Operating instructions

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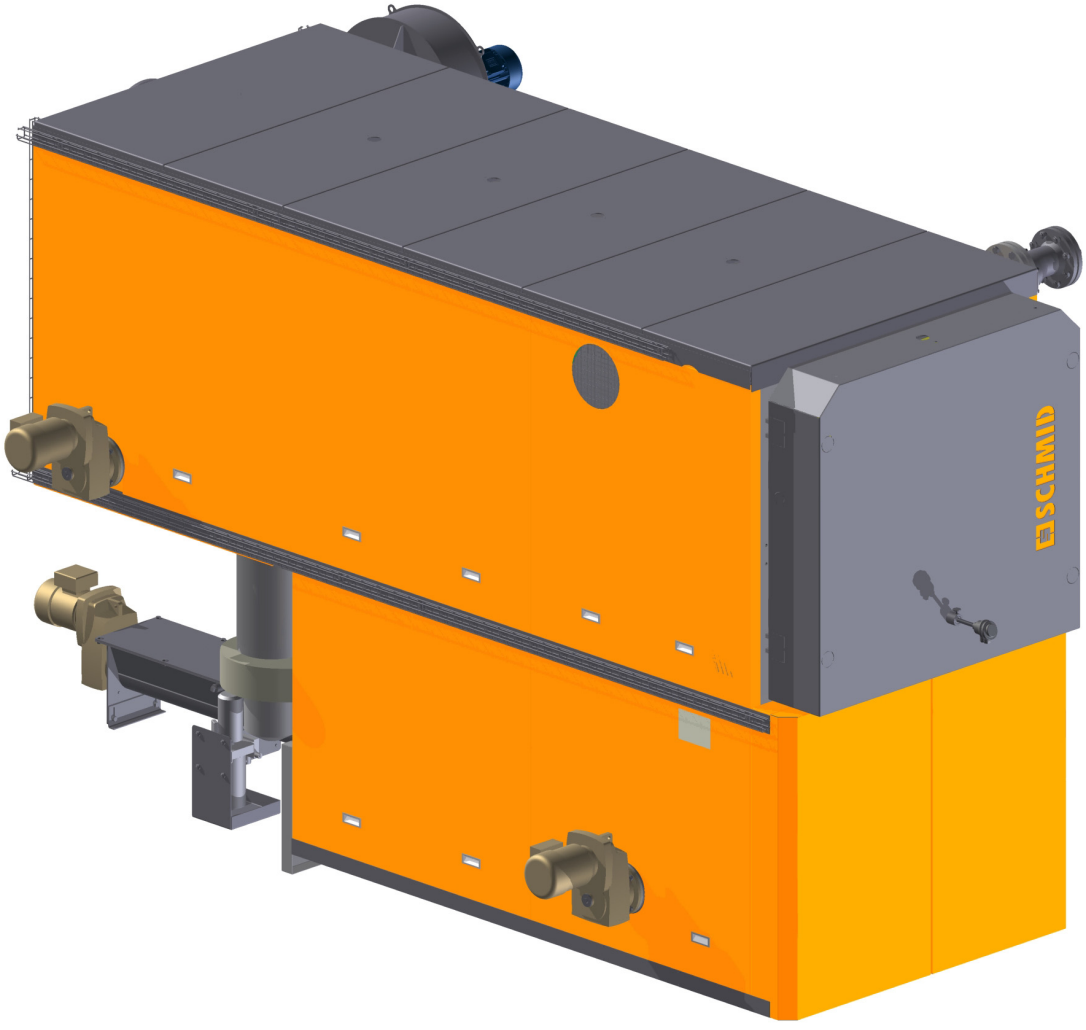
Underfeed grate UTSK

Series, Type:	UTSK-
Fabrication number:	See nameplate
System name:	
Year of manufacture:	2022



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1 Safety instructions

1.1 Intended use

The underfeed combustion system is only provided for combustion of the contractually specified fuels as bulk materials. This is clearly stated in the order confirmation of Schmid AG energy solutions and in the project design. Any other use, or the use of any other fuels is considered contrary to the intended use. The manufacturer is not liable for any damage resulting from such use. The user alone bears the risk of such unintended use.

1.1.1 Fuel

The fuel specifications are defined during system project design. It is recommended to operate the combustion system with fuel of the quality listed in section 2.8.4.

The defined fuels according to the order confirmation and project design must be complied with.

The introduction of any foreign objects, such as stones, nails, soil, and metal objects may result in severe damage to the transport assemblies and combustion system.

Never under any circumstances exceed the specified moisture content of the fuel. Excessive moisture content will result in improper combustion. If moisture content is too high, the combustion temperature will not reach the proper level, causing excessive flue gas emissions. There is also a risk that the combustion system will become over-filled, smothering combustion.

Failure to adhere to these guidelines voids the warranty on system parts, mechanics and emissions.

The system is not intended for combustion of any fuel other than virgin wood or residual wood from the wood processing industry. Other fuels, such as waste wood, contaminated wood waste, etc. do not conform to the intended use of the system and can result in damage to the system, such as corrosion, mechanical defects, and environmental damage (e.g. emissions of heavy metals).

Special fuels must be coordinated with Schmid AG energy solutions. Furthermore, the system must always be operated in conformity with applicable air quality laws.

1.1.2 Combustion grate and boiler

The values specified on the nameplate must be adhered to.

Failure to adhere to these specifications voids the warranty on system parts, mechanics and guaranteed emissions.

Also refer to «2.8.4 Planning values» of the UTSK series.

This applies to the following values in particular:

- Nominal heat capacity (kW)
- Heat capacity range (kW)
- Permissible operating pressure (bar)
- Maximum permissible operating temperature (°C)

To prevent corrosion damage on the boiler resulting from condensation, the minimum return line temperature in the boiler (boiler admission temperature) must be maintained. The system must be operated in conjunction with a return temperature controller.

1.2 Reasonably foreseeable misuse

Any use not in conformity with the specified "intended use" or any use beyond such use shall be considered a violation of the intended use of the system and is prohibited. Any other use must be coordinated with the manufacturer.

Modifications and changes:

Any modifications or changes to the machinery undertaken independently shall void the liability and warranty of the manufacturer.

Spare parts, wear parts and auxiliary materials:

Use of spare parts or wear parts from other manufacturers can involve risk. Use only original or manufacturer-approved parts.

1.3 Residual risks

The machine is built to the state of the art and in conformity with recognized safety standards. The following residual risks exist and should be kept in mind when operating the machinery. Residual risks associated with specific phases of the service life of the system are detailed in the corresponding chapters of these instructions.

The system may only be operated in good condition.

⚠ DANGER!

When working on live electrical parts, there is the risk of death, serious injury and damage to equipment.

Switch off the machinery/system in the event of a fault in the power supply.

If work is necessary on voltage-carrying parts, the system must be disconnected from the mains with the master switch. The master switch must be secured against accidental activation (e.g. with a personal padlock).

Only professional electricians should perform work on electrical systems and operating media.

Never remove any covers. The door of the control cabinet must be kept closed at all times.

⚠ WARNING!

High flue gas concentrations in the air can result in unconsciousness and the risk of suffocation.

Take the following precautions before working on the flue gas system:

Ensure that the combustion system has been stopped and that no flue gases are coming from the combustion system.

Ensure that the flue gas system has cooled down.

Ensure adequate ventilation.

Ensure that the combustion system is secured against unauthorised operation.

Operation without a connection to the flue gas pipes is prohibited.

Always close cleaning openings after cleaning.

⚠ WARNING!

There is a risk of falling when climbing on the system. Never climb on the system.

Do not use system parts for climbing. Wear fall-protection equipment during maintenance work at high elevations.

During work at heights of more than 1.8 m (6'), use safe climbing equipment or work platforms.

⚠ DANGER!

Risk of explosion (deflagration)!

Risk of flame exposure when opening the combustion chamber door!

In the event of faulty pre-ventilation or incomplete combustion, an explosive atmosphere can occur in the combustion chamber due to the formation of carbon monoxide (CO). This can ignite when the burner is repeatedly started, when the combustion chamber or maintenance doors are opened and cause deflagration. This can result in death, serious injury or damage to equipment.

Before lighting the fuel, close all maintenance doors. Lighting may only be performed manually through the combustion chamber door.

Never open the combustion chamber door after lighting the fuel or during the automatic lighting procedure.

It is prohibited to open the combustion chamber door during start-up and operation as well as after shutdown for faster cooling.

The combustion chamber door and the maintenance doors may only be reopened after pre-ventilation, especially after a power failure.

It is prohibited to bridge safety switches.

⚠ WARNING!

Obstruction of the respiratory tracts by dust!

Dust, ash and fly ash from the multi-cyclone or electrostatic precipitator can negatively affect breathing.

In the event of high dust concentrations (especially from the ash from the multi-cyclone or electrostatic precipitator), respiratory protection of class P3 or FFP3 must be worn. Caution! Respirator masks for fine dust do not provide protection against hazardous or suffocating gases and vapours.

⚠ WARNING!

Danger from heat and hot surfaces!

The combustion chamber, combustion chamber and maintenance doors, fuel supply and flue gas pipes can be hot.

Do not touch during operation. Wear gloves and protective gear.

1.3.1 Danger when entering the combustion chamber.

⚠ WARNING!

Risk of injury when entering the combustion chamber. Always secure the combustion chamber door.

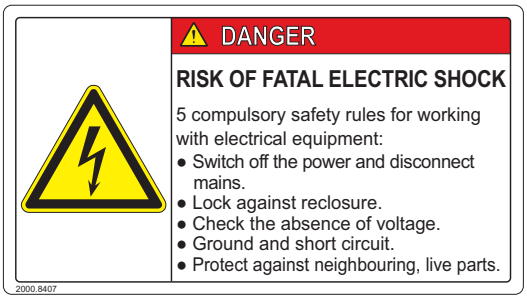
Before entering the combustion chamber always secure the combustion chamber door with the personal padlock.

⚠ WARNING!

Risk of injury due to rotating parts.

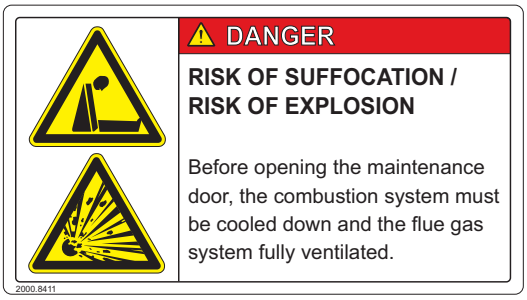
Before entering the combustion chamber, switch off the grate de-ashing screw on the maintenance switch and secure with the personal padlock to prevent reactivation.

1.4 Warning signs



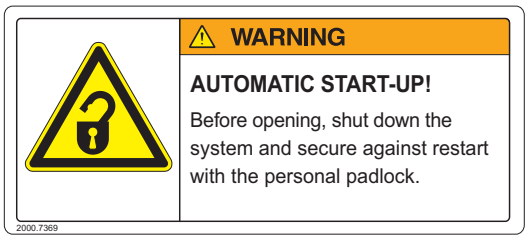
Sign below the main switch of the electrical circuit cabinet

- 5 safety regulations must be complied with when working on the electrical system.



Sign next to the maintenance openings in the flue gas path

- Before opening, the combustion system must have cooled and the flue gas path must be sufficiently purged.

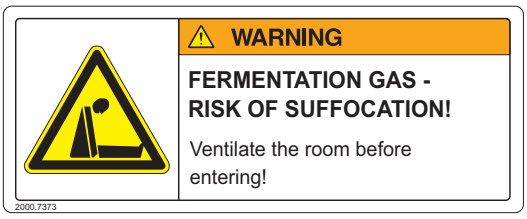


Sign next to service openings

- Before opening, shut down the system and secure with the personal padlock.

Sign next to combustion chamber door

- Do not open during start-lighting procedure



Sign next to access door to fuel storage room

- Caution fermentation gas choking hazard
- Lights red / green (permanent) for access control
- Coupled with the light (the fan switches on automatically when the light is switched on)

Sign next to the hot maintenance openings

- Do not open during operation

Designates a maintenance zone. This should never be blocked by installations such as electrical cables or water pipes etc.

Designates the position of a covered maintenance opening. This should never be blocked by installations such as electrical cables or water pipes etc.

Missing or unreadable pictograms must be replaced.

1.5 Emergency shut down

The movement of the wood combustion system can be stopped at any time by activating the emergency stop button.

Opening the combustion chamber door or the boiler door stops the movement of the system. Exception: the flue gas fan and combustion air fan continue to run.

Removal of the ash container stops the movement of all of the ash removal components.

The emergency cut-off does not immediately stop the combustion process in the combustion system. The fire continues to burn for a long time (Read chapter«1.3 Residual risks»).

1.6 Environmental impact

When operated properly, this wood combustion system fulfils the requirements of the Swiss air quality act LRV 92 and Germany's Federal Emissions Act (BImSchG).

Wood fuel is carbon neutral and there are no risks associated with its transport and storage, apart from the development of fermentation gases in storage. The use of wood fuel, therefore, makes sense from an ecological perspective and protects the environment.

The operator must arrange for the disposal of ash through the responsible authorities.

1.7 Ambient conditions

⚠ DANGER!

Flue gas inhalation hazard!

Lack of air in the boiler room can result in unconsciousness and severe injury to the central nervous system.

In the heating room the conditions given in Sections «1.7.1 Combustion air supply to the heating room» and «1.7.2 Ambient temperature in the heating room» must be complied with.

1.7.1 Combustion air supply to the heating room

Depending on the desired capacity, a certain air flow rate is necessary for wood combustion (combustion air).

The size of the openings is determined during planning in accordance with the valid local directives (e.g. VKF Directive).

Calculation of the combustion air opening in compliance with VKF:

10.3 x boiler capacity (kW) = free cross-section in cm2

Should forced ventilation (electronically controlled mechanical flaps/fans) be used for the supply of combustion air, it must be ensured at all times that the required combustion air is available during operation of the system. The valid standards, directives and regulations such as VKF etc. must be complied with. In addition, it must be ensured when the boiler has been switched off that combustion air flows into the heating room for at least 5 hours (systems up to 250 kW) or 10 hours (systems above 250 kW). There should never be any overpressure (max. +5 Pa in relation to the ambient air pressure) or underpressure (max. -5 Pa in relation to the ambient air pressure) in the heating room.

Never cover or close the air supply vents in the boiler room under any circumstances. Doing so will cause the combustion system to operate with an inadequate supply of air.

1.7.2 Ambient temperature in the heating room

The ambient temperature in the heating room of +10°C to max. +35°C must be complied with.

1.7.3 Installing the combustion system

With regard to the design of the heating room, the respective local building regulations, the applicable standards and fire regulations as well as the fire protection regulations are decisive. It is not permitted to place the combustion system on a wooden floor or combustible surface. Observe the respective regulations regarding fire protection as well as the valid regulations on accident protection and accident prevention. Ensure sufficient lighting at the installation site.

1.8 Safety and monitoring systems

The detailed description of the error messages is given in Register "C User manual, Control unit", section "11 Events".

