

Installation Manual



Wood-Fired Central Heating Boiler

FHG

Tested &
Listed By  **OTL**
CHUS Portland
Oregon USA
OMNI-Test Laboratories, Inc.
Report #236-O-06-2

TÜV
AUSTRIA

A French language manual may be obtained from Tarm Biomass by calling 800-782-9927 or by email request to: info@tarmusa.com.

Read and follow the operating instructions and safety information! Subject to technical change!

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□ Dear Installer,

The FRÖLING FHG is a state-of-the-art design that conforms to all currently applicable standards and testing guidelines.

Please read and follow the assembly instructions. They contain safety instructions and comprehensive information relating to transporting, setting up and assembling the boiler.

The continuous development of our products means that there may be minor differences between the illustrations and other content of the document. If you discover any errors, please let us know.

We reserve the right make technical changes.

□ Installation Requirements

It is strongly recommended that the installer resist the temptation to simply get started without reading this manual. Hours of time and frustration can be prevented by a simple understanding of this product.

This manual has been written with much care and thought. We want the first time installer to find installation as simple as for the experienced installer. Time spent reading now will save more time in the long run.

The boiler must be installed with a thermal storage system capable of absorbing the complete output of the boiler during periods when the building is not calling for heat. A means for protecting the boiler against cold return temperatures must also be provided.

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1 General information

It is unlawful to carry out modifications to the boiler or to change or deactivate safety equipment.

In addition to the operating instructions and the applicable national and local codes and regulations for installation and operation of the boiler system, all fire, police, and electrical regulations must be observed.

1.1 Installation Hazards

Install, modify and use only in accordance with manufacturer's manuals. Refer to authorities having jurisdiction for proper installation. Contact local building and fire officials about restrictions and installation inspection in your area. If there are no applicable local codes, follow ANSI/NFPA 211 and CAN/CSA B365. Special precautions are required for passing the Chimney through a combustible wall or ceiling.

Inspect and clean exhaust system, Fuel Loading Chamber, Combustion Chamber, Ash-Pits, and Heat Exchanger frequently in accordance with owner's manual.

☐ DANGER!

- ⚠ Working on electrical components may cause severe injuries from electric shocks!

☐ WARNING!

- ⚠ The electrical system of the boiler shall be supplied from a double 115 V 60 Hz (nominal 230 V AC) 15 amp branch circuit including neutral and ground connection. For wiring instructions please refer to Section 3.7 in this Installation Manual!
- ⚠ Chimney must be 6" (150 mm) diameter listed UL-103 HT or ULC-S629 residential all-fuel type or tile-lined masonry. Flue connector pipe must be 6" (150 mm) diameter made of a minimum 24 MSG black steel.
- ⚠ Inadequate design, installation and maintenance of the flue gas system will lead to insufficient chimney draft and could result in Danger of Life or Severe Injury caused by serious faults in combustion, e.g. explosively combustion of wood gases and flash fires!
- ⚠ This boiler requires fresh air for safe operation and must be installed so there are provision for adequate combustion and ventilation air!

☐ CAUTION!

- ⚠ Do not connect this unit to a Chimney flue serving another appliance!
- ⚠ Flooring must be a minimum 3/8" (10 mm) non-combustible material covering the installation clearance area! The floor must be level and reinforced if required. For construction of the floor beneath the boiler please pay attention to weight of boiler, water content and wood fuel according to the Installation Manual!
- ⚠ This boiler is not for use with an automatic stoker
- ⚠ Connect to an existing boiler system in combination with heat storage only!
- ⚠ Use original spare parts only. Installation of non-licensed replacement parts will void the warranty!

1.2 Boiler Installation

This section describes the steps to installing and starting-up the boiler. This section is directed at the **installer**.

1.2.1 Planning

Sizing the Boiler

It is critical to size the boiler properly. A proper up to date heat load calculation is advised. An accurate history of building fuel usage over several years can help to calculate the proper size boiler. Boiler sizing is the responsibility of the installer. Tarm Biomass bears no responsibility for boiler sizing, but can provide sizing input.

Choosing an Installer

Choosing a competent, licensed installer is critical to the successful installation of the boiler. The installer is responsible for all planning, installation, start-up, troubleshooting, owner training, and annual maintenance for the boiler. Some aspects of the system piping, start-up, and operation may differ from normal practice in fossil fuel boiler installation. To be successful, the installer must study this manual, follow conceptual drawings and instructions provided, understand the installation tasks, and contact Tarm Biomass for help when necessary. Tarm Biomass will provide phone assistance at no additional cost to the original boiler owner to assure success in the installation.

Locating the Boiler and Boiler Clearances

The boiler must be installed with the minimum installation clearances to combustible materials outlined on the next page. Clearances may only be reduced by means approved by the regulatory authorities.

- ☞ The boiler is not suitable for outdoor installation. It must be located in a weather-tight, protected space.
- ☞ The boiler must be placed on a level, non-combustible floor, such as a concrete slab on earth.
- ☞ If the boiler is placed near inhabited rooms, so that flue gas can easily penetrate into these rooms, a carbon monoxide alarm must be installed that can give a warning regarding possible escapes of carbon monoxide into the inhabited rooms.

CAUTION

DO NOT INSTALL THIS BOILER IN A MOBILE HOME. There is no safe way this boiler can be installed inside a mobile home.

The boiler must be installed with the minimum installation clearances to combustible materials outlined below. Clearances may only be reduced by means approved by the regulatory authorities.

➞ [Minimum installation clearances see chapter 3.2.2](#)

1.2.2 Approvals and reporting obligations

- ☞ **IMPORTANT:** Install, modify and use only in accordance with manufacturer's installation & operation manuals. Refer to authorities having jurisdiction for proper installation. Contact local building and fire officials about restrictions and installation inspection in your area. If there are no applicable local codes, follow ANSI/NFPA 211 and CAN/CSA B365. Special precautions are required for passing the Chimney through a combustible wall or ceiling. Inspect and clean exhaust system frequently in accordance with Owner's Manual.

1.2.3 Requirements for initial filling and re-filling of heating system

Water quality conditions for initial filling the heating system:

For first filling of heating system water must be clean, pure or purified, odorless and without suspended matter.

Water hardness must not exceed 580 grain/fl.oz. or 300 ppm CaCO_3 ; (300 mg/l), meaning medium hard to soft water.

Concentration of chlorides must not exceed 58 grain/fl.oz. (30 mg/l).

Boiler system water pH should be 8.0-8.6.

If water quality is poor, water treatment additives should be considered.

For re-filling of small amounts, water shall be clean at least.

NOTICE

For swimming pools or spas do not use heating water directly. Proper sized heat exchangers are required! Boiler water is not potable!

- ☞ **IMPORTANT:** For initial filling and re-filling bleed the filling hose before connecting to the heating system to prevent excess air from being introduced to the system.

Use of a suitable antifreeze mix is allowed, but will cause a loss in heat transfer efficiency.

1.2.4 Ventilation of boiler room

During the installation of your boiler provision must be made by the installer to provide a source of combustion air for the boiler. Maintaining this combustion air source is critical for proper operation of your boiler, do not close off, block or otherwise obstruct the combustion air source for your boiler. If you have questions regarding the combustion air source please contact your installer.

Provision for outside combustion air may be necessary to ensure that fuel-burning appliances do not discharge products of combustion into the house. Guidelines to determine the need for additional combustion air may not be adequate for every situation. If in doubt, it is advisable to provide additional air. The Froling FHG, due to its powerful Induced Draft Fan, needs adequate air to make up for the air being pushed up the Chimney, especially during start up before the Chimney is warm. The openings for the combustion air and the exhaust air should be arranged as nearly opposite each other to achieve a good thermal draft effect.

☞ The combustion air must be drawn in directly from outside. The exhaust air must be discharged directly to outside.

Both openings for air intake and exhaust air shall be well protected from any interference caused by environment, as weather, snow, greenery, small animals, etc.

Froling FHG boilers are not suitable for direct connection to outside air. Outside air should be ducted to no closer than 12" (30 cm) from the boiler. A 6" (150 mm) duct should be large enough for all sizes unless the duct run is over 25 feet (7.6 m).

In addition to local codes and regulations a minimum cross section of combustion air and exhaust air shall be 28 sq.in. (180 cm²) each. Account for the reduced cross section area if gratings or fins are used!

☞ **IMPORTANT:** Canada must conform to ANSI/NFPA outside air requirements of 1 sq. inch per 1,000 Btu/hr.

1.2.5 Installing the heating system

The entire heating system has to be designed according relevant national and local codes. The nominal power of the Central Heating Boiler shall be corresponding to the calculated heat demand for all heating appliances connected to the heating system both in summer and winter time.

The heating system must be able to carry all heat produced by the Central Heating Boiler and additional heat source, if applicable. The whole heating system as well as all heating zones have to be hydraulically balanced.

Special arrangements have to be provided for initial filling or re-filling and bleeding of all heating zones. Flow-check valves and zone-valves have to be installed for proper adjustment of water flow rates. All piping must be water and air tight and insulated safely.

For the heating system piping, it is possible to use either copper or iron piping materials. The supply and return water pipe should be insulated to avoid heat loss. Included in chapter "3.6 System plumbing" are conceptual piping diagrams showing the correct layout for a variety of situations. Tarm Biomass can provide additional conceptual plumbing diagrams.

IMPORTANT:

Any plastic or rubber tubing used with a Tarm Biomass boiler must have an oxygen barrier, or boiler corrosion will occur. If radiant tubing without an oxygen barrier is installed, water in the tubing part of the heating system must be separated from the boiler. Separation of system components is typically done by using a heat exchanger. Use of radiant tubing without an oxygen barrier will void the boiler warranty.

All safety devices have to be installed in accordance with relevant national and local codes and regulations and have to ensure that the maximum water temperature and the maximum system pressure are not exceeded. These conditions refer to pressurized heating systems. Related safety devices to be installed are Pressure Relief Valves, a closed and pressurized expansion tank and a proper gravity circuit at least. In addition the Central Heating Boiler is equipped with an Overheat Thermostat.

A circulator (Size and brand to be determined by the installer (not provided)) should be installed as C3 per drawings suggested by Tarm Biomass.

An aquastat (Honeywell L4008B (provided)) must be installed to protect the boiler from overtemperature conditions by energizing a chosen heating zone.

A tankless hot water coil is not available for the Froling FHG boiler.

Tarm Biomass recommends the use of the BLTCONTROL (available through Tarm Biomass) when burning the wood boiler in conjunction with a back up boiler. The BLTCONTROL is a three position control that allows switching between wood only, wood with automatic back up, or back up only, by controlling the operation of the back up auxiliary boiler. BLTCONTROL takes input from a zone relay control and determines, based on thermal storage system temperature, or second stage thermostat reading, whether to pull heat from the thermal storage system or the back up auxiliary boiler. The BLTCONTROL easily integrates the wood boiler and thermal storage system with an existing fossil fuel heating system.

A permanent pressurized domestic water supply must be provided with proper automatic filling and pressure reduction valves.

- The boiler is not suitable for outdoor installation. It must be located in a weather-tight, protected space.

If there is a risk of freezing for parts of the heating system all water within these heating zones has to be frost-proof!

Minimum Return water temperature

If the return water temperature is below the minimum, a part of the heated water output flow shall be mixed in.

A thermostatic mixing valve, set to open at 142°F (61°C), is required to temper return water to prevent cold return water from reaching the boiler. This valve helps prevent boiler corrosion. Tarm Biomass can provide this valve or a loading unit, at an additional cost.

Installing the boiler without proper unit providing a minimum return water temperature (e.g. Termovar loading valve or loading unit) can cause condensation water and fuel residue combine to form an aggressive condensate, leading to damage to the boiler!

- ☞ Minimum return water temperature is 142°F (61°C)

NOTICE

Combination with Thermal Storage System

The Froling FHG boiler is required to be installed with a Thermal Storage System, this system may require periodic maintenance. Please review the periodic maintenance requirements of the thermal storage system with the owner / system operator.

The Froling FHG boiler must be installed with a thermal storage system capable of absorbing the complete output of the boiler during periods when the building is not calling for heat. A means for protecting the boiler against cold return water temperatures must also be provided. Further information on acceptable ways of meeting these warranty requirements is provided in the owner's manual.

The manual and supporting documentation must be retained by the owner/ system operator for reference and future use.

The installer is responsible for familiarizing the owner/ system operator with all aspects of boiler operations, safety procedures, monitoring and cleaning requirements, shut down procedures, and annual maintenance requirements.

1.2.6 Chimney connection / Chimney system

The Chimney is one of the most critical factors in the successful operation of any solid fuel heater, including the Froling FHG boiler. A good Chimney will provide a continuous and dependable draft to pull the exhaust gasses out of the building.

NOTICE:

The boiler must be connected to a 6" (150 mm) diameter Factory-Built Type UL 103 HT (ULC S629 in Canada) approved Chimney or to a tile-lined masonry Chimney. The Chimney must be in good condition. If the boiler is connected to a dirty or inadequate Chimney, it can present a serious fire hazard.

All Chimneys and connections must conform to NFPA standard #211. No other appliance should be connected to this flue unless allowed by the local code authority. Consult your local inspector for Chimney requirements and install the boiler in accordance with all applicable codes. Please review the following diagram before connecting the boiler to the Chimney.

The entire flue gas system is to be designed to prevent possible soot-up, insufficient draft, and condensation.

Chimney must be 6" (150 mm) diameter listed UL-103 HT or ULC-S629 residential all-fuel type or tile-lined masonry. Flue Gas Pipe connection to the chimney must be 6" (150 mm) diameter made of a minimum 24 MSG black steel.

Follow manufacturer's installation instructions for installing and supporting any specific Chimney product.

Flue gas exhaust temperatures can be low enough to cause condensation in Chimneys. Condensation will, over time, damage a masonry Chimney. Accordingly, installation of a stainless steel Chimney liner (made with 316 or AL-294C alloys) inside the Chimney flue is strongly recommended.

At the connection to a factory-built Chimney, a dripless adaptor must be used.

The Chimney draft must be stable and between 0.03" (0.8 mm) water column (8 Pa) and 0.10" (2.5 mm) water column (25 Pa).

If the draft exceeds these amounts, a barometric draft regulator must be installed.

The top of Chimney must be 3 feet (0.9 m) above roof and 2 feet (0.6 m) above any portion of the roof within 10 feet (3.0 m) measured horizontally.

For the Froling FHG 20, 30, 40 and 50 best draft will be provided by a Chimney which has an 6" ID round flue, is 20-30 feet (6 – 9 m) in height and which is located inside the heated structure. The Chimney must be capable of maintaining a breech draft of 0.03" (0.8 mm) water column (8 Pa) during normal boiler operation.

Your Froling FHG gasification boiler is designed to burn efficiently and with virtually clear emissions, but under certain conditions creosote deposits can form in your Chimney. Chimneys that are too large, are poorly insulated, or have bends in the flue passages are especially prone to problems with draft and/or creosote.

Refueling with overly large loads of fuel can cause overheating, which leads to "Slumber" mode showing on the Boiler Control System. Condensation and creosote may increase caused by low flue gas temperature and flow.

Typical flue gas temperatures (at cleaned heat-exchanger) as well as additional flue gas values can be found in table "Basic boiler data for layout of Chimney system" below.

