

WARNING:

Improper installation, set-up, modification, operation or maintenance of the heating system can cause personal injury and property damage.

Follow these instructions precisely.

If you require assistance or further information, contact a licensed contractor / gas fitter.

WARNING:

The operating instructions are part of the technical documents that must be handed over to the owner or operator of the heating system. Explain to the owner or operator how to use the heating system using the operating instructions. Make sure that they are familiar with all required information for the safe and proper operation of the heating system.

These instructions are available in English and French.

Please keep these instructions for future reference.

Gas Condensing Stainless Steel Boiler

SSB BOILER

SSB85 | SSB120 | SSB160



BOSCH

Service Manual

6720866940 (2017/11) US



Contents

1	Key to symbols and safety instructions	3	7	Commissioning	.21
1.1	Key to symbols	3	7.1	First operation	.21
1.2	Safety instructions	3	7.2	Inlet Gas Pressure	.21
1.3	General warning	3	7.3	Switching from NG to LPG	.21
			7.4	CO ₂ Setting	.23
2	Product description	4	8	Maintenance schedule & procedures	.24
2.1	Introduction	4	8.1	Gas Leak Inspection	.24
2.2	Proper use	4	8.2	Flue / Combustion air piping inspection	.24
2.3	Start/Stop cycle	5	8.3	Checking for Wiring and connections	.24
			8.4	Burner Head Cleaning	.24
			8.5	Cleaning the Heat Exchanger	.26
			8.6	Cleaning the Ignition Electrode	.28
			8.7	Inspection, replacement and features of supply, return and flue NTC temperature sensors	.28
3	Boiler components	6	9	Electrical supply	.29
			9.1	Electrical supply wiring	.29
4	Main components	7	9.2	Access to the electrical terminal strip	.29
4.1	Burner head	8	9.3	Main electrical supply	.30
4.2	Heat exchanger	8	9.4	Room thermostat connection	.30
4.3	Combustion chamber	8	9.5	DHW tank sensor connection	.30
4.4	Ignition electrode	8	9.6	Outdoor temperature sensor	.30
4.5	Low Water Cut Off (LWCO)	9	9.7	Supplementary circulating pump relay	.30
4.6	Supply and return temperature sensors	9	9.8	Electrical wiring diagram	.31
4.7	Manual reset high limit	9	9.9	Lockout errors list	.32
4.8	Flue temperature sensor	10	9.10	Blocking errors list	.33
4.9	Fan	10	9.11	Errors not shown on display	.35
4.10	Gas valve	10			
4.11	Venturi	10	10	Spare parts	.36
4.12	Condensate trap	11			
4.13	Flue pressure switch	11			
4.14	Pressure relief valve	12			
5	Control Panel (LCD Display)	13			
5.1	LCD Display description	13			
5.2	Date and time setting	13			
5.3	Setting Central Heating CH and DHW setpoint	14			
5.4	Boiler information	14			
5.5	Outdoor reset (Climatic compensation)	15			
5.6	Parameters list	15			
6	Parameters description	17			
6.1	Central Heating (CH)	17			
6.2	Domestic Hot Water	18			
6.3	Pump mode and connections	20			

1 Key to symbols and safety instructions

1.1 Key to symbols

Warnings



Warnings in this document are identified by a warning triangle printed against a grey background.
Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.
- **NOTICE** is used to address practices not related to personal injury.

Important information



This symbol indicates important information where there is no risk to people or property.

1.2 Safety instructions

Observe these instructions for your safety.

The burner and control must be correctly installed and adjusted to ensure safe and economical operation of the gas boiler.

Read this installation and maintenance manual carefully and note the details on the boiler nameplate before placing the boiler in operation.

Risk of fatal injury from explosion of flammable gases

If you smell gas there is a danger of explosion.

