

Installation & Operation Manual



AUTOMATIC BIOMASS BOILERS & ACCESSORIES SUPERMAX 150 - 500 kW

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1. INTRODUCTION

Dear Customer,

Manufacture and development of a device like the biomass boiler receives great and permanent attention in the manufacturing plant in order to achieve maximum quality, reliability and safety of the product. Inasmuch as it is a combustion device, it is absolutely necessary for the operator to observe some simple, yet important rules.

Its reliability and safety is also determined by quality installation and observance of standards and legal regulations regarding installation and operation of the device.

Installation and commissioning of the device can only be done by a person with proper qualification. Putting into operation can only be executed by persons trained and provably authorized by the manufacturer.

In conformity with legislation in force in the given country, the plant operator is obliged to produce operating regulations of the boiler room.

Operation and operating maintenance can only be done by a person properly and provably trained by the manufacturer or installation company. As an integral part, the operator training must include:

- safety information
- operating maintenance, service openings, lubricating places
- control device and standard operation
- failure states and their solution

Before putting the device into operation, read the manual closely and carefully!

Risk analysis

Imminent risks during installation, operation and maintenance of the boiler can be divided into the following categories:

- handling of heavy loads
- shock hazard
- wood gas explosion hazard
- burns caused by contact with hot parts of the equipment
- poisoning by toxic gases, particularly carbon monoxide
- moving parts of the boiler

Familiarize yourself with the risk analysis in chapter 2 in detail.

1.1 INTRODUCTORY PASSWORDS

ASHES – must be fine, without slag, of grey colour. They must not contain unburned fuel.

AUTOMATIC IGNITION – the fuel is ignited by hot air. To evaluate that the boiler is burning, the specified flue gas temperature must be achieved. At the same time, the flue gas temperature must be higher than the current boiler water temperature.

BOILER SMART – is an automatic device working by the program and settings done by the service company during commissioning of the device.

CHIMNEY – the flue gas ducting works in under-pressure mode before the cyclone, and in overpressure mode behind the cyclone.

CHIPS – crushed wood material, permitted fraction P30, M30. This means the grain size of 30 mm, moisture of 30 %.

COMMISSIONING – activities connected with the boiler assembly, connection to the heating system, chimney and electric supply system, as well as activities connected with setting of operating parameters. They can only be done by an authorized person.

CONFIGURATION – during installation of the boiler, the method of its control must be pre-set. The boiler is always controlled by the EXT ON/OFF signal. Further, control from the storage bin, through the KNX busbar or by 0-10V signal can be used. It is also possible to specify peripheral devices connected to the boiler. It is set in the “i” menu after entering the password.

DATA – Keep the table of operating parameter settings in a written form for the purpose of check and necessary resetting. We recommend that the service company make use of the “FACTORY SAFE” function after optimizing the operating parameters. The data will be saved safely and can be reactivated any time.

GREEN LED – indicates that the boiler is in the UP Keep mode.

HIGH DRAUGHT – must be eliminated by means of a draught damper in the chimney part behind the cyclone. Too high draught would affect the combustion process without a possibility of control. In the damped mode, it could even maintain the fuel backfire process.

LOW DRAUGHT – low chimney draught is eliminated by exhaust fan.

PELLET – wood pellet is a quality fuel made by pressing wood material. Pellets of the 6–20 mm diameter can be used.

RED LED – indicates a failure. The current failure can be found in the Alarm List after clicking on the button with the red flashing LED. The failure history can be found in the Alarm History after pushing the same button twice.

SILO – when filling the silo with fuel, check the position of the flexible arms. If they are extended, start up the feeder shortly after adding approx. 0.5 m of pellets or approx. 1.0 m of chips. Use the User setting/Conveyor2/On – Off function.

SILO – the correct setting of the slot through which the fuel falls to the screw is 4 cm for pellets and 12 cm or more for chips. The gap size depends on the fuel fraction.

START – before putting the boiler into operation, check the proper connection and correct function of all boiler parts. Use the “Check list” document as a guide.

START – after switching the boiler on, check filling of the intermediate bin with fuel. Filling up is done automatically after the pre-set delay time (3–5 min) and opening of the safety fire damper.

START – before the first start, it is necessary to ensure that the fuel is brought up to the burner. Start burner 1 repeatedly until the fuel gets into the burner. Check the correct level through the inspection door.

YELLOW LED – indicates that some of the device is in the manual control mode.

2. SAFETY

To ensure safety and protection of health and property, observe, besides the generally known regulations, the following simple principles as well:

- Before putting the device into operation, read carefully the operating instructions, paying particular attention to safety instructions. If in doubt, look for the pertinent passages in this manual.
- Always carefully close all lids, manholes, covers of moving mechanical parts and electric parts.
- When opening the boiler door, take care that no smoke or sparks escape outside the boiler space. Never leave the boiler door open unattended.
- Never open the combustion chamber or any part of the boiler if the boiler is in the ignition mode. There is a danger of wood gas explosion.
- Provide for sufficient supply of fresh combustion air to the boiler room and protect it from low temperatures. Air inlet and exhaust openings of the boiler room must always be free and periodically checked.
- To improve combustion, never use flammable liquids or volatile matters.
- Regularly perform operating maintenance activities; service work must only be done by the manufacturer or an authorized service organization.
- During maintenance of the boiler or if covers are opened or removed, the boiler must always be isolated from electric power supply.
- Except for the actual fuel in corresponding amount, no combustibles or flammable liquids can be stored in the boiler room.
- A functional hand-held fire extinguisher – carbon dioxide or powder - must be located at a suitable place. The powder fire extinguisher is not suitable for extinguishing electric circuits.
- The device can only be operated with fuels specified by Wood Energy Solutions.
- Do not make any sudden and unauthorized changes in the device settings or shutdown.
- If emergency extinguishing equipment has been activated, this must in any case be connected with the failure of the device. In your own interest, contact our customer service immediately.
- In case of problems, we are always available to you on the phone numbers indicated on the first page of this manual.
- According to law, automatic combustion of biomass must be provided with equipment preventing backfire along the transport channel to the fuel storage. Our device is equipped with the following safety measures:

- i. The screw feeder channel and intermediate bin have a totally tight design up to the backfire damper. Thanks to that, the backfire is stifled due to lack of air. The damper is opened and closed by a position motor. The fuel transport does not start until the damper is fully open. In case of power supply fault or failure, the damper is closed automatically by a spring. If maintenance work is done, the damper must be closed, except for work directly related to it.
 - ii. The emergency extinguishing device at the screw channel of the fuel feeder is used as the last resort in extraordinary situations. It consists of a safety thermostatic valve with the opening temperature of 95 °C, water container and water level sensor in the container. The capillary of the safety thermostatic valve is located in a tube welded at both ends to the screw conveyer channel of the fuel feeder. The valve is connected to the container (with a discharge valve which must be in the opened position) filled with water. If the extinguishing device is activated, fuel in the fuel feeder channel is flooded, the glowing fuel is extinguished, contact of the water level float sensor in the container is opened and the boiler stops.
 - iii. The fuel channel temperature is continually measured and checked at two points. If the fuel channel temperature rises, the fuel is pushed to the burner in a controlled way.
 - iv. If the boiler is in the state when no thermal energy production is required, fuel is not supplied to the intermediate bin.
- If due to a failure the boiler is overheated to a temperature higher than 95 °C, the safety thermostat shuts down the device. If the temperature is higher than 100 °C, do not open any valves or fittings which would cause reduction of water pressure! Steam would be generated in this way and the operator may be scalded.
 - The device can only be installed and put into operation by an authorized and qualified person.
 - i. Persons authorized to install the device are those with the corresponding valid professional competence:
 - in electric engineering
 - in heating engineering
 - in chimney sweepingThese persons must be provably familiarized with the properties and requirements imposed on the SUPERMAX boilers. These can be juristic or natural persons.
 - ii. Persons authorized to put the device into operation are only those trained by the manufacturer, with valid certificate. If the certificate has been issued for a juristic person, the person is responsible for professional competence of its employees.
 - iii. Persons authorized for operation – persons provably competent and trained in operation and maintenance of the device. As a rule, training is done by the person putting the device into operation.
 - Relevant standards and regulations In case of installation in other countries in which the standards differ from those indicated in the appendix or the legislation in force is not harmonized, the installation company is obliged to consult the manufacturer about the deviations and ask for a written statement. Without this procedure, the manufacturer cannot bear responsibility for safe and reliable operation of the device.
 - Risk analysis

Risks during normal operation of the boiler and its accessories

Risk source	Risk effect	Risk elimination
Boiler body	Burn on the internal inspection door if the external door is open; scorching of hands or face at the moment of opening the inspection door.	Use protective gloves and goggles if opening the door. The internal door is in direct contact with flue gases and can reach a temperature of up to 400 °C. When opening the inspection door, stand so that the possible escape of hot flue gases does not hit any part of your body, particularly eyes. The danger lasts for a few seconds until the combustion chamber underpressure equalize automatically.
Ash pan	Hand injury, burn on the ash pan. Removal of ashes from the pan.	Handle the ash pan only by the grips intended for this purpose. Dispose of the ashes at the dedicated places. The ashes may still be glowing; therefore, store them only at the dedicated places.
Rotary parts of the boiler	Injury of hands or other parts of the body by moving or rotating parts of the boiler.	Always open the lid or protective cover only after safely disconnecting the rotating parts and their drives from electric power supply.
Discharge channel and discharge wheel	Serious injury of limbs by leaf springs during work in the fuel reservoir bin.	If you, for some reason, need to relocate fuel in the bin, remember that the leaf springs are wound around the discharge wheel, so when the fuel is removed from them, they are unloaded and unfolded. Therefore, never do that work alone, use tools of a sufficient length; the boiler must be switched off !!!

Risks during normal operation of the boiler and its accessories

Risk source	Risk effect	Risk elimination
Always do the maintenance if the device is switched off. Disconnect the boiler with the main switch on the boiler switchboard.		
Chain gears, bearing lubrication	Scratching, cutting, fall off the ladder during lubrication of the turbulator bearings. Slipping on grease. Falling of tools. Self-start of the motor	Use protective gloves. Handle the protective covers carefully. Put them to safe places so that they cannot restrict you during work. Do not place tools on inclined surfaces at the boiler edge, between the turbulators, etc. Disconnect electric power supply.
Combustion chamber	Burning, inhalation of dust, affection of eyes with dust.	If the boiler has not been shut off for a sufficient time, parts of the burner may still be hot; therefore, use protective gloves. Use protective goggles and breathing mask when cleaning the combustion chamber. The recommended shutdown time is 4 hours.
Ignition mode	Wood gas explosion.	Never open the combustion chamber or any parts of the boiler, if the boiler is being ignited and does not burn evidently.
Electric wiring	Electric shock.	Only intervene in the electric wiring after the device has been switched off on the main switch for at least 2 minutes.
Insufficient flue gas exhaust	Low under-pressure or blocked flue ducting. Imminent poisoning with carbon monoxide.	Check the under-pressure on the display. Inspect and clean the chimney systematically and regularly.
After completing maintenance work, before putting the boiler into operation again, check whether all covers are placed correctly and locked. See that you have all tools with which you started your work to prevent an unexpected collision.		

3. GUARANTEE AND CLAIM CONDITIONS

Automatic biomass boilers SUPERMAX 150 – 500 kW

WOODCO ENERGY provides for its products a guarantee for the period of 24 months from putting the device into proper or test operation; however, no longer than 27 months from the date of dispatch of the product from the manufacturing plant.

WOODCO ENERGY provides for the boiler body of the combustion chamber and exchanger a guarantee for the period of 63 months.

The guarantee does not apply to parts which should be considered consumer material. These include:

- Ceramic reflector
- catalogue number MTC00001, MTC00002, MTC00003
- Glowing spiral of the ignition gun
- catalogue number MET00001
- Relevant parts specified in a purchase subcontract

Justified claim and demand for delivery or replacement of a faulty part or demand for setting of the device to operating parameters specified in the device technical documentation is only possible under these conditions:

- There are no pending liabilities related to the claimed device after the due date.
- The boiler has been constantly stored and operated under the conditions specified by the manufacturer (climatic effects, mains voltage, fuel, regular maintenance, chimney body and flue gas exhaust, heating circuit quality and functionality, heating water quality).
- The device has been put into operation by a person or company (hereinafter the “person”) authorized by the device manufacturer.
- The person who has put the device into operation has provably sent to the manufacturer’s address the boiler operating parameters table filled in at commissioning.
- The fuel used is in full conformity with the fuel parameters for which the product was certified.
- Maintenance and service are carried out properly and responsibly in conformity with the operating manual, of which is kept a regular record.
- A copy of the record is regularly sent to the manufacturer once in three months.
- By request, the operator shall enable the manufacturer’s employees to inspect the device any time and without restrictions. Refusal of the inspection may be the reason for dismissal of a guarantee claim or termination of the guarantee conditions.
- A defect can only be claimed by an authorized person who ordered the boiler with the manufacturer pursuant to the contractual and business conditions, and to whom the boiler and its accessories were subsequently delivered.

The guarantee rights expire:

- If the guarantee period has expired.
- In case of incompetent installation or installation by an unauthorized person.
- In case of incompetent handling, operation, manipulation or neglected care.
- If protective seals or labels are impaired, provided parts of the device are equipped with them.
- If instructions specified by the manufacturer or supplier of the device are not observed.
- In case of connection to an incorrect voltage system or a system with unstable parameters
- In case of use of parts or elements which were not supplied or their use was not provably approved by the manufacturer.
- The guarantee expires if the goods were damaged by force majeure – acts of God.

Claims of incomplete or damaged partial deliveries:

- Claims regarding quantity and quality of the supplied goods are made in writing upon visual check within receipt of the goods by the purchaser.
- If the supply is apparently damaged at the delivery by the transport company, or it does not comply with the data indicated on the delivery note, the purchaser shall not take over the goods from the transport company unless a report on damaged goods or incomplete delivery is made and the necessary documentation produced. The purchaser shall also record the inconsistency in the international CMR way-bill. The report and documentations shall be signed by the purchaser's representative and the driver. The subject who ordered the transport will then lodge a claim on the goods damaged in this way with the transport company.
- Claims regarding quantity and quality of goods can be lodged within 3 (three) working days from the date of delivery and signing of the acceptance report.
- Claims regarding later findings as to inappropriate quantity or quality of the goods supplied may not be admitted by the seller without giving any reason.
- Claims shall be lodged for every partial delivery of goods separately.
- The claim shall be sent by post or e-mail together with records and documents proving this fact. If the claim is lodged by e-mail, its receipt must be confirmed by the seller's representative. Unless the seller confirms the receipt, the claim is considered not to be delivered. After receiving the claim by e-mail, the seller is obliged to confirm its receipt to the purchaser immediately.
- The date of sending the claim is the date of the postmark of the purchaser's country. The date of receipt of the e-mail is the date on which the e-mail receipt was confirmed by the seller.
- The purchaser shall supply missing goods or replace low-quality goods with quality ones immediately, but no later than 15 calendar days after the claim was received if the claim was confirmed as valid.

Ways of lodging a claim:

In the claim, the purchaser shall state in writing:

- Type and serial number of the boiler or goods.
- Installation and commissioning date.
- Name of the installing company.
- Kind of failure and detailed description of how it manifests itself, possibly with photographic documentation.
- Description of the cause of the failure, if it is apparent or known.
- Copy of the report on service and inspections of the device.

Ways of settling a claim:

- The purchaser shall send at its own expense the defective part to the manufacturer's address so that it can be further claimed, unless the parties to the contract agree that the part need not be sent.
- The defective part must be packed and designated properly so that it cannot further be damaged during transport.
- If the claim is legitimate, the manufacturer shall send a new faultless part at its own expense.
- If required by the situation, the manufacturer or supplier shall send by previous agreement its specialist in order to remove the failure. The claimant is obliged to settle the costs related to this journey in entirety if it is proved that the claimant has not removed the failure owing to its incompetence or neglect of its duties or provisions of granting and duration of guarantee conditions have been violated.
- If the claim is not legitimate, the purchaser is not entitled to free delivery of the spare part or free execution of the repair.
- Costs related to the defective part replacement within the guarantee period shall be settled by the purchaser.
- Repairs or service missions executed after the expiry of the guarantee period are always defrayable.

The address for settling claims:

Wood Energy Solutions,
Unit D, Cahir Business Park,
Cahir,
Co. Tipperary
Ireland

Wood Energy Solutions
Booths Hall,
Chelford Road,
Knutsford
England WA16 8GS

E-mail: info@woodenergysolutions.com

Tel.: +353 52 7445330

4. DETAILED DESCRIPTION OF CONTROL UNIT

4.1. MAIN MENU

After you switch the boiler on, the basic screen appears on HMI. Some data and items are displayed permanently.

According to the current system configuration (see chapter 4.3), some data and items are displayed only if the selected peripheral devices are on.

Main menu description:

SMART HEATING TECHNOLOGY	1/24	
01/01/13	xxxxxxxxxxxx	12:51
Burner	NO DEMAND	
Power	0.0%	
Timing	0.0s/ 0.0s	
B9 Outs.Temp	-9.6°C	
Boiler Temperature	75°C 64.0°C	✓
Boiler return Temp.	55.0°C	

SMART HEATING TECHNOLOGY	14/24	
Exhaust gas Temperature	112.6°C	
Pressure sensor	1.8bar	
Oxygen sensor	9.2%	
Underpressure	25.0Pa	
Backfire Temp.Upper	23.6°C	
Backfire Temp.Lower	18.4°C	
B4 Buffer top	55.0°	✓

SMART HEATING TECHNOLOGY	21/24	
B41 Buffer bottom	0.0°C	
B1 Flow HC1	0.0°C	
User		
Service		
Language selection		✓
Password enter		

SMART HEATING TECHNOLOGY	21/24	
User		
Service		
Language selection		
Password enter		
Hours run		
Servis confirmation		✓

Burner

A information on heat supply request. Displayed operating states include: NO REQUEST/ON/STANDBY/UP KEEP/IGNITION.

Power [%]

A information on current boiler output [30%–100%]. The output value is calculated from fuel dosing. The value is informative and may not correspond to the actual output. Correct dosing, corresponding to the fuel used, shall be set by the technician during boiler commissioning.

Timing [s/s]

A information on current fuel dosing rhythm. The dose timing is smoothly controlled by the boiler controller according to the burner output required.

B9 Outs. Temp [°C]

C information on momentary outside temperature (-50 °C – 50 °C).

Boiler Temperature [°C]

A information on current outlet water temperature of the boiler (60 °C – 85 °C).

Boiler return Temp. [°C]

A information on current return water temperature of the boiler.

Exhaust gas Temperature [°C]

A information on current flue gas temperature (90 °C – 150 °C).

Pressure sensor [Pa]

C information on current water pressure in the system (0–6 Bar).

Oxygen sensor [%]

C information on current oxygen value in flue gas (7% – 12%).

Under pressure [Pa]

A information on current combustion chamber underpressure (25 Pa / 8 Pa).

Backfire Temp.Upper [°C]

A information on current temperature at the upper end of flue duct (≤ 40 °C).

Backfire Temp.Lower [°C]

A information on current temperature at the lower end of flue duct (≤ 40 °C).

B4 Buffer top [°C]

C information on current temperature in the storage bin - upper temperature (0 °C – 85 °C).

B41 Buffer bottom [°C]

C information on current temperature in storage reservoir – lower temperature. (0 °C – 85 °C).

B1 Flow HC1

C information on current temperature in heating cycle 1.

Room HC 1

C information about the request on heating in to heated space or information on temperature inside of reference room (based on selected room sensor).

User

A entry into the user menu.

Service

A entry into the service menu – after the password is entered.

Language selection	A	entry into the menu for selection of required language.
Password enter	A	entering the password for entry into the service menu.
Hours run	A	entry into the menu with information on operating hours of functional parts of the boiler.
Service confirmation	A	entry into the menu for confirmation of required service actions.

Note:	[xx]	measured value
	(zz)	operating values normally achieved during regular operation
	A	the value is displayed permanently (Always)
	C	the value is displayed after system configuration (Config), chapter

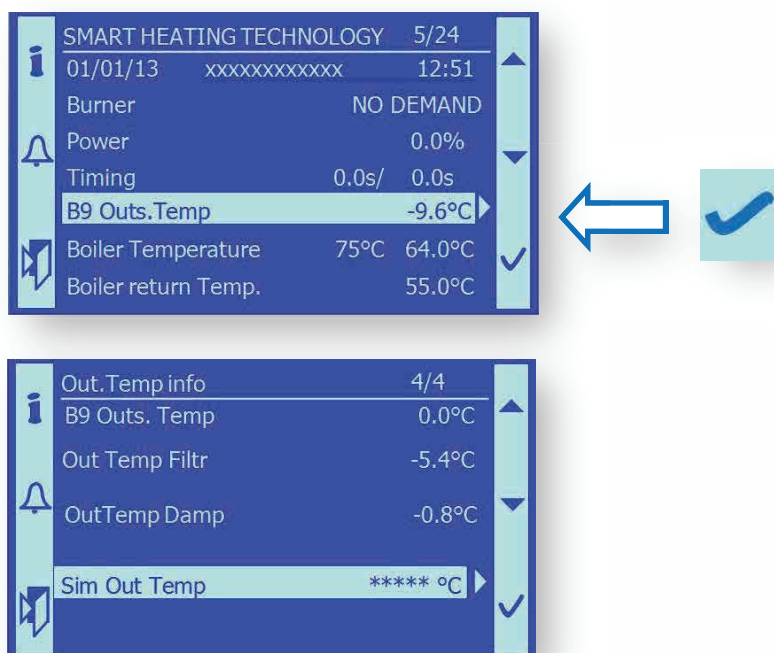
4.1.1. Outside Temperature

The value is only displayed if control of the heating circuit HC1 is enabled in the system configuration (chapter 10.3). The heating circuit is working in the Equitherm regulation mode and the outdoor temperature is one of the input values effecting control.

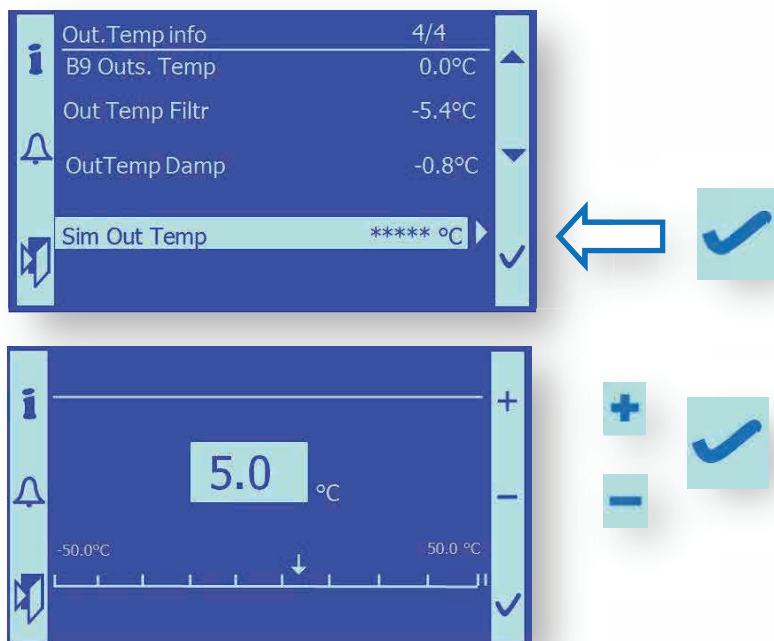
To facilitate overview to the operator, it is not only possible to view the momentary value of outdoor temperature, but also have information on filtered outdoor temperature and attenuated outdoor temperature. These variables are controlling variables in the Equitherm regulation process.

Hardware: Temperature sensor QAZ34, connection to terminals X1.105, X1.106.

Converted values of outdoor temperature can be obtained after opening the menu.

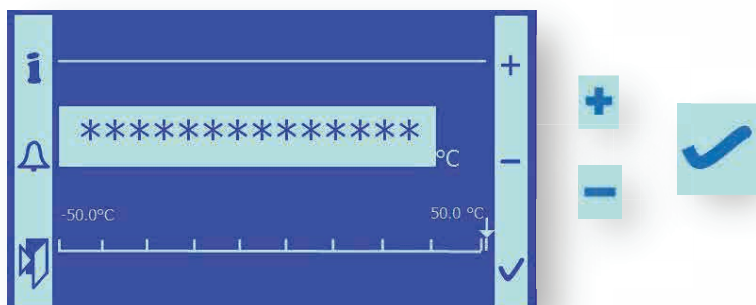


For the purpose of service, testing or contingency operation, the outdoor temperature value can be simulated by setting its required value:



Now the system works with the pre-set outdoor temperature, not the actually measured one.

To use the actual outdoor temperature variable, it is necessary to return temperature measurement to the AUTOMatic mode.



4.1.2. Pressure in the System

The value is only displayed if measuring of the water pressure in the system is enabled in the system configuration (chapter 10.3). Since June 2013, this safety element has been installed in the manufacturing plant by default.

Hardware: Pressure sensor QBE9210-P10, connected to terminals X1.101 - +24V, X1.102 – GND, X1.104 – input 0-10V

SMART HEATING TECHNOLOGY 14/24	
Exhaust gas Temperature	112.6°C
Pressure sensor	1.8bar
Oxygen sensor	9.2%
Underpressure	25.0Pa
Backfire Temp.Upper	23.6°C
Backfire Temp.Lower	18.4°C
B4 Buffer top	55.0°C

Pressure sensor 4/4	
P Low Limit	0.0bar
P High Limit	6.0bar
Pressure min	0.8bar
Pressure Critical	0.5bar



The service technician shall set the required values of system pressure.

The values are set by pressure conditions according to the specific installation.

If the water pressure drops below the Lower pressure limit value (0.8 bar), the boiler control system indicates pressure loss by an error message.

Important notice: If the system water pressure drops below the critical pressure, the boiler operation is stopped in a controlled way to prevent damage to the device.

Note: Red LED is flashing and the failure is recorded in the Alarm list

Note: If the system pressure increases, error indication persists. After the failure has been removed, the device must be enabled by a service technician or maintenance worker.
The pressure loss is saved in the failure list.

4.1.3. User Menu Entry

The User settings menu enables a trained operator (user) to set some of the functional parameters. This menu also enables checking of the current state of the individual devices.

SMART HEATING TECHNOLOGY 21/24	
User	
Service	
Language selection	
Password enter	
Hours run	
Servis confirmation	



Note: Detailed description of the User settings menu is in chapter 10.4.

4.1.4. Service Menu Entry

The service menu can only be accessed after the password has been entered, see chapter 10.1.6. Pertinent levels of program equipment can be accessed by the level of the password entered. The Service menu enables all settings of the boiler operating parameters.

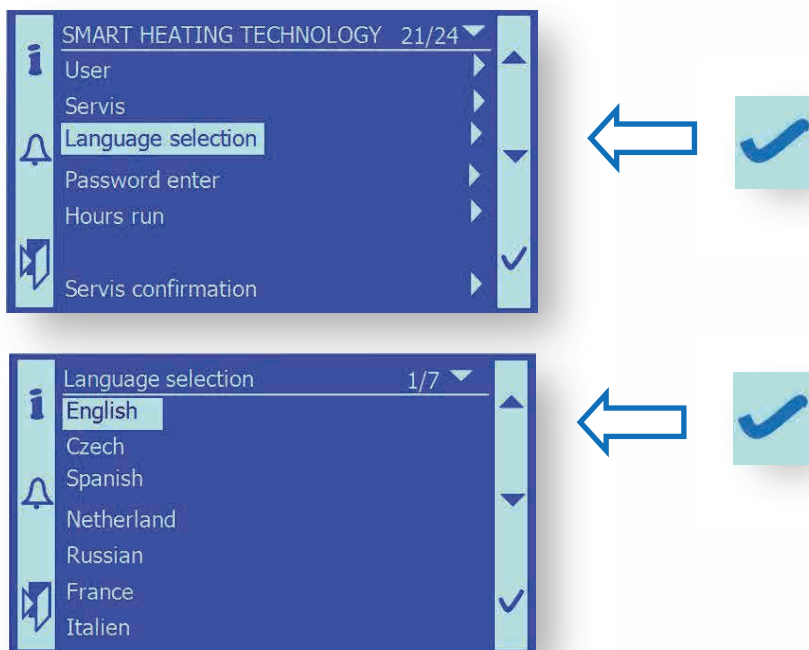



Note: Detailed description of the User settings menu is in chapter 10.5.

4.1.5. Language Selection

In conformity with the requirements of valid legislation, communication with the device operator must be carried out in the official language valid in the place of installation.

By language selection you can set the national mutation of the program equipment.



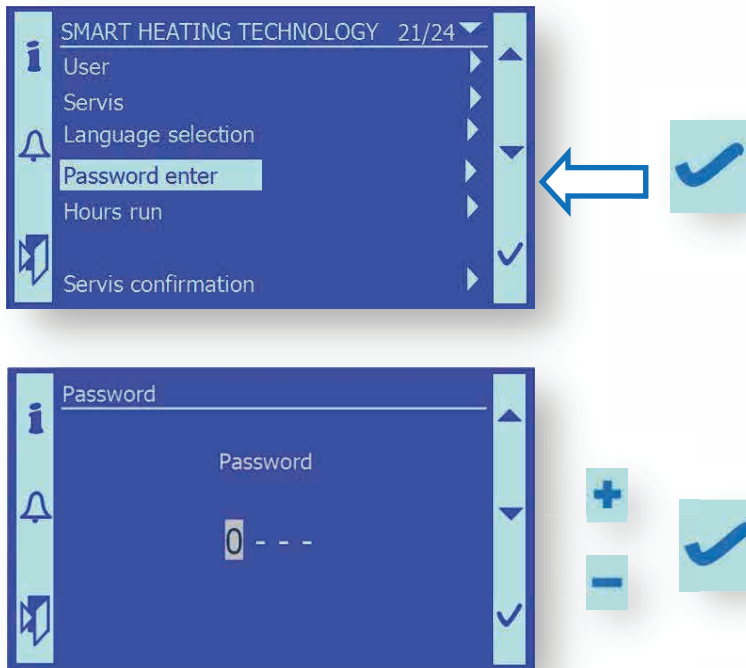
After you confirm the language setting with the Enter button  , the HMI communication will be carried out in the language selected.

4.1.6. Password Entry

To prevent unauthorized manipulation with the device, access to some areas of the program equipment is restricted by means of controlled access via a password.

The access passwords have 3 levels of importance.

After you enter the password, a key symbol appears in the top right-hand corner. According to the entered password level, 1, 2 or 3 keys are displayed.



Set all 4 figures of the access password with / keys and confirm them with .

After you enter the password, a key symbol appears in the top right-hand corner. According to the entered password level, 1, 2 or 3 keys are displayed.

If the password has been entered correctly, you can continue by switching to the Service menu; see chapter 10.5.

4.1.7. Operating Hours Menu Entry

The machine operating hour statistics, available after entry into this menu, is an informative service for the customer or service technician.

Here the real machine time of selected parts of the boiler is displayed.






After you enter the Operating hours menu, real time values are displayed for which the individual monitored parts of the boiler have been in operation:




Act.Time operation	- total time for which the boiler was in operating mode (output 30-100%).
Act.reduce time	- total time for which the boiler was in standby, without output requirements.
Deasching	- total time for which the ash discharge screws were active (M3).
Burner cleaning	- total time for which the grating process was active (M6).
Exchanger cleaning	- total time for which the cleaning process was active (M4,M5).
Exchanger deasching	- total time for which ash discharge under the exchanger was active (M7).
Boiler pump	- total time for which the boiler pump was running, including rundown times.
Conveyor 2	- total time for which fuel was supplied from the silo to intermediate bin).
Feeder 1	- total time for which fuel was fed to the burner (M2).
Ignition	- total time for which the hot-air gun was active.
Exhaust Damper	- total time for which the damper was in the "Exchanger" position.
Oxygen sensor	- total time for which the sensor was active, measuring residual O2.

Note: The   keys enable browsing the display in order to view all values of operating hours.

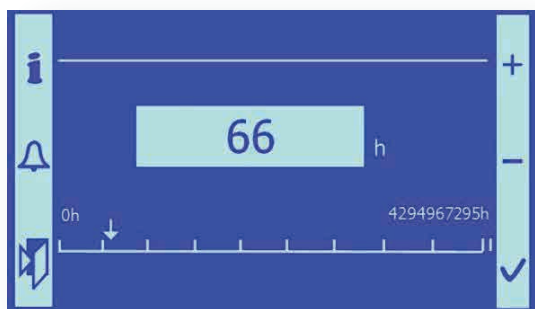
Important notice: If the program version is updated and SW application reloaded, the operating hour counters are reset. Before loading a new program version, note down all the data carefully and enter them in the counters again after reloading!