The Flue Gas Pipe connecting the Boiler to the Chimney flue must be black or stainless, have a minimum thickness of 24 gauge, and rise a minimum of ¼" per foot of run toward the Chimney (Fig 3.1). Flue Gas Pipe sections must be attached to one another with a minimum of three sheet metal screws and sealed with high-temp silicone. The Flue Gas Pipe should not contain more than two 90° elbows (45° elbows are preferred over 90° elbows).

The Flue Gas Pipe shall be insulated.

The entire flue gas system - the Chimney, the Flue Gas Pipe and connection pieces – must fulfill at least following conditions:

- Minimum draft at Flue Gas Pipe
- Minimum temperature at Chimney thimble, if Chimney system is non-condensing (not moisture / condensation proof) both at rated and partial load.

MASONRY CHIMNEYS: Masonry Chimneys must be lined, either with code-approved masonry or pre-cast refractory tiles, stainless steel pipe, or poured in place liner. Do not use an unlined Chimney.

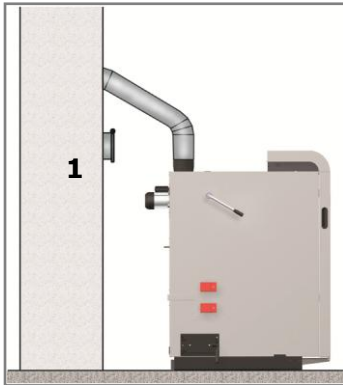
FACTORY BUILT CHIMNEYS: Factory built Chimneys must be tested and listed for use with solid fuel burning appliances to the High Temperature (HT) Standard (2100°F(1150°C)), UL 103, for the United States and High Temperature (650°C) Standard ULCS-629 for Canada. Factory-Built Chimneys must be installed as per the manufacturer's instructions.

Strong winds blowing across the top of a Chimney or a Chimney which has a particularly strong natural draft can cause the Froling FHG boiler to continue heating when the Induced Draft Fan is off. This is an unlikely scenario, as the blower on a Froling FHG, used with a thermal storage

system, should rarely be off while a fire is present. If however, an irregular or excessively high draft presents problems, the solution is the use of a barometric draft regulator.

Installation requirements for a barometric damper (draft regulator).

- The diameter of the draft regulator must be equal or greater than that of the Chimney connector.
- The draft regulator should be installed as close as possible to the boiler, on the Chimney connection or on Chimney itself.
- The draft regulator adjustment should be made with a vacuum gauge, if possible, with the boiler operating at full output. If the start-up is made in warm weather, a readjustment may be necessary in cold weather.
- If, at the maximum adjustment (maximum opening of the shutter of the draft stabilizer), the draft is always higher than 0.10" (2.5 mm) water column (25 Pa), a second draft regulator may be required.
- Recommended draft regulator location is shown (position 1).



The installation of a draft regulator as well as a blowback flap is strongly recommended!

Nevertheless applicable federal and local codes have to be fulfilled!

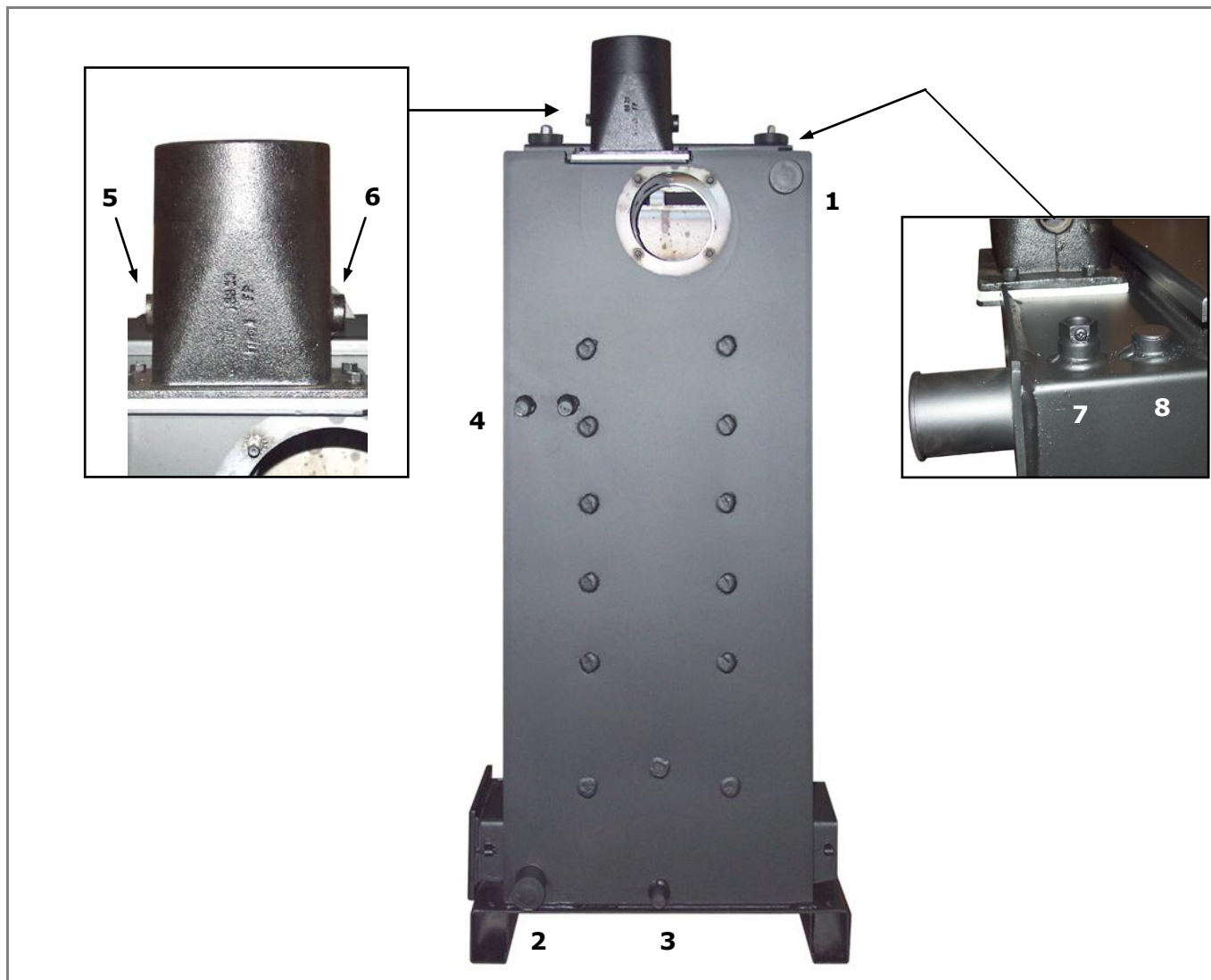
Avoid 90 degree angled connections to the boiler flue collar. If the chimney connection is mostly horizontal a cleanout tee is recommended for ash removal

Basic boiler data for layout of Chimney system

Quantity	Unit	FHG			
		20	30	40	50
Flue gas temperature	°C	150 / 100	170 / 110	150 / 100	170 / 110
Rated / partial load	°F	300 / 200	340 / 230	300 / 200	340 / 230
Flue gas mass flow	kg / h	50 / 29	76 / 43	97 / 54	122 / 65
Rated / partial load	lb / h	111 / 64	167 / 95	214 / 119	270 / 143
Minimum draft at Boilers flue gas connection	Pa inches water column	8 0.03	8 0.03	8 0.03	8 0.03
Maximum draft at Boilers flue gas connection	Pa inches water column	25 0.10	25 0.10	25 0.10	25 0.10
Flue gas connector	mm Inches	150 6	150 6	150 6	150 6

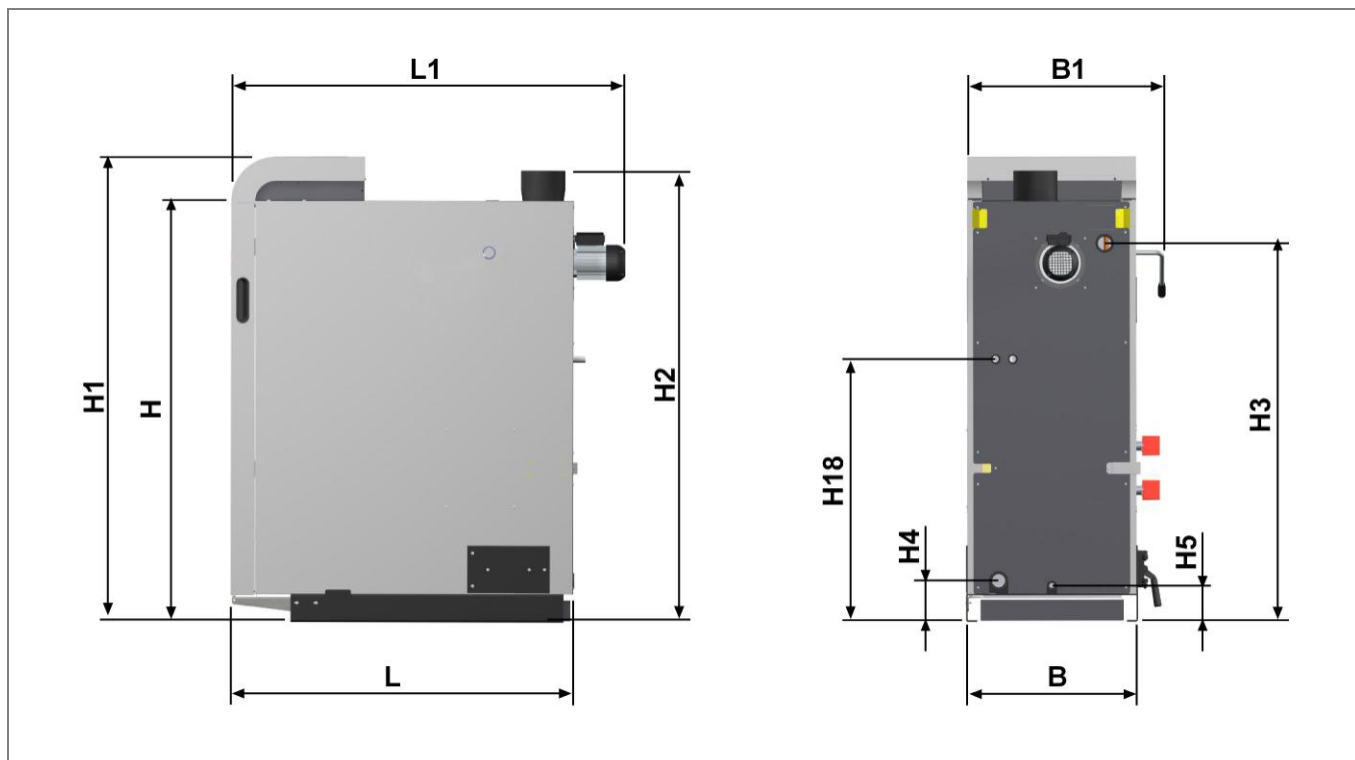
2 Technical data

2.1 Components and connections



Item	Description	Unit	Value
1	Boiler supply connection	inches	1.50
2	Boiler return connection		1.50
3	Connection for filling/drainage cock		0.50
4	2 x safety heat-exchanger connection sleeves for thermal discharge safety device (Not used in North America)		0.50
5	Flue gas sensor connector		0.50
6	Lambda probe connector		0.75
7	Immersion sleeve for boiler sensor and sensor for safety temperature limiter		0.50
8	Connection sleeve for thermal discharge safety device sensor		0.50
9	Flue gas connector		6.00

2.2 Dimensions



Item	Description	Unit	20/30	40/50
H	Total Height of Boiler	inches	56	60
H1	Total Height of Boiler including the Controller		61.75	65.75
H2	Height of Flue Gas Pipe Connection		60.25	64
H3	Height of Supply Feed Connection		50.25	54
H4	Height of Return Feed Connection		5	5
H5	Height of Drain		4.75	4.75
H18	Height of Safety Battery Connection		35	35
B	Total Width of Boiler	inches	22.75	26.75
B1	Total Width of Boiler including the Cleaning Lever		27.50	31.50
L	Total Length of Boiler	inches	45.50	50.25
L1	Total Length of Boiler including the Induced Draft Fan		52.50	56.50

2.3 Specification data

Description	Unit	20	30	40	50
Rated Heat Output	Btu/Hr	70,000	102,500	136,560	170,700
Heating Efficiency Range		35,000 - 70,000	51,250 - 102,500	68,280 - 136,560	85,350 - 170,700
Electrical Connection	V/Hz	240 / 60	240 / 60	240 / 60	240 / 60
Electrical Consumption	W	120	180	180	180
Output Temperature Range	°F	158 - 194	158 - 194	158 - 194	158 - 194
Boiler Weight	Pounds	1150	1150	1345	1345
Fuel Loading Chamber Door	inches	13 x 14.50	13 x 14.50	13 x 14.50	13 x 14.50
Fuel Loading Chamber Capacity	Cu Ft	5	5	7.4	7.4
Wood Length	inches	21	21	21	21
Water Contents	Gallons	32	32	50	50
Upstream Resistance	Psi	0.042	0.094	0.157	0.245
Minimum Return Feed Temperature	°F	131	131	131	131
Maximum Operating Temperature	°F	203	203	203	203
Maximum Operating Pressure	Psi	43.5	43.5	43.5	43.5
Permitted Fuel		Firewood	Firewood/ Coarse Waste-Wood	Firewood/ Coarse Waste-Wood	Firewood/ Coarse Waste-Wood
Boiler Test Pressure	Psi	65	65	65	65
Flue Gas Temperature Rated Load Partial Load	°F	303 203	329 212	311 214	253 223
Minimum Draft Required Rated Load Partial Load	Inch WC	-0.060 -0.028	-0.060 -0.040	-0.072 -0.040	-0.072 -0.040

3 Boiler Installation

3.1 Transport

The boiler comes packed on a pallet.

- ☞ Move the boiler without jarring or jolting
- ☞ Follow the instructions on the packaging when moving the boiler



3.1.1 Positioning

- ☐ Use a fork-lift or similar lifting device to move the pallet and position the boiler or
- ☐ Attach a cable winch or similar lifting device to the eyelet on the boiler and position the boiler

3.1.2 Remove boiler from pallet

At the front of the boiler:

- ☐ Remove securing devices used during transportation on the left and right side of the base.

At the back of the boiler:

- ☐ Remove securing devices used during transportation on the left and right side of the base.

3.1.3 Temporary storage

If the system is to be installed at a later date:

- ☐ Store the boiler, insulation and control unit in a safe, dust-free, and dry location
 - ☞ Moisture and frost reduce the effectiveness of insulation and can destroy electronic components.