- ▶ Never work on gas lines unless you are licensed contractor / gas fitter.
- ▶ Make sure that a licensed contractor / gas fitter installs the boiler, connects gas and vent, places the boiler in operation, connects the electrical power, and maintains and repairs the boiler.
- ▶ No open flame! No smoking! Do not use lighters.
- ▶ Prevent spark formation. Do not operate electrical switches, including telephones, plugs or door bells.
- ▶ Close main gas valve.
- ▶ Open doors and windows.
- ▶ Warn other occupants of the building, but do not use door bells.
- ▶ Call gas company from outside the building.
- ▶ If gas can be heard escaping, leave the building immediately, prevent other people from entering, notify police and fire departments from outside the building

Risk to life from electrical shock.

- ▶ Disconnect the power supply to the boiler heating system before conducting any work on it, e.g. turn off the heating system emergency switch outside the boiler room.
- ▶ It is not sufficient just to turn off the control.
- ▶ Do not carry out electrical work unless you are qualified for this type of work.
- ▶ Before servicing disconnect electrical power and lock out to prevent accidental reconnection.
- ▶ Observe and follow the local, state and federal installation regulations.

Risk of fatal injury from flue gas poisoning

Insufficient ventilation or combustion air availability may cause dangerous flue gas leaks or formation.

- ▶ Make sure that inlets and outlets are not reduced in size or closed.
- ▶ If faults are not corrected immediately, the boiler must not be operated until all faults have been corrected.
- ▶ Inform the system operator and/or owner of the fault and the danger in writing.
- ▶ When working on the flue gas venting leakage of flue gases may endanger the lives of people.
- ▶ Use only original parts when replacing vent system parts.

Risk to life by poisoning by spillage of flue gases

- ▶ If the blocked vent switch trips frequently the fault must be corrected and proper operation of the blocked vent switch test must be conducted.

Risk of fatal injury from neglecting your own safety in case of emergency, such as with a fire

- ▶ Never put yourself at risk. Your own safety must always take priority.

Fire danger due to flammable materials or liquids

- ▶ Make sure that there are no flammable materials or liquids in the immediate vicinity of the boiler.

Installation and maintenance

- ▶ Observe all current standards and guidelines applicable to the installation and operation of the boiler heating system as applicable in your state or local jurisdiction.
- ▶ Clean and service the boiler system once a year. Check that the complete heating system operates correctly.
- ▶ Immediately correct all faults to prevent system damage.
- ▶ Only use original Bosch spare parts. Losses caused by the use of parts not supplied by Bosch are excluded from the Bosch warranty.

1.3 General warning

The installation of the unit must comply with all local, state and federal applicable codes and regulation or, in absence of local codes in conformity with ANSI Z223.1 / NFPA 54 for gas-fired boilers and ANSI/NFPA 58 for LP gas-fired boilers. The equipment shall be installed in accordance with the current Installation Code for Gas Burning Appliances and Equipment, CSA B149.1 Canada. Authorities having jurisdiction and local inspection agencies must be informed before installation starts.

Where required by local, state and federal regulations, the system must comply with the American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers (ASME CSD-1). The hot water distribution system must comply with all applicable codes and regulations. When replacing an existing boiler, it is important to check the condition of the entire hot water distribution system to ensure safe operation. Valves external to the boiler must be fitted with T-handles and condensate piping must be installed in accordance with the State Plumbing Code.

NOTICE:

