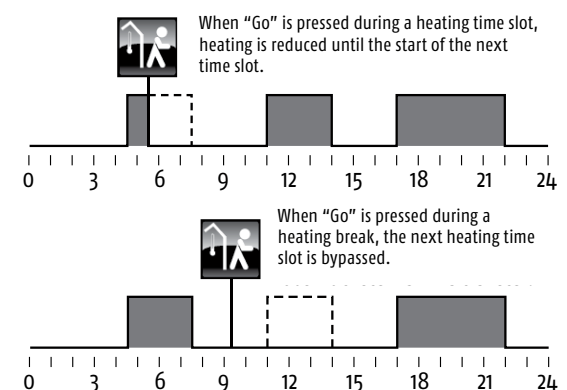


### Go

This function is **only available in "Auto" mode**.

Regardless of the current time slot, pressing the button (when you go out) switches the heating circuit to "Night" mode (button lights up ) until the next set time slot.

If the unit has a built-in room sensor, the heating circuit is regulated to the stored set-back temperature. If there is no room sensor, the heating circuit runs using the heating curve "Night".



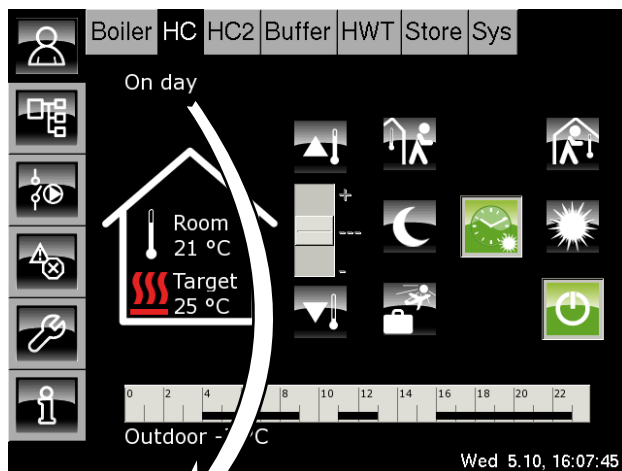


## Holiday mode

The "Holiday" button is used to set a period for which the **selected heating circuit** will run in "Night" mode.

Any adjustments made to the room temperature also influence the "Day" temperature, and thus the temperature for heating up at the end of the holiday. As such, it is best not to adjust the room sensor for holiday set-back.

If you wish to reduce the room temperature, you can set an individual "set-back temperature" in the timer. During **"Holiday" mode, the lowest of all the "set-back temperatures" in the timer is the one that applies.**



## On Day Current operating mode

This line shows the current operating mode of the heating circuit. Below is a list of the possible modes:

### On Day

The heating circuit is **within one of the timer's time slots** and in **"Day" mode**.

The flow temperature of the heating circuit is regulated using the "Heating curve day". If the unit has a built-in room sensor, the temperature is regulated to the highest room temperature set for the time slot. The switch can be in either the "Auto" or the "Day" position.

### On Night

The heating circuit is **outside of the timer's time slots** and in **"Night" mode**.

The flow temperature of the heating circuit is regulated using the "Heating curve night".

If the unit has a built-in room sensor, the temperature is regulated to the stored "set-back temperature". The switch can be in either the "Auto" or the "Night" position.

### Holiday On

The heating circuit is switched on and in holiday mode (= constant "Night" mode). It remains in this state until the "End of holiday" date.

### On Delay

The heating circuit is no longer demanding any heat and is in delay mode. The boiler pump is still running for a short time in order to channel the heat out of the boiler.

### On Freezing room

The heating circuit is in operation because the current room temperature is below the freezing protection temperature (10°C).

### On Freezing flow

The heating circuit is in operation because the current flow temperature is below the freezing protection temperature (10°C).

### On Heat dissipation

The heating circuit is in operation in order to cool the boiler by dissipating excess heat. Also displayed during emission measurement.

### On Overtemperature

The heating circuit is in operation because the boiler is running at overtemperature. The heating circuit is running at the highest set flow temperature in order to dissipate the heat from the boiler (overheating protection).

## On Screed

The heating circuit is in operation; the screed drying program is being run.

## Off Enable temp.

The heating circuit is still switched off because the boiler is not yet able to supply sufficient heat. The enable temperature for the heating circuit has not yet been exceeded.

## Off Target day

The heating circuit is switched off. The target flow temperature calculated from the heating curve "Day" is below the room temperature as measured by the room sensor.

If the unit does not have a room sensor, the calculated target flow temperature is below 18°C.

## Off Target night

The heating circuit is switched off. The target flow temperature calculated from the heating curve "Night" is below the room temperature as measured by the room sensor.

If the unit does not have a room sensor, the calculated target flow temperature is below 18°C.

## Off Target holiday

The heating circuit is within the set holiday time, and thus switched off.

The target flow temperature calculated from the heating curve "Night" is below the room temperature as measured by the room sensor.

If the unit does not have a room sensor, the calculated target flow temperature is below 18°C.

## Off Room day

The heating circuit is within a time slot, but switched off. The current room temperature is higher than the set "Room target" temperature by at least the "RoomOffDiff" temperature.

## Off Hot water

The heating circuit is switched off because the hot water is currently being heated.

## Off Room night

The heating circuit is switched off and outside the set time slots. The current room temperature is higher than the stored set-back temperature by at least the "RoomOffDiff" temperature.

## Off Room holiday

The heating circuit is within the set holiday time, and thus switched off. The current room temperature is higher than the stored set-back temperature by at least the "RoomOffDiff" temperature.

## Off Outside day

The heating circuit is switched off. The current outside temperature is higher than the set temperature for "Day Heating threshold".

## Off Outside night

The heating circuit is switched off. The current outside temperature is higher than the set temperature for "Night Heating threshold".

## Off Outside holiday

The heating circuit is within the set holiday time, and thus switched off. The current outside temperature is higher than the stored set-back temperature.

## Off Summer


The heating circuit is switched off. The only active functions are the freezing protection and the boiler pump's "anti-blocking protection", which runs at midday every Saturday.

## Off Sensor failure

The heating circuit is switched off due to a defect in the flow temperature sensor.

## Setting the heating time slots

The heating circuit timer can be used to set 3 different time slots for the heating for each day of the week.

 If the unit has a room sensor, a target room temperature can also be set for each time slot. Likewise, the reduced room temperature (set-back temperature) between the heating time slots can also be adjusted for each day of the week.

### "Day" mode

During a set time slot, the heating circuit is in "Day" mode.

If a room sensor is installed, this regulates the heating circuit to the set target room temperature for the time slot.

If there is no room sensor, the flow temperature of the heating circuit is calculated using the heating curve.

### "Night" mode

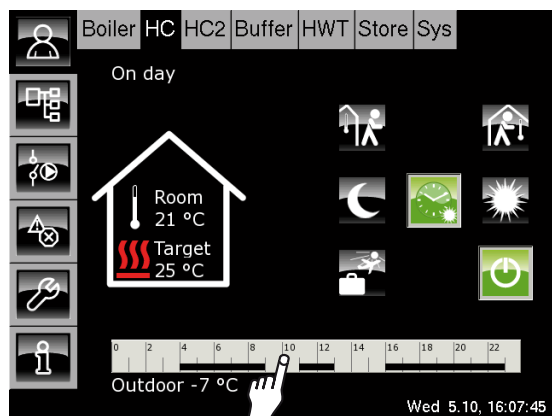
Outside the time slots, the heating circuit is in "Night" mode.

If a room sensor is installed, this regulates the heating circuit to the stored "set-back temperature" for the time slot.

If there is no room sensor, the flow temperature of the heating circuit is calculated using the heating curve.

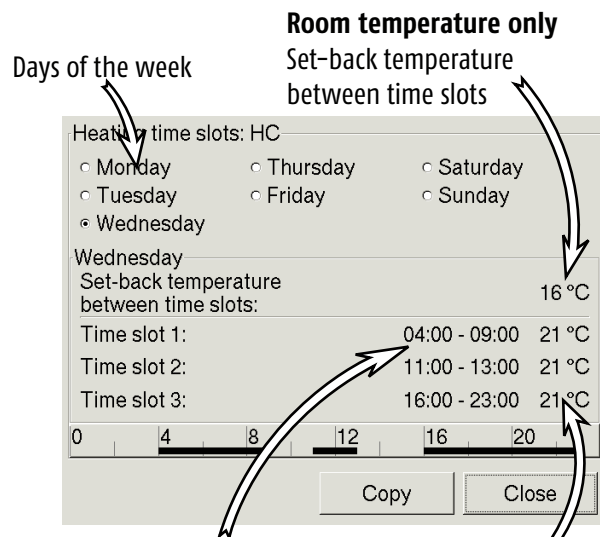
### Adjusting the timer (with room sensor)

In the overview for the selected heating circuit, tap the timer. The screen for setting the timer opens.



### Overview of current time slots

The current day of the week is selected automatically. The set time slots for the current day of the week are shown on the screen.




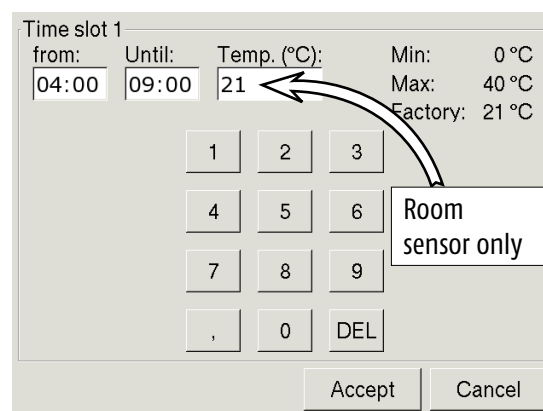
3 adjustable time slots for each day of the week      Target room temperature room sensor only

### Selecting a time slot

Tap the [Time slot 1] line. The time slot setting screen opens.

The times for "Day" mode can now be altered.


 If the unit has a built-in room sensor, the target room temperature can also be set.

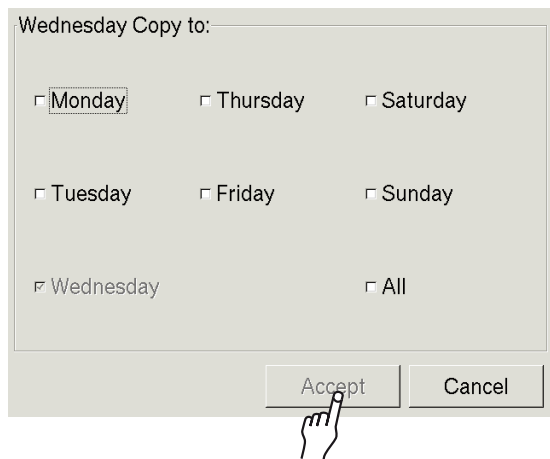



Press **Accept** to save the new settings. Use the same method to adjust the other time slots.

## Copying time slots to other days of the week

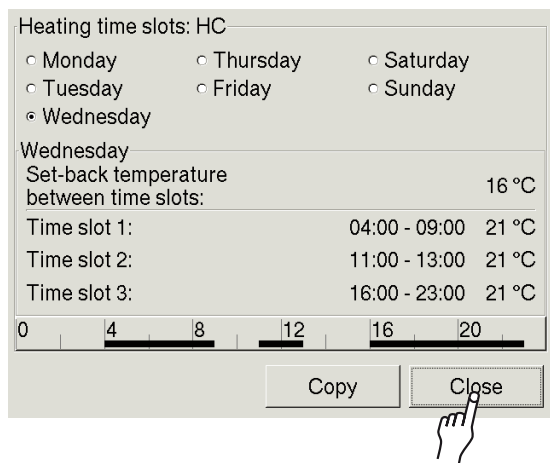
Once the time slots have been adjusted, they can also be adopted for other days of the week.

In the time slot overview screen, tap the  button. A screen appears for selecting a day of the week:



Tap to select the desired day of the week or [All] and then press . The time slots are adopted for the selected days.


The new time slots are displayed.




Finally, press .

The heating circuit overview reappears.

## "Holiday" function


With this function, the  button can be used to switch the heating circuit to **constant "Night" mode for an adjustable time period**. This setting only ever applies for the selected heating circuit.

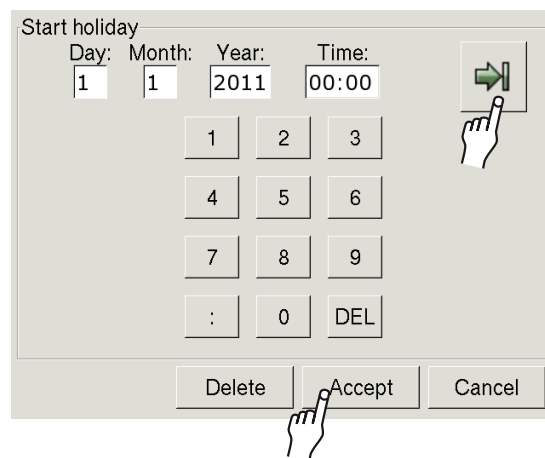
 The **hot water supply** from the hot water tank or the fresh water module is **not affected by the "Holiday" function**.


For "Holiday" mode, the heating circuit is regulated to the lowest set-back temperature set in the timer. If you wish to reduce the temperature for the "Holiday" time period, you can set an individual set-back temperature in the timer.


Adjusting the room sensor also affects the "Day" temperature when heating up at the end of the holiday. As such, it is best not to adjust the room sensor for holiday set-back.

## Setting a "Holiday" time period

In the "Heating circuit" overview screen, tap the  button. A screen opens:



Enter the time for the beginning of your holiday. The  button can be used to switch between the "Start" and "End" of the holiday.

Enter both times and press .

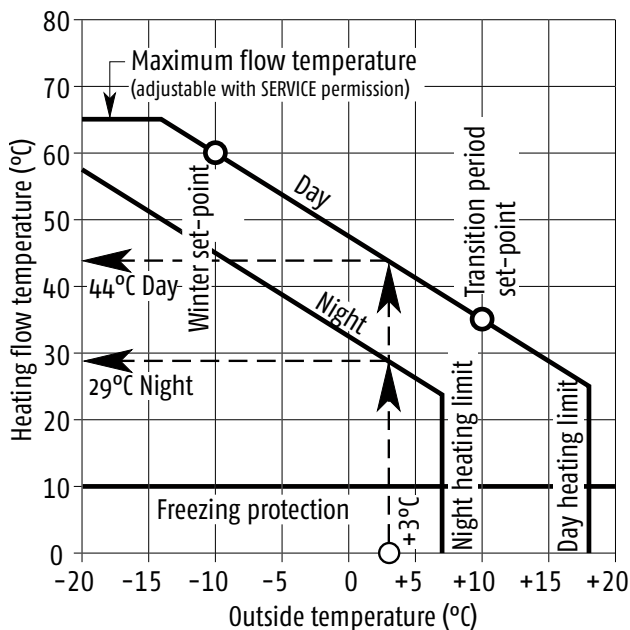
The heating circuit overview reappears.

## The heating curve

The heating curve **controls the flow temperature** for the **"Day"** and **"Night"** modes of the heating circuit in question. **During a set time slot**, the heating circuit is in **"Day"** mode. **Outside** the time slots, the heating circuit is in **"Night"** mode.

**Each heating circuit has its own heating curve**, as underfloor heating requires different settings to radiator heating.

The **diagram** shows a **heating curve** for radiator heating. If the control settings have been adapted to your system, **lower heating curves** may be set for **underfloor heating** and **higher heating curves** for radiator heating.



### Maximum flow temperature


This limit protects your heating system. Underfloor heating is usually limited to 45°C, while radiators with metal pipes can take temperatures up to 85°C.

## Heating curve "Day"

During a set time slot, the heating circuit is in "Day" mode. The heating curve for "Day" mode can be adjusted using the parameters "Flow at -10°C" and "Flow at +10°C". The control system uses these parameters to plot a line: the heating curve "Day".