3.2 Setting up in the boiler room

3.2.1 Moving the boiler in the boiler room

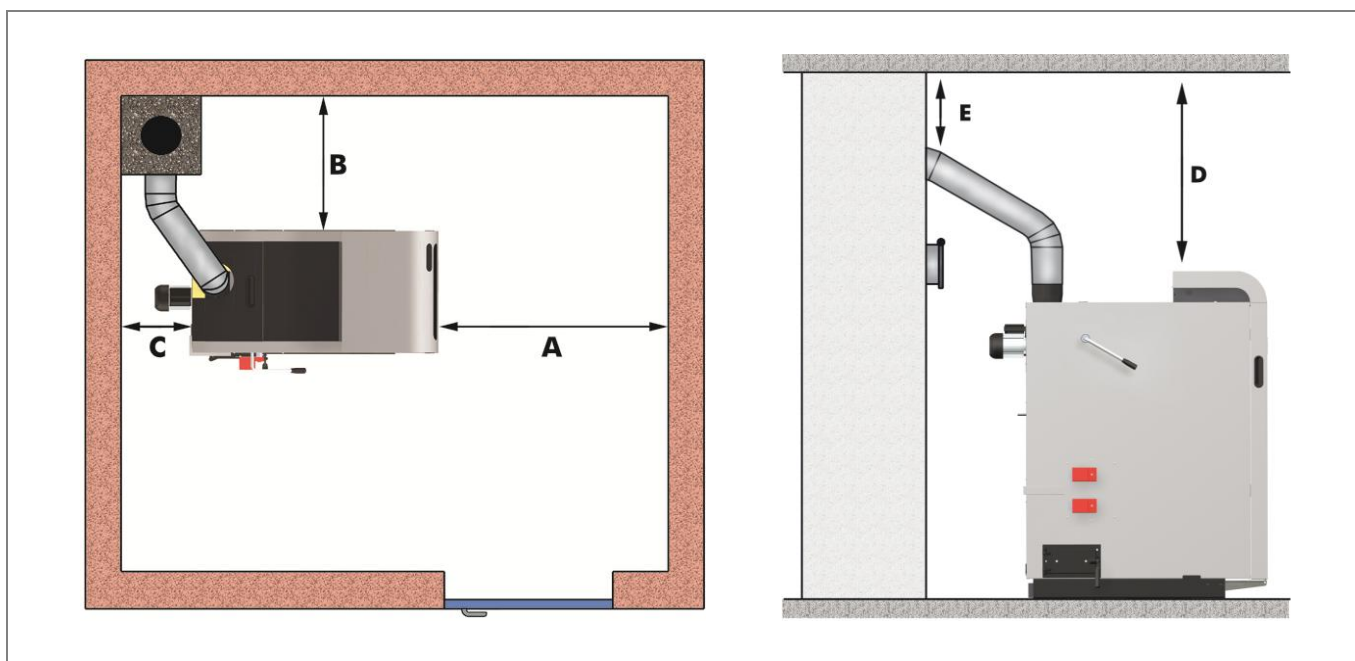
- ❑ Position a fork-lift or similar lifting device at the base frame of the boiler and move it to the designated position

To prevent damage:

- ❑ Move the boiler without jarring or jolting
 - Risk of damage to firebrick-lined combustion chamber.
- ❑ Move the packing materials carefully
 - Risk of scratching the insulation
- ❑ Position the boiler at the designated location
 - The boiler must be positioned so that it is rise slightly towards the supply fitting
 - Observe the minimum distances from other objects in the boiler room

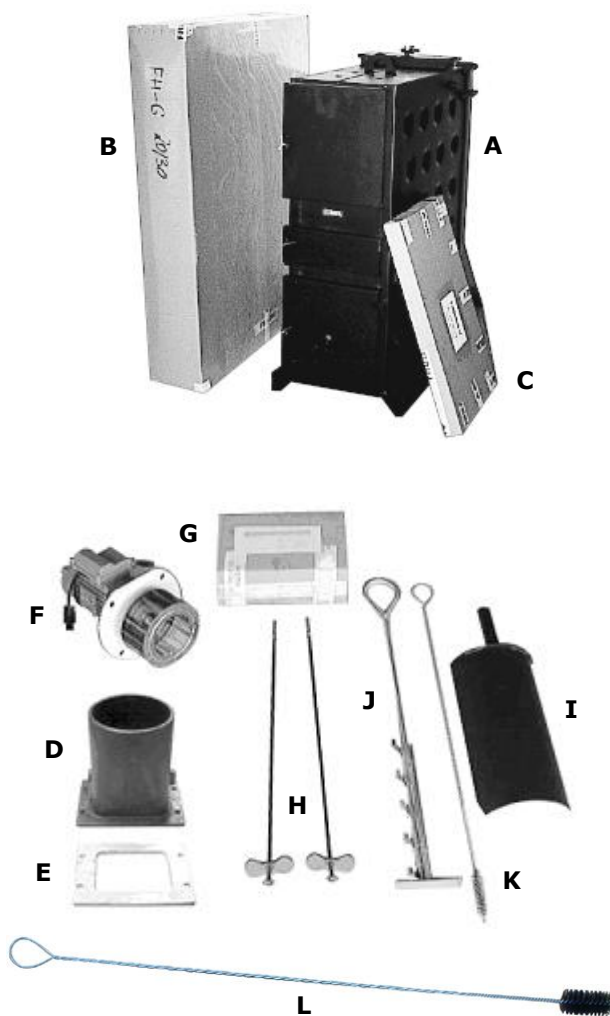
3.2.2 Minimum distances in the boiler room

Always set up the boiler in accordance with all applicable standards and regulations. The following minimum distances must be observed in all cases:



A	Front of Appliance to Combustibles	inches	36
B	Side Wall to Appliance	inches	9
C	Back Wall to Appliance	inches	14
D	Ceiling to Appliance	inches	18
E	Combustibles to Flue Pipe	inches	18

3.3 Package contents



A	Boiler
B	Insulation
C	Heat-exchanger system (optional)

D	Flue gas pipe nozzle
E	Ceramic fiber seal
F	Induced draught fan
G	Cardboard box containing small parts
H	Rods for primary and secondary air
I	Ash shovel
J	Cleaning kit
K	Cleaning brush, small
L	Cleaning brush, large

The following are also included in the package contents but not pictured: *Lambdatronic control unit, pressure relief valve, pressure/temperature gauge, Honeywell overheat aquastat, installation instructions, operating instructions, guarantee certificate, identification plate*

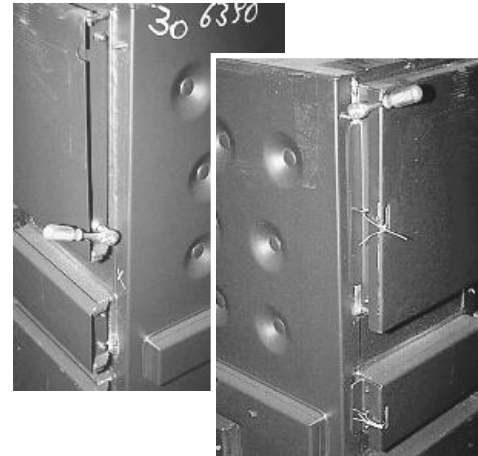
3.4 Before installation

- ⚠ **IMPORTANT:** The boiler doors are attached on the right hand side when delivered. Carry out the following assembly steps if the doors need to be attached on the left:

3.4.1 Fitting doors on the left

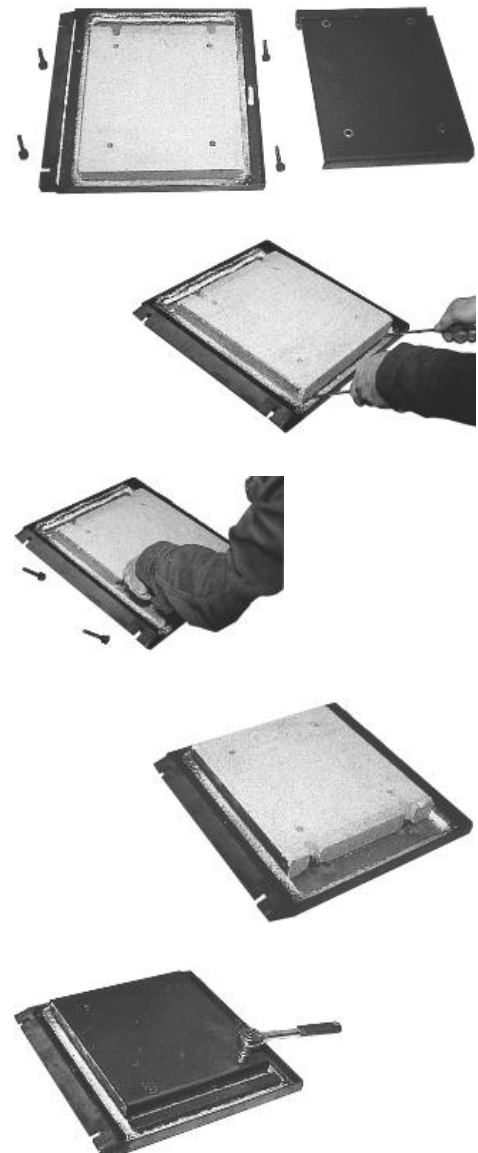
Remove hinge pin clips by using two small screw drivers to pry open the wings of the clips

- ❑ Detach the doors
- ❑ Unscrew the hinge and back plate, swap them over and reattach.
- ❑ Rotate the pre-heating chamber door and the combustion chamber door and attach them on the left hand side.



Additional steps for the fuel loading chamber door:

- ❑ Remove the gasket then remove the radiating plate.
- ❑ Detach the insulating plate from the ceramic fiber gasket
- ❑ Carefully lift out the insulating plate
- ❑ Turn the insulating plate by 180° and position it so that it lines up with the holes provided
- ❑ Re-install the radiation plate
- ❑ Fix the gasket in place using gasket cement
- ❑ To re-mount the door, perform removal procedure in reverse



3.4.2 Fitting the door handles

For the fuel loading chamber door:

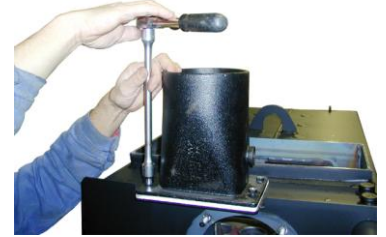
- ❑ Position the door handle in the hole provided
- ❑ Insert flange bushing into door handle
- ❑ Fasten the door handle in place
- ❑ Repeat the above steps for the pre-heating chamber door and the combustion chamber door
- ❑ Fitting the door for closure is accomplished by pressing the door closed until the gasket makes contact on the hinge side. Tighten the hinge side bolts. Re-tighten latch bolts after the door is mounted



3.5 Installing the FHG

3.5.1 Installing the flue gas pipe nozzle

- ❑ Place the ceramic fiber gasket in position
- ❑ Position the flue gas pipe nozzle and attach it using the pre-installed spacer washers and nuts
- ☞ Caution: ½" sleeve must point to the left as viewed from the rear of the boiler.

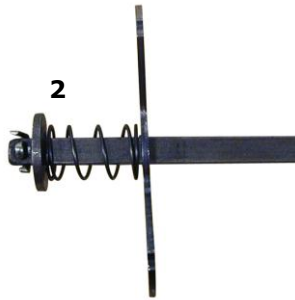
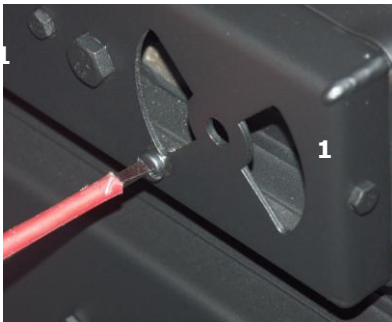


3.5.2 Install the pneumatic rods for the primary and secondary air

For both pneumatic rods:

- ❑ Remove the split pin opposite the spring and pull off one of the air flaps.

Right-hand actuators



- ❑ The hex head bolt (1) in the above picture must be used on the other side.
- ❑ Unscrew the stop screws on the right-hand side of the boiler far enough to allow the air flap to make contact with the thread.
- ❑ Insert the pneumatic rod at the left-hand side of the boiler
 - ☞ The flap with the spring (2) must be at the left-hand air duct.
- ❑ Position the flaps on the opposite side
 - ☞ Caution: Install the flaps in the same position.
- ❑ Secure the flaps with the split pins

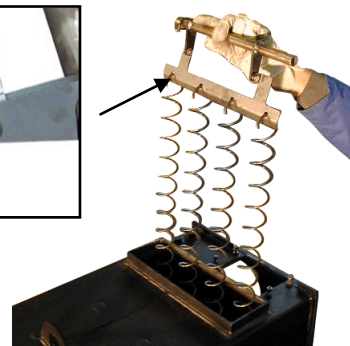


Left-hand actuators

- ❑ Unscrew and remove the stop screws on the right-hand side of the boiler and fit to the left-hand side
- ❑ Insert the pneumatic rod at the right-hand side of the boiler
- ❑ Carry out the remaining steps as for the right-hand actuators, but with the sides reversed.
- ❑ As a final step, attach the actuator mounting bracket as shown using the pre-installed screws

**3.5.3 Installing the heat exchanger system**

- ❑ Remove the screw on the upper cleaning cover
- ❑ Remove the cleaning cover
- ❑ Hook the turbulators (springs) onto the frame and insert them into the heat-exchanger pipes as shown. Orientation of the hooks is important.
- ☞ If a turbulator is dropped into a tube another turbulator can be used to thread into the dropped turbulator for removal.
- ❑ Determine which side the cleaning lever will be attached to
- ❑ Remove the screw cap from the required side
- ❑ Screw in the brass bushing



3.5.4 Final steps before insulating

- ❑ Add a 1/2" well (provided) into tapping 1 as indicated. This will be used with the Honeywell L4008B aquastat (provided) as the over-heat dump zone limit.



- ❑ Detach blank cover for the side cleaning port



3.5.5 Installing the insulating side panels

- ☞ **IMPORTANT:** The separate parts of the boiler insulation are fitted with a protective film. This must always be removed before installation!

The following steps apply if the insulating door is attached on the right side:

- ☞ If the insulating door is on the left, carry out the same steps with the sides reversed accordingly.
- ❑ Fit the spacer washers onto the threaded bolts
- ❑ Insert the door bracket into the upper edge of the insulated panel on the side that the door will be attached to the boiler (the same side as for the three boiler doors) and fix in place.
- ❑ Push in the pre-cut perforated corners at the cleaning ports to form an angle of approximately 100°
- ☞ Do not remove the corners



- ❑ Insert the L-plate into the insulating side panel as shown
- ❑ Fix the L-plate in position using 3 self-tapping screws
- ☞ Caution! Air channels (1) must not be obstructed (do not insulate)



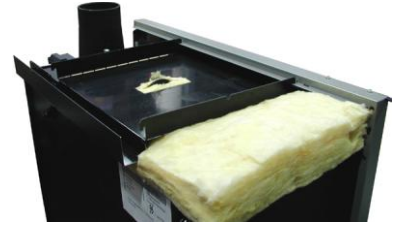
- ❑ Insert the insulating side panel into the tab (2) at the base of the boiler.
- ❑ Hang the top of door from the door bracket using the threaded bolt
- ❑ Fit the spacer washers and screw the nuts on lightly
- ❑ Lay the insulating wool pad for the top surface in position
- ☞ Pull the insulating wool pad completely forward, so that the entire switch panel base is 100% insulated



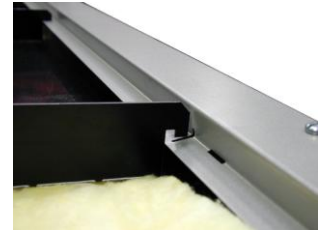
- ❑ Bend up the end plates on the cable tray to form right angles



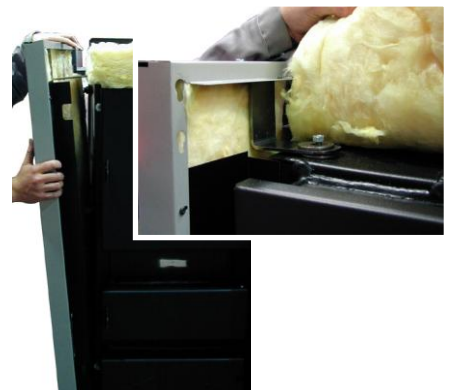
- ❑ Place the cable tray on top of the insulating wool pad and insert it into the recess provided in the insulating side panel



- ❑ Prepare the next insulating side panel
- ☞ Repeat the same steps as for the previous insulating side panel
- ☞ Use the side panel bracket (1) instead of the door bracket described above.



