Operating Instructions

Wood log boiler

Wood log boiler BioX

15-45

INTRODUCTION

The intended use of the wood boiler includes the replacement for heating systems according DIN EN 12828.

Consider the chart „technical data's“, *see chapter: technical data's.*

Please, read the operating instructions bevor you start the installation, to avoid damages by improper installation. The installation is may only make by companies after the „accepted rules of technic“ and of the latest standards and norms. Country specific regulations have to be consider. The guarantee is lost, when the installation isn´t make professional or intended use.

To get a failure-free operation, you have to consider some basically points of the installation, handling and service. Please consider that failures of wrong installation or handling aren´t embraced to the guarantee.

Consider the following rules and norms in respectively valid version*:

State building code

Industrial and fire protection laws and regulations

Country specific clean Air Act (in Germany: 1.BImschV)

Heat-production law:	regulations for combustion plants
EnEV off 2019 GEG:	regulations for energy-saving engineering on buildings
DIN EN 303-5:	heat boiler - Part 5: heat boiler for fixed fuels, manual and automatically feed
DIN 1988:	technical rules for drinking water-installation
DIN EN 806:	technical rules for drinking water-installation
DIN EN 12828:	heat boilers in buildings - strategy of warm water-heat systems
EN 12828:	technical safety instruments in buildings
EN 13384:	exhaust system - heat- and fluidic calculation methods
DIN 4759-1:	heat production systems for diver's energy types; A heat boiler for fixed fuels, an oil or gas fuel boiler, and only one smokestack; technical safety requirements and tests
VDI 2035:	avoidance of damages at warm water heat systems
DIN VDE 0100:	installation of low-level electric systems; installation of power plant systems
DIN VDE 0105:	run of electrical systems

*This list have no right on completeness, actuality and new publication.

DIRECTORY

1 SAFETY NOTES

- Please read the documentation carefully prior to commissioning and pay particular attention to the marked safety notes. Please look up in these instructions anything about which you are unsure.
- Ensure that you understand the instructions in this manual and that you are sufficiently informed about the functioning of the biomass furnace system. Solarbayer is at your disposal at all times for any questions.
- For safety reasons the operator must not alter the system, the construction or its condition, without the agreement of the manufacturer or their authorised representative.
- Ensure you have sufficient fresh air entering the boiler room. (Please take note of any regional regulations or directives).
- The tightness of all connecting points is to be monitored before the system is started up.
- A portable fire extinguisher of the prescribed size must be placed in front of the boiler room. (Please take note of any regional regulations or directives).
- When opening the combustion chamber doors take care that no flue gas and sparks are released. Never leave the combustion chamber door open. Toxic gases may be emitted.
- Never heat up the boiler with liquid fuels such as petrol or similar.
- Carry out maintenance work (maintenance plan) regularly or make use of our customer services.
- When maintaining the system or opening the control system the power supply must be interrupted and the general valid safety regulations respected.
- No fuels should be stored outside the equipment in the boiler room Furthermore, the storage of items not required for operating the equipment is not permitted in the boiler room.
- Always use low voltage lamps for lighting the storeroom (these must be approved for use by each manufacturer).
- The equipment can only be operated using designated fuels.
- Prior to further transportation of ashes, these must be cooled down for a minimum period of 96 hours before storage.
- If you have any questions, please contact us on telephone no. +49 (0) 8421 / 93598-0
- The first start-up must be carried out by Solarbayer factory customer service or an authorised specialist. (otherwise guarantee claims are invalid)
- The boiler conform the regulation of the Swiss VKF and respectively the particular state regulations regarding fire prevention. The costumer is fully responsible for the compliance with those regulations.

1.1 Warning notes

	Risk of injury from incorrect handling of the equipment. Material damage may also occur.
	Warning – hot surfaces
	Warning – injury to hands
	No access for unauthorised persons

However, adherence to guidelines for transportation, installation, operation and maintenance notices as well as technical data (in the operating instructions, product documentation and on the equipment itself) which are not specifically highlighted, is also vital to avoid breakdowns which may directly or indirectly cause major personal or material damage.

General note

For reasons of clarity and possible permutations, this documentation does not contain all detailed information and cannot take account of every conceivable operating or maintenance scenario. Should you require further information or encounter specific problems, which are not handled in detail in the documentation supplied, you can obtain the required information from your specialist dealer or direct from Solarbayer.

People (including children) who are not in a position to use the equipment safely due to their physical, sensory or mental capacities or their inexperience or lack of knowledge should not use this equipment without supervision or instruction by a responsible person.

Basic safety information

Due to its functionally limited electrical and mechanical characteristics with regard to usage, operation and maintenance, if the equipment is not able to work according to its appropriate use or improper interference occurs, it may cause serious health and material damage. It is therefore conditional that the planning and implementation of all installations, transportation, operation and maintenance will be carried out and supervised by responsible, qualified persons.

When operating electrical equipment certain parts are inevitably under electrical tension or mechanical stress. Only appropriately qualified staff may work on the equipment. Staff must be basically familiar with the content of these and all other instructions. The smooth and safe use of this equipment is dependent upon appropriate transportation and storage as well as designated operation and careful maintenance. Notes and indications on the equipment must also be observed.

1.2 Operation and maintenance

1.2.1 General notes

	For safe operation and maintenance of all equipment, it is assumed that actions will be carried out appropriately by qualified staff, taking heed of the warning notes in this documentation and the notes on the equipment.
	Under incorrect operating conditions, temperatures above 80°C could occur at parts of the casing.

Ambient conditions		
Operating temperature:		+10 bis +40 °C
Warehouse-/ transport temp:		-20 bis +70 °C
Humidity:	operation	5 to 85 %
	storage	5 to 95 %

1.2.2 Operation

General safety notes

	Coverings that prevent the moving of hot or rotating parts or which are required for the correct supply of air and effective functioning must not be opened during operation.
	Any faults or unusual operating conditions such as the emission of smoke or the appearance of flames mean that the equipment must be immediately switched off using EMERGENCY OFF. The Solarbayer factory customer service must then be notified of this straight away.

- When the main switch at the back of the boiler is deactivated or if the power supply fails, the equipment immediately goes out of operation. The residual amount of fuel burns independently without toxic gases being given off, provided that the naturally occurring chimney draw is sufficiently high. The chimney must therefore be dimensioned and designed according to EN 13384. When resetting the installation it is obligatory to check for serviceability and to ensure safe operation of the total installation.
- The noise caused by the machinery during operation does not have any adverse effects upon the health of people.

1.2.3 Maintenance

General safety measures

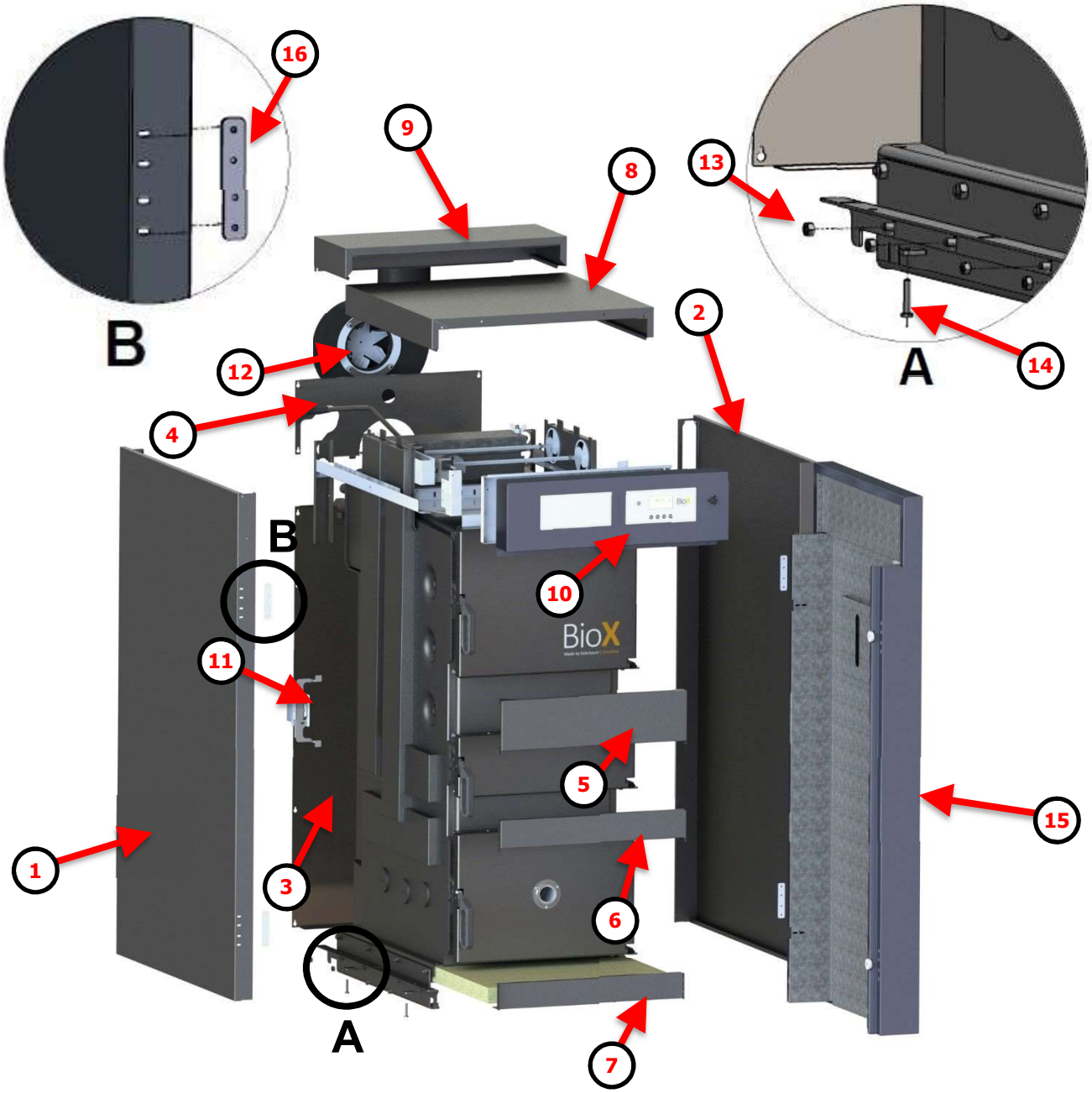
Before commencing any work on the equipment, but particularly before opening coverings of parts under voltage, the equipment must be enabled according to the instructions. As well as the main electrical circuit, any additional or auxiliary circuits should be noted. The usual safety rules according to DIN VDE are:

- Switch off all poles on all sides
- Ensure that they is not switched on again
- Check that there is no voltage
- Earth and short-circuit
- Covering neighbouring live parts and isolate dangerous parts

In order to prevent any commissioning errors due to incorrect maintenance, it is recommended that regular maintenance servicing be carried out by authorised staff or the Solarbayer factory customer service.

Spare parts may only be obtained direct from the manufacturer or sales partner.

2 COVER INSTALLATION BIOX – WOOD LOG BOILER 15 – 45



1	Side cover left	**9**	Top cover back
2	Side cover right	**10**	Front cover for display
3	Back cover behind bottom	**11**	Door switch
4	Back cover behind top	**12**	Exhaust blower
5	Front cover top	**13**	Nut´s for vertical position
6	Front cover middle	**14**	Elevation screw for high adjustment
7	Front cover bottom	**15**	Front door (optional)
8	Top cover front	**16**	Fixing plates for hinges of the front door (optional)

package 1 (at the side of the boiler):

- ✓ Side cover left
- ✓ Side cover right
- ✓ Back cover behind bottom
- ✓ Back cover behind top
- ✓ Ground isolation
- ✓ Front cover (top/middle/bottom)
- ✓ Screw´s, cable strap´s
- ✓ Front cover for display

package 2 (at the fill room):

- ✓ Exhaust blower

package 3 (at the fill room):

- ✓ Display

package 4 (at the fill room):

- ✓ Feet of the boiler

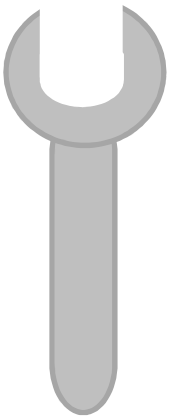
Plastic bag (at the fill room):

- ✓ Lables (status/display)
- ✓ Electrical connections

self-tapping screw

screw

Needed tools:



- Crosstip screwdriver
- Screwdriver for slotted screws (short)
- Fixed spanner (17/13/10/8)
- Allan wrench (8/6/5/4/3)
- Torx wrench (T20)
- Wire cutter

You can also use a ratchet and a cordless screwdriver for the installation.

General note

To get a correct function of the system, the assembly have to take by the relevant norms and the operating instructions of the producer!

Documents of the producer for the used products and components of the heat system are available by the producer.

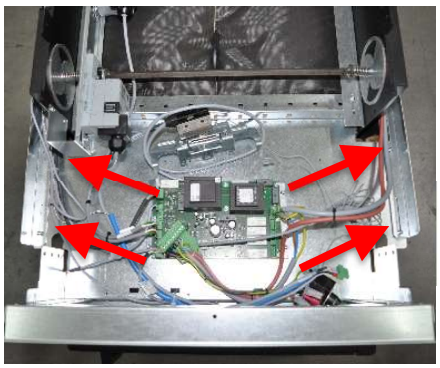
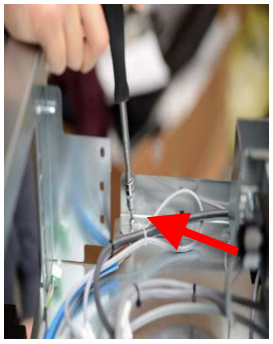
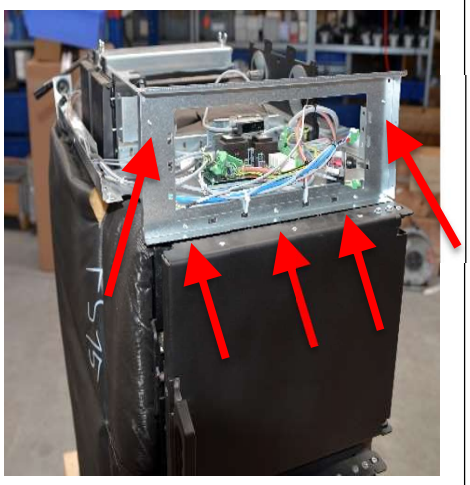
2.1 Adjust of the doors

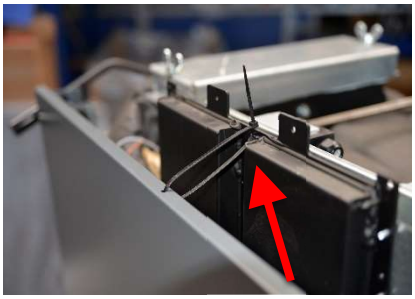
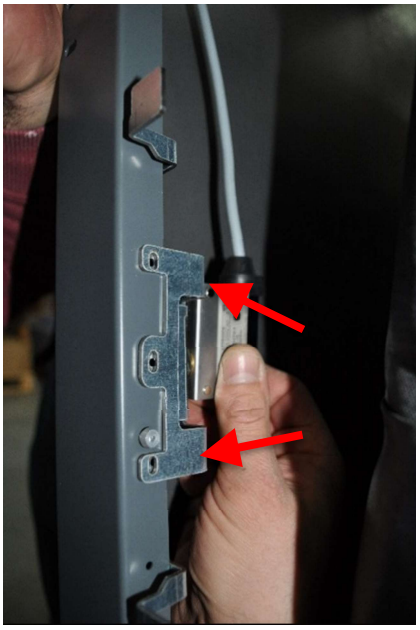
Surface pressure:
To adjust the surface pressure of the doors, you have to open the screws on the fixing to the boiler body. (look at ①+②). With the elongated holes, you can take the screws on the right position.

Adjust the hinges:
That you can take the hinges on the right position that the doors can close rightfully, you have to open the screws on the top and the bottom of the doors. With the elongated holes, you can take the screws on the right position. (look at ③+④).

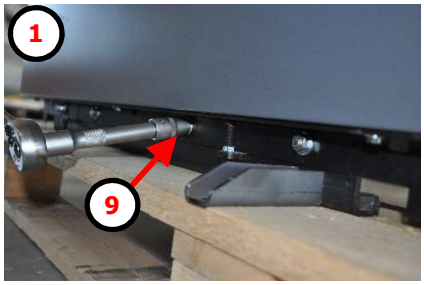
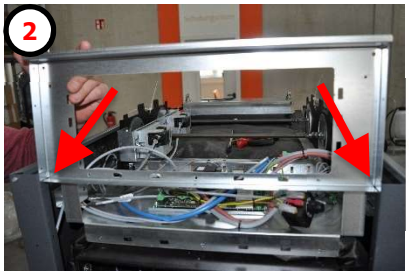
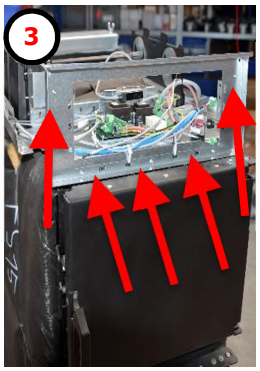
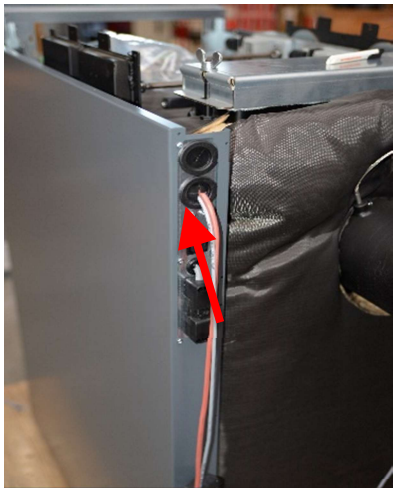
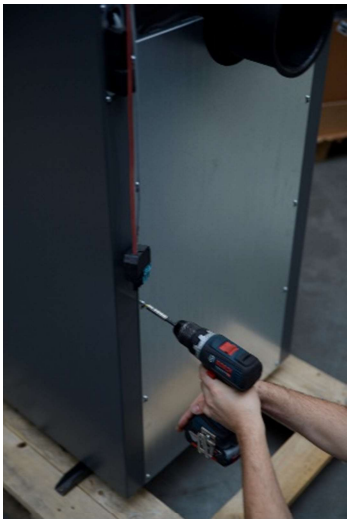
ATTENTION! When the boiler is lifted in the air, it´s crushing hazard! DON´T stand under lifted weights!

1.	2.	3.
		
Check the shipment of the wood boiler: - Boiler body - Side covers incl. screws in the package on the side of the boiler body - Exhaust blower, boiler feet and the controller in the fire room of the boiler body	Remove the top front cover (it´s fixed with two cable straps on the backside and one screw on the front side).	The boiler is getting out of the palette with a jack ring at the top of the boiler body. The boiler have to place on the intended boiler feet's. To do that, you have to screw the bolts form the top in the track (look at the short manual of the boiler feet's). The rubber buffers have to put under the boiler with the metal side on top. Put the boiler in the right position with a level (the wood log boiler can drop down to the front side, just in case if incurred condensate).

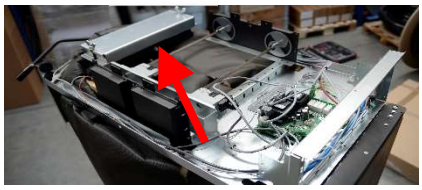
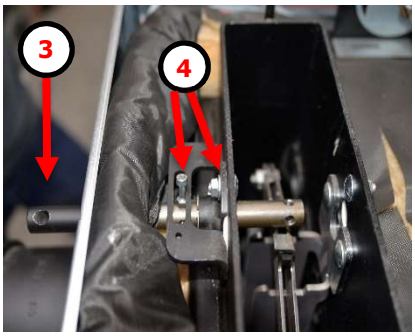
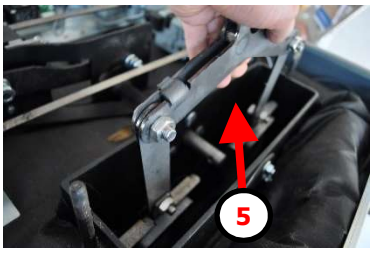
4.	5.	6.
 		 