Houf run	1/12	
 Act.Time Operation	132,5h	▲
Act.reduce time	84,0h	▶
 Deasching	3,6h	▶
Burner cleaning	10,8h	▼
Exchanger cleaning	8,0h	▶
Exchanger deasching	1,2h	✓
 Boiler pump	144,6h	▶



Reset hours run	1/12	
 Act.time operation	0h	▲
Act.reduce time	0h	▶
 Deasching	0h	▶
Burner cleaning	0h	▼
Exchanger cleaning	0h	▶
Exchanger deasching	0h	✓
 Boiler pump	0h	▶



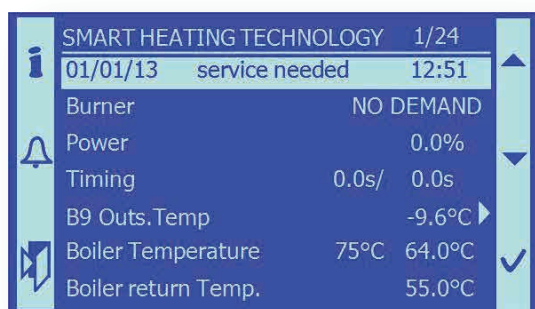


In the above way, set the operating hours of all elements monitored to the values valid before SW was changed.

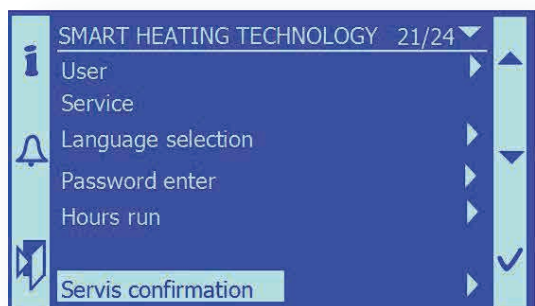
4.1.8. Service Menu Entry

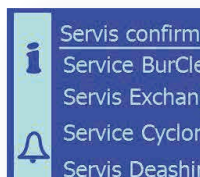
The SMART boilers require repeated and regular service to ensure operational safety and to fulfil the conditions of providing a guarantee for the device.

The “Service confirmation” menu is used as a supplementary aid. The service technician sets the service period in hours. After expiration of the preset operating time after which device maintenance is required, the “Service needed” message appears on the main screen.



Upon this message, the device operator is obliged to perform the specified check tasks and carry out the device maintenance. The service activities are confirmed by the operator in the service confirmation menu.





Servis confirmation		5/13	
i	Service BurClean	On	▲
	Servis Exchanger	On	
	Service Cyclone	On	▼
	Servis Deashing	On	
bell	Service Silo	On	▲
	Service Conveyor	On	▼
megaphone	Servis Bearing	On	✓

Servis confirmation		13/13	
i	Service Bearing	On	▲
	Service Conveyor Damper	On	
	Servis Exch.Damper	On	▼
	Servis Canystr	On	
bell	Servis interval	500h	✓
	Last service before:	123,5h	



After executing the maintenance, choose the given part of the boiler with arrows ▲ ▼ and confirm. ✓

</

Note: If the operator confirms execution of service tasks, the message changes from On to Off.

Important notice: The “Service needed” warning message flashing disappears from the main screen only when all tasks have been executed and their execution has been confirmed by the operator.

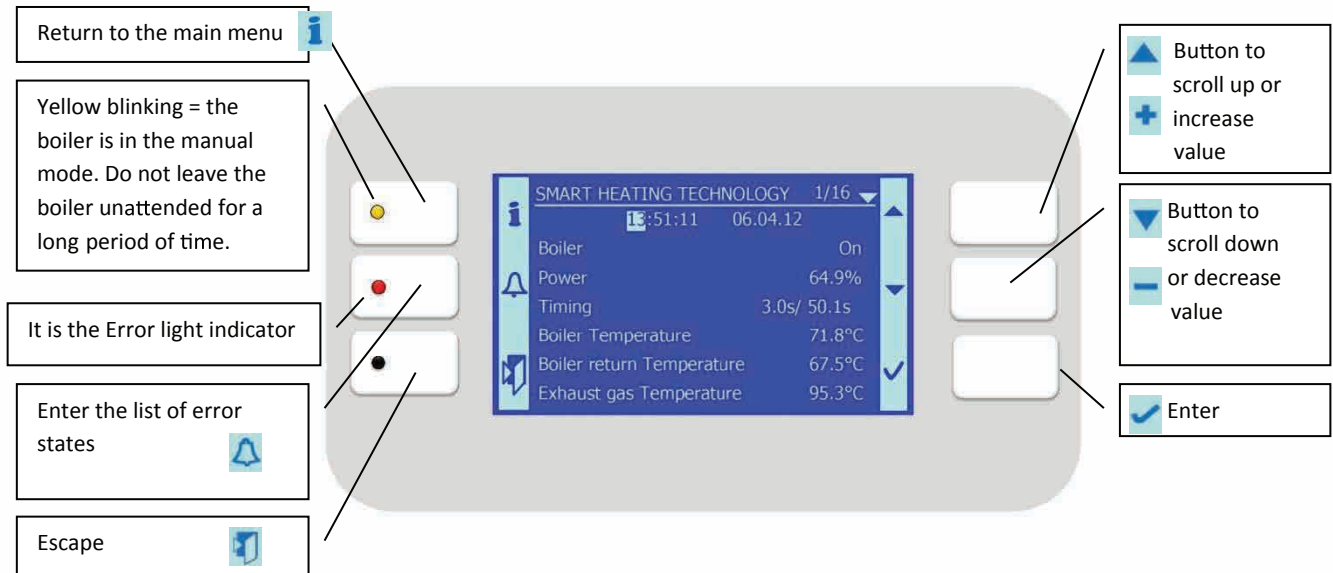
Important notice: The “Service needed” message has only an auxiliary informative character without limiting the boiler operation in any way. If the maintenance is neglected repeatedly, however, the customer loses its guarantee rights.

4.2. HMI TERMINAL

The HMI terminal has the function of a control and information panel of the SUPERMAX control unit.

It enables:

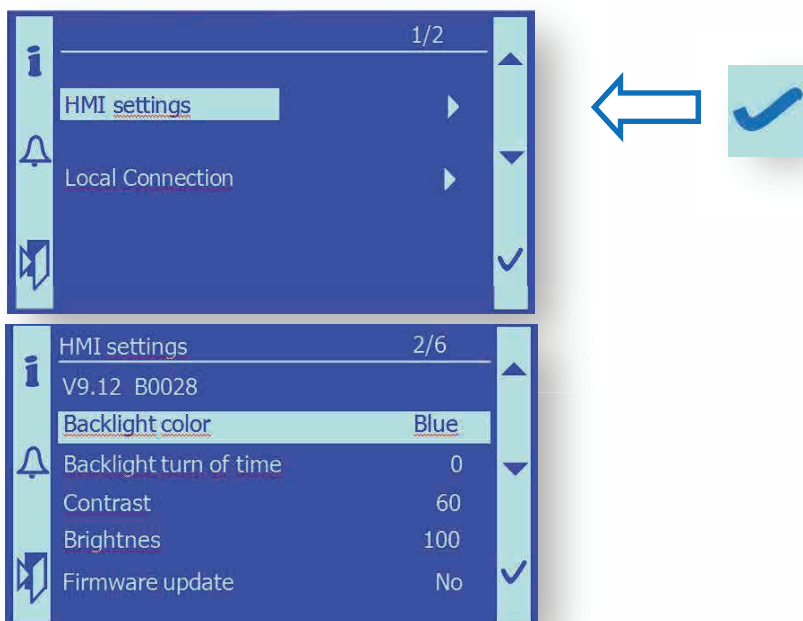
- control of the boiler function
- identification of the state of individual boiler peripherals
- identification of failure states
- control of boiler elements in the manual mode
- setting of boiler operating values



4.2.1. Special Functions

4.2.1.1. Escape

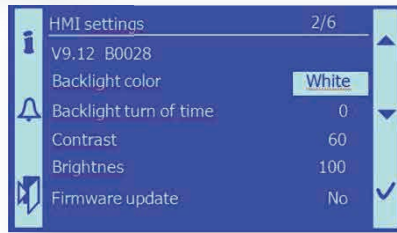
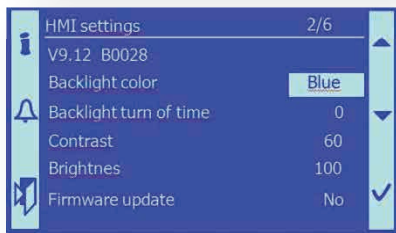
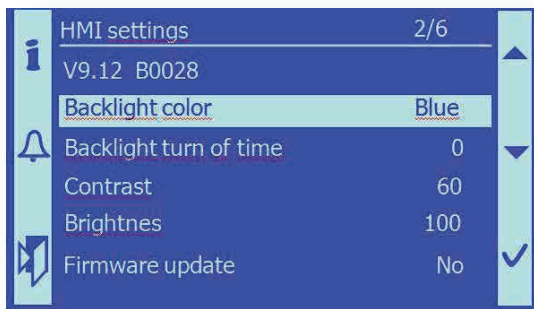
If you hold the ESC button  for approx. 5 seconds, you can enter the terminal setting mode.



Now you can change parameter settings of the HMI Terminal.

4.2.1.1.1. Backlight color

You can set either a blue or white backlight colour:

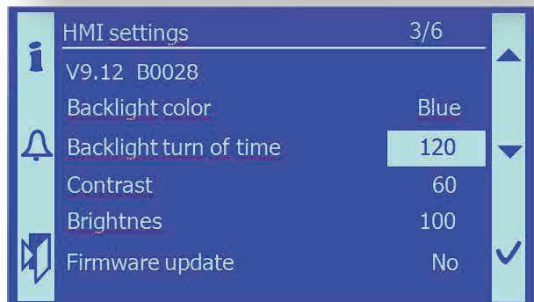
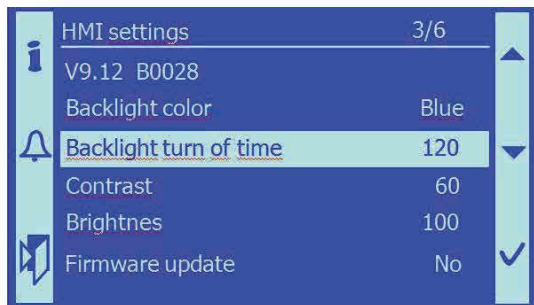


lue characters.

4.2.1.1.2. Backlight time

For standby mode of the HMI display, it is possible to set the Backlight turn off time, after which the display turns off.

After you push any button, the display lights up again.



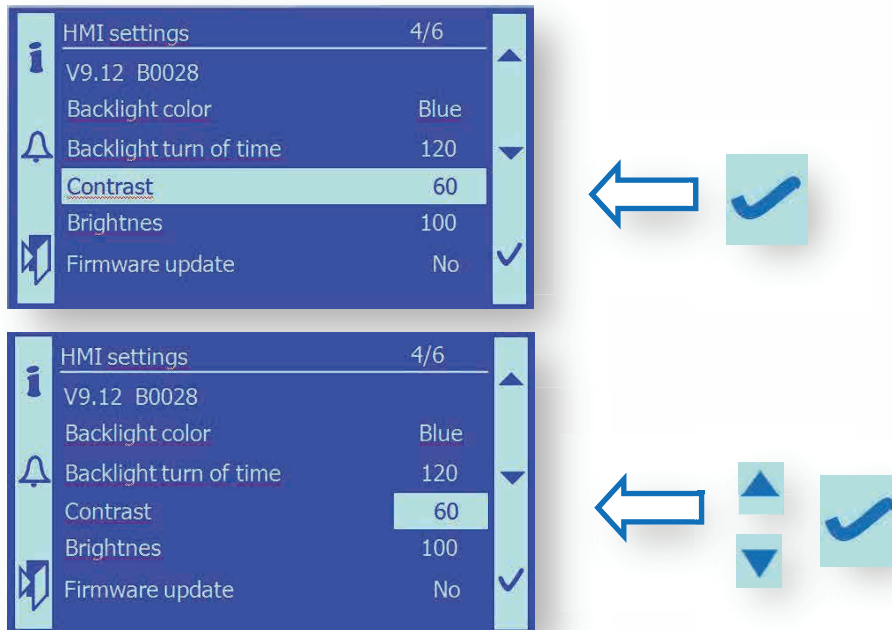
The setting range is 0 – 360 sec.

Important notice: If you set the time delay to “0”, the display will be lit permanently.

4.2.1.1.3. Contrast

The contrast of the HMI display can be set in the following way.

The user can choose the optimum setting.

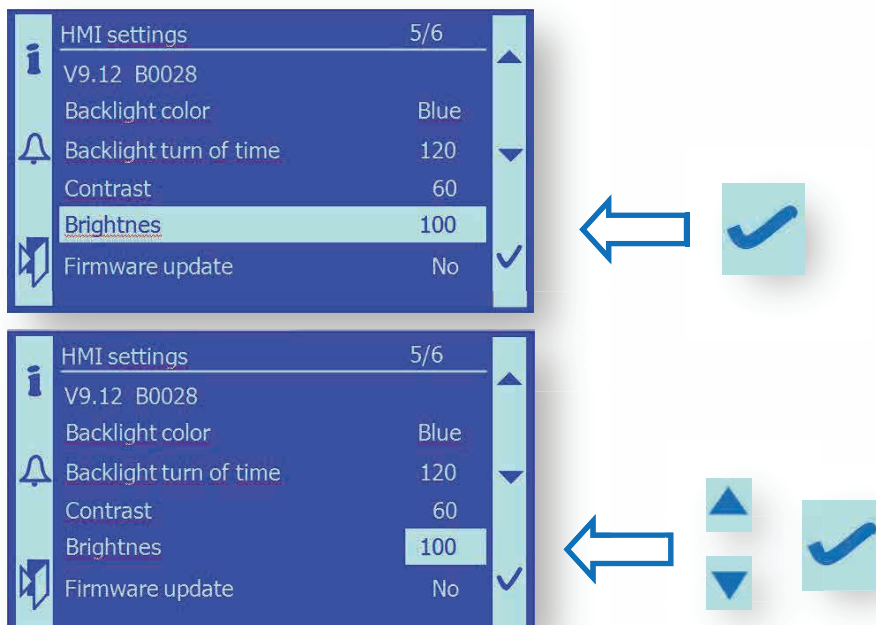


The setting range is 0 – 100 %

4.2.1.1.4. Brightnes

The HMI display brightness can be set in the following way.

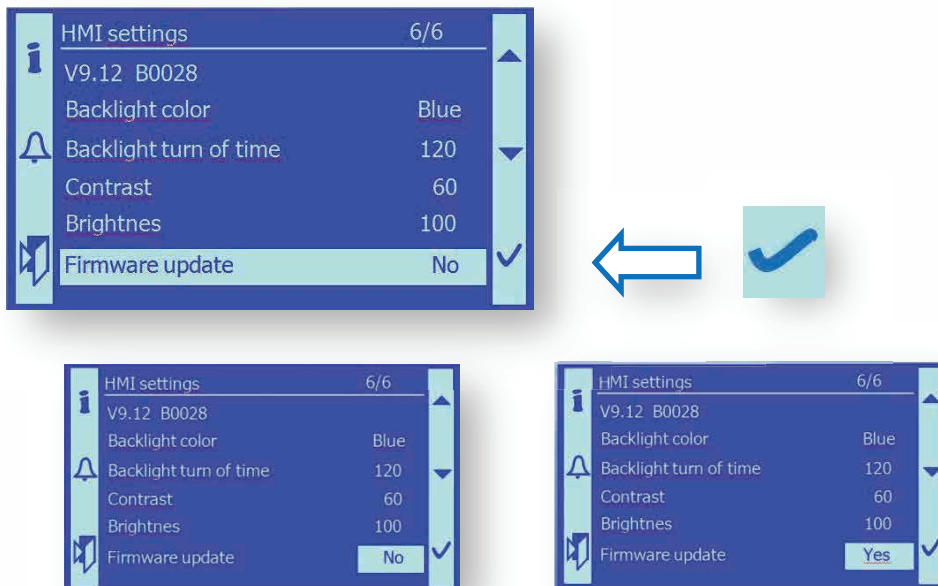
The user can choose the optimum setting with respect to the ambient light intensity.



The setting range is 0 – 100 %.

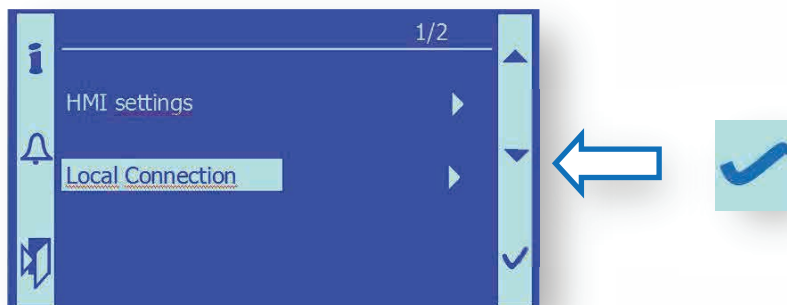
4.2.1.1.5. Firmware update

If you require that the setting return to the values set in the manufacturing plant, use the following function.




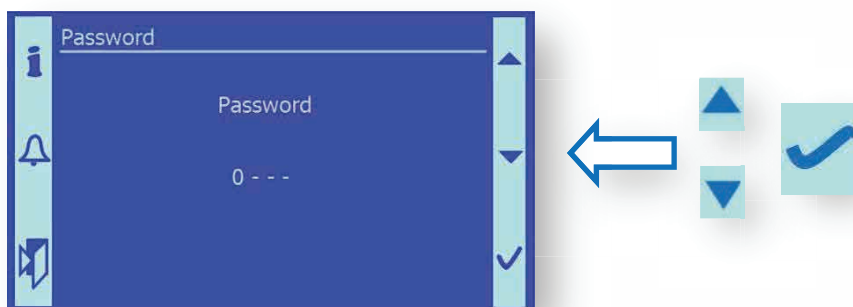
4.2.1.1.6. Return to standard mode

After you have set the necessary function of the HMI display, it is necessary to return to the standard function within the Local Connection application used.



4.2.1.2. Enter

If you hold the ESC button  for approx. 5 seconds, you can enter the setting mode of the access password.



Now you can enter the access password in a standard way.

4.3. SYSTEM CONFIGURATION



The boiler and its control unit can work:

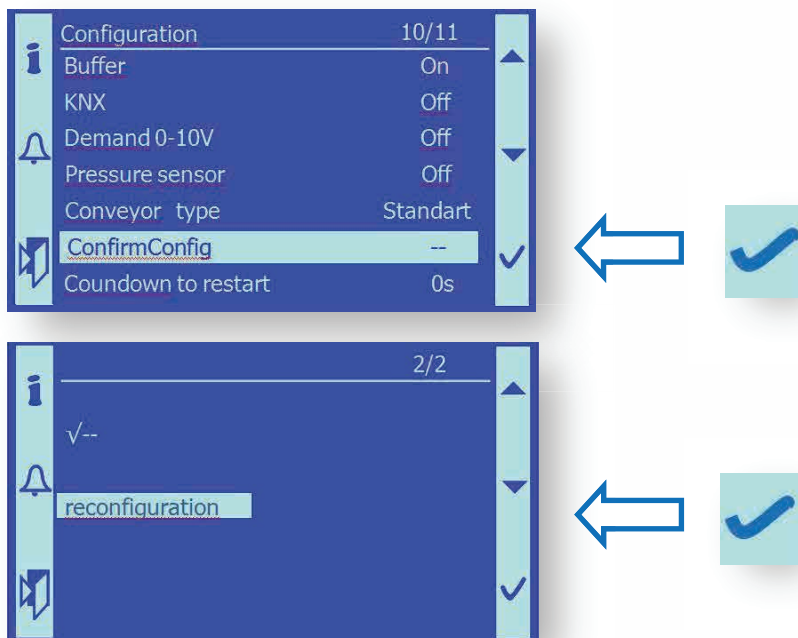
- with different connection to the hydraulic system according to the specific application.
- using optional peripheral devices.
- using several methods of the boiler control and communication with the ambient devices.
- using two methods of fuel transport to the intermediate bin.

According to the specific boiler connection and peripheral devices used, the service technician shall set the specific system configuration. Then the control unit works according to the pre-set configuration, using the devices selected and connected.

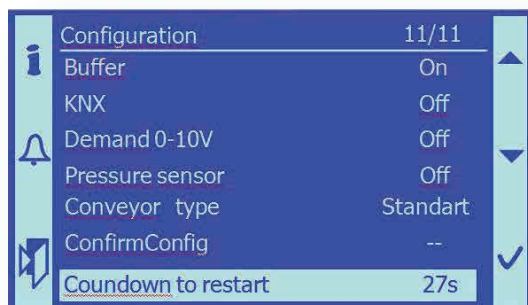
Note: The configuration can only be changed if the access password has been entered (PIN1 or PIN2 or PIN3).

After the configuration change, the system must be reset.

You can reset by enabling the reconfiguration signal.



Or the reset is done automatically after 30 s from the configuration change executed.



4.3.1. Boiler Control and Operation Configuration

The boiler always works in one of the pre-set control modes or their combinations:

4.3.1.1. Basic control signals

The boiler is always controlled by a signal

- *External ON/Off power supply requirement*

This mode has absolute priority, is enabled permanently and superior to all the other operating modes.

The Ext On/Off is a potential-free signal brought to the X1.96, X1.97 terminals.

Note: The external On/Off signal can also be set in the program menu:

User / Boiler service / Demand for boiler – [Auto/Off/On].

The basic setting must be in the AUTO mode, the On(Off mode is used for service purposes or in case of a special mode of the boiler operation.

The boiler is always controlled by a signal

- *Preset outlet water temperature – temperature sensor B2*

The boiler works pursuant to the outlet water temperature (B2) and suitably selected hysteresis for the boiler Start and Stop.

Note: The boiler temperature shall be set by the user or service technician.

Menu: User / Temperatures / Setting value.

Note: The hysteresis shall be set by the service technician (PIN level 3).

Menu: User / Temperatures

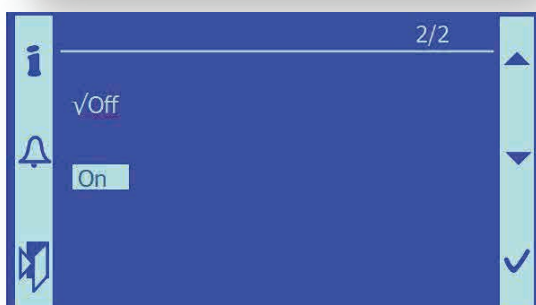
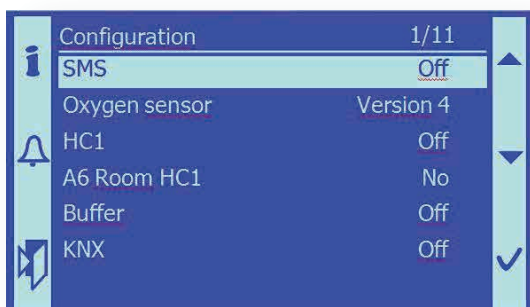
4.3.1.2. Additional Control Signals

The boiler operation control can further be supplemented according to the specific connection to the heating system and specific connection to the higher-level control system.

- **SMS**

SMS control and sending of status and error messages can be used after a GSM module has been connected. See chapter 13.2. SMS messages


To activate the GSM modem, the SMS device must be switched over to the ON state.

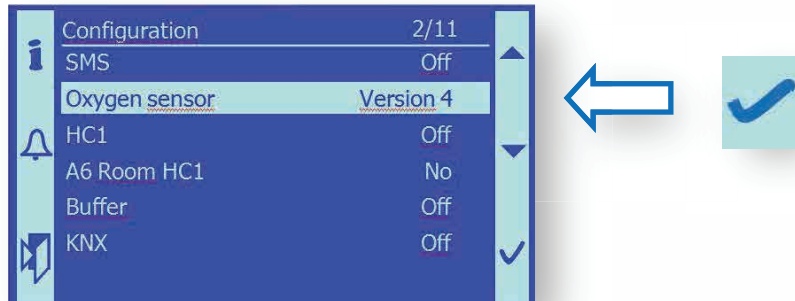


- **Oxygen sensor**

If the oxygen sensor (lambda-probe) is connected, its signal can be used for additional control of the combustion fans Secondary 1 and Secondary 2.

Note: The control deviation value and other parameters can then be set in the

 (Configuration) - Menu: Oxygen sensor / Off / Version4 / Version3

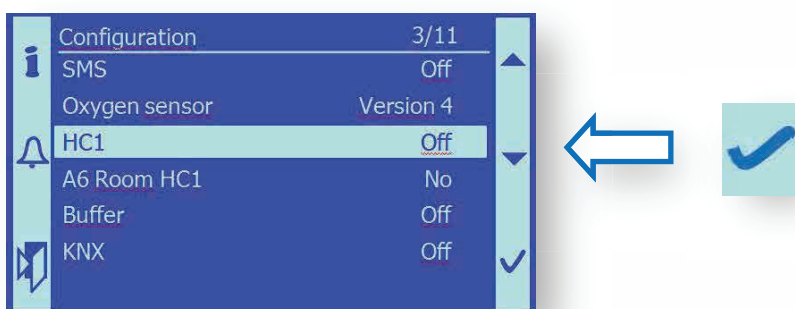


Note: If the oxygen sensor is activated, the momentary value of residual oxygen in the flue gas is displayed on the main screen.

- **HC1 – heating circuit control**

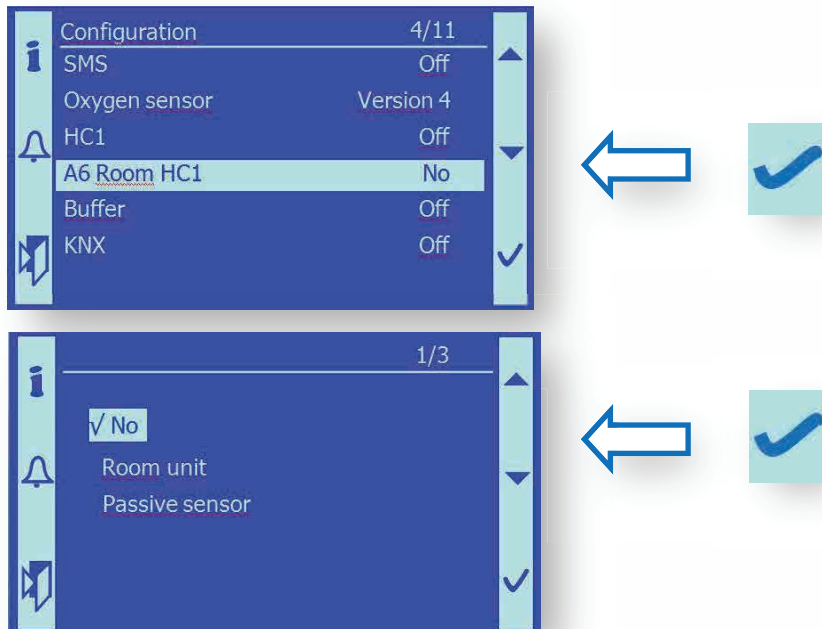
The program and technical equipment of the boiler enables control of a single regulated heating circuit.

The control of heating circuit is described in chapter 10.10 Heating circuit 1.



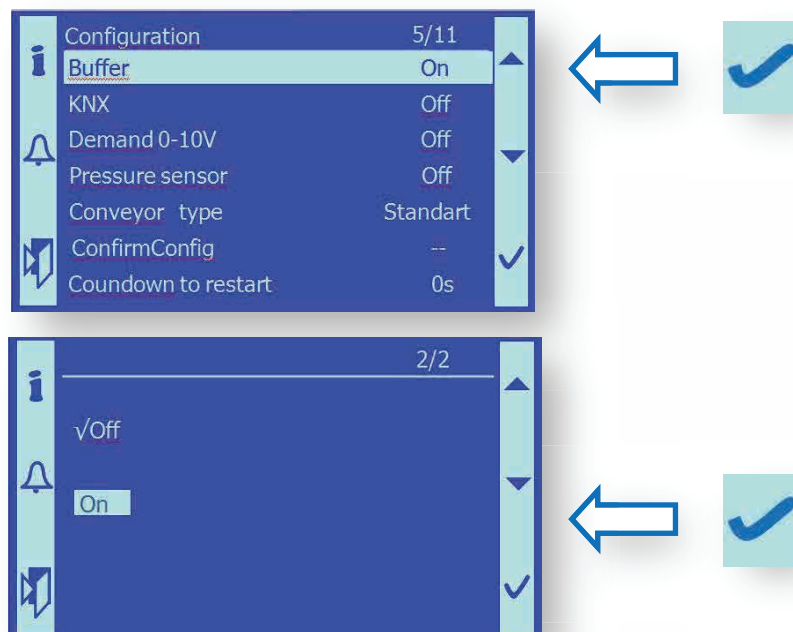
- **A6 Room HC1**

This activates the room sensor in the reference room heated by the heating circuit HC1. The heating circuit can work without a room sensor in the equitherm control mode without the influence of the room heated, or it can make use of the passive temperature sensor, or the room unit SIEMENS POL822.60; see the appendix.



- **Temperature control in Accumulation Tank (Buffer) – Temperature sensors B4,B41**

The boiler works pursuant to the preset temperature and the temperature of the upper and lower temperature sensor in the accumulation tank. Suitable hysteresis can be set for the individual sensors in this mode so that the boiler runs smoothly and optimally. The hysteresis shall be set by the service technician (PIN level 3).



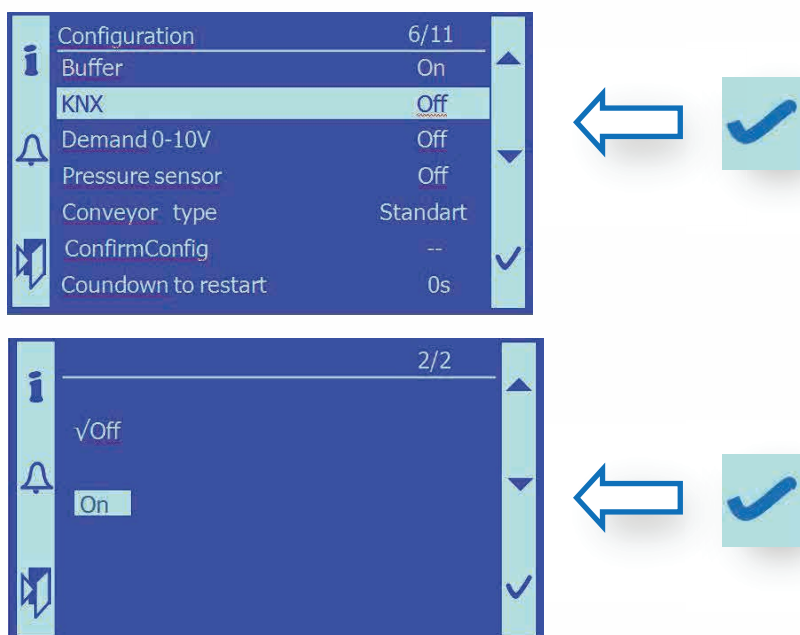
Note: If the accumulation is not in the ON mode, the B4, B41 thermometers and their values are not displayed on the main screen.

- **Boiler control through the KNX process busbar**

The control unit can be connected through the KNX-TP busbar.

Thus the boiler control unit can communicate either with the higher-level control system or with other boilers, in cascade coupling, for example.

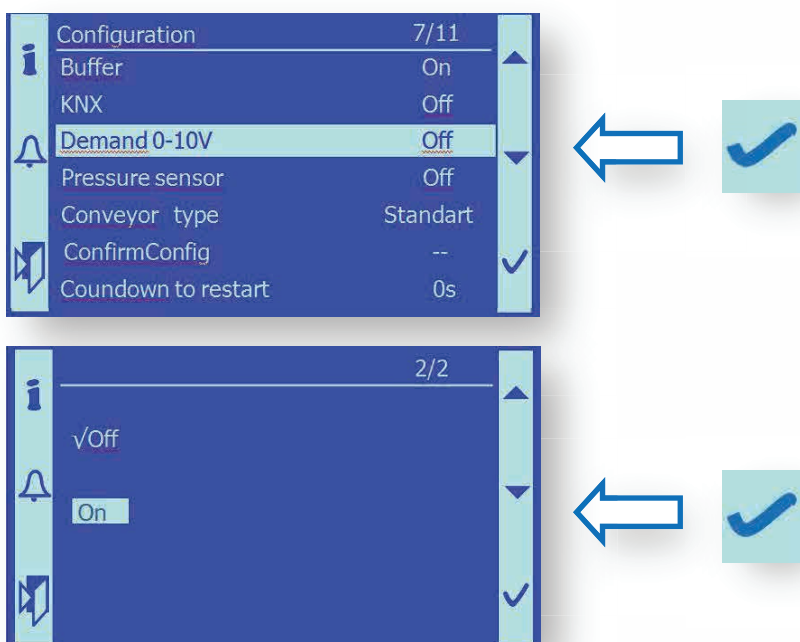
Description of control signals is in the e-maping table which is available by request.