- ❑ Fit the left-hand insulating side panel at the base of the boiler
- ☞ Ensure that the panel is properly engaged in the tab at the base of the boiler.
- ❑ Mount the panel onto the bracket using the threaded bolt
- ❑ Fit the spacer washers and screw the nuts on lightly



- ❑ Remove the protective film from the upper and lower spacer plates
- ❑ Mount the upper spacer plate at the upper end between the insulating side panels



- ❑ Mount the lower spacer plate at the lower end between the insulating side panels and secure it using 2 self-tapping screws



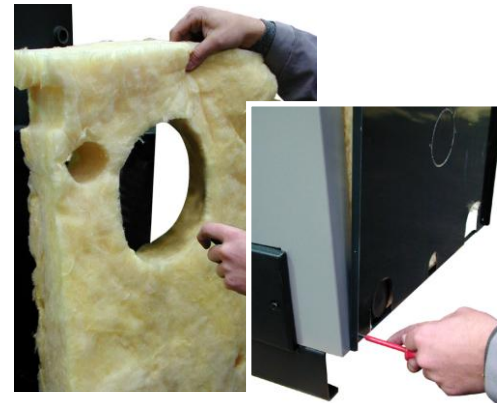
Installing the cleaning port door and blank cover

- ❑ Slide the complete side insulation assembly towards the rear until the black, perforated L plates meet the front face of the boiler body.
- ☞ Recommendation: Install the cleaning port door on same side as the cleaning lever.
- ❑ Install the cleaning port door using 3 Allen screws. Start with the large threaded boss.
- ❑ Attach the door handle for the cleaning port door using a round headed screw
- ❑ Install the blank cover for the side cleaning port on the required side
- ☞ When complete, the handle must latch with a downward motion.



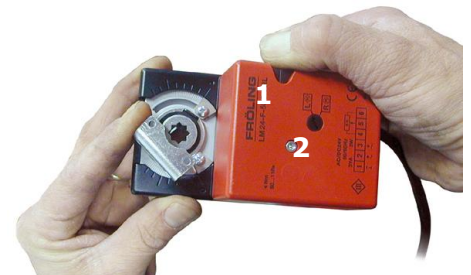
Installing the insulating back panel

- ❑ Attach the insulating wool pad to the back of the boiler
- ☞ Thread the cables for the induced draught fan through the insulation
- ❑ Mount the insulating back panel and fasten it at the lower edge
- ❑ Thread the cables for the actuators through the pre-stamped opening
- ❑ Attach the insulating back panel to the complete assembly
- ❑ Tighten the screws on the blank cover and cleaning cover

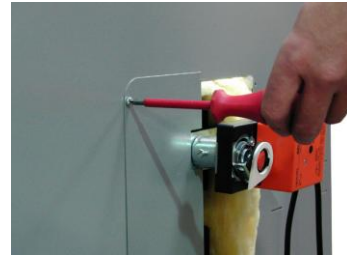


Installing the Actuators

- ❑ Using pliers, turn the pneumatic rods anti-clockwise until the left-hand limit stop is reached
- ❑ Press the safety-release button (1) and turn the actuator anti-clockwise to the "0" position
- ❑ Turn the selector switch (2) to position "L" using a screw-driver
- ❑ Fit the torque support to the actuator



- ❑ Attach the left- and right-hand cover plates using self-tapping screws
- ❑ Push the actuator onto the pneumatic rod and fasten in position
- ❑ Label the cables for the actuators using the stickers provided
 - ☞ Upper actuator = primary air
 - ☞ Lower actuator = secondary air
- ❑ Push on the cable cover and fix in position using self-tapping screws



3.5.6 Fitting the induced draught fan

- ❑ Fit the induced draught fan on the rear side of the boiler as shown
- ☞ Caution: Do not overstress the flange



- ❑ Attach the left- and right-hand cover plates using self-tapping screws



Installing the insulating door and insulation cover



- ❑ Align the insulating side panels by measuring the diagonal in the corner and tighten the nuts on the threaded bolts
- ❑ Fasten the right and left insulating side panels



If the insulating door is attached on the left:

- ❑ Insert flange bushings at the top and the bottom on the left-hand side of the insulating door



The following steps are for a door attached on the right:

- ☞ If the insulating door is attached on the left, carry out the steps with the sides reversed accordingly.
- ❑ Slide the lower door bracket into the base of the boiler and attach using 2 hexagon head screws
- ☞ Do not fully tighten the screws at this point
- ❑ Push an M6 x 30 hexagon head bolt through from below at the front end of the door bracket and attach using a nut

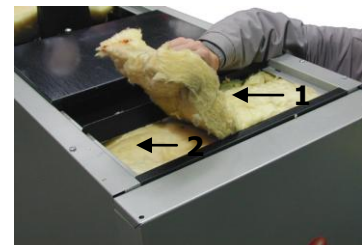
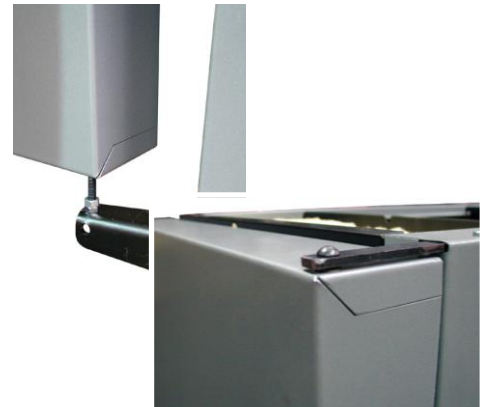


For the FHG 40/50, an additional U-profile must be fitted:

- ❑ Screw the door bracket onto the U-profile using 2 M6 x 12 hexagon head screws
- ❑ Slide the door bracket, together with the U-profile, into position and attach using 2 hexagon head screws



- ❑ Mount the insulating door onto the lower door bracket using the hexagon head screw
- ❑ Attach the insulating door at the upper door bracket using a hinge pin
- ❑ Adjust so there is an air gap of equal dimensions between the insulating door and the insulating side panel
- ❑ Fasten the lower door bracket so that this set up is maintained
- ❑ Install magnetic latches top and bottom on the inside of the insulating door
- ❑ Lay the additional insulating wool pad (1) in position
- ☞ The side openings (2) at the L-plates must be completely covered.
- ☞ Danger of the controller overheating due to chimney draught effect.



- ❑ Thread in the cable for the door contact switch
- ❑ Place the cover with the door contact switch in position
- ❑ Tighten front jacket mounting bolts and ash pit door mounting bolts



Installing the floor insulation

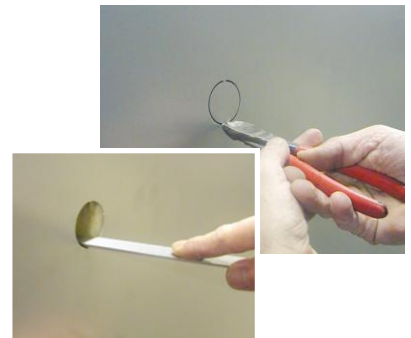
- ❑ Locate the floor insulation assembly into the U-profiles in the base of the boiler and slide in fully



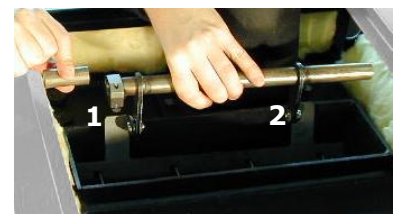
Installing the cleaning lever for the heat-exchanger system

On the same side as the brass bushing:

- ❑ Remove the pre-punched perforation from the insulating side panel
- ❑ File rough edges using a half-round file and remove burrs
- ❑ Place the plastic trim ring on the cleaning lever.
- ❑ Position the cleaning lever



- ❑ Fit the spacer tube (1) and the heat-exchanger bracket (2)



- ❑ Slide the cleaning lever fully into position and secure using clamping jaws



- ❑ Place the upper cleaning port cover in position and lock the linkage into place by turning it clockwise to tighten

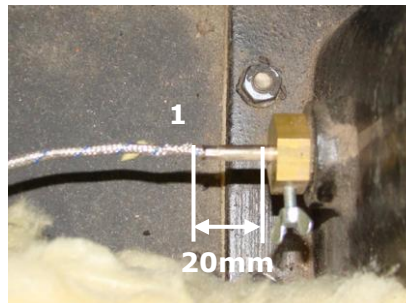


Installing the control unit



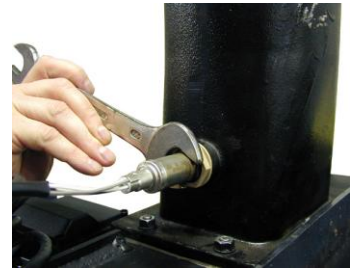
- ❑ Position the control box on the boiler
- ❑ Remove the cover from the control unit
- ❑ Attach the control unit to the boiler using four self-tapping screws

Installing the flue gas sensor



- ❑ Screw-in the brass bushing for the flue gas sensor
- ❑ Push in the flue gas sensor until about 20 mm of the sensor remains protruding from the bushing and attach lightly using the fixing screw
- ❑ Slide rubber insulation toward the control end of the wire.

Installing the lambda probe



- ❑ Unscrew the pre-installed bushing from the lambda probe
- ❑ Screw the bushing into the flue gas nozzle and tighten gently
- ❑ Screw the lambda probe into the bushing and tighten gently
- ☞ Never place a wrench or pliers on the cylindrical metal body

Installing the rear insulation covers

- ❑ Install the cabling
 - ➡ [See chapter 3.7 Electrical connection](#)
- ❑ Position the pieces of insulating wool pad on the left and right of the flue pipe nozzle
- ❑ Position the insulation covers



3.6 System plumbing

For the heating system piping, it is possible to use either copper or iron piping materials. The supply and return pipe should be insulated to avoid heat loss. In systems where plastic tubing is used, it must have an oxygen dif-fuser barrier. If non-oxygen barrier tubing is used, the boiler must be separated from the tubing by a heat exchanger. A thermostatic mixing valve, set to open at 140 °F (60 °C), is required to temper return water to prevent cold return water from reaching the boiler. This valve helps prevent boiler corrosion.

Plumbing diagrams --> Conceptual plumbing diagrams for the Froling FHG are provided in Appendix 10.1 and are also available from Tarm Biomass.

3.6.1 Safety plumbing

Overheat Loop: No Electricity: The piping and controls must be connected to the boiler in such a way that in the event of a power failure there is one loop of radiation available for gravity circulation. This loop must not be obstructed by any valves or other accessories which would prevent gravity circulation during a power failure. The piping is plumbed in such a way that excessive pressure will not be developed in any portion of the boiler or system. The loop must be large enough to dissipate at least 10% of the boiler's maximum rated heat output, assuming an ambient temperature of 65 °F (18 °C) and a mean water temperature of 180 °F (82 °C).

The minimum pipe size for this loop is ¾" (1" recommended) and if possible, the loop should be located and pitched to maximize natural thermal convection of the water. The loop must be positioned above the boiler. The design of the loop must be such that it can be made inoperative only in a deliberate manual action. If large enough, an existing heating radiation zone may be used for the over-heat loop. The loop must be equipped with zone valves which will open automatically during a power failure. We recommend AUTOMAG zone valves for this application (offered as an accessory).



Overheat Loop: With Electricity: The Honeywell L4008B aquastat provided with this boiler (shown at left) must be wired in parallel with the thermostat on the zone with the most heating capacity in the main living area (see wiring in Section 3.7.5). Upon reaching the aquastat set point (200 °F) the heating zone will be activated, pulling heat away from the boiler. The home owner is alerted to a potential problem with the boiler by an overly warm living space.

Pressure relief valve: The boiler pressure relief valve (part # **100705**) and pressure/temperature gauge (part # **PT1088**), must be installed as shown in the figure to the left. Both parts are included with the boiler. This is to ensure that excessive pressure will not be developed in the boiler. When the system pressure reaches a maximum of 30 psi (2 bar), the pressure relief valve opens and the heating water is released in the form of steam. The pressure/temperature gauge can be used for reading pressure and temperature in the boiler during a power outage.



3.7 Electrical connection

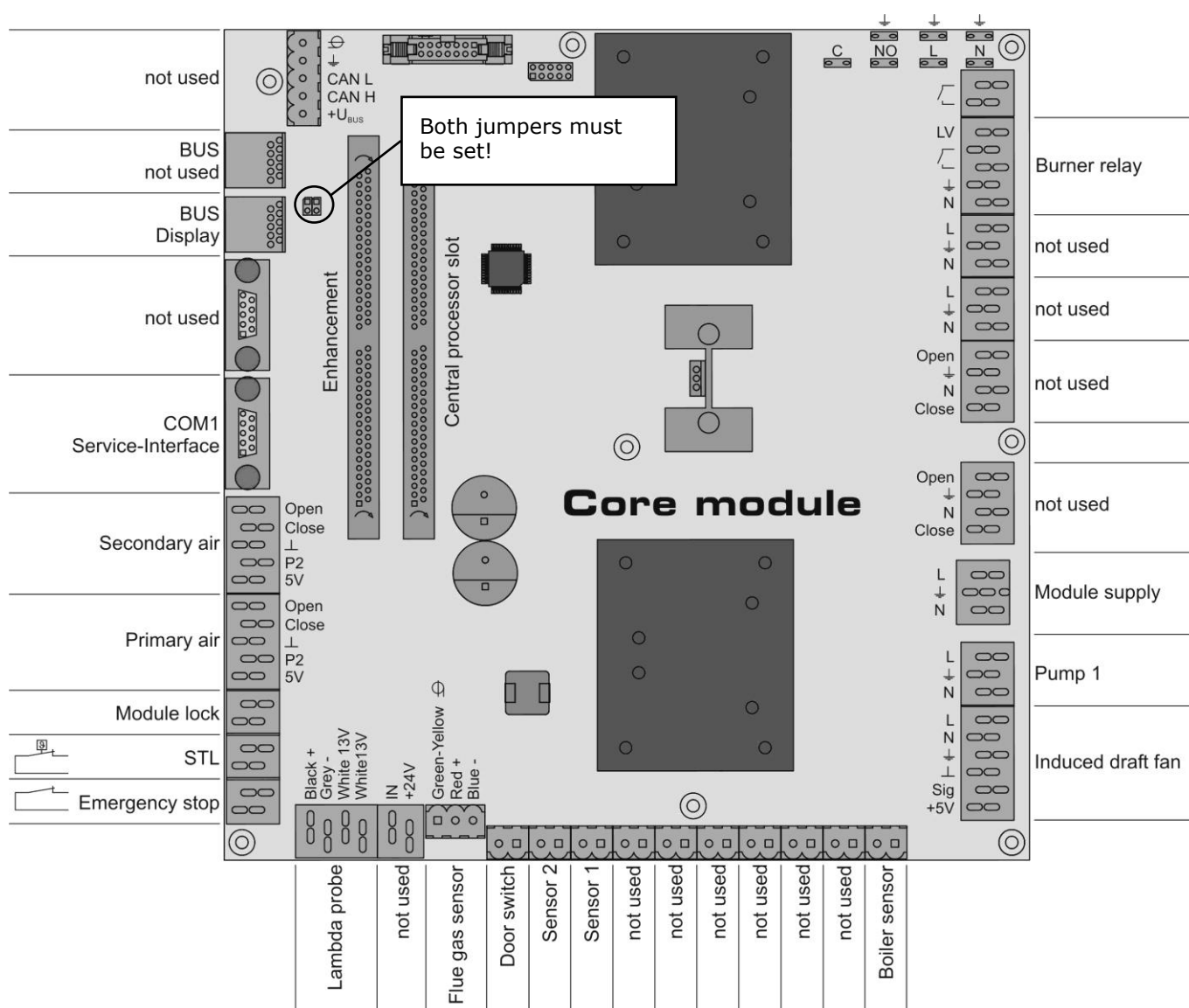
For the FHG 3000 boiler a 240 VAC, 60 hertz, 4 wire power supply is required. This electrical connection should be from a dedicated 15 amp, circuit breaker. A master service switch for the boiler, mounted on or in the proximity of the boiler, is recommended. Locally enforced electrical codes must be followed.