Slack the cable channel on the left and right side, to have more scope for the mount of the side covers. (2 screws torx each side)	Remove the plate of the display for an easier mount of the fairing plates (5 screws and 2 cable straps). The screws are needed at point 10. Please, lay the plate of the display and the screws separately.	Clip the side covers left and right in the track at the bottom of the boiler body (the srews for that are in the side covers) but DON´T lock the screws. The cut-outs in the side covers are for the cable fairlead on the backside.

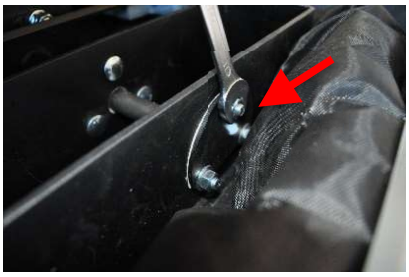
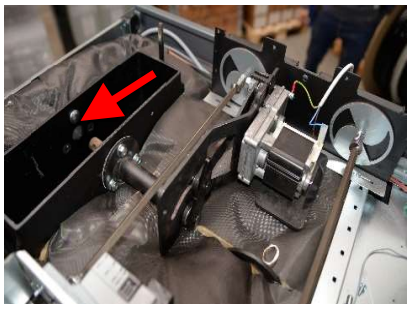
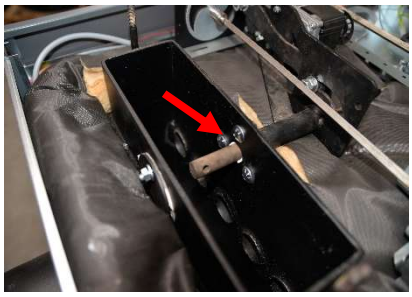
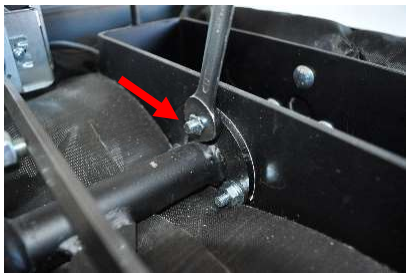
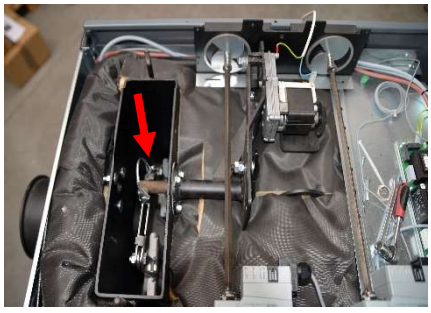
7.	8.	8.1
		
Save the side covers left and right against moving with a cable strap at the top of the boiler body. Take the cable straps in the first notches to have enough scope for the installation.	The cable of the door contact switch have to go upstairs. Fix the switch on the side covers with two screws. (2 self-tapping screws) Please, look at the correct position of the switch (picture at the top).	Attention: - BioX 15-45: fix the holding „visible in front“

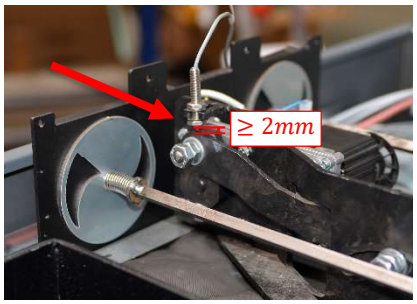
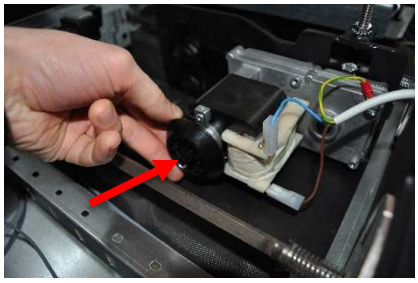
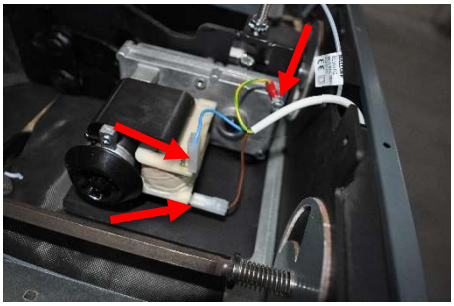
9. (optional)	9.1 (optional)	9.2 (optional)
		
WHEN THE FRONT DOOR WAS ORDERED: (optional equipment) *Otherwise go to point 10* Tip: You can order and install this later, too.	Remove the fixing plates on the front door and mount it on a side of the side covers. (4 screws M4 x 20, they are inside the box of the front door)	ATTENTION! If the door is install later, remove the screws on the backside (point 12), on the display plate (point 5+10) and the front covers (point 14), to can move the side covers.

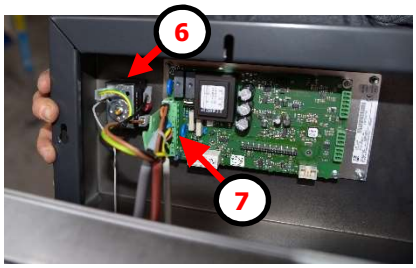
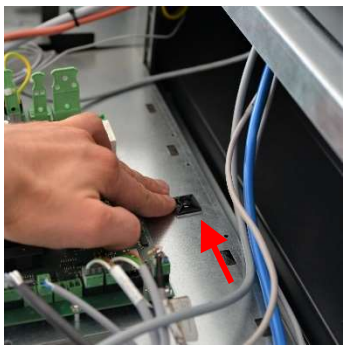
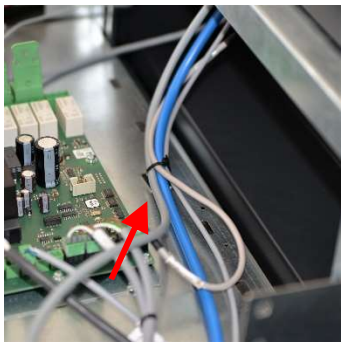
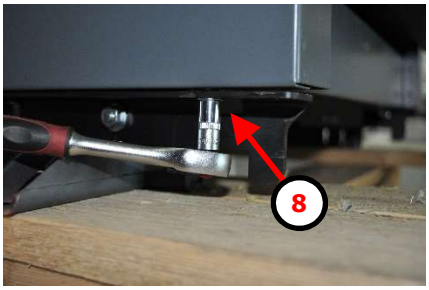
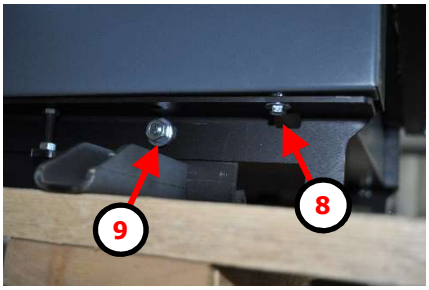
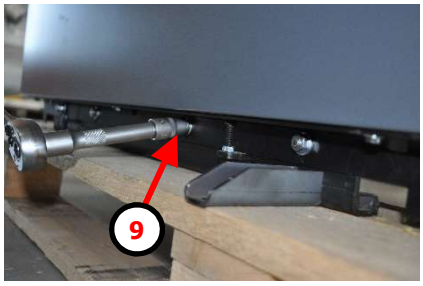
10.	11.	12.
   		 
Insert the plate of the display in the side cover from the top and fix it (screws of point 5). For that, you have to slack the nuts for the vertical attitude⑨ (look at point 20) and **insert the plate of the display in the side cover!** Open all doors to save the door switch against damage. Following, lock the screws of the side cover (4 self-tapping screws, picture②)	Execute the connector of the exhaust blower through the backside of the side cover (bottom hole of the right side cover) and screw both side covers witch the cable channel. (6 self-tapping screws) ATTENTION! Use only the outside fix holes! The inside holes are for the back covers.	To mount the back covers easier, spud in all screws (10 torx) easy. Clip the back cover bottom on the backside. Take the back cover top about the lever of cleaning and clip it on the backside. Consider the right position and fix all screws.

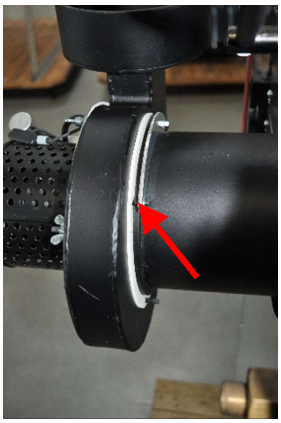
13.	14.
 	  Abb. BioX 20  
Push the ground isolation in the track on the boiler ground. Tip: The isolation is introducing difficult, because for this reason it´s more effective.	Clip and fix the front covers. (8 self-tapping screws) IMPORTANT! BioX 15-20: Slim cover = top Wide cover **WITHOUT** long profile = middle Wide cover **WITH** long profile = bottom BioX 25-45: Wide cover = top Slim cover **WITHOUT** long profile = middle Slim cover **WITH** long profile = bottom Following remove the cable straps of „point 7“

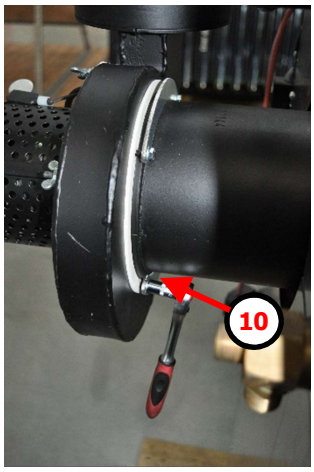
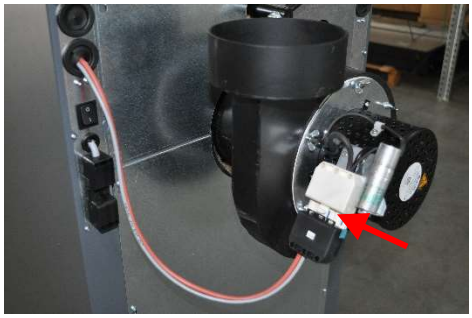
15. (optional)	15.1 (optional)	15.2 (optional)
 		 
REBUILDING TO AN AUTOMATICAL TRUBOLATOR CLEANER (optional equipment) Open the cleaning cap and remove the safety bolt of the turbolators. *<u>Otherwise further with point 17</u>* Tip: You can mount it later, too.	Remove the M12 nut on the lever of cleaning und pull the lever out③. Dismount the screw of stopping and the holding④.	Pull the turbolators out⑤. Dismount the stopping plate.

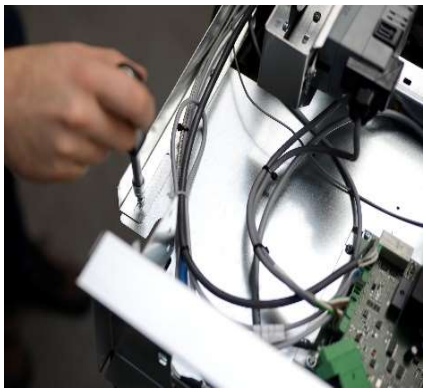
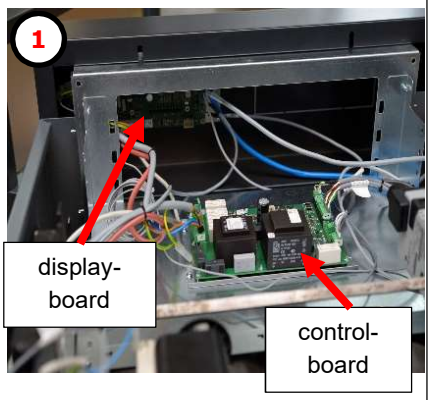
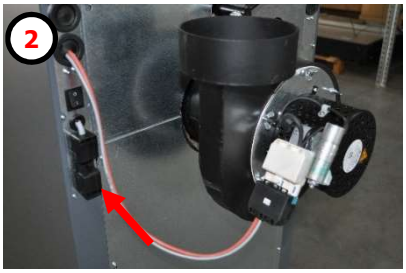
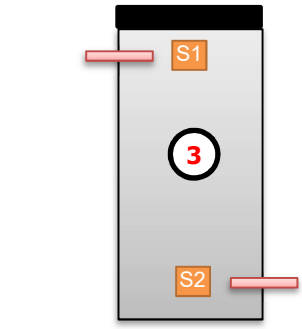
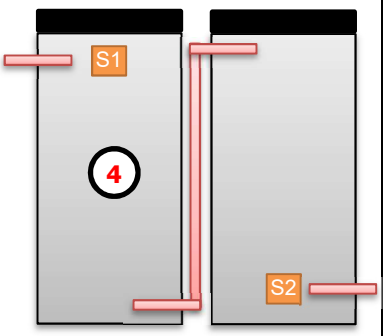
15.3 (optional)	15.4 (optional)	15.5 (optional)
 	 	
Mount the cover + seal on the other side. Take the automatically turbolator cleaner in the right position.	Fix the automatically turbolator cleaner at the exhaust room. (3 screws)	Insert the turbolators and fix it with the bolt on the shaft. Following mount the cleaning cover on the exhaust room.

15.6 (optional)	15.7 (optional)	16.
 	 	   
The sensor of the automatically turbolator cleaner is a contactless sensor: Install it so, that´s a distance of ≥ 2mm between the driving shaft and the sensor is (look at the picture on the top). For it, you have to turn the driving shaft about the electric motor upstairs and check the distance with a feeler gauge. The sensor must be positioned at the front, do NOT insert it completely into the groove! (above the joint with the rounded head)	Put the cable of the automatically turbolator cleaner in connector X1 of the display board with clamp 8 (L) brown, 9 (N) blue and 10 (PE) green/yellow. Fix the connector X12 on the control board and clamp it on the electric motor of the automatically turbolator cleaner. **(compare the electric documentation on page 55)** Look after a good cable routing!	Remove the protective film of the display and fix the display in the front cover (4 screws). Stick the BioX display label. (For it, we advise to use a crepe tape) BioX 15-20: From the top 40mm, from the right side 69mm BioX 25-45: From the top 40mm, from the right side 100mm Demount the STL-protection cap, insert the STL through the front cover, check the position and fix it© **(look also at point 18)**.

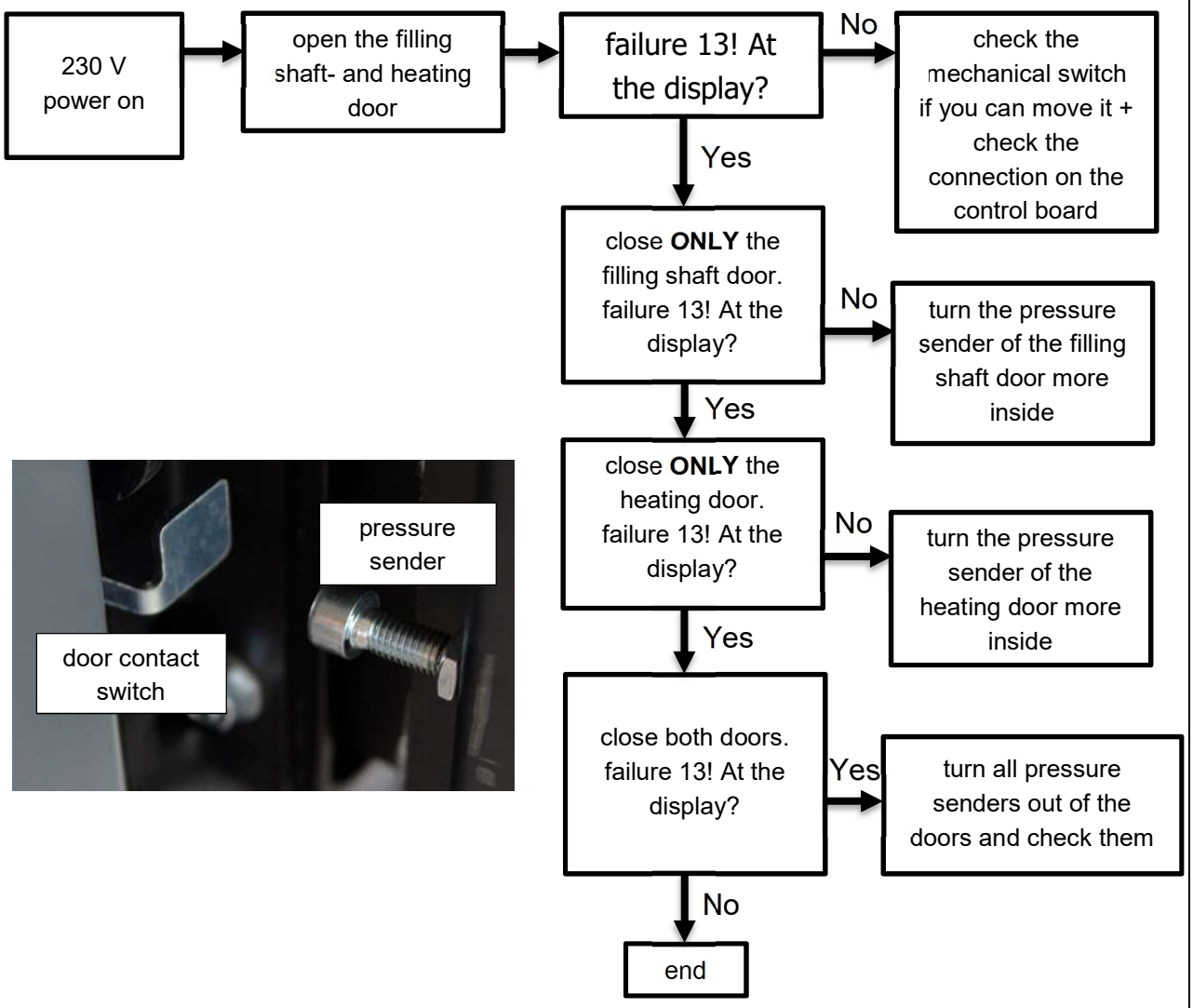
17.	18.	19.
 	 	  
Insert the connector X1 ⑦ in the display board and look though after a good cable routing. Insert the CAN-connection additional (connection place X3 display board / connector X13 control board). Clip and fix the front cover (2 self-tapping screws). Also you can insert the clamp X5 and X2 of the display board and X12 on the control board. IMPORTANT! Look therefor at the electric documentation!	Tape the cable clip holder to the sheet metal and attach connection and sensor cables that run to the display. ATTENTION! Make sure that the cables are correctly routed! The cables are not to touch the front panel of the display!	Fix the side covers on the track⑧. (3 pieces per side, M5 x 20) Slack the nuts for the vertical attitude⑨, to take the side covers on the right position. (4 pieces per side)

20.	21.	22.
  		 
Put the side covers with the 4 elevating screws in the right position. Check though the clearance of the filling shaft door and the distance between boiler body and the covers. Following fix the nuts for the vertical attitude. (look at point 20, number⑨)	Mountation of the exhaust blower Take the exhaust blower out of the package.	Remove the bottom holding bow⑩. Slack the top holding bow until the end of the thread and clip the blower on the connection of the smoke tube.

23.	23.1
	
Mount the bottom holding bow and take the blower in the favoured rake. (90°, 135°, 180°, look at the introduction at the package of the blower) Fix all nuts of the holding bows.	Close the connection of the exhaust blower. IMPORTANT! Make a leak test, when you start the wood log boiler at the first time.

24.	25.	26.
	 	 
Fix the cable channels at the top and the nuts for the vertical attitude.	Connect all of the rest of the connectors on the display- and the control board. Also connect the both PT1000 sensors on the control board. Look after a good cable routing and a correct connection. **(look at chapter „14 electric documentation, page 60)** Also you have to connect the power connection on the backside of the wood log boiler②. (it isn´t include in the shipment)	You HAVE TO connect the PT1000 tank sensors! They are important to use the residual heat. For these sensors, you need thermometer pockets. Mount it like the schemas on the top. When you use one tank, take schema③, please. When you have more tanks, use schema④. You don´t have thermometer pockets, you can also use PT1000 pull up sensors.