The heating curve "Day" and the current outside temperature are used to calculate the required flow temperature for the heating circuit. Example:

- at +3°C outside temperature => 44°C flow
- at -5°C outside temperature => 54°C flow


 If the unit has a room sensor, the calculated flow temperature is corrected. The actual flow temperature may be higher or lower.

## Heating curve "Night"

Outside the set time slots, the heating circuit is in "Night" mode.

The heating curve "Night" is set back from the heating curve "Day" by the adjustable value "Set-back". The heating curve "Night" and the current outside temperature are used to calculate the required flow temperature.

## Factory settings for the heating circuit


 With **software versions 1.20.0** and higher, the system configuration for the heating circuit offers the user a choice between **underfloor and radiator heating**.

This choice pre-sets some of the parameters in the heating circuit. For information on these parameters and their **factory settings**, see page 64.


# Heating circuit "Day Heating threshold" and "Night Heating threshold"


## The parameter "Day Heating threshold"

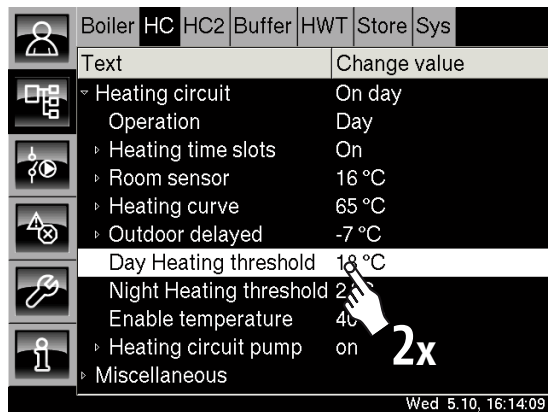
With the "Day Heating threshold" parameter, an outside temperature is set which, when exceeded, will result in the heating circuit being switched to "Day" mode.

 The factory setting for this parameter is 18°C. The "Day Heating threshold" can be set differently for each heating circuit.

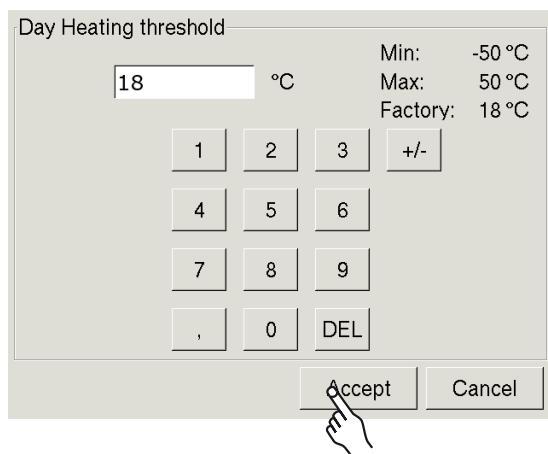
## Changing the parameter "Day Heating threshold"

Press  to open the text menu for the selected heating circuit.

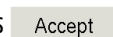
Tap the [Heating circuit] line to open the submenu. Double-tap on the [Day Heating threshold] line (or select the line and press the  button).




A settings screen opens:



Enter the new heating threshold for "Day" mode.

Press  to save the new value.

Press  to open the "Heating circuit" overview.


## The parameter "Night Heating threshold"

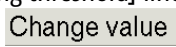
If the heating circuit is in "Night" mode, an outside temperature is set which, when exceeded, will result in the heating circuit being switched off.

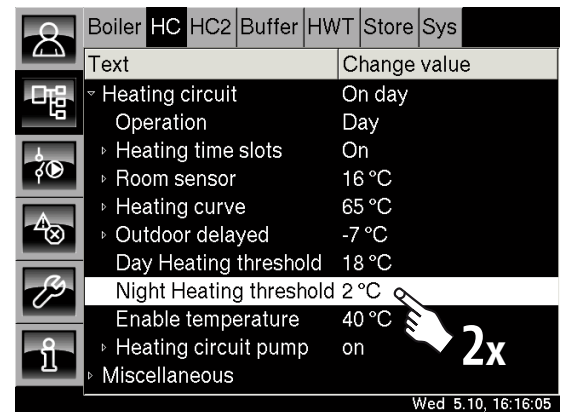


The factory setting for this value is 2°C. This applies as the **freezing protection limit** for this heating circuit. The "Night Heating threshold" can be set differently for each heating circuit.

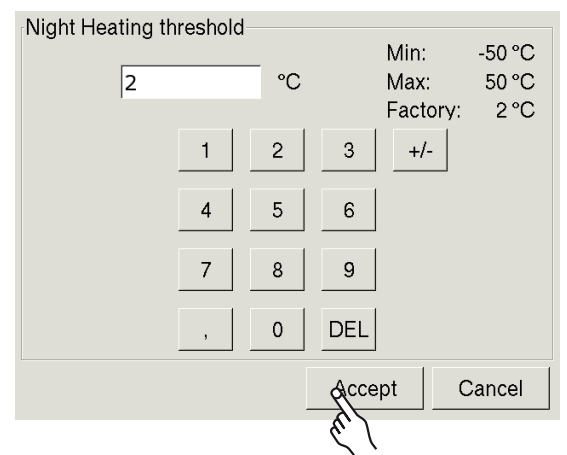
## Changing the parameter "Night Heating threshold"

Press  to open the text menu for the selected heating circuit.

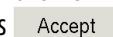
Tap the [Heating circuit] line to open the submenu. Double-tap on the [Night Heating threshold] line (or select the line and press the  button).



A settings screen opens:



Enter the new heating threshold for "Night" mode.

Press  to save the new value.


Press  to open the "Heating circuit" overview.

## Adjusting the heating curve

If the heating circuit is always too warm or too cold, the **flow temperature** must be adjusted. This can be done using two parameters: **"Flow at -10°C"** and **"Flow at +10°C"**.

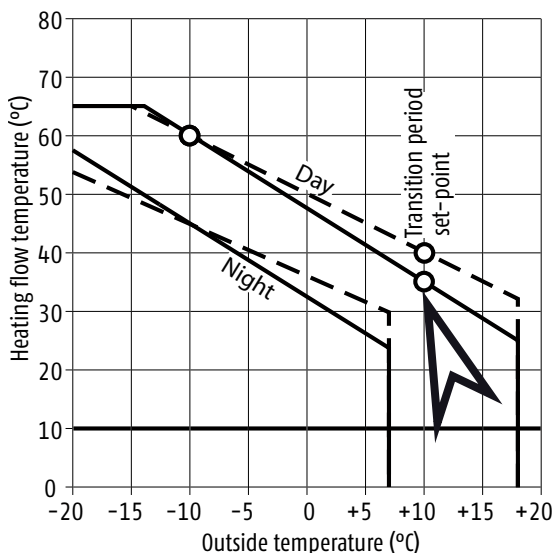
### No large jumps in temperature


Do not set any large jumps in temperature when adjusting "Flow at +10°C" and "Flow at -10°C":  
 For **underfloor heating**, never more than **2°C**  
 For **radiators** never more than **4°C**

 You may need to alter the flow temperatures again after one or two days, but working in small steps will help you to set the heating circuits more precisely, thus saving energy.


### During the transition period -> "Flow at +10°C"

If the heating circuit is always too warm or too cold during the **transition period** (spring and autumn), **only** the flow temperature for **"Flow at +10°C"** is **reduced or increased**.



 Do not change the flow temperature "Flow at -10°C" during the transition period.

## Factory settings for the heating circuit

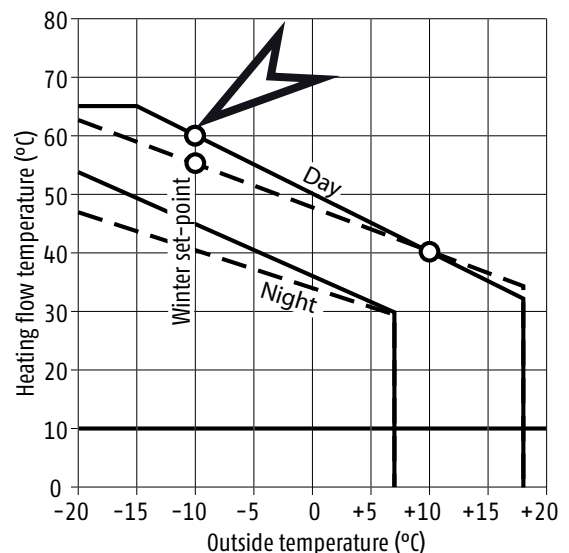
 With **software versions 1.20.0** and higher, the system configuration for the heating circuit offers the user a choice between **underfloor and radiator heating**.


This choice pre-sets some of the parameters in the heating circuit. These parameters and their factory settings can be seen in the table below:

Preset	Underfloor	Radiator
Max flow	45°C	65°C
Flow at -10°C	33°C	55°C
Flow at +10°C	25°C	35°C
Set-back	3°C	15°C
Enable temperature	25°C	40°C
Room effect	1°C	4°C

### In winter -> "Flow at -10°C"

If the heating circuit is always too cold or too warm **in winter**, **only** the flow temperature **"Flow at -10°C"** is **increased or reduced**.




 Do not change the flow temperature "Flow at +10°C" in winter.




## Adjusting the heating curve for outside temperatures above 0°C -> Changing "Flow at +10°C"

If the heating circuit is always too cold or too warm in the **transition period**, the flow temperature "Flow at +10°C" is increased or reduced.

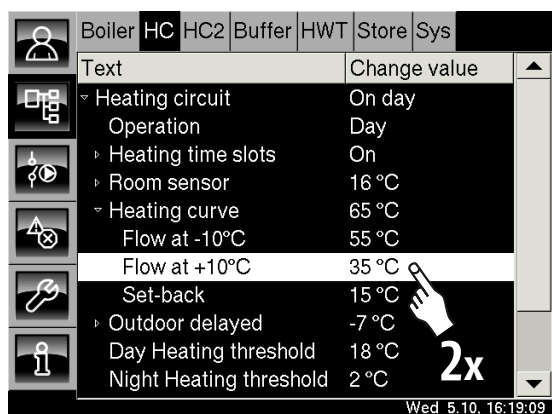
### No large jumps in temperature

 For underfloor heating, never more than 2°C  
For radiators, never more than 4°C

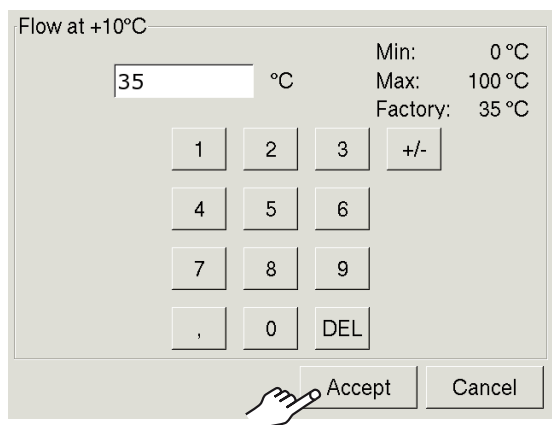
Press  to open the text menu for the selected heating circuit.

Tap the [Heating circuit] line and, in the submenu, tap the [Heating curve] line.


Double-tap on the [Flow at +10°C] line (or select the line and press the **Change value** button).



A settings screen opens:




Enter the new flow temperature for this heating circuit. Press **Accept** to save the new value.


The text menu for the selected heating circuit is displayed. Press  to open the "Heating circuit" overview.

## Adjusting the heating curve for outside temperatures below 0°C -> Changing "Flow at -10°C"

If the heating circuit is always too cold or too warm in **winter**, the flow temperature "Flow at -10°C" is increased or reduced.

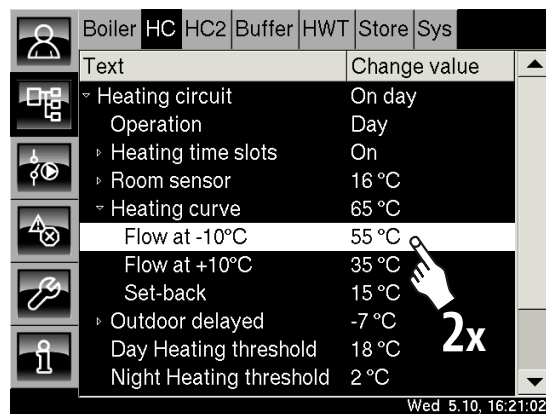
### No large jumps in temperature

 For underfloor heating, never more than 2°C  
For radiators, never more than 4°C

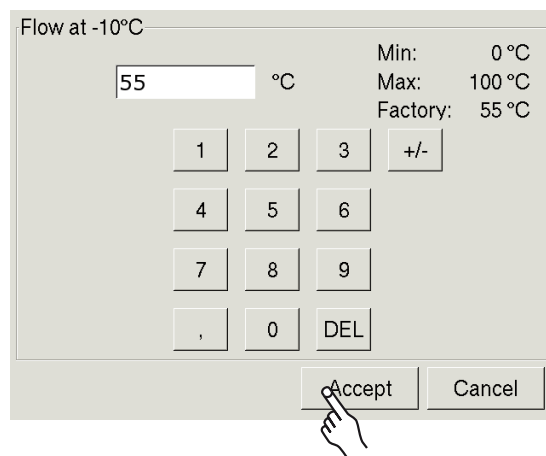
Press  to open the text menu for the selected heating circuit.

Tap the [Heating circuit] line and, in the submenu, tap the [Heating curve] line.


Double-tap on the [Flow at -10°C] line.



A settings screen opens:




Enter the new flow temperature for this heating circuit. Press **Accept** to save the new value.

The text menu for the selected heating circuit is displayed. Press  to open the "Heating circuit" overview.

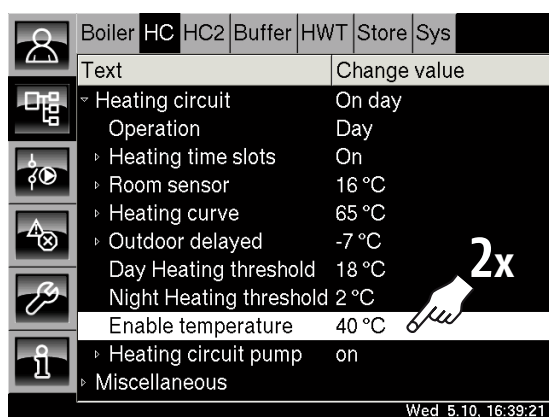
## Setting the parameter "enable temperature"

The heating circuit pump does not start until the energy source (buffer or boiler) has exceeded the "enable temperature". You can give a heating circuit priority by setting the "enable temperature" lower than that for all the other heating circuits in the system.

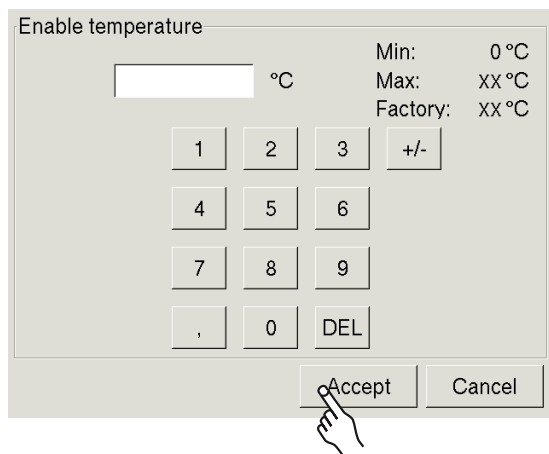
## Opening the heating circuit text menu

Press  to open the text menu for the selected heating circuit.


Tap the line [Heating circuit] and, in the submenu, double-tap the line [Enable temperature].



A settings screen opens:




Enter the new enable temperature for this heating circuit. Press  to save the new value.


The text menu for the selected heating circuit is displayed. Press  to return to the heating circuit overview.

## The parameter "Set-back"

If the unit does not have a room sensor, the parameter "Set-back" is used to adjust the night mode. The control system subtracts the "Set-back" parameter from the heating curve "Day" to get the heating curve "Night".