1.8.1 Overview

(In compliance with EN 303-5:2012)

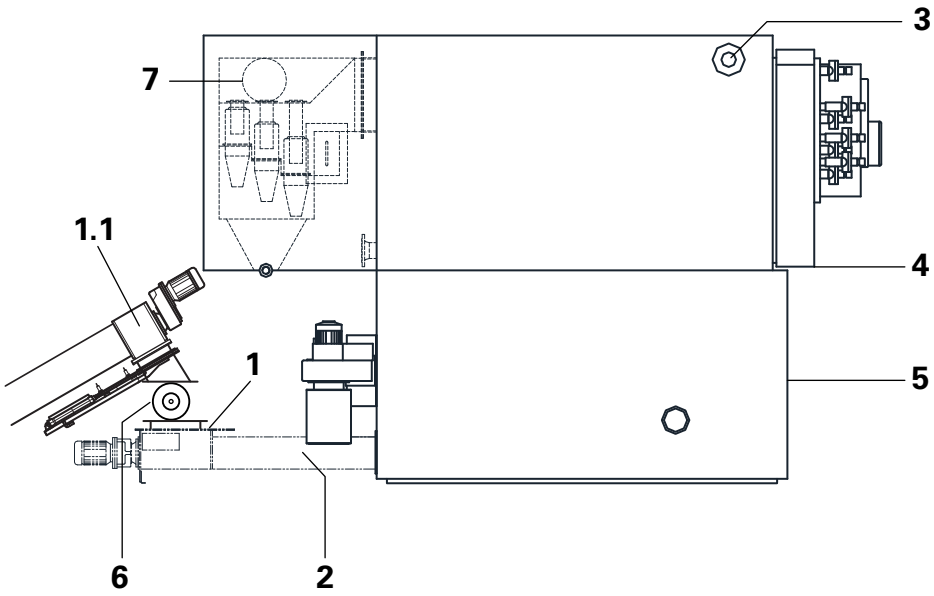


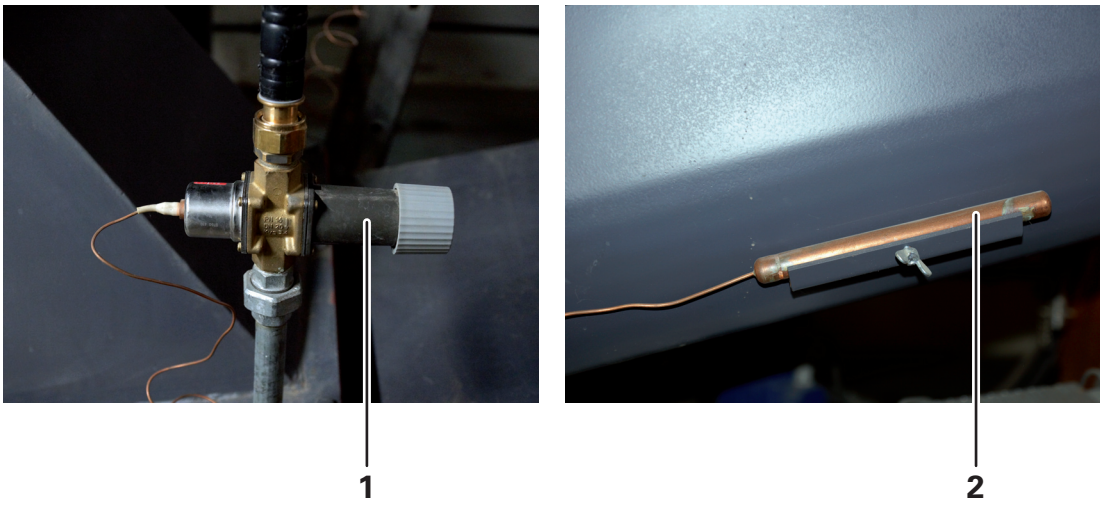
Fig. 1 Safety and monitoring systems

Item	Description	Function
1	Back fire thermostat (1 with rotary valve, 1.1 with back fire protection slide)	In the event of a backfire, switches off the combustion system and generates an alarm.
2	Thermal extinguishing water valve with sensor (optional)	Turns on extinguishing water supply in the event of a backfire in the stoker screw.
3	Safety thermostat	Switches off the combustion system in the event of excess temperature and generates an alarm.
4	Limit switch, boiler door	Switches off the combustion system if the boiler door is opened and generates an alarm.
5	Limit switch, grate door	Only allows the grate door to be opened when the “Open combustion chamber door” button is pressed.
6	Rotary valve or back fire protection slide	Separates the fuel supply from the combustion chamber.
7	O_2 sensor (lambda sensor)	Measures the oxygen content in the flue gas, installation in the flue gas connection or the flue gas fan

Annual function checks must be carried out on the back fire thermostat, the thermal extinguishing water valve, the safety temperature limiter, the O_2 sensor as well as on the rotary valve. This inspection work may only be carried out by service personnel of Schmid AG energy solutions.

1.8.2 Thermal extinguishing water valve

The sprinkler connection is equipped with a thermal valve with sensor (electrically decoupled) and installed directly on the stoker. If the temperature in the stoker exceeds 65°C, the extinguishing water valve automatically opens and the back fire is extinguished. The extinguishing water valve closes automatically once the temperature drops.



Item	Designation
1	Thermal valve
2	Contact sensor

Minimum water pressure	3 bar
Minimum water supply line	½"

A water supply must be ensured at all times. If a stop cock is installed, it must always be open. If necessary, the hand cock on the shut-off valve should be removed to prevent anybody from interrupting the water supply.

A drinking water separator must be installed in the extinguishing water supply in compliance with specific national regulations.

An annual functional check must be carried out on the thermal extinguishing water valve. This inspection work may only be carried out by service personnel of Schmid AG energy solutions.

1.8.3 O_2 sensor (lambda sensor)

The O_2 sensor is a sensor that measures the residual oxygen content in the flue gas. The signal of the O_2 sensor can affect the combustion air or the fuel quantity.

The O_2 sensor must be removed before cleaning the flue gas connection or the flue gas fan.

⚠ WARNING!

Risk of burns, the O_2 sensor is hot.

Before removal check the temperature of the O2 sensors, always wear gloves during work.

Clean with a soft cloth or blow off with compressed air. When blowing off maintain a distance of 20cm to prevent damage to the sensor.

1.8.4 Emergency stop button and maintenance switch for drive motors

Position emergency stop buttons:
The customer can provide emergency stop buttons on the access doors and escape routes to the heating room that can be integrated into the control cabinet front. Actuating the emergency stop button stops the system controlled by Schmid AG energy solutions.

Position of the maintenance switches to the electrical drive motors:
Immediately near the corresponding gear motors. When carrying out maintenance work on the drive motor or the corresponding display element, actuate the maintenance switch and secure against unauthorised activation.

Operation of the system with defective technical safety control devices is prohibited. The device status must be checked daily and the function of the devices must be checked every six months. Defective devices must be replaced and not bridged.

1.9 Operator workstations

Access to the system must be possible on all sides for the following tasks:

- General operation
- Fire monitoring
- Flue gas duct cleaning and flue gas recovery
- Cleaning of the combustion chamber
- Maintenance work in the area of the fuel and air intake areas
- Disposal of ash
- Clearance area of the boiler door

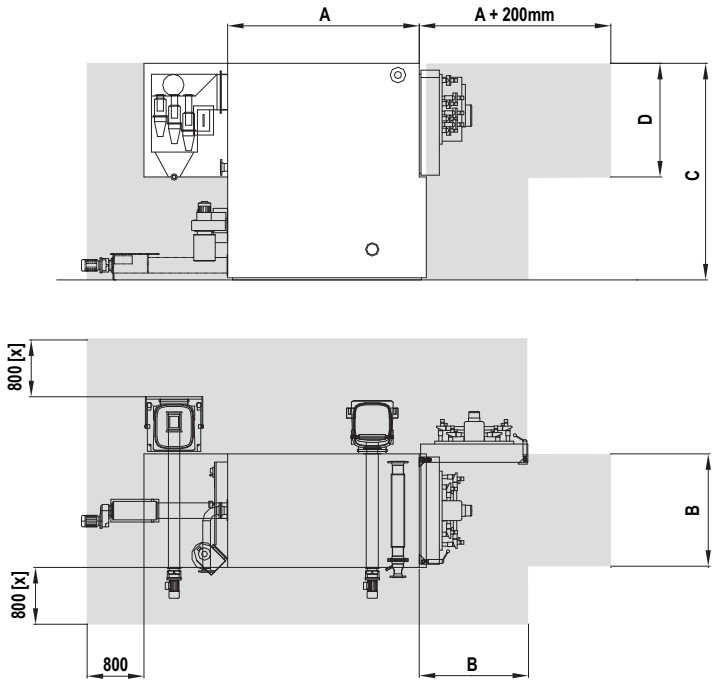


Fig. 2 Workstation

(x): This work area can be reduced after consultation.

Capacity (kW), in compliance with EN 303-5	A (mm)	D (mm)	B (mm)	C (mm)
180	1600	1200	1150	2300
240	1600	1200	1150	2300
300	1800	1250	1250	2350
360	1800	1250	1250	2350
450	2300	1300	1440	2550
500	2300	1300	1440	2550
550	2300	1300	1440	2550
700	2700	1600	1600	3100
900	2700	1600	1600	3100

2 Description UTSK

2.1 Introduction

This automatic underfeed combustion system is designed for the economical and low-emission combustion of forest woodchips. The energy released by combustion is used thermally.

Depending on the heat requirements, the combustion system adjusts its capacity within a range of 30 to 100 percent. Depending on the required capacity, the air and fuel quantities are adjusted automatically. The fuel quantity is controlled depending on the combustion temperature by varying the running time of the dosing screw. The stoker screw transports the dosed fuel onto the combustion retort. A rotary valve is installed upstream from the stoker to protect it against backfire. In addition an extinguishing water supply is connected with a non-electrical, thermostatically actuated valve and a thermostat with an electrical switching contact on the stoker inlet.

The fuel supplied with the stoker screw runs through the necessary phases required for optimum combustion - drying, gasification (pyrolysis), combustion (oxidation) as well as the charcoal burnout in the combustion tray and the combustion chamber. In order to control this process, the system has two different air supply zones. The primary air zone below the grate for drying, gasification and burnout as well as the secondary air zone in the combustion chamber for combustion of the gases. The combustion process is monitored by the two air flow measurements in the primary and secondary air ducts, the combustion temperature as well as the lambda/excess air measurement. The arrangement of the air-cooled cast ribs in the combustion tray guarantees regular combustion to prevent swirling of solid particles. The secondary air injection is effected from three sides, offset by 90° in the upper part of the combustion chamber to achieve optimum mixture of the wood gases with the combustion air and therefore full burnout with low CO values. This construction complies with the low NOx process with air stages. The combustion chamber is lined with fireproof concrete on the combustion chamber side, on the one hand to protect the steel construction, on the other for storing the temperature required for optimum combustion. The radiation ceiling comprises shaped stones and serves to efficiently dry the fuel and protect the flame tube of the boiler. The combustion chamber is air cooled to minimise the radiation losses, protect personnel and prevent physical contact; the entire combustion system is insulated with 100 mm insulation mats and clad with a powder-coated metal sheet. At the same time air cooling serves to pre-heat the secondary combustion air.

The heat energy in the hot flue gas is transferred to the water in the downstream boiler. The colder return line of the heating system is routed at the lower end of the boiler. The warm supply is discharged at the top side. To boost the efficiency, turbulators made of stainless metal sheets are inserted into the boiler tube passes. The boiler is positioned directly on the combustion chamber and insulated with rockwool mats. If the heat discharge fails, the boiler is cooled by a heat exchanger coil supplied with mains water. The mains water is supplied with a non-electrically powered, thermostatically actuated valve.

The solids formed during combustion flow with the hot flue gas through the boiler. Afterwards the particles are separated in a multi-cyclone that runs in accordance with the centrifugal force principle. The multi-cyclone is mounted compactly on the boiler and also insulated as a unit with the combustion grate / boiler and integrated into the sheet metal cladding.

To lower dust emissions even further, the gases can be additionally cleaned by a downstream filter system. The flue gas fan is installed in accordance with the filter type on the inlet or outlet side of the filter.

The flue gas fan draws off the combustion gases through the boiler and the multicyclone and transfers these to the flue gas pipe that leads to the stack. An underpressure measurement system combined with an electronic control unit regulates the speed of the fan to ensure the underpressure required in the combustion chamber.

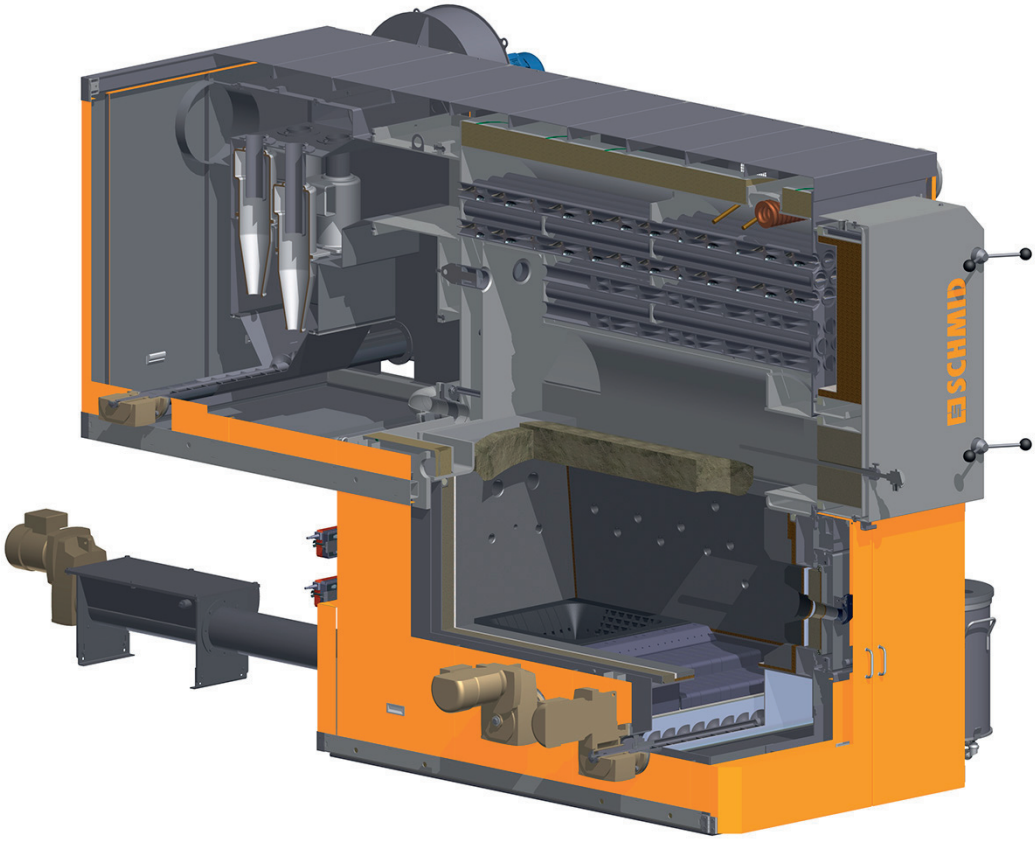


Fig. 3 Cross-section of the underfeed combustion system

2.2 Heat storage

The locally applicable regulations for the design of the heat storage system for automatic wood boilers must be observed.

In Switzerland, according to the Swiss Ordinance on Air Pollution Control (LRV) Annex 3, Section 523, automatic wood boilers with a nominal heat capacity of up to 500 kW must be equipped with a heat storage tank with a volume of at least 25 litres per kW of the nominal heat capacity.

Schmid AG generally recommends installing a minimum heat storage volume of 30 litres per kW of the nominal heat capacity of the largest boiler, regardless of the boiler size.

2.3 Description of functions

To ensure optimal combustion, the fuel, which is dosed with the stoker screw, undergoes the necessary phases:

- Drying
- Gasification (pyrolysis)
- Combustion (oxidation)
- Charcoal burnout

In order to control this process, the system has two different air supply zones.