27.



Adjust the door contact switch

explanation:

To use the system safely, you have to adjust the door contact switch with the pressure senders (look at the picture on the top). When one of the doors are open, the switch open the electric circuit too. If one of the doors are open, the control board regulate the exhaust blower to full load, to generate an optimal smoke outlet.

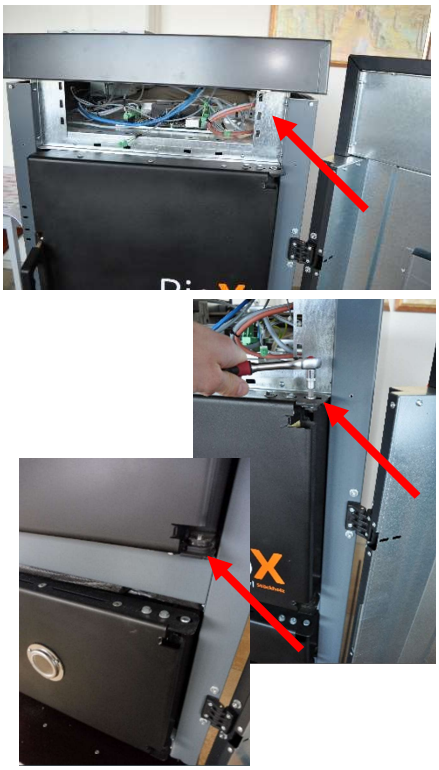
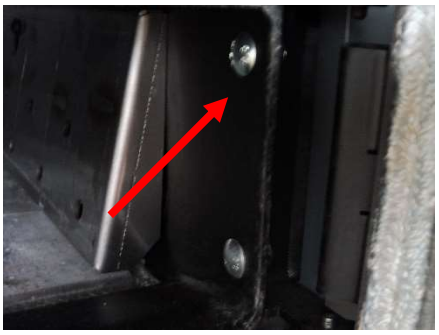
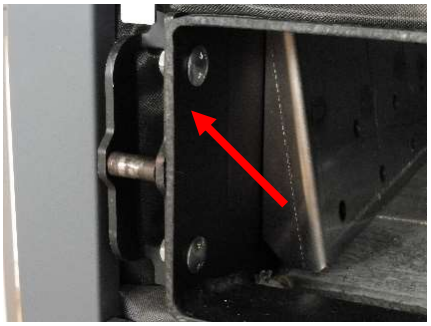
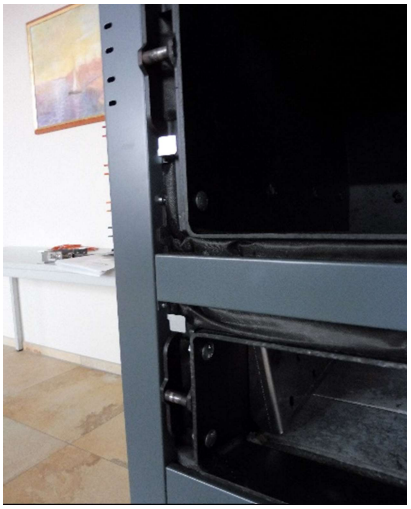
adjust the door contact switch :

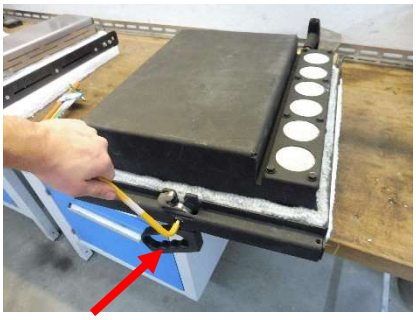
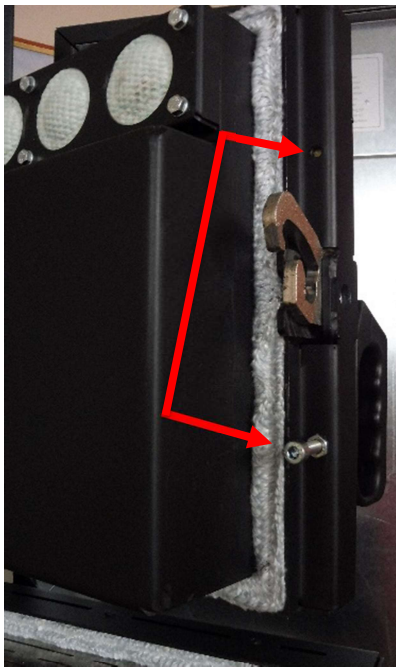
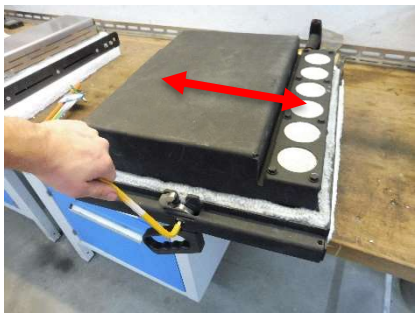
Adjust as long the pressure senders that appears the “failure 13!” on the display, when min. one of the doors are open. Therefore, you slack the lock nut and turn the pressure senders more out/in the door with an Allan key.

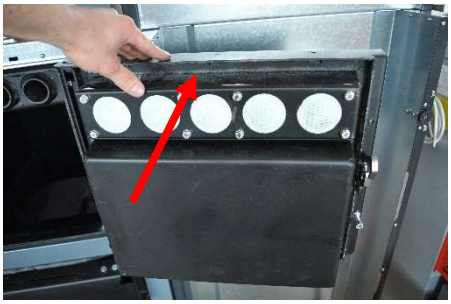
28.	29. (optional)
	
Apply, slide and fix the top cover front (2 screws). Following, fix the bottom cover front (2 screws). You have finished the mount of the covers, when you have the standard model.	Fix the optional stainless steel panels with 8 screws M8. Please, check the right position of the panels. Normally there are NO panels inside the wood log boiler!

30. (optional)	30.1 (optional)	30.2 (optional)
		
In this point, it´s describe the mounting of the optional front door.	Adjust the position of the door magnets and fix it (2 x M4 x 20 Allan key). You have to do this, when the magnets are to far away or to near of the covers.	Take the front door in the right position with the long holes of the hinges (4 x M4 x 20 Allan key). Attention the clearance between the front door and the side covers.

Door catch alteration (optional):

1.	2.	3.
	 	
Remove the front cover with the display (look at point 10, picture ②+③). Take all doors off about the door hinges.	Remove the door stopper and the plates of the hinges left and right and fix them on the other side.	Change the position of the door switch. For that, slack the side covers and fix the door switch on the other side (look at the picture on step 8)

4.	5.	6.
  		
Remove the door handle with the bolts (Allan key size 8), turn it 180° around and fix them on the doors again.	Adapt and adjust the pressure sender of the door switch on the filling shaft and heating door. ATTENTION! Do this on all three doors!	You have to turn around the inside isolation of the filling shaft door only. This get explained in the following points.

7.	8.	9.
		
Remove the 6 screws (3 on the top and 3 on the bottom) of the inner lining.	Following, remove the seal outside.	Pull out the element of the inner isolation.

10.	11.	12.
		
The inner lining of the door have a notch, that´s taking accurately fitting in the door.	Turn the inner lining of the door at 180° and fix it on the door.	At last, mount the door on the hinges again and make a leak test. .

Labels

Apply of the labels on the filling shaft door and the optional front door.

BioX 15-20:

front door:

- ← from right 42mm
- ↑ from the top edge orange band 20mm
- ↓ from the top edge plate 19,8mm

filling shaft door:

- ← from right 55mm
- ↑ from the bottom edge 50mm

BioX 25-45:

front door:

- ← from right 42mm
- ↑ from the top edge orange Band 20mm
- ↓ from the top edge plate 19,8mm

filling shaft door:

- ← from right 55mm
- ↑ from the bottom edge 50mm

3 INSTALLATION

3.1 Start-up

The Solarbayer service mechanicals or the authorized service mechanicals have to make the first start-up.

When the service mechanical makes the start-up and the delivery to the user, it´s important to test the function of all regulate- and safety installations. The service mechanical have to explain the function, handling and servicing of the wood log boiler.

The start-up protocol have to complete and send to Solarbayer, that the guarantee of 5 years can come into effect.

3.2 Important tips for heating contractors

The User have to write the confirmation, that he

- was introduced in the function, handling and servicing correctly.
- became the operating instructions and if need be other documents.
- can handle the wood log boiler correctly.

Tip: The boiler return flow sensor is already installed as a contact sensor at the boiler return flow in the factory. In addition, an analogue temperature display (with immersion sensor), e.g. at the return flow boost, is recommended on site.

The hydraulic balancing of the system (pipe installation) must be carried out by an (authorised) specialist company (installer). The heating specialist company is obliged to

- to install a properly designed membrane expansion tank (MAG).
- to prepare documentation (according to EN 12170) for the entire system, which must be kept in the heating room.

All recognised rules, regulations and standards must be applied by the heating company.

SOLARBAYER offers numerous recommendation schemes, if the installation is carried out according to other schemes, no proper boiler operation can be guaranteed. All customer service calls arising for this reason are at the expense of the customer or the heating company.

Heating water:

Please observe EN 12828 Part 1 and VDI 2035 with regard to the condition of the heating water.

3.3 Range of application and water connection

- The BioX boiler is suitable for burning logs to heat central heating systems for closed hot water systems.
- The boilers are used and approved as heat generators for heating systems with buffer storage tanks with max. admissible flow temperatures up to 90 °C. This buffer tank must be dimensioned in accordance with EN 303-5 and the 1st BImSchV.

Solarbayer recommends the installation of an appropriately dimensioned buffer storage tank. Solarbayer recommendation:

- BioX 15 → min. 1.500 liter
- BioX 20 → min. 2.000 liter
- BioX 25 → min. 2.000 liter
- BioX 35 → min. 2.500 liter
- BioX 45 → min. 3.000 liter

At variance with this, any larger minimum volumes for grants must be taken into account.

3.3.1 Expansion tank – safety valve

A closed expansion tank and a type-tested safety valve must be installed in accordance with EN 12828.

3.3.2 Excess temperature drain

In systems according to EN 12828, solid fuels may only be burned if the boilers are installed with a suitable safety heat exchanger and a type-tested thermal drain safety device. This safety device will protect the boiler against overheating, but can only carry out its function if:

- a flow pressure of at least 2 bar is available at the cold water inlet into the pipe line (and that continuously, mains voltage-dependent self-supplies are not safe enough),

- the delivery pressure at the exhaust pipe socket of the boiler does not rise above the specified value (see chapter 3.8)

Therefore, before installing the boiler, check if these two conditions are complied with or can be fulfilled.

Local regulations must be taken into account when connecting to drinking water networks!

3.4 Return flow boost

The return flow temperature must not drop below 65 °C! The position of the return flow connection is shown in chapter 5.2 (Connections). The return temperature increase is controlled to 70 °C by the boiler itself. This requires an **electronic** mixer unit! A thermal bimetallic cartridge is **NOT** permitted, otherwise the boiler cannot work properly!

Attention:

Corrosion damage caused by too low return temperature is not covered by warranty.

The boiler return sensor is already factory-fitted on the boiler return as a contact sensor.

3.5 Installation, boiler room and supply air

In the case of fireplaces, the building regulations of the respective countries apply with regard to the structural requirements for boiler rooms and their ventilation. FAVOR Sufficient fresh air supply to the heating room so that the fresh air required for operation of all installed firing systems can flow in and no lack of oxygen occurs to protect the operator!

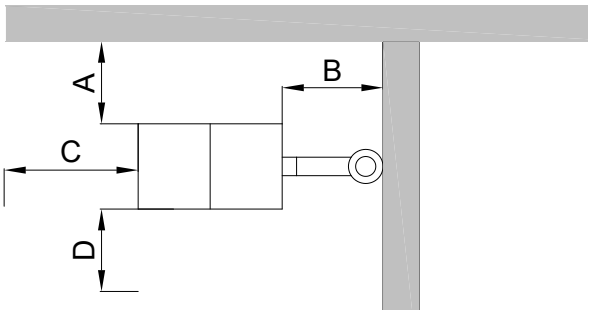
To meet this requirement, we recommend a supply air cross-section of 400 cm2 for all boiler sizes up to 50 kW. For rectangular openings, the aspect ratio should not be greater than 1.5:1; for grids, an appropriate allowance should be made so that the free cross-section meets the above requirement.

Requirements for an installation / heating room:

Closed room with ventilation openings that comply with the respective legal requirements. The room must have a lockable door which must be kept permanently closed.

3.6 Installation location

Ensure horizontal alignment. For unhindered operation and maintenance of the boiler system, it is essential that at least one side **(A or D)** has a free passage width of at least **85 cm (see illustration)**. Sufficient bright electrical lighting must be provided for the display and safety devices, the operating instructions and the access routes. Flammable objects which are not required for the operation or maintenance of the boiler system must not be stored in the boiler room or installation site (observe building and safety regulations, state building codes!).



	Minimum distance in mm	
	BioX 15 – 20	BioX 25 – 45
B	600	600
C	520	600
A and D	20 or 850 min. one side	

3.7 Transport tot he boiler room

If a crane is available for transport, the boiler can be inserted by means of transport hooks and load chain. Another option is to transport the boiler on the transport pallet using a forklift truck, making sure that the forks are long enough to prevent the boiler from tipping over. If the space is too narrow, the boiler can easily be transported on rollers on flat surfaces after dismantling the transport pallet. If stairs have to be crossed, all doors can be dismantled (weight saving, see assembly instructions on page 24). During transport, it is essential to pay attention to the floor insulation mounted on the underside so that it is not damaged or slipped out!

3.7.1 Checks after transport

The following points must be observed after transport to the boiler room:

- Correct position of the combustion chamber bricks.
- The combustion chamber bricks should not be removed during transport of the boiler.

Attention:

Be careful when handling the combustion chamber bricks - danger of breakage!

Tightness of all doors:

- For the correct boiler to function properly all doors and lids must close tightly and all doors and openings must be checked for leaks.

3.8 Chimney

The Solarbayer BioX wood log boiler is a technically high-quality product, the advantages of which can only be achieved by careful coordination of all factors necessary for good combustion. Boiler and chimney form a functional unit and must fit together to ensure trouble-free and economical operation. It is therefore essential to achieve the right "delivery pressure" for each type of boiler.

If the delivery pressure is too low, this prevents the flue gases from being transported properly and can lead to

- bad burning behaviour
- smoke outlet at the boiler during refilling
- smoke outlet at the draft regulator
- smoke outlet with leaking exhaust gas pipes
- overpressure in the chimney with danger of explosion

If the delivery pressure is too high, the combustion is faster and the fuel is supplied:

- expansion of the flame, possibly into the chimney
- high wear of the combustion chamber parts
- high flow speed, resulting in increased emission of dust and/or smoke
- hollow firing, resulting in a rapid drop in power

Reaching the correct delivery pressure depends on three essential factors:

- characteristics of the chimney
- vorschriftsmäßiger Anschluss des Kessels an den Kamin mit Zugregler
- Correct connection of the boiler to the chimney with draft regulator

3.8.1 Characteristics of the chimney

The requirements for a small draft drop in the chimney are:

- a good thermal isolation - to avoid rapid cooling of the exhaust gases
- a flat inner surface - to avoid turbulences
- the tightness of the chimney - to prevent the entry of false air (the cooling of the flue gases is accelerated by the entering false air)
- The chimney must be resistant to wetness and calculated or dimensioned in accordance with EN13384.

These requirements are met by fireplaces of type I and II according to EN13384, part 2.

3.8.2 Correct connection of the boiler to the chimney

The exhaust pipe must be connected to the chimney continuously rising and thermally isolated. It is recommended to install the draft regulator with explosion flap in the chimney cheek (between chimney pipe connection and cleaning door). If the draft regulator is installed in the exhaust pipe connection, there may be unwanted dust leakage. Each exhaust pipe bend increases the resistance and can cause flow noises which are boosted via the chimney. This can lead to noise pollution. For this reason, exhaust pipe bends should be avoided as far as possible.

Furthermore, the following must be taken into account:

- the connecting piece must not protrude into the chimney
- if bends are used, the inner radius of the bend must not be smaller than the pipe diameter
- the connection point on the chimney must be carefully tightened
- vertical, straight chimney guide without distortion (especially for extensions)
- all cleaning doors and measuring openings on the chimney must be closed tightly
- to reduce false air, only one heat generator should be connected to a chimney
- a chimney draft regulator is to be recommended. This provides a better efficiency and therefore maximum economy

3.8.3 Correct dimensioning of the chimney (according to EN 13384)

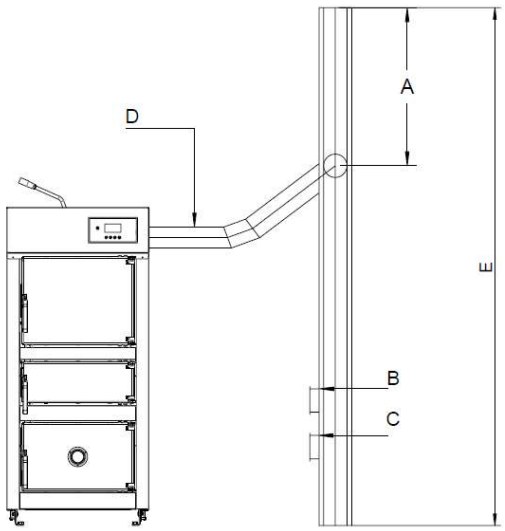
The boiler may only be connected to a chimney which has been calculated for the intended fuels and loads and which complies with the building regulations applicable to the installation site. The following local situations are difficult to take into account in the chimney calculation, but are important for the correct functioning of the boiler and chimney:

- the position of the house (due to hillside position or different building heights, drop winds or dynamic pressure zones arise)
- Position of the chimney on the roof (chimney opening must be at least 0.5 m above the highest point of roofs with an angle of inclination of more than 20° or at least 1.0 m away from roof surfaces with an angle of angle of 20° or less)
- Design of the chimney opening (decorative attachments create bottlenecks and turbulence which prevent undisturbed introduction of the exhaust gases into the wind flow)

In practice, it may happen that a chimney builds up too high a delivery pressure continuously or sometimes (due to changes in the weather, gusty wind etc.). By installing a draft regulator, the burn-up conditions can be kept almost constant, which improves the efficiency. However, it is always better to consult the responsible chimney specialist at the planning stage!

Attention:

The whole chimney system must be installed in accordance with the valid EN 13384 standard. Incorrectly dimensioned chimney systems can lead to malfunctions (dangerous situations).