Outside the time slots set in the timer, the heating circuit is in "Night" mode, and runs using the heating curve "Night".

 The factory setting for this "Set-back" is 15°C.

 The **"Set-back" can be adjusted for each heating circuit**. The following steps are the same for all heating circuits.


## Do not use large set-backs

Do not overuse "set-back", as much higher air temperatures will be required to ensure comfort in the morning if the walls have cooled down too much overnight. In addition to reducing comfort, this also wastes the energy saved overnight.

Depending on the "Flow at -10°C" temperature and the type of heating circuit used (radiator or underfloor heating), the following guidelines apply for the set-back:

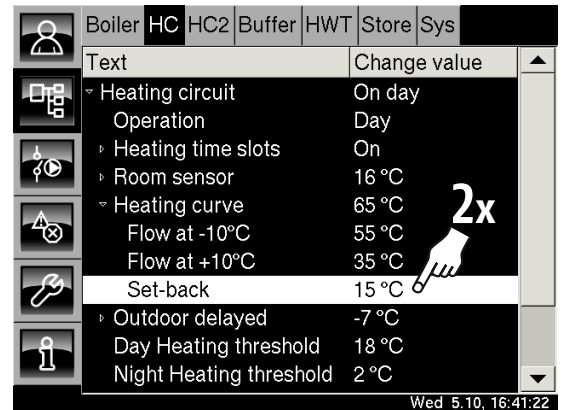
Temperature	Radiator			Underfloor
	40°C	60°C	80°C	
Flow at -10°C	40°C	60°C	80°C	30-40°C
Set-back	5-8°C	10-15°C	15-22°C	3-5°C

## Changing the parameter "Set-back"

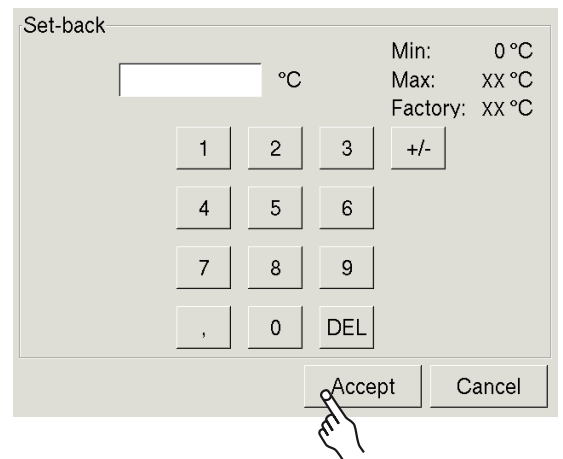
Press  to open the text menu for the selected heating circuit.

Tap the [Heating circuit] line and, in the submenu, tap the [Heating curve] line.

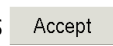
Double-tap on the [Set-back] line.




A settings screen opens:





Enter the new temperature difference for the "Set-back". Subtracting the "Set-back" from the heating curve "Day" gives you the heating curve "Night".

Press  to save the new value. The text menu for the selected heating circuit is displayed once more.

Press  to return to the heating circuit overview.

## HACK "Special conveyor" – Overview

 This FUB is only available on **wood chip boilers** with the **HE-C extension circuit board**.



Press  and  to open the "Special conveyor" overview screen.

This screen is used to control the special fuel conveyor variants for wood chip boilers. The overview differs depending on the special variant:

- **Intermediate conveyor screw** (also for silo conveying systems), see example on page 70.
- **Double agitator** (2 agitators supplying one boiler), see example on page 74.
- **Double discharge conveyor** (one agitator supplying 2 boilers), see example on page 77.

If multiple special conveyor systems are installed, each one is displayed in a separate FUB.

Example: Double agitator (page 74):

Agitator 1 is displayed in the  FUB, and agitator 2 is displayed in the  FUB.

### Optional light barrier

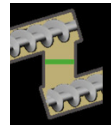
An optional light barrier is offered for ETA fuel conveying systems to control the fuel conveyance and the respective conveying system.

If the drop chute contains sufficient fuel, the light barrier is interrupted, and the conveying system stops to be continued at a later point. If a **light barrier is installed**, it will be **displayed in the overview**.



### Light barrier red

There is sufficient fuel in the drop chute. The light barrier has been interrupted and is displayed in red, with fuel. The special conveyor screw is switched off.



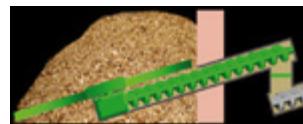
### Light barrier green

If the light barrier is displayed in green, there is no fuel or insufficient fuel in the drop chute.



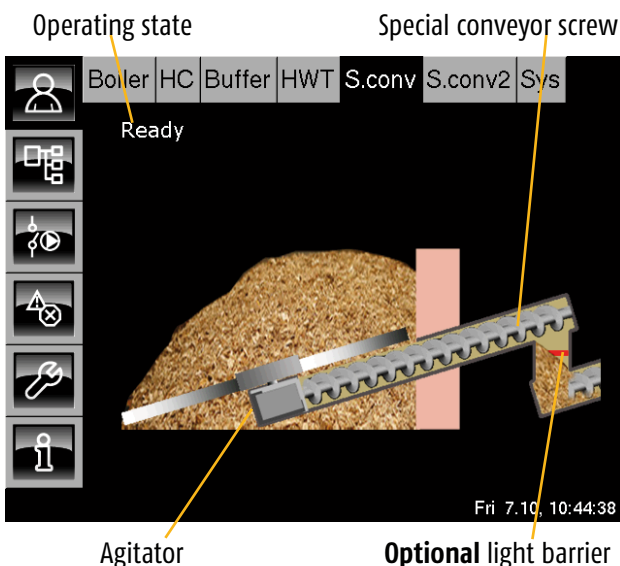
### Agitator on standby

The agitator and screw are displayed in grey when not in operation or if the screw is turning against the discharge direction, e.g. in order to remove a blockage.



### Agitator conveying fuel

The agitator and screw are displayed in green when the screw is turning in the discharge direction.



### Ready **Current operating mode**

This line shows the current operating mode of the special conveyor. Below is a list of the possible modes:

#### Ready

The special conveyor is not currently in operation. There is no demand for fuel.

#### Full

There is sufficient fuel in the drop chute. The light barrier has been interrupted.

## Conveying

The agitator and screw of the special conveyor are in operation. Fuel is being conveyed.

## Error Self-check

A malfunction has occurred during the self-check.

## Error conveyor

The special conveyor motor has caused a malfunction.

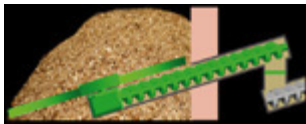
## Drop chute open

The sensor on the drop chute has been triggered. This may be due to a blockage.

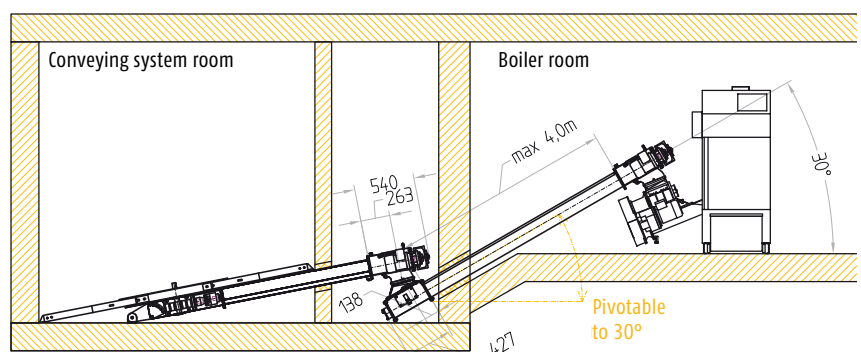
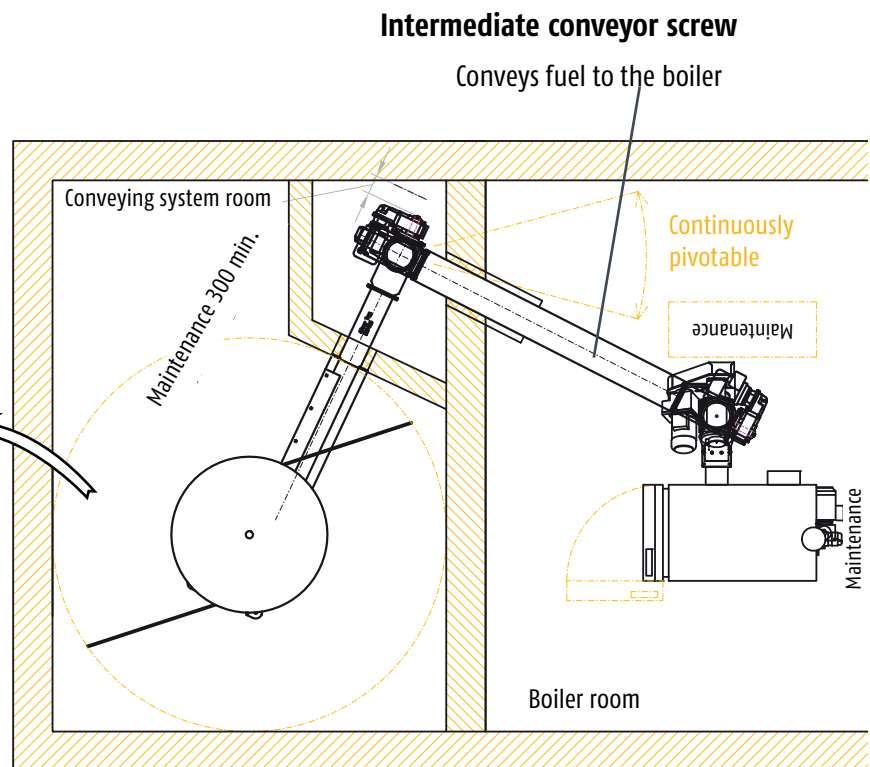
## Safety chain interrupted

The safety chain, e.g. water shortage, emergency stop, safety temperature limited, ash box, rotary valve maintenance cover... has been broken. Heating is locked and cannot be resumed.


## Special conveyor S.conv



Conveys fuel to the intermediate conveyor screw



## "Intermediate conveyor screw" overview

 The "Intermediate conveyor screw" overview in the special conveyor FUB is only displayed if **several conveying systems one after another** carry the fuel to the boiler. (See example on next page.)

These additional conveying systems are also known as "**Intermediate conveyor screws**", and they carry the fuel to a subsequent conveying system or the wood chip boiler.

Each individual conveying system or intermediate conveyor screw is displayed in a separate FUB, e.g.: `S.conv`, `S.conv2`, `S.conv3` ...

### Operating modes

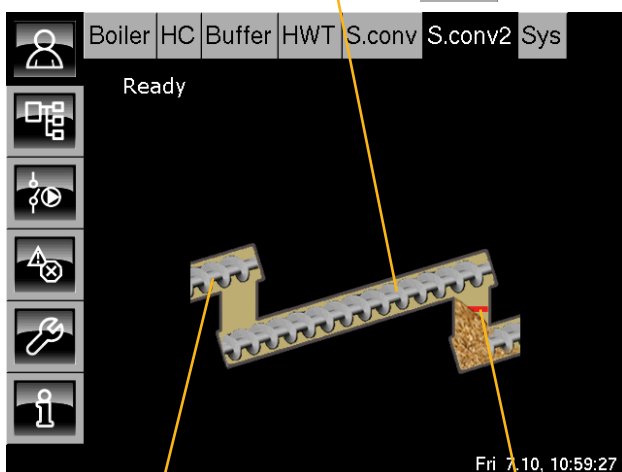
The different operating modes are listed on the previous page.

### Optional light barrier

In order to control the fuel conveying system, a light barrier can also be installed in the drop chute of the intermediate conveyor screw. If the drop chute contains sufficient fuel, the light barrier is interrupted, the intermediate conveyor screw stops, and then next conveying system begins to operate.

 If a **light barrier is installed**, it will be **displayed in the overview**.

Intermediate conveyor screw for Special conveyor 2 FUB `S.conv2`



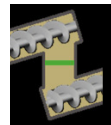
Intermediate conveyor screw receives fuel from `S.conv` FUB, e.g.: Agitator

**Optional light barrier**



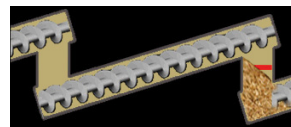
### Light barrier red

There is sufficient fuel in the drop chute. The light barrier has been interrupted and is displayed in red, with fuel. The intermediate conveyor screw is always switched off.



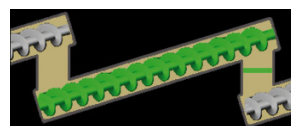
### Light barrier green

If the light barrier is displayed in green, there is no fuel or insufficient fuel in the drop chute.



### Intermediate conveyor screw on standby

The intermediate conveyor screw is displayed in grey when not in operation or if it is turning against the discharge direction, e.g. in order to remove a blockage.




### Intermediate conveyor screw conveying fuel

The intermediate conveyor screw is displayed in green when it is turning in the discharge direction.

## Conveying system with intermediate conveyor screws

The existing silo conveying system is displayed in the Special conveyor 1 **S.conv** FUB. This carries the fuel to intermediate conveyor screw 1.

From there, it is conveyed further to intermediate conveyor screw 2 **S.conv2**, and eventually reaches the boiler.

 **Intermediate conveyor screw 1 **S.conv2** is the consumer and producer of the fuel.** As such, the **"Producer demand"** option must be selected in the **S.conv2** FUB system configuration.

## No light barriers installed?

In this example, there are light barriers installed on the discharge connection to intermediate conveyor screw 1 and in the drop chute to intermediate conveyor screw 2.

If **no light barriers** have been installed, the **fuel conveying system is controlled** using the **runtime scale factor**

This factor reduces the demand placed on the previous conveying system in order to prevent blockages.