- Primary air zone under the grate for drying and gasification
- Secondary air zone in the combustion chamber for burnout of the gases

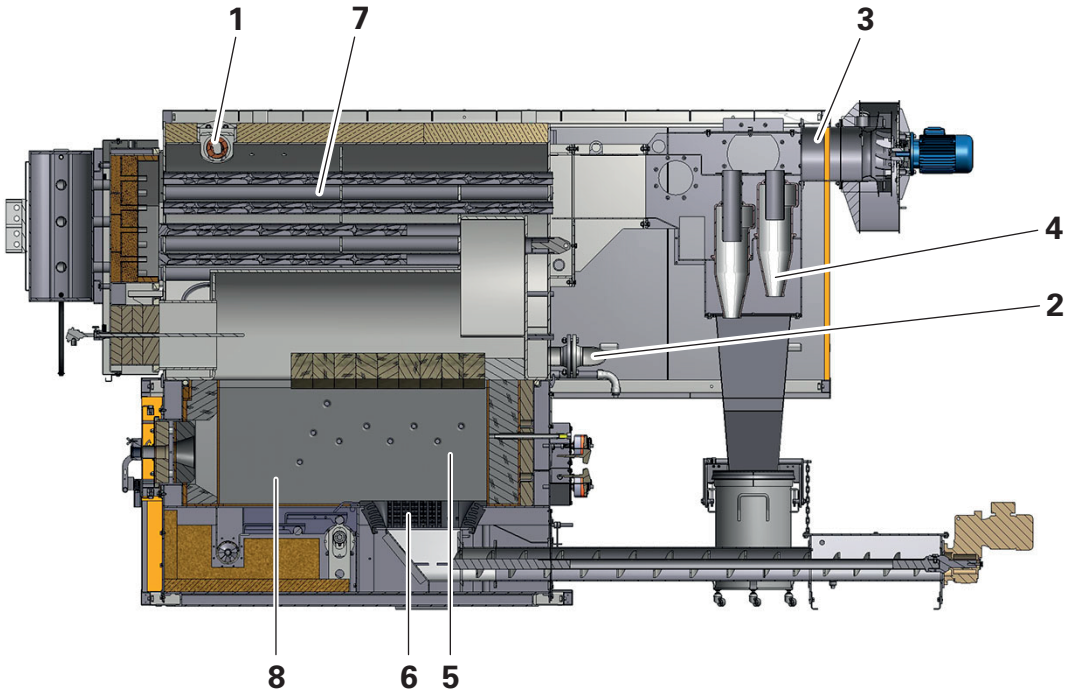


Fig. 4 Basic construction

Item	Designation
1	Supply line
2	Return line
3	Flue gas connection (for flue gas fan)
4	Flue gas dedusting
5	Secondary air
6	Primary air
7	Hot water boiler with boiler tube passes
8	Combustion chamber

The following measurements control the combustion process:

- Primary air quantity
- Secondary air quantity
- Combustion temperature
- Excess air measurement (Lambda)
- Underpressure in the combustion chamber

The combustion grate is filled with refractory concrete.

- To protect the steel structure
- As thermal insulation

The combustion grate is insulated with 100 mm insulation mats covered by a sheet-metal cladding in order to minimise radiation losses and as burn protection.

Hot water boiler

The hot flue gases from the combustion chamber heat the water in the boiler by means of the boiler tube passes. The return line from the consumer runs underneath the unit. The energy generated in the boiler system is distributed to the heating system from above.

Stainless steel turbulators can be installed in the boiler tubes. They improve heat transfer, thereby lowering the flue gas temperature to approximately 50°C. This improves efficiency by about 3%.

The boiler is installed directly on the combustion system and equipped with the same insulation and cladding. This reduces radiation losses.

Flue gas dedusting

Combustion of solids produces fly ash which is released in the hot flue gas.

The fly ash is normally separated out of the gas via multi-cyclones (centrifugal principle). The result is a flue-gas reference value of less than 150 mg/Nm3 following separation.

The multi-cyclone is attached to the boiler and is also insulated and equipped with sheet metal cladding together with the combustion grate/boiler.

Flue gas fan

The flue gas fan is especially designed for the respective system in accordance with the order confirmation and the project planning documents. Additional information is given in the separate instruction manual.

The flue gas fan extracts combustion gases through the boiler and the multi-cyclone and conveys the gases to the flue gas pipe and then the stack.

Fine particle filter

A fine particulate filter can be optionally integrated into the system. Additional information is given in the separate instruction manual.

The flue gas is further purified through a fine particle filter. If the filter is operated with underpressure, it is installed upstream of the flue gas fan.

Mechanical de-ashing system

The semi-automatic de-ashing feature is especially designed for the respective system in accordance with the order confirmation and the project planning documents. Additional information is given in the separate instruction manual.

The residues of combustion such as grate and fly ash as well as fuel contaminants are automatically discharged with screws out of the combustion system and the multicyclone. The ash is routed into a container of 50, 240 or 800 litres.

2.4 Structure of the wood combustion system

The automatic wood combustion system consists of the following system components:

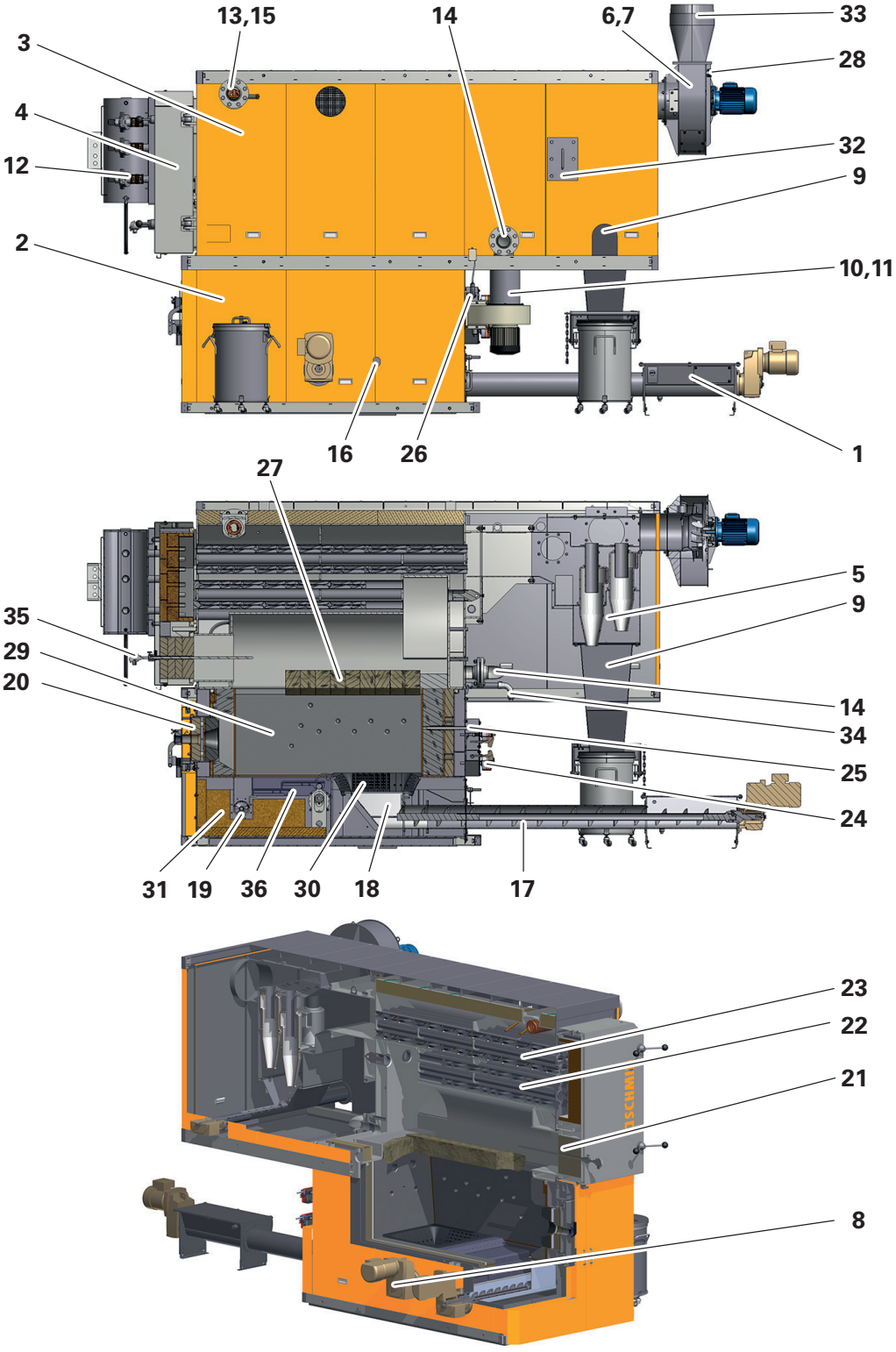


Fig. 5 Structure of the wood chip combustion system

Item	Designation	Description / Comments
1	Fuel transport, inlet	Inlet for fuel, e.g. via stoker screw
2	Combustion grate	Consists of a vault, refractory lining, and a combustion retort
3	Hot water boiler	Heats the hot water
4	Boiler door	Access to the hot water boiler
5	Flue gas dedusting (cyclone separator)	Usually by means of a multi-cyclone
6	Location of the flue gas fan	The flue gas fan may also be located downstream of a dedusting unit (electrical, cartridge filter, etc.).
7	Flue gas pipe/stack	Possible location: right or left side, rear
8	Grate de-ashing	Possible location: right or left side
9	Ash separation and removal system	Possible location: right or left side
10	Combustion air fan	Fresh air intake for combustion
11	Supply air tube	Air intake behind the boiler cladding
12	Automatic boiler cleaning (optional)	Cleans the boiler tubes with compressed air
13	Supply line	Possible location: right or left side
14	Return line	Possible location: right or left side
15	Thermal process safeguard TAS	Possible locations: right or left side (independent of supply line)
16	Automatic ignition (optional)	Mounted on the side of the combustion system
17	Stoker pipe	
18	Combustion retort	
19	Ash trough, grate de-ashing screw	Catches ash and conveys it to the de-ashing unit
20	Combustion chamber door	Access to burnout zone
21	Cleaning opening	1. pass
22	Boiler tubes	2. pass
23	Boiler tubes	3. pass
24	Supply air duct	Primary air
25	Supply air duct	Secondary air
26	Connection for underpressure measurement	Measures the pressure in the combustion chamber
27	Vault	Refractory lining of the combustion chamber
28	O_2 sensor (lambda sensor)	Measures the oxygen content in the flue gas, installation in the flue gas connection or the flue gas fan
29	Combustion chamber	Refractory lining of the burn-off zone
30	Grate bars	
31	Lower grate	Collects residual ash
32	Cleaning opening, cyclone separator	
33	Outlet flue gas fan	Connection flue gas pipe
34	Boiler drain KE	
35	Combustion temperature sensor	Measures the temperature in the combustion chamber
36	Burnout grate	Burnout zone / de-ashing

2.4.1 Automatic boiler tube cleaning (optional)

The thermally insulated boiler door swings out fully to enable proper cleaning of all boiler passes. A powerful blast of pressurised air cleans the inside of the boiler tubes. The air rapidly cleans loose ash particles sticking to the inside of the tubes. The dense blast of air is created through the use of special valves with extremely high air throughput in a short opening time. This cleaning principle ensures that the tubes remain clean, reducing cleaning work and keeping flue gas temperature down. The result is an improved boiler efficiency.

- Quick-closing valves installed in boiler door
- Compressed air tank directly in front of the valves, with pressure switch and safety valve
- Automatic valve control with adjustable cleaning interval

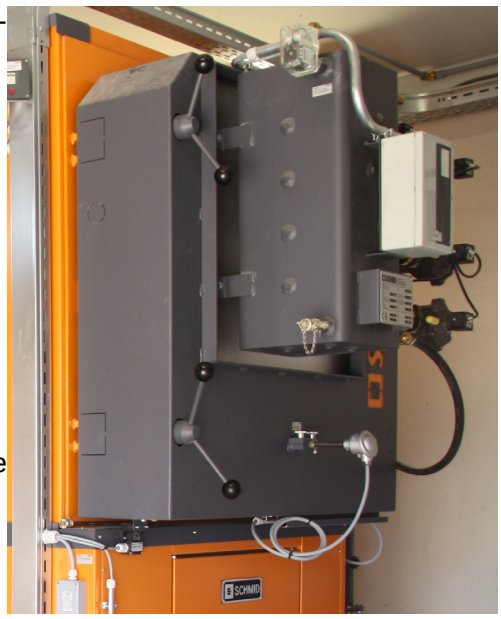


Fig. 6 Automatic boiler tube cleaning unit

Before carrying out any maintenance work on the automatic boiler tube cleaning system, the compressed air tank of the cleaning system must be disconnected from the air supply (e.g. by closing the ball tap or releasing the quick-action coupling on the compressor). The compressed air tank of the cleaning system must then be vented by opening the drain valve. During maintenance work the drain valve must remain open. When opening the combustion chamber or boiler door, activation of boiler tube cleaning is blocked by opening of the door limit switch. The safety valve must be serviced or replaced in accordance with specific national regulations. When carrying out maintenance work wear the protective gear.

2.4.2 Automatic ignition (optional)

Automatic ignition is performed with an industrial hot air blower installed on the side of the combustion system. The fuel is ignited automatically directly in the combustion chamber. The automatic ignition consists of:

- Electrical hot air blower
- A console with mounting bracket
- An ignition tube from the blower to the combustion retort made of fire-proof steel
- Electrical control unit for the lighting procedure

Fig. 7 Automatic ignition unit

2.4.3 Temperature safety valve

The thermal process safeguard is designed for discharging the boiler idle capacity, e.g. in the event of failure of the boiler pump or a power failure. In the event of excess temperatures the thermostatic valve opens automatically and cools the boiler.

Discharge must be effected through a heat-resistant pipe.

The heat exchanger should never be used as a water heater.

Maximum cold water admission temperature	15 °C
Hot water flow temperature	50-80 °C (when starting the cooling process 103°C)
Min. cold water pressure	4 bar
Valve connection	3/4"
Activation temperature	103 °C

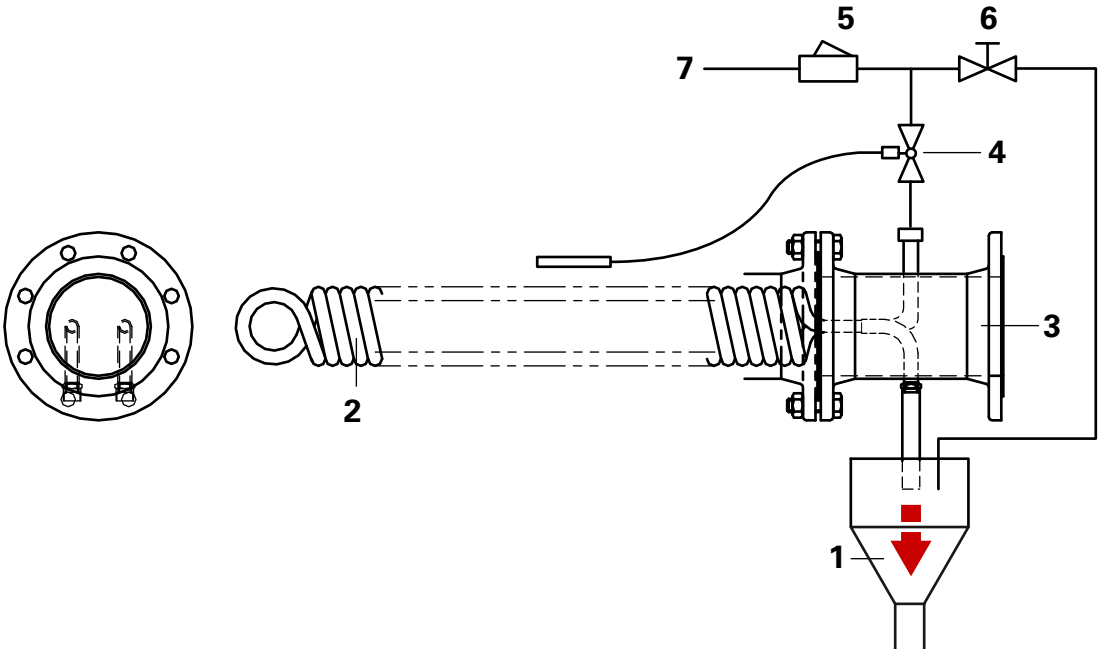


Fig. 8 Temperature safety valve

No.	Designation
1	Discharge of the hot water in the free funnel
2	Heat exchanger
3	Supply line
4	Thermal drain valve
5	Filter (by customer)
6	Sampling cock (by customer)
7	Cold water supply line

A water supply must be ensured at all times. If a stop cock is installed, it must always be open. If necessary, the hand cock on the shut-off valve should be removed to prevent anybody from interrupting the water supply.

A drinking water separator must be installed in the extinguishing water supply in compliance with specific national regulations.

An annual functional check must be carried out on the thermal process safeguard. This inspection work may only be carried out by service personnel of Schmid AG energy solutions.

Operating range (kW)	Cooling water flow rate (m^3/h)	Cooling capacity (kW)
150 ... 240	1.0	50
300 ... 360	1.0	60
450 ... 550	1.0	70
700 ... 900	1.0	80

2.4.4 Flue gas recovery (option)

The flue gas recovery unit is a system which recirculates part of the flue gas to the secondary air zone. This reduces the combustion chamber temperature. The amount of flow is regulated as a function of combustion temperature and boiler capacity. The complete procedure is set during assembly and runs automatically.