- ▶ This boiler must be installed by a licensed contractor/ gas fitter. Failure to do so shall void the product warranty.
- ▶ The boiler is intended only for the use for which it was specifically designed and built. Bosch is hereby excluded from any liability for damages caused to persons, animals or property resulting from installation errors, improper adjustment, maintenance or use.
- ▶ In order to ensure safety and correct operation, the installation shall always take place in full compliance with the applicable Codes and following with the instructions provided by the manufacturer, and must always be carried out by a licensed contractor / gas fitter only.
- ▶ The equipment must be installed in appropriate place and in combination with appropriate systems as specified by code.
- ▶ The unit may be exposed to temperatures between 5° F (-15°C) and 150°F (65°C) in its original packaging. Do not expose the unit to weather without the protection of the original packaging until the boiler has been properly installed. Until then there is no frost protection for the boiler.
- ▶ After removing the packaging check the integrity and completeness of delivery and in case of non-compliance, contact your dealer.
- ▶ If there is a water loss, disconnect the boiler from the main power supply, close the water supply and immediately call technical assistance or installer/local contractor.
- ▶ Periodically check that the condensate drain is free from obstruction.
- ▶ Periodically check the system pressure. System pressure should be checked when the system is in standby mode and no call for heat is present.
- ▶ Maintenance is mandatory and shall be carried out at least once a year.
- ▶ This manual shall be read carefully, in order to install and operate the boiler appropriately, and safely.
- ▶ Boiler installations, settings and service should only be performed by experienced licensed contractor / gas fitter. End Users should only make adjustments with the assistance of a licensed contractor / gas fitter.
- ▶ Any maintenance operation or service before disconnecting the boiler from the main power supply is forbidden.
- ▶ Do not remove or modify safety equipment.
- ▶ Do not pull or twist the electrical wires, from the boiler, even if the device is disconnected from the main power supply.
- ▶ Do not obstruct or reduce the ventilation openings.
- ▶ Do not put the unit outdoors.
- ▶ Do not leave any combustibles or containers of flammable substances in the room where the boiler is installed.
- ▶ Do not dump the packing material. Keep out of reach of children the packing material because it can be potentially dangerous. It must be disposed of as required by law.
- ▶ The opening of metal casing of the device and removing of the cover are prohibited to the end user. Any service on the boiler must be carried out by qualified technician.
- ▶ Dispose of equipment in accordance with local codes, and in a environmentally responsible manner.

2 Product description**2.1 Introduction**

- The gas-fired condensing SSB boilers are designed to be used in central heating systems. Any other use is prohibited.
- This boiler can be connected to an indirect storage tank for the production of domestic hot water.
- There are several options for venting including single pipe, two pipe and concentric. See section "4.7 Venting and air piping system" for details.
- The quality of the system water is very important. Poor water quality can damage heating systems and boilers due to scale formation and corrosion (see water quality section).
- The boilers can also function directly with any hydronic emitter. When installing the boiler and system connections, the installer must consider the total head loss and flow rates in order to adequately size piping and circulator pumps.
- The SSB boiler can be connected to a room thermostat.
- An outdoor air temperature sensor must also be connected to the boiler for an outdoor reset supply temperature control for increased fuel efficiency and comfort.

2.2 Proper use

- ▶ The SSB Boilers are designed for residential, and light commercial applications.
- ▶ The appliance may only be installed in closed loop hot water central heating systems.
- ▶ Any other purpose is considered improper use. Any resulting damage is excluded from the manufacturer's warranty.
- ▶ In some heating applications like pool, spa snow melt or process water heating a heat exchanger must to be installed.