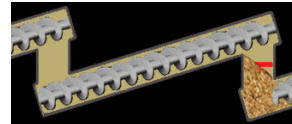
### Existing silo conveying system **S.conv**



Light barrier in discharge connection

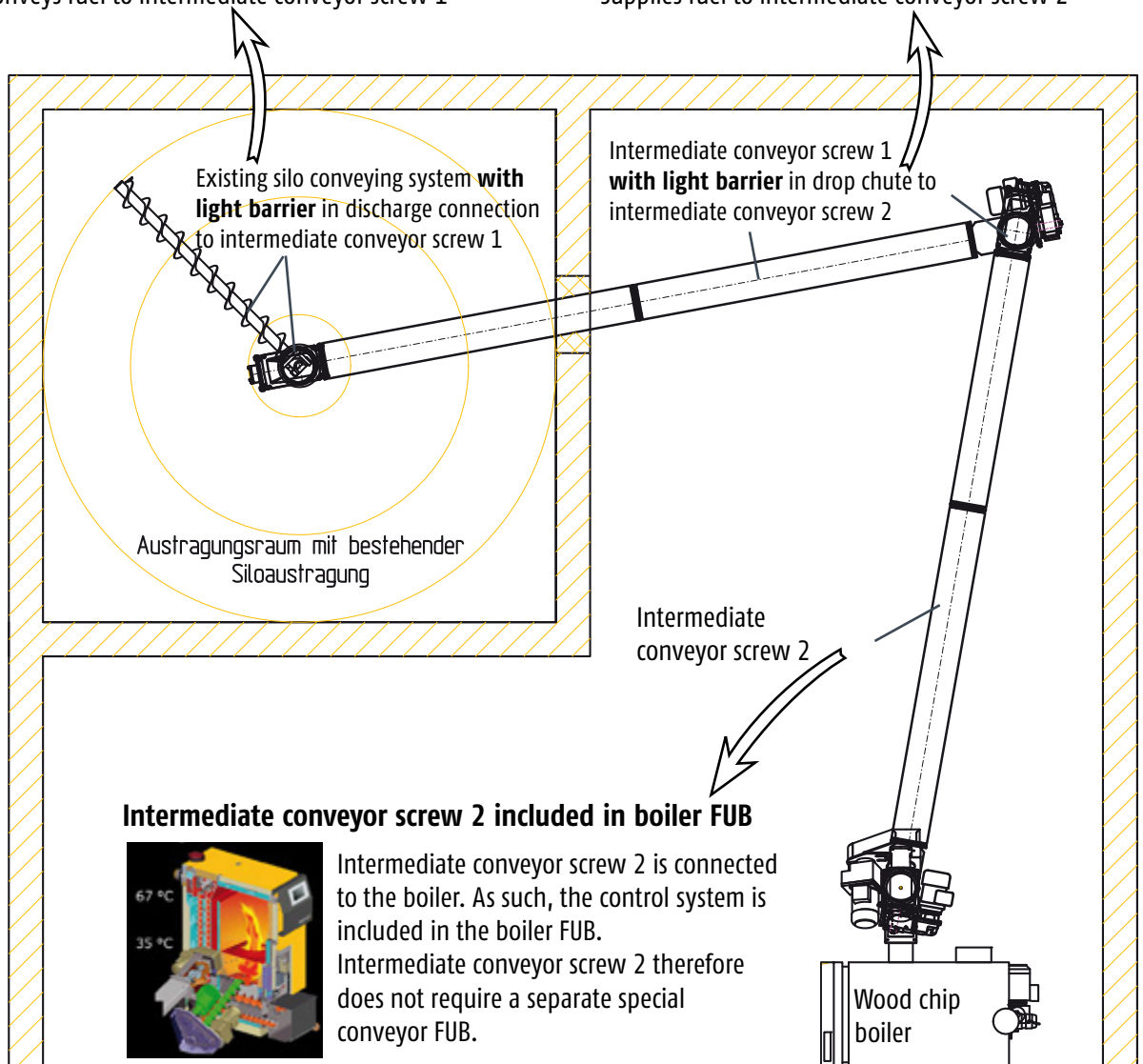
Conveys fuel to intermediate conveyor screw 1

### Intermediate conveyor screw 1 **S.conv2**



Light barrier in drop chute to intermediate conveyor screw 2


Supplies fuel to intermediate conveyor screw 2




## Multiple intermediate conveyor screws

The two conveying systems Agitator 1 `S.conv1` and Agitator 2 `S.conv2` take turns in conveying the fuel to **Intermediate conveyor screw 1** `S.conv3`.

From there, it is conveyed further to **Intermediate conveyor screw 2** and to the boiler.

 **Intermediate conveyor screw 2** is connected to the boiler. This means that the **control system is already contained in the Boiler FUB**, and this intermediate conveyor screw **does not require a separate Special conveyor FUB**.

 **Intermediate conveyor screw 1** `S.conv3` is the **consumer and producer** of the fuel. As such, the **"Producer demand"** option must be selected in the `S.conv3` FUB system configuration.

### Switching between conveying systems

The two conveying systems take it in turns to supply Intermediate conveyor screw 1 with fuel. In order to ensure that the fuel deposit is emptied at a steady rate, the system **switches** between the two agitators **automatically**.

This **switch can also be actuated manually**, for example if you only want one agitator to convey the fuel. **How to change** switching is described on page 76.

The discharge time for each conveyor is set in the Boiler FUB, and can be **changed** at any time. The factory setting for the **shifting time is 5 hours**. For more information, see page 76.

### Modes for multiple conveying systems

The following modes are **only displayed** if a conveying system FUB controls two additional conveying systems.  
(See example opposite.)

#### Conveyor 1

The conveying system 1 FUB is currently conveying the fuel to the intermediate conveyor screw or to another conveyor.

#### Waiting Conveyor 1

Fuel conveying is being switched to the Conveyor 1 FUB. This FUB will continue the conveying.

#### Self-check 1

The self-check for the conveying system 1 motors is currently being carried out.

#### Conveyor 2

The conveying system 2 FUB is currently conveying the fuel to the intermediate conveyor screw or to another conveyor.

#### Waiting Conveyor 2

Fuel conveying is being switched to the conveying system 2 FUB. This FUB will continue the conveying.

#### Self-check 2

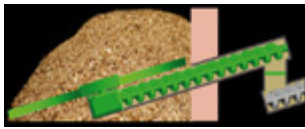
The self-check for the conveying system 2 motors is currently being carried out.

#### Error

There are errors in the conveying system FUBs. Fuel conveying cannot continue.



Conveying system 1 S.conv

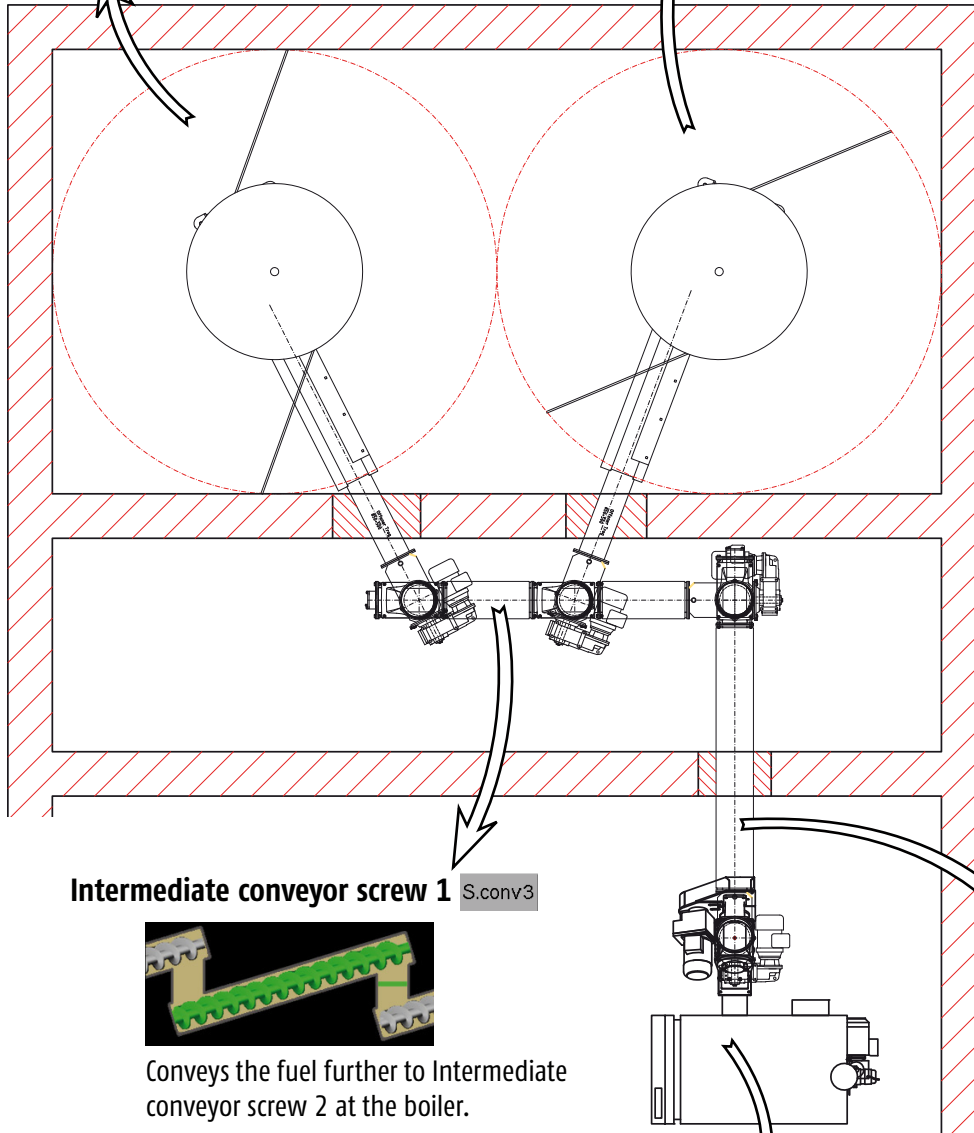


Alternately conveys fuel to the intermediate conveyor screw S.conv3.

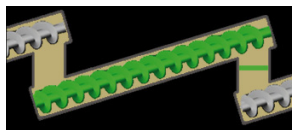
Conveying system 2 S.conv2



Alternately conveys fuel to the intermediate conveyor screw S.conv3.



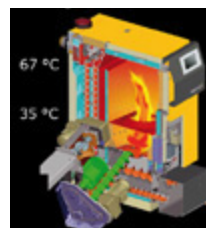
Intermediate conveyor screw 1 S.conv3



Conveys the fuel further to Intermediate conveyor screw 2 at the boiler.

Intermediate conveyor screw 2 is included in boiler FUB


Intermediate conveyor screw 2 included in boiler FUB



Intermediate conveyor screw 2 is connected to the boiler, and its control system is contained in the Boiler FUB. Intermediate conveyor screw 2 therefore does not require a separate special conveyor FUB.

## Double agitator 2 agitators on one boiler

The two conveying systems **Agitator 1** S.conv1 and **Agitator 2** S.conv2 take turns in conveying the fuel to the intermediate conveyor screw on the boiler.

 This **intermediate conveyor screw** is **connected to the boiler**, and the **control system** is thus **contained in the Boiler FUB**. As such, the intermediate conveyor screw **does not require a separate Special conveyor FUB**.

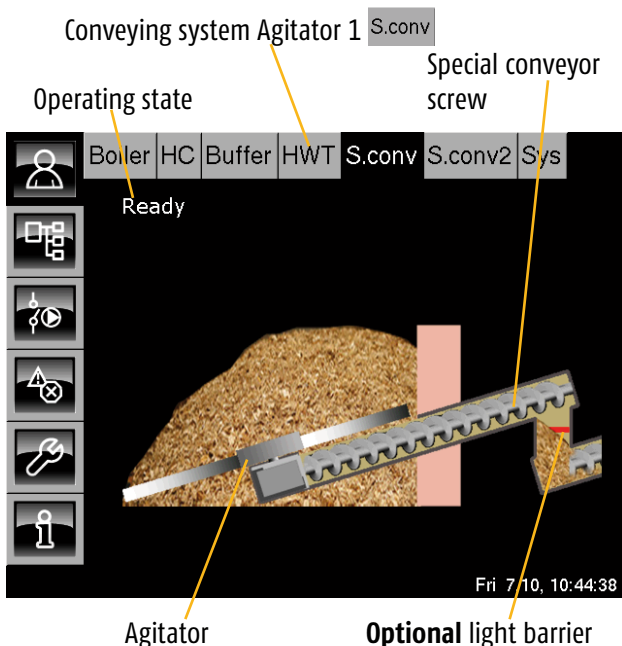
### Automatic switching

The two conveying systems take it in turns to supply the intermediate conveyor screw with fuel. In order to ensure that the fuel deposit is emptied at a steady rate, the system **switches** between the two agitators **automatically**. This **switching process** and the **discharge times of the conveyors** can be **changed** (for more information, see page 76).

### Overview of the conveying system

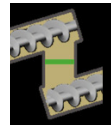
#### Agitator 1 S.conv1

The overview of the conveying system **Agitator 2** is displayed in the S.conv2 FUB.



#### Light barrier red

There is sufficient fuel in the drop chute. The light barrier has been interrupted and is displayed in red, with fuel. The special conveyor screw is switched off.



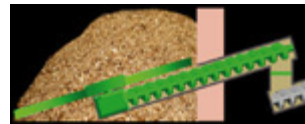
#### Light barrier green

If the light barrier is displayed in green, there is no fuel or insufficient fuel in the drop chute.



#### Agitator on standby

The agitator and screw are displayed in grey when not in operation or if the screw is turning against the discharge direction, e.g. in order to remove a blockage.



#### Agitator conveying fuel

The agitator and screw are displayed in green when the screw is turning in the discharge direction.

#### Ready **Current operating mode**

This line shows the current operating mode of the respective conveying system. Below is a list of the possible modes:

#### Ready

The conveying system is not currently in operation. There is no demand for fuel.

#### Full

There is sufficient fuel in the drop chute. The light barrier is interrupted.

### Conveying

The conveying system is in operation and is conveying the fuel to the intermediate conveyor screw.

### Error Self-check

A malfunction has occurred during the self-check.

### Error conveyer

The conveying system motor has caused a malfunction.

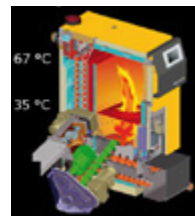
### Drop chute open

The sensor on the drop chute has been triggered. This may be due to a blockage.

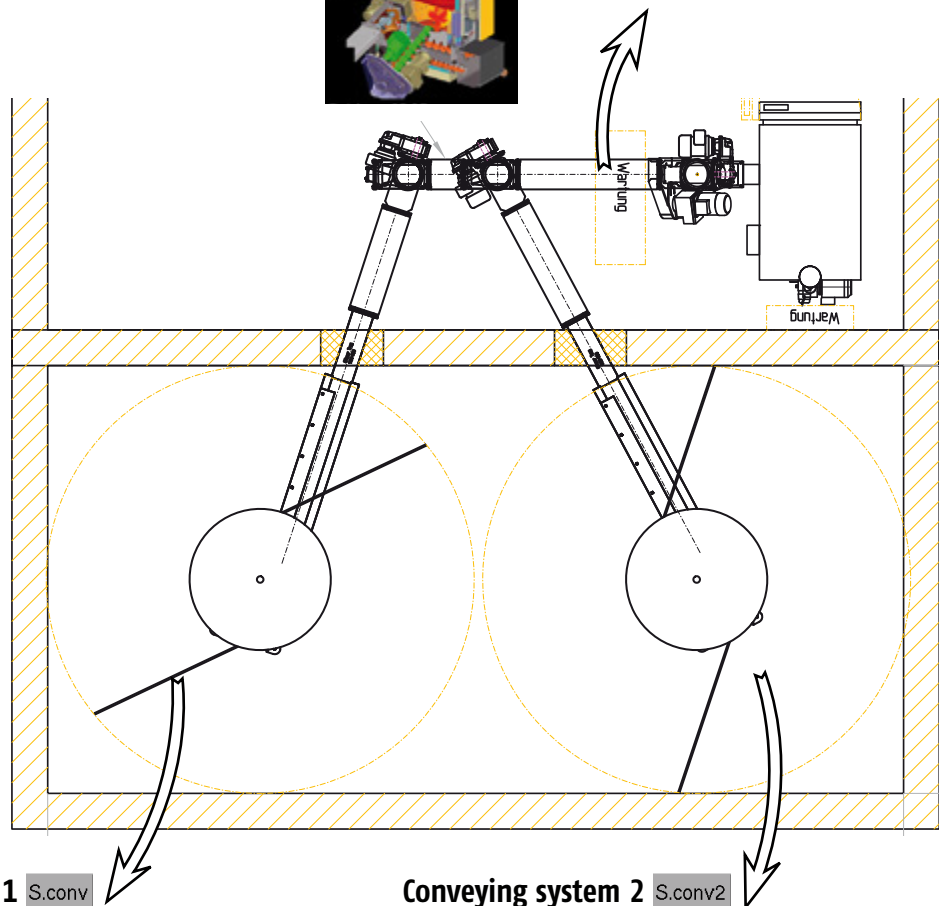
### Safety chain interrupted

The safety chain, e.g. water shortage, emergency stop, safety temperature limited, ash box, rotary valve maintenance cover... has been broken. Heating is locked and cannot be resumed.

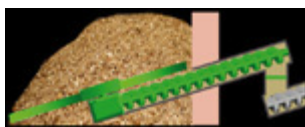
### Intermediate conveyor screw included in boiler FUB



The intermediate conveyor screw is connected to the boiler. The control system is included in the boiler FUB.



**Conveying system 1** S.conv



Alternately conveys fuel to the intermediate conveyor screw or the boiler.

**Conveying system 2** S.conv2



Alternately conveys fuel to the intermediate conveyor screw or the boiler.