- Flue gas recovery fan with frequency converter
- Flue gas pipe with non-return flap, compactly mounted on the underfeed combustion system (insulated by customer)
- Control unit and regulation in the control cabinet

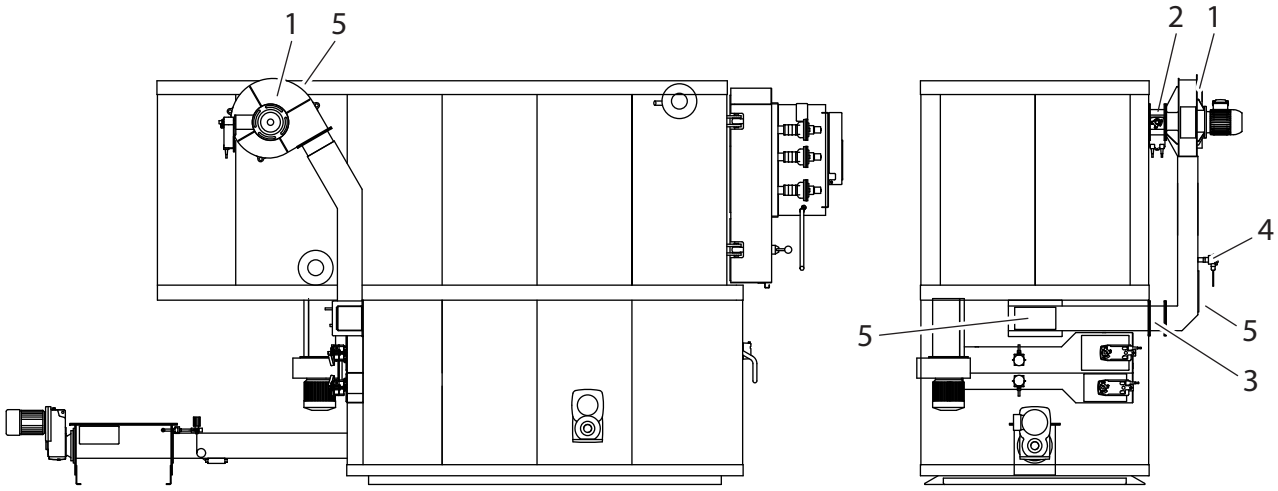


Fig. 9 Flue gas recovery

Item	Designation
1	Recirculation fan
2	Check flap valve
3	Swing-type check valve
4	Temperature monitoring
5	Cleaning openings

Boiler size	Flue gas recovery (mm)
UTSK-180-240	120 / 100
UTSK-300-360	120 / 100
UTSK-450-550	150 / 150
UTSK-700-900	150 / 150

2.4.5 Active postcombustion grate

The burnout zone comprises rows of air-cooled grate elements. Each second grate row is moved by a joint drive motor with an eccentric drive. The air flow is adjusted with a manual flap below the primary air supply.

The ash occurring after the combustion tray and burnt residues are fully burned and routed to the grate de-ashing screw through the stepped grate.

The cleaning openings below the burnout grate are accessible when the cladding has been removed. Cleaning work must be carried out every six months.

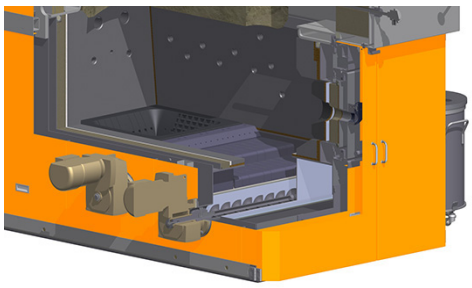


Fig. 10 Combustion chamber with postcombustion grate

2.4.6 Economiser (option)

The economiser (2) is mounted compactly to the hot water boiler (1). The flue gases scrubbed in the multi-cyclone unit also pass through to horizontally arranged boiler tube passes which reduce the flue gas temperature to 110-130°C. To prevent the gas from dropping below the dew point, a bypass valve regulates the amount of flue gas in order to maintain an adjustable minimum temperature.

- Heat exchanger designed as a floating structure.
- Bypass valve with adjustment motor, flue gas temperature controlled.
- Insulation and cladding as a unit with the boiler.

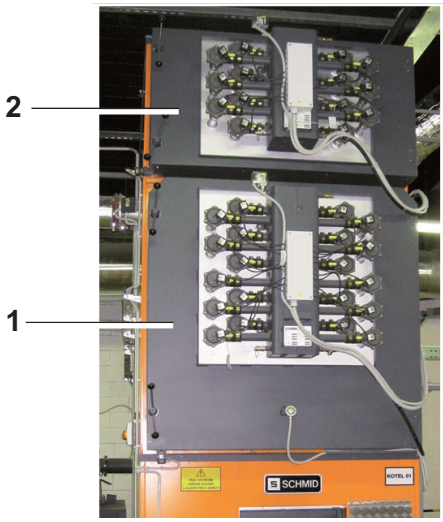


Fig. 11 Combustion system with hot water boiler and economiser

Item	Designation
1	Hot water boiler with optional boiler tube cleaning
2	Economiser with optional boiler tube cleaning

Before carrying out any maintenance work on the automatic boiler tube cleaning system, the compressed air tank of the cleaning system must be disconnected from the air supply (e.g. by closing the ball tap or releasing the quick-action coupling on the compressor). The compressed air tank of the cleaning system must then be vented by opening the drain valve. During maintenance work the drain valve must remain open. When opening the combustion chamber or boiler door, activation of boiler tube cleaning is blocked by opening of the door limit switch. The safety valve must be serviced or replaced in accordance with specific national regulations. When carrying out maintenance work wear the protective gear.

2.4.7 Flue gas filter system (option)

To lower dust emissions even further, the gases can be additionally cleaned by a filter system installed downstream from the multi-cyclone.

The flue gas fan is installed in accordance with the filter type on the inlet or outlet side of the filter.

For further information refer to the order confirmation or the filter documentation, if a filter was installed.

To be able to guarantee the required filter availability, the respective combustion system must be run for a minimum running time of 5 hours in the load range of 30-100% between standby/shutdown.

2.5 Nomenclature key

Using as an example the UTSK-700.22 underfeed combustion system

UTS	K	-700	22
UTS = combustion system	K = underfeed combustion system	Output capacity in kW	Type of de-ashing system 21 Combustion system with ash tray 22 De-ashing in container or bucket

2.6 Inlet design variants

The inlet of the UTSK underfeed combustion system is designed for the combustion of wood chips, shavings etc. (according to the order confirmation and project documentation).

2.7 Structure of the combustion system

A system always comprises the process stages:

- Fuel storage (separate instruction manual)
- Ash removal system and transport (separate instruction manual)
- Combustion
- Hot water boiler (heat exchanger)
- Flue gas cleaning (separate instruction manual)
- De-ashing (separate instruction manual)

2.8 Technical data

2.8.1 Dimensions

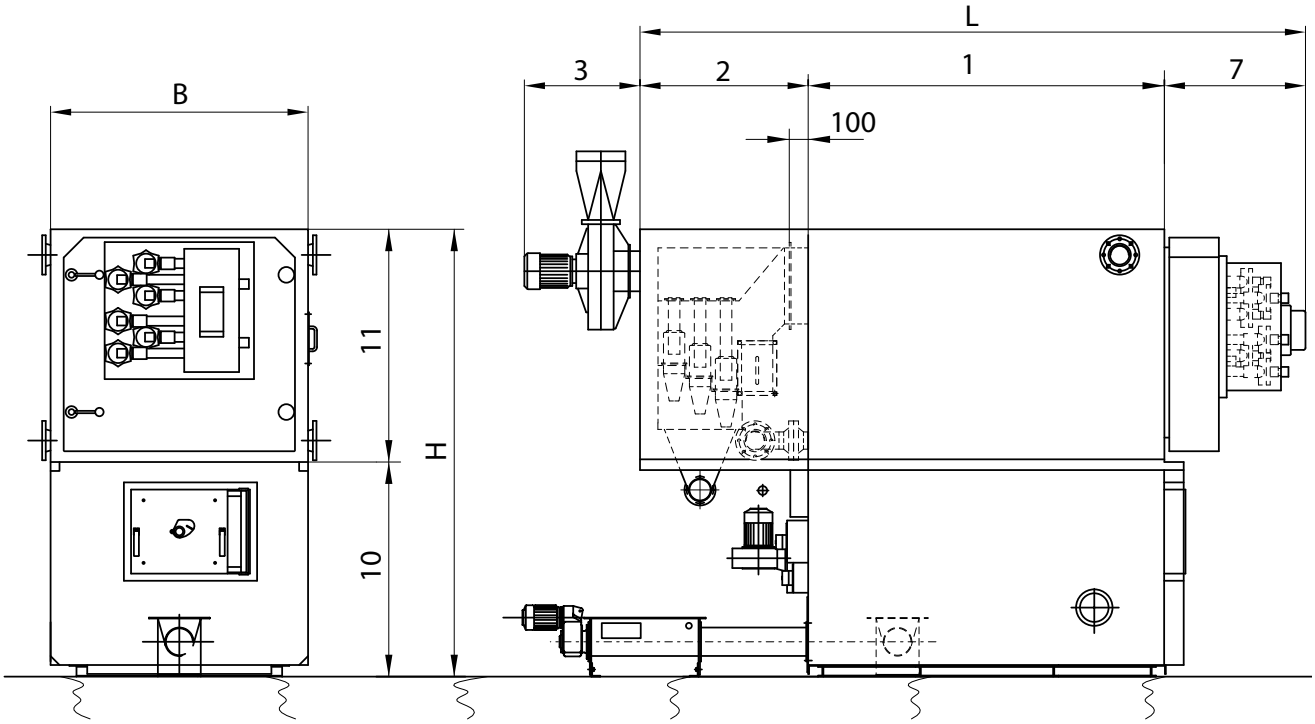


Fig. 12 Dimensions

Capacity (kW)	L AKP (mm)	L without AKP (mm)	B (mm)	H (mm)	1 (mm)	2 (mm)	3 (mm)	7 AKP (mm)	7 without AKP (mm)	10 (mm)	11 (mm)
180	3630	3180	1150	2300	1600	1300	750	730	280	1100	1200
240	3630	3180	1150	2300	1600	1300	750	730	280	1100	1200
300	3830	3380	1250	2350	1800	1300	750	730	280	1100	1250
360	3830	3380	1250	2350	1800	1300	750	730	280	1100	1250
450	4330	3380	1440	2550	2300	1300	820	730	280	1250	1300
500	4330	3880	1440	2550	2300	1300	820	730	280	1250	1300
550	4330	3880	1440	2550	2300	1300	820	730	280	1250	1300
700	4930	---	1600	3100	2700	1500	1030	730	---	1500	1600
900	4930	---	1600	3100	2700	1500	1030	730	---	1500	1600

Key:

AKP = automatic boiler cleaning

2.8.2 Connection sizes

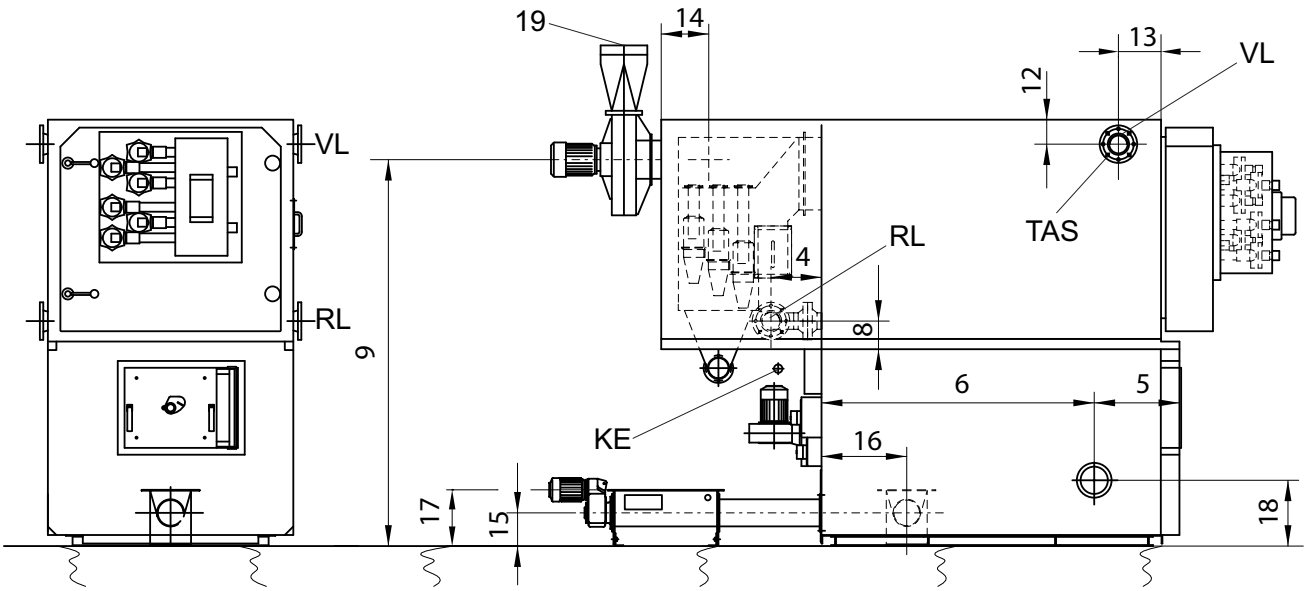


Fig. 13 Connection sizes

Capacity (kW)	4 (mm)	5 (mm)	6 (mm)	8 (mm)	9 (mm)	12 (mm)	13 (mm)	14 (mm)	15 (mm)	16 (mm)	17 (mm)	18 (mm)	19 (Ø mm)	VL RL (DN,PN16)	KE
180	235	400	1300	100	2130	150	250	360	195	510	335	300	200	65	1"
240	235	400	1300	100	2130	150	250	360	195	510	335	300	200	65	1"
300	265	400	1500	110	2150	150	250	360	195	590	335	300	200	80	1"
360	265	400	1500	110	2150	150	250	360	195	590	335	300	250	80	1"
450	295	400	1900	120	2290	150	300	310	195	---	335	300	315	100	1 ¼"
500	295	400	1900	120	2290	150	300	310	195	---	335	300	315	100	1 ¼"
550	295	400	1900	120	2290	150	300	310	195	---	335	300	315	100	1 ¼"
700	300	400	2400	150	2780	165	300	310	205	---	365	300	315	100	1 ¼"
900	300	400	2400	150	2780	165	300	310	205	---	365	300	400	100	1 ¼"

Key:

VL = supply line
RL = return line
TAS = thermal process safeguard NW 3/4"
KE = boiler drain
14 = side connection of the AGV
16 = side connection of the stoker
19 = flue gas pipe

2.8.3 Weights

Capacity (kW)	Empty weight (kg)	Grate weight (kg)	Boiler weight (kg)	Separator weight (kg)	AKP door weight (kg)	Weight boiler door without AKP (kg)	Operating weight (kg)
180	2880	1700	1400	240	280	220	3530
240	2880	1700	1400	240	280	220	3530
300	5600	2100	1731	290	320	240	6460
360	5600	2100	1731	290	320	240	6460
450	7500	3000	2472	350	370	290	8820
500	7500	3000	2472	350	370	290	8820
550	7500	3000	2472	350	370	290	8820
700	8300	4350	3935	570	500	---	10640
900	8300	4350	3935	570	500	---	10640