- **Boiler temperature control by the input signal Demand 0-10V**

The control signal comes from the higher-level system and the outlet temperature of the boiler depends on it. The outlet temperature range can be set depending on the 0-10V signal.

The lowest boiler temperature is limited to 60 °C.

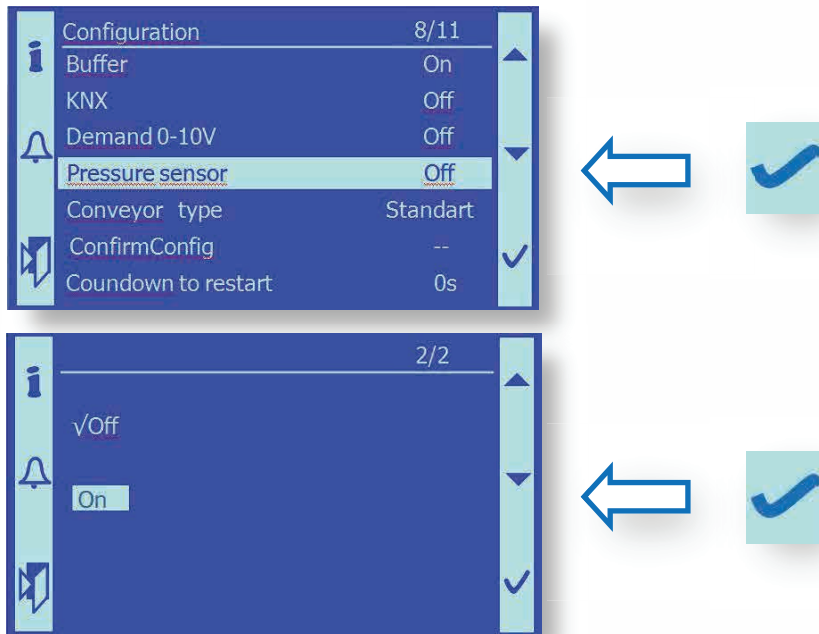


- **Pressure sensor**

Since 2014, the boiler has been by default equipped with a water pressure sensor which protects the boiler against operation without sufficient system pressure.

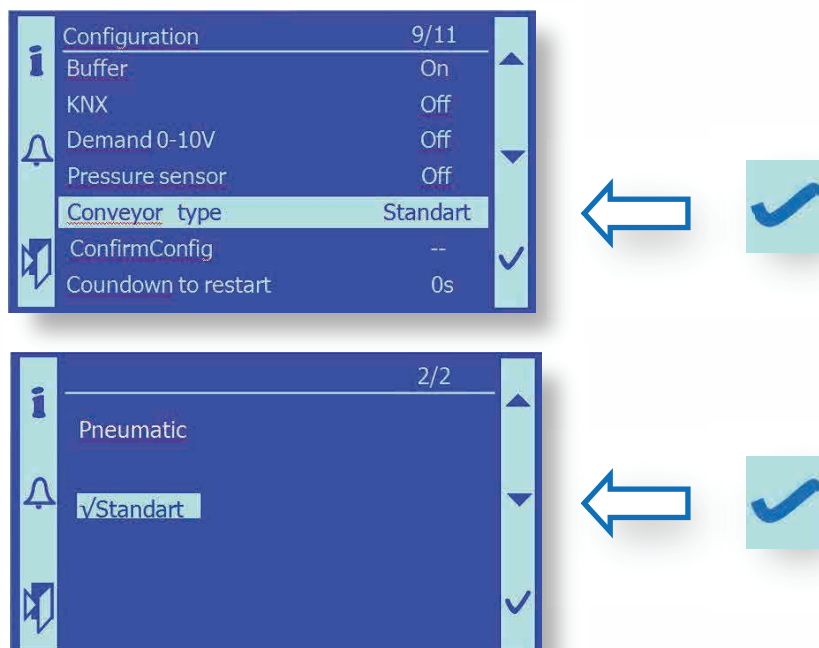
Note: If the pressure sensor is activated, the momentary water pressure value is displayed on the main screen.

Note: The system pressure and limit values are set in the menu
Main menu / Pressure sensor.



- **Intermediate bin feeder (Conveyor type)**

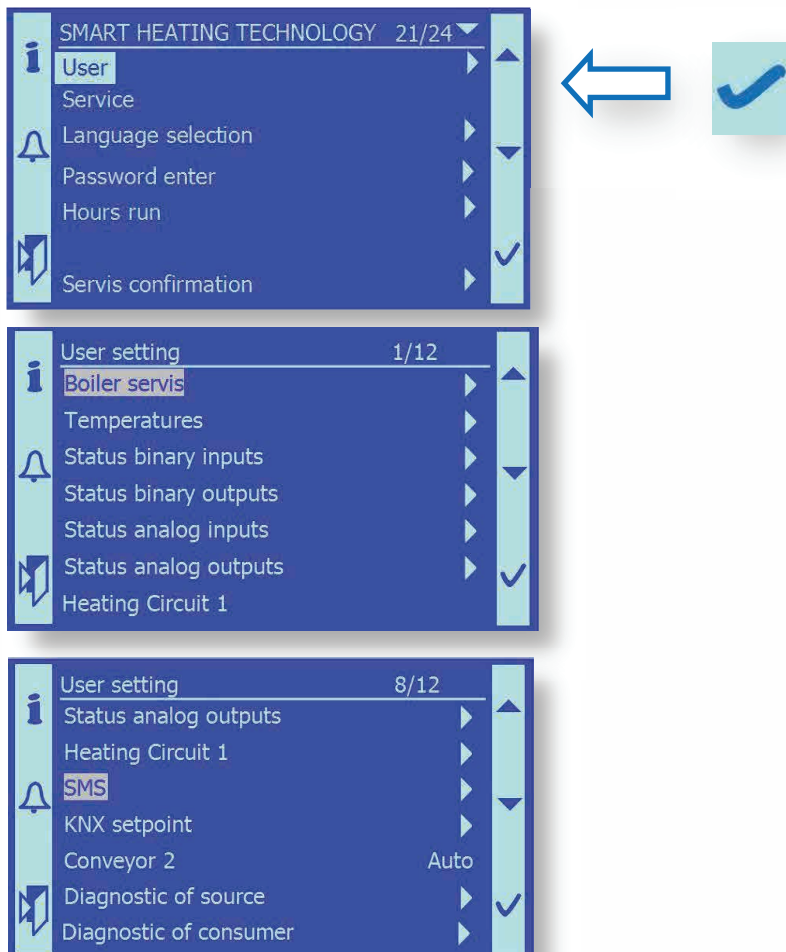
According to the boiler equipment, it is possible to choose standard fuel feeding with a screw conveyor, or, in exceptional cases, feeding by means of pneumatic transport.



4.4. USER SETTINGS

The User setting menu enables a trained operator (user) to set some functional parameters. This menu also enables checking of the current state of the individual devices.

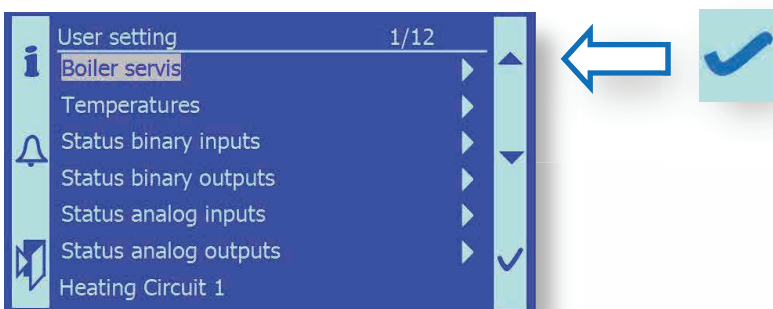
The Menu can be entered from the main screen. Choose the User setting line and confirm with the Enter button.

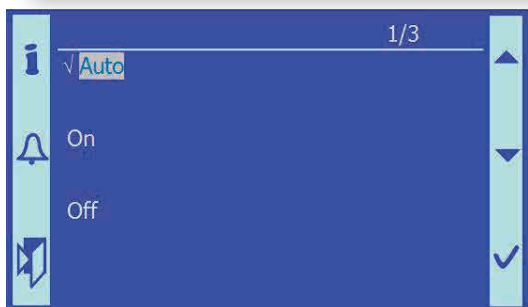
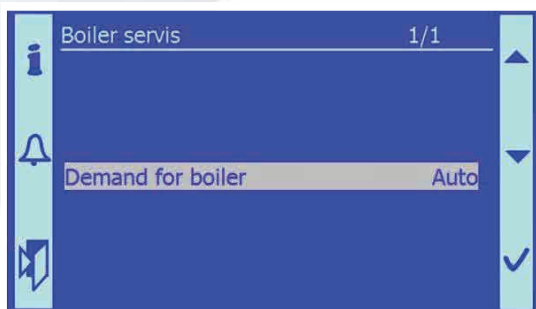


4.4.1. Boiler service

Pursuant to the operating requirement or the required setting of the boiler service, this menu enables setting of the boiler in the Automatic control mode, the permanent-on or permanent-off state.

In this menu, SW simulates the External On/Off contact – brought to terminals X.96, X1.97.





If the **"Auto"** mode is selected, the boiler works according to the External ON/Off contact state.

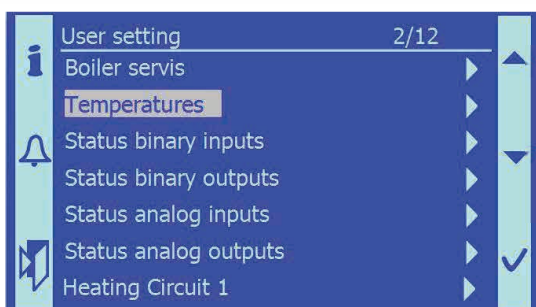
If the **"On"** mode is selected, the boiler is continually demanded to produce heat energy. This SW input has a higher priority than the External On/Off binary input.

If the **"Off"** mode is selected, the boiler is continually in the Stand By state. This SW input has a higher priority than the External On/Off binary input.

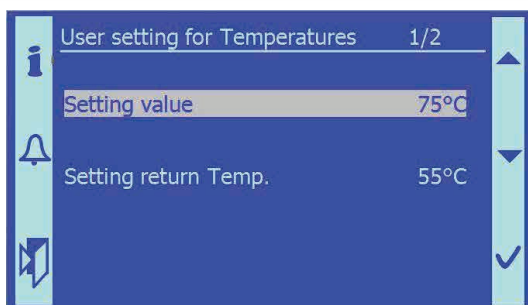
4.4.2. Temperatures

This mode enables setting of the required boiler operating temperature and return water temperature.

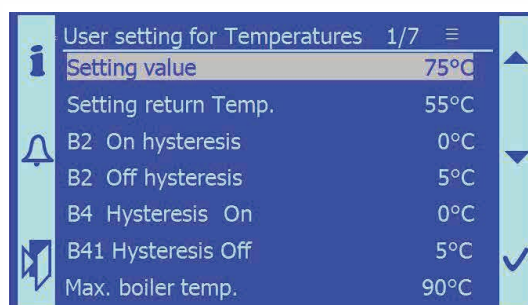
Both values can only be modified in the range permitted by the service technician or in the manufacturing plant.



If no password has been entered:



If password "3" has been entered



Setting value [°C]
{60°C – 90°C}

US required temperature of boiler outlet water
If higher temperature is achieved, the boiler shifts to the Stand By mode.

Setting return Temp. [°C]
{50°C – 65°C}

US required temperature of boiler return water. By this temperature, the mixing valve in the boiler short circuit is controlled.

B2 On hysteresis [°C]
{0°C – 10°C}

S If the boiler temperature drops below the required value by this hysteresis, value the boiler switches from the Stand By to the operation state.

Example: Required temperature = 75°C, B2 On hysteresis = -2°C. Boiler starts working at 75-2=73°C.

B2 Off hysteresis [°C]
{1°C – 10°C}

S If the boiler temperature rises above the required value by this hysteresis value, the boiler switches to the Stand By state.

Example: Required temperature = 75°C, B2 Off hysteresis = 5°C. Boiler shifts to Stand By at 75+5=80°C

Note: It is a very convenient property of the boiler because the outlet water temperature can be kept slightly above the required temperature and the control elements have a control reserve.

B4 Hystereses On [°C]
{0°C – 20°C}

S If the upper temperature in the accumulation tank drops below the required temperature by this hysteresis value, the boiler switches from the Stand By to the operation state.

Example: Required temperature = 75°C, B4 Hystereses On = 0°C. Boiler starts working at 75-0=75°C.

Note: It is used for the boiler control by the accumulation tank temperatures. It is a very convenient property of the boiler because the boiler can be started in sufficient advance before the accumulation tank water temperature drops under the acceptable limit. Temperature variation in the accumulation tank is restricted.

Note: It is permanently compared with B2 hystereses; the boiler starts working according to the condition fulfilled first.

B41 Hystereses Off [°C]
{-5°C – 10°C}

S If the lower accumulation tank water temperature rises above the value of the required boiler temperature minus this hysteresis value, the boiler shifts to the Stand By state.

Note: It is permanently compared with B2 hystereses Off; the boiler shifts to Stand By according to the condition fulfilled first.

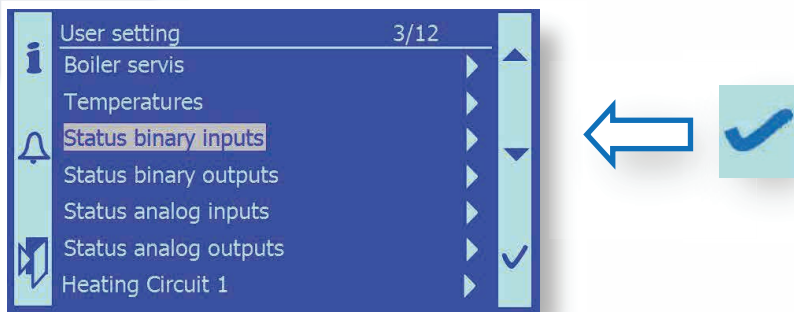
Explanations:

U user setting

S service technician setting after level “3” password is entered

4.4.3. Status Binary Inputs

The menu is used to check instantaneous operating states of all binary inputs led in the control system. It is used for service and analysis of possible operating and error states.



The individual binary inputs have the following functions:

External On/Off	Information on heat supply requirement. If the state is ON and the boiler temperature lower than required, the boiler is working. In the Off state, the boiler is in Stand By. Operating states: On/Off
Safety limit thermos.	Information on the current state of the thermostat contact OK – emergency thermostat is OK Error – the boiler achieved temperature above 95°C, contact opened. Failure.
KM1 Fault	Information on the current state of the safety contactor. The contactor is controlled by the emergency thermostat. KM1 and KM2 must always be in the same operating position. OK – contactor is OK Error – contactor is disconnected by the emergency thermostat or the KM1 and KM2 operating positions do not correspond.
KM2 Fault	Information on the current state of the safety contactor. The contactor is controlled by the emergency thermostat. KM1 and KM2 must always be in the same operating position. OK – contactor is OK Error – contactor is disconnected by the emergency thermostat or the KM1 and KM2 operating positions do not correspond.
Safe tank	Information on water state in the tank Full – water level is OK Empty – low level or the tank was discharged for quenching the channel
TKM Conveyor 2	Information on the current state of the M1 motor Thermo-contact, conveyor OK – low motor temperature, TK is OK Error – Thermo-contact is opened, motor overheated
TK Feeder 1	Information on the current state of the M2 motor Thermo-contact, fuel auger OK – low motor temperature, TK is OK Error – Thermo-contact is opened, motor overheated

TK Deasching

Information on the current state of the M3 motor Thermo-contact, ash screw
OK – low motor temperature, TK is OK
Error – Thermo-contact is opened, motor overheated

TK burner cleaning

Information on the current state of the M6 motor Thermo-contact, grating
OK – low motor temperature, TK is OK
Error – Thermo-contact is opened, motor overheated

TK Exch.cleaning

Information on the current state of the M4, M5 motor Thermo-contact, Heat Exchanger cleaning.
OK – low motor temperature, TK is OK
Error – Thermo-contact is opened, motor overheated

TK Exch.deashing

Information on the current state of the M7 motor Thermo-contact, exchanger ash
OK – low motor temperature, TK is OK
Error – Thermo-contact is opened, motor overheated

Conveyor level

Information on the current fuel state in the intermediate fuel bin
OK – sufficient fuel level
Low – fuel consumed, must be replenished, M1 will be actuated

Damper Conv.2open

Information on current state of the safety damper of intermediate fuel bin
Not open – Damper is either closed or opening. Limit position not reached.
Open – Damper is fully open, limit switch B closed (opening angle over 70°)
Note: Information on opposite position of the damper must be followed.

Damper Conv.2close

Information on current rest position of safety damper of Interm. fuel bin
Not closed – Damper is in intermediate position, limit switch not closed
Closed – Damper is safely closed, limit switch A is closed (opening angle smaller than 5°)
Note: Information on opposite position of the damper must be followed.

Note: If none of the limit switch inputs of the damper is in active state, the damper is in intermediate position between being fully closed and fully opened.

Exchanger damper

Information on current position of the exchanger safety damper.
By-pass – Damper is in position when the flue flows to the chimney directly.
Exchanger – Damper is in position when the flue flows through the exchanger.

Silo 50%

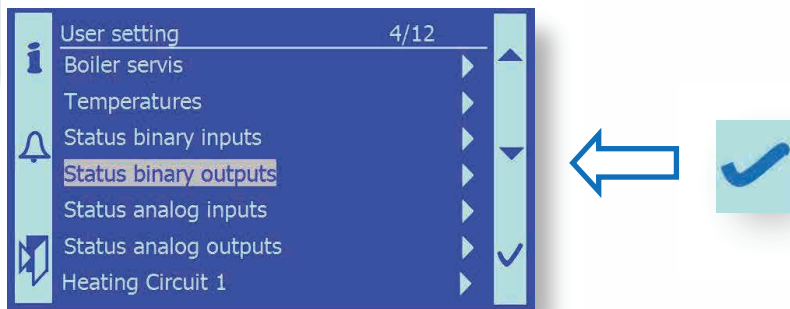
Information on current fuel level in the silo
OK – The level is higher than 50% of the silo height.
Low – The fuel in the silo is below the 50% level.

Silo 100%

Information on current fuel level in the silo
OK – The level is sufficient, silo is full.
Low – The fuel in the silo is below the 100% level, but above 50%.

4.4.4. Status Binary Outputs

The menu is used to check the momentary operating states of all binary outputs led out of the control system.



The individual binary outputs have the following functions:

Conveyor 2	Information on current state of control of conveyer motor M1. Operating states displayed. On - motor M1 is on and the conveyer operating Off – motor M1 is off
Feeder 1	Information on current state of fuel screw motor M2. On – motor M2 is on and fuel is being fed Off – motor M2 is off
Deasching	Information on current state of ash screws motor M3. On – motor M3 is on and ash discharge operating Off – motor M3 is off
Burner cleaning	Information on current state of grating motor M6. On – motor M6 is on and ash discharge is operating Off – motor M6 is off
Exchanger cleaning	Information on current state of exchanger cleaning motor M4/M5. On – motor M4/M5 is on and ash discharge is operating Off – motor M4/M5 is off
Exchanger deashing	Information on current state of the ash screw of exchanger M7. On – motor M7 is on and ash discharge is operating Off – motor M7 is off
Mix opening	Information on current state of the three-way valve servo-motor Y7 Y8. On - servo-motor is on and the three-way valve is opening Off – servo-motor is off and the valve remains in the set position
Mix closing	Information on current state of the three-way valve servo-motor Y7 Y8. On - servo-motor is on and the three-way valve is closing Off – servo-motor is off and the valve remains in the set position <i>Note:</i> These outputs are used for the servo-drive with three-point control. Parallel to these outputs, the analog output 0-10V “Reverse valve” is also used for continuously controlled servo-drive.

Boiler pump

Information on current state of the boiler pump Q1.

On – pump is on and working Off – pump is off

Exhaust Damper

Information on current state of the safety flue gas damper.

On – flue gas damper is energized and flue gas flows to the exchanger
(normal state in standard boiler operation)

Off – flue gas damper is off and flue gas flows into the chimney directly
(state of cold boiler start or emergency state at boiler overheating)

Conveyor Damper

Information on current state of the safety fire damper in the fuel ducting located on the intermediate fuel bin.

On – damper is energized and opened
(state during fuel replenishment)

Off – damper is closed and the fuel transport duct is tightly closed
(state during boiler operation, when fuel is not filled up)

Note: The damper position determined by the control voltage On/Off can be controlled by means of the binary inputs “Feeder damper opened / Feeder damper closed”.

Ignition

Information on current state of the hot-air ignition gun.

On – ignition gun is on and blowing hot air of approx. 400 °C

Off – ignition gun is off

Pump HC1

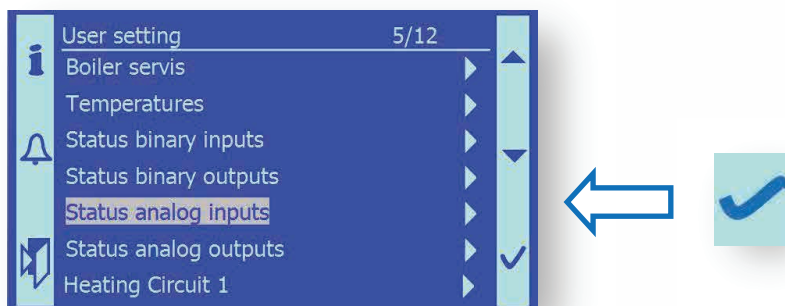
Information on current state of the heating circuit HC1 pump.

Zap – pump is on and working

Vyp – pump is off

4.4.5. Status analog inputs

The menu is used to check momentary operating states of all analog inputs led into the control system. These include, in particular, thermometers, the lambda-sensor.



The individual analog inputs have the following functions:

Boiler Temperature

current temperature value of the boiler outlet water – sensor B2.

Boiler return Temp.

current temperature value of the boiler return water – sensor B71.

B4 Buffer top

current upper temperature value in the accumulation tank – sensor B4.

B41 Buffer bottom

current lower temperature value in the accumulation tank – sensor B41.

Note: The B4 and B41 temperatures are only displayed if the boiler operation mode with the accumulation tank is chosen – see chapter 10.3 System config.

B9 Outside Temp

current outdoor temperature – sensor B9.

Note: The B9 temperature is only displayed if the boiler operation mode with heating circuit HC1 is chosen – see chapter 10.3 System configuration.

Exhaust gas Tem.

current temperature value of flue gas behind the boiler – sensor B4.

Backfire Temp.Upper

current temperature value at the upper side of the fuel channel - protection against fire penetration.

Backfire Temp.Lower

current temperature value at the lower side of the fuel channel - protection against fire penetration.

Underpressure

current underpressure value in the combustion chamber.

Oxygen sensor

current value of residual oxygen in the flue gas.

B1 Flow HC1

current temperature value of heating water for heating circuit HC1.

Note: The value is only displayed if the heating circuit HC1 control system is chosen – see chapter 10.3 System configuration.

Room HC1

current value of control signal [V]- higher-level control system requirement for the boiler temperature.

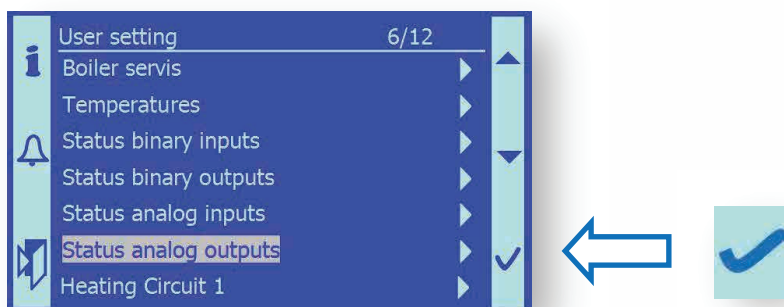
Note: The value is only displayed if the control mode with the 0-10V signal is chosen, see chapter 10.3 System configuration.

Pressure sensor

current value of water pressure in the heating system.

4.4.6. Status analog outputs

The menu is used to check momentary operating states of all analog outputs led out of the control system. This particularly includes fans, servo-drives,...



The individual analog outputs have the following functions:

Exhaust Fan

current output of exhaust fan in [%]

Primary Fan

current output of primary fan in [%]

Secondary Fan 1

current output of secondary fan 1 in [%]

Secondary Fan 2

current output of secondary fan 2 in [%]

Return valve

current position of servo-drive for return water control in [%]- analog control

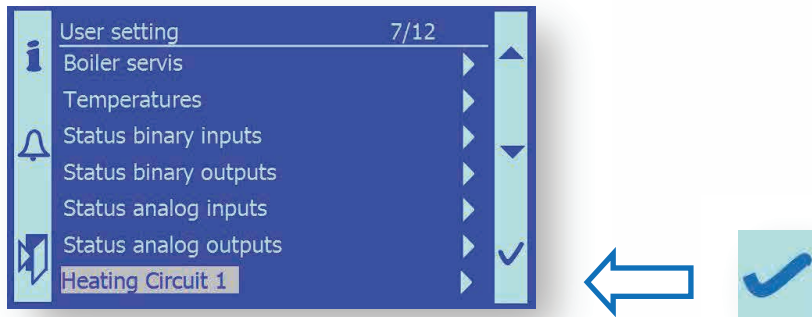
Valve HC1

current position of servo-drive for heating water control HC1 in [%]- analog control.

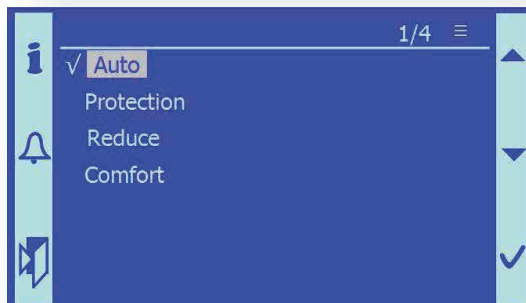
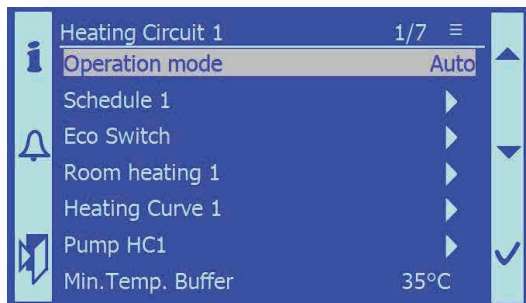
4.4.7. Heating Circuit 1

The menu is displayed if the Heating circuit HC1 control mode is chosen – see chapter 10.3 System configuration.

It is used to set working parameters of a full-fledged heating circuit with equitherm regulation.



The heating circuit control has the following functions:

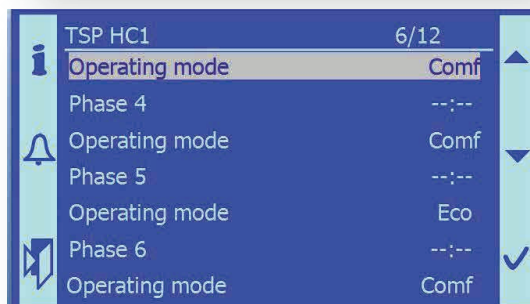
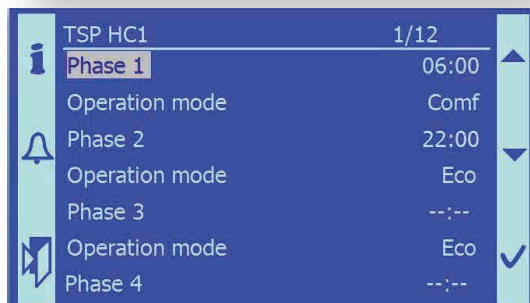
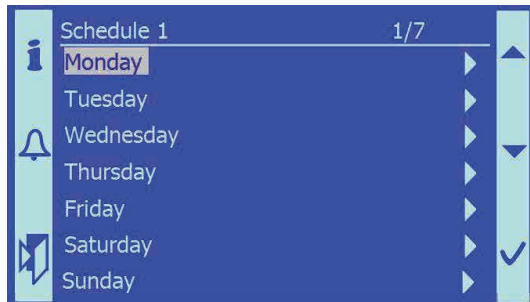


- | | |
|-------------------|--|
| Auto | heating circuit is program-controlled according to the time schedule, required temperatures (Comfort/Reduce/Protection). |
| Protection | heating circuit will permanently maintain the system temperature which will prevent freezing of the system and heated object; typically, +5°C. |
| Reduce | heating circuit is permanently set to heating at attenuated temperature. This temperature is usually by 3–5 °C lower than the comfortable temperature for night heating or heating on Saturdays, Sundays and public holidays, when the object is not used. |
| Comfort | the heating circuit is permanently set to heating at comfortable temperature. As a rule, this temperature is the highest temperature used for room heating. |

Schedule 1

It enables setting of the temperature course in the individual days of the week. Up to 6 time periods with different temperatures in the heated room can be set for each day. Temperature can be set at the Comfort/Stand By level.

The Comfort and Stand By temperatures are set in the following Eco Switch menu.



ECO switch

In this menu, the user can set:

Summer/Winter lim. Temperature at which the system switches from the winter heating mode to summer operation. The integrated outdoor temperature is set. The Summer/Winter mode switch is only apparent when the integrated value of outdoor temperature exceeds the set value.

Heating Limit Comfort The set value represents the required comfortable temperature in the heated area; e.g., 21 °C. The system will apply this temperature whenever the comfortable temperature is required.

Heating Limit Reduce The set value represents the required attenuated temperature in the heated area; e.g., 17 °C. The system will apply this temperature whenever the attenuated temperature is required.

Heating Limit Switch The operator can manually switch heating mode in the Auto mode, controlled by the preset temperature parameters, to the Winter or Summer mode. Until the mode is switched back to the Auto mode, the selected mode (Summer or Winter) will be respected constantly.

Room parameters

In this menu, the user can set:

Room limit Temperature at which the system switches from the winter heating mode to summer operation. The integrated outdoor temperature is set. The Summer/Winter mode switch is only apparent when the integrated value of outdoor temperature exceeds the set value.

Room Limit SD The set value represents the required comfortable temperature in the heated area; e.g., 21 °C. The system will apply this temperature whenever the comfortable temperature is required.

Quick Seback The operator can switch on/off the mode of quick shift to attenuated room temperature. By default, this mode is off.

Boost Setpoint The operator can set the dynamics of shift from the attenuated room temperature to the comfortable one. The dynamics is given by the temperature value [°C]. In reality, the value set as quick heat-up is added to the pre-set comfortable temperature in the time period when the room heating mode shifts from the Attenuation to the Comfort state.

Example: Comfortable temperature =21°C, quick heat-up =5°C, virtual comfortable temperature in the Quick heat-up, mode = 26°C After the required temperature is achieved in the heated room, the quick heat-up value will be ignored.

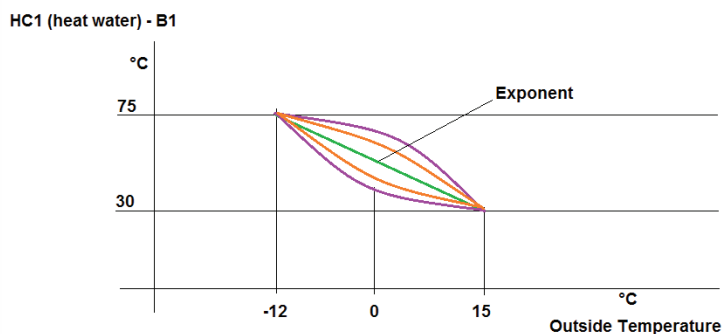
Note: If you set quick heat-up =0°C, the Quick heat-up is off.

Room Temp. Factor The operator can set the influence of the room temperature on the correction.
Equitherm regulation. The limit values are:
Room influence 0% – pure equitherm regulation
Room influence 100% – full room temperature control w/o equitherm

Heating Curve 1

In this menu, the user sets parameters of the equitherm curve for the given object heated. The curve cannot be calculated; it must be set empirically in the course of the heating season. 2 working points and an exponent (curvature) are set.

P1 Outs. Temp	Working point 1, low outdoor temperature – typically -12°C , range $[-40^{\circ}\text{C} - 0^{\circ}\text{C}]$.
P1 FlowTemp	Working point 1, setting of heating water temperature at low outdoor temperature at point P1; for example 75°C .
P2 Outs.Temp	Working point 2, high outdoor temperature – typically $+15^{\circ}\text{C}$, range $[+5^{\circ}\text{C} - +25^{\circ}\text{C}]$.
P2 FlowTemp	Working point 2, setting of heating water temperature at high outdoor temperature at point P2; for example, 30°C .
Exponent	The operator can set the Equitherm curvature for radiator heating, the value 1.3 is set, range $[1 - 2]$.
Setp.Min.	The operator can set the minimum heating water temperature, range $[8^{\circ}\text{C} - 75^{\circ}\text{C}]$.
Setp.Max	The operator can set the minimum heating water temperature, range $[8^{\circ}\text{C} - 90^{\circ}\text{C}]$.