## Switching between conveying systems, "Shifting time" parameter in the Boiler FUB

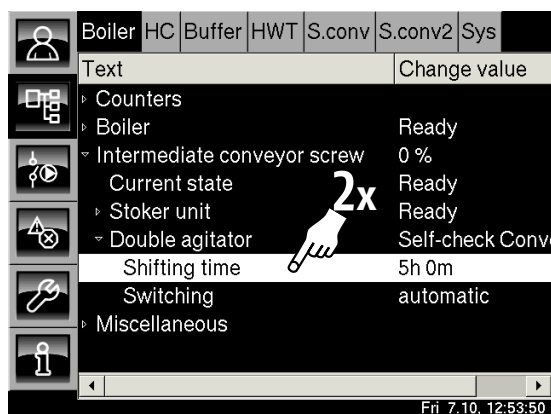
The discharge time for a conveyor can be set using the **"Shifting time" parameter** in the **Boiler FUB**. This sets the length of time for which a conveying system is in operation and supplying fuel. **Once this "Shifting time" has expired** (factory setting: 5 hours), the **system switches to the second conveying system to continue the process**.

## Changing the shifting time between conveying systems

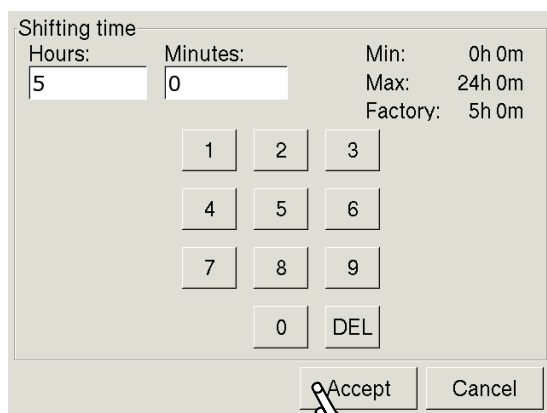
Press the buttons **Boiler** and **[Boiler]** to go to the boiler text menu.

Tap the [Intermediate conveyor screw] line and, in the submenu, select [Double agitator].

Double-tap the [Shifting time] line.



A settings screen opens:



Enter the new time and press **Accept** to save.

## Manually switching between conveying systems

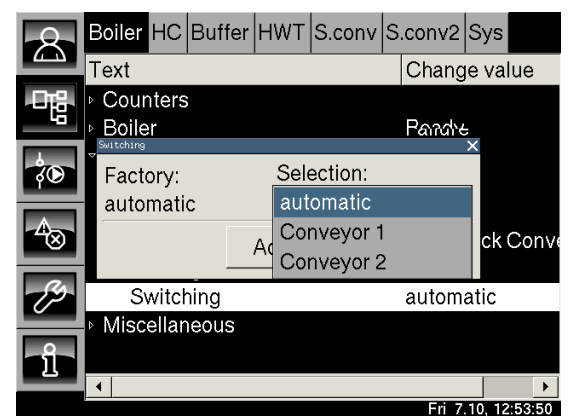
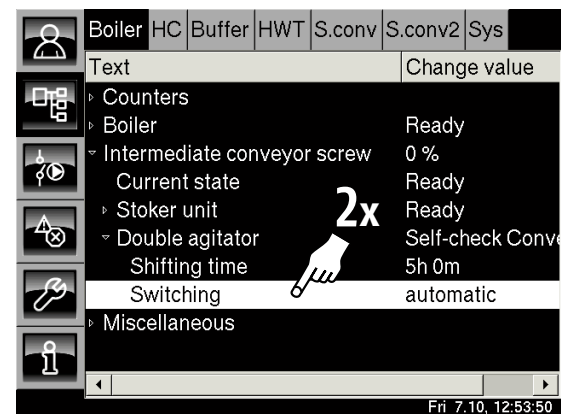
When using the factory settings, the system switches automatically between the conveying systems once the "Shifting time" has expired. However, this **switch can also be actuated manually**, for example if you only ever want one agitator to convey the fuel. You can switch manually between the conveying systems using the **"Switching" parameter in the Boiler FUB**.

## Manually changing conveying system

Press the buttons **Boiler** and **[Boiler]** to go to the boiler text menu.

Tap the [Intermediate conveyor screw] line and, in the submenu, select [Double agitator].

Double-tap the [Switching] line. A settings screen opens:



Select the desired conveying system and press **Accept**.

**Only the selected conveying system will now be used to convey the fuel.**

To re-activate automatic switching, repeat the above procedure and select "automatic".

## Double discharge conveyor one agitator supplies 2 boilers

If one agitator is supplying two boilers, the **separate drive** is only used to drive the **agitator with the flat springs**.

The **conveyor screws are driven** by the corresponding **control system in the boiler**.

The agitator is put into operation as soon as one of the boilers demands fuel. At the same time, this boiler sets its discharge screw into operation in order to convey the fuel to the boiler.


## Alternating boiler operation, boiler order

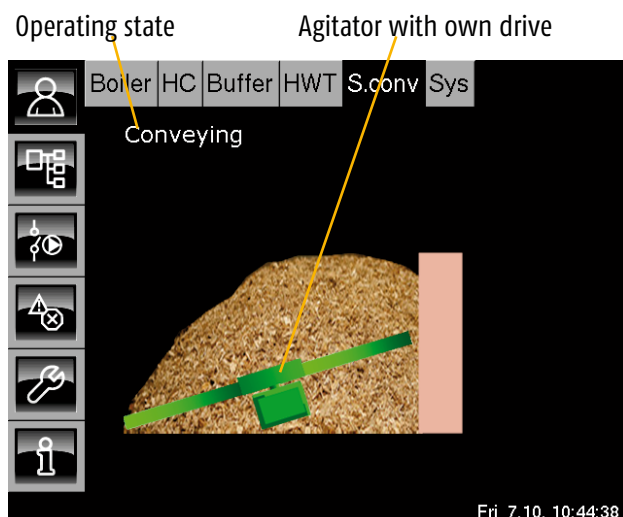
In order to ensure that both boilers are used equally, in the **factory settings**, only **one boiler** is in operation and the **heating switches** to the other boiler every **50 operating hours**.

If **one boiler can no longer meet the demand** from the consumers, **the second boiler is automatically put into operation**.

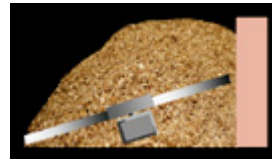
However, if only one boiler is ever in operation, e.g. in summer, when heating demand is low, the priority of the boilers must be changed using the **"Boiler Order" parameter** (for more information, see page 79).

The "Boiler Order" defines a **"Main boiler" which is always in operation**. The other boilers are then only switched on when demand is high.

 In the **factory settings**, **all the boilers** have the **same boiler order**, so they automatically alternate operation after every 50 operating hours.

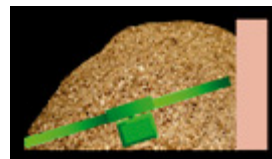


## Agitator on standby



The agitator is displayed in grey when not in operation.

## Agitator in operation



The agitator is displayed in green when it is in operation and conveying fuel.

## Conveying Current operating mode

This line shows the current operating mode of the agitator. Below is a list of the possible modes:

### Ready

The agitator is not in operation. There is no demand for fuel.

### Conveying

The agitator is in operation and is conveying fuel to one of the boilers.

### Error Self-check

A malfunction has occurred during the agitator motor self-check.

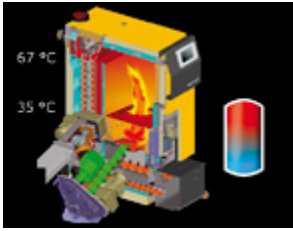
### Error conveyor

The agitator motor has caused a malfunction.

### Safety chain interrupted

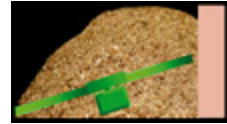
The safety chain, e.g. water shortage, emergency stop, safety temperature limited, ash box, rotary valve maintenance cover... has been broken. Heating is locked and cannot be resumed.

## Boiler 1 Boiler

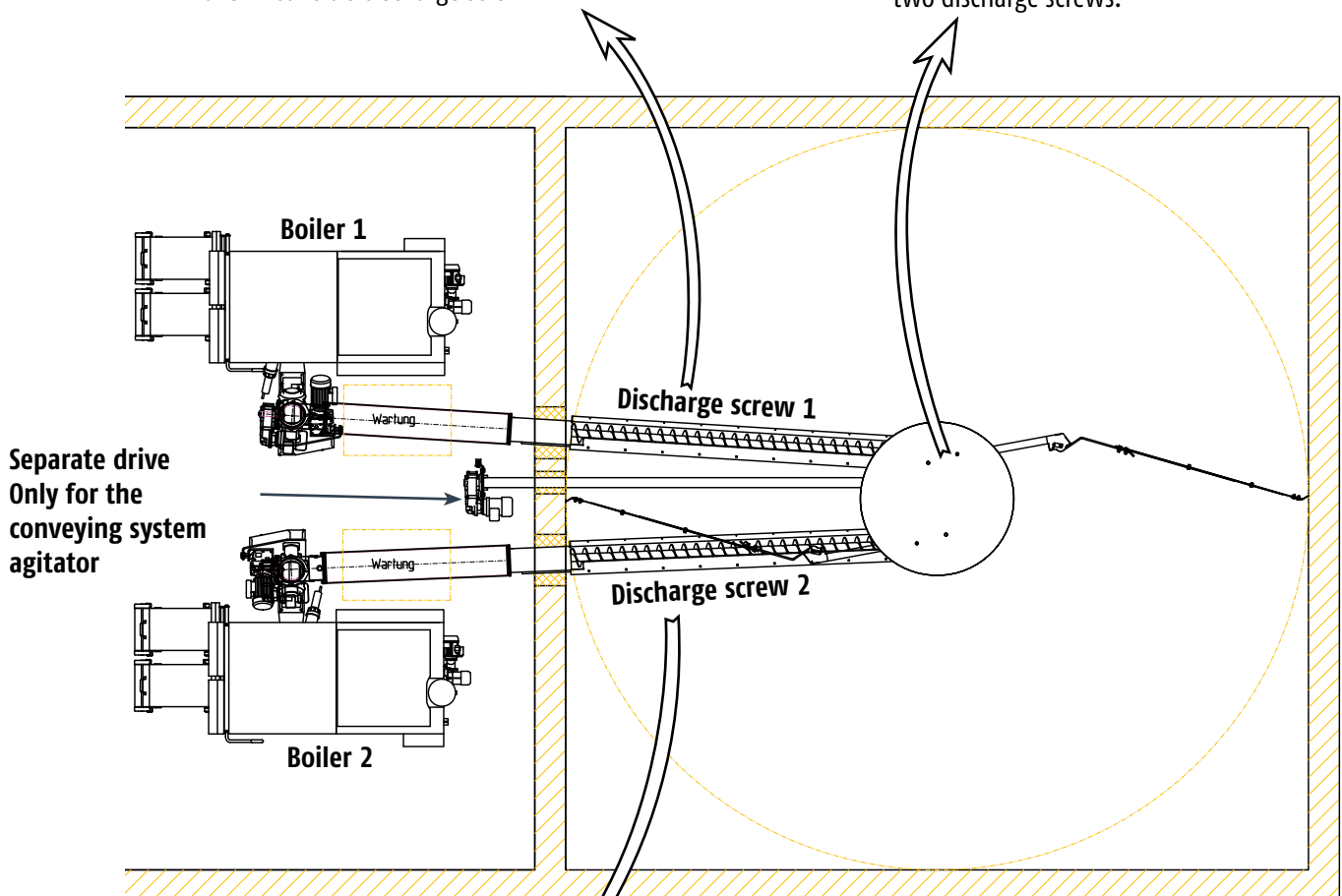


Boiler 1 controls discharge screw 1

## Agitator S.conv

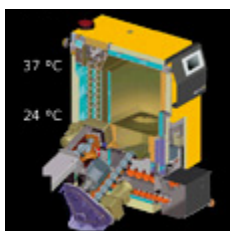


The agitator only conveys the fuel to the two discharge screws.



Separate drive  
Only for the  
conveying system  
agitator

## Boiler 2 Boiler 2




Boiler 2 controls discharge screw 2


## Adjusting the boiler order


The parameter "**Boiler Order**" is used to adjust the **priority of each boiler**. This can be given a setting from 1 (highest) to 4 (lowest).

The boiler with the **highest priority (1)** is defined as the "**Main boiler**" and is **always in operation**. Boilers with the priorities 2, 3 and 4 are automatically put **into operation in this order** if the "Main boiler" can no longer meet the demands of the consumers.

 If **2 boilers have the same priority**, they will be put into **alternating** operation, and the system will switch between them after every 50 operating hours. **In the factory settings**, every boiler has a priority of **1**.

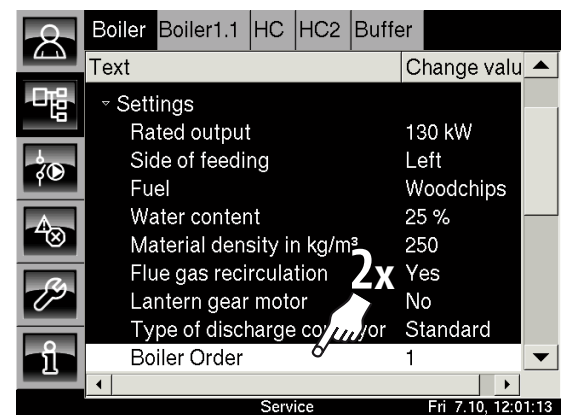
## Changing the boiler order

 The access level "Service" is required to change the "Boiler Order". For safety purposes, the **boiler order should be checked for all boilers**.

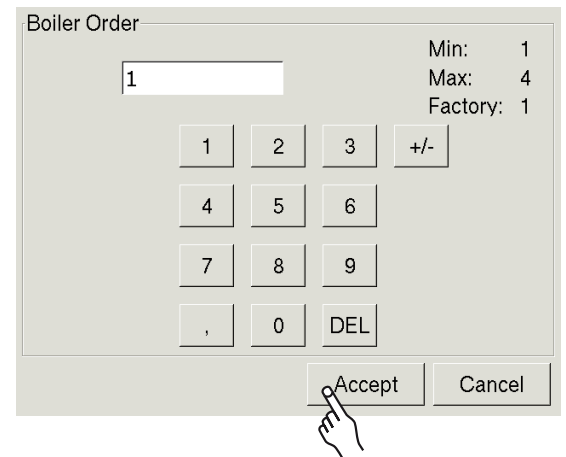
Select the corresponding **Boiler** FUB and press  to open the text menu.

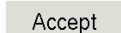
Tap the [Boiler] line and, in the submenu, tap [Settings].

Double-tap the [Boiler Order] line.






A settings screen opens:



Change the boiler order (priority) for this boiler and press  to save.

## "Ash removal" overview

Press  and  to open the "External ash removal" overview screen.

 This FUB is only available on **wood chip boilers** with the **HE-C extension circuit board**.

With external ash removal, an additional ash screw is installed in place of the ash box. This conveys the ash from the boiler to a separate waste bin.

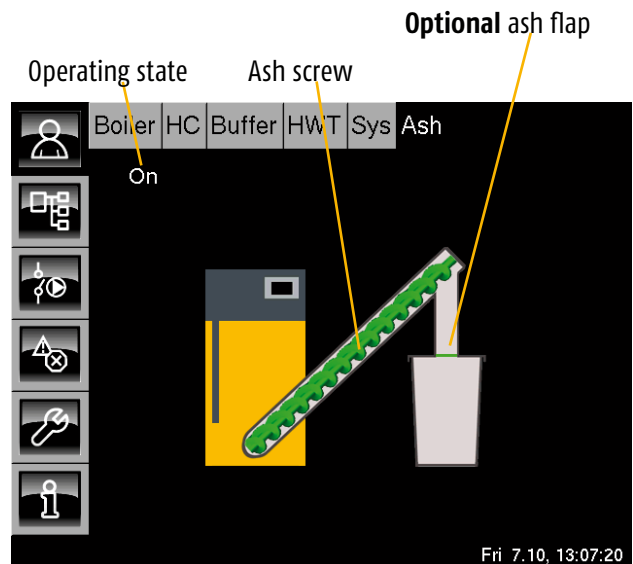
### Optional "Ash flap"

The ash flap is located in the drop chute of the external ash removal unit to prevent the leak air from reaching the boiler via the ash screw. The ash flap is always closed, and only opens when the grate in the boiler tips up during ash removal.