A effective chimney height

B chimney draft controller with explosion flap

C cleaning opening

D exhaused pipe rising and insulated

E total chimney height

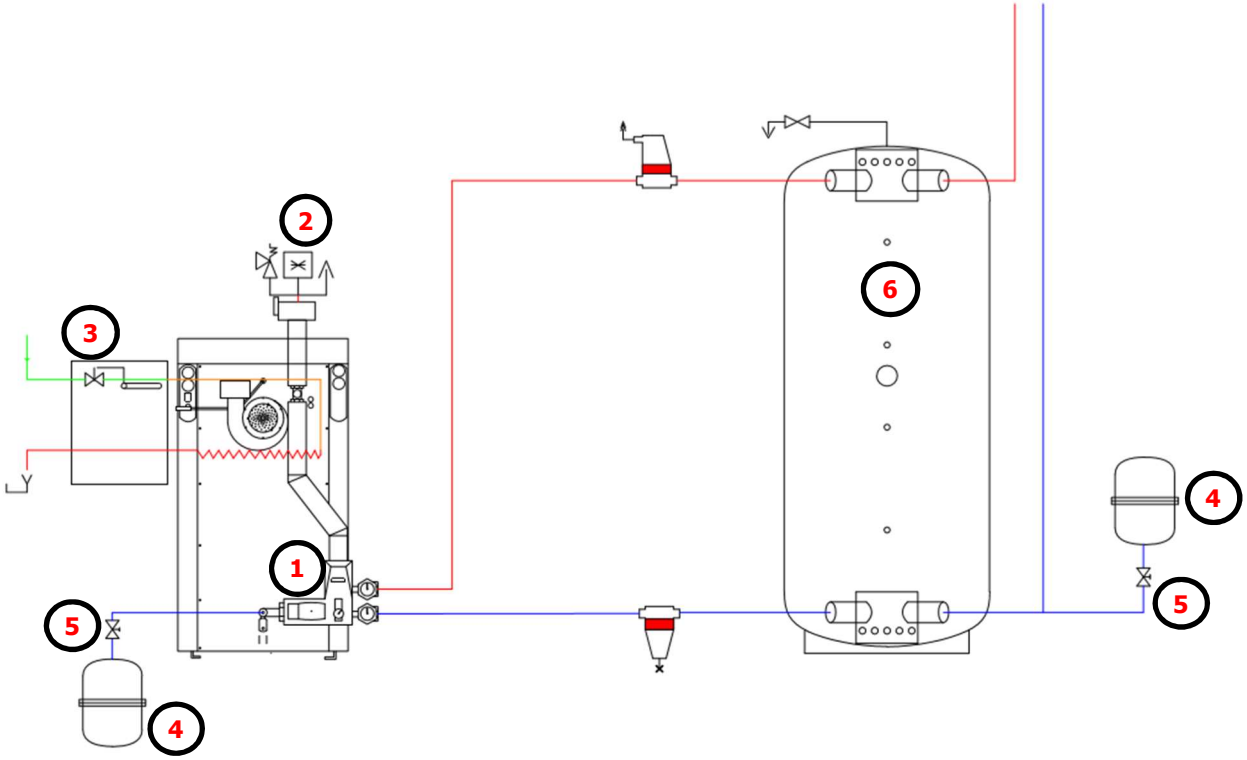
allowable delivery pressure (previously referred to as drawbar requirement) 2 mm WS = 0.2 mbar

Effective chimney height = height difference between the exhaust gas inlet into the chimney and the chimney outlet (according to EN 13384).

This calculation of the whole chimney system must be made by the chimney supplier or an authorised company.

Type	Max. allowed delivery pressure in mbar	Examples of suitable chimneys		
		Diameter	Delivery head	Design type
BioX 15	0,20	∅140, ∅160	min. 7m	I
BioX 20	0,20	∅140, ∅160	min. 7m	I
BioX 25	0,20	∅140, ∅160	min. 7m	I
BioX 35	0,20	∅140, ∅160	min. 7m	I
BioX 45	0,20	∅160, ∅180	min. 7m	I

4 OVERVIEW SAFETY EQUIPMENT



1 Boiler return flow boost *
The opening temperature of the return flow boost should be about 70°C to protect against condensation and corrosion and to reach a sufficient operating temperature.

2 Boiler safety group* (safety valve, pressure gauge and air vent)
The boiler must be protected with an approved and type-tested safety valve in accordance with DIN EN ISO 4126-1:2013-12 with a response pressure of max. 3 bar.
The connecting line between the boiler and the safety valve must not be lockable.

3 Thermal drain safety device* according to DIN EN 14597
The drain safety device must be connected to a pressurised tap water network in such a way that it cannot be shut off. A pressure reducing valve is required for a cold water pressure of ≥ 6 bar.

4 Membrane pressure expansion vessel according to DIN EN 13831
The dimensioning must be carried out in accordance with DIN EN 12828.

5 Cover valve*

6 Buffer tank*
We recommend the installation of a buffer stratified storage tank with a minimum storage volume of 55 litres per kW nominal heat output of the boiler, legal requirements and promotion rules must be observed.

* The installation instructions of the producer must be observed.
An yearly inspection of the safety devices by a specialist company is mandatory.

5 TECHNICAL DATA AND SIZES

5.1 Technical data

General data		BioX 15	BioX 20	BioX 25	BioX 35	BioX 45
Boiler rating	kW	16,6	19,4	25,0	33,6	43,2
efficiency	%	90,6	90,9	90,7	90,7	90,5
Boiler water volume	l	85		108		
max. operating pressure	bar	3				
Pressure drop at nominal load (dt 10K)	mbar	8,4	8,4	13,2	28,2	27,2
Pressure drop at nominal load (dt 20K)	mbar	2,1	2,1	3,2	8,0	7,3
Allowed pressure range drainage safety device	bar	min. 1 to max. 4 bar				
Waterinlet temperature drainage safety device	°C	4 to 15°C				
Opening temperature drain safety device	°C	at 95°C				
Noise level at 30% requirement (at 90%)	dB (A)	36 (44)				
Energy efficiency class	--	A+	A+	A+	A+	A+
Energy Efficiency Index EEI	--	115	115	115	115	115
Room heating yearly utilisation rate η_s	%	77,0	77,0	77,0	77,0	77,0
Dust emission (PM) [1]	mg/m³	10	10	11	11	10
OGC emission (OGC) [1]	mg/m³	1	1	1	1	1
CO emission (CO) [1]	mg/m³	28	28	26	26	26
NO_x emission (NO_x) [1]	mg/m³	115	116	130	130	126

[1] *based on 13 vol.% O_2*

Filling chamber / fuel consumption		BioX 15	BioX 20	BioX 25	BioX 35	BioX 45
Allowable fuel		Air-dried split logs with <20% residual dampness				
max. log length	mm	550		550		
Filling chamber depth	mm	590		590		
Filling chamber high	mm	525		665		
Filling chamber width	mm	400		460		
Dimenson filling opening w/h	mm	400/260		460/305		
Combustion chamber volume	L	125		185		
max. filling weight (beech)	kg	40		54		
Fuel consumption at nominal load (beech)	kg/h	5,0	6,7	6,8	7,7	7,5
Burning time at nominal load (beech)	h	6,0	5,0	7,0	6,0	4,5

Exhauset gas routing		BioX 15	BioX 20	BioX 25	BioX 35	BioX 45
Recommended min. chimney diameter	mm	140		140		
Delivery pressure	mbar	0,2		0,2		
Recommended effictive chimney height	m	7		7		
Exhaust gas mass flow	kg/s	0,0098	0,0122	0,0152	0,0212	0,0272
Exhaust gas temperature modulating	°C	180	220	180	200	240
Exhaust gas routing to the chimney	--	Stretched length < 1,5m (max. 2 bends)				
Chimney draft control	--	recommended				

Technical data and sizes

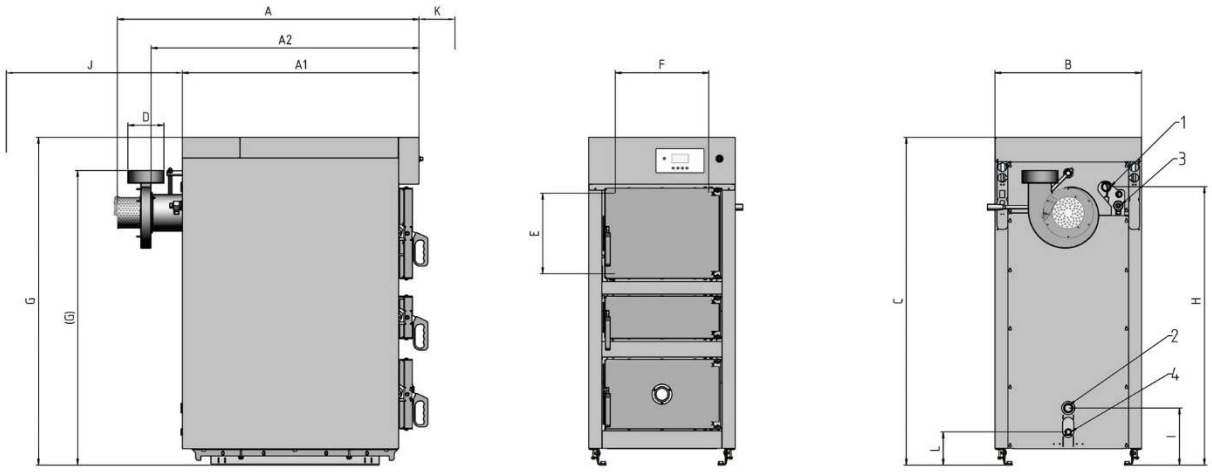
Electrical data		BioX 15	BioX 20	BioX 25	BioX 35	BioX 45
Voltage / Frequency	V/Hz	~230/50				
Power consumption standby	W	< 0,3				
Power consumption operation	W	90		150		
Hydraulic		**BioX 15**	**BioX 20**	**BioX 25**	**BioX 35**	**BioX 45**
Recommended minimum buffer volume **	L	1000	1500	2000	2000	3000
Manufacturer recommendation	L	1500	2000	2500	2500	3000
Minimum pipe dimensioning (Cu/precision steel pipe)***	mm	Ø 28	Ø 28	Ø35	Ø 35	Ø 35
Minimum pipe dimensioning (steel pipe)***		DN 25 (1")		DN 32 (1 ¼")		
Recommended boiler return temperature	°C	70°C				
Preset minimum return flow temperature of the Solarbayer boiler return flow increase (control via boiler control)	°C	70°C				

***** If the room height is less than 2.20 m for the BioX25/35/45 or less than 2.00 m for the BioX 15/20, the version with split turbulators is required.

****** The legal framework and funding criteria must be observed.

******* Depending on pipe length, number of bends, mixers, switching valves, etc., also dimension larger pipes.
The pipe dimensions given here are only a suggestion and are no substitute for technical planning.
Emission values according to test report based on dry exhaust gas and 13.% oxygen;
Product information in accordance with the requirements of Regulation (EU) 2015/1189 regarding energy consumption labeling of solid fuel boilers.

5.2 Dimensions and connections



Dimensions and weights		Unit	Boiler type 15 20	25 35 45
Length - total	A	mm	1255	1339
Length - covering	A1	mm	1021	1021
Length to exhaust pipe end	A2	mm	1154	1154
Width	B	mm	610	670
Height*	C	mm	1365	1585
Exhaust pipe diameter	D	mm	150	150
Filling chamber height	E	mm	260	305
Filling chamber width	F	mm	400	460
Exhauset pipe – upper edge	G	mm	1225	1494
Exhauset pipe - middle	(G)	mm	1050	1275
Flow connection height	H	mm	1155	1380
Return connection height	I	mm	240	240
Minimum distance back	J	mm	600	600
Minimum distance front	K	mm	520	600
Fill / empty connection height	L	mm	135	135
Boiler flow / return connection	1 + 2	Ø	1" (IG) DN 25	1 ¼" (IG) DN 32
Safty heat exchanger	3	Ø	1/2" (IG) DN 15	1/2" (IG) DN 15
Emptying	4	Ø	1/2" (IG) DN 15	1/2" (IG) DN 15
Boiler weight		kg	461	564

6 FUELS

The Solarbayer BioX is suitable for burning logs to operate central heating systems for closed hot water installations. Smaller split logs enable higher boiler performance than whole ones. We recommend triangular firewood with side lengths of **50cm** and edge lengths of **8cm**. To course or to long firewood may lead to reduced performance and hollow fire. The heat value of the wood is primarily dependent on its dampness content. The heat value decreases with increased dampness. The combustion of wood with high dampness content also causes a decrease in the degree of efficiency of the boiler.

Wood should therefore be stored for at least two years in a dry, ventilated place. Oak needs to be stored for about a year longer. Dry bark displays a heat value similar to wood but there is more likely to be increased formation of ash.

The burning of **unsuitable fuels** could lead to uncontrolled combustion. The guarantee expires! Breakdowns and consequential damage are probable.

Possible consequential damage:

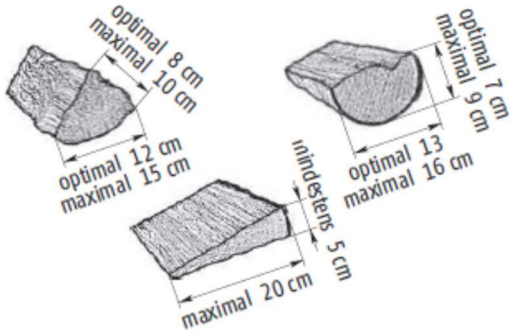
- Damage to the thermodynamic combustion chamber, the lambda sensor, the exhaust gas sensor due to aggressive residues in the boiler.
- Soot formation or corrosion in the filling area due to condensation resulting from the use of excessively wet fuel.
- The escape of exhaust gas from the airflow apertures through uncontrolled combustion (deflagrations).

Combustion time at nominal load up to

	Combustion time in hours				
Type	**BioX 15**	**BioX 20**	**BioX 25**	**BioX 35**	**BioX 45**
Softwood	5	4	6	5	3,5
Hardwood	6	5	7	6	4,5

6.1 Suitable fuels

The firewood must be air-dried, that is, dried at least one year with water content below 20%, preferable half-meter logs with an average diameter of 10cm. Are the cleavage planes of the log much longer, according to the log should be thinner, in extreme cases 20 to 5cm.



6.2 Unsuitable fuels

When heating wet fuel with a water content of more than 20%, condensation forms and thus corrosion takes place on the filling chamber walls.

Furthermore, it must not be burned:

Waste, plastics, paper, cardboard, wood grinding dust, sawdust and wood chips

Coal and coke, from the respective Air Pollution Control Laws

(state law) usually forbids fuels such as old railway sleepers,

plastics, chipboard, impregnated wood, construction timber, furniture or waste wood.

Water content w in %		10	15	20	25	30
Wood moisture u in %		11	18	25	33	43
Tree type / density[1)]	**Unit**	**Heating value in kWh**				
Spruce	kg	4,61	4,32	4,02	3,73	3,44
379 kg TM/fm	fm	1942	1925	1906	1885	1860
	rm	1360	1348	1334	1319	1302
Pine	kg	4,61	4,32	4,02	3,73	3,44
431 kg TM/fm	fm	2209	2189	2168	2144	2116
	rm	1546	1533	1518	1500	1481
Beech	kg	4,43	4,15	3,86	3,58	3,30
558 kg TM/fm	fm	2748	2723	2695	2664	2627
	rm	1923	1906	1887	1864	1839
Oak	kg	4,43	4,15	3,86	3,58	3,30
571 kg TM/fm	fm	2812	2786	2758	2726	2689
	rm	1968	1951	1931	1908	1882
Cottonwood	kg	4,43	4,15	3,86	3,58	3,30
353 kg TM/fm	fm	1738	1723	1705	1685	1662
	rm	1217	1206	1193	1179	1163

[1)] values in kg dry matter (TM) per solid cubic metre (fm)

source: LWF Merkblatt 12

7 START-UP WITH COLD SYSTEM

After a long period of downtime or during the first start-up, you should observe the following points in particular when heating up:

- When the system is cooled down, the boiler needs a relatively long time to reach the temperature if all heat consumers are switched on during heating. Therefore, only put a small heating circuit into operation at first and only switch on the other heating circuits gradually when the boiler has reached its operating temperature. Initial commissioning may only be performed by SOLARBAYER customer service or authorized personnel.

8 HANDLING OF THE HEATING SYSTEM

8.1 Sealing the boiler

It is imperative that all doors are closed during operation so that no leak air can disrupt the combustion process. If this is not observed then damage to the boiler may result.

8.2 Operation with low performance decrease

Should fuel be burned in the transition period (spring or autumn) it is vital to ensure that for low decreased performance (less than 50%) the filling shaft is not completely put on. Decreased performance of less than 50%, means the boiler and the chimney may become clogged with soot. It is also possible that smoke may develop in the chimney. The BioX wood log boiler should therefore basically be operated equipped with a **correctly dimensioned buffer** (according to EN 303-5). Recommended dimensions are listed in the document “installation instructions”.

8.3 Overheating of the boiler

Should the boiler temperature exceed maximum boiler temperature, the safety temperature limiter switches the controls off and the warning light illuminates. After the equipment has cooled off under about 75°C, the Safety Temperature Limiter (STL) should be tripped by unscrewing the covering cap (press the knob). Then screw up the covering cap again afterwards. Before re-starting the cause of the overheating should be identified and corrected.

Thermal flow protection

If the boiler overheats, then the “thermal flow protection” opens automatically (at 95°C) via a sensor and cold water flows through the heat exchanger. The boiler water is thereby cooled off and dangerous operating conditions are prevented. The water heated up in the heat exchanger must be able to run away freely (directly into the waste water channel). After the boiler water has cooled off to about 90°C, the "thermal flow safeguard” automatically interrupts the cold water feed. After cooling off, the equipment pressure and/or water level of the equipment is to be controlled and if necessary the missing amount of water topped up. According to DIN 4751 sheet 2, the operator is obliged to regulate the functioning of the “thermal flow safeguard” and the heat exchanger belonging to it at least once a month by activating the test button. Furthermore this safety instruction is to be monitored once a year by the manufacturing company or another competent organisation.

Note:

Where there is a combined non-functioning of the “thermal flow protection” and heat exchanger, the set-up of the equipment is not allowed.

8.4 Sweating of the boiler

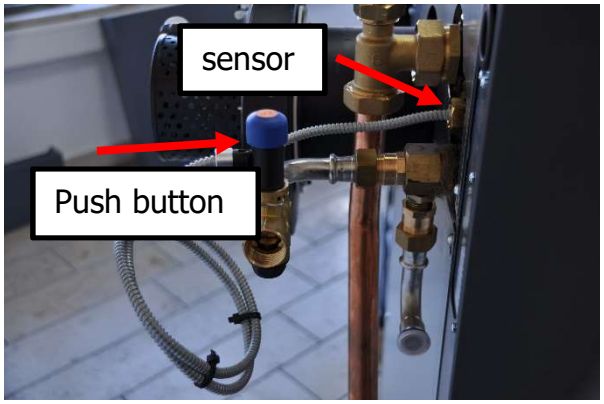
During long-term operation it should be guaranteed that the return flow temperature does not fall below 65°C. For this reason a return flow temperature bypass is obligatory.

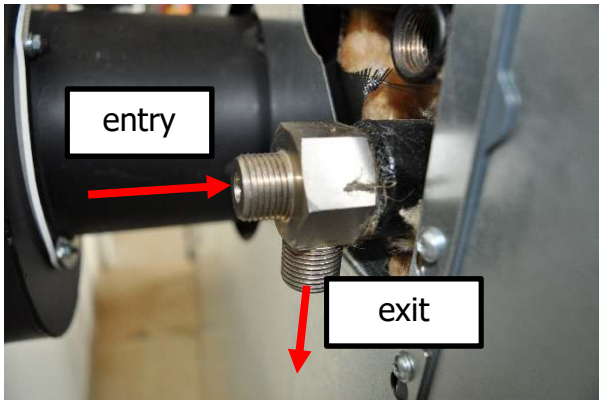
Note:

Corrosion damage caused by too low return flow temperatures, do not come under the guarantee or warranty claims.

8.5 Taking out of operation

The mains switch should not be turned to “OFF” during the burn-off but only after complete burn-off. (Status: **unit off (1)**)





9 BOILER OPERATION

9.1 Preparation for heating up

If possible, store enough fuel for two or three combustion processes near the boiler room.

Prepare firewood

The firewood must correspond to size (circumference 8 – 10cm) and dimensions to the size of the boiler. Firewood without bark burns better.