Pump HC1

In this menu, the user sets parameters for the circulation pump operation in the heating circuit HC1.

Run Out Time	Setting of the pump running period after the end of the heating requirement HC1. It involves excessive heat discharge from the source and increase of the system operating stability, range $[0 - 1200\text{s}]$.
Plant frost	If anti-freeze is on, the pump starts up if the water temperature falls below 4°C . This function can be enabled or disabled

4.4.8. SMS

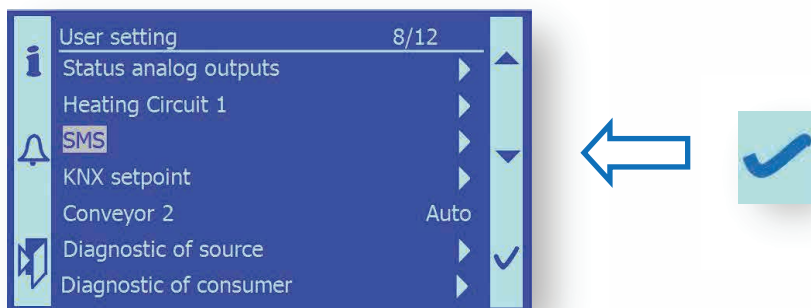
The menu is displayed if the SMS sending and receiving mode is chosen – see chapter 10.3 System configuration.

Important notice: To ensure this service, it is necessary to supplement the device by a GSM Modem.

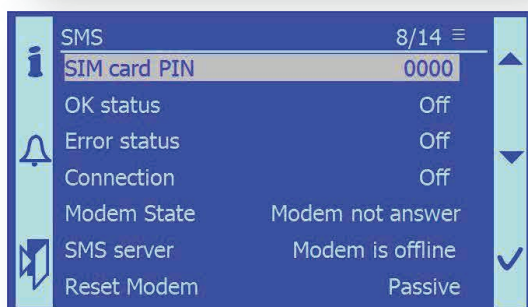
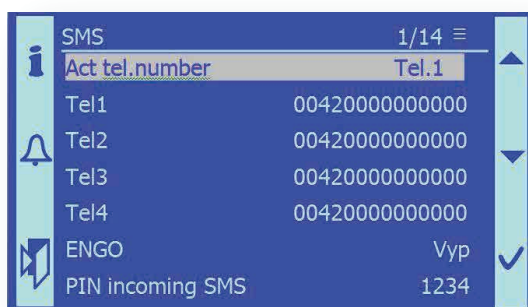
Pursuant to a special order, the manufacturer will connect this device in production directly, or it will be added by the service technician to a device which is already in operation.

Important notice: A SIM card of the local phone operator is to be inserted in the modem. A sufficiently strong signal must be available.

It is used to check pre-set working parameters of the boiler, send SMS messages in case of failure. Exceptionally, this function can be used for the boiler control and setting of necessary parameters.



After the modem is connected and service activated, up to 4 phone numbers can be entered. However, SMSs will only be sent to one current phone number.



Act.tel number

Current phone number to which the SMS message will be sent

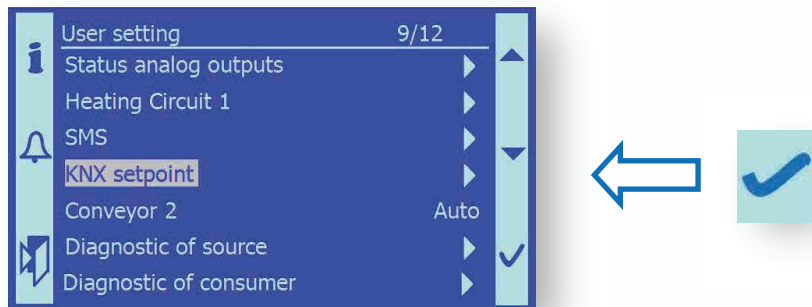
Tel1 – 4	list of phone numbers; the user shall preset the numbers including the national prefix. It is not necessary to fill in all numbers.
ENGO	sends SMS even on return to normal state after failure removal.
PIN incoming SMS	every SMS must contain this PIN (1234). The message will not be accepted without the PIN.
SIM Card PIN	PIN code of the SIM card inserted in the GSM modem. It is also possible to disable using of the PIN code before inserting the SIM card into the modem if a phone set is used.
OKStatus	determines whether the modem is functional. <i>Operating states:</i> OK – modem is ready/ Not functional– modem is not able to transmit SMS.
Error Status	modem errors. <i>Operating states:</i> OFF – no error / ON – error.
Connection	shows modem connection to the transmission network Network type: GSM / Analog / Off (no signal state).
Modem state	shows current modem activity. <i>Operating states:</i> Modem does not respond/Initiation/OK.
SMS server	shows signal state, whether it is suitable for SMS transmission. <i>Operating states:</i> Modem is online / Modem is Offline.
Reset Modem	modem reset information. <i>Operating states:</i> Passive – standard operation / Active – modem is being reset.

Note: Modem use, its connection and setting are described in chapter 13.2. GSM modem.

4.4.9. KNX setpoint

The menu is displayed if the boiler control mode from the higher-level system by means of the KNX busbar is chosen – see chapter 10.3 System configuration.

It is used for full-fledged boiler control from the co-operating system, using the KNX process busbar.

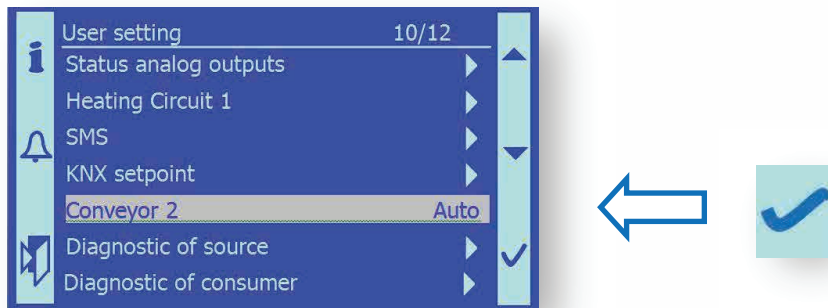


After you open the KNX info menu, the state of the control and monitoring registers is displayed. You can easily diagnose the boiler function requirement and the response to this requirement.

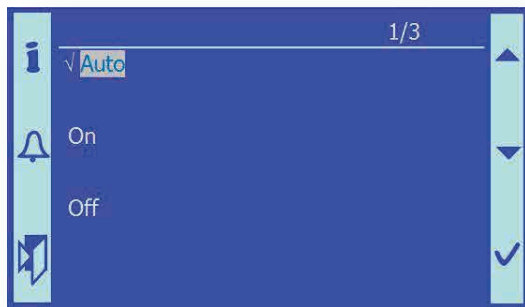
KNX setpoint	current state information on requirement from co-operating control system. <i>Operating states:</i> No requirement 0°C / Requirement 72°C.
HZ 1	current state information on requirement from co-operating control system. <i>Operating states:</i> No requirement 0°C / Requirement 55°C.
HZ 2	current state information on requirement from co-operating control system. <i>Operating states:</i> No requirement 0°C / Requirement 54°C.
HZ 3	current state information on requirement from co-operating control system. <i>Operating states:</i> No requirement 0°C / Requirement 53°C.
Excess heat 1	current state information on requirement for heat discharge from the boiler. Protection against boiler overheating. <i>Operating states:</i> Yea – removal is active / No – heat removal is not active.
Excess heat 2	current state information on requirement for heat discharge from the boiler. Protection against boiler overheating. <i>Operating states:</i> Yea – removal is active / No – heat removal is not active.
External Lock	current state information on requirement for boiler operation. <i>Operating states:</i> OK – boiler is active / No requirement.
KNX partner error	Current state information on the communication channel. <i>Operating states:</i> OK / No communication.
HZ 1 Comm.	Current state information on the communication channel of heating zone 1. <i>Operating states:</i> OK / No communication.
HZ 2 Comm.	Current state information on the communication channel of heating zone 2. <i>Operating states:</i> OK / No communication.
HZ 3 Comm.	Current state information on the communication channel of heating zone 3. <i>Operating states:</i> OK / No communication.

4.4.10. Conveyor 2 – of intermediate fuel bin

It is used for simple control of the fuel feeder from the silo to the intermediate bin (conveyor).



After the silo has been emptied, the disintegrating mechanism (tilting arms and spring system) is in extended position. If you fill the silo with a high level of fuel in this state, the arms may get stuck in the fuel. When the fuel has been filled to the defined height – see chapter 6.2 Filling the silo with fuel, the mechanism must be set in motion shortly. The tilting arms and spring retract under the protective plate, and there will be no risk of blocking the system.

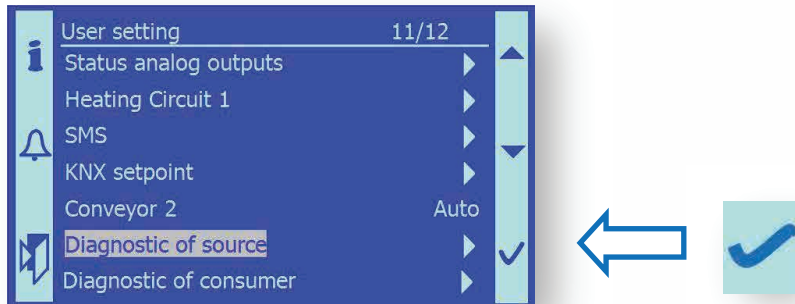


- Auto** feeder is controlled in conformity with program equipment of the control unit.
- On** fire damper on the intermediate fuel bin will open automatically. After it opens, the feeder motor starts for a preset time. This time is set by the service technician in the pertinent menu. When the time – typically 30-90 s – lapses, the feeder motor stops and the damper is closed. The time is set so that the disintegrating mechanism arms can safely hide under the protective plate.
- Off** feeder can be switched off at any moment.

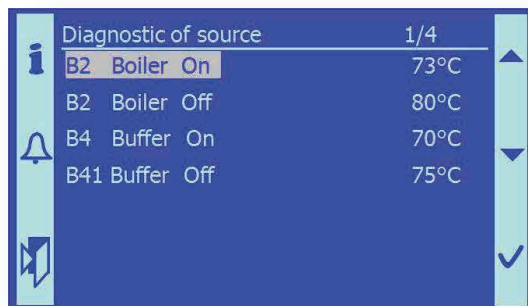
Important notice: The operator must not forget to use this function during filling of the silo.

4.4.11. Diagnostic of source

Auxiliary information menu, in which the operator can easily find out the conditions of starting and stopping the boiler in relation to control temperatures.



After you open the menu, the following information appears.

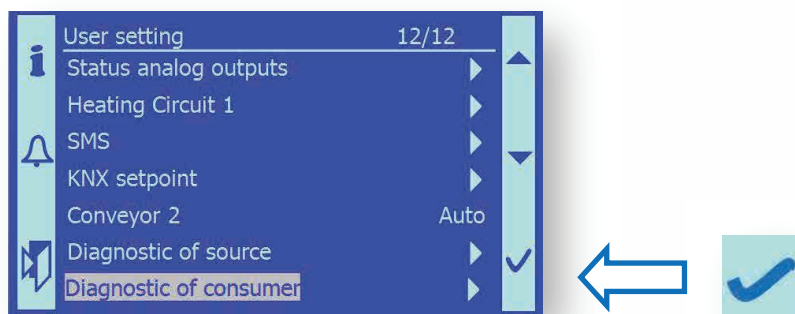


The displayed values provide information about the temperature at which the boiler starts working and producing heat, and also the temperature at which it transfers to the Stand By state.




Note: For a more detailed description, study the chapter 10.4.2. Temperatures.

4.4.12. Diagnostic of consumer




Auxiliary information menu, in which the operator can easily find out the current conditions of the heating circuit with regard to time control, required temperatures, outdoor temperatures, etc...



After you open the menu, the state of the operational part of the heating system appears, which is called appliance.

Diagnostic of consumer		1/6	
	Heating Circuit 1		▶
	External On/Off	Vyp	
	KNX setpoint	0.0°C	▼
	HZ1 level of demand	0.0°C	
	HZ2 level of demand	0.0°C	
	HZ3 level of demand	0.0°C	✓



Diagnostic of HC1		1/7	
	Operating mode	Auto	▲
	Mode	Comfort	
	Reason	Min.source Temp	▼
	Room status	On	
	B1 Flow HC1	55.2°C 54.9°C	✓
	Room HC1	21.0°C 21.3°C	

Heating circuit 1

After you open this menu, the heating circuit control state appears.

Operating mode	<p>Current state of heating circuit control is the Automatic mode. which means that the heating circuit is controlled by the time schedule, according to equitherm regulation, or other conditions.</p> <p><i>Operating states:</i> Auto / Comfort / Reduce / Protection.</p> <p><i>Note:</i> The operator can set the operating states in the menu > User setting / Heating Circuit 1 / Operating mode.</p>
Mode	<p>Current state of the heating system specified by the time program or manual setting of the operating mode.</p> <p>Operating states: Comfort / Reduced / Protection.</p>
Reason	<p>Information on the cause of the current state in which the heating circuit is at the moment.</p> <p>Operating states: Off/Protection/ Room limit/ Fast Stand By. /Summer/Daily limit/Room requested/ /Quick start up/ Minimal source temperature/ Boiler Off/ Limit active/ Flue gas temperature.</p>
Room status	<p>Current state of room influence on the heating water temperature.</p> <p>Operating states: Off/Anti-freeze protection/ Room limit/ Fast stand-by /Summer/Daily limit/Room requested/ /Quick start up/.</p>
B1 Flow HC1	<p>Current state of heating water temperature. The required heating water temperature and current temperature measured by sensor B1 are displayed.</p>
Room HC1	<p>Current temperature state in the room heated. Required room temperature and current temperature in the room heated are displayed.</p> <p><i>Note:</i> The room temperature is obtained from the room unit SIEMENS PO822.60 or a passive temperature sensor. The temperature sensor is selected according to chapter 10.3 System configuration.</p>
External On/Off	<p>Heating circuit control state; the heating can be switched off externally or switched on from the room unit SIEMENS POL822.60.</p> <p>Operating state: Off / On</p>
KNX Setpoint	<p>State of heating requirement on HC1, transmitted via the KNX busbar.</p>
HZ1 level of demand	<p>State of heating requirement on heating zone 1, transmitted via KNX. Required temperature value of TZ1 [°C] is displayed.</p>
HZ2 level of demand	<p>State of heating requirement on heating zone 2, transmitted via KNX. Required temperature value of TZ2 [°C] is displayed.</p>
HZ3 level of demand	<p>State of heating requirement on heating zone 3, transmitted via KNX. Required temperature value of TZ3 [°C] is displayed.</p>

4.5. SW and Operating System Download

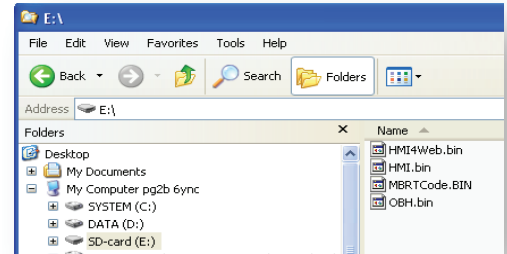
4.5.1. SW download

Recording SW by using SD memory card

1. Recording SW on to SD card

Aplication contains these files:

- MBRTCode.BIN – *aplication itself*
- HMI.bin – *operating file*
- OBH.bin – *language support*
- HMI4Web.bin – *web browser look*



All files has to be uploaded directly on to memory card (do not create any file for that).

Type of memory card: SD max. 2 GB, format FAT16.

Important: Before you start uploading SW safe all data from the boiler either by back up or writing it down.

2. Inserting the SD card SD in to control system POL 687

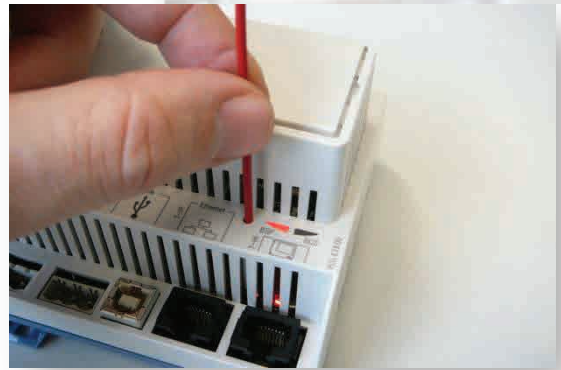
- Insert SD card with loaded data in to a control system so the connectors of the card are facing upwards.
- Press the card gently over the spring pressure, untill you feel a little click.



(take out the card the same way press the card against a spring strain, and the card will pop out from SD slot).

3. Pressing the service button

- Turn off the power of control unit (main switch).
- by using the right tool gently press the service button.
- Important: too much force can damage the button on the control board; do not use any sharp or pointed tool.
- Hold the service button all the time while uploading the SW.
- Turn on the power.
- While downloading the SW data LED signal light will flash from red to green and vice versa.
- The end of uploading will be signaled by BSP LED light turning in to orange color.

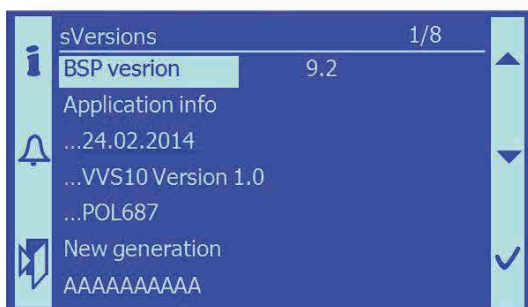


- Restart the control unit (on / off).
If the upload has been successful the BSP light will turn to green color.
- If the light does not come on please repeat the steps one more time.
- After successful upload set the parameters of the boiler (either by manufacturer recommendations or according to individual installation).

4. Application description:

- SW for boilers 150-500kW, 3 phase power source, standard installation or installation in container.
- Possible system configuration for: SMS, O2 sensor, Heating circuit 1, External control unit, Accumulation tank, KNX, Control 0-10V, Pressure in the system, Fuel conveyor type.
- Communication over SMS modem with active inquiry of the boiler status, error unlock....

Load the correct version of the operating program and find the correct version of the menu Service / Diagnostics / Version.



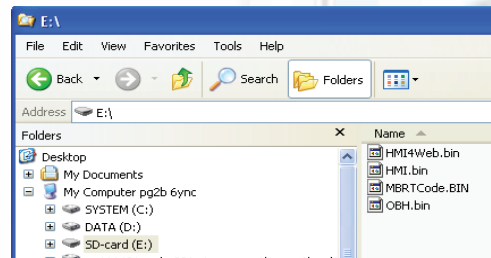
4.5.2. Recording BSP Operating System

4.5.2.1. Loading BSP system to SD card

Upload this file on to SD card:

POL687_BSP_V1022.UCF

or newer...



All file has to be uploaded directly on to memory card (so-called Root directory, do not load it to any subdirectory file).

Parameters of memory card: type SD max. 2 GB, card format FAT16.

Important: By loading BSP system you will erase all date save in control unit. Please back up all boiler settings before you start to reload new BSP system.

4.5.2.2. Inserting SD card into control system POL 687

- Turn OFF control unit.
- Insert SD card with uploaded BSP file in to control system, place it the way so connectors of the memory card are facing up.
- Gently press the card over the spring strain, until you hear light click, when the card is locked inside.



(take out the card the same way press the card against a spring strain, and the card will pop out from SD slot).

4.5.2.3. Pressing the service button

Turn OFF control unit:

- by using the right tool gently press the service button.
- Important: too much force can damage the button on



the control board; do not use any sharp or pointed tool.

- Hold the service button ON all the time while uploading BSP.
- Turn on the power.
- While downloading the BSP data LED signal light will flash from red to green and vice versa.
- The end of downloading will be signaled by switching off both signal LED lights.
- Wait for couple of seconds.
- Restart control unit (on / off).
- After the restart BSP orange LED light will flash that means that only BSP operating system is recorded in regulator.
- If the light does not come on please repeat the steps one more time.
- After successful download continue with the next step, Upload SW by SD card

4.5.2.4. POL 687 – Change over to the operating system 10.22

General information:

Siemens as the holder of advanced technologies is constantly working to improve and innovate their products. At the present time there is a new version of the operating system V10.22

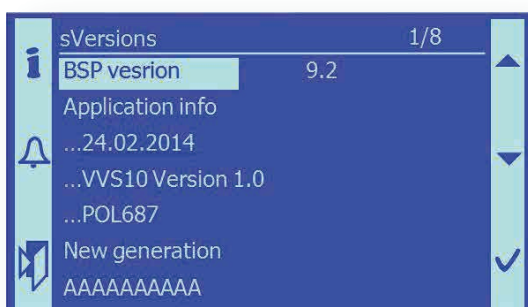
The most striking feature of this operating system is the ability to connect and service on the Cloud center.

Here is possible to store and track all the trends and data on the use of available equipment and innovation.

The connection to Cloud area does not require setting IP addresses, you need only to connect via Ethernet to any functioning network of Internet. Authorized person has access to all information stored here.

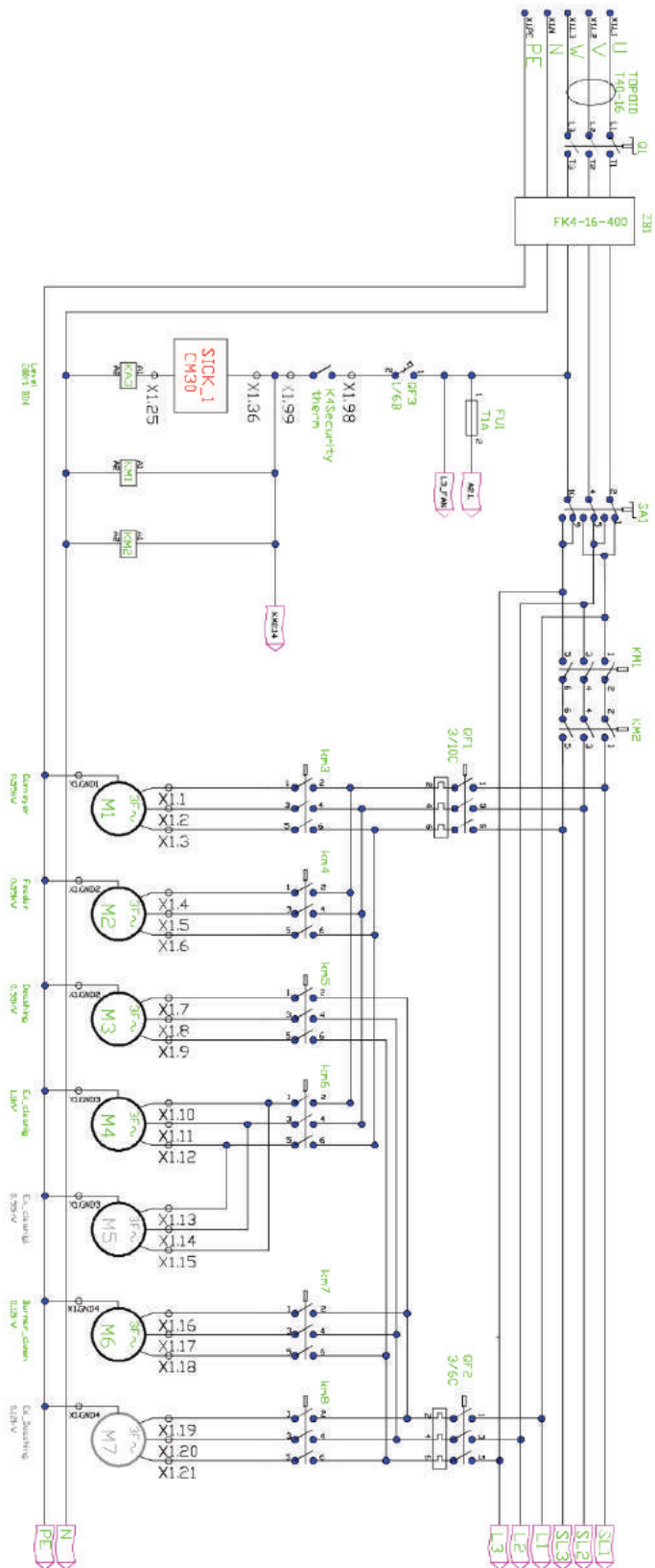
SMART, as an important partner of Siemens, got as one of the first companies consent to use of the new operating system V10.22. In a very short time has managed software application for boilers SMART adapt to the new operating system and now we present this solution available.

Load the correct version of the operating program and find the correct version of the menu Service / Diagnostics / Version.

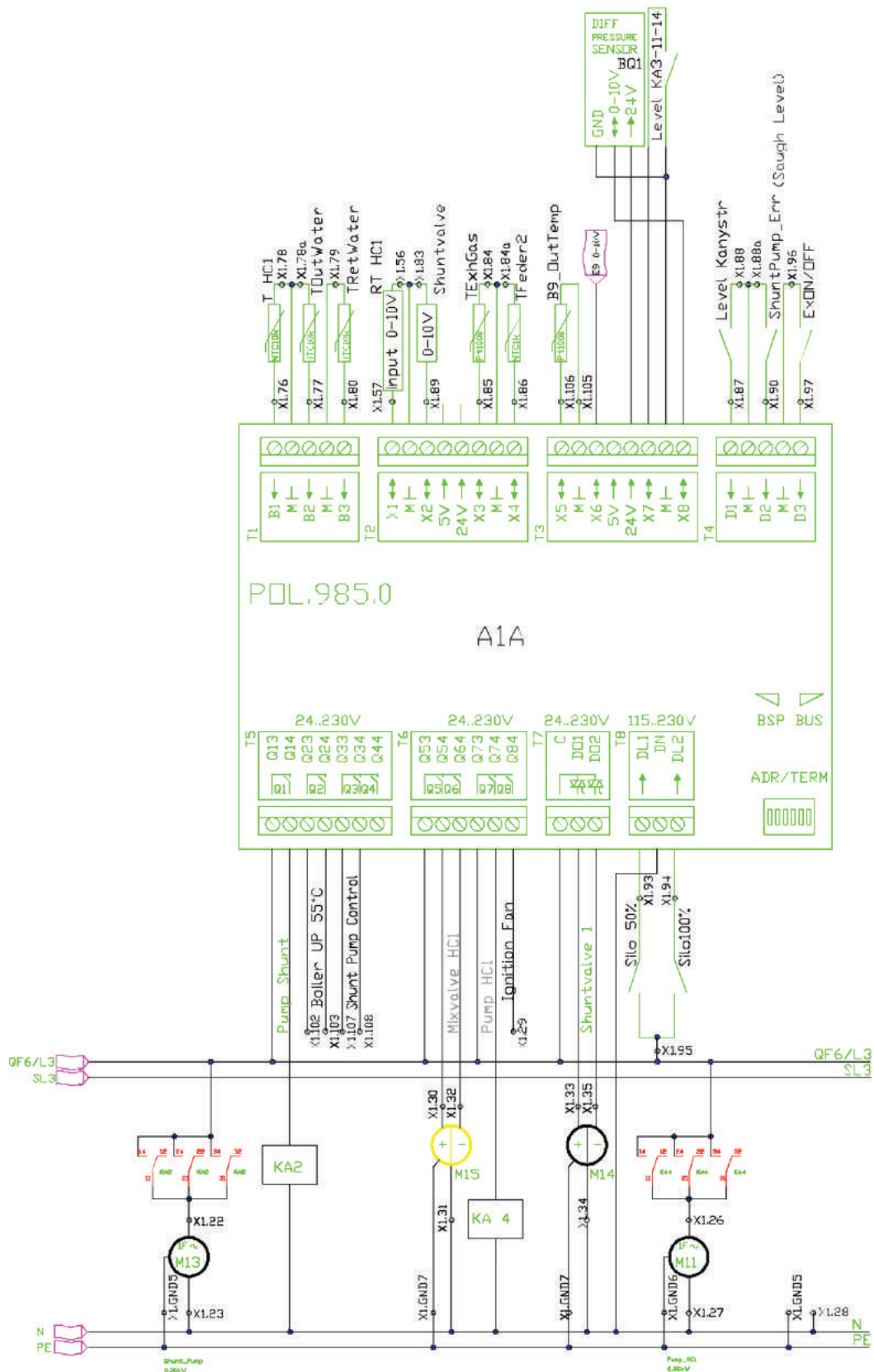


5. ELECTRIC CONNECTION

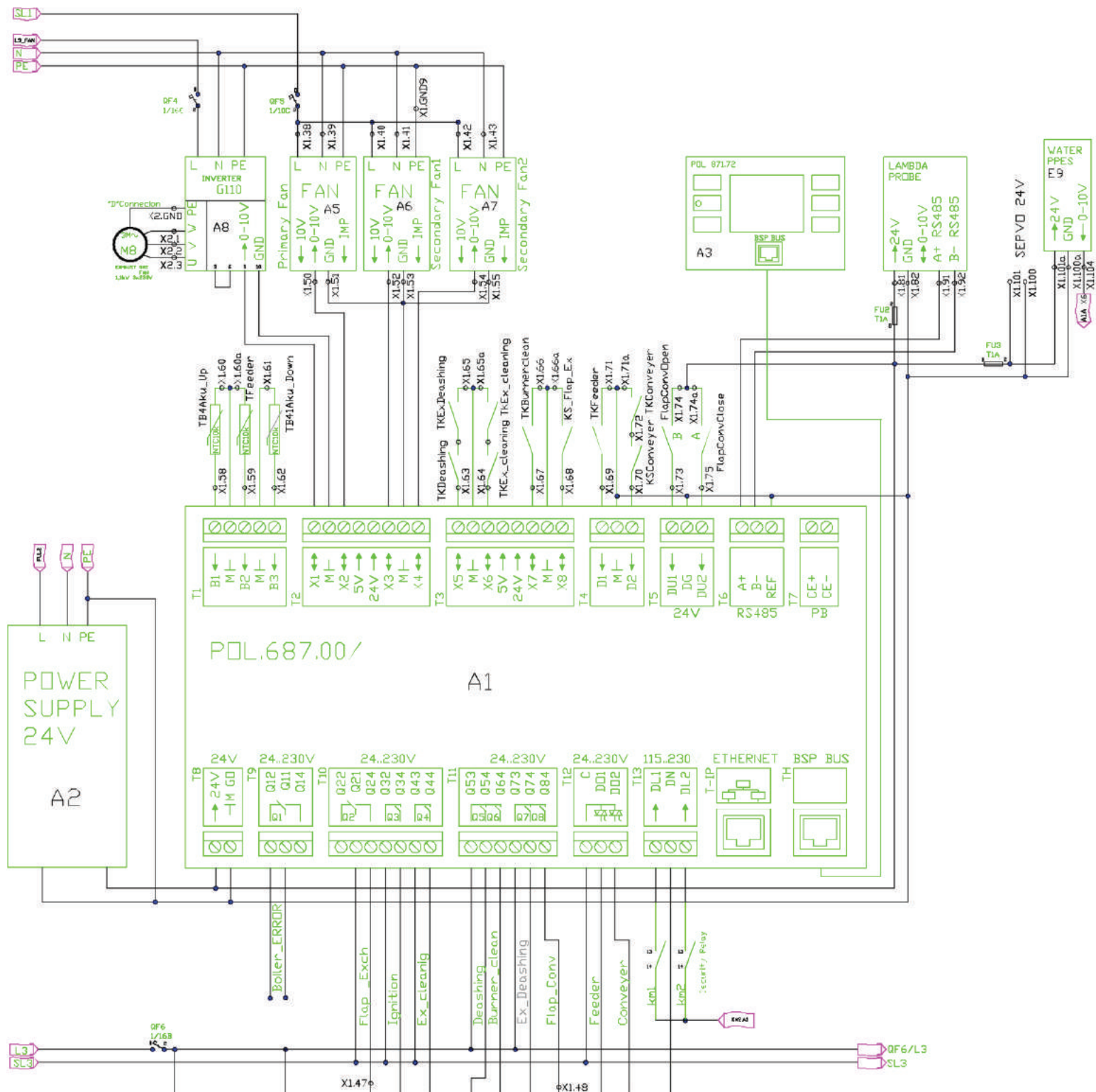
5.1. MOTORS



5.2. CONNECTION SCHEME POL985



5.3. CONNECTION SCHEME POL687



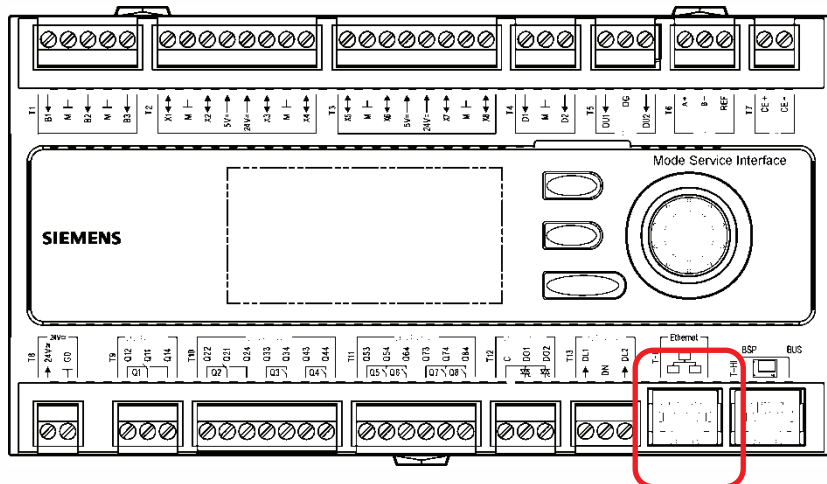
6. REMOTE MONITORING AND BOILER CONTROL

6.1. CONNECTION OVER THE INTERNET

Operation of an Internet connection is work for IT technician.