⚠ DANGER

Work on electrical components is very dangerous. Avoid severe personal injuries and death.

Only licensed electricians to perform electrical work!

3.7.1 Core Module - Overview

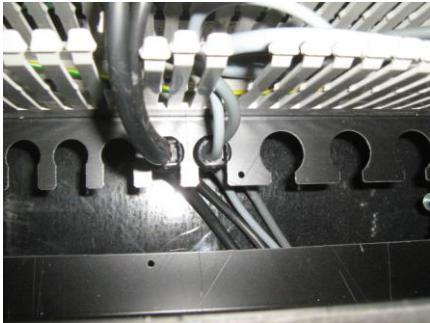


3.7.2 Connecting actuators

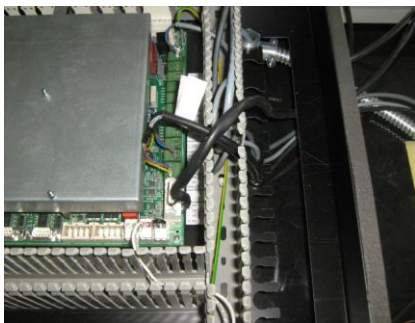
Primary and Secondary Air Damper Actuator



Feed Through Air Damper Wires



Feed Air Damper Wires Through Wire Knockout



Plug in Air Damper Wire Connectors

Secondary air		Open
		Close
		L
		P2
		5V
Primary air		Open
		Close
		L
		P2
		5V

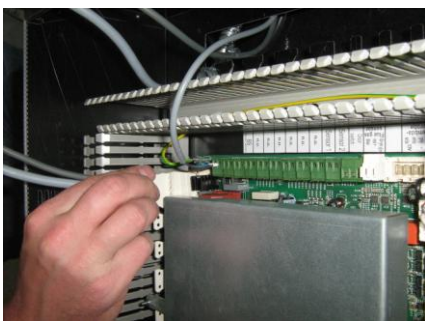
Induced Draft Fan



Feed Draft Fan Wires through Back Panel



Feed Wires Through Wire Knockout



Plug in Draft Fan Connector

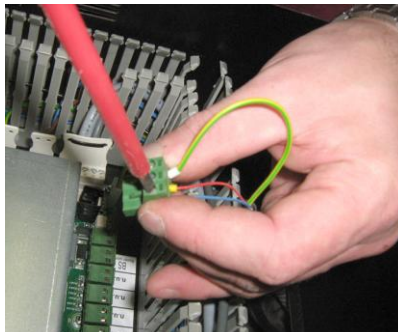
L		Induced draft fan
N		
↓		
L		
Sig		
+5V		

3.7.3 Connecting sensors

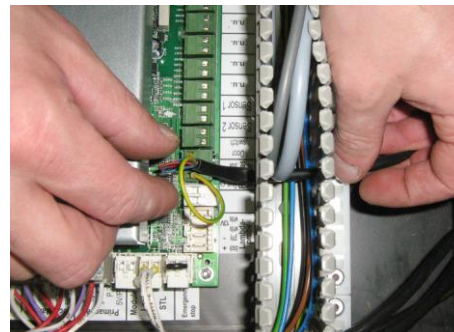
Flue Gas Sensor



Feed through Flue Gas Sensor Wires



Connect Wires to Connector



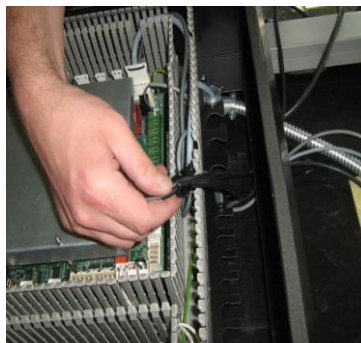
Plug in Flue Sensor Connector



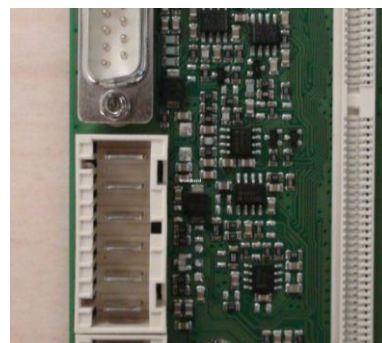
Lambda Probe



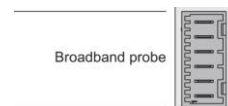
Feed through Lambda Probe Wires



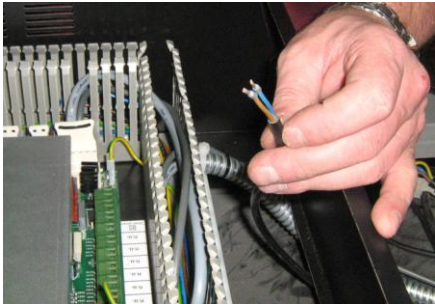
Feed Wires through Wire Knockout



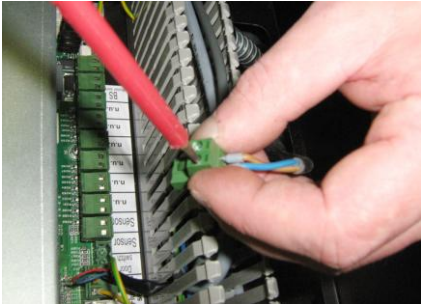
Plug in Broadband Probe Connector



Sensor of Door Switch



Feed through Door
Sensor Switch Wires



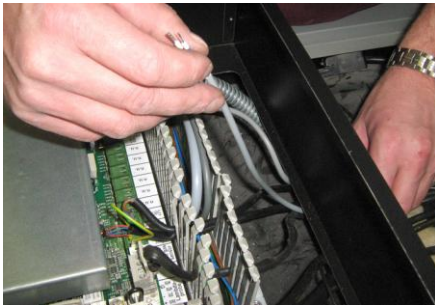
Connect Wires to
Connector



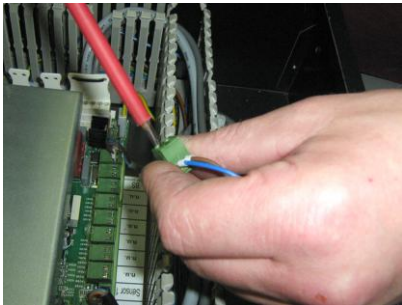
Plug in the Door
Switch Connector



Sensors for Thermal Storage System



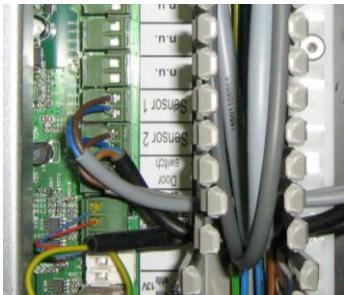
Feed through Sensor
Wires



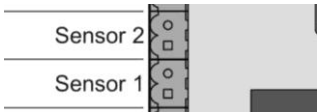
Connect Wires to
Connector



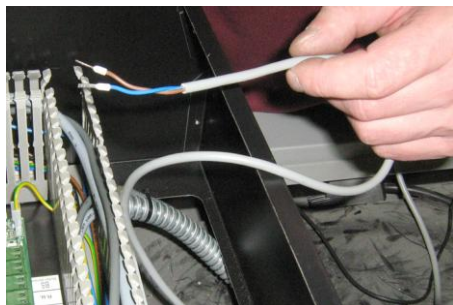
Plug in Sensor 1
Connector



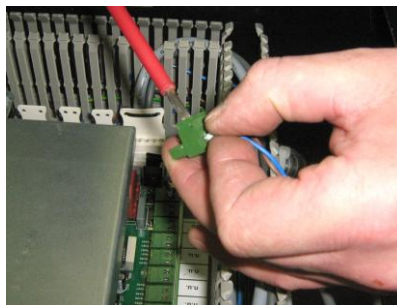
Plug in Sensor 2
Connector



Boiler sensor and Sensor of Safety Temperature Limiter



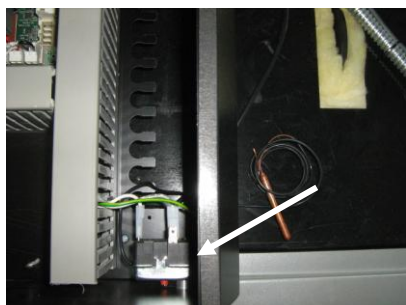
Feed Boiler Sensor Wires
(sensor is installed below
with STL)



Connect Wires to
Connector



Plug in Boiler Sensor
Connector



Locate Safety
Temperature Limiter
and its bulb



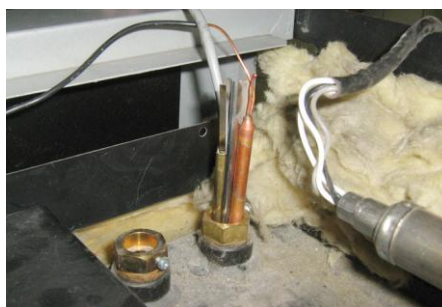
Feed bulb and
capillary to back of
boiler



Bring the bulb to the
back of the boiler



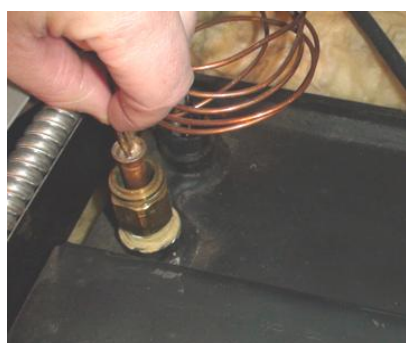
Prepare STL bulb and
boiler temperature
sensor



Install bulbs into well



Make sure the sensors
are pushed completely
into well



Install overheat
aquastat bulb and well

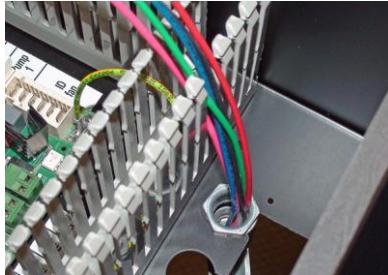
Connecting Main Supply and Pump 1



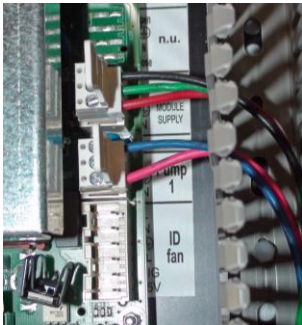
Mount Interface Panel



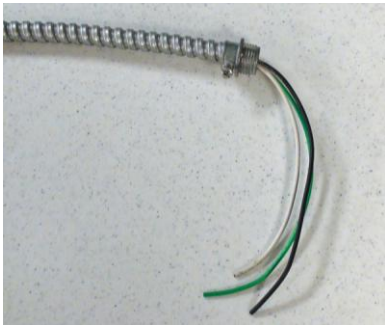
Loosen Mounting Nut



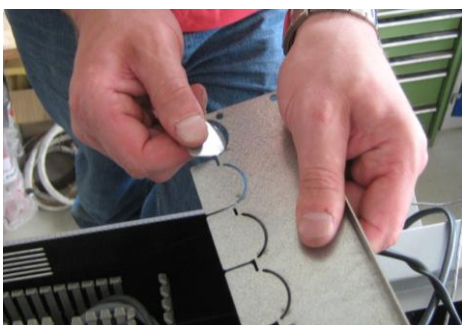
Mount Wire End into Control Head



Attach this end to circulator

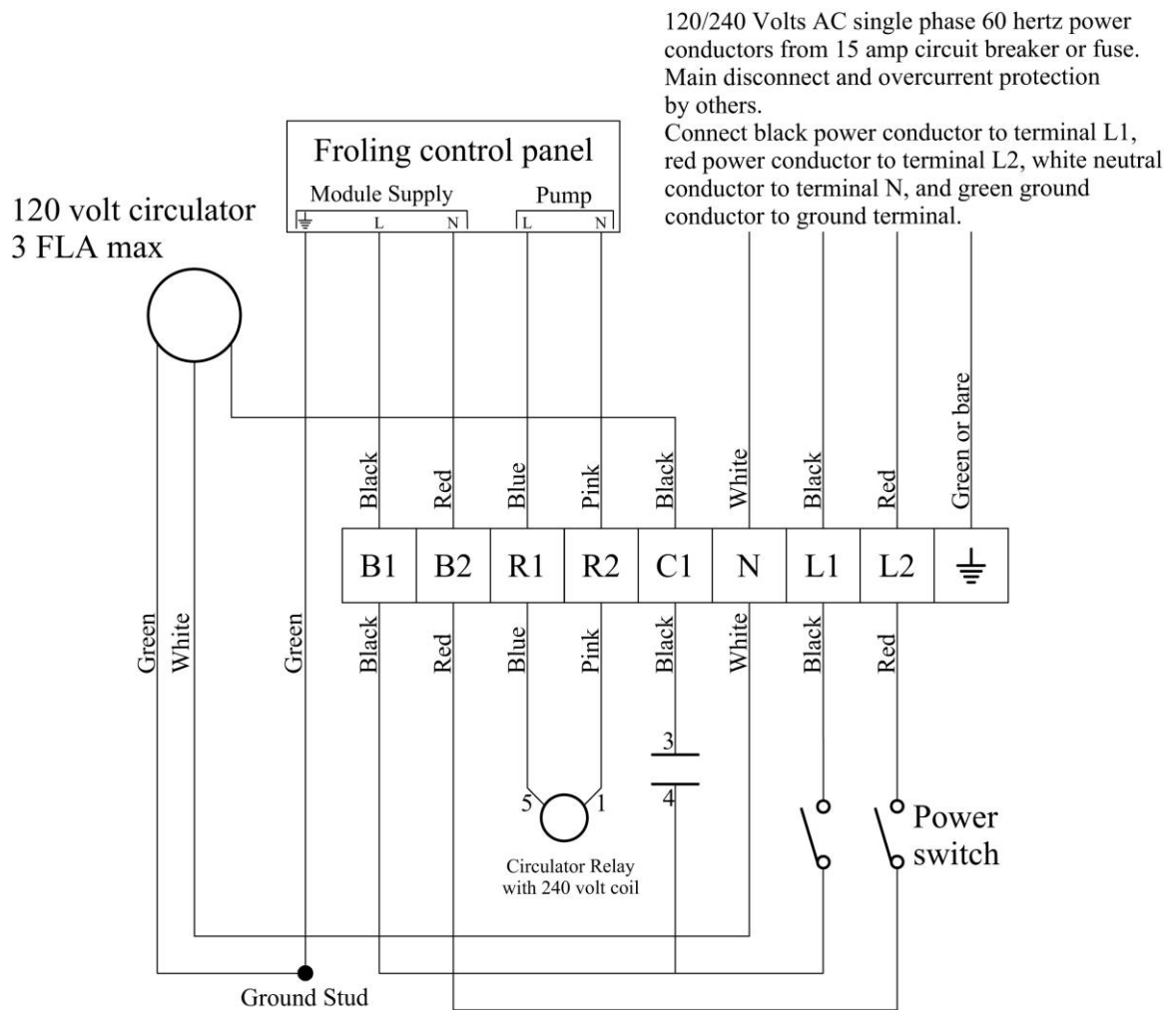


Remove Knockouts on Strain Relief Plate

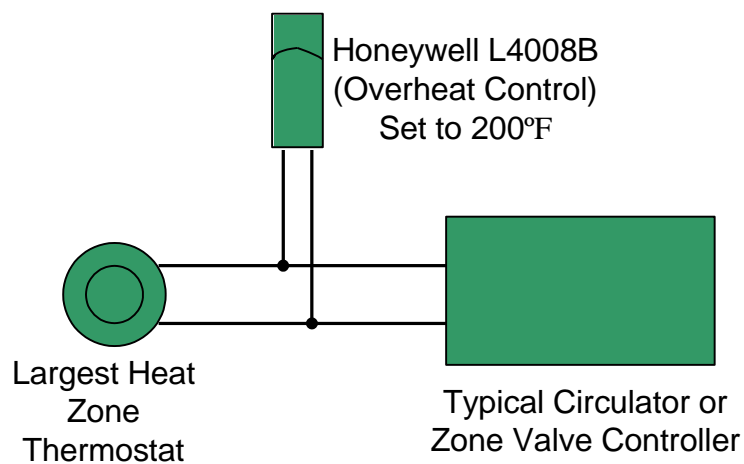


Install Plate

Wiring diagram



Wiring diagram for overhear aquastat connections



4 First Start-up

4.1 General information

- ☞ **IMPORTANT: First start up of boiler system shall be carried out only in attendance of an authorized installer or manufacturer's representative**