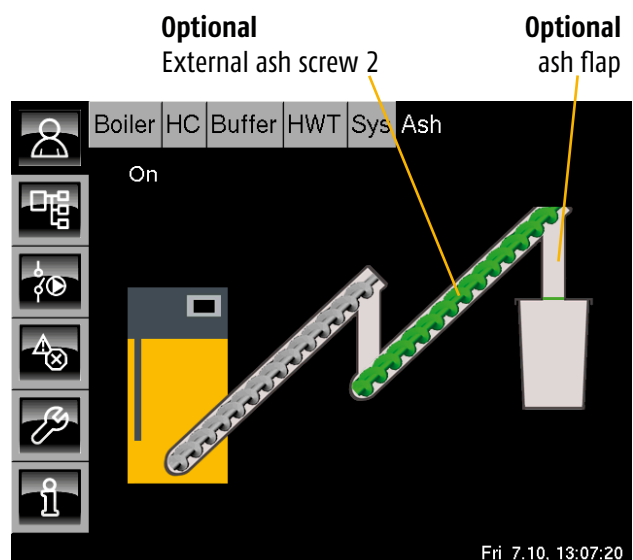
### Optional "External ash screw 2"

If a second ash screw (the optional "External ash screw 2") is configured, this is also shown in the overview.

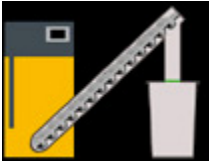
### External ash removal with one ash screw



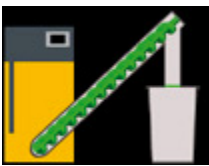
### External ash removal with 2 ash screws





**Ash screw on standby**

The ash screw is displayed in grey when not in operation.

**Ash screw in operation**

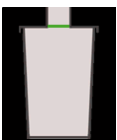
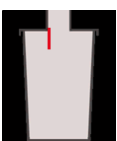
The ash screw is displayed in green when it is turning in the discharge direction.

**Ash screw 2 on standby**

Ash screw 2 is displayed in grey when not in operation.

**Ash screw 2 in operation**

Ash screw 2 is displayed in green when it is turning in the discharge direction.

**Ash flap closed****Ash flap open****On** Current operating mode

This line shows the current operating mode of the ash screw. Below is a list of the possible modes:

**Self-check screw 1**

Ash screw 1 is performing a self-check on the drive.

**Self-check screw 2 (external ash screw 2 only)**

Ash screw 2 is performing a self-check on the drive.

**Ready**

The ash screw is not currently in operation. There is no demand from the control system.

**On**

The ash screw is conveying the ash to the waste bin.

**Error**

There is an error. There was an error either in the ash screw self-check or in the power supply, or the ash flap is not opening or closing.

## Using remote control

With remote control, you can control your ETA boiler over long distances via the Internet with a PC, smartphone or tablet (pad), just as if you were standing in front of the boiler's touch screen.

For example, if you are away from home for a long time, you can verify that the heating is switched off. You can also switch it back on before you return.

The ETA boiler's touch screen is connected to the Internet. Once you have registered your touch screen, you can log in to the ETA homepage <[www.meinETA.at](http://www.meinETA.at)> using your access details.

You can access this homepage via a PC with an Internet connection or a smartphone or tablet with Internet capabilities. You can view the touch screen at <[www.meinETA.at](http://www.meinETA.at)> and control your boiler remotely.



## Data transfers, downloading and flat rates

As soon as remote control has been activated, the touch screen automatically connects to the Internet. The current status of the Internet connection is indicated by an icon at the bottom of the screen.

The data is transmitted via the Internet, adding to the amount of data you download via your connection. In order to avoid excessive costs, we recommend that you use a flat rate or a contract with no data download limit for your Internet connection.

## Boiler with touch screen and software version 1.18.0 or higher

In order to use the remote control function, your boiler must be equipped with an ETAtouch control system (touch screen). The software installed on the boiler must be version 1.18.0 or higher. If this is not the case, the software must be updated.

## Internet connection

In order to establish an Internet connection to your boiler, the touch screen must be connected to the Internet. To do this, the house must have a broadband Internet connection. The connection can be established via:

- a network cable from your modem to the touch screen
- or
- the ETA FreeLine wireless connection

## Browser for remote control

You can connect your PC, smartphone or tablet to the boiler via <[www.meinETA.at](http://www.meinETA.at)>.

In order to do this, you must have a browser that supports HTML 5, e.g.:


- Mozilla Firefox
- Apple Safari
- Google Chrome
- Microsoft Internet Explorer version 9 or higher
- some default Android browsers 2.2 or higher


## Internet connection via smartphone or tablet

In order to use the remote control function from your smartphone or tablet (pad), your device must use either Android or iOS (Apple) as its operating system. Your network operator's Internet service must provide at least "EDGE"-level service ("3G" recommended).

## Remote control operating modes

In the boiler overview, the current remote control mode is shown at the bottom of the screen. The remote control system has 3 different operating modes.

 A different operating mode can be selected for each touch screen.

 **Remote control must** always be set to **"Off"** or **"Only View"** before rectifying errors or performing maintenance work.

 **"On"**


Remote control is on and the unit is connected to the Internet. The heating system can be controlled remotely.

 **"Off"**

Remote control is switched off. The remote control can only be switched on again directly via the touch screen of the boiler or the control system.

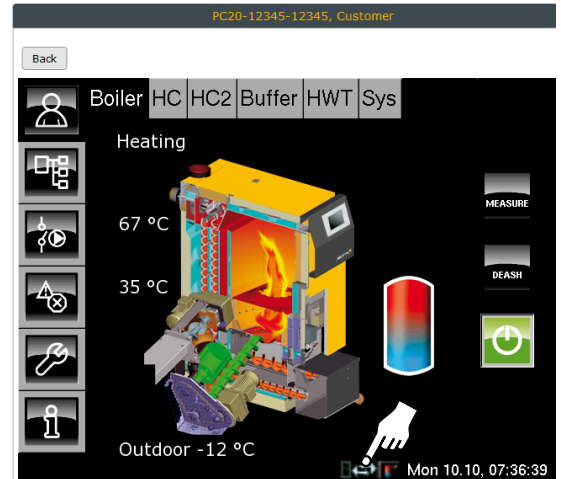
 **"Only View"**

In "Only View" mode, the touch screen is displayed via the homepage <www.meinETA.at>. The boiler can be **monitored**, but it is **not possible** to send **commands via remote control**.

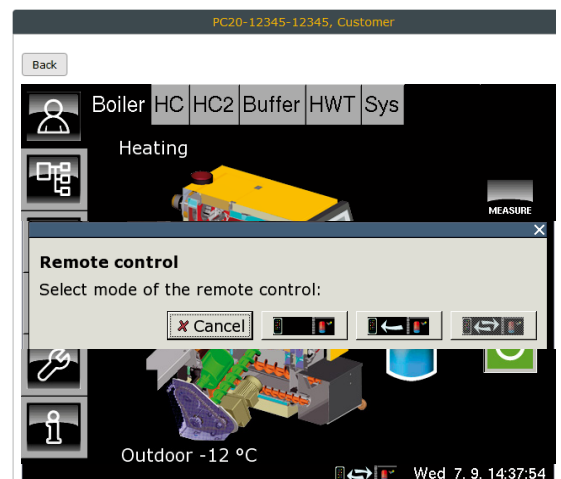
 **Remote control must** always be set to **"Off"** or **"Only View"** before **rectifying errors or performing maintenance work**. This prevents others from switching the boiler on via remote control while an error is being fixed or maintenance is being carried out.

## Changing the operating mode of the remote control system

In the "Boiler" overview, tap the remote control icon at the bottom of the screen.






A selection window appears:




Tap the operating mode you require to select it.

## Switch remote control back on

 If remote control has been switched off, it can only be switched on again via the touch screen of the boiler or the control system.

To re-activate remote control, tap the  icon on the touch screen and select **"On"**  in the window that appears.

The  symbol appears while the connection is being established.

## For safety reasons, some commands can only be executed at the boiler itself

With remote control, you can control the boiler as if you were standing right in front of it.

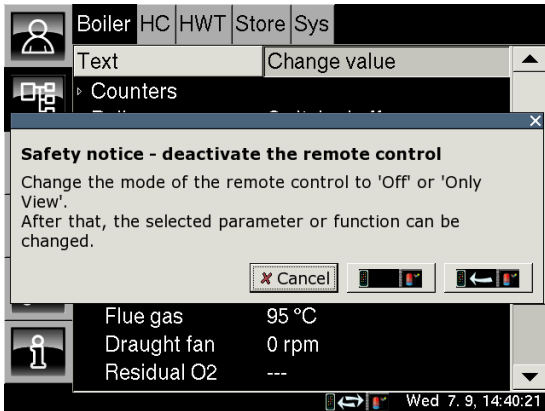
However, for safety reasons, some **parameters and functions are unavailable remotely**. These can only be executed when somebody is by the boiler itself. This also prevents somebody else from activating a drive remotely while an error is being fixed or maintenance work is being carried out.

For example, none of the drives (stoker, ash screw etc.) can be set to manual operation using remote control.

**Remote control must always be set to "Off" or "Only View" before rectifying errors or performing maintenance work** (see page 83).

## Note on blocked parameters/functions

If a blocked command is selected while remote control is active, a notice window will appear.



If no buttons are pressed, this notice window automatically disappears after 4 seconds.

If the "Only View" mode is selected, using remote control, the ETA customer service is able to monitor and provide assistance, for example, but is unable to make changes.

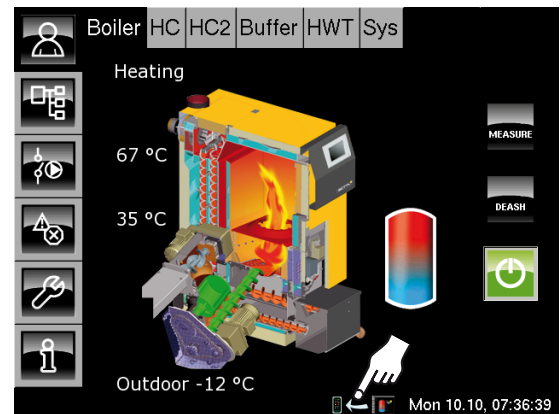
In "Off" mode, remote control is switched off. Remote display of the touch screen is therefore not possible.

## Modifying parameters

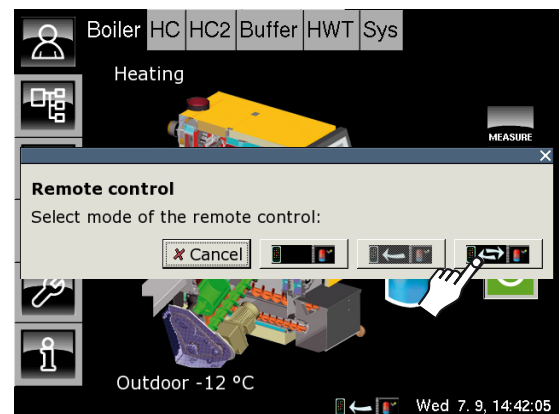
**Do not modify parameters unless you know what their function is.** Read the corresponding section of the operating instructions before making any modifications. If the explanation of the relevant function given in the instructions is not sufficient for your purposes, **contact a technician**.

## Switching remote control back on

Tap the remote control icon on the touch screen.



A window appears:

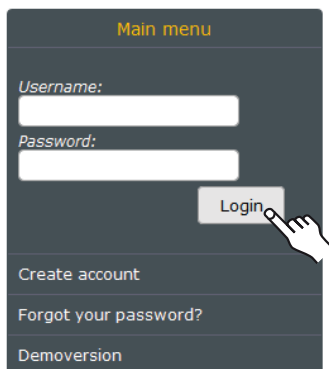


"On" is the only available option.

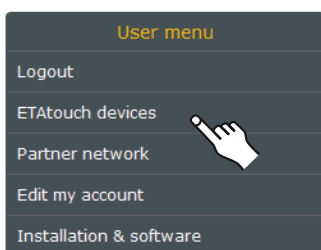
"Only View" mode can only be selected when remote control is "On".

## Logging on at <www.meinETA.at>

Open the homepage <www.meinETA.at> and enter your login data. Press the [Login] button to log in.

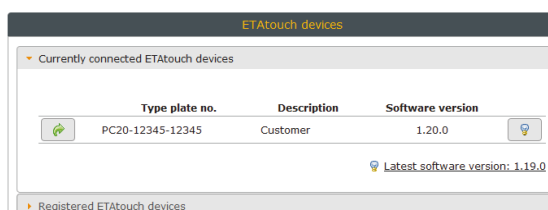


Once you have logged in successfully, the user menu will appear. Tap the [ETAtouch devices] button.



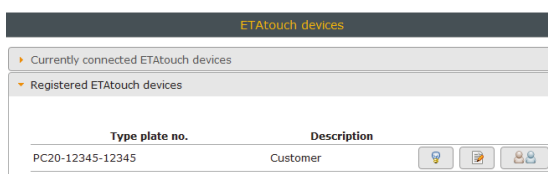
## Opening the touch screen

The [Currently connected ETAtouch devices] window shows the currently available touch screens.



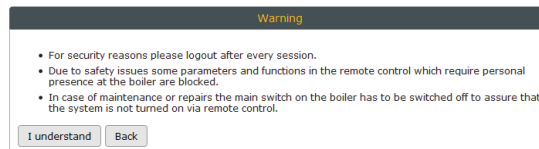
Press the **button**  to view the corresponding touch screen.

In the [Registered ETAtouch devices] window, you can use the **button**  to **change the data** for each registered touch screen.

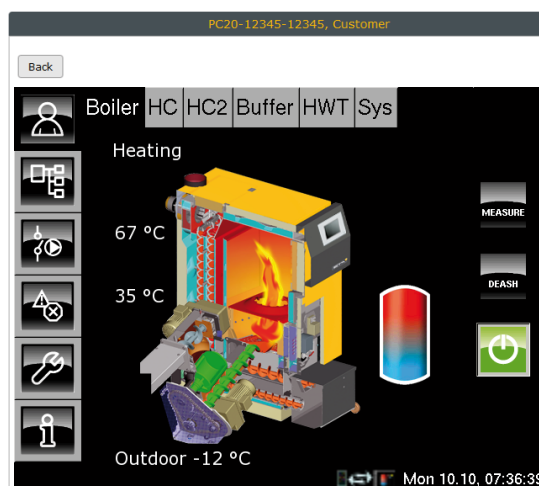


## Safety notice


Before the touch screen is displayed, a safety notice appears. This notice must be observed in order to ensure safe operation of the heating system.



Confirm that you have read and understood the safety notice by pressing [I understand]. The touch screen will then appear. The display is the same as the current display on the boiler.




You can now control the boiler remotely, exactly as if you were standing in front of it.

 For safety reasons, some functions and parameters **cannot be changed via remote control** (page 84).