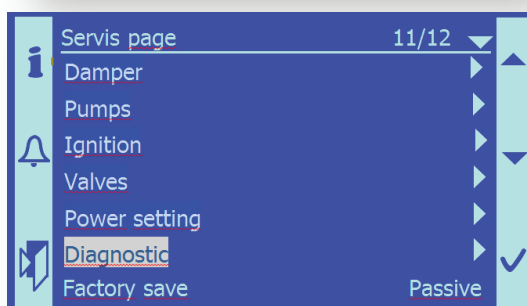
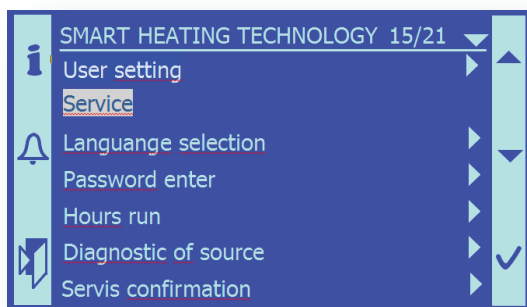
POL 687 is acting as a webserver on port 80.

1. Connect cable to the Ethernet terminals on the POL687. For connection use a standard RJ45 connector.



2. The controller as a standard comes with the assigned IP address of 192.168.1.42 from production.
To change the IP address and its settings according to local area networks requirements, perform the following settings.

3. Enter the SERVICE menu (password Level 3) / Diagnostic / TCP_IP.



	Diagnostic	2/12	▼
	Version		▶
	TCP/IP:		▶
	Restart counter	22	▼
	Internl Temp	36.9	
	Operating hours	22h	
	Cycle time reset		✓
	Cycle time actual	82ms	



4. Find out in the item Actual IP, what address the router on the local network provides (eg 10.42.1.89).

	sIP-Config	1/19	▼
	DHCP	Active	▲
	Actual IP	010.042.001.089	
	Actual Mask	255.255.255.000	▼
	Act.Gateway	192.168.001.001	
	Given IP	192.168.001.042	
	Given Mask	255.255.255.000	✓
	Giv.Gateway	192.168.001.001	



010.042.001.089

5. This address rewrite into the Givenl IP (10.042.1.89).

	sIP-Config	1/19	▼
	DHCP	Active	▲
	Actual IP	010.042.001.089	
	Actual Mask	255.255.255.000	▼
	Act.Gateway	192.168.001.001	
	Given IP	010.042.001.089	
	Given Mask	255.255.255.000	✓
	Giv.Gateway	192.168.001.001	



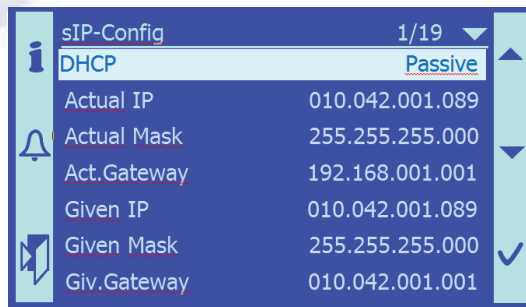
010.042.001.089

6. Set Given Gateway the scope of (family) provided addresses (10.042.1.1).

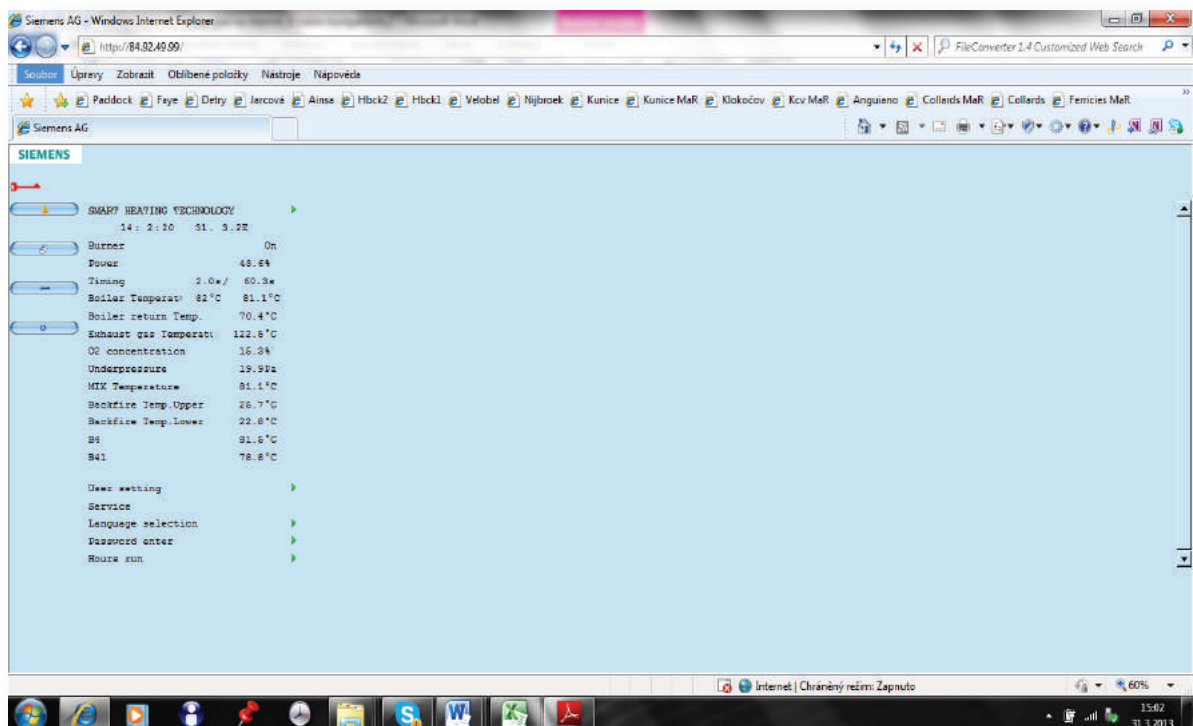
	sIP-Config	1/19	▼
	DHCP	Active	▲
	Actual IP	010.042.001.089	
	Actual Mask	255.255.255.000	▼
	Act.Gateway	192.168.001.001	
	Given IP	010.042.001.089	
	Given Mask	255.255.255.000	✓
	Giv.Gateway	010.042.001.001	



7. Set DHCP – passive. By this you will forbid the assigning of dynamic addresses to the boiler control unit.



8. Ensure router settings, so that boiler has reserved its address (10.42.1.89) and it did not assign it to another device.
9. Now, the device must be accessible on your local network by entering the address (Actual IP) into the address bar of your Web browser (Mozilla, Seemonkey).
10. For access from the external INTERNET network configure the router and its “port forwarding” so that after entering the address of the router and port 80 (or 8080), there is a connection directly to the address of the Actual IP.
11. The change goes into an effect after the device RESET. It is necessary to turn off and turn on the controller! RESET the device.
12. Try the connection of the newly set IP address.



6.2. SMS REPORT

GSM module (extra feature not part of standard delivery).

Inside of package:



Antenna



Modem



Data cabel



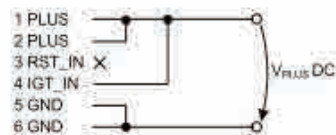
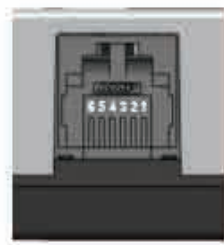
Power cable

Power supply of GSM module

GSM module is connected by 6 pol. connector to a power supply

clamps 1, 2 connect + 24V

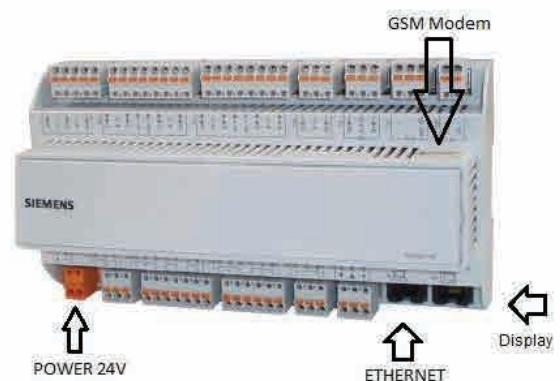
clamps 5, 6 connect GND



Power supply 24V DC is on clamps X1.101 + 24VDC in control unit ,X1.100 GND or directly on power supply SITOP+ 24V and GND.

Data from GSM module

Cable for data transportation from RJ45 connector in to GSM modem and RS-232 connector to a modem, to connect internet use ETHERNET connector.

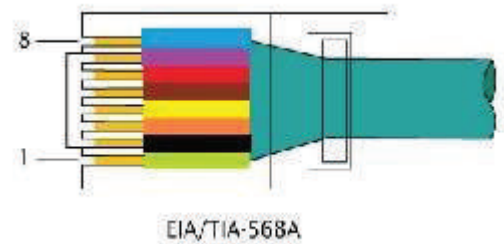


RJ45 in to Climatix.

1 DSR/RI
2 DCD
3 DTR
4 GnD
5 RxD
6 TxD
7 CTS
8 RTS

9 pol. connector RS-232 for modem

6 green
1 black
4 orange
5 yellow
2 brown
3 red
8 purple
7 blue



Connect an antenna to GSM module and place it where it has a signal.

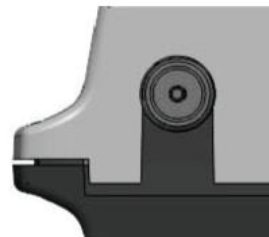


Figure 10: Antenna connector

SMS menu description in control unit

ActTelNumber – active phone number where sms messages are being sent to.

TEL1 up to **TEL4** – saved ph. no. – possibility to save up to 4 numbers

ENGO – it will send SMS even it will go back to regular mode

PIN incoming SMS – enter a password 1234

SIM Card PIN – PIN code of SIM card inserted into GSM modem

OKStatus – shows if the modem is functional

Error Status – modem error, OFF – no error / ON – error

Connection – shows modem and line GSM or Analog

Modem State – shows in what state GSM is currently

SMS server – shows signal status

Reset Modem – modem restart

GSM module setting in control unit of the boiler

- Enter under a password PIN1
Password enter > password > PIN1> confirm
- GSM module setting
Push the button “i” (it is on left side of display) > SMS > ON
-wait about 25 sec. (reconfiguration of control unit)
- Go to menu GSM modem setting (SMS message setting)
User > SMS
- Enter phone number, where you want to have the SMS message send to
TEL1 up to TEL4 number has to have also an international state number
- Select one number, which will be active (all sms will be send to selected number)
 - ActTelNumber – is for phone number (TEL1) selection
- Insert SIM card in to modem



- Orange LED light will stop blinking when the SMS card is correctly inserted
- Enter PIN cod (pin sim-cart) in menu:
User > SMS > SIM Card PIN > confirm
- in to a PIN incoming SMS line enter 1234
User > SMS > PIN incoming SMS > confirm
- restart GSM modem
User > SMS > Reset Mode – Active
- parameter OKStatus shows ON
- parameter Error Status shows OFF
- parameter Connection shows GSM modem
- parameter Modem State shows SMS / data transver
- parameter SMS server shows Normal and Correct
- GSM modem is fully functional

Possible problem solutions:

- **OK Status: OFF**

check if GSM modem is connected correctly and it is powered by 24VDC

check if GSM modem lights green

- if not check power supply 24VDC

- **Error Status: ON**

check if GSM modem is connected correctly and it is powered by 24VDC

check if GSM modem lights green

- if not check power supply 24VDC

- **Connection: OFF**

- modem does not communicate with control unit
 - check connection between modem and control unit
- modem is not powered by 24VDC
 - check if modem lights green
 - check power supply of 24VDC

- **Modem State:**

- **Modem not answer /Net searching**
 - weak signal
 - check if antenna is placed and mounted correctly
 - move antenna to different spot for better signal
 - restart modem by selecting menu Reset Modem
 - modem does not communicate with control unit
 - Check connection between modem and control unit
- **Modem not answer /Not login to provi and orange LED light is blinking**
 - check if the SIM card is inserted correctly

- **SMS server:**

- **Modem is offline**
 - weak signal
 - check if antenna is placed and mounted correctly
 - move antenna to different spot for better signal
 - restart modem by selecting menu Reset Modem

Communication with service

The query an authorized operator for the operating hours Feeder1:

send a text message in the form 'Feeder'R:1234

The query an authorized operator for the current boiler output:

send a text message in the form 'Pwr'R:1234

The query an authorized operator for the operating status of the boiler:

send a text message in the form 'State'R:1234

The query can also be sent in the accumulated form:

send a text message in the form 'Feeder'R+'Pwr'R+ 'State'R:1234

The command authorized operator to unlock the fault condition:

send a text message in the form 'Ack'1:1234

Important: The person who will send this text message is required to make sure in advance that unlocking a fault in the boiler operating status does not lead to a dangerous condition of the equipment.

The person who will send this text message is fully responsible for this.

Comment: 1234 is set authorization password (authentication password).

Without specifying the password in the text message, the device will ignore this text message.

7. ERROR MESSAGES

7.1. ALARM LIST

ALARM LIST	List of current errors	Passive 3	No. of errors which were not cleared by activating it
Alarm history:	History of last 50 errors		+ Record of error origin
			- Record of error end
Alarm history detail	Detailed error description	Error description	Error description Type of error - critical, low, warning Date and time of errors start and finish

7.2. LAMBDA ERROR

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Assymetry	Lambda sensor	Error message		Service/Oxygen sensor/Clear err flags/On
	Modbus Lambda OXY-LC	Error message		Replace Lambda sensor
Heater Error	Lambda Sensor	Low heat temperature Lambda	Lambda cold	Check contact on clamps - 1(Grey), 2(Yellow/Green)
		WARNING! Temperarute up to 800°C!	Change resistance of ignition spiral 2,5 Ohm - 1(Grey), 2(Yellow/Green)	Replace Lambda sensor
	Modbus Lambda OXY-LC		Change ignition spiral voltage to 4,45V DC	Repair contact on clamps
				Replace Modbus chip Service/Oxygen sensor/Clear err flags/On
Modbus Error	Modbus Lambda OXY-LC	Lack of data communication	Change power supply voltage OXY_LC 6(+24V), 7(GND)	Repair power supply Repair module OXY-LC
	Cable	Lack of data communication	Change continuity between POL687 A+, X1.91, OXY-LC 8(A+)	Repair cable or change polarity
			Change continuity between POL687 B-, X1.92, OXY-LC 8(B-)	Repair cable or change polarity
	POL687	Lack of data communication	Faulty input RS485	Replace POL 687
			Faulty SW	Download SW

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
O2under 0,1	Lambda sensor	Not valid Value O2	Make a calibration	Replace Lambda sensor
				Service/Oxygen sensor/Clear err flags/On
Pump Err	Lambda Sensor	Error message	Check Lambda sensor cable 3(Brown), 4(Black), 5(Blue)	Repair cable connection, Replace Lambda sensor
	Modbus Lambda OXY-LC	Error message	Check cable connection on clamps 3,4,5	Repair cable connection

7.3. MANUAL OPERATION ERROR

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Boiler_demand_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Boiler servis/Demand for Boiler/AUTO
ExhClack_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Damper/Exhaust Damper/AUTO
ConvClack_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Damper/Conveyor Damper/AUTO
ExhFan_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Fans/Exhaust Fan/*****
PrFan_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Fans/Primary Fan/*****
Sec1Fan_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Fans/Secondary Fan 1/*****

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Sec2Fan_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Fans/Secondary Fan 2/*****
Ignition_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Ignition/AUTO
M1_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control /Engines/Conveyor2/AUTO
M2_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Engines/Feeder1/AUTO
M3_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control /Engines/Deashing/AUTO
M4_5_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Engines/Exchanger cleaning/AUTO
M6_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Engines/Burner Cleaning/AUTO
M7_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Engines/Exchanger Deashing/AUTO
M9_Manually	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control /Pump/Boiler Pump/AUTO

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
MixClose Manually:Fault	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control /Valves/MIX closing/AUTO
MixOpen Manually:Fault	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control /Valves/MIX opening/AUTO
Return_Valve_Manually:Fault	None	Alarm list error	Boiler has been put into operation by using Manual control mode	Change to mode "AUTO" in Manual control mode
		Yellow LED light is flashing		Service/Manual Control/Valves/Return valve/*****

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Maintenance Needed	None	ServiceNeeded is flashing on the main screen	Regular maintenance is needed - Boiler has exceeded set operating hours	Maintenance and proper check-out has to be performed on the boiler!
				After it you are finished confirm it
Last service before:	None	None	Current value of operating hours from last maintenance	
Maintenance BurClean	None	Maintenance request	Maintenance of the burner needed - clean the burner	Maintenance has to be performed - after you are finished confirm it
				Servis confirmation/Maintenance-BurnClean/ON
Maintenance Exchanger	None	Maintenance request	Maintenance of Heat exchanger needed - clean the bottom part of the exchanger	Maintenance has to be performed - after you are finished confirm it
				Servis confirmation/MaintenanceExchanger/ON
Maintenance Cyclone	None	Maintenance request	Maintenance of cyclone is needed - take out the ash from the ashtray of the cyclone	Maintenance has to be performed - after you are finished confirm it
				Servis confirmation/MaintenanceCyclone/ON

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Maintenance Deashing	None	Maintenance request	Maintenance of the ashbox is needed - take out the ash, check its consistency and quality	Maintenance has to be performed - after you are finished confirm it
				Servis confirmation/MaintenanceDeashing/ON
Maintenance Silo	None	Maintenance request	Maintenance of the silo is needed - check the fuel level, its quality and spring condition	Maintenance has to be performed - after you are finished confirm it
				Servis confirmation/MaintenanceSilo/ON
Maintenance Conveyor	None	Maintenance request	Maintenance of the auger system is needed - check auger, steeres system, bearings	Maintenance has to be performed - after you are finished confirm it
				Servis confirmation/Maintenance-Conveyor/ON

7.4. SENSORS ALARM LIST

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Safety limit thermostat:Fault	None	Open contact of the safety thermostat	Check the boiler temperature	Finding out the cause of the boiler overheating!!!
		Boiler is overheated more than 95°C		Make sure that you remove excess heat
		At the same time you will see KM1 and KM2 fault		After the temperature drop to 65°C. Reactive Security Thermostat
KM1 Fault:Fault	Contactor KM1	Different oper. position of the contractor KM1 than KM2	Check the operating position of connector KM1	Contractor replacement
		When functioning correctly both KM1 and KM2 has to have the same position	Check the wire connection with el. scheme	Contractor repair
				Check the safety thermostat
KM2 Fault:Fault	Contrator KM2	Different oper. position of the contractor KM1 than KM2	Check the operating position of connector KM1	Contractor replacement
		When functioning correctly both KM1 and KM2 has to have the same position	Check the wire connection with el. scheme	Contractor repair
				Check the safety thermostat

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Safe tank:Empty	None	Low water level in the water tank	Check the water inside the tank	Fill the water in to a tank
	Level sensor	Faulty level sensor - false error message	Check the position of the level sensor	Correct and firmly attach the position of the level sensor
			Check the correct functionality of the sensor	Measure by using ohmmetr
		Faulty cabling or connector	Check the correct functionality of the sensor on clamps X1.87,X1.88	Measure by using ohmmetr
			Check the correct functionality of the sensor on clamps POL985 T4 D1,T4 M	Measure by using ohmmetr
TKM Conveyor 2:On	None	Open limit switch of Conveyor	Check the cover	Clean up the space between the cover and the conveyor body
			Check the quality and amount of the fuel, if it does not lift up the cover, which can open the end switch connection	Use only recommended fuel
	Thermocontact, motor	Temperature of the motor is higher than 95°C	Blocked auger or the auger is having a hard time with the fuel	Take out the parts which have blocked the auger Take out the parts which have blocked the flaps inside the silo
	Connector or Cabling	Interruption of el. power	Check the connection in the thermodcontact M2 and end switch X1.70,X-1.71,X1.72 for any cut or other visible damage on the wire.	Measure by using ohmmetr
TK Burner cleaning:Fault	Thermocontact, motor	Temperature of the motor is higher than 95°C	Blocked grating wheel or the motor is having a hard time to move the wheel	Take out the parts which has blocked the grating system
	Connector or Cabling	Interruption of el. power	Check the connection in the thermodcontact M6 and end switch X1.66,X1.67 for any cut or other visible damage on the wire.	Measure by using ohmmetr
Tkdeasching:Fault	Thermocontact, motor	Temperature of the motor is higher than 95°C	Blocked auger or the motor is having a hard time to move the auger	Take out the parts which has blocked the grating system
	Connector or Cabling	Interruption of el. power	Check the connection in the thermodcontact M6 X1.63,X1.65 for any cut or other visible damage on the wire.	Measure by using ohmmetr

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
TKfeeder 1:Fault	Thermocontact, motor	Temperature of the motor is higher than 95°C	Blocked auger or the motor is having a hard time moving the auger	Take out the parts which have blocked the auger system
	Connector or cabling	Interruption of el. power	Check the connection in the thermocontact M6 X1.69,X1.71 for any cut or other visible damage on the wire	Measure by using ohmmetr
TkExchanger cleaning:Fault	Thermocontact, motor	Temperature of the motor is higher than 95°C	Blocked turbulators or the motor is having a hard time moving the turbulators	Take out the parts which have blocked the auger system
	Connector or cabling	Interruption of el. power	Check the connection in the thermocontact M6 X1.69,X1.72 for any cut or other visible damage on the wire	Measure by using ohmmetr
TK Exch.deasching	Thermocontact, motor	Temperature of the motor is higher than 95°C	Blocked turbulators or the motor is having a hard time moving the turbulators	Take out the parts which have blocked the auger system
	Connector or cabling	Interruption of el. power	Check the connection in the thermocontact M6 X1.63,X1.65 for any cut or other visible damage on the wire	Measure by using ohmmetr
Exhaust Damper - bypass	Servomotor GCA326.1E	High temperature of exhasut gases	Servomotor is in permanent position Bypass	Use only recommended fuel
			Servomotor is permanently between position	Check correct functionality in manual mode
			Position of the servomotor manually set	Turn the servo manually to open the flap and let go, it should close automatically
			Loose connection between servomotor and flap axis	Set to correct position and tighten the crew
			Check the flap by removing cover of the flap on the top of the Burning chamber	Set and securely attach the flap, remove any possible obstacles

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Exhaust Damper - bypass	Servomotor GCA326.1E	Servo is not working as it is set in CU	Check the power supply 230V cable	Measure by using ohmmeter
			Check the power supply 230V while the servo is closing X1.46-X1.47	Measure by using ohmmeter
		Flap is in correct position	Faulty message of the end contact	Check / set position of the contracor B
			Check the end switch X1.66-X1.68	Measure by using ohmmeter
Exchanger damper - exchanger	Servomotor	Flaps is in permanent position - exchanger	Low temperature of exhaust gases - while in ignition process	Set to correct position and tighten the crew
			Boiler is trying to ignite repeatedly	Check the mechanical block of servomotor
	Exhaust gases flap		If the fault is lasting for a long time it could cause a condensation inside of heat exchanger	
Exchanger damper - exchanger	None	On	The flpa is closed in the idle position	
	None	Not Off	Flap is locked in between position while opening	
		Not Off	Incorrectly set contact A X1.74-X1.75	Measure by using ohmmeter
				Check the readings on the screen User/Binary input
		Foreign obstacles between flap		Clean the opening flange of the flap
Damper On	None	Off	Flap is open while the fuel is filing up	
		Not Off	Incorrectly set contact B X1.74-X1.73	Measure by using ohmmeter
				Check the readings on the screen User Settings/Binary input

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Pneumatic_Transport.EmSwitch_TK_Conveyor	End switch of the lid	Turbine of pneu system does not turn on	The lid of the cyclone is removed or placed incorrectly	Check the position of the lid
	Pneu feeding system		Open connector TKM1	Check the connector and its connection
			Defected cables	Measure by using ohmmeter
			Measure contact switching on X.70-X1.71-X1.72	Measure by using ohmmeter
Backfire Temp.Upper:open loop	Thermal sensor QAL36.225	Invalid value on the screen	Measure resist- ance of the sensor 6-20kOhm	Sensor replacement
			X1.59-X1.60	Check all cables
Backfire Temp.Upper:short loop	Thermal sensor QAL36.225	Invalid value on the screen	Measure resist- ance of the sensor 6-20kOhm	Sensor replacement
			X1.59-X1.60	Check all cables
Backfire Temp.Upper:open loop	Thermal sensor QAL36.225	Invalid value on the screen	Measure resist- ance of the sensor 6-20kOhm	Sensor replacement
			X1.84-X1.86	Check all cables
Backfire Temp.Upper:short loo	Thermal sensor QAL36.225	Invalid value on the screen	Measure resist- ance of the sensor 6-20kOhm	Sensor replacement
				Check all cables
Conveyor Lever	None	Ok	Level of the fuel is intermediate fuel bin has its correct level	
	None	UnderLevel	Level of the fuel is low	Fuel will be automatically filled
	Relay KA3	Bin is Empty but signal is OK	Relay is always swithced ON	Replace relay
	None	Bin is Empty but signal is OK	Level sensor sensi- tivity is too high	Adjusted lower sensitivity
		Bin is Empty but signal is OK	Level sensor surface is dirty from wood dust	Clear level sensor
KNX bus error	Set incor- rectly	Any KNX error message	KNX ON - use of the bus bar is sonnected, but the equipment is not connected to the same bus bar	Set KNX OFF
		Any KNX error message	KNW ON is set cor- rectly, equipment is connected to the same bus bar	Check the connection
				RESET equipment. KNX will connect automatically

MESSAGE	FAULTY PART	DESCRIPTION OF THE ERROR	ANALYSIS	CLEARING THE FAULTS
Underpressure Fault	Underpressure sensor	Underpressure is lower than it is set in the menu	Service door are open for a long time	After the door is closed the error will disappear off the lid itself
		Service/Underpressure	Service door are open for a long time	After the door is closed the error will disappear off the lid itself
		Service/Fans/Underpressure hysteresis		
		Sensor is incorrectly set	Check the microswitch inside of the sensor	Set the switch to the range of 100Pa
		Faulty sensor	Output syshnal has to be in the range 0-10V POL985 M-X8	Measure by using voltmeter
	Flue gas fan		Fan is turning the wrong direction	Check direction of fans revolutions
			The output performance is not as required	Check the fan output performance in the menu User/ Analog Output
			Check if the range of revolutions is 30-100% of its performance	Check the functionality of the fan in the manual mode Service/Manual Control/ Fans/Exhaust Gas Fan

8. CHECK BOOK – EQUIPMENT MAINTENANCE

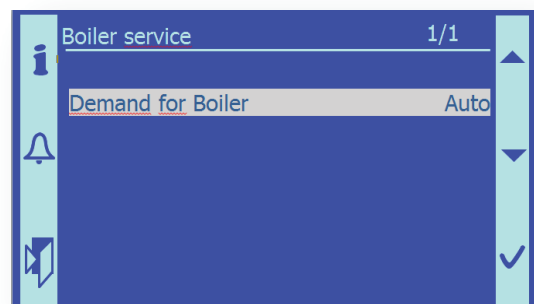
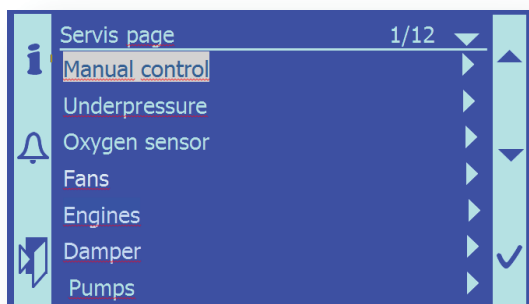
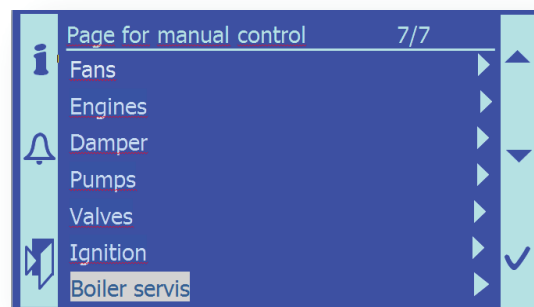
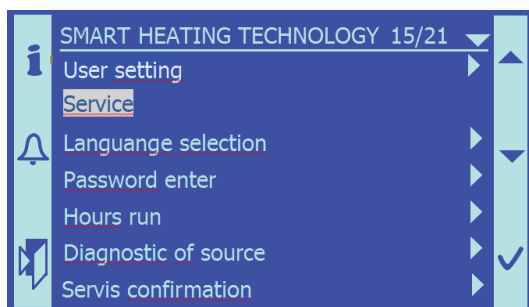
8.1. CHECK OF COMBUSTION CHAMBER AND BURNER

This chapter aims to describe the actions related to correct maintenance and service of the combustion chamber, and the burner in particular.

8.1.1. Preparatory actions

Before accessing the combustion chamber:

- Put the boiler out of operating power and let it cool down adequately.
- The boiler can be put out of operating power:
 - By disconnecting EX_OFF in the higher-level system (not recommended for safety reasons)
 - By switching the boiler off in the Service/Manual Operation/Boiler Service menu



Set OFF

- By turning the emergency switch to the "0" position

- To improve working conditions as well as combustion dust and flue exhaust, set the exhaust fan in the manual mode to a suitable output level.
Menu SERVICE/Manual control/Fans/ Exhaust Gas Fan/ 35%
- The area before the combustion chamber must be free and without flammable subjects.

8.1.2. Safety advice

When opening the combustion chamber or working in it, there are the following risks and dangers of the operators' health and possible risks of damage to the property:

- Risk of wood gas explosion. Never open accesses to the combustion chamber during boiler ignition or if the chamber and boiler are filled with grey wood gas!!
- Risk of fire – unburned fuel residues may occur in the combustion chamber. If they fall out of the combustion chamber on a flammable material, fire may occur. Check the availability of extinguishers.
- Risk of poisoning by toxic gases. Ensure removal of flue and gases by means of an exhaust fan. Provide for sufficient ventilation of the boiler room.
- Risk of burning – all parts of the combustion chamber may have a high temperature. Therefore, work in suitable protective clothing and gloves.
- Risk of contamination of eyes and lungs with dust – always use protective goggles and respirator during work.
- Risk of hand injury by rotary and moving parts of the device.
- Always work in pair, never alone.

8.1.3. Opening the combustion chamber

- First of all, check the state in the combustion chamber by opening the inspection door. There should not be a high flame in the burner; there must not be visible smoke in the combustion chamber.
- Remove the upper front jacket cover – push it to the side and remove forwards.
- Remove the lower grating cover – lift it up on the left and right, and pull forwards.
- If conditions for safe opening of the chamber are met, dismount the 3 screws M10 with a M17 spanner.
- When loosening the screws, stand so that you cannot be hit in case of a sudden opening of the door.
- Open the door slowly and carefully so that the operator cannot be stricken by the flame, glowing ashes, etc.

8.1.4. Combustion chamber inspection

After opening the combustion chamber service door, always check:

- Quantity and quality of ashes and combustion residues. The ashes must be grey, light, without apparent fuel residues.
- State of ash screws and ash level under the burner.
- State of the ceramic reflector. It must be compact and without cracks.
- State of paints in the combustion chamber. The original colour is black. If the colour is pink at some places, these parts must have been extremely heat-stressed – find the cause!!
- There must be no black places with soot in the combustion chamber. This would indicate bad combustion or untightness and presence of foreign air in the combustion chamber.

8.1.5. Burner inspection

The actual burner consists of two parts – the lower secondary ring and the upper ring.

For correct function, it is necessary to ensure air supply from secondary fans A6 – secondary fan 1 and A7 – secondary fan 2.

- Check whether the burner leans against the air channel sealing!
- The burner must touch the cord sealing firmly, not exceedingly.
- Check the position of the upper ring of the burner according to the position of spacing arrows. The arrows must point to each other (right-hand boiler) or from each other (left-hand boiler). They must never point at one side (both upwards or both downwards), for the upper ring would be turned by 180°.
- Check whether the fixing screws (located on the burner side opposite to the air channels) have a sufficient dilatation clearance. The correct distance of the screws from the burner in operation is 1.2–2mm.

Important notice: If the fixing screw is firmly tightened to the burner during boiler operation time, the burner ring dilatation is restricted. There is a risk of damage and deformation of the burner. It may even burst.