9.2 Heating up

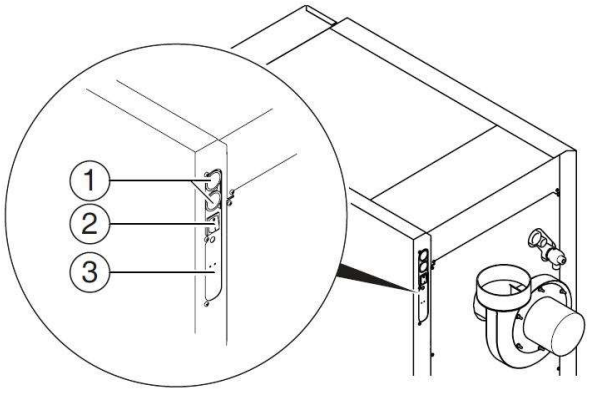
	Warning: Risk of system damage due to improper maintenance! Wrong position or lack of firebricks inside the boiler can lead to damage or destruction of the boiler. ■ Before heating up the boiler, check the position of the firebricks.
	Warning: Risk of system damage due to improper maintenance! Excessive fuel feeding can cause overheating and damage to the boiler. ■ Adapt the amount of fuel to the energy absorption capacity of the heating system.
	Crucial for the clean burn-off in the boiler are the correct operation of the boiler as well as a sufficient feed pressure of the exhaust system.

In the following a possibility for the heating up of the boiler is described. Depending on the ambient conditions (draft, exhaust system, wood, and so on) other heating up processes may be better.

Get familiar with the boiler and find out the best handling for you to use. Test the best opportunity for heating up the boiler.

Please note always the safety notes!

■ Switch on the main switch [2] and regulator (→ On/Off – button). The regulator displays status 1.



1 … Cable bushing

2 … Main switch

3 … Electric supply

■ After the filling shaft or lighting-up door is opened the “burning phase” (Status: 2) starts automatically.

	If it is not desired or necessary to heat up the boiler, this process can be interrupted with a long press of the On/Off button.

■ To form a good flame it is recommended that the lower third of the filling shaft be filled with small pieces of wood.

■ After that normally chopped wood (size around 8cm) can be used for filling.

■ Then open the lighting up door (4) and light up with an oil ignition, wood shavings or cardboard.

■ When the exhaust gas temperature is more than 120°C, close all doors

By sufficient feed pressure a firebed (draft) is built up and the wood in the filling room is burning von bottom to top.

Heat-up process

Step1:

Open the filling chamber and firing door and insert a bed of normal logs, soft wood is preferred for this purpose. The nozzle slot must **NOT** be covered!

Step 2:

Place a sheet of finer wood on top of the first coat over the nozzle area.

Step 3:

Fill the remaining filling space compactly with your firewood without canting the logs.
Incorrectly placed wood can lead to a hollow fire!

Step 4:

Close the filling chamber door and heat the boiler via the firing door as shown. Do **NOT** place the starter on the bottom of the filling chamber. Place it between the first and second layer of wood.

Step 5:

To speed up the burning process, leave the firing door open a crack (approx. 2-3 cm) and close it as soon as the flue gas temperature (S05) reaches approx. 80 - 100 °C.

	Too short and thick wood logs lead to an uneven burning behaviour. Too short and thin wood reduces the burning time → Only use wood logs according to specification
	During operation, all doors must be closed to ensure that no false air can disturb the combustion process.
	The heating-up time can change due to the cleaning condition of the boiler, the local conditions, the used fuels and the weather changes (low pressure in the exhaust system).

The boiler operates according to the principle of the lower burn-up. The control device controls the boiler automatically and completely.

9.3 Energy absorption capacity / STL

The energy absorption capacity of the heating system (in general consisting of the boiler and buffer) depends on the actual value of the water temperature of the buffer. For economic operation of the heating system, the amount of the used fuel must be adjusted to the relative energy absorption capacity. As a result, the overheating of the boiler is avoided and the pollutant emission is reduced. By significantly transgression of the maximum boiler temperature, the safety temperature limiter switches off the controller. If the system is cooled below 75°C the safety temperature limiter (STL) must be unlocked.

- Unscrew the cover cap of the STL.
- Press the button of the STL. The STL is unlocked.
- Screw on the cover cap again.

Before resuming operation: Find and fix the cause of failure.

9.4 System

Legende:

1 … control
2 … D30 heat controler (optional)
3 … filling shaft door
4 … heating door
5 … cleaning door
6 … exhaust take-off pipe
7 … gasifier room
8 … jet nozzle
9 … cyclone burning room
10 … turbolators
11 … lambda sensor
12 … primary and sacondary air aperture
13 … exhaust blower
14 … isolation

9.5 Re-heating

Depending on the wood type and quality the burning time of a filled boiler by nominal capacity is about three to eight hours.

	By intermediate opening of the fill shaft door the combustion is disturbed. These can lead to a poorer combustion behaviour and excessive escape of flue gas. ➔ Filling should burn down completely

To refill fuel or to check the level:

	■ Open the filling shaft door slowly – the ventilator going at full speed, so that the flue gas is sucked out via the smoke flue channel by opening the filling shaft door. ■ Put in the fuel ■ Close the filling shaft door.
	■ A quick covering of the glow with wood logs reduces the leakage of hot gases from the filling room. Refill only as much fuel as for the energy absorption capacity of the system is permitted.
	■ Pay attention to the lower buffer temperature. If the buffer is already loaded (lower buffer temperature over 40°C), please avoid a reloading of fuel. By too slight heat consumption the risk of tar formation and overheating of the boiler is existing.

The Solarbayer BioX special boiler is characterised by its long combustion duration. It does not have to be re-filled with fuel at frequent intervals. It is recommended that the **filling shaft only be filled according to the heating requirement**, so that frequent opening of the filling shaft door does not have a negative effect on combustion.

10 MAINTENANCE AND CLEANING

10.1 De-ashing and cleaning general

In order to counteract increased fuel consumption, rising flue temperature, decreasing efficiency level, etc., we recommend that the boiler be cleaned at frequent intervals. The combustion chamber only has to be cleaned every two to six days, depending on the type of fuel used. The heat recovery areas must be cleaned manually at each start-up or switching off of the equipment.

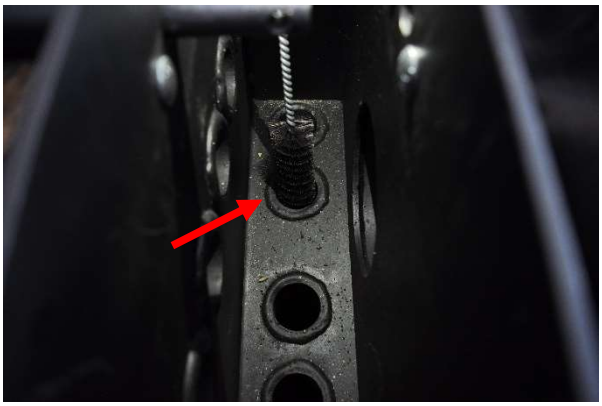
10.2 Cleaning of the heat recovery areas (manual)

The heat exchanger pipes are to be checked regularly for soiling and should be cleaned manually if required. Rust and fly ash deposits on the heat recovery areas have a considerable effect on the economy and performance of the boiler.

For an optimized regular cleaning SOLARBAYER recommends retrofitting the automatic heat exchanger cleaning system for the BioX boiler. The boiler control monitors the turbulators independently and cleans them at regular intervals.

The resulting ash must be removed via the ash door.

Nevertheless, a careful cleaning of the pipes with a brush at regular intervals (every 1000 operating hours) is necessary.



10.3 Cleaning of the combustion chamber

This only has to be cleaned every two to six days, depending on the type of fuel used. When burning fuels with a high proportion of fly ash (e.g. paper, cardboard, bark, etc.) on combustion, the combustion chamber should be cleaned more frequently:

- Open the casing door and ash door (7)
- Clean the combustion chamber
- Keep the primary air feeds (3) clean with bellows for primary air feeds (19)
- Keep the combustion plate inputs clean with (5) clean with bellows for primary air feeds (19)
- Clean out the combustion tray and combustion plate using the bellows for the combustion plate (18)
- Close the ash door (7).

Any elongation fissures on the insulation plates or combustion chamber bricks do not affect their functioning and therefore do not represent a claim against the guarantee.

During cleaning ensure that the slot between the burner plates is not clogged (see picture below). On the burner plates themselves, an ash layer of about 3cm can be left which is provided for glow sustainment.

Note:

The combustion chamber must always be cleaned last, as the ash may fall in the burn-off areas when cleaning the heat exchanger pipes.

10.4 Cleaning the flue pipe

This should be cleaned at least once a month using a chimney cleaning brush.

Note: Remove the flue temperature sensor before cleaning as it could be damaged.

10.5 Filling shaft – Filling shaft door

The filling shaft walls are not heating surfaces and must therefore not be cleaned. The deposit arising on the filling shaft walls is a normal chemical process and flakes off from time to time by itself or can be removed using the bellows.

Note:

For perfect functioning oft he boiler the filling shaft door must always be shut tightly.

The filling shaft door should be tested for leaks once a year!

10.6 Checking the heat exchanger

In “hard water” areas in particular, there should be checks on whether the heat exchanger is furred up and has to be cleaned. Where faults are identified, ongoing maintenance is offered, as this may mean important safety checking for operation in closed heating units (checking the heat exchanger can be carried out by manually pressing the thermal flow protection. There should be a free flow of water into the heat exchanger).

10.7 Checking the water level for the heating unit

Care should be taken that the required water level or unit pressure (min. 1.5 bar in cold condition) should be maintained in the heating unit. Regular checks are required.

Too low a unit pressure may lead to simmering noises or the build up of steam bubbles in the unit.

10.8 Keeping the boiler room clean

Items that are not required for the operation or maintenance of the boiler unit should not be stored in the boiler room. Cleanliness and tidiness enable good access for service and maintenance and reduce the risk of accidents.

For reasons of fire protection and according to the valid regulations: Only designated and permitted.

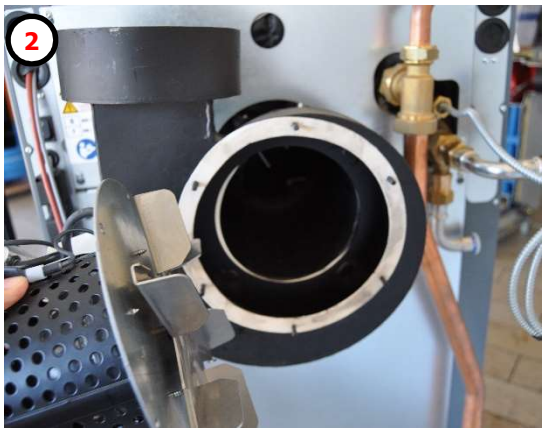
10.9 Cleaning the exhaust blower and the exhaust stack

The fan wheel in the exhaust blower and the boiler exhaust pipe must be cleaned at least once a year.

1) Disconnect the system from the power supply
2) Unplug the induced draft blower
3) Loosen the wing nuts of the blower motor①
4) Loosen the lock nut of the blower motor②
5) Pull the blower motor with fan out of the housing.
   Note: This procedure can be a bit strict, be careful not to damage the seal!
6) Clean the fan wheel (compressed air / brush)
7) Clean the exhaust gas connection with a brush

Attention: When cleaning the exhaust gas connection, pay attention to the lambda sensor and the exhaust gas temperature sensor. Damage may be possible if the connection piece is not cleaned carefully!

8) Check the seals of the blower motor
9) After cleaning, reinstall the blower and reconnect the exhaust pipe to the induced draft blower
10) Make sure that the exhaust pipe to the chimney is tight



10.10 Lambda sensor cleaning

The lambda sensor of the BioX wood log boiler must be checked once a year for dirt or cleaned.

	**Attention:** The lambda sensor can easily be damaged, so handle it with care during operation. A damaged lambda sensor does not guarantee clean combustion and must therefore be replaced.
	The lambda sensor is heated during operation! Danger of burns!

Recommendation: Clean the lambda sensor in system state 1 "OFF":

- Disconnect the system from the power supply
- Remove the two top cover parts
- Unplug the white plug connection of the lambda sensor (see picture) ①
- Remove the top back cover (4 screws torx)②
- Carefully unscrew the lambda sensor using a suitable **socket wrench**③
- Carefully clean the sensor with a clean, dry cloth
- Carefully reinsert the sensor and screw it in place
- Reconnect the lambda sensor to the control board
  Mount the boiler covers again

IMPORTANT!
DO NOT install or remove with pliers! Damage caused by incorrect handling will not be refunded!

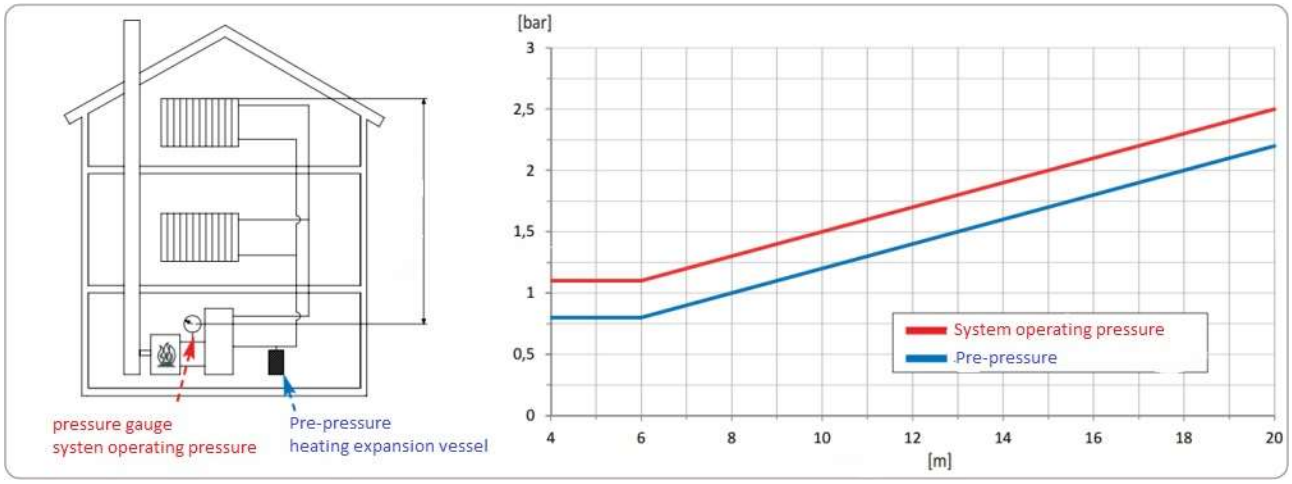
10.11 Service plan

Service work \ Service interval	W1–Each boiler charge (daily)	W2–Each 5th boiler filling (2x weekly)	W3-After 1000 operating hours (all 6 weeks)	W4 (yearly)
Filling chamber ✓ If necessary, remove excess fine ash [rough cleaning sufficient]. ✓ Charred wood waste from the earlier combustion can remain in the filling chamber and can be used to facilitate the next heating process of the boiler. ✓ Black gloss soot deposits on water-cooled steel walls are quite normal [excessively thick deposits, however, indicate too fine firewood or smouldering fire due to frequent overheating/boiler shutdown].	●	●	●	●
Exhaust turbolators ✓ Use cleaning lever / automatic heat exchanger cleaning (WTR) becomes active (optional)	●	●	●	●
Combustion & ash chamber ✓ Clean [(light-) grey dust → OK; black sticky coating → bad combustion!]	-	●	●	●
Cyclone combustion chamber ✓ Check for damage and wear ✓ Check the continuity of the flow channels	-	-	●	●

Exhaust gas heat exchanger / Exhaust turbulators ✓ Cleaning with a brush ✓ Automatic WTR control: Lubricate moving parts as needed ✓ WTR - Control: Check position and functionality of sensor	-	-	●	●
Lambda sensor ✓ Check measuring head in exhaust pipe for dirt [clean with dry soft cloth; lambda sensor is heated when boiler is in operation! Danger of burns! Maintain the lambda sensor when installed; otherwise disconnect the cable before unscrewing the lambda sensor!]	-	-	-	●
Exhaust pipe ✓ Check [if necessary, remove deposits/dust so that the flow cross-section is not narrowed]	-	-	-	●
Exhaust blower ✓ Check fan wheel [if necessary remove dust / blow out with compressed air]	-	-	-	●
Filling & Ash chamber door ✓ Check doors and heat exchanger cover for tightness	-	-	-	●
Heating expansion vessel ✓ Check [Inlet pressure: Gas overpressure behind the membrane of the expansion tank, if the expansion tank is depressurized on the water side; System pressure: Water overpressure of the cold system]	-	-	-	●

Safety devices ✓ Check functionality [In the event of overheating, the thermal drain safety valve opens automatically and cools the boiler via the safety heat exchanger with tap water; the pressure gauge shows the current operating overpressure of the system; if necessary, the overpressure valve opens automatically and thus limits the operating overpressure to max. 3 bar]	-	-	-	●

Seals, sensors, fireclay parts and parts in contact with fire are wear parts.



11 BOILER STATUS

1 Unit off

In this condition the unit is switched off.

2 Burning phase

In the **BURNING PHASE(2)** condition wait to see if the logs catch fire in the combustion chamber. During 30 minutes an adequate flue temperature (**HEATING UP FROM MIN(P06)**) is adjusted so that it can be switched on into the **HIGH RUNNING PHASE(3)** condition. If this flue temperature is not set, it switches into the **UNIT OFF(1)** condition and a fault is declared accordingly.

In this condition it is possible to switch manually into the **UNIT OFF(1)** condition.

3 High running phase

In the **HIGH RUNNING PHASE(3)** condition, after lightings the logs, it tries to stabilise the combustion and achieve the minimum boiler temperature. The optional combustion control (lambda control) is already activated at this time. When reaching 65°C the boiler temperature (set out in the program) is switched on into the control phase. Should the flue temperature decrease in this phase (under **HEAT UP MIN(P06)**), it switches into the **NEW START-UP(6).**

4 Control phase

The **CONTROL PHASE(4)** condition carries out actual boiler control, which splits into an output and combustion control (OPTIONAL). If the boiler temperature in this phase increases above the maximum boiler temperature (**BOILER MAX(P02)**), it switches into the **READY(5)** condition. Should the flue temperature decrease in this phase (**HEAT UP MIN(P06)**), it switches into the **NEW START-UP(6).**

5 Ready

The maximal boiler temperature **(BOILER MAX(P02)**) has been reached due to too low heat capturing. Therefore the boiler has been switched off. The boiler starts up again if the boiler temperature falls 3°C below **BOILER MAX(P02).**

6 New start-up

The **NEW START-UP(6)** condition tries to re-stabilise the combustion within a time limit (adjustable via **MAXIMUM RE-START(P07)**). It will always be activated if the flue temperature is too low. If stable combustion adjusts again, it switches immediately into the **CONTROL PHASE(4)**. Should a sufficient flue temperature not be achieved after a specified time (under **HEAT-UP MIN(P06)**), the boiler is switched off as it is switched to the **UNIT OFF(1)** condition.

7 Re-heating

The **RE-HEATING(7)** condition is used for safe operation for re-heating. If the customer re-heats a larger amount of logs in operation, then this operation is activated. The boiler then remains in this condition for the time set. Should the boiler temperature in the meantime increase above the maximum boiler temperature, the boiler will be switched off. After the set time, it switches to the **CONTROL PHASE(4)** condition once an adequate flue temperature is reached, and if the flue temperature is too low (under **HEAT UP MIN(P06)**), it is switched off and reported as a fault. This function may only be activated by long pressing the On/Off-switch in the STATUS MENU, if the unit is in **HIGH RUNNING(3) or CONTROL PHASE(4).**

8 Chimney sweeper

The **CHIMNEY SWEEPING(8)** condition is available as a test mode for the chimney sweeper. The boiler is precisely operated using rated output and the chimney sweeper can carry out its test measurements. The boiler usually runs high and the chimney sweeper function is only activated instead of the **CONTROL PHASE(4).** This condition is left when deactivation occurs or when the boiler maximum temperature is exceeded or when the maximum chimney sweeping time is exceeded (45min).