2.8.4 Planning values

UTSK series in compliance with EN 303-5: 2012		UTSK-180	UTSK-240	UTSK-300	UTSK-360	UTSK-450	UTSK-550/500	UTSK-550
Heat generation calculation basis:								
Nominal heat capacity	kW	180	240	300	360	450	500	550
Heat capacity range 30-100%	kW	54-180	72-240	90-300	108-360	135-450	150-500	165-550
Permissible operating overpressure	bar	5	5	6	6	5	5	5
Permissible operating temperature	°C	95	95	95	95	95	95	95
Minimum return line temperature	°C	65	65	65	65	65	65	65
Temperature controller setting range	°C	65-95	65-95	65-95	65-95	65-95	65-95	65-95
Boiler class		5	5	5	5	5	5	5
Water side resistance at Δt 10°C	mbar	19	34	28	30	30	35	42
Water side resistance at Δt 20°C	mbar	5	9	7	8	9	9	10
Boiler water content	litres	645	645	855	855	1315	1315	1315
Fuel definition:								
Fuel class in compliance with EN 17225-4 chopped material		A2	A2	A2	A2	A2	A2	A2
Fuel class in compliance with EN 303-5 chopped material		B1	B1	B1	B1	B1	B1	B1
Fuel dimensions in compliance with EN ISO 17225-4		P31S	P31S	P31S	P31S	P31S	P31S	P31S
Flue gas system, design basics:								
Necessary conveying pressure at the outlet of the flue gas fan	Pa	20-30	20-30	20-30	20-30	20-30	20-30	20-30
Flue gas temperature at the nominal capacity **	°C	120*	150*	130*	130*	110*	114*	114*
Flue gas temperature at the lowest capacity **	°C	70*	70*	70*	70*	72*	72*	72*
Flue gas flow rate at the nominal capacity **	g/s	117*	170*	220*	248*	350*	368*	368*
Flue gas flow rate at the lowest capacity **	g/s	40*	40*	65*	75*	100*	100*	100*
Diameter flue gas connection	mm	200	200	200	250	315	315	315
Calculation basis for the thermal process safeguard:								
Cooling water flow rate	m3/h	1	1	1.2	1.2	1.3	1.3	1.3
Minimum cooling water pressure	bar	4	4	4	4	4	4	4
Maximum cooling water admission temperature	°C	15	15	15	15	15	15	15
Electrical connection without filter:								
Voltage	VAC	230/400	230/400	230/400	230/400	230/400	230/400	230/400
Frequency	Hz	50	50	50	50	50	50	50
Capacity under partial load	kW	0.7**	0.7**	0.6**	0.6**	0.6**	0.6**	0.6**
Capacity at nominal heat capacity	kW	1.0**	1.5**	1.5**	1.6**	2.2**	2.4**	2.4**
Maximum capacity	kW	2.5**	2.5**	2.2**	2.2**	2.5**	2.5**	2.5**

UTSK series in compliance with EN 303-5: 2012		UTSK-180	UTSK-240	UTSK-300	UTSK-360	UTSK-450	UTSK-550/500	UTSK-550
Electrical connection with electrostatic precipitator (without electrostatic precipitator power consumption):								
Voltage	VAC	230/ 400	230/ 400	230/ 400	230/ 400	230/ 400	230/ 400	230/ 400
Frequency	Hz	50	50	50	50	50	50	50
Capacity under partial load	kW	0.8**	0.8**	0.6**	0.6**	0.5**	0.5**	0.5**
Capacity at nominal heat capacity	kW	1.1**	1.6**	1.6**	1.7**	2.1**	2.3**	2.3**
Maximum capacity	kW	2.6**	2.6**	3.3**	3.3**	2.5**	2.5**	2.5**

UTSK series in line with EN 303-5: 2012		UTSK-700	UTSK-900
Heat generation calculation basis:			
Nominal heat capacity	kW	700	900
Heat capacity range 30-100%	kW	210-700	270-900
Permissible operating overpressure	bar	5	5
Permissible operating temperature	°C	95	95
Minimum return line temperature	°C	65	65
Temperature controller setting range	°C	65-95	65-95
Water side resistance KVS	mbar	180	180
Boiler water content	litres	2355	2355
Fuel definition:			
Fuel class in compliance with EN 17225-4	chopped material	A2	A2
Fuel class in compliance with EN 303-5	chopped material	B1	B1
Fuel dimensions in compliance with EN ISO 17225-4		P31S	P31S
Flue gas system, design basics:			
Necessary conveying pressure at the outlet of the flue gas fan	Pa	20-30	20-30
Flue gas temperature at the nominal capacity	°C	170*	170*
Diameter flue gas connection	mm	315	355
Calculation basis for the thermal process safeguard:			
Cooling water flow rate	m3/h	1.5	1.5
Minimum cooling water pressure	bar	4	4
Maximum cooling water admission temperature	°C	15	15
Electrical connection without filter:			
Voltage	VAC	230 / 400	230 / 400
Frequency	Hz	50	50

UTSK series in line with EN 303-5: 2012	UTSK-700	UTSK-900
Electrical connection with electrostatic precipitator (without electrostatic precipitator power consumption):		
Voltage VAC	230 / 400	230 / 400
Frequency Hz	50	50

* Values can vary depending on the flow temperature
** Values determined under test conditions (not guaranteed values)

3 Transport

All of the products offered by Schmid AG energy solutions are transported by our own specialists and delivered to the correct location. The components of the system are protected against corrosion for transport and storage.

The components of the combustion system are delivered separately as follows:

- Combustion grate incl. insulation
- Hot water boiler with a built-in boiler door and multi-cyclone separator
- Cladding plates, insulation mats for the combustion grate on pallets
- Add-on components, flue-gas and supply air fans, damper actuators, various small parts, on pallets
- Control cabinet on pallets

If system components are temporarily stored, they should be covered to protect against dirt and moisture.

The unprotected storage of electrical components as control cabinets, motors, etc. is prohibited.

The following regulations must be complied with if the components are collected and temporarily stored by our partners or customers:

- Prevention of exposure to water
- When transporting systems or system components are transported on open vehicles, suitable packaging is necessary for protection against the effects of the weather and soiling.
- Prevention of vibrations as far as possible
- Never expose systems and system components to temperatures of below -20°C (risk of brittling breakage)
- Suitable packaging must be used for sea transport (preferably overseas shipping container), wooden crates should never be loaded on deck for shipping
- Corrosion protection is necessary for all modes of transport
- Transport vehicles must be equipped with pneumatic or hydraulic suspension to prevent vibration breakage.

⚠ WARNING!

Danger from falling loads!

Falling loads can cause serious injury.

System components may only be lifted by the lifting brackets designed for that purpose and only in the presence of our specialists.

Use only suitable, tested, and approved lifting equipment.

Never stand or work under suspended loads.

⚠ WARNING!

The boiler door can open accidentally during transport and cause injury to the head and upper body.

The boiler door must be closed before lifting the boiler.

Never stand between the lifted boiler and a wall - risk of crushing.

3.1 Lifting loads

Dimensions and weights, according to technical specifications.

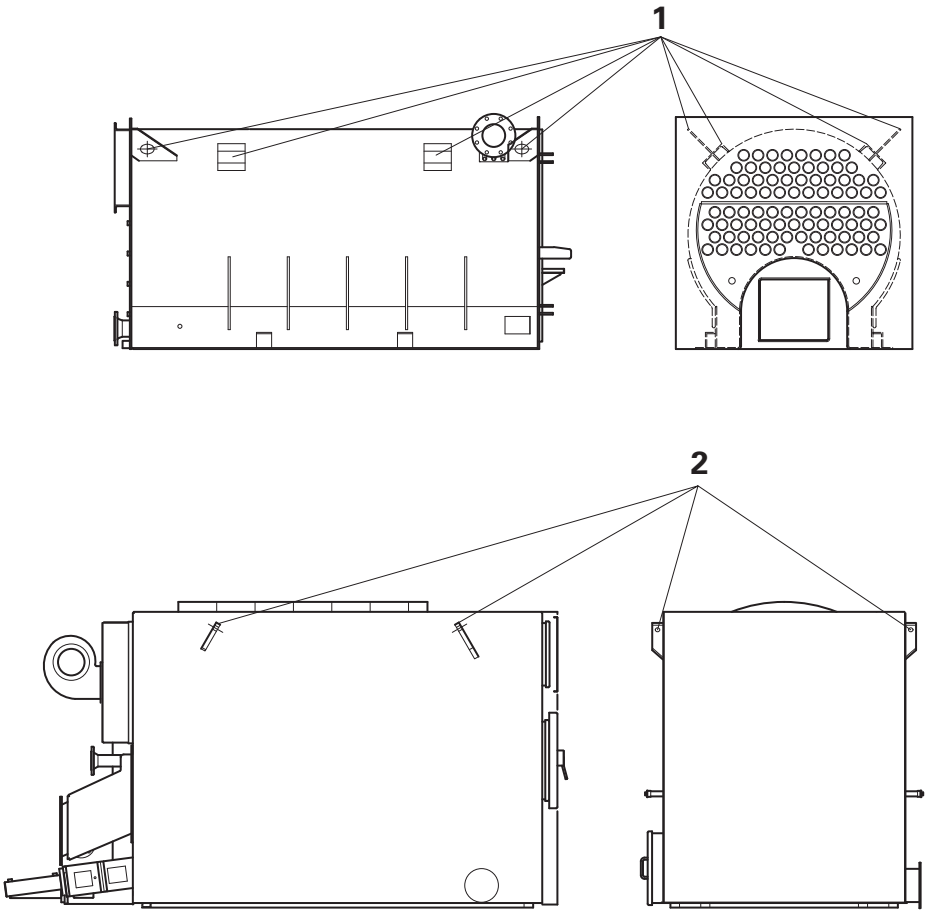


Fig. 14 Lifting brackets for hot water boilers and combustion grate

Item	Designation
1	Lifting brackets for hot water boilers.
2	Lifting brackets for combustion grate

Alternatively, the system components can also be unloaded using a forklift. In this case make sure to tell the Schmid AG energy solutions project lead. In this case the components are supported with pallets or squared timber during truck loading.

4 Installation, commissioning

4.1 Installation, assembly

The underfeed combustion system may only be assembled and commissioned by qualified Schmid AG energy solutions staff.

It is positioned according to the project-specific installation diagram.

The installation location must be clean and dry at the beginning of the assembly work (swept clean).

The scope of supply and provisions regarding the services to be provided by the customer are specified under assembly and commissioning in the order confirmation, as well as in the general terms and conditions of delivery. The electrical assembly and installation is not included within the Schmid AG energy solutions scope of supply.

⚠ DANGER!

Danger from electrical energy.

An electric shock can cause serious injury!

Please note the connection information. See wiring diagram in the appendix as well as the nameplate on the combustion grate.

During the installation work the system must not be subjected to a voltage.

Electrical connections must only be performed by specialists.

Defective cables and connectors must be replaced immediately.

⚠ WARNING!

Danger of fire resulting from installation on site.

Incorrect floor or wall conditions, or flammable materials in the installation location can cause a fire hazard.

The firing unit may only be placed on a fireproof surface.

The distances to walls and other structures must be complied with.

There must not be any flammable materials in the combustion chamber or near the underfeed combustion system.

Fire protection measures as stipulated in local regulations and guidelines must be complied with.

Higher ground temperatures can occur near the boiler installation site (max. ambient temperature +60°C).

4.2 Commissioning

All Schmid AG energy solutions products are normally taken into operation by our trained staff.

An essential part of the commissioning process includes the instruction of the future equipment operators.

The equipment operators must be present during commissioning. The personnel should be familiar with the instruction manual prior to commissioning. The instruction of the equipment operators is part of the acceptance of the system.

4.2.1 Requirements for circulating water up to 110° C

In order to prevent damage, particularly due to scaling in the hot water boilers circulating water in new and refills must fulfil the following conditions:

Characteristic	Value	Notes
Total water hardness	Max 0.2° f Max 0.1° dH	1° f = French degree of hardness, respectively 0.56 °dH = German hardness equal to 10 mg/l calcium carbonate per litre of water
PH-value at 20°C	8.5 ... 9.5	
Phosphates (PO4)	30 mg/l max.	
Chlorides (Cl)	30 mg/l max.	
Oxygen (O2)	0.1 mg/l max.	Hot water up to 110°C

The circulating water must be checked annually. Furthermore the valid national standards must be complied with.

4.2.2 Water treatment for different types of raw water

Up to 20° f	▶	Add hardness stabilisers and an alkalising agent
Over 20° f	▶	Softening through ion exchange to 0° f hardness and addition of an alkalising agent. Large systems (e.g. piped heating networks) may require complete softening and alkalisation

4.2.3 Technical safety equipment

The technical safety equipment such as safety valves, pressure limiters, water minimum level protection devices and expansion vessels must be specified and executed in accordance with the valid national regulations and standards (for example SWKI Directive, EN 12828, EN 12953).

The drain lines of safety valves must be routed at a downward angle away from the valve to the drain. It is essential to ensure that scalding caused by hot water or steam is prevented by effective and suitable pipe configurations.

4.2.4 Filling with circulation water

Before the system is started, the heat generation system and water distribution system must be filled with circulation water and tested for tightness. Operation of the system is only permitted when it is completely full.

4.3 Heating the combustion chamber

When commissioning the system, the temperature of the combustion chamber must be raised very carefully. This is done to prevent damage to the refractory lining from moisture build-up. The following heating curve for drying the refractory lining applies to low-cement refractory concrete:

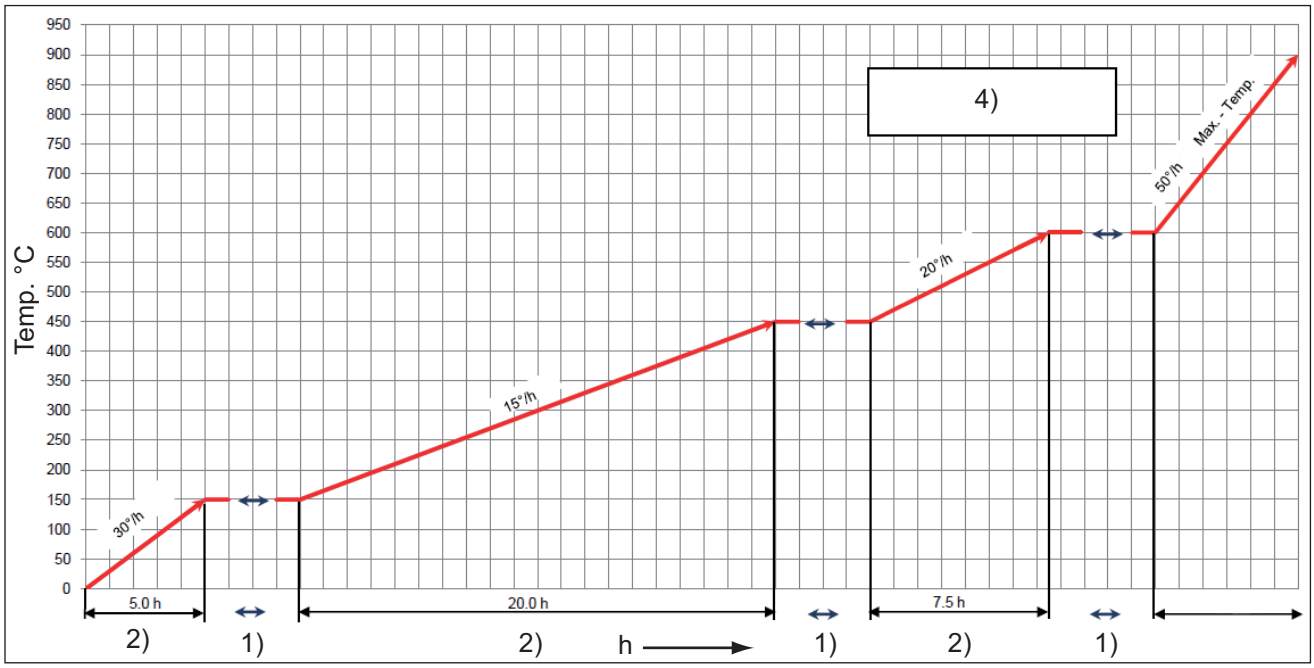


Fig. 15 Heating curve

Chart key

1) Holding time at temperature per 25mm of concrete wall thickness = 1 hour.
2) Never heat faster, especially at the lower temperatures, as the water contained in the refractory lining cannot evaporate quickly enough. If heated too quickly, the refractory lining may be destroyed in an explosion-like event.
3) Continue heating until operating temperature is reached.
4) Once dry, the refractory should be heated at a rate of 50°C/h until it reaches the maximum temperature.

We recommend letting specialists from Schmid AG energy solutions or from another specialised service provider heat up the underfeed combustion system for the first time.

Heating the combustion chamber after an idle period of more than two weeks.

After a prolonged idle period of the combustion system (e.g. during the summer break) we recommend slowly heating the combustion chamber to minimise the wear on the refractory material. To this purpose the combustion controller can be used in heat-up mode.