Important notice: If the boiler is in operation and the fixing screws tightened, the guarantee for the device expires immediately for this reason.

- Check the height of the gap between the lower edge of the burner and the grating plate. The correct height is 15-20 mm for pellets and 30-40 mm for wood chips.

Important notice: The optimum height can only be set in operation according to the specific fuel used. The service organization is responsible for correct setting and optimization of the necessary gap height!

8.1.5.1. Upper Ring Inspection

- The burner body must be clean, without any adherent combustion residues.
- The circular air holes must be clean and clear all over their diameter.
- No ashes or other dirt can remain inside the hollow burner body.
- If need be, clean the burner ring with a scraper and wire brush.
- If need be, clean the holes by means of a drilling machine and drill of the pertinent diameter.

8.1.5.2. Lower Ring Inspection

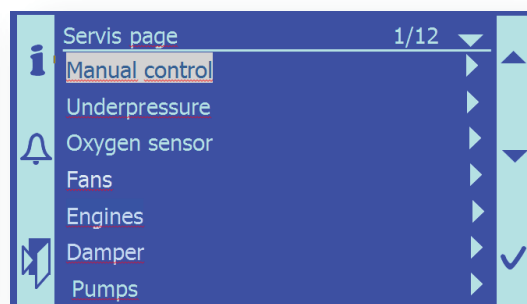
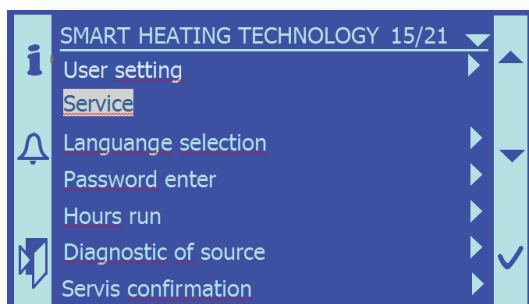
- The burner body must be clean, without any adherent combustion residues.
- The circular air holes must be clean and clear all over their diameter.
- No ashes or other dirt can remain inside the hollow burner body.
- If need be, clean the burner ring with a scraper and wire brush.
- If need be, clean the holes by means of a drilling machine and drill of the pertinent diameter.

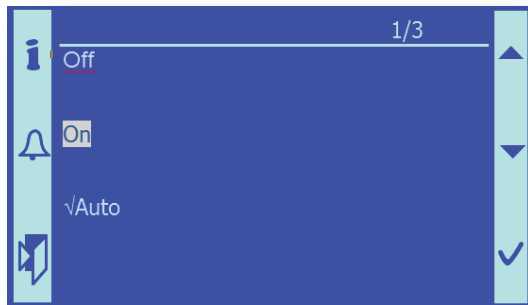
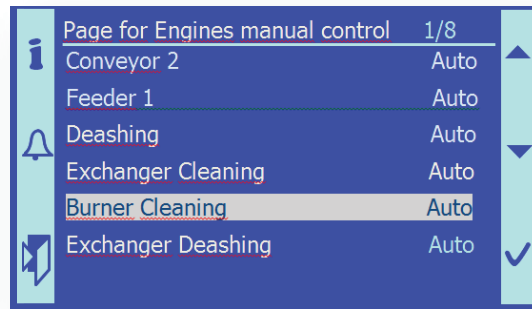
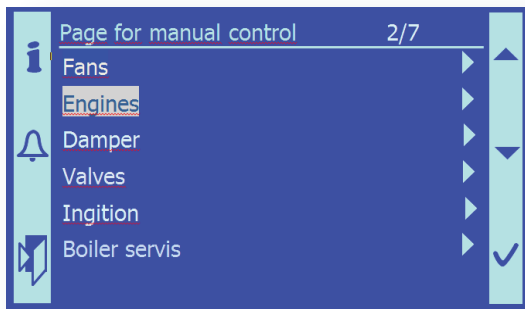
8.1.5.3. Primary Burner Inspection

- The cast-iron circular primary burner is perforated with holes of 4 mm diameter.
- The ring body must be intact, without any deposits.
- If need be, clean the burner ring with a scraper and wire brush.
- All of the holes must be clean and clear.
- If need be, clean the holes by means of a cordless drilling machine and a drill D=4mm.
- Check whether the fuel input channel does not contain pitch deposits.
- If need be, remove carefully all deposits with a scraper or big screwdriver.

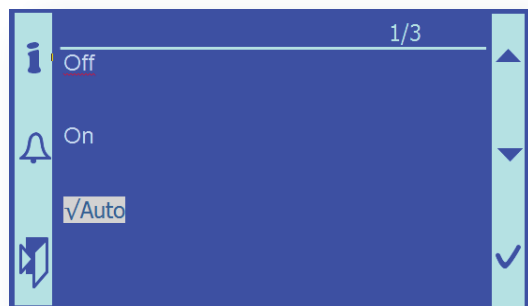
8.1.5.4. Grating mechanism inspection

- Check the integrity of the level grating mechanism.
- Check the coupling pins on the grating levers and the grating wheel
- All pins must be locked with cotters.
- Set the grating mechanism in motion.
 - Emergency switch to position “1”
 - Switch on the M6 motor in the Service/Manual Operation/Engines menu.





- Check its trouble-free operation.
- If the grating operates well, return the grating motor control to the Automatic mode.



8.1.6. Burner Removal

After opening the big service door and carefully checking the existing state, you can continue to remove the burner parts:

Important notice: The burner parts can be very hot; use protective gloves. MOREOVER, USE FOOTWEAR WITH REINFORCED STEEL TOES.

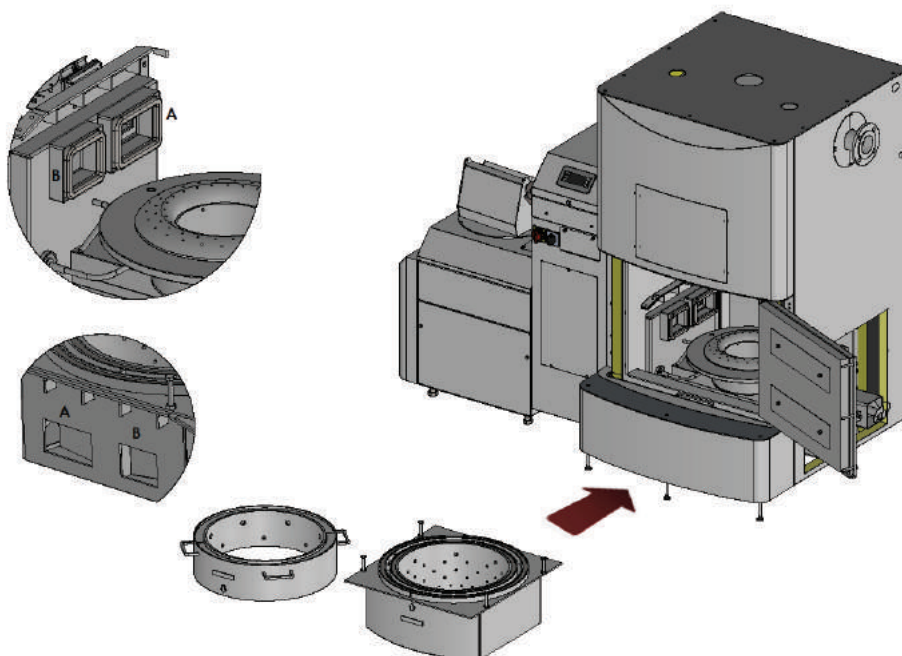
- Remove the cover of the fixing screws located on the jacketing on the ash pan side.
- Loosen the fixing screws by turning them by about 5 mm anti-clockwise.

- Take the upper ring by the metal grips, lift it by about 50 mm and try to move the ring left- or rightwards.
- It is necessary to move the ring so that it springs out of the sealing grooves provided with the sealing cord.
- Then it is possible to remove the ring forwards easily.
- The lower ring is to be removed similarly; lift it at the front and pull forwards intensely.
- Smooth forward removal is restricted by the cast-iron ring of the primary fan. Therefore, you must hold the front side of the burner lower part very high.
- By repeatedly moving the front part of the lower burner ring up- and downwards and pulling it vigorously, you can get the part to the combustion chamber edge.
- Take the burner in pair and replace it to the inspection site.

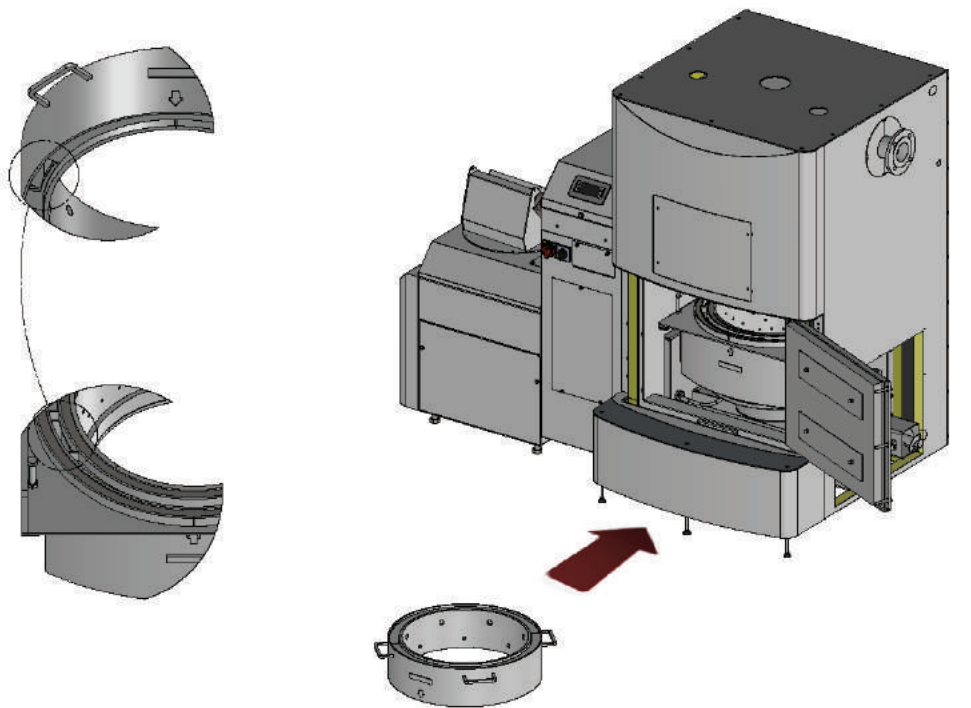
Important notice: The parts of the burner may be very hot, put them on fireproof base only.

8.1.7. Burner Mounting

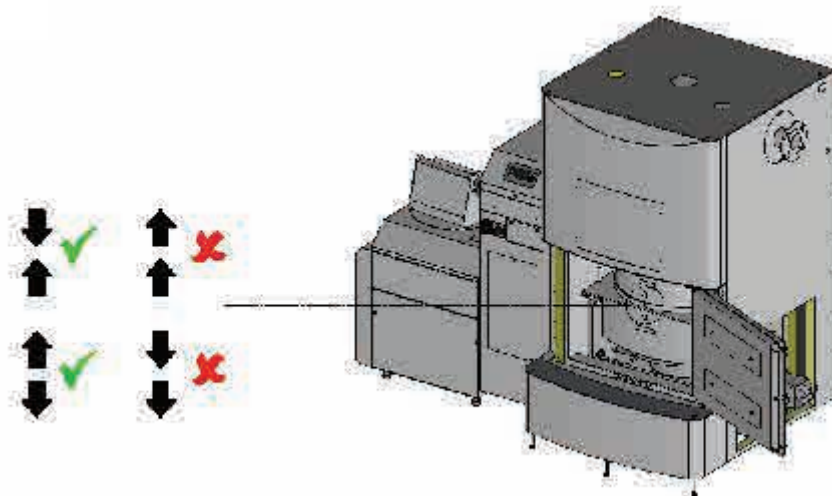
- After careful check of the combustion chamber and cleaning, the burner can be mounted back to the combustion chamber.
- Turn the burners of the lower ring before the combustion chamber so that the air holes and air channels are on the same side.



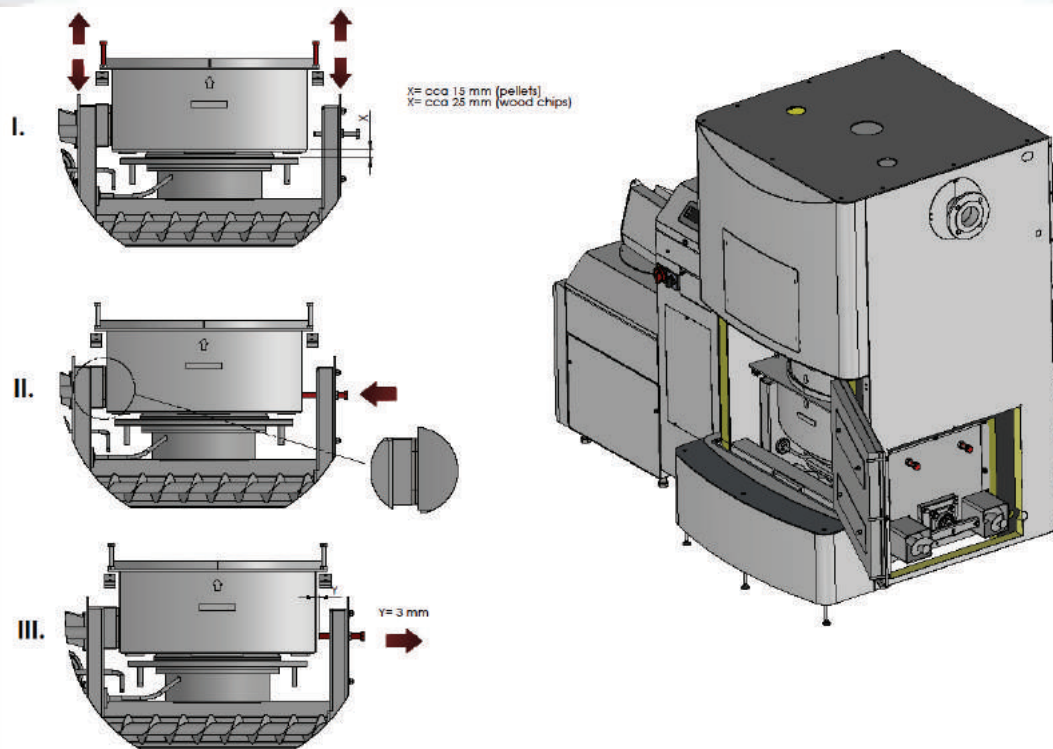
- Lift the lower burner ring in pair and set it on the skids in the combustion chamber.



- Push them backwards by force.
- Carefully check whether the lower burner ring is set at the correct height which corresponds to the fuel used (chapter 15.1.5).
- All of the 4 set-screws must bear on the skid!! Check that.
- The lower burner ring must be set horizontally; there must be the same gap above the grating wheel in front and back.
- Check the correct position of the air channel between the lower burner ring and upper burner ring.
- Set the upper burner ring and check the correct position by the identification arrows.



- Tighten the fixing screws so that the burner touches the air channel with sealing.
- LOOSEN the fixing screws so that there is a gap of 1.5–2 mm between the screw and the burner.



- Further, carry out checks according to chapter 15.1.5.

8.1.8. Primary Burner Removal

- The primary burner must be removed within the annual boiler overhaul.
- The primary burner is fixed with three spring pins located with a spacing of 120° .
- Visibly mark the primary ring position to the fixed part of the fuel channel.
- Knock the pins out with a hammer and a round bar of $D=6\text{mm}$.
- The pins will fall into the burner, into the space where the primary air flows.
- Remove the primary burner with a crowbar (big screwdriver, chisel).
- Clean the space under the primary burner and in the air channel with a vacuum cleaner.

8.1.9. Primary Burner Mounting

- Set the primary burner according to the mark made before.
- Knock the primary burner to the right position by means of a rubber mallet.
- The pre-bored holes \varnothing must be concentric on the fixed part of the fuel channel and on the primary burner.

- Lock the primary burner with spring pins.
- Use new pins for the locking.

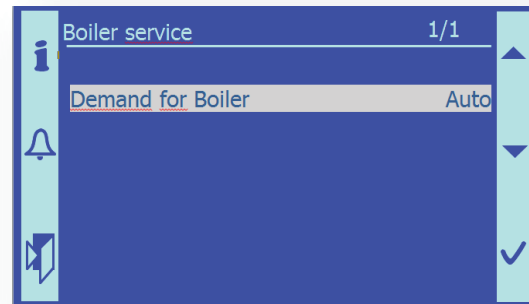
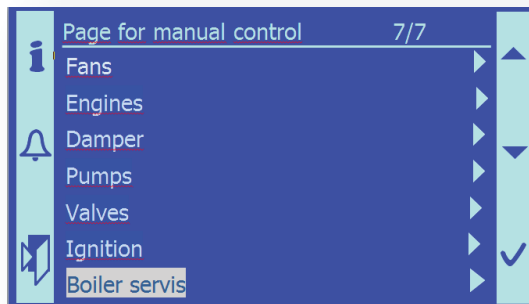
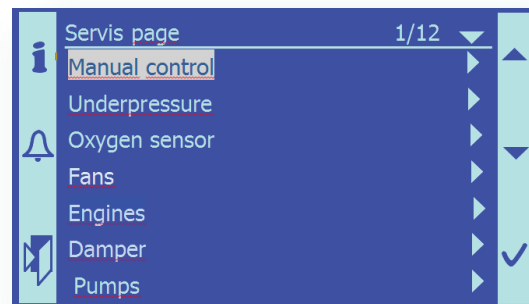
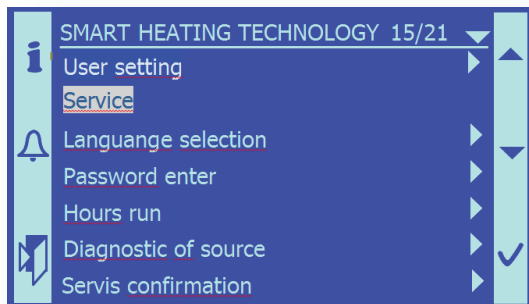
8.2. EXCHANGER INSPECTION

This chapter aims to describe the action related to correct maintenance and service of the exchangers and group of cleaning - turbulators.

8.2.1. Preparatory actions

Before accessing the exchanger

- Put the boiler out of operating power and let it cool down adequately.
- Put the boiler out of operating power according to the procedure in chapter 15.1.1.
 - By disconnecting EX_OFF in the higher-level system (not recommended for safety reasons)
 - By switching the boiler off in the Service/Manual Operation/Boiler Service menu



Set OFF

- By turning the emergency switch to the "0" position.
- To improve working conditions as well as combustion dust and flue exhaust, set the exhaust fan in the manual mode to a suitable level.
Menu SERVICE/Manual control/Fans/ Exhaust Gas Fan/ 35%.
- The area before the cleaning holes of the exchanger must be free and without flammable subjects.

8.2.2. Safety advice

When opening the combustion chamber or working in it, there are the following risks and dangers to the operators' health and possible risks of damage to the property:

- Risk of wood gas explosion. Never open accesses to the exchanger during boiler ignition or if the exchanger and boiler are filled with grey wood gas!!
- Risk of fire – glowing ashes residues may occur in the combustion chamber. If they fall out of the combustion chamber on a flammable material, fire may occur. Check the availability of extinguishers.
- Risk of poisoning by toxic gases. Ensure removal of flue and gases by means of an exhaust fan. Provide for sufficient ventilation of the boiler room.
- Risk of burning – all parts of the combustion chamber may have a high temperature. Therefore, work in suitable protective clothing and gloves.
- Risk of contamination of eyes and lungs with dust – always use protective goggles and respirator during work.
- Always work in pair, never alone.
- Safely disconnect the turbulator motor/motors from electric power supply.

8.2.3. Opening of the exchanger inspection door

- If the conditions for safe opening of the exchanger cleaning door are fulfilled, loosen the four M10 screws with a M17 spanner.
- There are cleaning doors on both sides of the exchanger – to facilitate access to the spacious room under the exchanger.
- Open the door slowly and carefully so that the operator cannot be hit by the flame, glowing ashes, etc.

8.2.4. Inspection of the space under the exchanger

After opening the exchanger cleaning door, always check:

- Quantity and quality of combustion residues. The ashes must be grey and light.
- Quantity of ashes.
- Ash consistency – it must be loose, without pitch particles and any moisture.
- Pitch and moisture may present a serious problem – contact the manufacturer.
- State of insulation materials.
- There must be no black spots with soot under the exchanger. These would indicate bad combustion or untightens and presence of foreign air in the exchanger flue ducting.

8.2.5. Inspection of the space over the exchanger

The space over the exchanger can be checked through the chimney extension after removing one of the covers.

- A certain amount of dust particles may be deposited over the exchanger (turbulators).
- Check the ash quality and colour – it must be light grey.
- Check quiet and trouble-free operation of the turbulators.
- Check the state and contamination of the lambda-probe – there must be no layer of ashes and soot.
- Check the state and contamination of the flue gas thermometer – there must be no layer of ashes and soot.

8.2.6. Check of the turbulators drive

The turbulators drive consists of the drive motor/motors of 0.55 kW output, with a spur gear box $i=64$, as well as a system of sprocket-wheels with a chain.

The turbulators are mounted in bearings.

The turbulators near to the motor are loaded most; therefore, they have reinforced axes.

The design of the turbulators differs according to sense of rotation. Therefore, they have suitably ground wiping bars respecting the sense of rotation.

- Dismount the cover of the turbulators drive – aluminium tear-patterned sheet – Allen key No. 6.
- Dismount the chain cover above the motor/motors.
- Check the state and tightening of the chain drive – chain tightening is checked at the place between the motor pinion and the first turbulators. After a strong push, the chain deflection should be approx. 1.5-2 cm.
- If need be, tighten the chain by tightening the two screws M10 on the motor bracket with a M17 spanner.
- Before tightening, loosen the 4 motor fixing screws with a M17 screw!!
- After proper tightening, firmly retighten the 4 fixing screws in the new position.
- Check lubrication of all bearings – if necessary, use a forced-feed lubricator and the Chevron grease for lubrication.

If the turbulator operation causes problems such as heavy running (evident from large chain deflection at the compression side of the chain), it is necessary to centre the bearings of turbulators.

The turbulator axis must be identical with the exchanger tube axis:

- Loosen the 4 fixing screws on the turbulators drive motor – spanner M17.
- Sufficiently loosen the 2 tightening screws on the motor bracket – spanner M17.
- Disconnect the chain coupler.
- Remove the chain and store it at a place without dust particles. It is greased and would be contaminated.
- Rotate the individual

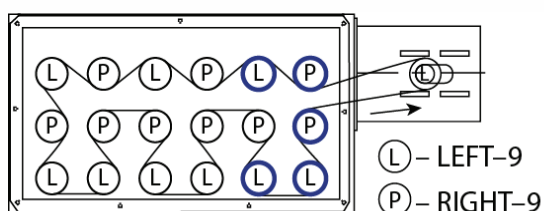
- Loosen the bearing-fixing screws of the resisting turbulator. Use the M17 spanner for the UCF204 bearings and M19 spanner for UCF206 bearings.
- Set the bearing to a position in which it will not seize and will rotate freely. Fix it in this position by firmly tightening the screws.
- Repeat the procedure with every problematic turbulator.

If it is possible to rotate all turbulators easily, put on the chain according to the diagram. You must respect the sense of rotation of the individual turbulators – see the pictures below.

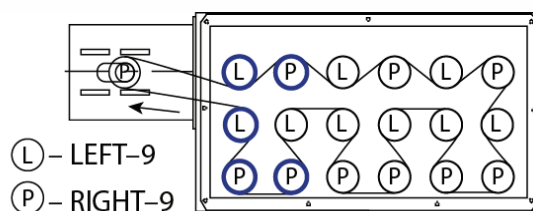
- Join the chain with the coupler.
- Tighten the chain with the 2 tightening screws on the motor bracket – tighten them gradually with the M17 spanner.
- Tighten the 4 fixing screws of the chain drive motor – spanner M17.

SUPERMAX 150 kW:

Boiler type – right-hand



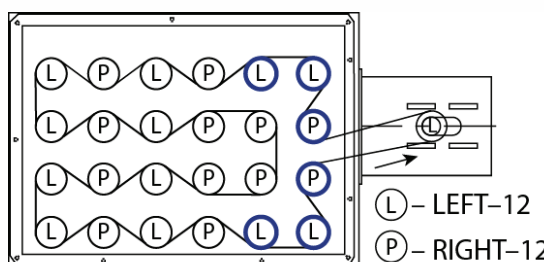
Boiler type – left-hand



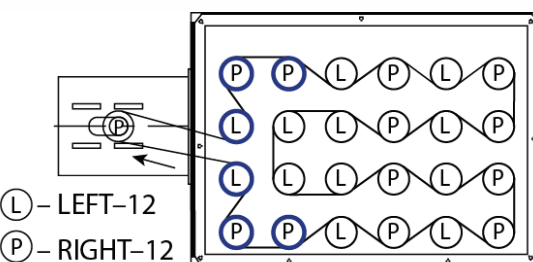
○ Reinforced type
Chain length 3679 mm

SUPERMAX 180 kW:

Boiler type – right-hand



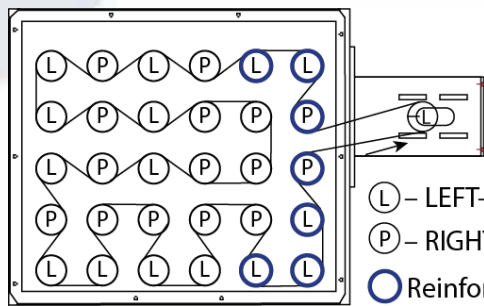
Boiler type – left-hand



○ Reinforced type
Chain length 4373 mm

SUPERMAX 200 – 220 kW:

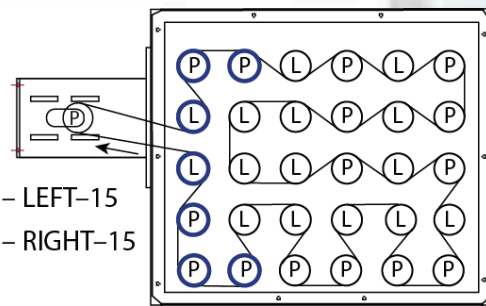
Boiler type – right-hand



Ⓕ – LEFT-15
Ⓖ – RIGHT-15

Ⓕ Reinforced type
Chain length 5609 mm

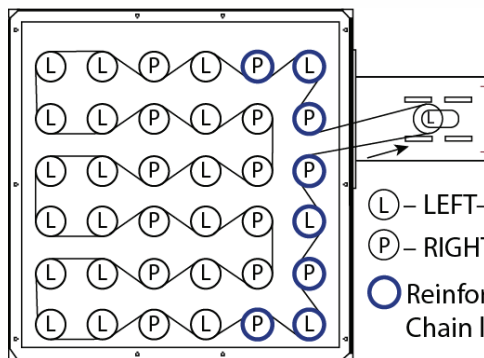
Boiler type – left-hand



Ⓕ – LEFT-15
Ⓖ – RIGHT-15

SUPERMAX 250 kW:

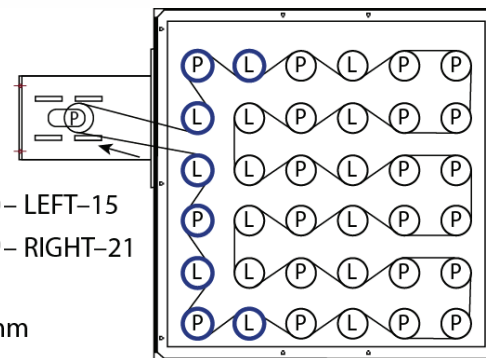
Boiler type – right-hand



Ⓕ – LEFT-21
Ⓖ – RIGHT-15

Ⓕ Reinforced type
Chain length 6254 mm

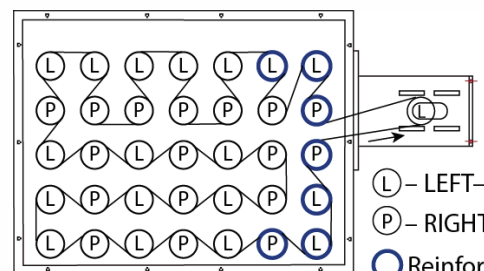
Boiler type – left-hand



Ⓕ – LEFT-15
Ⓖ – RIGHT-21

SUPERMAX 300 kW:

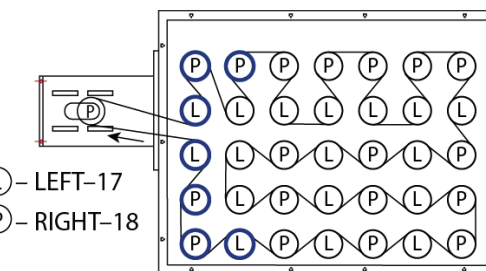
Boiler type – right-hand



Ⓕ – LEFT-18
Ⓖ – RIGHT-17

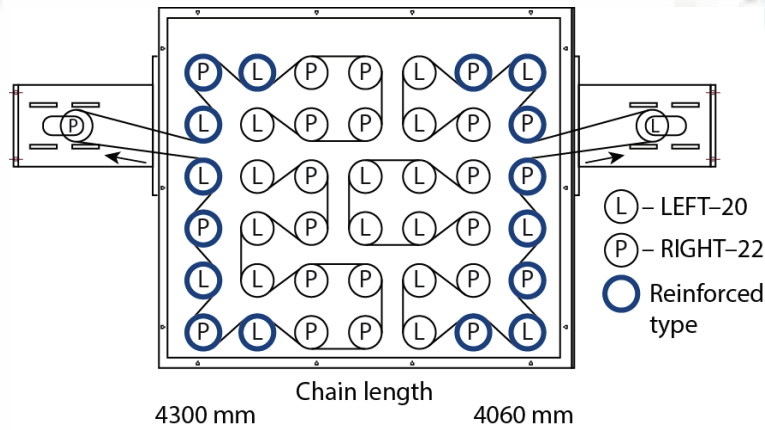
Ⓕ Reinforced type
Chain length 6636 mm

Boiler type – left-hand

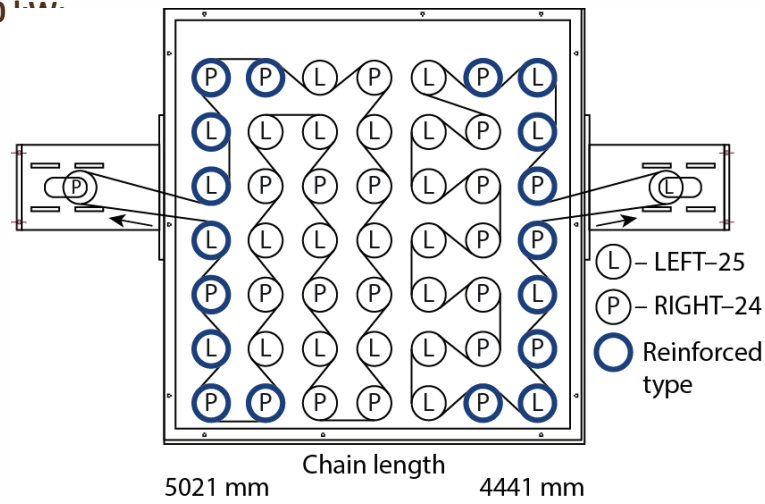


Ⓕ – LEFT-17
Ⓖ – RIGHT-18

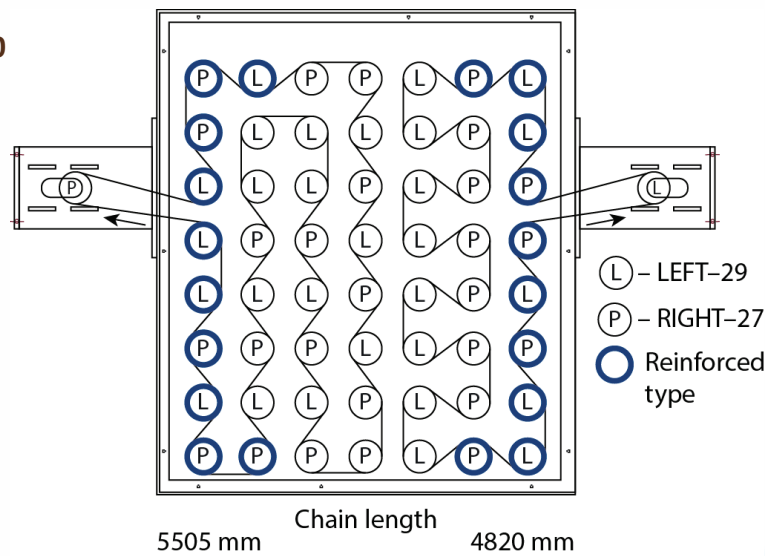
SUPERMAX 350 kW:



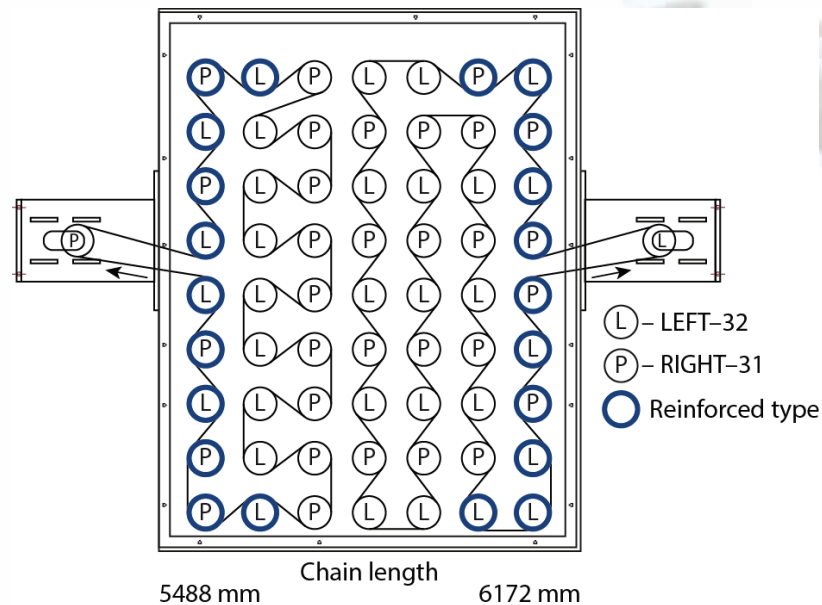
SUPERMAX 400



SUPERMAX 450



SUPERMAX 500 kW:



Note: The blue colour indicates turbulators with reinforced axis.