WARNING

During normal operation of boiler all surfaces and control handles behind insulation door get hot. Touching hot surfaces can cause serious burns! Additionally there is the risk of injuries by splinters of fire wood!



When heating up the boiler:

- ☐ Always wear protective gloves
- ☐ Always use control handles for open boiler doors

CAUTION

Too rapid heat-up of boiler at first start-up is dangerous. First heating of boiler using too much fuel can cause cracks or explosions in combustion chamber

- ☞ ☐ **IMPORTANT:** Condensation within the boiler during first start-up does not indicate a fault! If this occurs, clean up using a cleaning rag.

4.1.1 Before heating up for the first time

- ☐ Check the system pressure of the heating system
- ☐ Check that the heating system is completely vented
- ☐ Check if the safety devices are present and working correctly
- ☐ Check that there is sufficient combustion air supply and venting
- ☐ Check the contact seals of the boiler
 - ➔ All doors and inspection openings must be tightly sealed!
- ☐ Check that drives and actuators are working and turning in the right direction
 - ➔ [See page 55, Digital and analog Outputs](#)
- ☐ Check that the Door Contact Switch at Insulation Door is working correctly
 - ➔ [See page 56, Digital Inputs](#)

4.1.2 Preparing fire wood

Prepare the necessary amount of fuel within boiler area before opening boiler doors. For usability and preparation of fire wood; please pay attention to chapter 2.2 within the Owner's Manual.

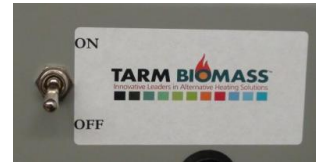
4.1.3 Main Switch at Boiler Control System

- ❑ Check the Main Switch at the right hand side of the boiler

WARNING

Switching off the Main Switch when boiler is hot may cause explosive gases!

- ☞ Avoid switching off Main Switch at Boiler Control System during heating season!



4.1.4 Error status of Boiler Control System

- ❑ Check the Status LED at Boiler Control Display unit for activated and error free system (green flashing light)
 - ☞ In case any error message is displayed at Boiler Control System (red flashing light at Status LED) or display is blank refer to chapter 6 "Troubleshooting"

4.1.5 Starting the boiler for the first time

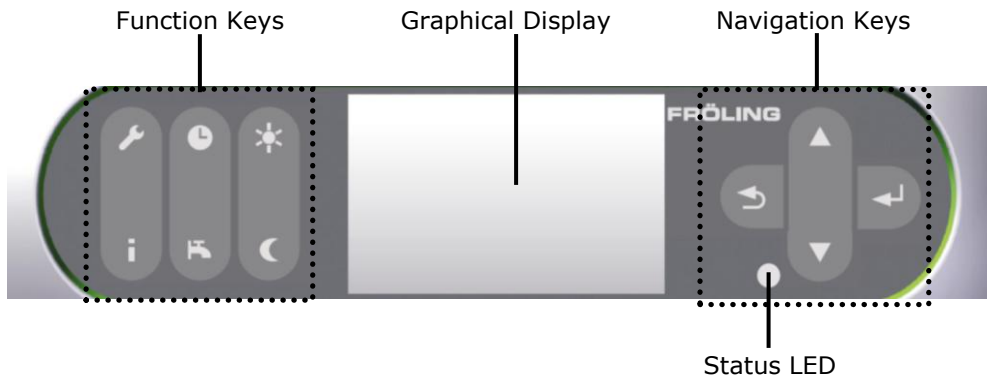
- ☞ Please refer to the Operation and Service Manual Section 3.1.5 "Starting the boiler for the first time" for first start-up instruction.

5 Boiler Control System Lambdatronic S 3200

This chapter contains information about use, control parameters, of the Boiler Control System Lambdatronic S 3200. All parameters, which are visible at the service technician operator level, are shown. The parameters at Owner's level are shown with a grey background!

5.1 Overview of the Basic Functions

5.1.1 Control keys and Display



Navigation Keys

The navigation keys are for scrolling in the menu and changing parameter values

Key	Function for ..
 UP arrow	Navigation: Move up in the menu Parameter change: Short keystroke: Increase value Long keystroke: Increase value in steps of 10 Long keystroke (> 10 sec): Increase value in steps of 100
 DOWN arrow	Navigation: Move down in the menu Parameter change: Short keystroke: Decrease value Long keystroke: Decrease value in steps of 10 Long keystroke (> 10 sec): Decrease value in steps of 100
 Enter key	Navigation: Go to selected menu Parameter change: Short keystroke: Unlock parameter for editing or save parameter value
 Back key	Navigation: Go back to higher menu Parameter change: Short keystroke: Do not save parameter value Long keystroke: Back to Basic Display without saving

5.1.2 Status LED

The status LED shows the operating status of the system:


















- GREEN light flashing (Interval: 5 sec. OFF, 1 sec. ON): OFF
- GREEN light constant: BOILER SWITCHED ON
- ORANGE light flashing: WARNING
- RED light flashing: ALARM

5.1.3 Function Keys

It should always be noted that most function keys of the Lambdatronic have dual functions. Different functions can be called with long or short keystrokes, using the following definitions of keystroke duration:

Short keystroke < 1 sec

Long keystroke > 4 sec

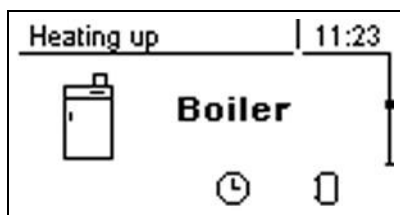
Keystroke		Function / Symbol in status line		
 Service Program	Short	Chimney sweep	System is operated for 30 minutes with rated load To exit this function: Use "Automatic Program" below	
	Long	Service operation	Function not used	
 Automatic Program	Short	Automatic (On)	Function not used (exit other functions only)	
	Long	Off	Function not used	
 Party Program	Short	Party operation	Function not used	
	Long	Extra heating	Function not used	
 Info	Short	Display info text	Query / Information text on menu points or errors To exit this function: Use "Back key" above	
	Long	No function		
 DHW tank-Program	Short	Extra loading	Function not used	
	Long	Summer operation	Function not used	
 Drawdown Program	Short	Drawdown	Function not used	
	Long	Continuous drawdown	Function not used	

Info Key

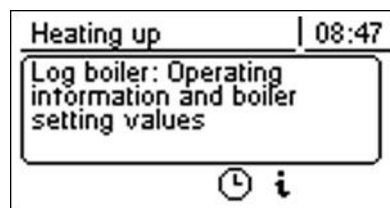


The info key can be pressed at any time and always shows a text window, with information about the current menu point or the currently pending error. Error messages always have the highest priority.

Info key in normal operation:

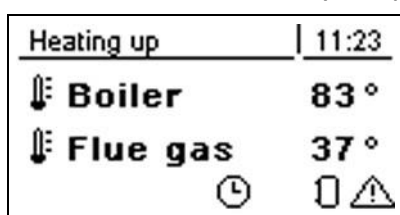


In normal operation (without error messages) the info key can be pressed to display information or an explanation for every menu point or parameter.

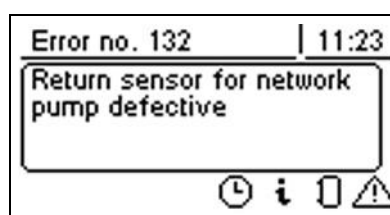


The info text is also identified by the frame and the info symbol in the status line.

Info key for pending error messages:



If an error message was acknowledged after arising, but not resolved, this is displayed by an error symbol at the bottom right on the status line.

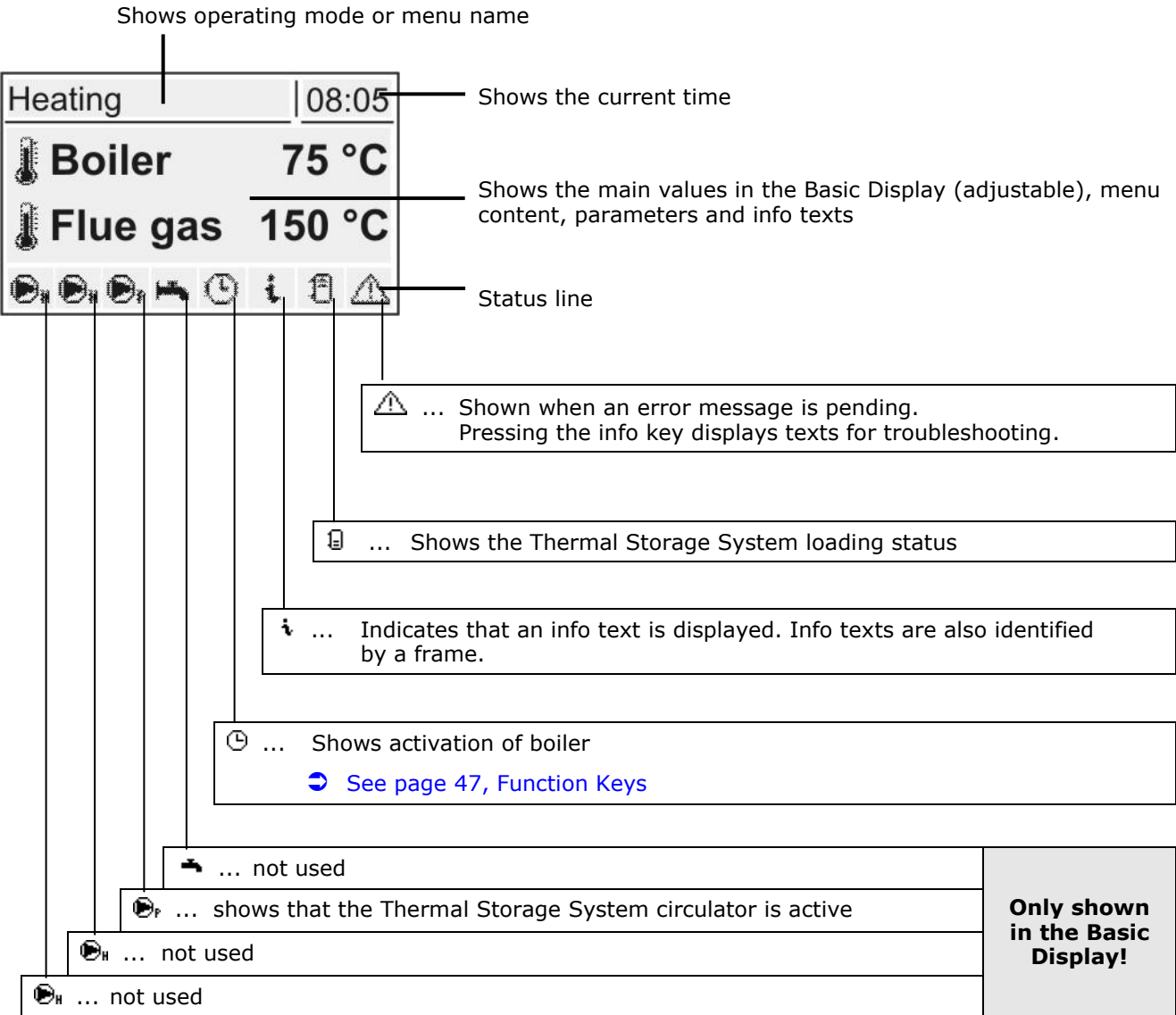


Pressing the info key calls up the information on the currently pending error message again.

How to proceed when troubleshooting an error message:

- ➔ [See Operation and Service Manual Section 6.3.2 List of possible error messages](#)

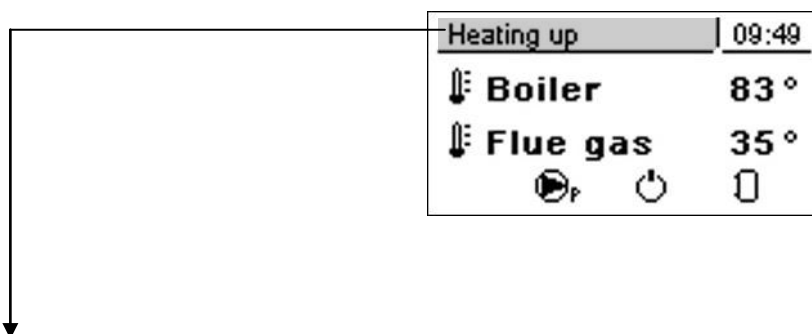
5.1.4 Graphical Display



Thermal Storage System loading status

Loading Status	Description
	No dash or one dash visible in loading status symbol: <input type="checkbox"/> You can fill up the Fuel Loading Chamber completely and set fire.
	Two dashes visible in loading status symbol: <input type="checkbox"/> Only fill half the Fuel Loading Chamber.
	Three or four dashes in loading status symbol: <input type="checkbox"/> Do not heat up or recharge the boiler! The Thermal Storage System is still too hot to store additional amount of energy.