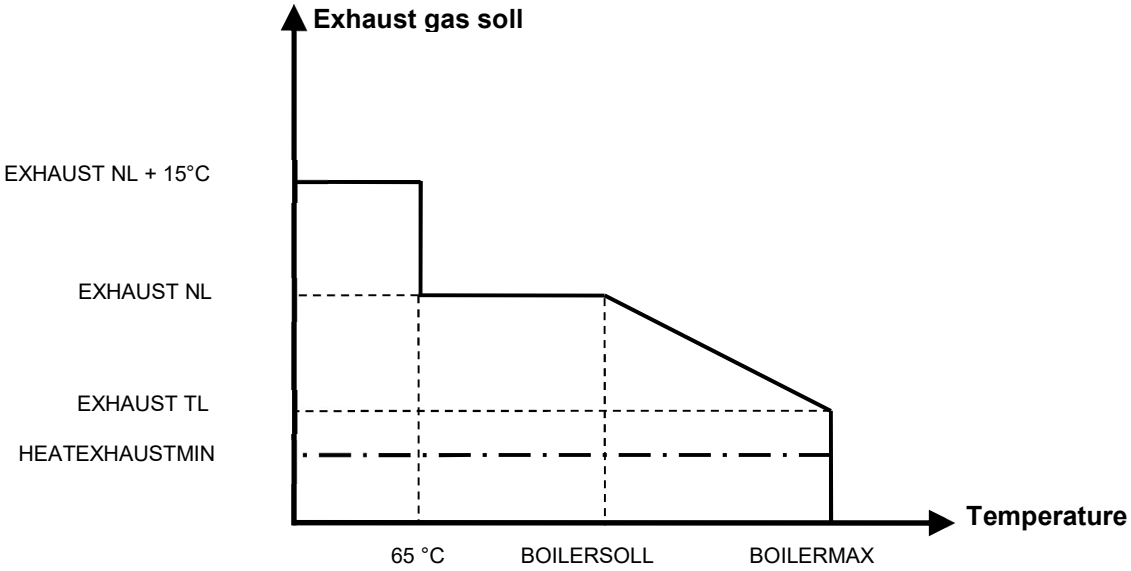
11.1 Exhaust gas temperature control

The flue temperature control begins if the **HEAT UP FROM MIN(P06)** is exceeded. The target temperature modulates between the set values **FLUE NL(P04)** and **FLUE PL(P05).** In the high running phase as well as when re-heating, it will be controlled at an increased flue temperature (**FLUE NL + 15**). The 15°C are a setpoint specification. The actual temperature deviance may be higher.

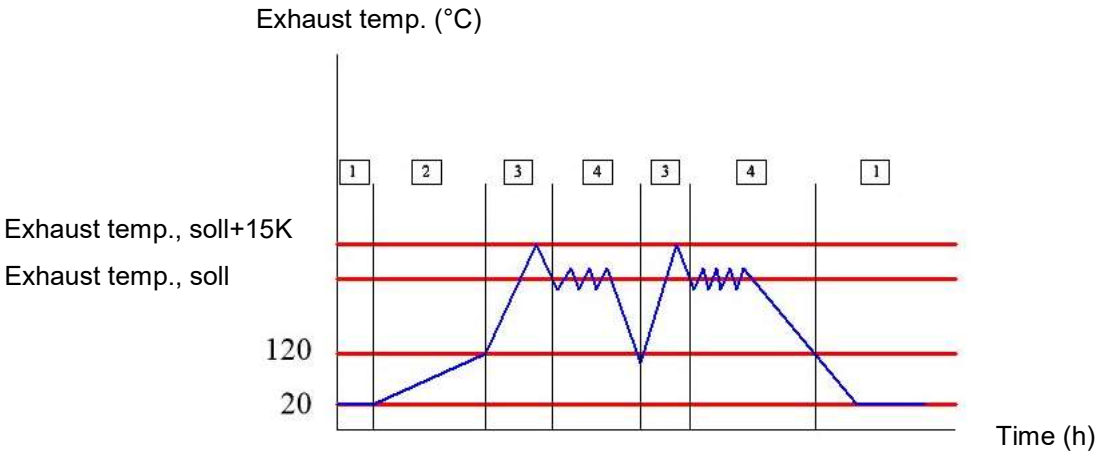
11.2 Lambda control

The primary and secondary air is controlled by a lambda sensor. It is used for combustion optimization and can detect and regulate small fuel deviations.

11.3 Control curve



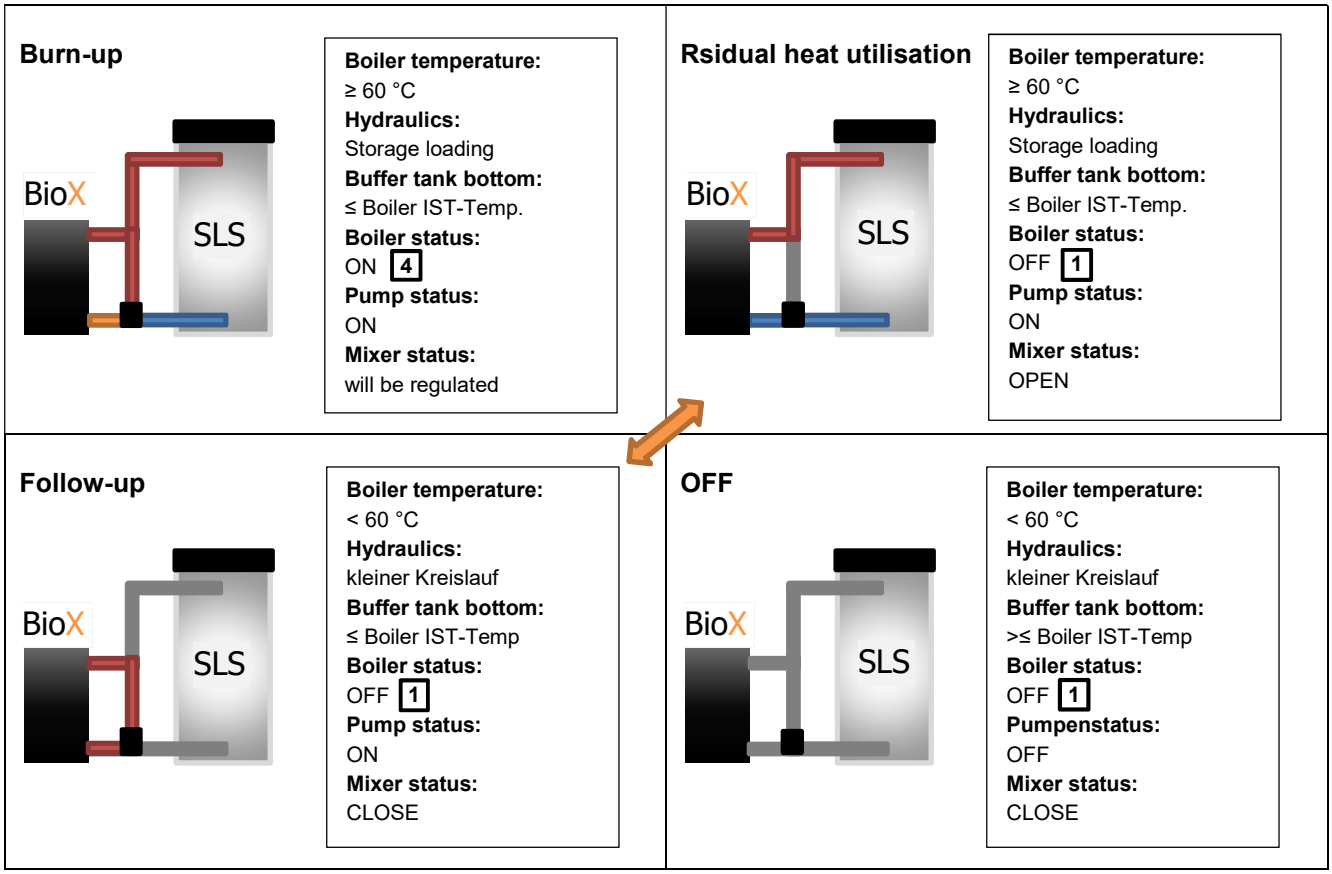
To make it easier to understand, a normal operating sequence of the BioX wood gasifier is shown and divided into the individual control phases.



11.4 Residual heat utilisation

When the boiler has burnt down completely and there is only coal left in the combustion chamber, the BioX wood log boiler automatically switches to boiler status 1 (system off). Now the function of residual heat utilisation begins, which absorbs the energy still contained in the charcoal and transports it to the storage tank.

If the boiler temperature drops below the actual value of the upper buffer tank sensor during residual heat utilization, the system switches to overrun and the tank is no longer loaded. It is possible, however, that the temperature will rise slightly over time and thus switch back to residual heat utilisation. The minimum running time of the circulation pump at the start of residual heat utilisation and in the run-on phase is 15 minutes.



12 DESCRIPTION OF MENU NAVIGATION AND SETTING VALUES

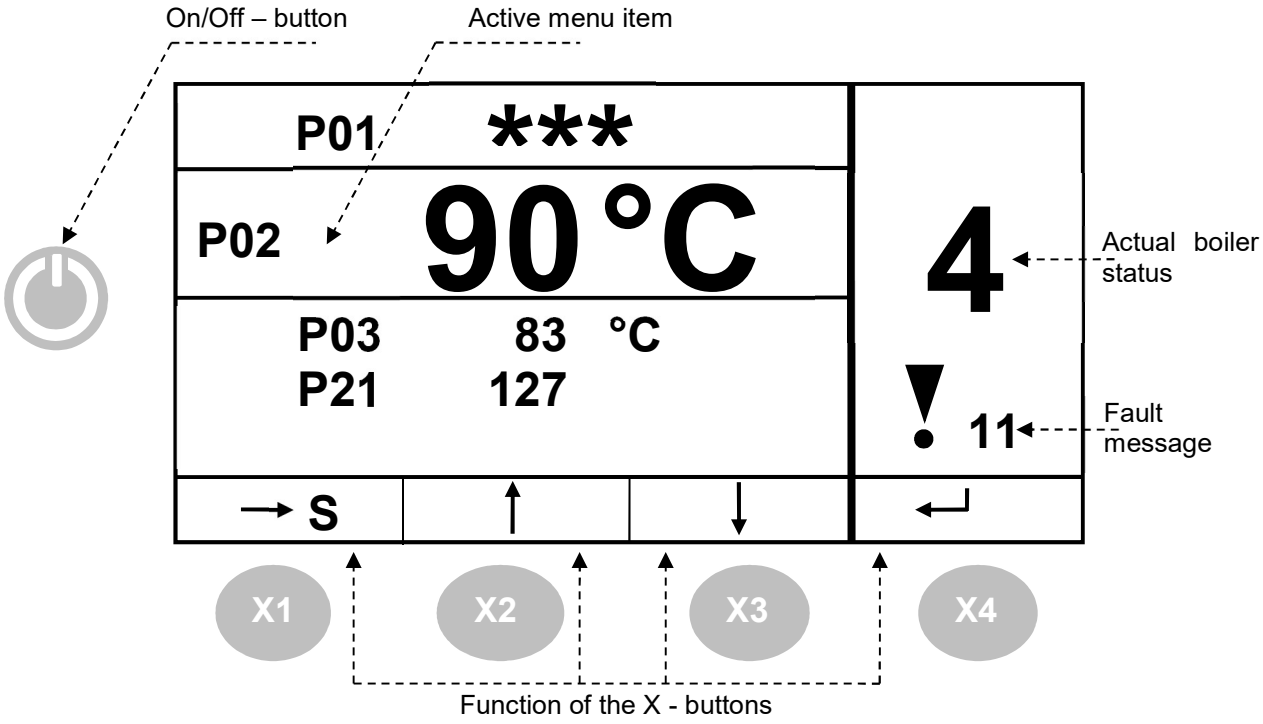
12.1 Main menu

12.1.1 Structure

The structure of the display consists of the menu (parameters, status, unit test inputs and unit test outputs), the boiler status and the error messages.

This page is automatically loaded after you have switched on the system with the main switch (on the back). From here you can easily navigate through the settings.

12.1.2 Display



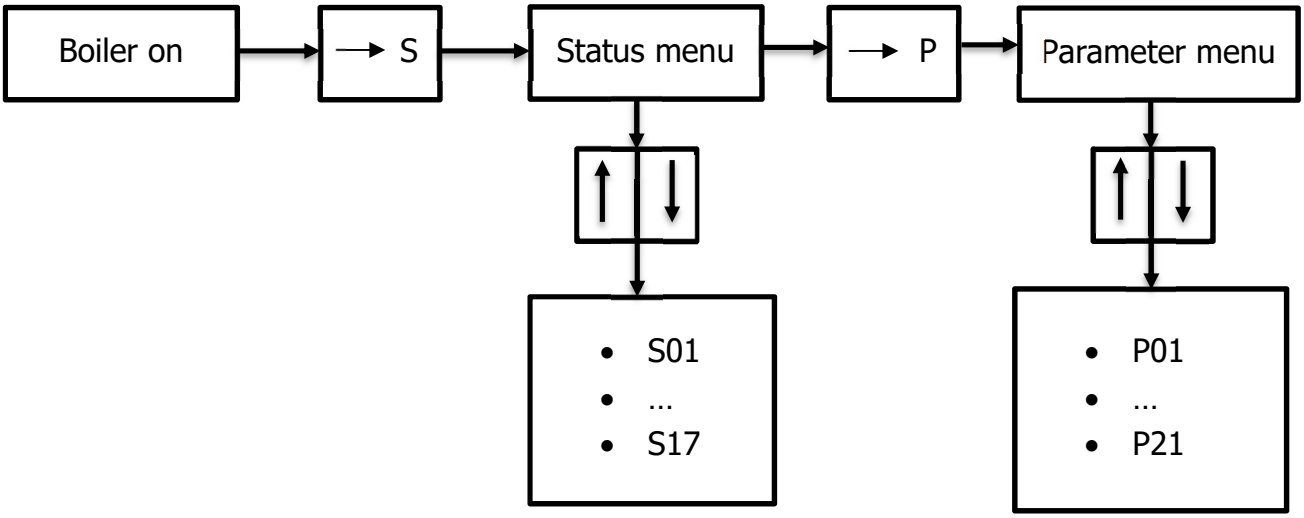
Boiler status:

1 … Unit Off
2 … Burning phase
3 … High running phase
4 … Control phase
5 … Ready
6 … New start-up
7 … Re-heating
8 … Chimney sweeper

By pressing the button:

„On/Off“:	Press and hold: the system is switched on or off. Press shortly: the error check is carried out.
„X1“:	Changes to the displayed menu / confirm change
„X2“:	Scroll up / increase value
„X3“:	Scroll down / decrease value
„X4“:	"ENTER" - button / Cancel change / When the " ⊥ " symbol is displayed, the status changes to chimney sweep mode

12.2 Customer level



Status menu (S)

S01	BOILER TEMPERATURE Display of boiler temperature in °C
S02	RETURN FLOW TEMPERATURE Display of return flow temperature in °C
S03	BUFFER-TOP-TEMPERATURE Display of the actual top buffer temperature in °C
S04	BUFFER-BOTTOM-TEMPERATURE Display of the actual bottom buffer temperature in °C
S05	EXHAUST GAS TEMPERATURE Display of exhaust gas temperature in °C
S12	RETURN PUMP Display of the status of the return pump
S13	RETURN MIXER OPEN Display of the RL mixer status
S14	RETURN MIXER CLOSE Display of the RL mixer status
S17	Sum fault / alarm

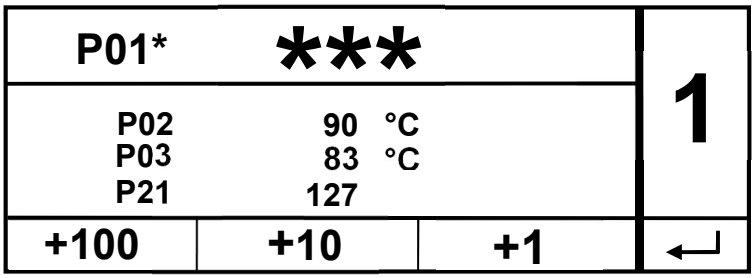
Parameter menu (P)

P01	CODE: code input
P02	BOILERMAX: Temperature for control end (system goes into READY state)
P03	BOILERSOLL Temperature for control start
P21	CONTRAST SETTING

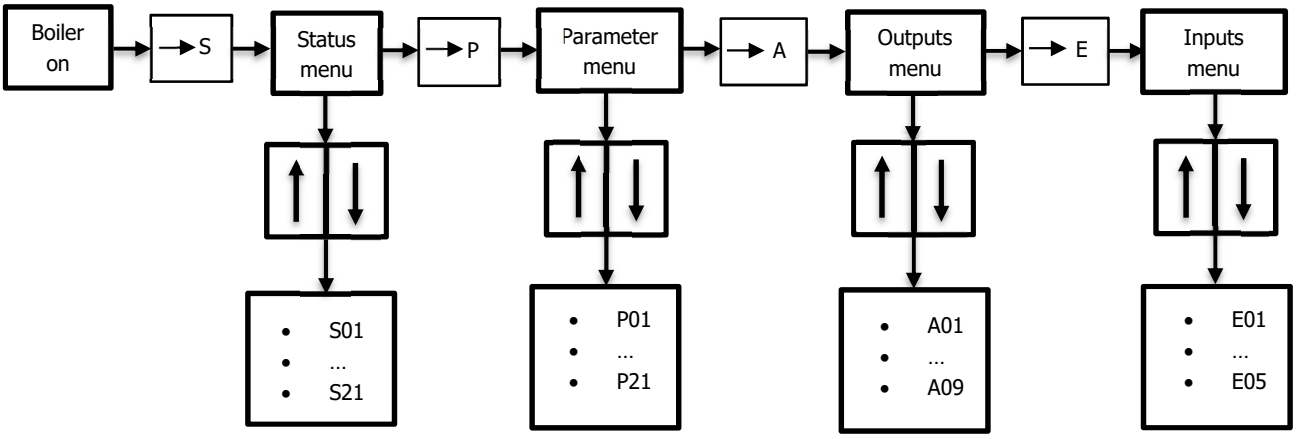
12.3 Specialist level (111)

Code i (P01):

The keys X1, X2 and X3 stand respectively for the 100s digit, 10s digit and 1s digit!
Code of the specialist level = **111**
For the start-up, the outputs (A) must be checked. For this purpose, the boiler **MUST** be in status **1 (Off)** (see p.56)! Code level resets automatically after a few minutes!