## Errors and warnings may NOT be rectified via <www.meinETA.at>

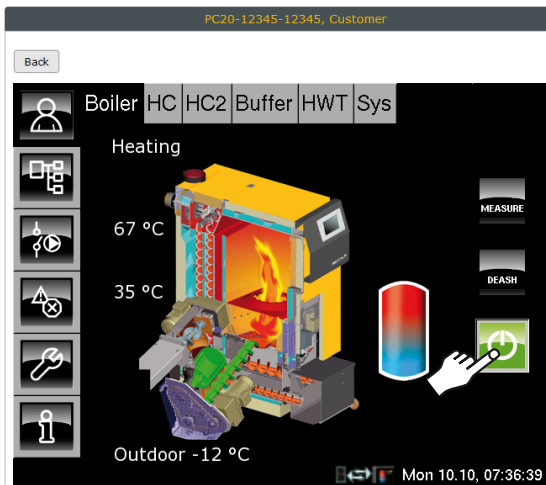
 **Any errors or warnings that are displayed can and may only be rectified on site, i.e. directly via the boiler.**

Rectifying an error using the remote control is not permitted. This is because doing so could injure anyone who is working on the boiler to rectify the error.

 **In particular, you should avoid switching the boiler on via remote control if an error message is present.**

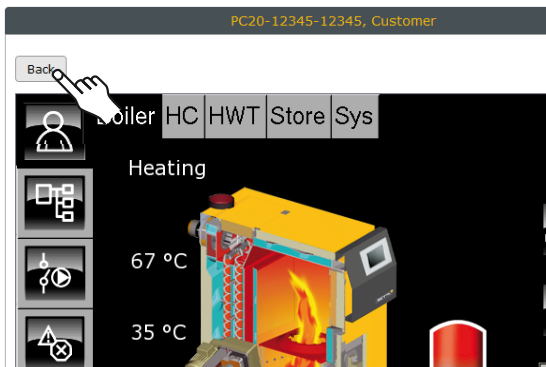
## Example: Switching on the boiler

Press the On/Off button  to switch on the boiler.

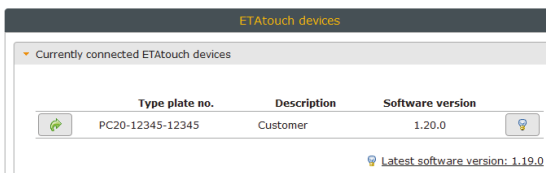



## Closing the touch screen display

Press [Back] to close the touch screen display.



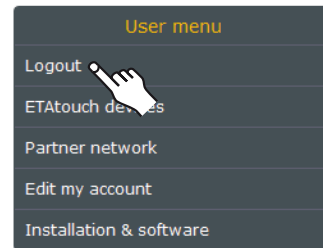
The menu display appears again.



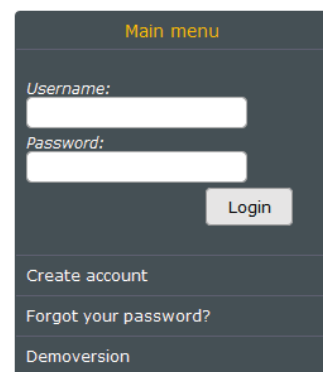
Press the  button to view the corresponding touch screen.


## Logging out of remote control

Once you have finished using remote control, press the [Logout] button on the homepage.



The display returns to the start page.




 Logging out minimises the data flow from the touch screen to the homepage, thus significantly reducing the download volume. This is especially important for reducing the download volume for Internet connections **without** a flatrate tariff. The touch screen remains connected to the meinETA server via the Internet.


## Automatic logout after 10 minutes of inactivity

If the remote control remains unused for longer than 10 minutes, you will be logged out automatically.

## Personal login data

Once you have registered, you will be sent your personal login data (username and password).

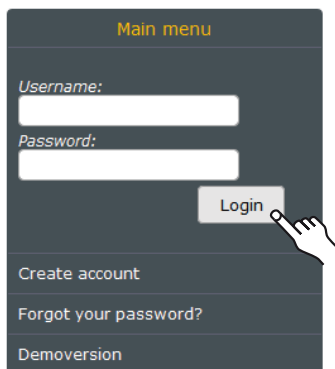
 For the login at <www.meinETA.at>, it is only possible to change the password. Your username will always stay the same, even if you change the e-mail address in your personal details.

 If you change your password for logging in at <www.meinETA.at>, your new password will also be the password required to register another touch screen.

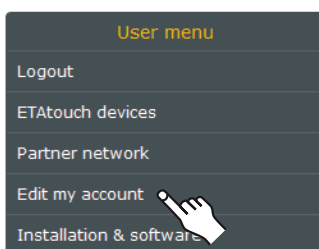
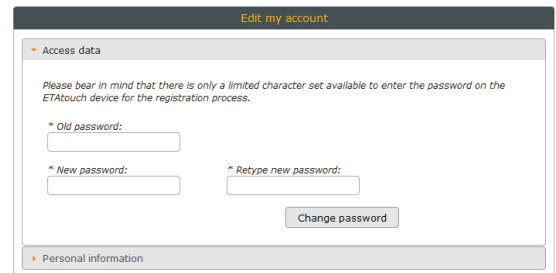
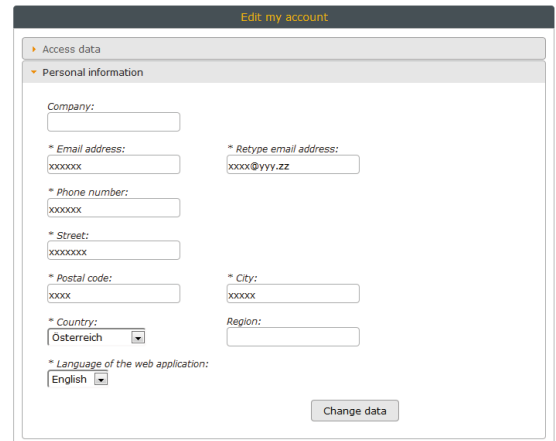
If a touch screen is added at a later date, the current login data (username and current password) are always required.

## Changing your password or personal details

Log in to the homepage <www.meinETA.at> using your current login data.




In the user menu, tap [Edit my account]. The screen will display your current details.

You can now change your password and core details.

Press the [Change password] or [Change data] button to save your changes.

 If a touch screen is added at a later date, the current login data (username and current password) are always required.

## Decay and mould

For water content up to approx. 25 %, the water is bound up in the wood fibres. Above 25 %, water can be found between the fibre cells in pores and capillary vessels. This unbound water is a habitat for, and also a basis for the reproduction of, microbes and fungi which can penetrate into the tree through wounds in the wood structure, especially cuts or breaks. These microbes convert cellulose and lignin into the basic building blocks carbon dioxide and water. The wood rots, hollows out and becomes brittle, ultimately losing all of its heating value.

When a tree is felled, the race between drying and decay begins. With decreasing water content, the living conditions for microbes worsen until they die off when the water content drops below 25 %. The faster the drying process, the more heating value remains in the wood.

For thin branches, the microbes have a very large contact surface in comparison with the wood volume. No matter how neatly the branches are stacked, losses in heating value over 25 % are the rule (considerably more in wet weather). This is why forestry businesses don't even take part in this race with branches smaller than 3 to 5 cm; the material is left behind as nutrient material for the forest.

## Easy recognition of moist or dry wood

Even if professionals who work daily with wood chips only trust the oven test for measurements of the exact water content, there is still a very simple way to distinguish moist from dry. Chips that feel dry in the hand have a water content below 25 % and can be stored without problems. If they feel wet, the water content is sure to be above 35 %.



If the wood chips are dark brown, light and already crumbly, then you are holding rotten wood in your hands, wood that has already lost the majority of its heating value. From such "compost" you can only expect problems, but not boiler output.

## Do not store moist wood chips without ventilation

Wood chips can only be stored without ventilation (for example in a concrete cellar) with a water content of no more than 30 %.



If moist wood chips from a sawmill are to be used anyway, then no more than three weeks' supply should ever be kept in an unventilated bunker. An air inlet and an outlet fan can remove water vapour and at least limit mould growth.

## Wood chips – from best to worst

"Dream" wood chips would be finely chopped (G30) hardwood without bark and with low dust content and a water content less than 20 %. With the highest heating value and the lowest storage volume requirement, it would be the optimum fuel for any boiler.

**Fine wood chips (G30 or finer) can be made from dry wood to reach a higher storage density.**

Wood chips with water content **under 30 % are fit for storage.**

**Wood chips from a sawmill** with a water content of 40 % and **coarsely chopped** are also not to be sneezed at if they are burned after a short time or can be kept in a **well-ventilated store**. Due to the hot, refractory-lined combustion chamber, the attainable boiler output decreases only slightly.

**Wood that has been kept dry and stored for a long time (10 years) has lost 10 % of its heating value.**

**Wood chips from dry branches and shrubbery cuttings** have a higher bark content and usually also large amounts of fine splinters, dirt and decayed material, resulting in **more ash**. If it was chopped from dry wood, there will be no storage problems and the reduction in boiler output is tolerable.

Forest-chopped wood chips **from fresh branches are not fit for storage** and reduce the attainable boiler output significantly.

**Wood that has stored in damp conditions for a long time (10 years) has lost 50 % of its heating value.** Chips from such wood reduce the attainable boiler output significantly.

**The final product from wet wood is compost**, which can be disposed of in a refuse incinerator but can hardly be burned in a normal boiler. Ensure **well-ventilated storage**. The higher the **water content** of the wood, **the coarser it should be chopped**. **Never store more than a year's supply** of wood chips (round logs can be stored more easily and densely).

Be very careful where **wood chips from waste wood** are on offer at especially low prices; the **fraction of decayed material** or also the **amount of foreign material** (nails, wood preservatives, sand, stones) can be very high.

## Store moist wood chips in an open hall

During the decay process, moist wood chips release heat that drives out water. Wet areas form on the surface, and rising water vapour may also be visible. If the wind is given the chance to transport the water away, coarse wood chips will dry while decay and fungi will stay within acceptable limits.

Best is a flying roof separate from living and working quarters, which keeps rain out but lets the wind work unhindered. At least one side of the storage hall should be completely open. Additional openings in all other walls improve the storage conditions.



## Coarse wood chips with minimal fine content dry fastest

Coarse chips (chopped with sharp blades!!!) dry faster with less loss of material due to better air circulation. Fill heights between 4 and 6 m have proven effective. This height is also safe as regards self-ignition, which only becomes a danger at heights of about 8 m.



Even when coarsely chopped, very moist and green material (leaves and needles) and bark have high fine content (typical and unavoidable features of shrubby cuttings and delimiting material) and higher biological activity, and allow only minimal air circulation. In spite of higher self-heating, the low air circulation slows the drying process and material loss is considerably higher.

## Dry like hay on a hard surface

For your own use, spread out moist wood chips in a layer 10 cm thick on an asphalt or concrete surface on hot summer days. Good results can also be had on sunny autumn days if you turn the chips over several times. Two days are usually enough to attain a water content below 30 %, making the chips fit for storage even under poor conditions.

## Drying in a covered mesh enclosure

When building a new wood chip storage facility, roofed storage containers with mesh walls should be considered for air-drying of moist chips. A windy location is important. Southward orientation can help with drying even in winter. The height of the container depends on the height of the front end loader needed for filling. The lowest wall element must be removable to allow removal of the wood chips. The depth can be up to 2 m. Drying time is 4 to 8 months and a water content below 20 % is attainable.

## Artificial ventilation

In spite of a few elaborate pilot projects with solar energy, drying with heated air blown into the store via channels in its floor has not proven itself very economical thus far. The energy costs for drying often exceed the attainable increase in heating value.

## Dry wood before chopping, fell in winter and chop in summer



It is much easier to dry the wood before chopping it. With interim storage before chopping in summer, a water content below 30 % can be reached, ensuring problem-free storage for the wood chips.

Whether to dry entire trees, or trunks and branches separately, depends largely on the accessibility of the forest and the harvesting methods. Here are a few tips for orientation:

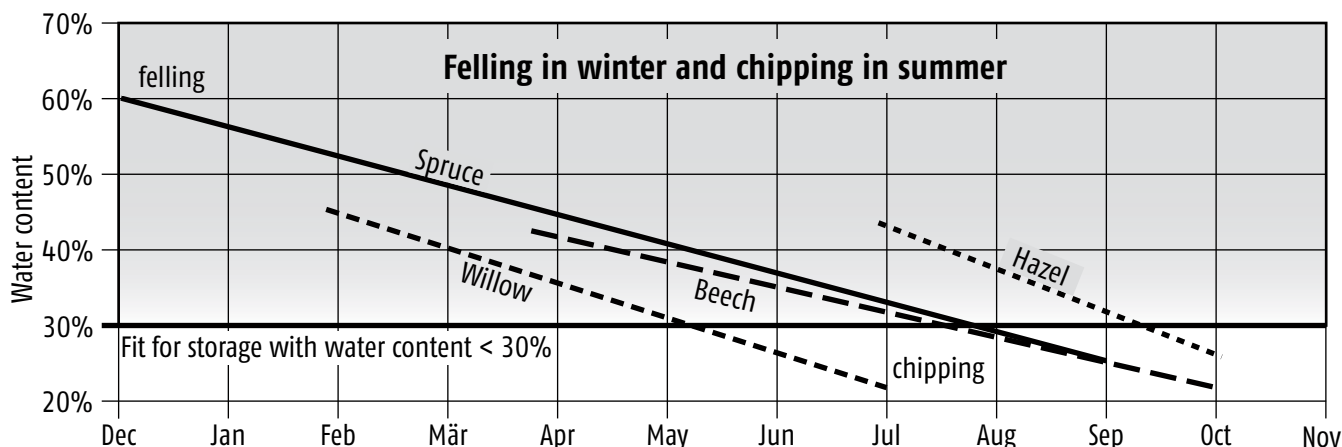
Well-ventilated piles, trunks with bark removed, or entire trees dry faster and better. Sun helps, and wind is indispensable for drying.

Softwood should be felled no later than December and stored at least 50 m from the forest due to the danger of beetles.

If the first regeneration felling is done for softwood in September, the wood will no longer be infested by beetles in the spring. It can be left in the forest without delimiting and chopped as entire trees in summer.

## Leave green branches in the forest as nutrients

Leave green branches and treetops in the forest; as fuel they are only "air and water". As valuable nutrients, they should remain in the forest.



General quality requirements for wood chips	
Criterion	Comments
Dust content	Dust burns poorly and is often a sign of decayed or contaminated wood chips; thus ÖNORM M 7133 "Holzhackgut für energetische Zwecke" (wood chips for energy generation) limits the dust content to 4 %.
Large pieces	Individual thick pieces up to 12 cm long may be present in the fuel. They are cut by the blade in the rotary valve. The majority of the chips should be no longer than 5 cm to ensure that there are no blockages in the fuel conveying system.
Dirt	Soil and sand cause slag formation on the grate and result in more effort spent on cleaning.
Green leaves and needles	A layer of chips from green branches with leaves or needles can cause a blockage in a pile of chips on which rising moisture condenses, resulting in decay and mould.
Metal/stones	Even though the boiler cannot be brought to a stop by nails and small stones, such foreign materials should be avoided in wood chips because they cause increased wear in the fuel conveying system.