5 Operation

5.1 General instructions

The underfeed combustion system can be automatically ignited (option) and controlled with the central control unit. If the automatic ignition system does not work or is not installed, the system must be ignited manually.

The underfeed combustion system may only be operated in a safe, functional and good condition.

The system must be shut down and secured immediately in the case of malfunctions.

⚠ DANGER!

Risk of explosion (deflagration)!

Risk of flame exposure when opening the combustion chamber door!

In the event of faulty pre-ventilation or incomplete combustion, an explosive atmosphere can occur in the combustion chamber due to the formation of carbon monoxide (CO). This can ignite when the burner is repeatedly started, when the combustion chamber or maintenance doors are opened and cause deflagration. This can result in death, serious injury or damage to equipment.

Before lighting the fuel, close all maintenance doors. Lighting may only be performed manually through the combustion chamber door.

Never open the combustion chamber door after lighting the fuel or during the automatic lighting procedure.

It is prohibited to open the combustion chamber door during start-up and operation as well as after shutdown for faster cooling.

The combustion chamber door and the maintenance doors may only be reopened after pre-ventilation, especially after a power failure.

It is prohibited to bridge safety switches.

⚠ WARNING!

During operation very high temperatures prevail in the combustion chamber. Risk of combustion caused by flame emissions when the combustion chamber door is open.

During the operating phase the combustion chamber door may only be opened for a short time and with care.

Other hot surfaces can occur near the combustion system. For this reason take care when carrying out any activities.

⚠ WARNING!

High flue gas concentrations (CO and CO_2) in the air can result in unconsciousness and the risk of suffocation.

Operation without a connection to the flue gas pipes is prohibited.

After shutting down the system only open the doors when the interior temperature has dropped below 100°C.

5.1.1 System operation

To guarantee minimum system wear, continuous operation is necessary. With continuous operation, the thermal loads from repeated cooling and heating are prevented, which has a positive effect on the service life of the entire system.

With regard to the set number of activation/deactivation operations per day and the minimum combustion time, in Switzerland the regulations of the canton must be taken into account. A capacity range of 30 – 100% for 24h/d is recommended as a minimum operating time for optimum and low-wear operation. If the minimal loads are frequently underrun, it may not be possible in some cases to comply with the emission requirements and the filter availability.

Generally running the system with short-term load changes should be avoided. Optimum combustion can be impeded with fast load changes. Due to the mass of the refractory lining (slow heat absorption and discharge) as well as the large grate surface (slow increase and decrease of the covering with fuel) the control behaviour is slow. If the loads change quickly, emissions and wear can be negatively affected.

Typically it takes around 45 - 70 minutes to increase the wood boiler capacity from 30% to 100% (when the combustion system is warm), this corresponds to 1...1.5 % / minute. Running the system down from 100% to 30% takes approximately 30 minutes, which corresponds to approx. 2 % / minute. This control behaviour must be taken into account when looking at load peaks and integrating the combustion system by means of an external capacity signal.

When managing the boiler it must be ensured that the entire boiler capacity of the boiler is utilised. This can cover load peaks, has a positive effect on the control behaviour and the minimum operating time of the combustion system as well as the availability of the filter system.

Contaminants in the fuel as well as changes to the defined fuel quality during operation influence the emissions as well as the efficiency and can result in higher wear and additional maintenance work.

5.2 Switching the combustion system on

⚠ DANGER!

Explosion hazard due to deflagration!

An overfilled combustion chamber can create an explosive atmosphere, which can cause serious injury when lit.

Empty the combustion chamber before firing.

Never use fire accelerants (petroleum or similar) when lighting the fire.

The detailed description of how to switch on the combustion system is given in Register "C User manual, Control unit", section "4.2 Automatic mode".

5.2.1 Correct manual lighting

1.

Materials:
Firewood and wax-soaked wood shavings or wood chips.
Never use fire accelerants (e.g. petroleum or similar) for lighting - risk of burns.

2.

In addition to these highly flammable materials, add middle sized and large pieces of firewood, observing the rule of thumb: "From fine to coarse, from soft to hard"

3.

It is important to ensure that the fire spreads slowly across a large area of the grate and that there is a controlled burn off for the entire duration of the burn.

5.3 Emergency shut down

The movement of the underfeed combustion system can be stopped at any time by activating the emergency cut-off switch. In addition, opening the combustion chamber door, the boiler door, or removal of the ash container will stop movement in the system. No more fuel will be conveyed to the system.

The emergency cut-off does not immediately stop the combustion process in the combustion system. The fire will continue to burn for a long time. Allow the fire to burn down (see also «5.1 General instructions»).

5.4 Operating and display elements

The underfeed combustion system is visualised on the central control unit and controlled from there (see separate instruction manual for the control unit).

5.4.1 Mains disconnection devices

All of the actuators can be fitted by the customer with suitable power cutoff units, normally a maintenance switch. Such switches must be installed in accordance with country-specific regulations.

5.4.2 Machine control unit

The entire system can only be operated via the control unit. It is set up by Schmid AG energy solutions personnel during the commissioning process (see «4 Installation, commissioning»). Changes to the settings may only be made by Schmid AG energy solutions service personnel.

⚠ WARNING!

Risk of injury due to incorrect combustion settings.

Incorrect settings can result a poor combustion and carbon monoxide poisoning.

The system control unit must only be operated by trained individuals who are familiar with this instruction manual.

The personnel of Schmid AG energy solutions reserve the exclusive right to specify settings that influence clean combustion.

5.4.3 Operating mode selector switch

As per the separate instruction manual for the control unit.

5.5 Recommissioning after a longer interruption

No special measures are necessary if recommissioning after a period of downtime of up to one year. After longer periods of downtime, proceed according to «4.2 Commissioning».

During commissioning, the underfeed combustion system must be inspected for proper functionality without material.

6 Maintenance

6.1 Introduction

Operational failures due to inadequate or improper maintenance can cause very high repair costs and long downtimes. The operational safety and service life of this system depend on proper maintenance, as well as several other factors.

Because of the different operating conditions, it is not possible to specify in advance how often it is necessary to check for wear, or carry out inspections, maintenance and repair. Suitable inspection intervals must be drawn up which take the individual operating conditions into account.

⚠ WARNING!

A lack of maintenance or improper maintenance can cause injury and damage to equipment!

Closures on covers, doors, etc. must not be altered under any circumstances. Safety devices must not be removed or bypassed.

When welding in or near the equipment, the earth terminal needs to be attached adjacent to the welding area so that no current can flow uncontrolled over the bearings and electrical components.

During maintenance, cleaning, and repair work the power must be cut off to all actuators and secured against unintentional switching on.

The master switch on the control cabinet must be shut off and secured.

The staff responsible for carrying out this work must be personally satisfied that all drives are secured against switching on unintentionally.

Schmid AG energy solutions cannot honour warranty claims resulting from damage caused by insufficient maintenance.

6.2 Maintenance contract

In order to prevent faults and defects to the system, and to ensure optimal combustion, we recommend maintenance of the system by Schmid AG energy solutions either annually or every 4000 hours of operation. The operating hours can be read off from the touch panel of the control unit.

Schmid AG energy solutions offers maintenance contracts with different performance levels. Request an offer through our customer service department.

Schmid AG energy solutions cannot honour warranty claims resulting from damage caused by insufficient maintenance.

6.3 Cleaning

⚠ WARNING!

Risk of injury when entering the combustion chamber. Always secure the combustion chamber door.

Before entering the combustion chamber always secure the combustion chamber door with the personal padlock.

⚠ WARNING!

Risk of injury due to rotating parts.

Before entering the combustion chamber, switch off the grate de-ashing screw on the maintenance switch and secure with the personal padlock to prevent reactivation.

Because a large amount of soot and ash accumulates in the combustion system over time, it must cleaned occasionally. The cleaning interval is dependent on the type of fuel used and the amount of ash. Check the quantity of ash at least once a month.

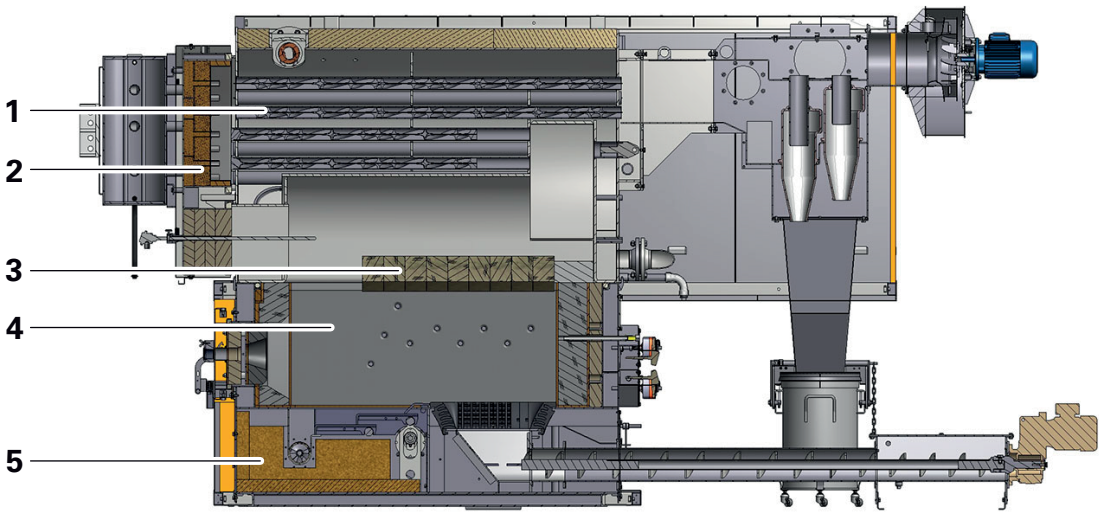


Fig. 16 Cleaning

Item	Description
1	Boiler passes
2	Boiler door
3	Vault
4	Combustion chamber
5	Lower grate

⚠ WARNING!

Surfaces and interior are very hot and can cause burns.

Before cleaning allow the combustion system to cool.

Always wear personal protective equipment.

Secure the system against accidental activation.

⚠ WARNING!

Dust and fly ash can negatively influence breathing and cause irreversible damage to lungs and respiratory tracts.

In the event of high dust concentrations always wear respiratory protection of class P3 or FFP3. Caution! Respirator masks for fine dust do not provide protection against hazardous or suffocating gases and vapours.

6.3.1 Clean boiler passes

▶ **Procedure:**

1. Remove the turbulators (optional) where present.
2. Clean using the tube brush from the cleaning kit.
3. Reinstall the turbulators.

6.3.2 Clean the vault

▶ **Procedure:**

1. Open the cover.
2. Push the ash into the oven.
3. Pull the ash on the top vault to the front.

⚠ WARNING!

The interior is very hot and can cause burns.

Before cleaning allow the combustion system to cool.

It is essential to wear fire resistant gloves when opening the lid.

Secure the system against accidental activation.

6.3.3 Clean ash removal box

▶ **Procedure:**

1. Open the cover.
2. Push the ash to the rear, inward and suction off.

6.3.4 Clean fan

▶ **Procedure:**

1. Open cleaning opening.
2. Clean the fan hub with a brush (preliminary cleaning using the square brush, final cleaning with a round brush).
3. Close the cleaning opening.

6.4 Maintenance overview

The maintenance and inspection data are based on continuous operation. If the requirement is not fulfilled within the corresponding period, the period can be extended. However, a complete overhaul must be performed every two to three years.

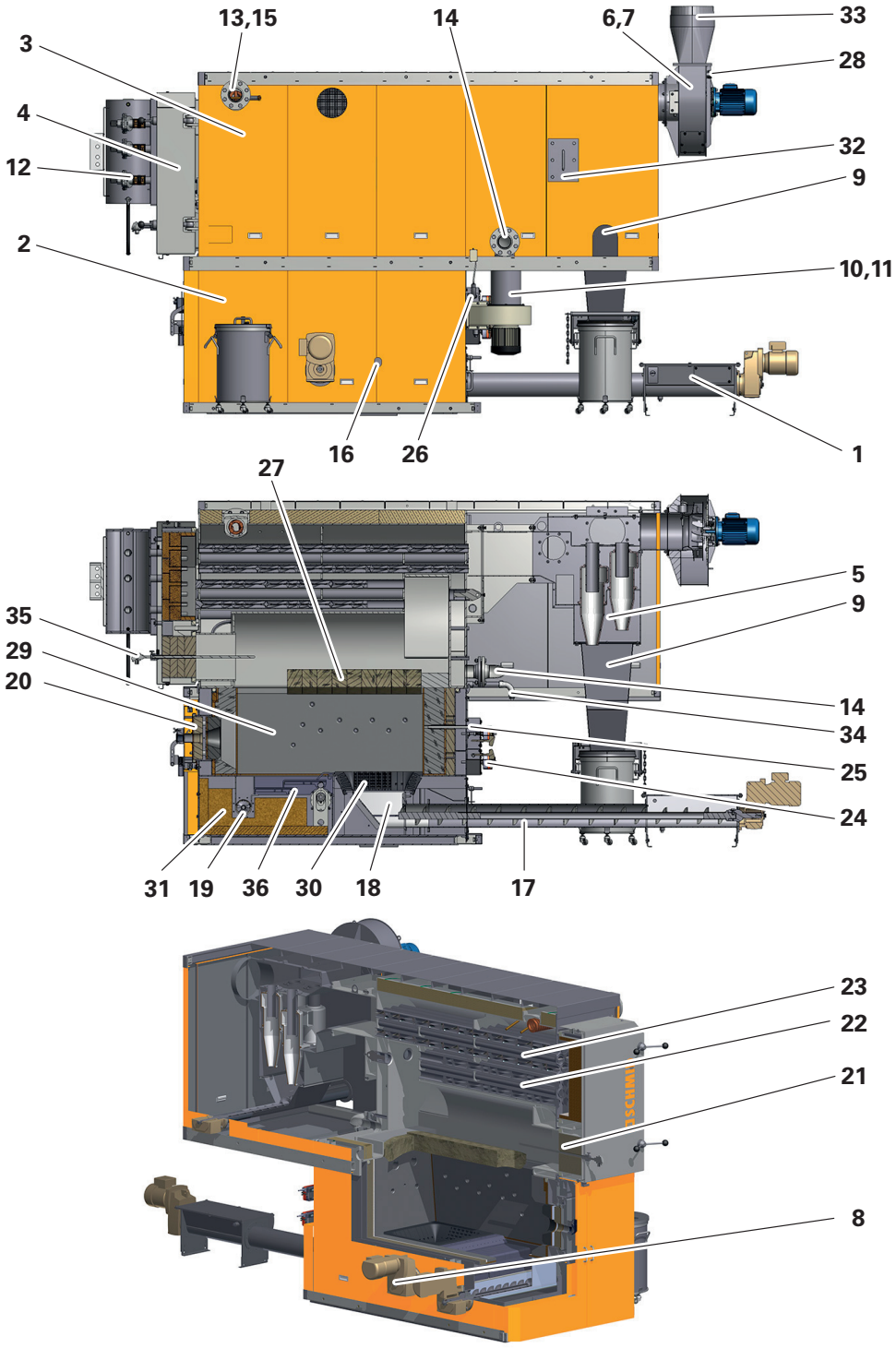


Fig. 17 Maintenance overview (for key see 2.4)

The key to the drawing above is contained in section «2.4 Structure of the wood combustion system»

Maintenance tasks	Daily	Weekly	Monthly	Every six months	Yearly	Reference
Visually inspect the combustion chamber (29) and fire appearance.	X					
Check the flue gas temperature	X					6.5.1
Listen for unusual noise in the motor or other unusual noises	X					
Check the fill level of the ash container.	X					Operating manual, de-ashing system
Check fuel level in the silo	X					BA silo
Clean lower grate (31), also refer to 2.4.5			X			
Check for leaks in the flue gas fan outlet (33) (visually and by smelling)	X					
Check that all maintenance openings are closed and secured	X					
Check for and remove any dust deposits on the flue gas pipes and all hot system components		X				
Check the oil level of the compressed air compressor		X				Option
Drain condensate from the air compressor		X				Option
Check the combustion chamber (29), burnout zone (36) and vault (27) for accumulations, such as slag			X			
Check the water level and system pressure in the heating system			X			
Clean the combustion chamber (29) and grate (30 / 36). Before this work the system must be set to "ventilation" for approx. 60 minutes. (Manual mode fans). The cleaning interval can vary dependin on the load and the fuel quality.			X			