Specialist level



Statusmenü (S)

S1	Boiler temperature	S8	O_2-actual value	S15	Heat exchanger cleaning (WTR)
S2	Return flow temperautre	S9	Lambda heating	S16	WTR-monitoring
S3	Buffer-top	S10	Primary air	S17	Sum error
S4	Buffer-bottom	S11	Secundary air	S18	Hardware-Version HZS621
S5	Exhaust gas temperautre	S12	Return pump	S19	Software-Version HZS621
S6	Fan power	S13	Return mixer open	S20	Hardware-Version HZS631
S7	Fan rotation speed	S14	Return mixer close	S21	Software-Version HZS631

Parametermenü (P)

P01	Code input	P03	Boiler temp. setting **(83°C)**	P07	Max. new start-up time **(10min)**
P02	Boiler temp. max **(90°C)**	P06	Igniter detection **(120°C)**	P21	Contrast display **(127)**

Ausgänge - Aggregattest (A)

A01	Return pump(O/X)	A04	Fan power (%)	A07	Secundary air(%)
A02	Return mixer-open* (O/X)	A05	Lambda heating	A08	Heat exchanger cleaning(WTR)
A03	Return mixer-close* (O/X)	A06	Primary air (%)	A09	Sum error

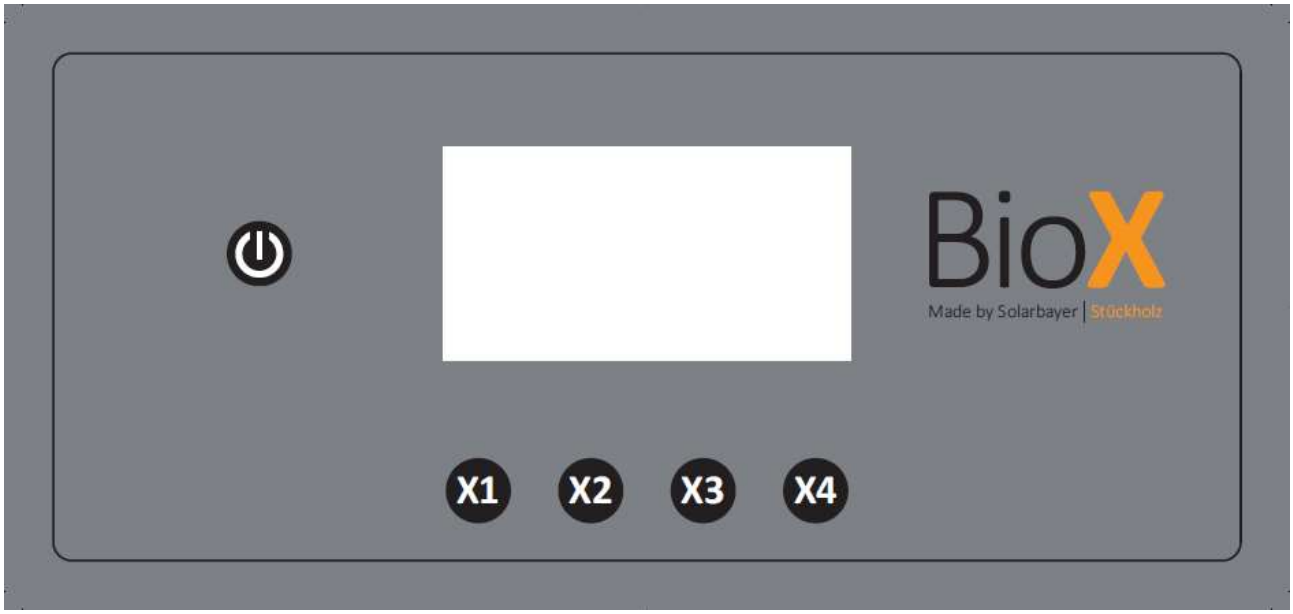
* To test the return mixer, the signals (0/X) must always be controlled in the opposite direction!

Eingänge (E)

E01	STL	E03	Fan rotation speed	E06	WTR-monitoring
E02	Door contact	E05	O_2-actual valve		

13 ELECTRICAL DOCUMENTATION

13.1 Control wood log boiler BioX



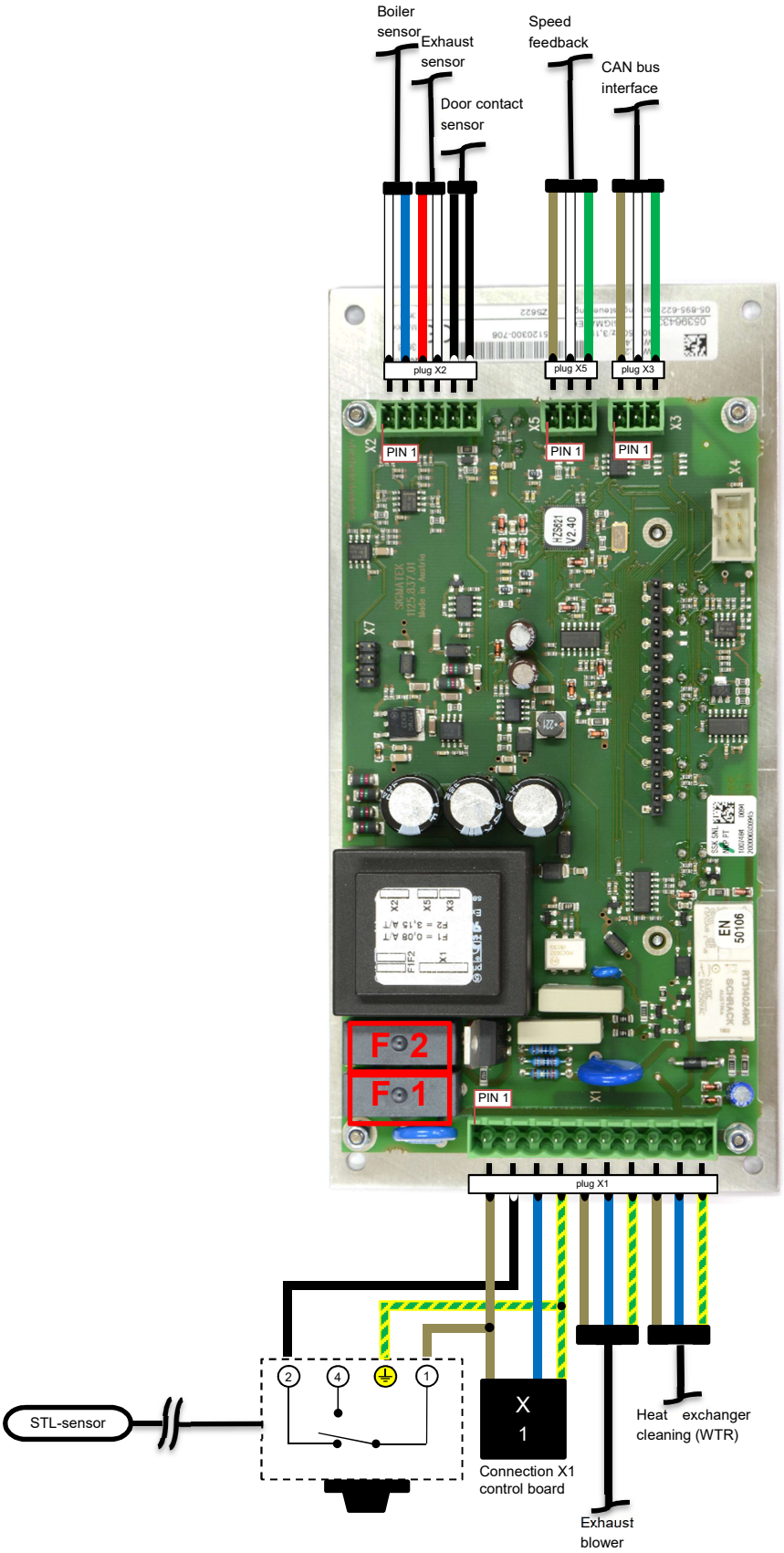
13.2 System description

The control unit is a simple, intelligent controller for visualizing and controlling automated processes in the BioX wood log boiler heating system. The heating controller can be used to read in temperature values, process digital inputs and control motors via phase control or relay output.

A keyboard with 5 buttons serves for the input of process data and parameters. The output takes place on a 128x64 pixel display.

All interfaces and connections for controlling the burner boiler are located on the back of the control unit. They are adapted to the requirements of the boiler.

Display board



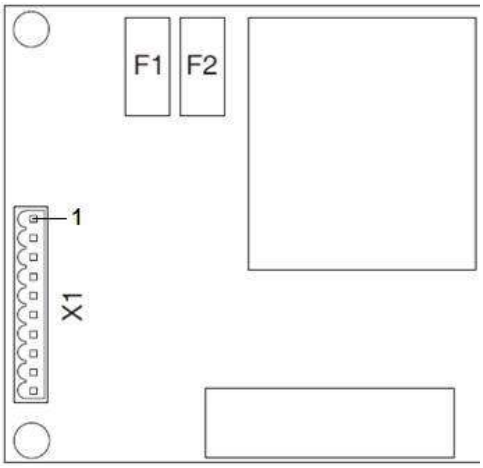
X1 – 230 V AC – Power line – Phönix RM 5,08		
Pin	**Signal**	**Function**
1	L_{IN}	Mains voltage
2	L_{STL}	Mains voltage STL
3	N	Neutral line
4	PE	Ground conductor
5	$L_{exhaust\ blower}$	Mains voltage exhaust blower
6	N	Neutral line
7	PE	Ground conductor
8	L_{WTR}	Mains voltage WTR
9	N	Neutral line
10	PE	Ground conductor
X2 – Digital und analog inputs – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	AI1	Analog input boiler temperature
2	AGND	AGND
3	AI2	Analog input exhaust gas temperature
4	AGND	AGND
5	+24V	+24V supply voltage
6	DI1	Digital input: filling chamber door
X3 – CAN-Bus: Interface to modules – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	–	CAN A
2	–	CAN B
3	–	GND
X5 – Digital input: speed feedback – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	+24V	Supply voltage +24V DC digital input
2	DI1	Counter input: speed feedback
3	GND	GND

Fuses

A fuse change may only be carried out by trained specialist personnel with the 230 V AC supply disconnected. The applicable safety regulations and rules must be observed!

The power supply for the electronics is protected by fine-wire fuses.

To change a fuse, please observe the following overview with the arrangement of the fuses on the power unit:



Fuses	Value	Description	Configuration
F1	0,08 A/T	–	Back-up fuse transformer (electronics)
F2	3,15 A/T	–	Fuse protection for 230 V supply according to STL for relay (heat exchanger cleaning) and phase angle control (exhaust blower)

[see picture p. 53]

In addition, self-resetting PTC fuses are used:

Fuses	Value	Description	Configuration
F3	0,12 A	+24 V-1	+24 V output for digital inputs: DI0 X2 for filling chamber door DI1 X5 for speed feedback

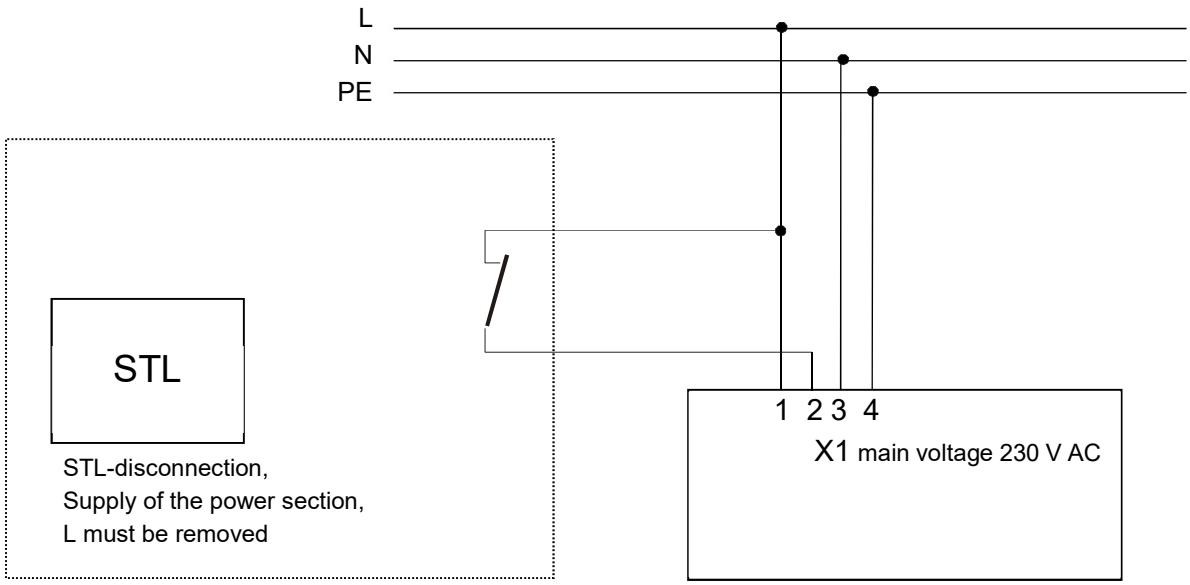
These PTC fuses are service-free and may only be replaced by trained specialist personnel!

The PTC fuse remains high-impedance as long as overload current is present. The PTC fuse thus protects continuously until the fault is eliminated or the current is switched off.

When resetting itself, the resistance of the PTC fuse quickly returns to its initial value.

STL – disconnection

The STL switch-off must be wired externally!



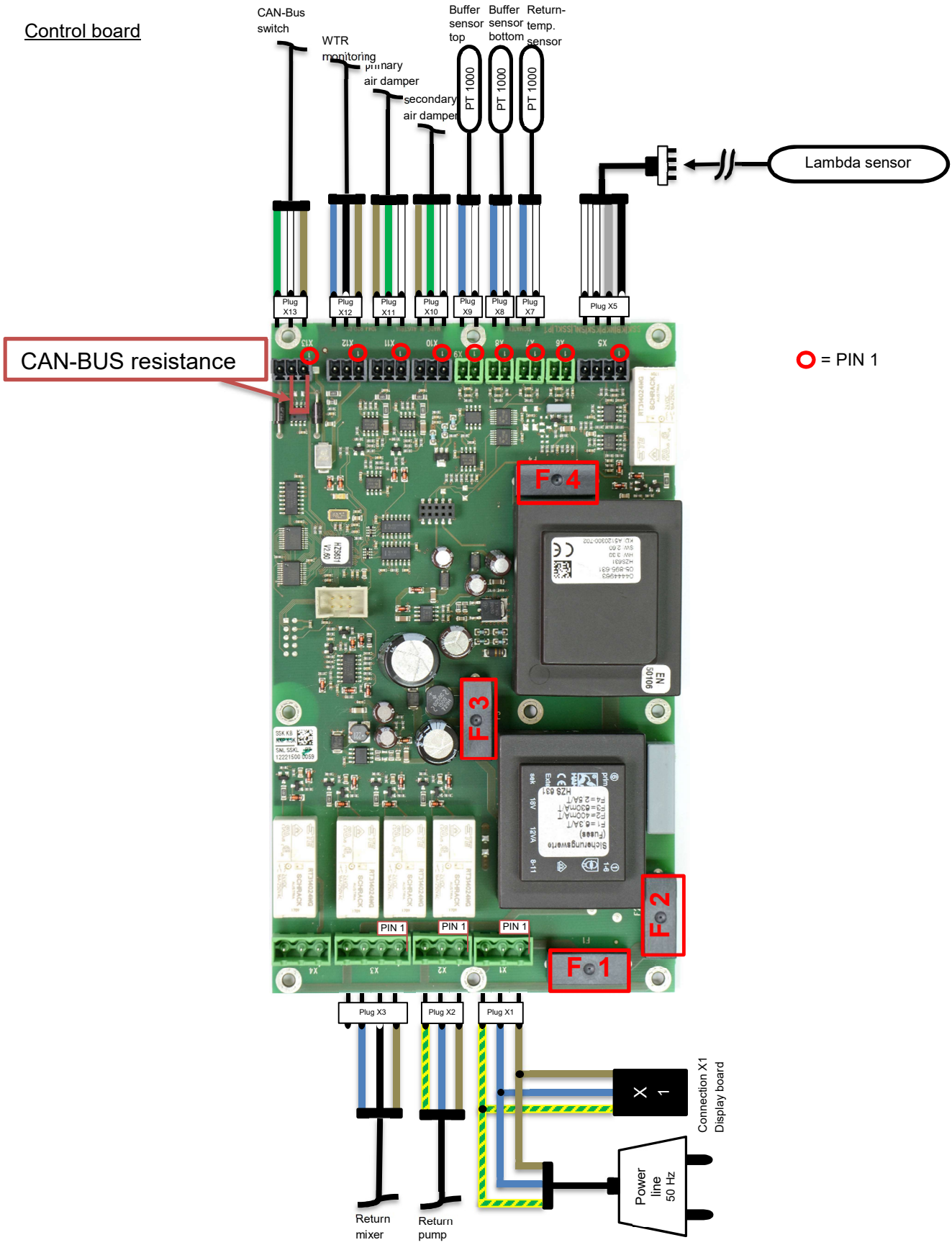
If the STL switch-off responds, then all 230 V AC outputs of the expansion board are no longer supplied:

- Phase angle control: exhaust blower
- Relay output 230 V AC: Heat exchanger cleaning (WTR)

13.3 Connection diagram control board

X1 – 230 V AC – Power line – Phönix RM 5,08		
Pin	**Signal**	**Function**
1	**L**	Mains voltage
2	N	Neutral line
3	PE	Ground conductor
X2 – 230 V AC Relay output return pump – Phönix RM 5,08		
Pin	**Signal**	**Function**
1	L-RO01	Mains voltage return pump
2	N	Neutral line
3	PE	Ground conductor
X3 – 230 V AC Relay output return flow mixer – Phönix RM 5,08		
Pin	**Signal**	**Function**
1	L-RO02	Mains voltage return mixer OPEN
2	L-RO03	Mains voltage return mixer CLOSE
3	N	Neutral line
4	PE	Ground conductor
X5 – Analog input lambda sensor – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	AI5+	Lambda sensor +
2	AI5–	Lambda sensor –
3	12 V AC1	Sensor heating 12 V AC shifted
4	12 V AC2	Sensor heating 12 V AC
X7 – Analog input return flow temperature – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	AI02	Return flow temperature
2	AGND	AGND
X8 – Analog input buffer bottom temperature – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	AI01	Buffer bottom temperature
2	AGND	AGND
X9 – Analogue input buffer top temperature – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	AI00	Buffer top temperature
2	AGND	AGND
X10 – 230 V Analog output secondary air damper – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	+24 V	+24 V
2	AO2	secondary air damper
3	GND	GND
X11 – 230 V Analog output primary air damper – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	+24 V	+24 V
2	AO1	primary air damper
3	GND	GND

Control board



X12 – +24 V DC Digital input with +24 V-supply voltage – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	+24 V	+24 V
2	DI01	WTR – monitoring
3	GND	GND
X13 – CAN-Bus switch – Phönix RM 3,5		
Pin	**Signal**	**Function**
1	CAN_A	CAN-Signal Low
2	CAN_B	CAN-Signal High
3	GND	GND

Fuses (made of ceramic)

A fuse change may only be carried out by trained specialist personnel with the 230 V AC supply disconnected! The applicable safety regulations and rules must be observed!

The power supply unit for supplying the electronics and all 230 V AC circuits are protected by fine-wire fuses.

To change a fuse, please observe the following overview:

Fuses	Value	Description	Configuration
F1	6,3 A T	–	Protection 230 V AC: Return pump, Return mixer OPEN/CLOSE
F2	400 mA T	–	Protection 230 V: Transformer primary side
F3	630 mA T	–	Protection 18 V AC: internal electronics (transformer secondary side)
F4	2,5 A T	–	Protection 12 V AC: Heating lambda sensor

[see picture p. 58]

PTC – Fuses

In addition, self-resetting PTC fuses are used:

Fuses	Value	Description	Configuration		
F10	0,5 A	+24 V 2	+24 V- Output for digital outputs and analog inputs:		
			DI1	X12	WTR-monitoring
			AO1	X11	primary air damper
			AO2	X10	secondary air damper

These PTC fuses are service-free and may only be replaced by trained specialist personnel!

The PTC fuse remains high-impedance as long as overcurrent is present. The PTC fuse thus protects continuously until the fault is eliminated or the current is switched off.

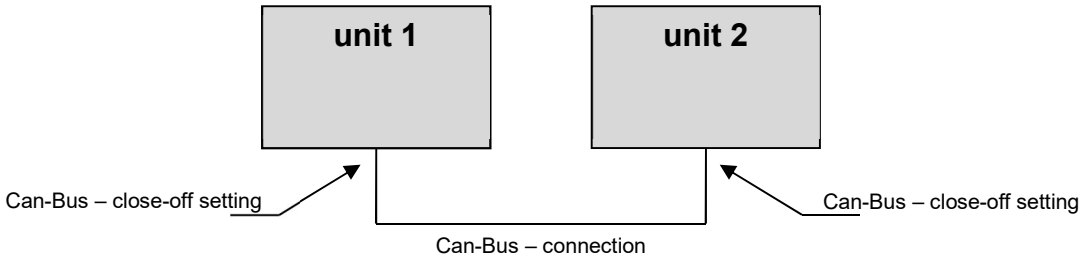
When resetting itself, the resistance of the PTC fuse quickly returns to its initial value.