Judging wood chip quality when buying in loose cubic metres					
Criterion	Comments			Effect on heating value	
Water content	The lower the water content, the higher the heating value. In addition, under 25 % water content the wood shrinks so a cubic metre of W20 contains approx. 3 % more wood than a cubic metre of W30. Per ÖNORM M 7133, water content is given in percent of total weight (see "Determination of water content" on page 93). <b>Wood chips can be stored without problems up to a water content of 30 %. Above 35 % they begin to mould and decay over longer storage periods, with loss of heating value.</b>			W20 (<20 %)	+6 %
				W30 (20-30 %)	0 %
Storage				W35 (30-35 %)	-2.5 %
				W40 (35-40 %)	-4 %
				W50 (40-50 %)	-7 %
Chip size	The more finely the material is chopped, the more material fits in a cubic metre. Per ÖNORM M 7133, the average length of the pieces in mm is given by the size class (see "Standard size classes" on page 92).			(G20)	+10 %
				G30	0 %
				G50	-16 %
Kind of wood	Hardwood is denser and heavier and thus has a higher heat content per cubic metre.	Hombeam, black locust	+53 %	Pine, larch	+19 %
		Beech	+44 %	Spruce, alder	0 %
		Oak, ash	+40 %	Fir, willow	-6 %
		Birch, maple	+25 %	Poplar	-19 %
Bark content	The lighter in colour the wood chips are, the lower their bark content. Wood chips from small branches or wood chips with bark from sawmills have a high bark content <b>with high ash content and usually also higher dirt content</b> . That results in more effort spent on cleaning.			No bark	+5 %
				10 % bark	0 %
				30 % bark	-10 %
Small branches	Wood chips from small branches usually have a high degree of decay.			From small branches	app. -25 %

Judging wood chip quality when buying by the kilogram					
Criterion	Comments			Effect on heating value	
Water content	The lower the water content, the higher the heating value. Per ÖNORM M 7133, water content is given in percent of total weight (see "Determination of water content" on page 93). <b>Wood chips can be stored without problems up to a water content of 30 %. Above 35 % they begin to mould and decay over longer storage periods, with loss of heating value.</b>			W20 (<20 %)	+12 %
				W30 (20-30 %)	0 %
Storage				W35 (30-35 %)	-12 %
				W40 (35-40 %)	-20 %
				W50 (40-50 %)	-32 %
Chip size	The chip size has no effect on the heating value per kilogram.				
Kind of wood	Heavy hardwood, when dried, has about 5 % less heating value than softwood, and about 6 % less when moist; light hardwood has about 6 % less when dried and 7 % less when moist.			Softwood	0 %
				Hardwood	-5 to -7 %
Bark content	The bark content has little influence on the heating value per kilogram, but high bark content means <b>higher ash content and more effort spent on cleaning</b> .				
Small branches	Wood chips from small branches usually have a high degree of decay.			From small branches	app. -25 %

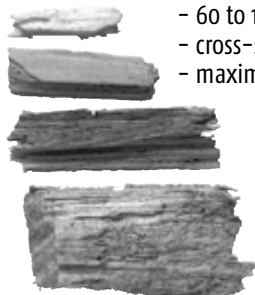
Other fuels	
<b>Pellets</b>	Pellets have a higher fuel density and can only be burned with a flue gas recirculator (available as an accessory). Pellets are always sold by weight. The heating value of hardwood pellets (4.60 kWh/kg) is about 6 % less than that of softwood pellets (4.9 kWh/kg).
<b>Miscanthus</b>	The heating value is the same as for air-dried softwood; best bought by weight. Since its ash has a very low sintering point, a flue gas recirculator (available as an accessory) is required to prevent slag formation. To reduce boiler corrosion, ensure that <b>chlorine-free fertiliser (potassium sulphate</b> instead of potassium chloride) is used. Regardless of whether it is chopped or made into pellets, miscanthus needs a very large combustion chamber, so for size 35/50 a maximum of 35 kW heating output, for size 70/90 a maximum of 63 kW, for size 130 a maximum of 95 kW and for size 200 a maximum of 140 kW can be reached.
<b>Old wood</b>	Wood kept in dry storage loses only the volatile components (about 10 % of the heating value). Wood stored in moist storage decays (cold oxidation process) to the point of total loss of heating value.
<b>Wood shavings</b>	The heating value per cubic metre varies widely and is around 30 to 60 % less than that of G30-W30 wood chips from the same wood. Since wood shavings are usually air-dried (15 to 20 % water content), they are best bought by weight. Wood chips from some kinds of hardwood cause rapid wear on the combustion chamber's refractory lining. With wood shavings, the full rated output of the boiler cannot be reached.
<b>Sawdust</b>	The heating value per loose cubic metre is between 25 and 50 % less than that of G30-W30 wood chips from the same wood. Sawdust is best bought by weight, after determination of its water content. The boiler described here is not suitable for operation with pure sawdust. A drastic reduction of output and higher effort for cleaning must be expected.
<b>Chipboard</b>	Technically, the boiler is suitable for burning chipboard waste with the optional flue gas recirculator if the waste free of formaldehyde, wood preservatives and PVC coatings. However, this is only allowed with an official permit, which is usually only granted on a case-by-case basis to wood-processing facilities.
<b>Demolition wood</b>	Only wood that is free of halogens and wood preservatives may be burned. The fraction of rotten wood is often high, and the heating value low, and it is often contaminated with dust, metal and stones.

	based on Weight		Cubic metres				Loose cubic metres G30 wood chips				Loose cubic metres G50 wood chips			
	Heating value		Round logs 1 m		Cut logs 1 m		Weight		Heating value		Weight		Heating value	
	w=15 %	w=30 %	Heating value	Heating value	Heating value	Heating value	Weight	Weight	Heating value	Heating value	Weight	Weight	Heating value	Heating value
Water content	kWh/kg	kWh/kg	kg/stere	kg/stere	kWh/stere	kWh/stere	kg/lcm	kg/lcm	kWh/lcm	kWh/lcm	kg/lcm	kg/lcm	kWh/lcm	kWh/lcm
Softwood			0.65 m <sup>3</sup> per stere		0.56 m <sup>3</sup> per stere		1 lcm contains 0.40 m <sup>3</sup>				1 stere contains 0.33 m <sup>3</sup>			
Fir	4.40	3.51	<b>1,270</b>	<b>1,170</b>	<b>1,100</b>	<b>1,010</b>	178	205	<b>780</b>	<b>720</b>	148	171	<b>650</b>	<b>600</b>
Spruce	4.49	3.58	<b>1,380</b>	<b>1,260</b>	<b>1,190</b>	<b>1,090</b>	189	218	<b>850</b>	<b>780</b>	157	181	<b>710</b>	<b>650</b>
Douglas fir	4.43	3.53	<b>1,480</b>	<b>1,360</b>	<b>1,280</b>	<b>1,170</b>	206	237	<b>910</b>	<b>840</b>	172	198	<b>760</b>	<b>700</b>
Pine	4.32	3.44	<b>1,630</b>	<b>1,490</b>	<b>1,400</b>	<b>1,290</b>	232	267	<b>1,000</b>	<b>920</b>	193	223	<b>830</b>	<b>770</b>
Larch	4.27	3.39	<b>1,660</b>	<b>1,520</b>	<b>1,430</b>	<b>1,310</b>	239	275	<b>1,020</b>	<b>930</b>	199	229	<b>850</b>	<b>780</b>
Hardwood			0.59 m <sup>3</sup> per stere		0.50 m <sup>3</sup> per stere		1 lcm contains 0.40 m <sup>3</sup>				1 stere contains 0.33 m <sup>3</sup>			
Poplar	3.99	3.16	<b>1,020</b>	<b>930</b>	<b>870</b>	<b>790</b>	174	200	<b>690</b>	<b>630</b>	145	167	<b>580</b>	<b>530</b>
Willow	3.76	2.97	<b>1,200</b>	<b>1,100</b>	<b>1,020</b>	<b>930</b>	217	250	<b>810</b>	<b>740</b>	181	208	<b>680</b>	<b>620</b>
Alder	4.06	3.23	<b>1,270</b>	<b>1,160</b>	<b>1,080</b>	<b>990</b>	212	245	<b>860</b>	<b>790</b>	177	204	<b>720</b>	<b>660</b>
Maple	4.04	3.21	<b>1,550</b>	<b>1,420</b>	<b>1,310</b>	<b>1,200</b>	260	300	<b>1,050</b>	<b>960</b>	217	250	<b>880</b>	<b>800</b>
Birch	4.01	3.18	<b>1,570</b>	<b>1,430</b>	<b>1,330</b>	<b>1,210</b>	265	305	<b>1,060</b>	<b>970</b>	221	254	<b>890</b>	<b>810</b>
Ash	4.10	3.25	<b>1,760</b>	<b>1,610</b>	<b>1,490</b>	<b>1,360</b>	291	335	<b>1,190</b>	<b>1,090</b>	242	279	<b>990</b>	<b>910</b>
Oak	4.10	3.25	<b>1,760</b>	<b>1,610</b>	<b>1,490</b>	<b>1,360</b>	291	335	<b>1,190</b>	<b>1,090</b>	242	279	<b>990</b>	<b>910</b>
Beech	4.13	3.28	<b>1,800</b>	<b>1,640</b>	<b>1,520</b>	<b>1,390</b>	295	340	<b>1,220</b>	<b>1,110</b>	246	283	<b>1,020</b>	<b>930</b>
Hornbeam	4.06	3.23	<b>1,920</b>	<b>1,760</b>	<b>1,630</b>	<b>1,490</b>	321	369	<b>1,300</b>	<b>1,190</b>	267	308	<b>1,090</b>	<b>990</b>
Black locust	4.11	3.27	<b>1,920</b>	<b>1,760</b>	<b>1,630</b>	<b>1,490</b>	317	365	<b>1,300</b>	<b>1,190</b>	264	304	<b>1,090</b>	<b>990</b>

Factors for converting solid cubic metres to loose cubic metres according to A. Höldrich, H. Hartmann, M. Schardt (2006): "Rationelle Scheitholzbereitungsverfahren" (Efficient Methods for Preparing Firewood), Report 11 TFZ Straubing

## G30 wood chips

per ÖNORM M 7133



- 60 to 100 % **main content**
- cross-section between 2.8 and 16 mm
- maximum length (nominal length) 30 mm

- maximum 20 % **fine content**
- cross-section less than 2.8 mm
- of this, maximum 4 % **dust content**
- cross-section below 1 mm

- maximum 20 % **coarse content**
- maximum cross-section 3 cm<sup>2</sup>
- maximum length 85 mm



## G50 wood chips

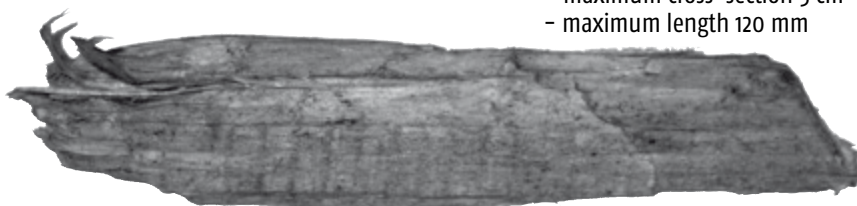
per ÖNORM M 7133



- 60 to 100 % **main content**
- cross-section between 5.6 and 31.5 mm
- maximum length (nominal length) 50 mm

- maximum 20 % **fine content**
- cross-section less than 5.6 mm
- of this, maximum 4 % **dust content**
- cross-section below 1 mm

- maximum 20 % **coarse content**
- maximum cross-section 5 cm<sup>2</sup>
- maximum length 120 mm



Size classes per ÖNORM M 7133					
Total mass 100 %		G 30 fine	G 50 medium	G 100 coarse	
Coarse content 20 % max.	Max. cross-section	cm <sup>2</sup>	3	5	10
	Max. length	mm	85	120	250
	Coarse screen nominal mesh size	mm	16	31.5	63
Main content 60 to 100 %	Medium screen nominal mesh size	mm	2.8	5.6	11.2
Fine content 20 % max.	Fine screen nominal mesh size	mm	1	1	1
Dust contained in fine content, 4 % max.					
Size classes per EN 14961-1					
Total mass 100 %		P31,5	P45	P63	
Coarse content 6 % max.	Max. cross-section	cm <sup>2</sup>	2	5	10
	Max. length	mm	120	120	350
	Coarse screen nominal mesh size	mm	45	63	100
Main content at least 75 %	Medium screen nominal mesh size	mm	31.5	45	63
Fine content 8 % max.	Fine screen nominal mesh size	mm	3.15	3.15	3.15

In the boilers described here, maximum possible is P45 or G50.

Waste wood classes A1 to A4 (Germany)	
<b>A1</b>	Untreated wood without foreign substances. May be burned without restrictions.
When A1 waste wood is on offer, it may be rotten wood with no heating value; only buy waste wood by weight and with limited water content (20 or at most 30 %).	
<b>A2</b>	laminated, painted, coated Waste wood without halogens or wood preservatives. May be burned in wood-processing facilities (in Germany from 50 kW as fuel Kl.7 (class 7) according to BImSchV, emission control regulations)
<b>A3</b>	Waste wood with organohalogen compounds in the coating without wood preservatives. May be burned in wood-processing facilities with suitable and approved boilers.
<b>A4</b>	Waste wood treated with wood preservatives. May only be incinerated in properly equipped hazardous waste disposal plants.

### Price correction depending on water content

To trade wood chips by weight, corrections depending on water content are needed.

Typically, agreement is reached on a base price for water content of 20 or 30 %. For an individual delivery, the kilogram price is corrected based on the measured water content, with percentage reductions for higher water content and percentage increases for lower water content.

Softwood			Water content in % of total mass	Hardwood		
Increase/decrease for base water content of 30 %	Increase/decrease for base water content of 20 %	Heating value in kWh/kg		Heating value in kWh/kg	Increase/decrease for base water content of 30 %	Increase/decrease for base water content of 20 %
-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 %
<b>0.0 %</b>	<b>-14.6 %</b>	<b>3.49</b>	<b>30 %</b>	<b>3.30</b>	<b>0.0 %</b>	<b>-14.7 %</b>
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 %	<b>0.0 %</b>	<b>4.09</b>	<b>20 %</b>	<b>3.86</b>	17.2 %	<b>0.0 %</b>
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 %

### Using an oven for determination of water content

A kilogram of wood chips is spread out on a baking sheet and dried in an oven for 6 to 12 hours at 101 to 104 °C. To be certain of a temperature over 100 °C in a typical electric oven in spite of the inexact thermostat, you can set it to 110 °C, but no higher as the wood will begin outgassing even at slightly higher temperatures. Fine and very moist pieces will need to be turned a few times. The difference in weight between the moist test material and the dry material corresponds to the water content.

Longer interim storage of samples can falsify their water content.

### Take samples after transport

A pile of wood chips has 10 to 30 % more water content in the upper layers than in the middle. The material is mixed by the loading and unloading process during transport. By taking about a litre from 5 different places at a depth of at least 20 cm (never from the surface) in each load, you can get a good average with low error.

### Taking the test quantity from the total sample

From several transports, you will get more than 1 kg of test material. To get a smaller quantity, mix the material by rebuilding the pile, always emptying the shovel over the top of the pile so that the material is distributed over its entire surface. Then flatten the pile and remove the two opposing quarters from it. Repeat the mixing and extracting until you have two batches of test material of 1 kg each, 1 kg for the buyer, who usually determines the water content in the oven, and 1 kg for the seller as a control sample. The volume for one kilogram is around 3 litres for wet, heavy wood chips and as much as 5 litres for very dry and light material.

### Water content and moisture

Water content has become the established measurement for wood that is used for generating energy; in the lumber business, the wood's moisture is usually given.

$$\text{Water content [ \% ]} = \frac{\text{water in wood [kg]}}{\text{total mass of wood [kg]}} \times 100$$

$$\text{Water content [ \% ]} = \frac{0.25 \text{ kg}}{1.0 \text{ kg}} \times 100 = 25 \%$$

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

$$\text{Moisture [ \% ]} = \frac{0.25 \text{ kg}}{0.75 \text{ kg}} \times 100 = 33.3 \%$$

### Converting moisture to water content

$$\text{Water content [ \% ]} = \frac{\text{moisture [ \% ]}}{100 \% + \text{moisture [ \% ]}} \times 100$$

# Service and maintenance records

## Keep records for service, maintenance or repairs

We recommend that you keep records about all service and maintenance work, as well as malfunctions. These records can be entered in the following pages.

Then you and our customer service will always have an overview of the work performed on the system.

Date Performed by	<b>Service / maintenance / cleaning</b> Work performed / parts replaced

## Service and maintenance records

Date Performed by	<b>Service / maintenance / cleaning</b> Work performed / parts replaced

# ATTENTION!

**Floor agiator must operate during filling, see user manual!**

**Switch main power supply to OFF for maintenance work!**

**Entering the fuel deposit is prohibited!**

**Area unsafe for children!**