5.1.5 Operating modes



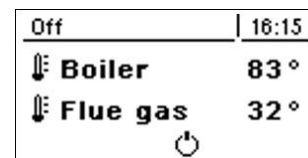
Heating up	<p>Mode of Boiler Control System during the heating process up to a certain minimum flue gas temperature. Induced Draft Fan and primary air at 100%.</p> <p>In case of requested fueling wait for operating mode "Heating" or "Off"</p>
Heating	<p>The Boiler Control System controls combustion according to the boiler set points. If refueling required refer to Error! Reference source not found. Error! Reference source not found.</p>
Slumber	<p>Very low heat consumption.</p> <p>When the set point of boiler temperature is exceeded by a specified value, the Boiler Control System switches to "Slumber" mode. The Induced Draft Fan stops, the air dampers are closed to the minimum opening.</p> <p>If the temperature falls below the set point of boiler temperature the Boiler Control System returns to "Heating" mode".</p> <p>Do not open Boiler Doors! Do not refill fuel!</p>
Door open	<p>The Insulation Door is open, the Induced Draft Fan runs at maximum speed.</p> <p>On closing Insulation Door properly the operating mode has to change to "Heating up" mode. Follow instructions mentioned there.</p> <p>If operating mode does not change to "Heating up" refer to Error! Reference source not found. Error! Reference source not found.</p>
Off	<p>The fuel wood loaded is burnt down to residual embers.</p> <p>If operating mode is "Off" a "Cold Start" procedure (fueling and ignition) has to be carried out. Please refer to Error! Reference source not found. Error! Reference source not found.</p>
Fault	<p>Alarm: Combustion was stopped by overheat thermostat (safety temperature limiter - STL)! Error message pending!</p> <p>Do not open Boiler Doors! Do not refill fuel!</p> <p>For procedure for error messages refer to Error! Reference source not found. Error! Reference source not found.</p>

5.2 Initial start-up (programming the controller)

After power up the start logo is displayed. The Boiler Control System performs a system check.

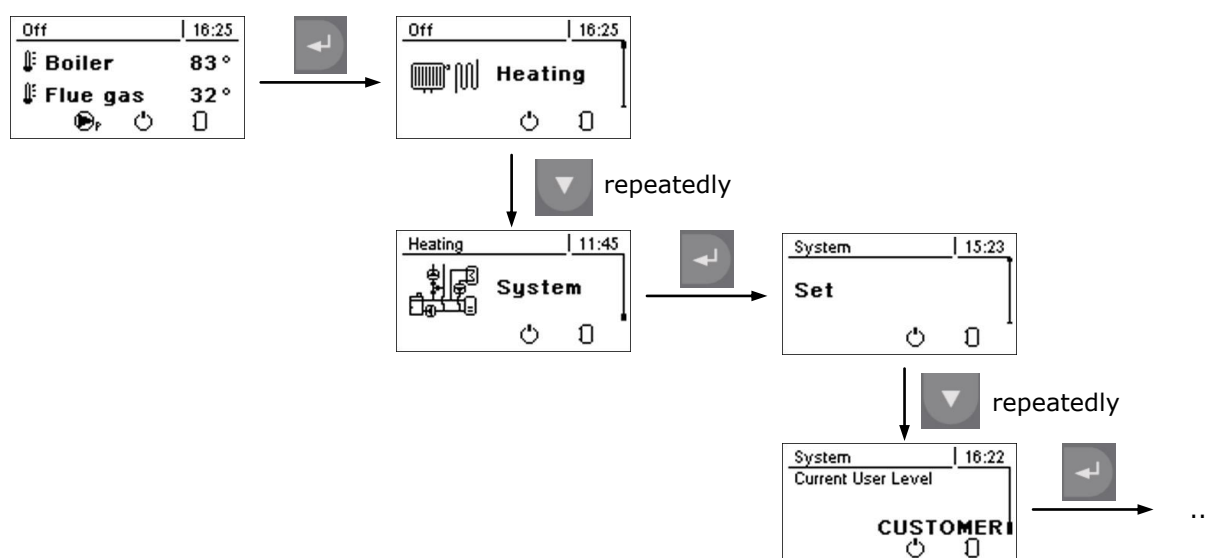


After the system check the Basic Display is shown. The Basic Display is shown as default during normal operation, giving information about the two most important parameters; the display can be configured individually.



5.2.1 Changing the User Level

For safety reasons certain parameters are only visible at specific User Levels. To change to another level it is necessary to enter the relevant user code:

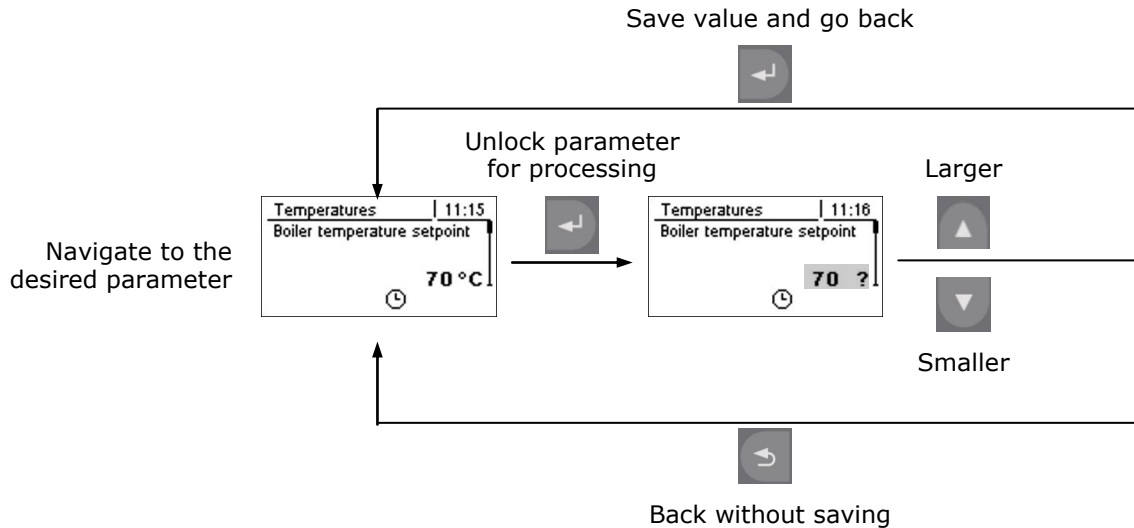


Child lock (User Code 0)	At "Child lock" level, only the Basic Display is shown. It is not possible to change any parameter at this level.
Owner (User Code 1)	Standard level for normal operation of controls. All parameters for Owner's use are displayed and released for adjustment.
Installer / Service*	Detailed level for Installation and Service purposes. All parameters and system controls available are displayed and released for adjustment. All parameters shown in these operating instructions are available.

*Installer: Please call Tarm Biomass for Installer Code.

5.3 Setting parameters

Changing values is very simple and is the identically for all parameters:



- ☞ All parameter values are pre-set to allow optimal operation in a wide range of application without any need of further changes to the parameter.

The following parameters, however, can/should be set as desired by the Owner:

- Desired target boiler temperature

- ☞ All temperature values at Boiler Control System are displayed in Centigrade or °C only!
- ☞ Temperature values in Fahrenheit or °F can be estimated using the following conversion table, based on:

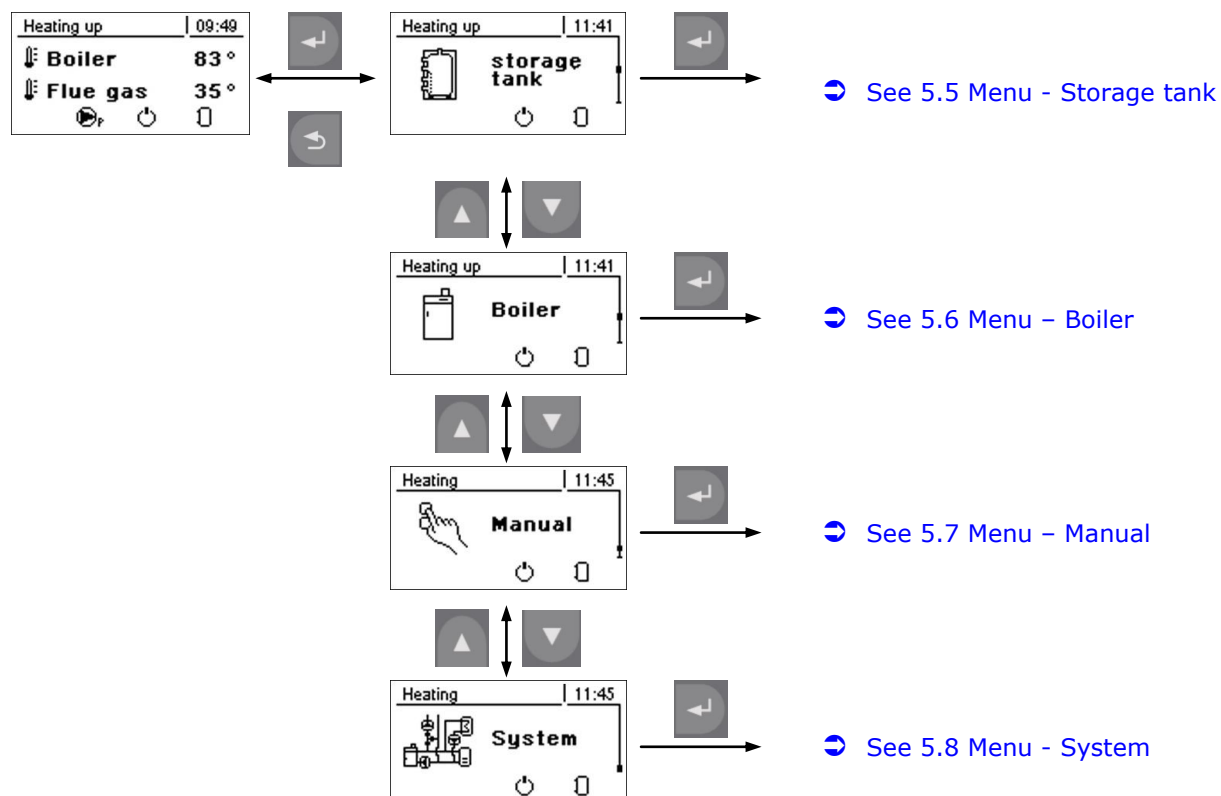
$$^{\circ}\text{F} = 1.8 \times ^{\circ}\text{C} + 32$$

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) / 1.8$$

°C	°F	°C	°F
0	32	65	149
5	41	70	158
10	50	75	167
15	59	80	176
20	68	85	185
25	77	90	194
30	86	95	203
35	95	100	212
40	104	105	221
45	113	110	230
50	122	115	239
55	131	120	248
60	140	125	257

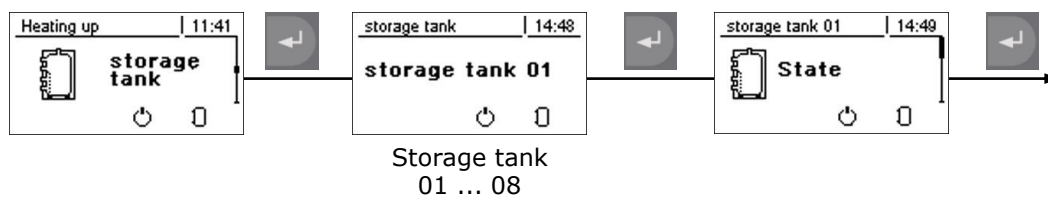
°F	°C	°F	°C
32	0	160	71
40	4	170	77
50	10	175	79
60	16	180	82
70	21	185	85
80	27	190	88
90	32	200	93
100	38	210	99
110	43	220	104
120	49	230	110
130	54	240	116
140	60	250	121
150	66	255	124

5.4 Menu Overview



5.5 Menu - Storage tank

5.5.1 Status display of the Thermal Storage System

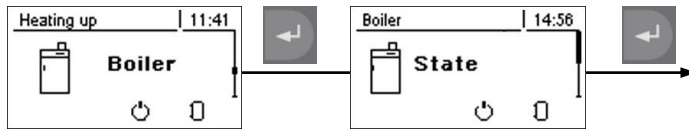


Display	Description
Storage tank top temperature 55°C*	Current temperature at Thermal Storage System top sensor.
Storage tank bottom temperature 50°C*	Current temperature at Thermal Storage System bottom sensor.
Storage tank pump control 0%	Function not used! Pump control either 0% or 100% speed! Specifies the speed of the Thermal Storage System circulator as a percentage of maximum speed.

*Verify sensor readings.

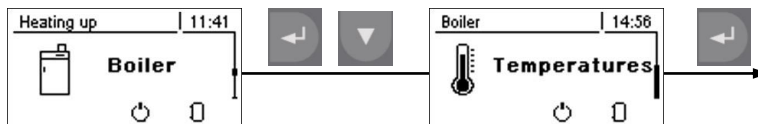
5.6 Menu – Boiler

5.6.1 Status Displays for the Boiler



Display	Description
Boiler temperature 80°C	Actual state values of boiler control system : :
Flue gas temperature 167°C	
Flue gas setpoint 165°C	
Boiler control variable 95%	
ID fan - control 90%	
ID fan speed 3240U	
Primary air 97%	
Position of primary air flap 96%	
Oxygen control 36%	
Secondary air 36%	
Position secondary air flap 38%	
Sensor 1 50°C	

5.6.2 Temperature settings for the Boiler



Setting value	Description
Boiler temperature setpoint 82°C*	Major set point for Boiler Control System. The boiler temperature is continuously controlled to reach and hold this temperature
Shutdown if current boiler temperature is higher than boiler setpoint + 8°C*	If the boiler temperature exceeds the target value by this parameter value, the Boiler Control System switches to "Slumber" mode (on-off control). The combustion will restart if boiler temperature drops below the target temperature again.
Always switch off at maximum boiler setpoint + 3°C	If the boiler temperature exceeds the maximum target value of 90°C (194°F) by this parameter, the Boiler Control System switches to "Slumber" mode (on-off control). To prevent overheat the Thermal Storage System circulator will be forced to cool the boiler. The combustion will restart if boiler temperature drops below the target temperature.
Minimum boiler temperature to release the boiler pump. 65°C	The circulator is released above this boiler temperature. Differential = 2 degrees C. The pump will shut off at 63 degrees C.(Hysteresis 2°C)

*Adjust to desired temperature. Recommend 82° C.

5.7 Menu – Manual

Use this section to verify the proper function of components connected to the digital and analog outputs. This is important before initial start-up. It is also used to activate Lamda probe for proper calibration.