Maintenance tasks	Daily	Weekly	Monthly	Every six months	Yearly	Reference
Clean the boiler passes (22 / 23) with a brush. Also clean the optional turbulators. If the AKP boiler-tube cleaner is being used, six-monthly cleaning is adequate. When using fuels with high levels of sulphur and chlorine (e.g. waste wood, shrub prunings), the cleaning interval is shorter.			X	(X)		6.3.1
Clean the boiler passes of the economiser with a brush. Also clean the optional turbulators. If automatic boiler tube cleaning is being used, six-monthly cleaning is adequate.			X	(X)		2.4.6 Option
Automatic boiler cleaning (12). Check the compressed air tank for condensate formation. Slowly open the drain tap and blow out the condensate.			X			2.4.1 Option
Clean the turbulators, also see 6.3.1			X	(X)		Option
Check the condition of the vault firebricks (27) and the refractory lining				X		
Complete cleaning of the combustion chamber (29), under the combustion retort (18), the flue gas fan (including the hub) (6), the cyclone inlet (32) and the flue gas recirculation				X		2.4.4 6.3
Lubricate according to the lubrication table				X		6.5.6
Drive motors: Level control				X		
Screw conveyor drive motors: Level control				X		
Clean the flue gas recovery unit (recirculation)				X		2.4.4 Option
Clean the O_2 sensor				X		6.5.2
Check the thermal extinguishing water valve					X	Only have carried out by Schmid AG energy solutions customer service
Check the back fire thermostat					X	
Check the rotary valve or back fire protection slide					X	
Check the differential pressure gauge					X	
Check the safety temperature limiter					X	
Check the thermal process safeguard					X	
Calibrate the O_2 sensor when the system is running					X	
Check the seals on all doors					X	6.5.3
Check circulating water, replace if necessary					X	4.2.1

Maintenance tasks	Daily	Weekly	Monthly	Every six months	Yearly	Reference
Cleaning of the flue gas pipes (33) and the chimney (33) by the chimney sweep in accordance with local regulations. Minimum cleaning interval in winter operation: 1x yearly Minimum cleaning interval in summer/winter operation: 2x yearly					X	
The safety valves of the compressed air tank (e.g. the compressor and automatic boiler tube cleaning) must be checked regularly by venting (EKAS directive no. 6516). Furthermore the specific national standards must be complied with.					X	2.4.1, 2.4.6, 4.2.3
The safety valves of the compressed air tank (e.g. the compressor and automatic boiler tube cleaning) must be checked replaced regularly (EKAS directive no. 6516). Furthermore the specific national standards must be complied with.	Every 8 years					2.4.1, 2.4.6, 4.2.3

6.5 Maintenance tasks

⚠ WARNING!

Risk of injury when entering the combustion chamber. Always secure the combustion chamber door.

Before entering the combustion chamber always secure the combustion chamber door with the personal padlock.

⚠ WARNING!

Risk of injury due to rotating parts.

Before entering the combustion chamber, switch off the grate de-ashing screw on the maintenance switch and secure with the personal padlock to prevent reactivation.

6.5.1 Emissions control

In the case of officially mandated flue gas emissions inspections, we recommend carrying out emissions maintenance by Schmid AG energy solutions customer service ahead of time.

Please coordinate the inspection date with our customer service department as early as possible.

In the event of deviation from the values determined during commissioning, the system must be cleaned or Schmid AG energy solutions customer service must be contacted.

6.5.2 Clean the O_2 sensor (lambda sensor)

The O_2 sensor must be removed before cleaning the flue gas connection or the flue gas fan.

⚠ WARNING!

Risk of burns, the O_2 sensor is hot.

Before removal check the temperature of the O2 sensors, always wear gloves during work.

Clean with a soft cloth or blow off with compressed air. When blowing off maintain a distance of 20cm to prevent damage to the sensor.

6.5.3 Check the doors

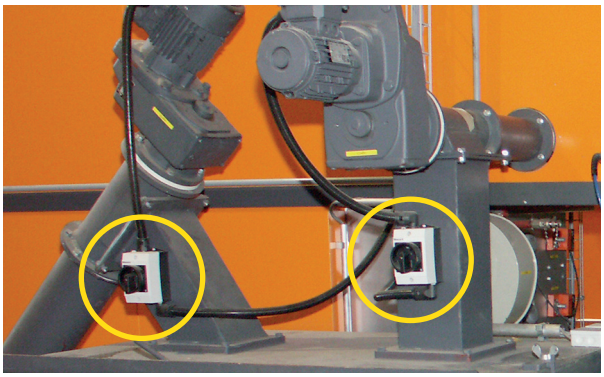
Check all doors and covers at least annually.

- Check all seals for visible damage. Replace defective seals immediately.
- Have defective or stiff hinges and fasteners repaired.

6.5.4 Maintenance work on components with drive units

All individually deactivating drives are equipped with a maintenance switch and can be individually disconnected from the mains for maintenance purposes.

No maintenance switches are permitted for electrical drive units which cannot be individually deactivated for safety reasons. The main switch fulfils the function of a maintenance switch. During maintenance work the system is shut down, switched off, secured against reactivation and cooled if necessary.



Example - de-ashing:
The maintenance switches are generally mounted near the drives.

⚠ WARNING!

Drive units can be accidentally started which can cause dangerous situations.

Before maintenance work disconnect the drive units from the power supply with the maintenance switch.

In addition the maintenance switches must be locked with a personal padlock and secured against reactivation.

6.5.5 Dangers resulting from flue gas

CO_2 is a colourless gas and generally tasteless and odourless. Therefore, it is virtually unnoticeable by the human sensory organs.

⚠ WARNING!

High flue gas concentrations (CO and CO_2) in the air can result in unconsciousness and the risk of suffocation.

Operation without a connection to the flue gas pipes is prohibited.

Always close cleaning openings after cleaning.

6.5.6 Lubrication

All the parts of the system are lubricated prior to delivery. Periodic lubrication is indispensable for fault-free operation of the system and prevents expensive repairs (refer to the maintenance table).

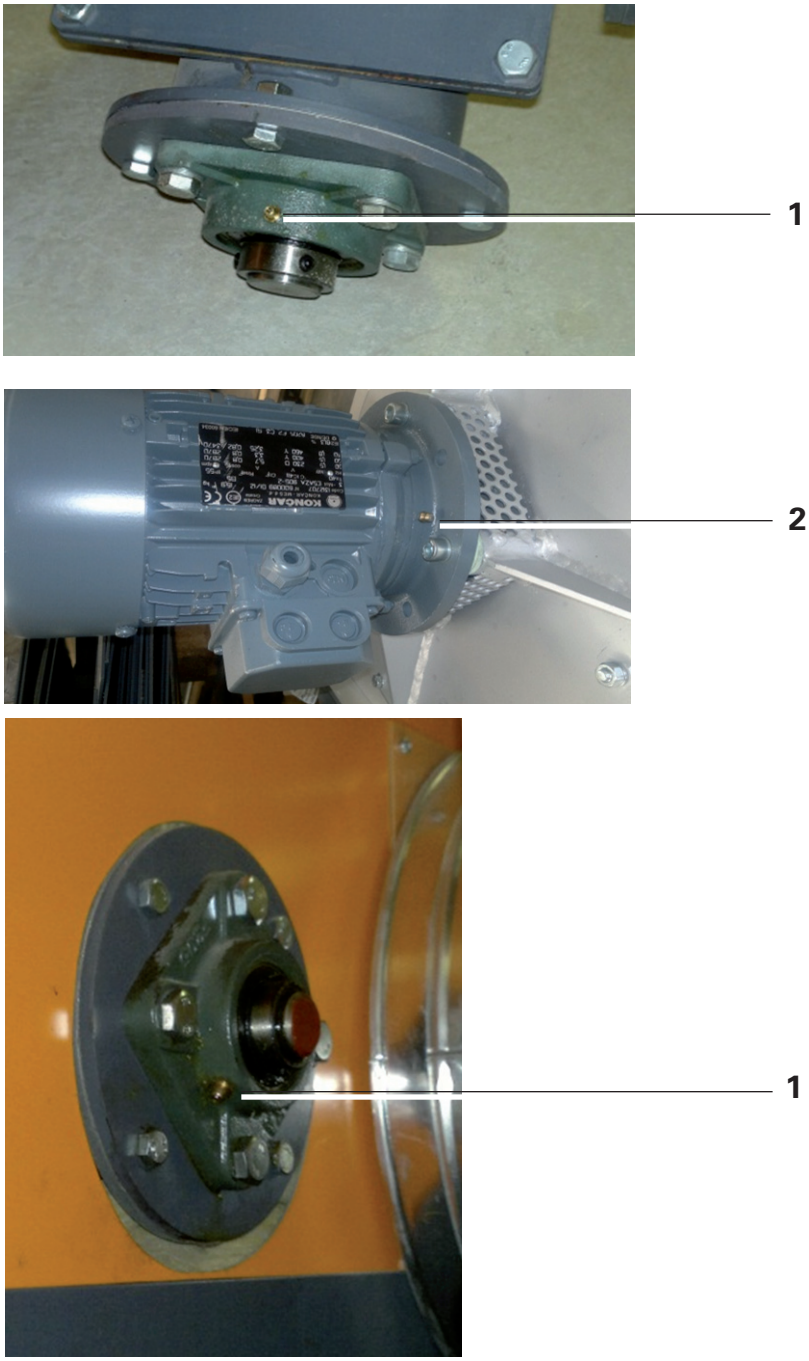


Fig. 18 Lubrication points

Item	Maintenance tasks	Lubricant
1	Lubricate flanged bearings, roller chains, and bearing points on screw conveyors	Multi-purpose grease, lithium saponified, e.g. High-performance lubricating grease Motorex FETT 3000 art. no. 6000.4374
2	Grease bearings on flue gas fans, generally 11 kW capacity and above	Special high-temperature grease, (up to 7.5 kW, usually permanently lubricated), e.g. High-performance lubricating grease Motorex FETT 3000 art. no. 6000.4374
3	Drive motors: Oil change	Transmission oil e.g. Mineral oil ISO VG 220 art. no. 6000.4376
4	Screw conveyor drive motors: Oil change	Transmission oil HD e.g. Mineral oil ISO VG 220 art. no. 6000.4376

Prevent mixture of different lubricants; it is particularly important that synthetic oils are not mixed with mineral oils.

Particularly important for large systems: Lubricate according to the lubrication plan!

The lubrication intervals and lubricant types must be complied with in accordance with the supplier documentation!

7 Disassembly and disposal

7.1 Disassembly

Schmid AG energy solutions strongly recommends that disassembly be carried out by our specialists. Schmid AG energy solutions assumes no liability for injury, damage to machinery or buildings resulting from improper disassembly performed by third parties.

⚠ WARNING!

Improper disassembly can cause damage to persons and to the building!

Before disassembly, it is essential to disconnect the power supply.

The competent authorities responsible for the operating permit must be informed immediately.

«1 Safety instructions» must be observed.

7.2 Disposal

If a system is extended or modified, any disassembled system components or subassemblies which cannot be reused must be disposed of in accordance with any applicable regulations. Local regulations for the disposal of equipment, operating media and system components must be complied with.

The system essentially consists of the following materials:

- Iron
- Casting (steel and cast iron)
- Refractory concrete lining
- Insulation mats
- Ash and slag residue
- Oils and lubricants

We recommend engaging the services of a local waste management company to ensure the materials are disposed of properly.

8 Spare parts

8.1 General

Schmid AG energy solutions strongly recommends that repair work be carried out by our specialists. Schmid AG energy solutions assumes no liability for injury, damage to machinery or buildings resulting from improper disassembly performed by third parties.

⚠ WARNING!

Danger - hazard from installation of third-party spare parts.

Installing spare parts from third-party manufacturers can result in injury and damage to the equipment! Under certain circumstances, the installation and use of such products may have a negative impact on and thus affect the safety of the system's design features.

In principle, only original components or those that are approved by Schmid AG energy solutions may be installed in the system.

Note:

The following spare parts lists correspond to standard systems (valid in March 2014). Customised modifications and technical further developments can result in deviations.

To receive the latest information on your system, please contact your respective customer service office.

8.2 How to order spare parts

Spare part order must include the following information:

- Plant type according to the details in the order confirmation, the operating instructions or the nameplate
- Production number
- System component
- Part description and item number
- Rough dimensions
- Number of pieces