The arrow indicates the chain movement direction.

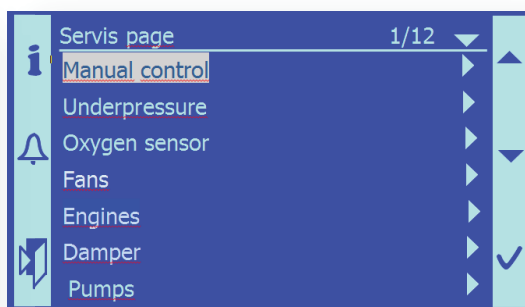
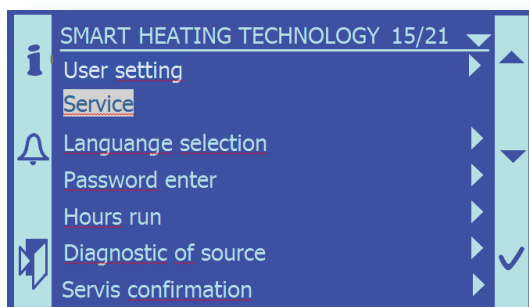
L- turbulator with left sense of rotation

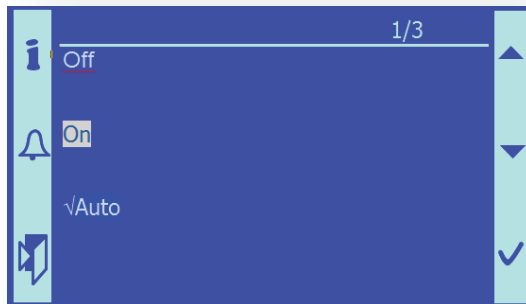
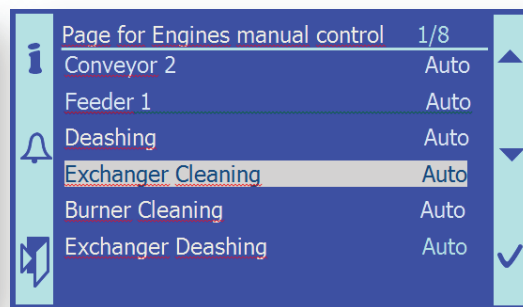
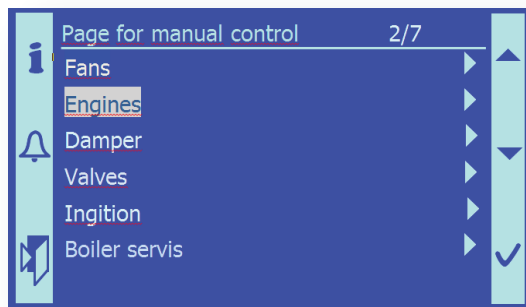
P- turbulator with right sense of rotation

After a repair or service action, check the cleaning mechanism function.

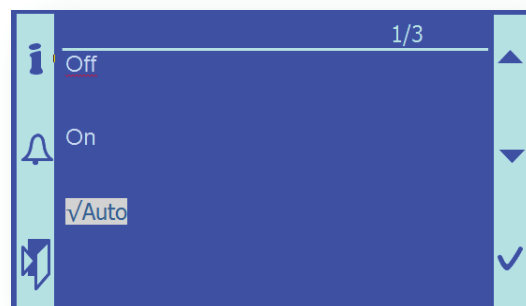
Before putting into operation, carefully check adherence to safety principles!!!

- Set the cleaning mechanism into motion.
 - Emergency switch to position "1".
 - Start the M4/M5 motor in the Service/Manual Operation/Engines menu.





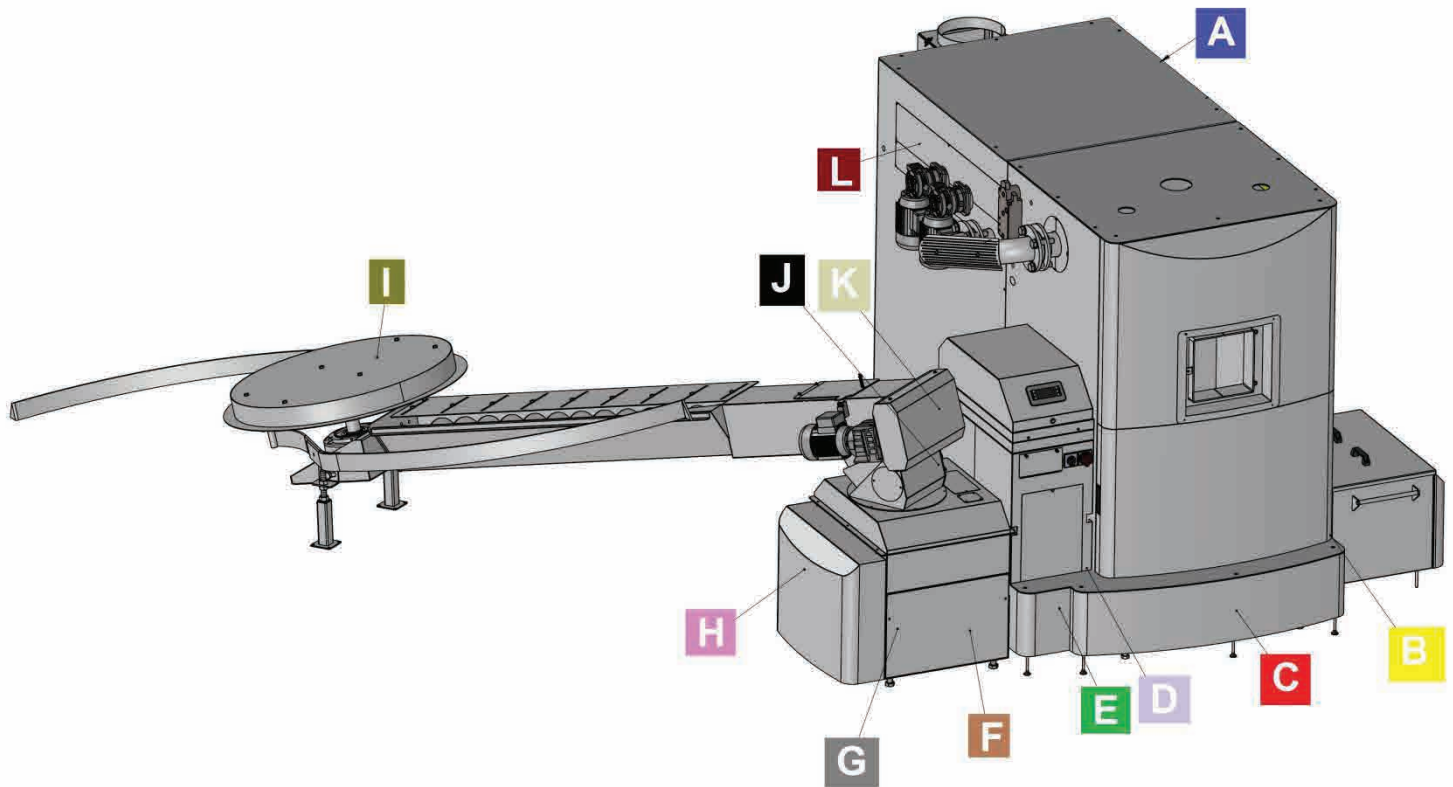
- Check its trouble-free operation.
- If the exchanger cleaning operates well, return the grating motor control to the Automatic mode.



- Mount back the chain cover on the motor bracket.
- Mount back the upper cover of the chain drive

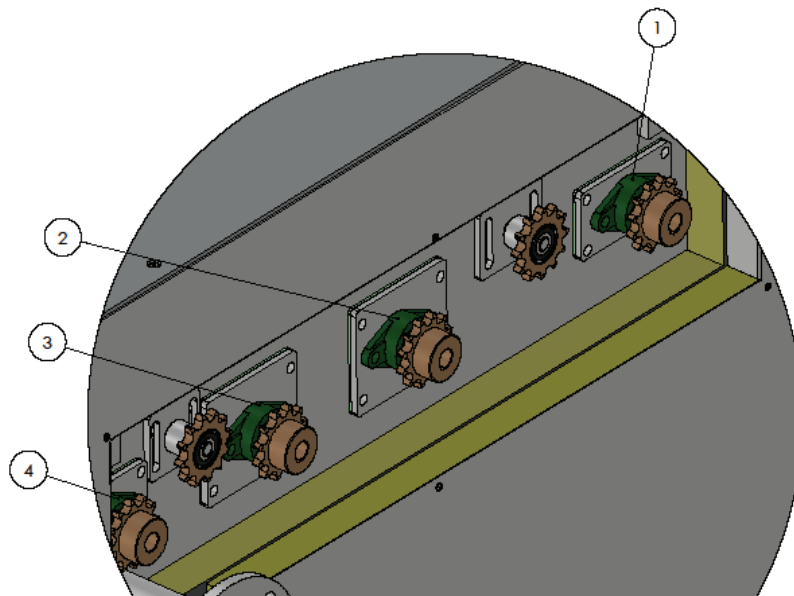
8.3. Spare part list specifications

8.3.1 Bearings

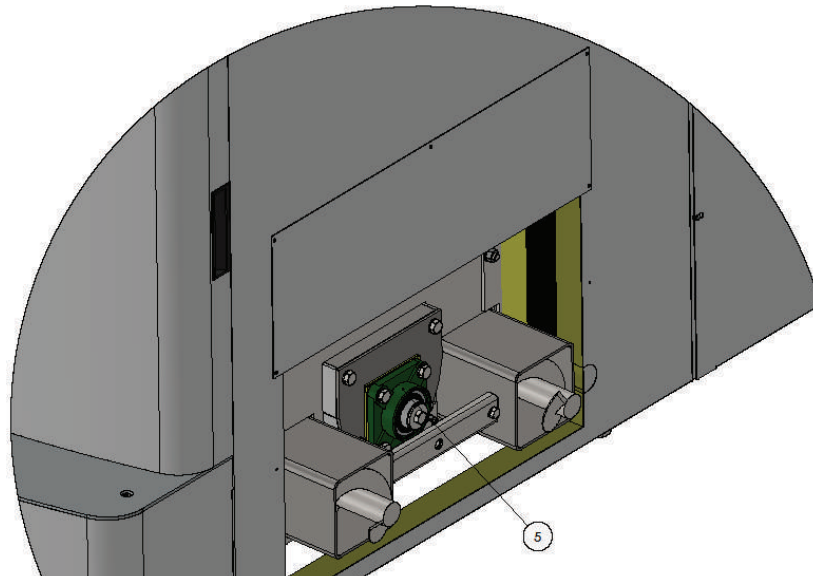


Position	Catalog No.	Bearing type	pcs / set	Maintenance period		Grease type	Note
1	MDG00004	UCFL204	1	3	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability
2	MDG00004	UCFL204	1	3	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability
3	MDG00004	UCFL204	1	3	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability
4	MDG00004	UCFL204	1	3	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability
5	MDG00007	ASAHI206	1	1	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability
6	MDG00012	KU2010	4	12	M	NONE	visual check
7	MDG00011	KU2015	10	12	M	NONE	visual check
8	MDG00005	UCFL205	1	6	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability
9	MDG00005	UCFL205	1	6	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability
10	MDG00005	UCFL205	1	6	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
11	MDG00005	UCFL205	1	6	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
12	MDG00010	6302RS	1	6	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
13	MCS00132	Lubricating head	4	1	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
14	MDG00002	UCF207	2	3	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
15	MDG00010	6302RS	1	3	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
16	MDG00001	UCF206	1	3	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
17	MDG00009	PFL206	4	12	M	Bearing holder	while the silo is empty
18	MDG00008	SB206FK	4	12	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
19	MDG00004	UCFL204	1	3	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
20	MDG00002	UCF207	1	3	M	ISO 6743/9, DIN 51 502 (Mogul LV2-3)	Operating temperature -30 +130°C
21	MDG00004	UCFL204	1	3	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability
22	MDG00004	UCFL204	1	3	M	Ulti-plex® Synthetic Grease - Chevron	High Temperature Stability

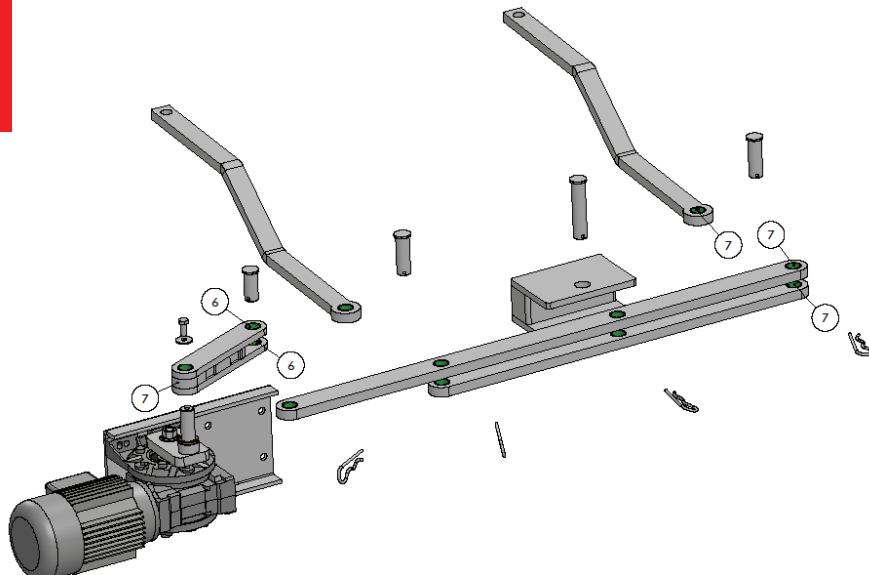
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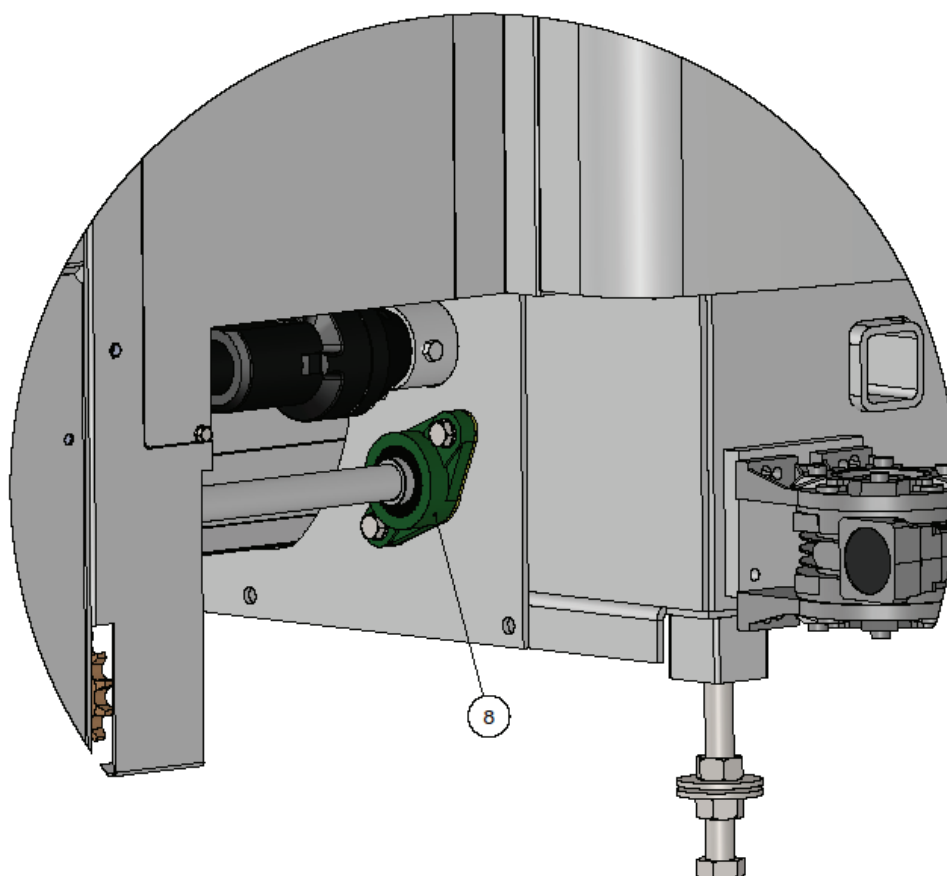
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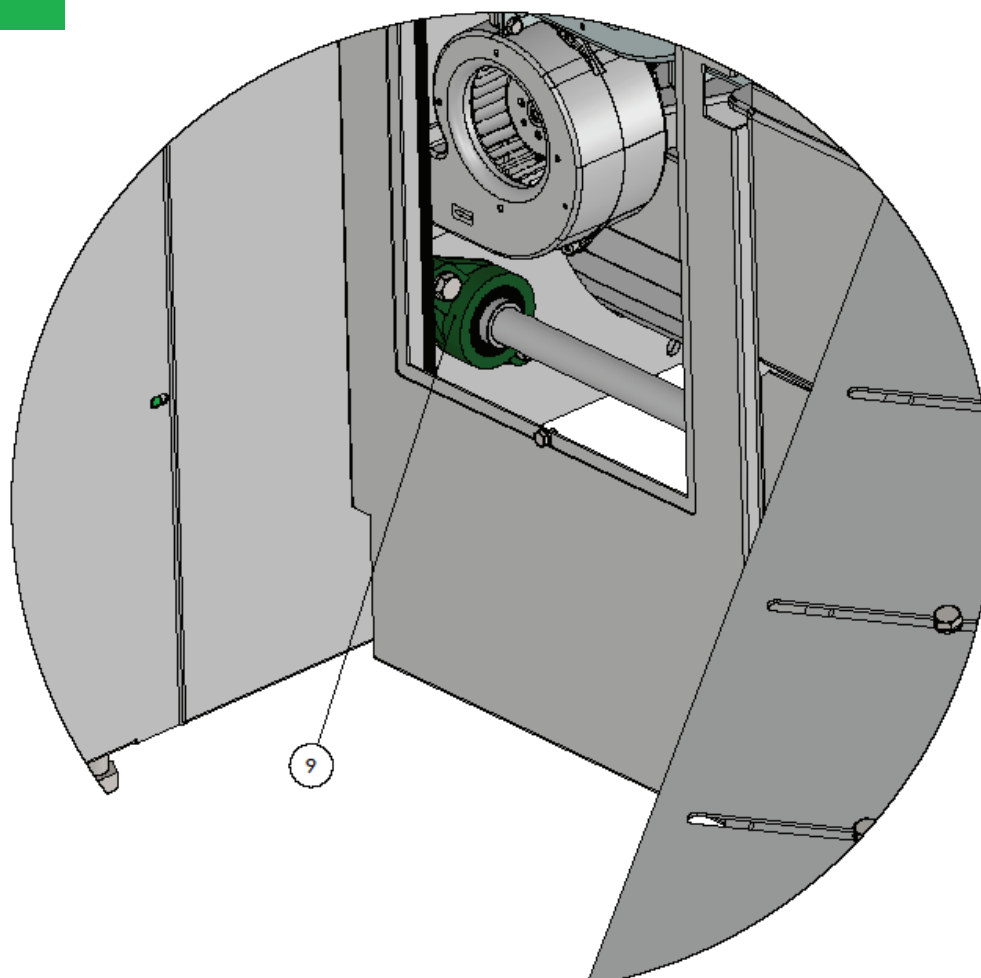
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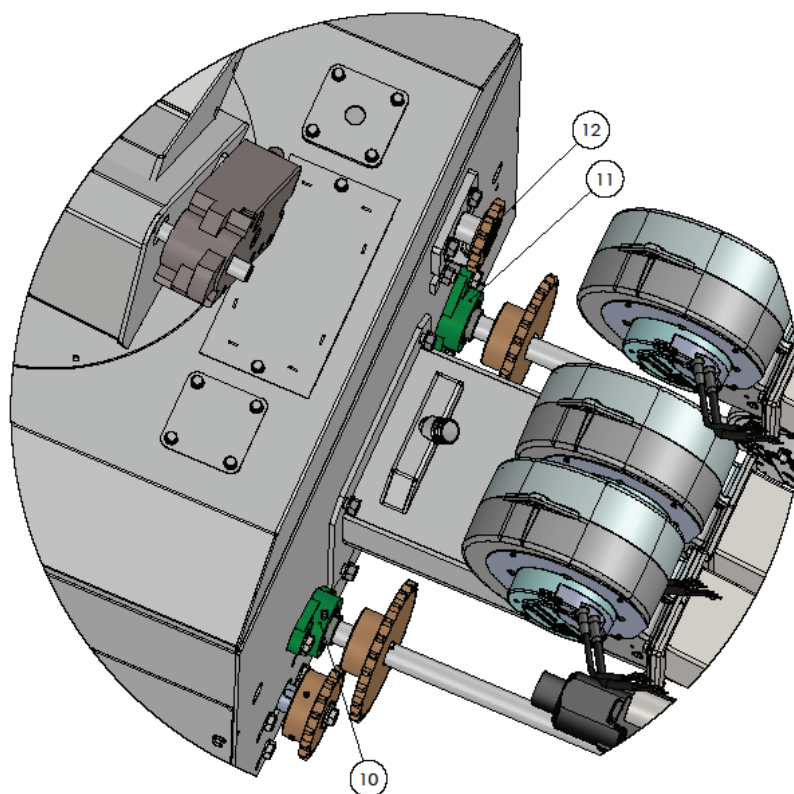
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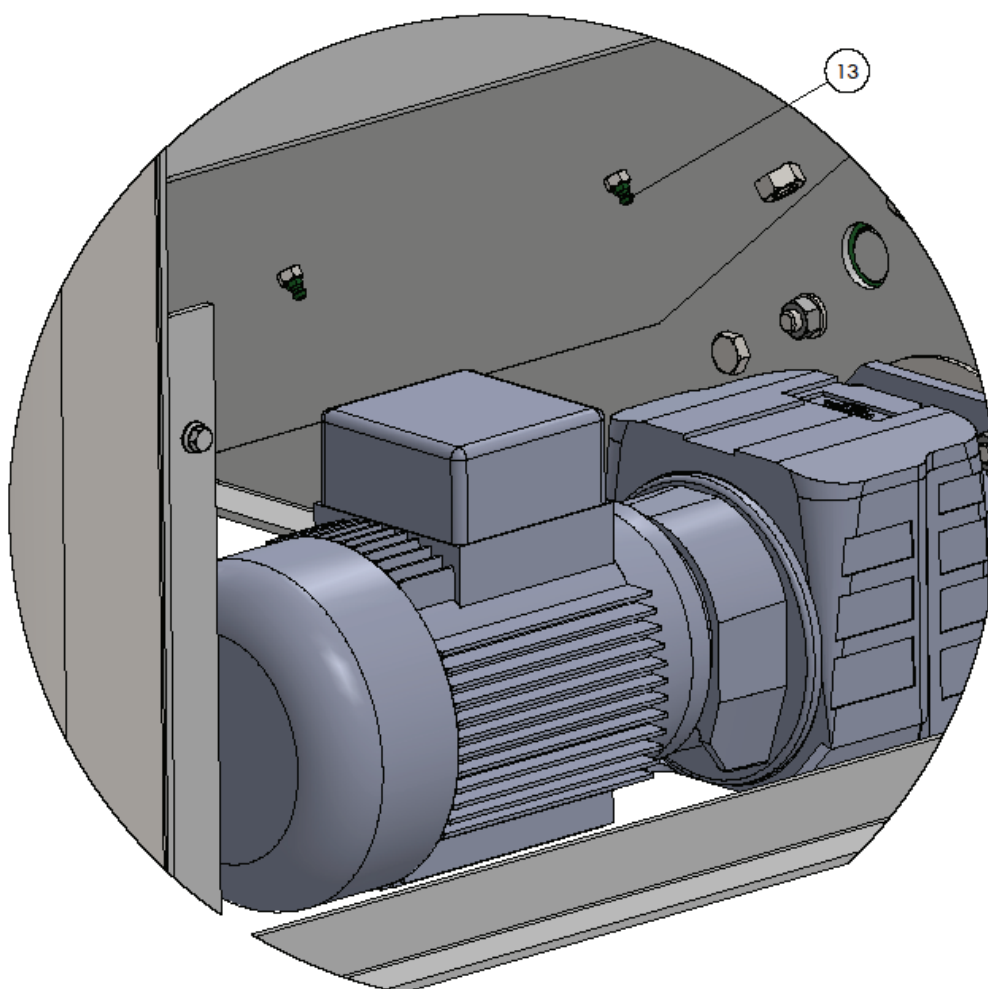
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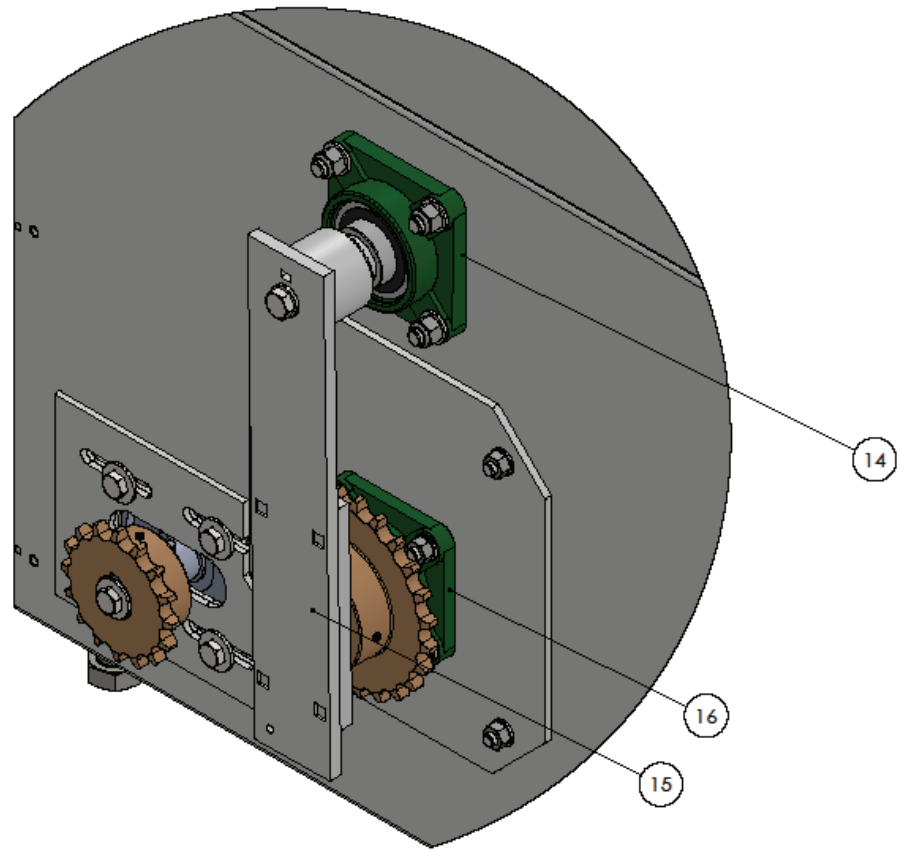
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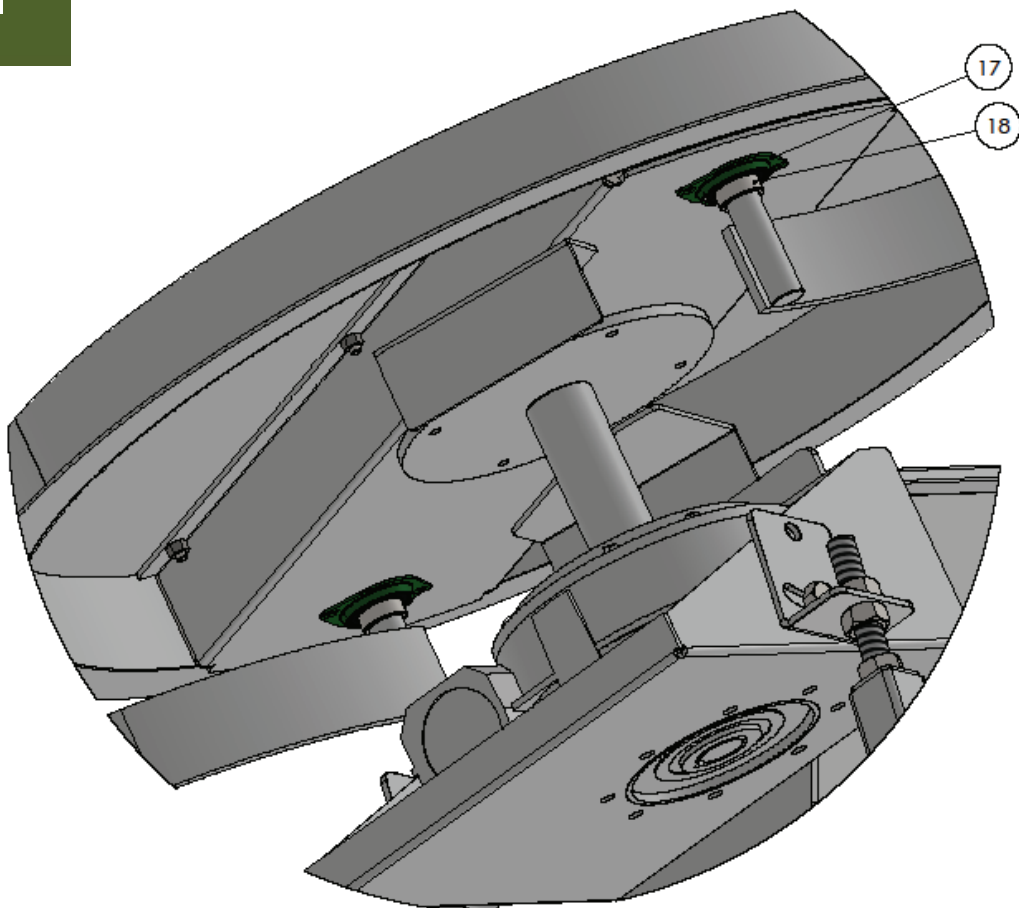
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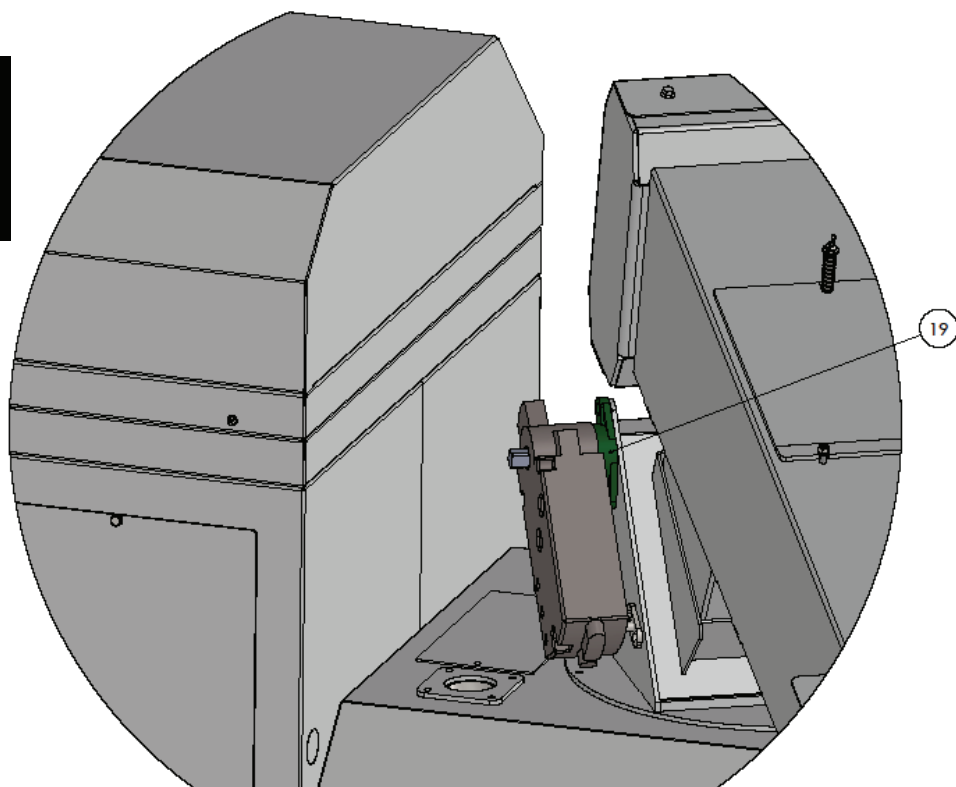
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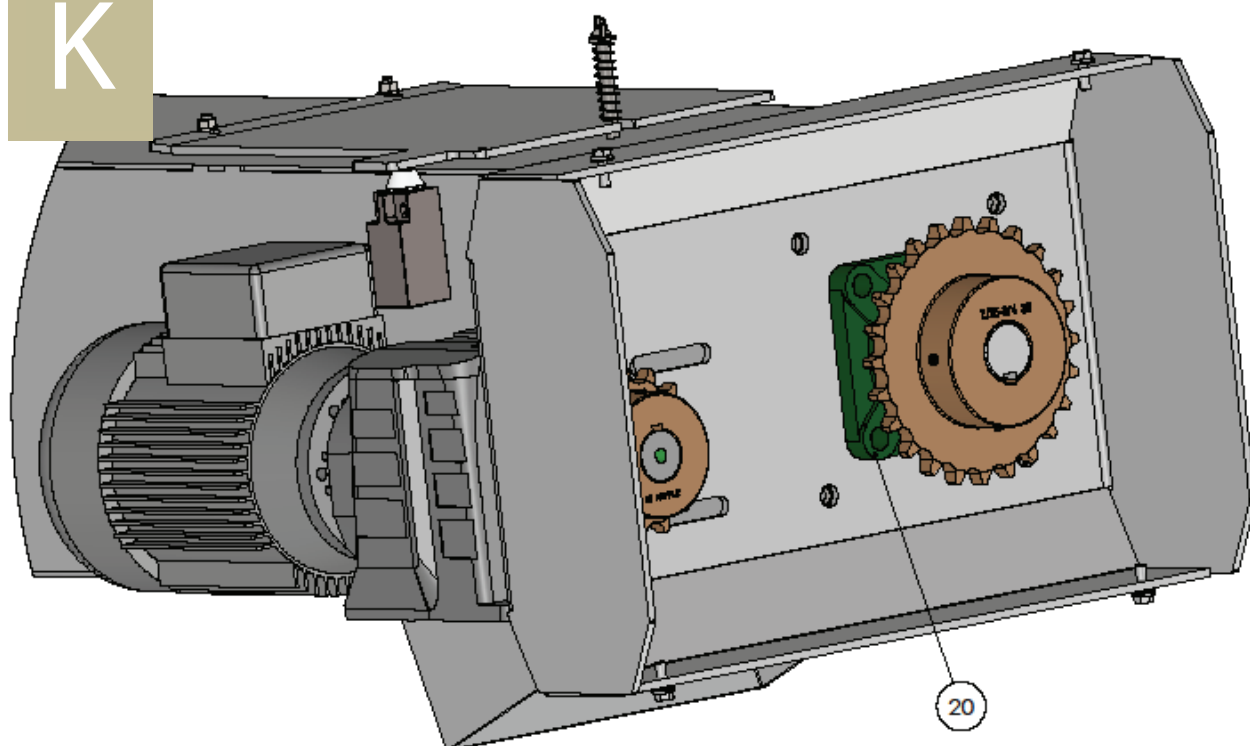
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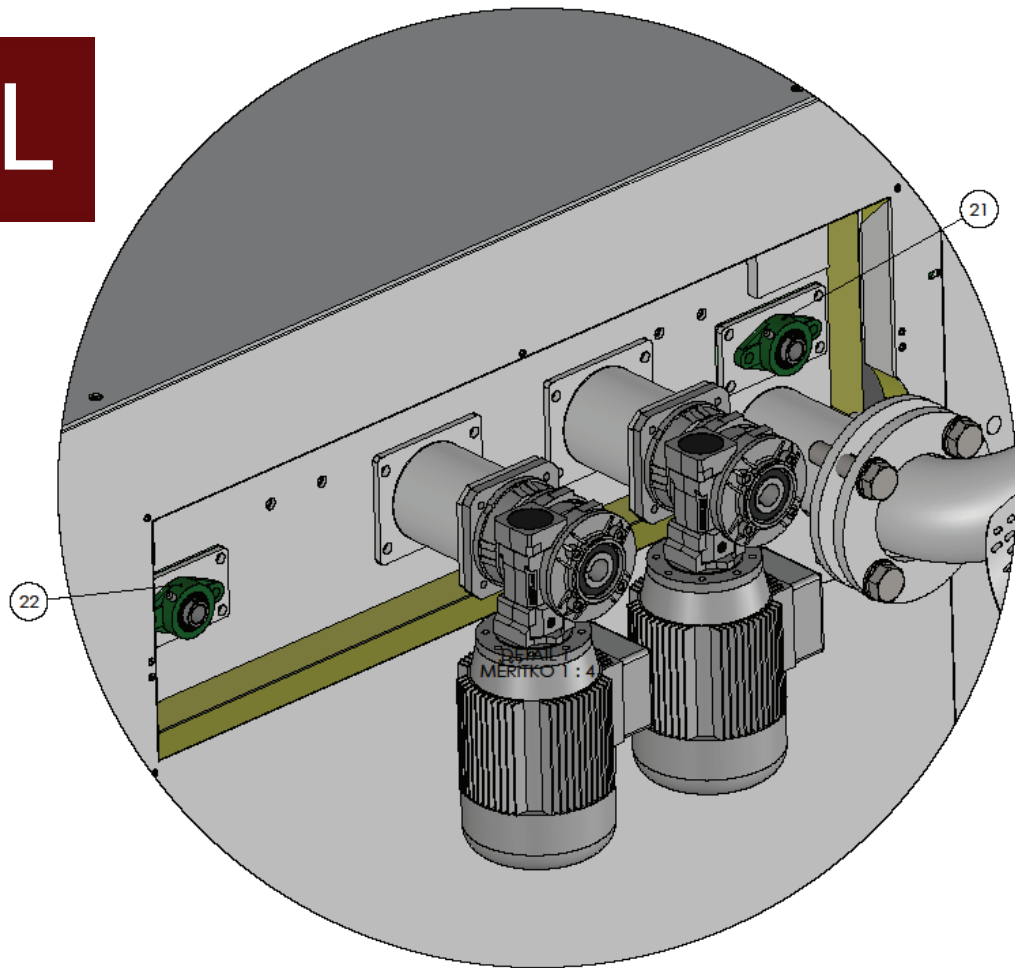