5.7.1 Digital Outputs



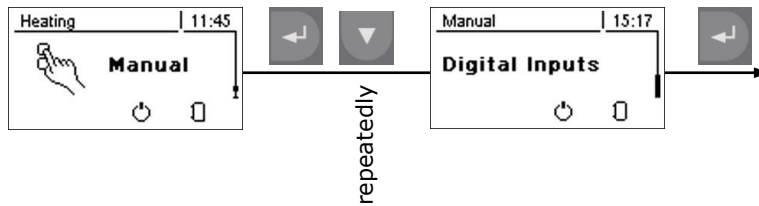
Digital Outputs		Description
Lambda probe heating	A 0	<p>This menu is used to test the digital outputs by service technicians only! The parameters displayed vary depending on the configuration. In Automatic mode the state of the output signal can be supervised:</p> <p>A ... Automatic - A 0 ... Automatic, OFF - A 1 ... Automatic, ON</p> <p>In Manual mode the output signals can be forced ON or OFF:</p> <p>0 ... Manual, OFF 1 ... Manual, ON</p>
Heating circuit pump 0	A 0	
Primary air flap OPEN	A 0	
Primary air flap CLOSE	A 0	
Secondary air flap OPEN	A 0	
Secondary air flap CLOSE	A 0	
Standby relay	A 0	

5.7.2 Analog Outputs



Analog Outputs		Description
Primary air	Actual value: 0% A 0%	<p>This menu is used to test the analog outputs by service technicians only! The parameters displayed vary depending on the configuration.</p> <p>In Automatic mode the state of the output signal can be supervised: A ... Automatic - A 0% ... Automatic, OFF - A 1%-100% ... Automatic, ON at % value</p> <p>In Manual mode the output signals can be forced to an user-defined value: 0% ... Manual, OFF 1%-100% ... Manual, ON at % user-defined value</p> <p>ID Fan = Induced Draft Fan</p> <p>Pump 1 on core module = Thermal Storage System circulator</p> <p>All other pump outputs (circulators): not used</p>
Secondary air	Actual value: 0% A 0%	
ID Fan	Actual value: 0% A 0%	
Pump 1 on core module	A 0%	
Pump 1 at hydraulic module address 0	A 0%	
Pump 2 at hydraulic module address 0	A 0%	
Pump 1 at hydraulic module address 7	A 0%	
Pump 2 at hydraulic module address 7	A 0%	

5.7.3 Digital Inputs

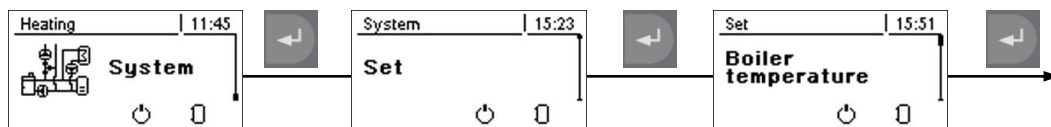


Digital Inputs	Description
Door switch A 0	<p>This menu is used to test the digital inputs by service technicians only! The parameters displayed vary depending on the configuration.</p> <p>In Automatic mode the state of the output signal can be supervised: A ... Automatic - A 0 ... Automatic, OFF - A 1 ... Automatic, ON</p> <p>In Manual mode the output signals can be forced ON or OFF: 0 ... Manual, OFF 1 ... Manual, ON</p> <p>Door switch = Door contact switch Hi-limit stat input (STL Input) = Overheat Thermostat (STL) E-stop input (EMERGENCY OFF input) = Emergency Off Switch Boiler Release Contact: not used</p>
Hi-limit stat input A 0	
E-stop input A 0	
Boiler enable A 0	

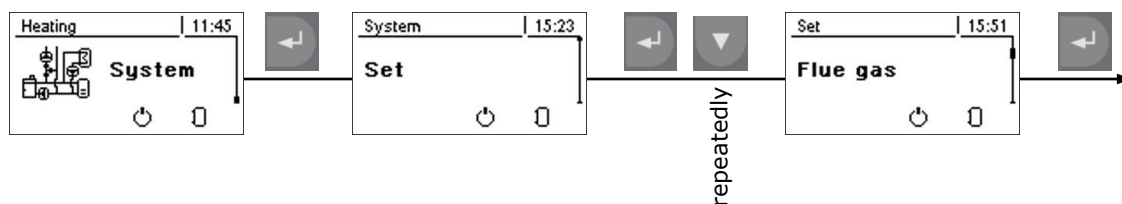
5.8 Menu - System

5.8.1 Adjustable Parameters

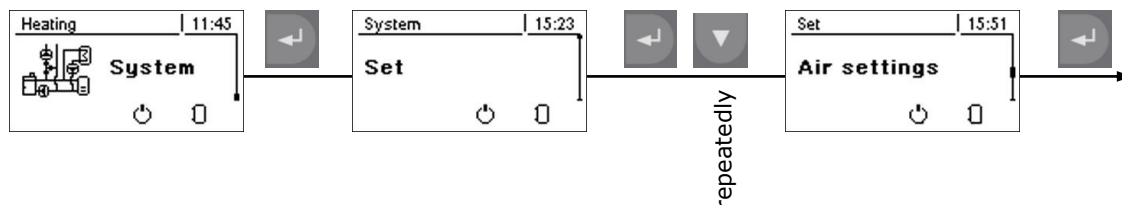
Adjustable Parameters - Boiler Temperature (visible for service purposes only)



Parameter	Description
Boiler temperature setpoint 80°C	Major set point for Boiler Control System. The boiler temperature is continuously controlled to reach and hold this temperature
Shutdown if current boiler temperature is higher than boiler setpoint + 5°C	If the boiler temperature exceeds the target value by this parameter value, the Boiler Control System switches to "Slumber" mode (on-off control). The combustion will restart if boiler temperature drops below the target temperature again.
Always switch off at maximum boiler setpoint + 3°C	If the boiler temperature exceeds the maximum target value of 90°C (194°F) by this parameter, the Boiler Control System switches to "Slumber" mode (on-off control). To prevent overheat the Thermal Storage System circulator will be forced to cool the boiler. The combustion will restart if boiler temperature drops below the target temperature.
Minimum boiler temperature to release all pumps 65°C	The circulator is released above this boiler temperature. (Hysteresis 2°C)

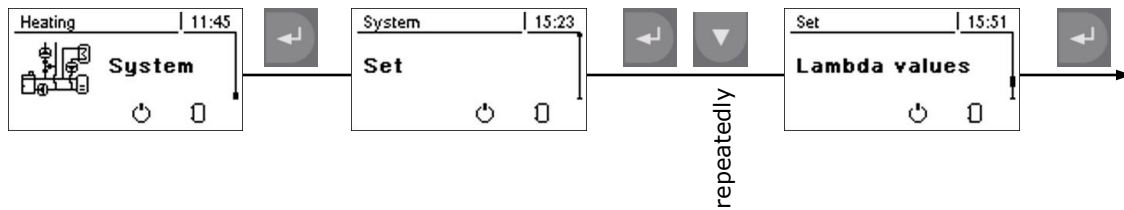
Adjustable Parameters - Flue Gas

Parameter	Description
Maximum heating up time, during which HEATING mode must be reached 10 m	After this time has elapsed, after the start of heating, and the minimum difference between flue gas and boiler temperature has not been reached, the Boiler Control System switches to "Off" mode.
Minimum flue gas temperature 120°C	Min. target value for the flue gas temperature. Lowest load point for continuous operation.
Maximum flue gas temperature 250°C	Max. target value for the flue gas temperature. Highest load point for sufficiently good degree of efficiency.
Start increase of flue gas temperature 20°C	Value, by which the flue gas target temperature is increased when heating up.
Minimum difference between flue gas temperature and boiler 15°C	Starting condition for "Heating" mode.
Flue gas temperature, below which boiler switches to SHUTDOWN status 80°C	If the flue gas temperature is below this value for the duration of the maximum heating up time, the Boiler Control System switches to "Off" mode.

Adjustable Parameters - Air settings

Parameter	Description
Minimum ID fan speed 35%	Adjusting the minimum speed of the Induced Draft Fan
ID fan min 16%	Base point for setting the Induced Draft Fan characteristic line
ID fan max 85%	End point for setting the Induced Draft Fan characteristic line
Minimum primary air 20%	Minimum opening of the primary air damper
In heating minimum secondary air from 10%	Minimum opening of secondary air damper in "Heating" mode
Primary air during slumber 20%	Opening of the primary air damper in "Slumber" mode
Safety time for checking for air leaks 115m*	If the secondary air is 0% and the flue gas temperature is over 100°C this time starts to run. If it is certain that within this time the two values do not change, the error note "Boiler has air leak" will be displayed.

*Change from 90m.

Adjustable Parameters - Lambda values

Parameter	Description
Residual oxygen content setpoint 8.0%	The air dampers are regulated according to this target value.
Residual oxygen content, above which it switches to SHUTDOWN 19.0%	If the residual oxygen content in flue gas exceeds this value during "Heating" mode, and the value "maximum heating up time" (see Adjustable Parameters - Flue Gas) has elapsed, the Boiler Control System switches to "Off" mode.

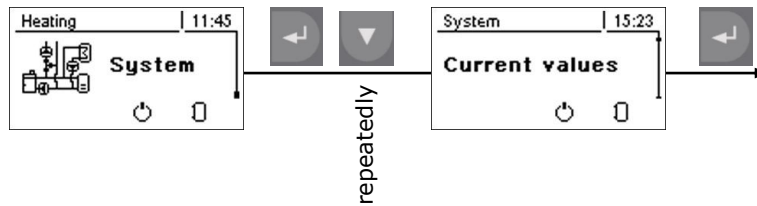
Calibrating the Lambda Probe

Calibrating the Lambda should be performed before initial start-up. Boiler doors must be open and Lambda Probe activated.

➡ See section 5.7.1 for Lambda probe activation

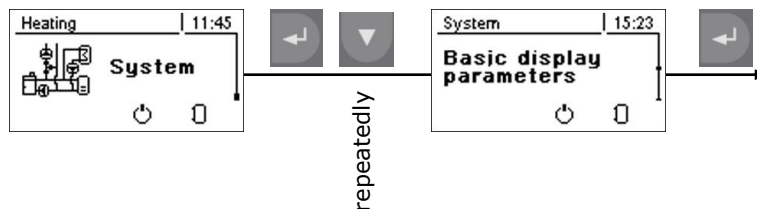
Parameter		Description
Broadband probe heating current	0.00A	Display of the current values for the relevant broadband probe parameter
Broadband probe heating voltage	0.00V	
Broadband probe pump current	0.000m	
Broadband probe internal resistance	0R	
Residual oxygen content	1.9%	
Broadband probe type (1...Bosch/2...NTK) (3...LSM11 input)	1	Defines the probe type used (Must be 1)
Broadband probe calibration (Probe must be at 21% O₂)	NO	After activation of the Lambda probe heating, the lambda probe can be calibrated using this value. CAUTION: The probe must be at 21% O ₂ (air). NOTICE: Only possible at "Door Open" status!

Current system values



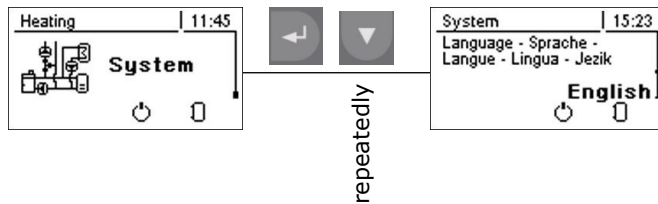
Parameter	Description
Boiler temperature 80°C	Display of the current state values for boiler control system : :
Flue gas temperature 167°C	
Flue gas setpoint 165°C	
Boiler control variable 95%	
ID fan control 90%	
ID fan speed 3240U	
Primary air 97%	
Position of primary air flap 96%	
Residual oxygen content 8.0%	
Oxygen control 36%	
Secondary air 36%	
Position of secondary air flap 38%	
Board temperature 38°C	
Service hours 23h	
Service hours in slumber 2.1h	
Software version Version: 50.04 Build: 04.12	

5.8.2 Basic Display



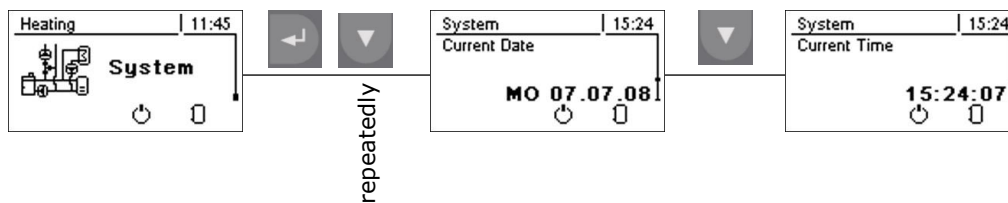
Basic Display	Description
	<p>The display of the two values in positions 1 and 2 within the Basic Display can be adjusted individually, and for each position you can choose from the following parameters:</p> <p><i>Boiler temperature, flue gas temperature, Thermal Storage System top temperature, Thermal Storage System bottom temperature, Thermal Storage System graphic, residual Oxygen, Induced Draft Fan</i></p>

5.8.3 Language settings



☞ **Current menu language can be changed, e.g. to French (User Code "Installer" necessary)**

5.8.4 Time settings



In American configuration Date and Time are used for display purposes only!

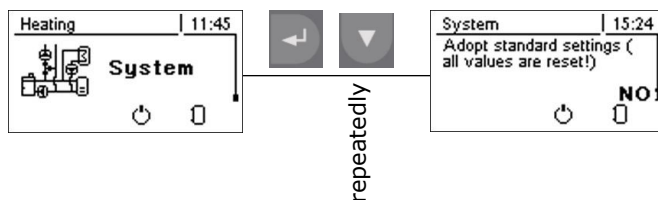
Format of Calendar Date:

Weekday (2 letters) – Day (2 digits) . Month (2 digits) . Year (2 digits)
e.g.: MO 07.07.08 = Monday 07th of July, 2008

Format of Time:

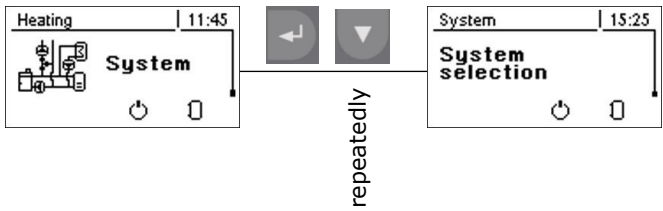
Hour (2 digits, 24-hour-clock) : Minute (2 digits) : Second (2 digits)
e.g.: 15:24:07 = 3:24 pm and 7 seconds

5.8.5 Standard settings



☞ **Adopting manufacturer's standard settings. This resets all settings! (User Code "Installer" necessary)**

5.8.6 System parameters



For changing the current system parameters

Boiler type – Do not change!

..	Boiler type	-	S4 Turbo 15		Lambda probe installed	YES
.			S4 Turbo 22/28		Servo-motors installed	YES
			S4 Turbo 34/40		Ignition installed *)	NO
			S4 Turbo 50/60		Return feed lift pump Installed *	NO
			FHG Turbo 3000 20	Selected	Return feed mixer installed *)	NO
			FHG Turbo 3000 30			
			FHG Turbo 3000 40			
			FHG Turbo 3000 50			
			FHG Turbo 3000 70			
			Pellet boiler P2 - 10			
			:			
			Pellet boiler P2 - 25			
			Pellet boiler P4 - 15			
			:			
			Pellet boiler P4 - 38			
			Turbomatic			
			Turbomatic 28...55			
			Turbomatic 70...110			
			Wood boiler F2 22 / 30			

Do not select
S4 Turbo,
FHG Turbo 3000 70,
Pellet boilers P2,
Pellet boilers P4 or
Turbomatic

* All marked components not used! Adjust parameter to NO!

System selection

..	Syst. selection	-	Hydraulic system 0	☞ Do not select!
.			Hydraulic system 1	
			Hydraulic system 2	
			Hydraulic system 3	
			Hydraulic system for S3 boiler (Next prompt is NO)	☞ Select this System only!
			H3200 Variant 1	☞ Do not select!
			H3200 Variant 2 und 5	
			H3200 Variant 3	
			H3200 Variant 4	

Hydraulic system

..	DHW Tank System	-	DHW tank 01 installed	J/N	☞ Not used! Do not change!
.				:	
			DHW tank 08 installed	J/N	

..	Heating Circuit System	-	Heating circuit 01 installed	J/N	☞ Not used! Do not change!
.			Remote control 01 installed	J/N	
				:	
			Heating circuit 18 installed	J/N	
			Remote control 18 installed	J/N	

..	Solar Panel System	-	Solar collector 01 installed	J/N	☞ Not used! Do not change!
.					