13.4 CAN-Bus-Setup

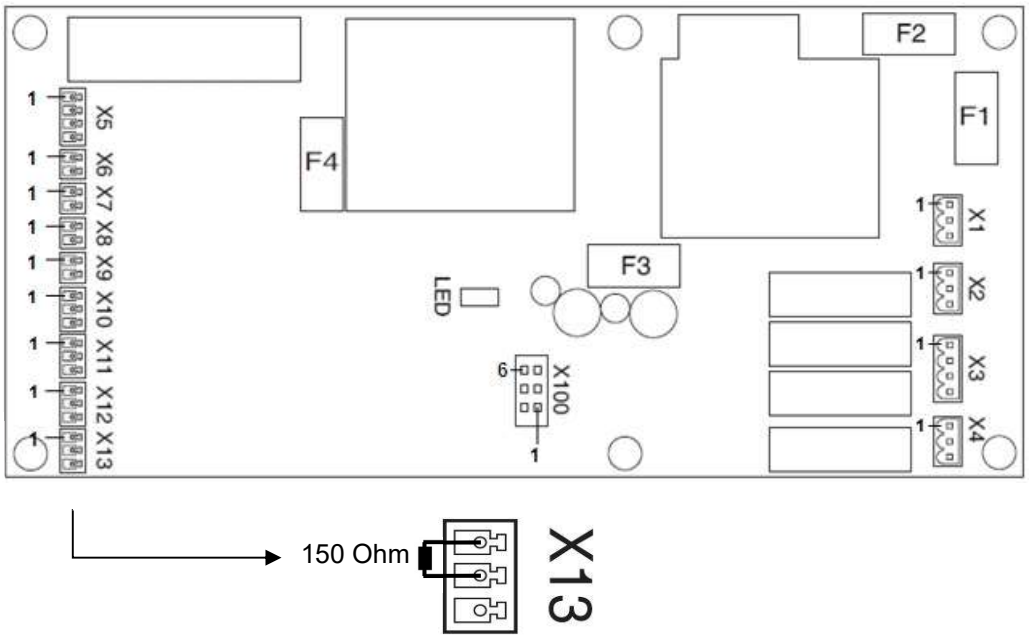
This section explains how to configure the CAN bus correctly.

CAN-Bus-closing-off

At both terminals in a CAN bus system a line termination must be made. This is necessary to prevent transmission errors due to reflections on the line.



The cable must be terminated at connector X13 with a 150 Ω resistor (X13 with termination resistor included in scope of delivery).



13.5 Wiring instructions

The signals that can be captured by the analog inputs are very small compared to the digital signals. In order to guarantee perfect functioning, it is essential to observe careful cable routing:

- The connecting lines to the analog signal sources must be wired as short as possible and without parallel routing to digital signal lines.
- The signal lines must be shielded.
- 230 V AC lines (mains line and relay outputs etc.) must not be installed parallel to analog and digital input lines.

Wiring instructions Digital Inputs

The input filters used eliminate interference pulses. In addition, careful wiring is recommended in order to guarantee perfect operation.

The following **guidelines** must be observed:

- Eliminate parallelism of input lines with load circuits or AC lines.
- Correct grounding

General information about the relay outputs

All relay coils are supplied by the internally generated +24 V DC. The conductor cross section of the relay outputs is designed for the maximum continuous loads according to the specifications of the relay outputs for the loads listed at 230 V AC. It should be noted that thermal loads act on the conductor lines at higher currents and this can lead to their destruction in the event of permanent overload! Higher voltages can lead to leakage currents or flashovers between the different potentials!

In order to guarantee correct functioning, it is essential to observe careful cable routing.

Eliminate parallelism of load circuits with input lines.

Wiring instructions for analog input

The signals that can be captured by the analog input are very small compared to the digital signals. In order to guarantee correct functioning, it is essential to observe careful cable routing.

- The connecting lines to the analog signal sources must be as short as possible and must be routed to digital signal lines or alternating current lines, without parallel routing.
- The signal lines should be shielded with 2 poles.

Temperature measurement with thermocouples

Temperature measurement with thermocouples is based on the temperature-dependent voltage that occurs at each connection of two conductors made of different metals (alloys) (Seebeck effect).

13.6 Connections

All plugs are arranged at the edge of the printed circuit board of the heating control. It must be ensured that the connection cables or the connection wiring are provided with a strain relief. When connecting the controller, make sure that the connection terminals are plugged into the correct pin strip!

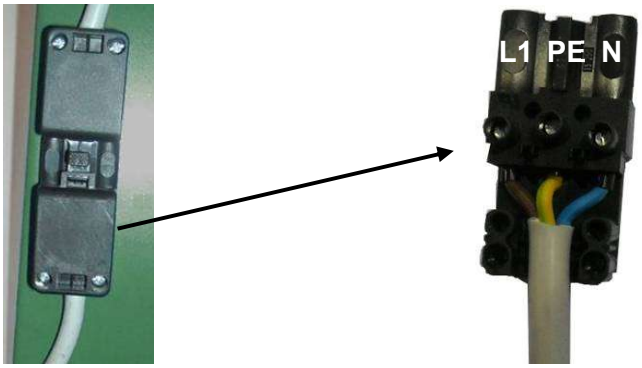
The control must be installed in a boiler under a cover which can only be opened with a tool. The cover may only be opened and the cables connected by trained specialist personnel with the 230 V AC supply disconnected! The applicable safety regulations and rules must be observed!

Do not carry out wiring under mains voltage! Only after the complete wiring has been carried out may the X1 connector plug (230 V AC mains supply cable) be plugged in.

Do not plug connections under voltage!

Electrical connection

The mains supply must be carried out in accordance with the latest electrical regulations of the respective country, whereby at least 1.5 mm² of cable cross-section must be used. Connection is made to the boiler using the mains plug supplied.

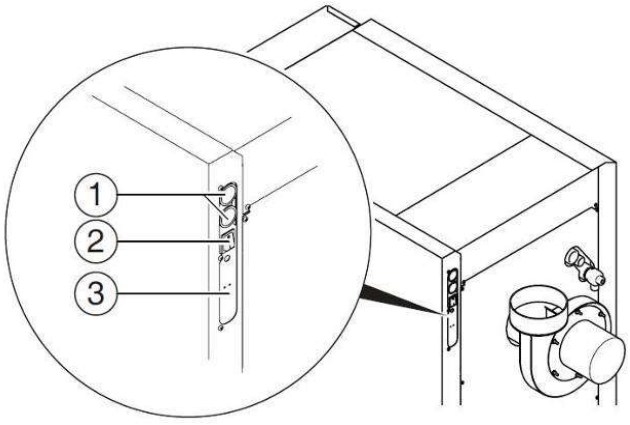


Connector on the boiler Connector and connection

Mains connection:

L1 … Mains voltage L1 PE … Ground conductor N … Neutral line

Main switch on the boiler



1 … Cable bushing 2 … Main switch 3 … Mains connection

14 EMISSION MEASURMENT

Boiler and system damage due to inadequate heat transfer.

Insufficient heat transfer leads to shutdown of the exhaust blower, to release of the thermal drain safety device and possibly to boiler damage.

- Provide a sufficient heat transfer during boiler operation for emission measurement.

14.1 Measurement notes

The emission measurement, below referred to as measurement, has to be carried out with clean, unpolluted and dry logs. The fuel must conform to the properties specified in the documents (length, size, wetness, etc.). The combustion process must not be disturbed during the measurement.

Disturbances in the combustion process are:

- Dirty (e.g. treated, painted, with earth deposits) or wet firewood
- Open the boiler doors
- Stoking the fuel
- Switch off the exhaust blower

The failures mentioned are reflected in the measurement result, falsify it and possibly lead to the loss of the operating licence. We recommend cleaning the boiler thoroughly 1 to 3 days in advance.

14.2 Preparing the measurment

The measurement must be carried out at a measurement port in a straight exhaust pipe. The distance from the exhaust gas connection to the measurement port must be twice the exhaust gas pipe diameter. Bends and deflections in the exhaust pipe between the exhaust connection and the measurement port falsify the measurement result.

The following conditions must be observed for emission measurement:

- enough combustion air
- enough suitable fuel
- enough heat transfer

14.3 Creating a measurement condition (continuous operating state)

- Heat the boiler following the instructions.
- Create an glowing bed with a sufficient amount of wood (approx. ¼ edition).
- Burn off the fuel support.
- Check that the operating conditions are observed:
  - Minimum return temperature 65 °C
  - Chimney draft is permanently within the allowed range
  - The draft control valve is set to the correct value according to the installation instructions
  - The exhaust gas temperature is inside the allowed range
- Fill the boiler with the maximum allowed amount of fuel according to the instructions.
- Wait at least 5 minutes until the combustion process has built up and the steady state described below has been reached:
  - Buffer loading pump is permanently in operation (switch-on temperature)
  - Permanent boiler temperature of at least 80 °C
  - Exhaust gas temperature is within the allowed range.

14.4 Performing a measurment

The measurement must be carried out in the core flow of the exhaust gas for 15 minutes during undisturbed continuous operation. The measurement must be carried out with a measuring instrument that can calculate an average value from the measurement process. Alternatively, an estimate can be made. For this purpose, 15 continuous one-minute measurements must be carried out, from which an average value is then calculated.

The exhaust gas temperature displayed on the boiler controller does not have to match that at the measuring port. Since the exhaust gas temperature for boiler control is often measured at a different location, the temperatures displayed may vary considerably.

15 FAULT REPORTS AND THEIR ELIMINATION

Always observe the safety instructions!

In the case of all faults that are detected, the fault must first be rectified and then acknowledged by switching it on again. If several errors appear at the same time, they are displayed in the order in which they happened.

Error message on the display	Sum fault / alarm	Possible reason?	Proposals for repair
Failure 01 *F:Check sum*	X	Check sum isn´t correct	Change control unit
Failure 02 *F: Comparison data HZS 621/622*	X	Comparison data not correct	Change control unit
Failure 03 *F: Comparison data HZS 631*	X	Comparison data not correct	Change control unit
Failure 04 *F:STL*	X	Mains voltage faulty • Safety temperature limiter (STL) has activated	Allow system to cool down and confirm STL
Failure 05 *F:Boiler sensor*	X	Sensor break boiler temperature	Change the boiler sensor
Failure 06 *F:CAN-fault*	X	Fault during transmission via CAN bus	Check CAN connection (wiring)
Failure 07 *F:EEProm*	X	Fault when writing / reading on EEProm	Change control unit
Failure 08 *F:Stack HZS 621/622*	X	Overflow from stack pointer	Change control unit
Failure 09 *F:Stack HZS 631*	X	Overflow from stack pointer	Change control unit
Failure 10 *F:Exhaust temperature*	X	Sensor break exhaust temperature PT1000	Change the exhaust temperature sensor
Failure 11 *F:Lambda calibration*	X	Lambda calibration error lambda value outside defined range	Carry out calibration again or change lambda sensor.
Failure 12 *F:Speed feedback*	X	• Fault in speed monitoring of exhaust blower • Wrong impulse number	Check exhaust blower or speed feedback
Failure 13 *Door contact*		-One door is open - Door contact screws incorrectly adjusted -Door contact switch defective	Only information – NO FAILURE -Close the door - Re-adjust door contact screws -Change the door contact switch
Failure 14 *F:Ready*		Boiler temperature overt Boilermax (90°C) • Boiler loaded with too much wood (faulty operation) • Return pump or return mixer defective • Buffer storage too small designed	• Insert less wood • Change the return pump or return mixer. • Increase buffer volume
Failure 15 *F:Lambda sensor*	X	Lambda sensor is defective or disconnected	Change the lambda sensor or check the clamping.
Failure 16: *F:Return flow sensor*	X	Sensor break return flow temperature	Change return flow temperature sensor

Error message on the display	Sum fault / alarm	Possible reason?	Proposals for repair
Failure 17 *F:Return flow boost*	X	Return flow setpoint temperature could not be reached in operation	Check RL boost
Failure 18 *F:Buffer top*	X	Sensor break buffer temperature top	Change sensor break buffer temperature top
Failure 19 *F:Buffer bottom*	X	Sensor break buffer temperature bottom	Change sensor break buffer temperature bottom
Failure 21 *F:Heating*	X	The boiler has not reached the exhaust gas temperature level within the specified time when it burns on. • Too rough material used • Too wet wood used • Brennplattenlöcher verstopft	• Kleineres Holz verwenden • Trockenes Holz verwenden • Brennplattenlöcher reinigen
Failure 22 *F:Reheating*	X	Kessel hat beim Nachheizen innerhalb der vorgeschriebenen Zeit die Abgastemperatur-schwelle nicht erreicht • Zu grobes Material verwendet • Zu feuchtes Holz verwendet • Fire plate holes blocked up	• Use smaller wood • Use dry wood • Clean burner plate holes
Failure 23 *F:WTR-monitoring*	X	Fault during WTR monitoring • WTR out of function	• Check the heat exchanger tubes for dirt and possibly manual cleaning (see chapter 10 page 44) • Checking the WTR motor or limit switch
Failure 24 *F:Overtemperature*		Overtemperature! Boiler¬-temperature above BoilerMax • Fuel values set with too high power • BoilerMax set too high • Return pump or return mixer defective	• Correct fuel values • Set down BoilerMax • Change return pump or return mixer
Failure 25 *F:Frost protection*		Frost protection mode	Only information – NO FAILURE
Failure 26 *F:Blocking protection*		Blocking protection mode	Only information – NO FAILURE
Failure 27 *F:Cleaning !!!*		The system has passed 1000 operating hours.	• Clean (clean heat exchanger - see chapter 10 page 44) Acknowledge fault: 1 Boiler must be in the OFF condition (1) 2 Press and hold the ON/OFF button (to start the boiler)

Other fault possibilities	Cause	Remedy
Boiler power too low	The heating value of the fuel used is too low. The wetness of the fuel is higher than 25%.	■ Use specified fuel at specified dampness.
	The operating conditions were not observed.	■ Service call.
	The exhaust receiver or system is not tight.	■ Check test openings and exhaust gas connection and tighten if necessary.
	The boiler power is too small for the application.	■ Service call.
	There is no supply air.	■ Provide enough fresh air. ■ Service call.
	The door seals are defective.	■ Service call.
	The exhaust receiver and the combustion chamber are dirty, so there is hardly any heat transfer.	■ Clean the boiler
	False air intake.	■ Check the tightness of the test openings and doors.
Dust build up on or in the vicinity of the cleaning cover	The cleaning cover is not properly closed or the seals are not tight.	■ Close the cleaning cover correctly. ■ Service call.
Condensate forms excessively in the filling chamber of the boiler.	Excessive boiler output with little heat removal (exhaust blower does not rotate).	■ Use less fuel ■ Correct insufficient heat transfer of the heating system.
	The fuel is wrong or too wet.	■ Use required fuel
	The boiler water temperature is too low.	■ Service call.
Exhaust blower does not rotate or is too loud. **Attention!** A stopped blower leads to incomplete combustion and coal tar deposits.	Only with the fan stopped: The maximum boiler temperature or exhaust gas temperature has been reached.	■ No problem! Boiler works correctly. The exhaust blower starts when the filling chamber door is opened. Too much fuel.
	The blower motor is defective.	■ Service call.
	The door contact switch is in the wrong position or defective.	■ Service call.

Fault reports and their elimination

Other fault possibilities	Cause	Remedy
Short burning time	Incorrect or fuel with too low a heating value (e.g. softwood).	■ Use allowable fuel or hardwood.
	The delivery pressure (chimney draft) is too high.	■ Service call.
Boiler pulse	Too much heating gas that can't be burned and removed.	■ Check fuel dimensions. ■ Service call.
	False air intake	■ Check the tightness of the test openings and doors. ■ If there's a leak, Service call.
Buffer tank charging too long	The boiler power is too small for the application.	■ Service call.
	The hydraulics are faulty.	■ Service call.
	The heating behavior is faulty.	■ Adapt heating behaviour to heat demand.
In the chimney condensate forms too much.	The chimney insulation is insufficient.	■ Service call.
	The exhaust receiver or system is not tight.	■ Check test openings and exhaust gas connection and seal.
cracks in the chimneys	The components contain a certain amount of residual water. (Note: low edge removal, surface removal, crack formation etc. does not lead to any malfunction and therefore does not constitute a warranty claim.)	■ For wide cracks or broken pieces that reach down to the boiler construction: Service call.

16 GUARANTEE / WARRANTY (GENERAL)

SOLARBAYER furnaces are guaranteed for 5 years on the boiler body. In principle, we provide a 2-year warranty for the freedom from defects of movable and immovable purchase objects. Wear parts are excluded from the warranty. The warranty does not apply if the return flow increase is missing or does not function properly, if the unit is not put into operation/maintained by qualified personnel authorised by SOLARBAYER, if it is operated without a buffer storage tank with a heating load of less than 70% of the nominal capacity (manually charged boilers must always be operated with a sufficiently dimensioned buffer storage tank), if hydraulic diagrams not recommended by SOLARBAYER are used, or if the prescribed fuel logs according to DIN EN 14961, Part 5 are not used.

The general terms and conditions of business and delivery of SOLARBAYER GmbH as well as the agreements confirmed with the acceptance of the order shall apply to all transactions.

These can be found at www.solarbayer.de.

Annual maintenance by qualified personnel authorized by SOLARBAYER is a prerequisite for claiming warranty service.

Guarantee work does not extend the general guarantee period. A warranty case does not postpone the due date of our claims. We only provide a guarantee if all our claims for the delivered product have been paid.

The guarantee takes place after our choice by repair of the purchase object or replacement of the defective parts, exchange or price reduction. The exchanged parts or goods shall be returned to us free of charge at our request. The wages and costs incurred for installation and removal shall be borne by the purchaser. This applies in the same way to all guarantee services.

Work carried out by the customer or commissioned by the customer to third parties for maintenance, troubleshooting or the like cannot be charged to SOLARBAYER.

Subject to technical changes without notice.

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17 NOTE

18 WASTE DISPOSAL IN GERMANY

The boiler is marked according to the directives: 2006/42/EC, 2014/30/EU, 20145/35/EU and contains electrical components.

According to the EU regulation 2015/1189 for the implementation of the directive 2009/125/EC with regard to the definition of requirements for the environmentally friendly design of solid fuel boilers, we draw your attention to this fact:

- Your boiler has been dispensed from its obligations under the Ordinance on Waste Electrical Equipment and the Battery Ordinance and can be returned via a return and collection system available to you.

19 EG/EU CONFORMITY DECLARATION

CE

Manufacturer's address: **Solarbayer GmbH**
Preith, Am Dörrenhof 22, 85131 Pollenfeld
Deutschland/ Germany

Designation oft he machine/
Of the product: **Solarbayer BioX**

Machine type: **Wood log boiler**

Type: **BioX 15**
BioX 20
BioX 25
BioX 35
BioX 45

The description of the execution and the intended use are to be found in the order confirmation and the operating instructions in the machine documentation - other agreements are not the basis.

The installation and commissioning of the firing system must be carried out by qualified personnel authorised by Solarbayer. In the event of improper installation or use, connection to other machines or changes to the technical design, this declaration will lose its validity.

We hereby declare that the machine / product described above conforms to the relevant provisions of the following EC/EU Directives. Conformity is proven by complete compliance with the following standards:

EU/EG – Guideline	Norm applied
2014/35/EU low-voltage equipment regulation	EN 60335-1:2012 EN 60335-2-102:2006
2014/30/EU Electromagnetic Compatibility Ordinance	EN 55014-1:2006 EN 61000-3-2:2014 EN 61000-3-3:2013 EN 61000-6-2:2005 EN 61000-6-3:2007
2006/42/EG machine safety regulation	ISO 12100:2010 EN ISO 13849-1:2015
additionally applied standards	EN 303-5:2012 EN ISO 3834-3:2005
	prTRVB 118 H

Authorised representative for the compilation of the technical documentation:

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- Buffer storage technology
- Fresh water systems
- Wood heatings
- Solar heating
- Heat pumps

Technical changes and errors excepted.

The current version of these assembly instructions on our homepage is valid.
www.solarbayer.de