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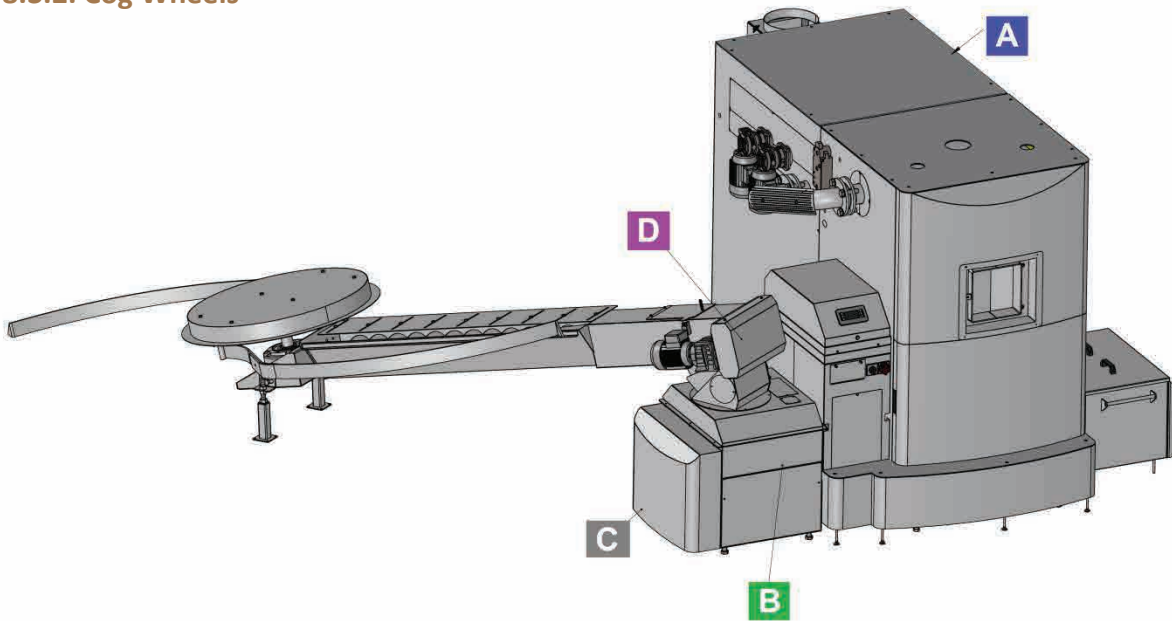


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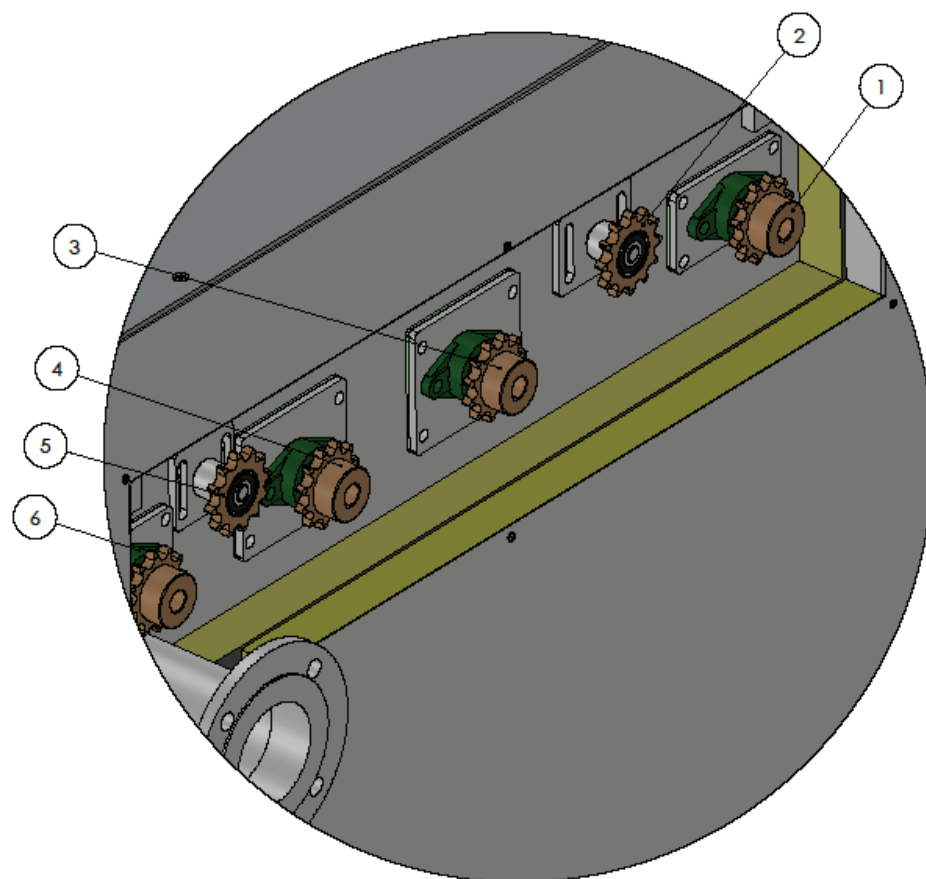


8.3.2. Cog Wheels

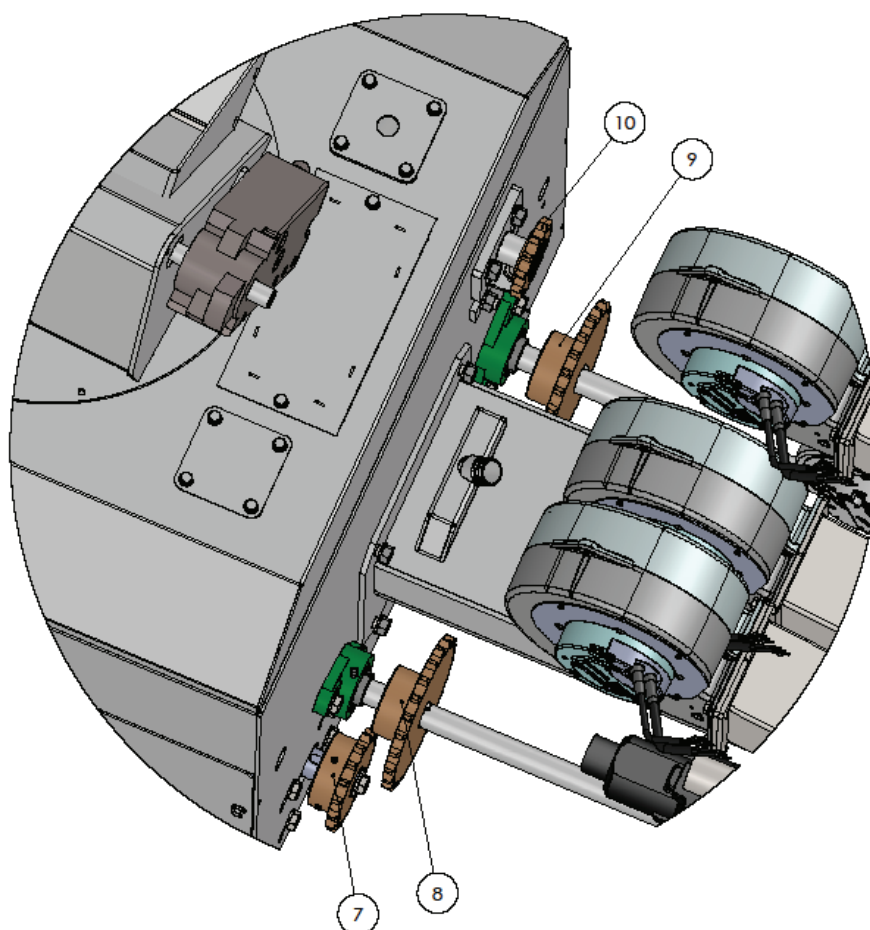


Position	Catalog No.	Cog Wheel type	pcs / set	Maintenance		Picture
1	MDS00005	3/4 Z=12/20	1	6	M	A
2	MDS00009	3/4 Z=12/25	1	6	M	A
3	MDS00005	3/4 Z=12/20	1	6	M	A
4	MDS00005	3/4 Z=12/20	1	6	M	A
5	MDS00009	3/4 Z=12/25	1	6	M	A
6	MDS00005	3/4 Z=12/20	1	6	M	A
7	MDS00002	3/4 Z=16/30	1	6	M	D
8	MDS00009	3/4 Z=12/25	1	6	M	D
9	MDS00009	3/4 Z=12/25	1	6	M	D
10	MDS00004	3/4 Z=25/30	1	6	M	D
11	MDS00004	3/4 Z=25/30	1	6	M	D
12	MDS00002	3/4 Z=16/30	1	6	M	D
13	MDS00002	3/4 Z=16/30	1	6	M	D
14	MDS00007	3/4 Z=25/35	1	6	M	D

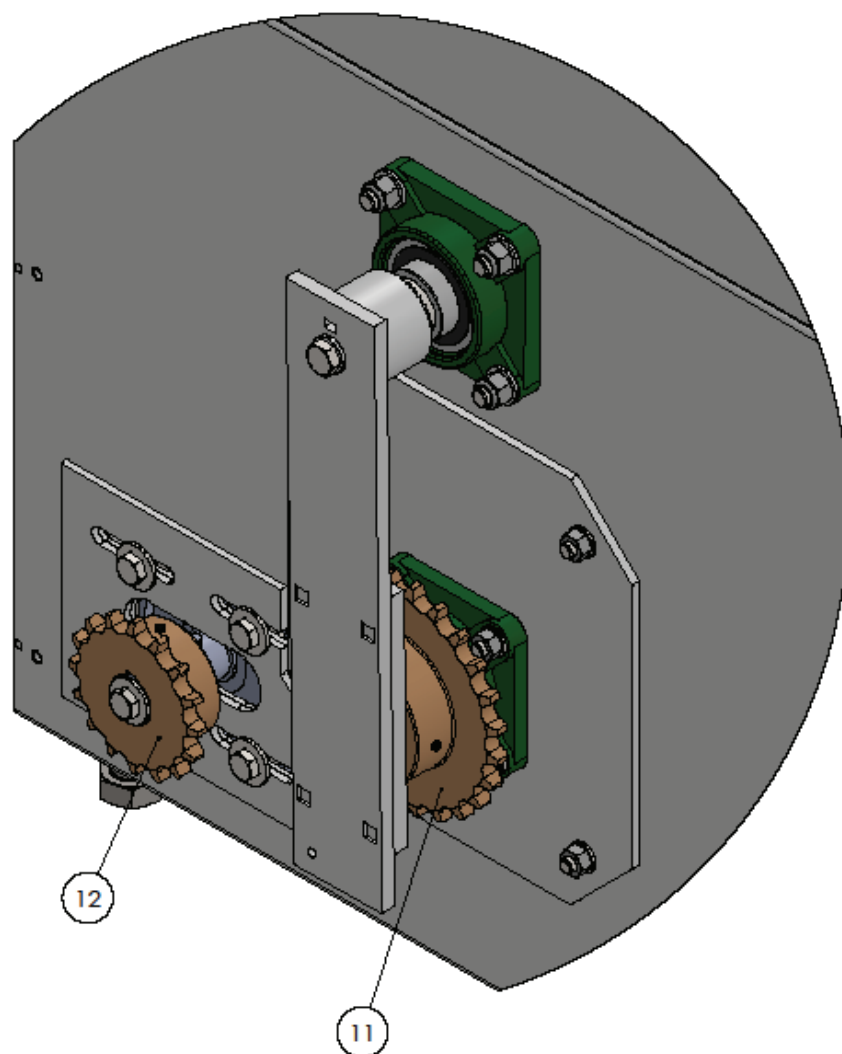
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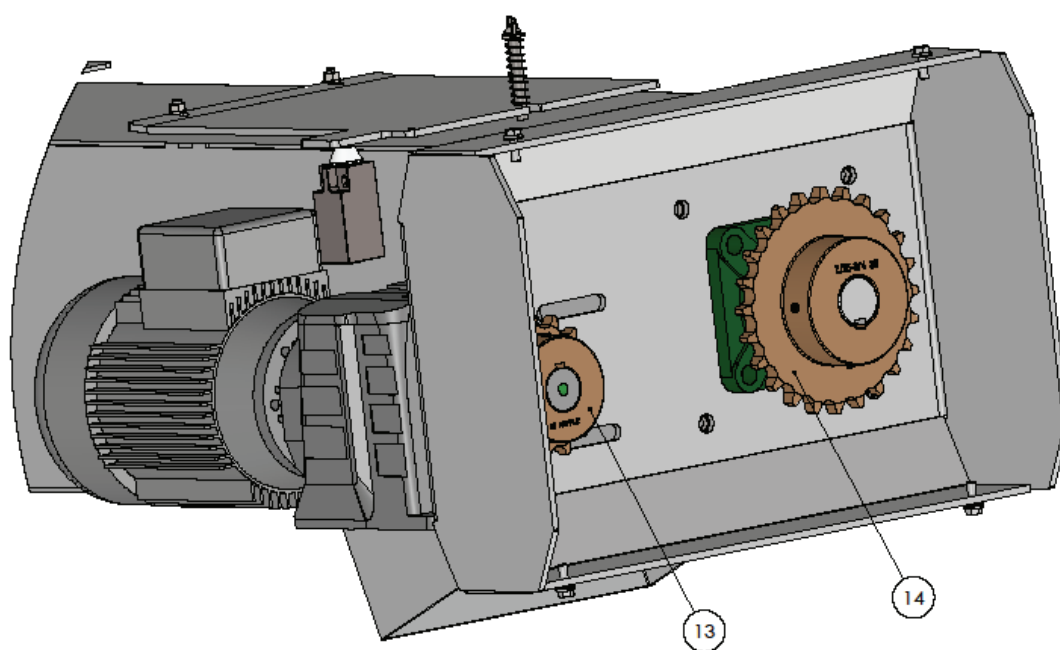
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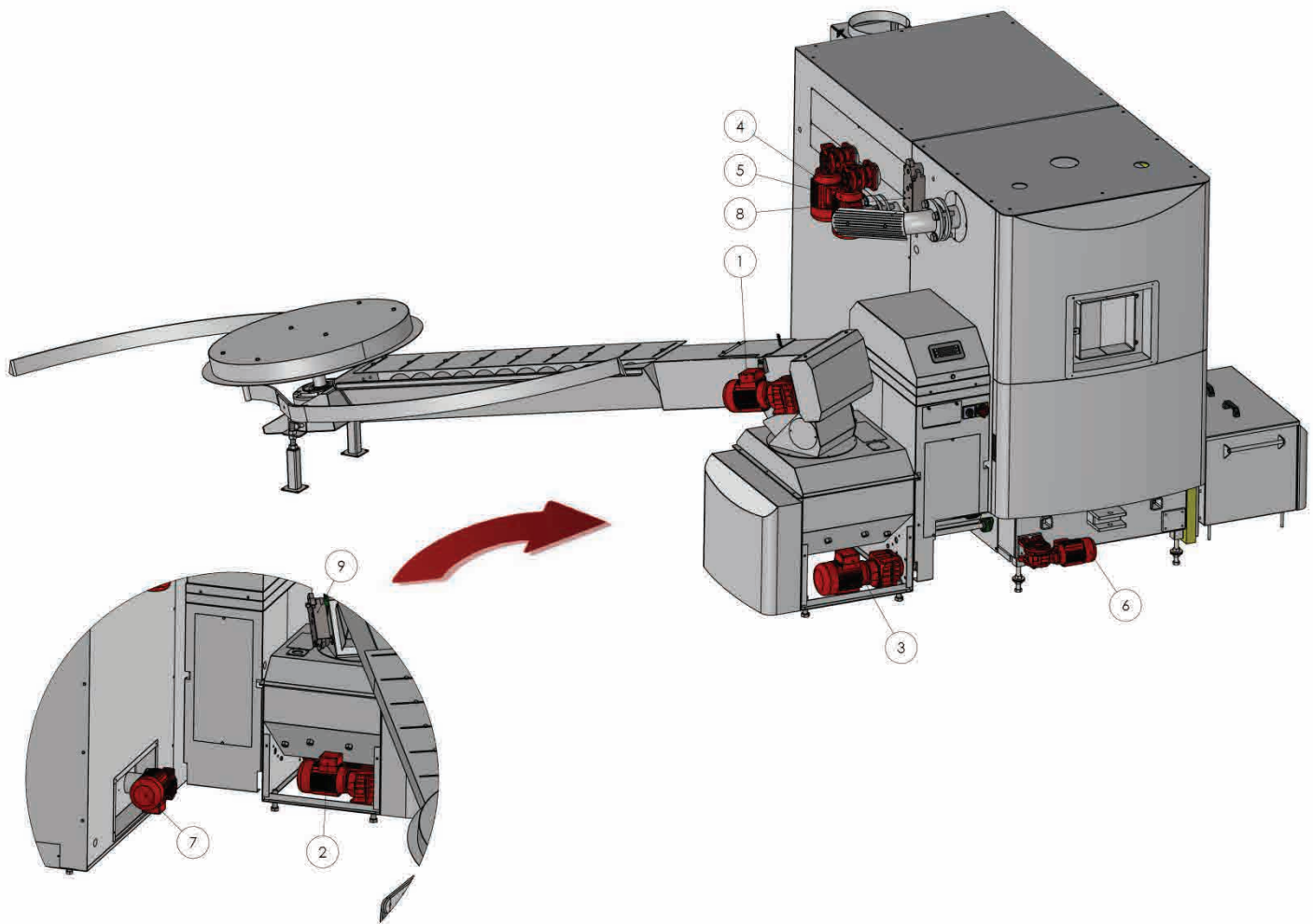
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D



8.3.3. Motors



Position	Catalog. No.	Motor type	Maintenance period		Clamps	Contactors	I/O PLC	Note
1- M1	MEM00004	Motor 0,55 kW gear box I:64	1	M	X1.1,X1.2,X1.3,GND1	KM3	POL687 - DO2	Fuel conveyer
2- M2	MEM00004	Motor 0,55 kW gear box I:64	1	M	X1.4,X1.5,X1.6,GND2	KM4	POL687 - DO1	Fuel feeder
3- M3	MEM00004	Motor 0,55 kW gear box I:64	1	M	X1.7,X1.8,X1.9,GND2	KM5	POL687 - Q5	De-ashing
4- M4	MEM00015	Motor 1,1 kW gear box I:28	1	M	X1.10,X1.11,X1.12,GND3	KM6	POL687 - Q4	Heat ex. cleaning
5- M5	MEM00015	Motor 1,1 kW gear box I:28	1	M	X1.13,X1.14,X1.15,GND3	KM6	POL687 - Q4	Heat ex. cleaning_1
6- M6	MEM00001	Motor 0,12kW gear box 1:100	1	M	X1.16,X1.17,X1.18,GND4	KM7	POL687 - Q6	Burner grating
7- M7	MEM00026	Motor 0,12kW gear box 1:100	1	M	X1.19,X1.20,X1.21,GND4	KM8	POL687 - Q7	Heat ex. de-ashing
8	MET00003	Flap servo drive	1	M	X1.47,N49,GND7		POL687 - Q2	Chimney flap
9	MET00003	Flap servo drive	1	M	X1.48,N49,GND7		POL687 - Q8	Fire safety flap

8.4. OPERATION JOURNAL OF THE BOILER ROOM

It is the Checking Book of the automatic equipment for the wood waste combustion

Equipment operator:

Manufacturer of the equipment: WOODCO ENERGY

Heating equipment:

Supplier:

Type:

Year of production:

Heating output:

The equipment operator must perform the following checks of the automatic heating equipment during the whole time period of operation and record the checks' results in the checking book. During the checking and maintenance work execution the operator must observe all the safety rules mentioned in the "Operating Manual".

Important telephone numbers

Police: 112, local telephone number:

Fire-Fighting Brigade: 112, local telephone number:

Ambulance: 112, local telephone number:

Service: WOODCO ENERGY - +353 52 7445330

8.4.1. Weekly checks

Once a week it is necessary to visually check the whole heating equipment, including the fuel storage. The discovered defects must be immediately remedied.

Or after initial boiler installation or fuel change or any other significant change of the boiler operation, we recommend that the user do a regular checks for some period of time (1x daily). Until you see that it has no effect on the boiler operation itself.

- We highly recommend write down the values on regular basis in to a form Daily records. These values can be used for analyses in the future when there is possible problem.
- Visual check of the boiler
 - check for possible leaks of the system; check the pressure inside of the system
 - check the burning chamber
 - the flame has to be clear yellow color.
 - there should not be any visible black spots from the soot.
 - the burner has to be clean without any ash build-ups.
 - check the level of the ash in lower part of the burner. If the level is high and there are ash build-ups, please contact your service technician.
 - while in regular operation there should not be any visible smoke coming out of the chimney. When the boiler is operated in lower temperatures – the smoke is white (water vapour).
 - check the ash bin. Ash has to be light grey color, powdery.
 - check the bottom of exchanger for ash and if there is automatic ash removing system in exchanger, check please ash bin of exchanger.
 - check the bottom part of cyclone for the ash.
- If the Alarm light is on, press the button with red LED light blinking, and find out the reason of the error. Write down the time when the error occurred in the a Daily record. Call your service technician, if you do not know how to remove the error safely yourself.
- Check the fuel level and quality inside of the silo.
- While the boiler is in operation there should not be any strong or unwanted sound coming out of the moving parts of the boiler; except Heat exchanger cleaning, when the noise level is higher.

Note: When you open the service door, ash bin or ash bin of the cyclone, the underpressure in the boiler will drop. If the set under-pressure will not be restored within 2 min, the power of the boiler will shut down.

8.4.2. Monthly checks

It is necessary to perform monthly the following checks and record them in the checking book:

- Fully includes the steps in menu 1.3 Weekly check.
- Functionality of the flap valve of backward burning, especially. Manually and SW Manual control.
- Safe operation of the closing. Check tightness of flap.
- Functionality of the emergency fire extinguisher including the water supply. Press red button on the valve – max 10 sec.
- Faultless operation of the regulation. Simulate error stages of the water tank, flue gas fan, motor.
- Correct functions of motors.
- Functionality of the failure message device/alarm equipment.
- Correct functions of all fans.
- Complete check of burning chamber and burner.
- Complete check of heat exchanger.
- Complete check and clean-up of chimney ducting.
- Faultless operation of the combustion and exhaust fans.
- Due state of the combustion space.
- Readiness of functionality of the hand fire extinguisher.
- Due storage of the ash.
- No combustibles can be stored in the boiler room.
- Roof must be free of any combustible deposits.
- Lubrication of bearings of the turbulators and bearings placed close to the boiler walls.
- Lubrication points of moving floor in to intermedial bin.

15.4.3 Half-year checks

It is necessary to perform a half-yearly general inspection of the boiler, to lubricate all the bearings and to execute all the maintenance works. At least once a year this inspection should be performed by our Service Department or by a contractual service company (it is valid for the length of the guarantee period).

8.4.4. Records of the checks

8.4.4.1. Weekly Record book

Year:			Boiler type:				Serial No.:		
Week	1	2	3	4	5	6	7	8	9
Date:									
Time:									
Outside temperature:									
Burner									
Power									
Timing									
Boiler Temperature									
Boiler return Temp.									
Exhaust gas Temp.									
O2 concentration									
Underpressure									
MIX Temperature									
Backfire Temp. Upper									
Backfire Temp. Lower									
B4 Buffer top									
B41 Buffer bottom									
System pressure									
Service interval									
Last Service Before									
Combustion Chamber	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Burner	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Burner - ash level	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH
Burner cleaning	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Ash Quality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Water tank level	OK LOW	OK LOW	OK LOW	OK LOW	OK LOW	OK LOW	OK LOW	OK LOW	OK LOW
Fuel type	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips
Fuel quality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD

Exchanger Cleaning	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Ash Bin Cleaninh	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Exchanger Ash Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Conveyor Flap Function	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Flue Gas Ducting Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Chimney Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Cyclone Ash Bin Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Flue Gas Fan	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Alarm list No. of New Alarms									

Any condition marked other than OK and/or YES, please make a note – reason why.

Notes:

8.4.4.2. Monthly Record book

Year:		Boiler type:				Serial No.:	
Week	1	2	3	4	5	6	
Date:							
Time:							
Outside temperature:							
Burner							
Power							
Timing							
Boiler Temperature							
Boiler return Temp.							
Exhaust gas Temp.							
O2 concentration							
Underpressure							
MIX Temperature							
Backfire Temp. Upper							
Backfire Temp. Lower							
B4 Buffer top							
B41 Buffer bottom							
System pressure							
Service interval							
Last Service Before							
Act. time operation							
Act. Recuce time							
Deashing							
Burner Cleaning							
Exchanger Cleaning							
Exchanger Desashing							
Boiler pump							
Conveyor 2							
Feeder 1							
Ignition							
Exhaust Damper							
O2ActRunTime							
Combustion Chamber	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	
Burner	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	
Burner - ash level	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH	LOW HIGH	
Burner cleaning	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	
Ash Quality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	
Water tank level	OK LOW	OK LOW	OK LOW	OK LOW	OK LOW	OK LOW	

Fuel type	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips	Pellets Woodchips
Fuel quality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Exchanger Cleaning	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Ash Bin Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Exchanger Ash Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Conveyor Flap Function	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Flue Gas Ducting Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Chimney Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Cyclone Ash Bin Cleaning	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Flue Gas Fan	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Alarm list No. of New Alarms						
Flap conveyor check	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Thickness of the Flap	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Emergency Flap Extinguisher	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
M1 - Motor Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
M2 - Motor Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
M3 - Motor Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
M4 - Motor Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
M5 - Motor Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
M6 - Motor Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
M7 - Motor Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
M8 - Motor Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD

Fuel Primary fan Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Sec. Fan 1 Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Sec. Fan 2 Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Exhaust Gas Fan Functionality	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD	OK POOR BAD
Complete Check Exchanger	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Lubrication of all Bearings	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
Lubrication of moving floor in intermediate fuel bin	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

Any condition marked other than OK and/or YES, please make a note – reason why.

Notes:

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