8.3 Underfeed combustion system UTSK

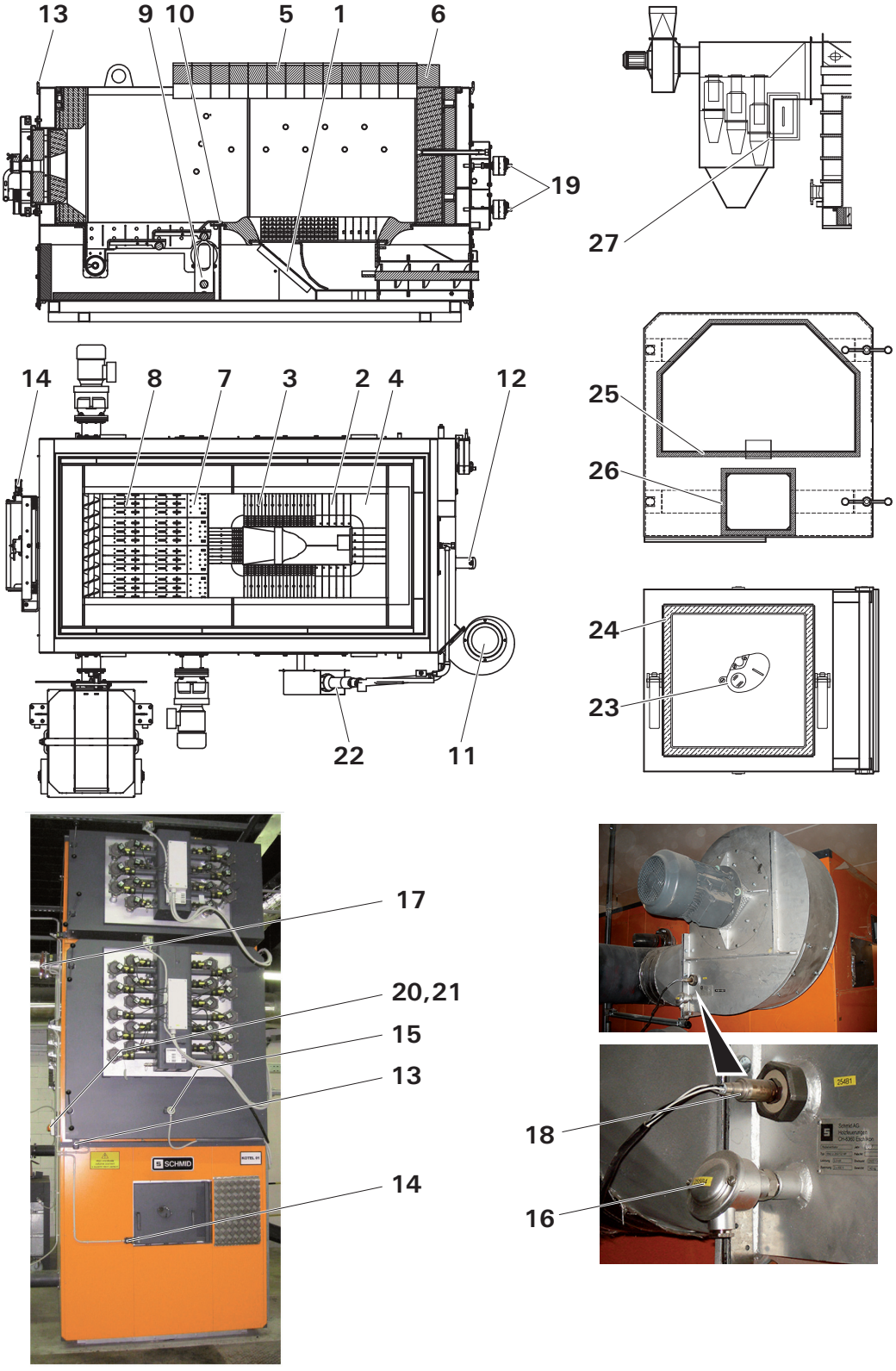


Fig. 19 Spare parts for the UTSK moving grate combustion system

8.3.1 UTSK 180 - 240

Item	Quantity	Description	Article no.	Notes
1	1	Combustion retort	4000.1691	
2	10	Grate rib, closed, 040mm GG25 short with recess	4001.1906	
3	14	Grate rib, open, 040mm GG25 short	2000.2120	
4	4	Corner piece, 040mm GG25 short	2000.2123	
5	8	Vault firebrick TE200Z pressed, brick 100x131.31x480	4002.0634	
6	1	Refractory arch stone A45t pressed, 480x145x80 / UTSK 180-240	4000.6795	
7	4	Cover plate UTSK 180/240	4001.3914	
8	8	Triple grate bar, UTSK 180/240	4001.3913	
9	1	Grate bar support UTSK 180/240	4001.3909	
10	0.55 m	Gasket KERA, ø010mm (1050º) type IR	6000.4181	For grate bar support
11	1	Supply air fan (IE3), CMP 718-2T, 0.75 kW/ 2880 rpm	2000.8743	
12	2	Air velocity sensor, IVL 20/105mm	2000.3678	
13	1	Limit switch, AZ 15 ZVRK-M16	2000.0015	
14	1	Safety interlock, AZM 161SK-12/03RK-024G	2000.7217	
15	1	Flame temperature sensor, 2xNiCr-Ni / Ø15x750mm	2000.0161	
16	1	Flue gas sensor, PT 100 incl. cable and connector	2000.0416	
17	1	STB 103° with PT100 compl., HWK	4001.4418	
18	1	Lambda sensor, NGK OZA-685-WW1	2000.6545	
19	2	Spring return actuator with Wieland connector NF24A-SR SE, AC/DC24V, 10Nm	2000.7235	
20	1	Differential pressure sensor, SDF-50-250U, incl. Low-pass filter	2000.0359	
21	0.3 m	Plastic hose, clear width ø5x1.5mm	2000.1357	For differential pressure gauge
22	1	Ignition blower, BAK-Eron 230V/ 3400W	2000.4304	Option
23	1	Mica glass, Ø048x0.5mm	2000.2070	For boiler door sight glass
24	1.6 m	Gasket Kera, 22x22mm (1050º) type IC	6000.1371	Seal for combustion chamber door
25	3.15 m	Gasket Kera, 30x30mm (550º) type SC	6000.1344	Seal boiler door
26	1.6 m	Gasket Kera, 30x30mm (550º) type SC	6000.1344	Seal boiler door
27	1	Insulation panel, 3x206x288	4001.3642	
28	1	Tube brush, Ø051x120 mm, G 3/8 inches	2000.1400	

8.3.2 UTSK 300 - 360

Item	Quanti-ty	Description	Article no.	Notes
1	1	Combustion retort	4000.1692	
2	12	Grate rib, closed, 040mm GG25 short with recess	4001.1906	
3	20	Grate rib, open, 040mm GG25 short	2000.2120	
4	4	Corner piece, 040mm GG25 short	2000.2123	
5	9	Vault firebrick TE200Z pressed, brick 100x164.7x580	4002.0625	
6	1	Refractory arch stone A45t pressed, 580x185x100 / UTSK-UTSR 300-360	4000.6794	
7	4	Cover plate UTSK 300/360	4001.3119	
8	8	Triple grate bar, UTSK 300/360	4001.3060	
9	1	Grate bar support UTSK 300/360	4001.3073	
10	0.6 m	Gasket KERA, ø010mm (1050º) type IR	6000.4181	For grate bar support
11	1	Supply air fan (IE3), CMP 820-2T, 1.1 kW/ 2880 rpm	2000.8686	
12	2	Air velocity sensor, IVL 20/105mm	2000.3678	
13	1	Limit switch, AZ 15 ZVRK-M16	2000.0015	
14	1	Safety interlock, AZM 161SK-12/03RK-024G	2000.7217	
15	1	Flame temperature sensor, 2xNiCr-Ni / Ø15x750mm	2000.0161	
16	1	Flue gas sensor, PT 100 incl. cable and con-nector	2000.0416	
17	1	STB 103° with PT100 compl., HWK	4001.4418	
18	1	Lambda sensor, NGK OZA-685-WW1	2000.6545	
19	2	Spring return actuator with Wieland con-nector NF24A-SR SE, AC/DC24V, 10Nm	2000.7235	
20	1	Differential pressure sensor, SDF-50-250U, incl. Low-pass filter	2000.0359	
21	0.3 m	Plastic hose, clear width ø5x1.5mm	2000.1357	For differential pressure gauge
22	1	Ignition blower, BAK-Eron 230V/ 3400W	2000.4304	Option
23	1	Mica glass, Ø048x0.5mm	2000.2070	For boiler door sight glass
24	1.6 m	Gasket Kera, 22x22mm (1050º) type IC	6000.1371	Seal for combustion chamber door
25	3.15 m	Gasket Kera, 30x30mm (550º) type SC	6000.1344	Seal boiler door
26	1.6 m	Gasket Kera, 30x30mm (550º) type SC	6000.1344	Seal boiler door
27	1	Insulation panel, 3x206x288	4001.3642	
28	1	Tube brush, Ø051x120 mm, G 3/8 inches	2000.1400	

8.3.3 UTSK 450 - 550/500 - 550

Item	Quanti-ty	Description	Article no.	Notes
1	1	Combustion retort	4000.1694	
2	15	Grate rib, closed, 040mm GG20 short with recess	4001.1819	
3	25	Grate bar open, 040mm GG20	2000.2119	
4	4	Corner piece, 040mm GG20	2000.2125	
5	13	Vault firebrick TE200Z pressed, 2-section, brick 100x188.8x690	4002.0622	
6	1	Refractory arch stone A45t pressed, 680x120x120 / UTSK-UTSR 450-1200	4000.6781	
7	4	Cover plate UTSK 450/550	4001.5198	
8	8	Triple grate bar, UTSK 450/550	4001.5106	
9	1	Grate bar support UTSK 450/550	4001.5101	
10	0.65 m	Gasket KERA, ø010mm (1050º) type IR	6000.4181	For grate bar support
11	1	Supply air fan (IE3), CMP 820-2T, 1.1 kW/ 2880 rpm	2000.8686	
12	2	Air velocity sensor, IVL 20/105mm	2000.3678	
13	1	Limit switch, AZ 15 ZVRK-M16	2000.0015	
14	1	Safety interlock, AZM 161SK-12/03RK-024G	2000.7217	
15	1	Flame temperature sensor, 2xNiCr-Ni / Ø15x750mm	2000.0161	
16	1	Flue gas sensor, PT 100 incl. cable and con-nector	2000.0416	
17	1	STB 103° with PT100 compl., HWK	4001.4418	
18	1	Lambda sensor, NGK OZA-685-WW1	2000.6545	
19	2	Spring return actuator with Wieland con-nector NF24A-SR SE, AC/DC24V, 10Nm	2000.7235	
20	1	Differential pressure sensor, SDF-50-250U, incl. Low-pass filter	2000.0359	
21	0.3 m	Plastic hose, clear width ø5x1.5mm	2000.1357	For differential pressure gauge
22	1	Ignition blower, BAK-Eron 230V/ 3400W	2000.4304	Option
23	1	Mica glass, Ø048x0.5mm	2000.2070	For boiler door sight glass
24	1.6 m	Gasket Kera, 22x22mm (1050º) type IC	6000.1371	Seal for combustion chamber door
25	3.4 m	Gasket Kera, 30x30mm (550º) type SC	6000.1344	Seal boiler door
26	1.74 m	Gasket Kera, 30x30mm (550º) type SC	6000.1344	Seal boiler door
27	1	Insulation panel, 3x206x288	4001.3642	
28	1	Tube brush, Ø051x120 mm, G 3/8 inches	2000.1400	

8.3.4 UTSK 700 - 900

Item	Quanti-ty	Description	Article no.	Notes
1	1	Combustion retort	4000.1697	
2	17	Grate bar closed, 040mm GG20	2000.2117	
3	33	Grate bar open, 040mm GG20	2000.2119	
4	4	Corner piece, 040mm GG20	2000.2125	
5	0			Brick-built vault
6	0			Brick-built vault
7	4	Cover plate UTSK 700/900	4001.7522	
8	8	Triple grate bar, UTSK 700/900	4001.7871	
9	1	Grate bar support UTSK 700/900	4001.7807	
10	0.75 m	Gasket KERA, ø010mm (1050º) type IR	6000.4181	For grate bar support
11	1	Supply air fan (IE3), CMP-922-2T-3, 2.2 kW/ 2880 rpm	2000.8582	
12	2	Air velocity sensor, IVL 20/105mm	2000.3678	
13	1	Limit switch, AZ 15 ZVRK-M16	2000.0015	
14	1	Safety interlock, AZM 161SK-12/03RK-024G	2000.7217	
15	1	Flame temperature sensor, 2xNiCr-Ni / Ø15x750mm	2000.0161	
16	1	Flue gas sensor, PT 100 incl. cable and con-nector	2000.0416	
17	1	STB 103° with PT100 compl., HWK	4001.4418	
18	1	Lambda sensor, NGK OZA-685-WW1	2000.6545	
19	2	Spring return actuator with Wieland connec-tor NF24A-SR SE, AC/DC24V, 10Nm	2000.7235	
20	1	Differential pressure sensor, SDF-50-250U, incl. Low-pass filter	2000.0359	
21	0.3 m	Plastic hose, clear width ø5x1.5mm	2000.1357	For differential pressure gauge
22	1	Ignition blower, BAK-Eron 400V/ 5600W	2000.8254	Option
23	1	Mica glass, Ø048x0.5mm	2000.2070	For boiler door sight glass
24	1.6 m	Gasket Kera, 22x22mm (1050º) type IC	6000.1371	Seal for combustion chamber door
25	4.07 m	Gasket Kera, 30x30mm (550º) type SC	6000.1344	Seal boiler door
26	1.81 m	Gasket Kera, 30x30mm (550º) type SC	6000.1344	Seal boiler door
27	1	Insulation panel, 3x206x288	4001.3642	
28	1	Tube brush, Ø051x120 mm, G 3/8 inches	2000.1400	

8.4 Automatic boiler tube cleaning unit

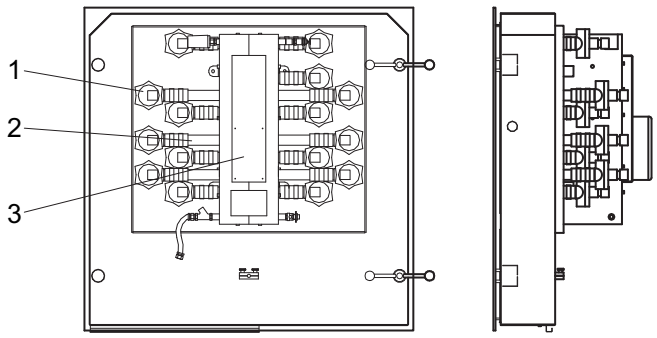


Fig. 20 Automatic boiler tube cleaning unit

UTSK 180 ... 550

Item	Quanti-ty	Description	Article no.	Notes
1	6	Valve diaphragm, Viton, ASCO G 1 1/2 24/DC	2000.3468	
2	12	Hose to AKP, Ø64/50, L= 85mm, black	2000.5310	
3	24	Hose clips Ø60-63mm	2000.5281	

UTSK 700 ... 900

Item	Quanti-ty	Description	Article no.	Notes
1	15	Valve diaphragm, Viton, ASCO G 1 1/2 24/DC	2000.3468	
2	30	Hose to AKP, Ø64/50, L= 85mm, black	2000.5310	
3	60	Hose clips Ø60-63mm	2000.5281	

8.5 Automatic ignition unit

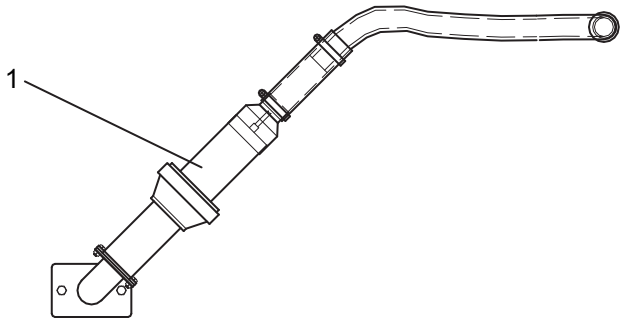


Fig. 21 Automatic ignition unit

UTSK 180 ... 550

Item	Quanti-ty	Description	Article no.	Notes
1	1	Ignition blower, BAK-Eron 230V/ 3400W	2000.4304	3.4 kW
2	1	For Leister Elektron heating unit 2A, Leis-ter Elektron 2A Typ32, 3st	2000.1288	

UTSK 700 ... 900

Item	Quanti-ty	Description	Article no.	Notes
1	1	Ignition blower, BAK-Eron 400V/ 5600W	2000.8254	5.6 kW
2	1	Heating insert to Leister 2750 +2750W, 400 V, type 39A1	2000.8562	

8.6 Back fire protection BRA

Fig. 22 Back fire protection BRA

UTSK

Item	Quanti-ty	Description	Article no.	Notes
1	1	Extinguishing water valve, AVTA 20 3/4 inch 50-90°C	2000.0956	Complete, probe, corrugated tube and valve

8.7 Flue gas recovery (option)

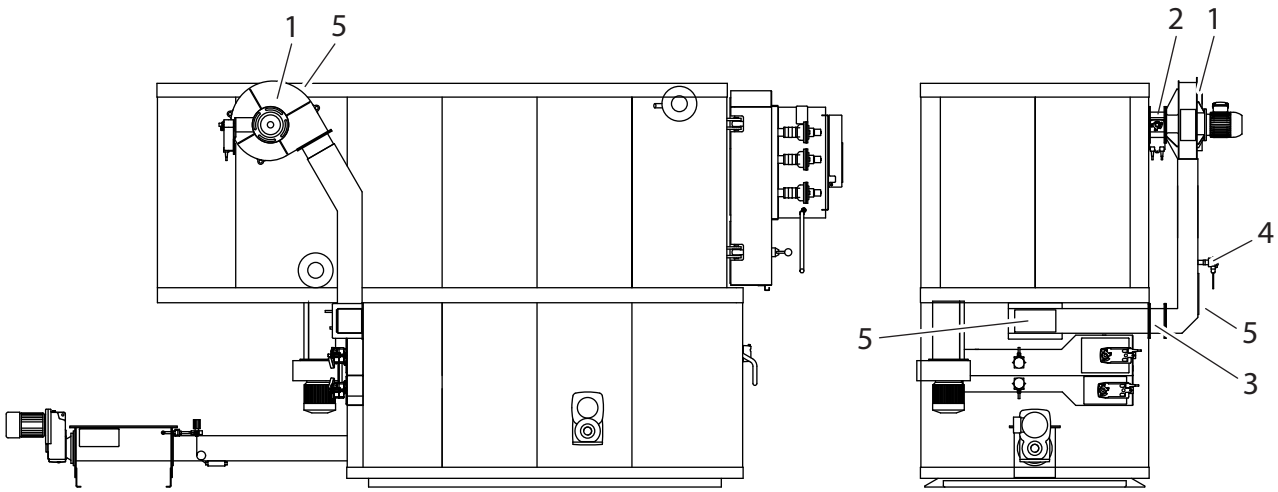


Fig. 23 Flue gas recovery

Item	Designation
1	Recirculation fan
2	Check flap valve
3	Swing-type check valve
4	Temperature monitoring
5	Cleaning openings

Boiler size	Flue gas recovery (mm)
UTSK-180-240	120 / 100
UTSK-300-360	120 / 100
UTSK-450-550	150 / 150
UTSK-700-900	150 / 150

Dimensions, part numbers

Boiler size	Recirculation fan		Check flap valve		Swing-type check valve	
	Item no.	Type	Item no.	Dimension	Item no.	Dimension
UTSK-180	4000.9955	RHS 160/ 1.1 kW / 2800 rpm	2000.6836	ø160	4001.4235	150 x 150mm
UTSK-240						
UTSK-300						
UTSK-360						
UTSK-450						
UTSK-550						
UTSK-700						
UTSK-900						