2.3 Start/Stop cycle

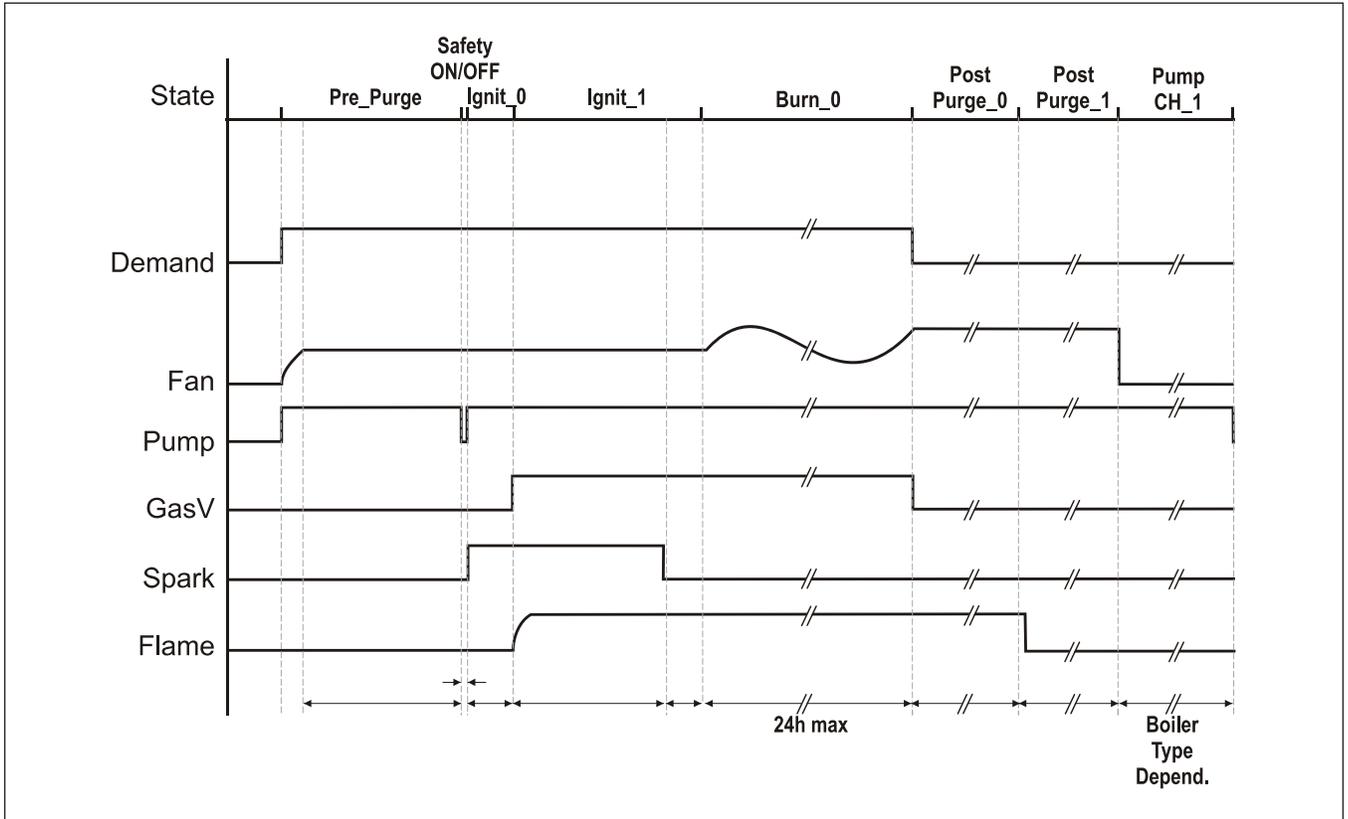


Fig. 1 Burner ignition cycle diagram

False flame detection	If flame is detected at the end of the pre-spark period (Ignit_0) a lockout error occurs (This lockout has a maximum of 3 auto resets).
Re-ignition	If at the end of the safety period no flame is detected the control will go to post-purge to remove the unburned gas. After this a re-ignition attempt is started following the same cycle. The number of re-ignition attempts is limited to Max_Ignit_Trials after which a lockout occurs.
Intermittent operation	The burner can only be ON continuously for a period of 24 hours. After this the burner is switched OFF and a restart sequence follows.
Flame establishing time	Sparking stops Spark_Before_End_Of_Safety_Period seconds before the end of the Ignit_1 period to allow for ionization detection.
Flame out too late	If after Max_Post_Purge_0 time flame is still detected a lockout follows.
Safety relay test	In Safety ON/OFF state the correct working of the safety relay is proven.
Demand	Once the ignition sequence is started it will be finished*. Even if the demand is taken away during the ignition sequence the sequence up to the burn state is ended. If during Burn_0 state the demand is taken away, a Post_Purge_Period follows at Post_Purge_Speed speed.

Tab. 1

3 Boiler components



Fig. 2 Boiler components

- [1] Pressure differential switch
- [2] Fan
- [3] Burner head
- [4] Spark electrode
- [5] Circulation pump
- [6] Condensate trap
- [7] Return temperature probe

- [8] Heat exchanger
- [9] Main controller
- [10] Automatic air vent
- [11] High limit temp. safety switch
- [12] Supply temperature probe
- [13] Gas valve
- [14] Low water cut off probe

4 Main components

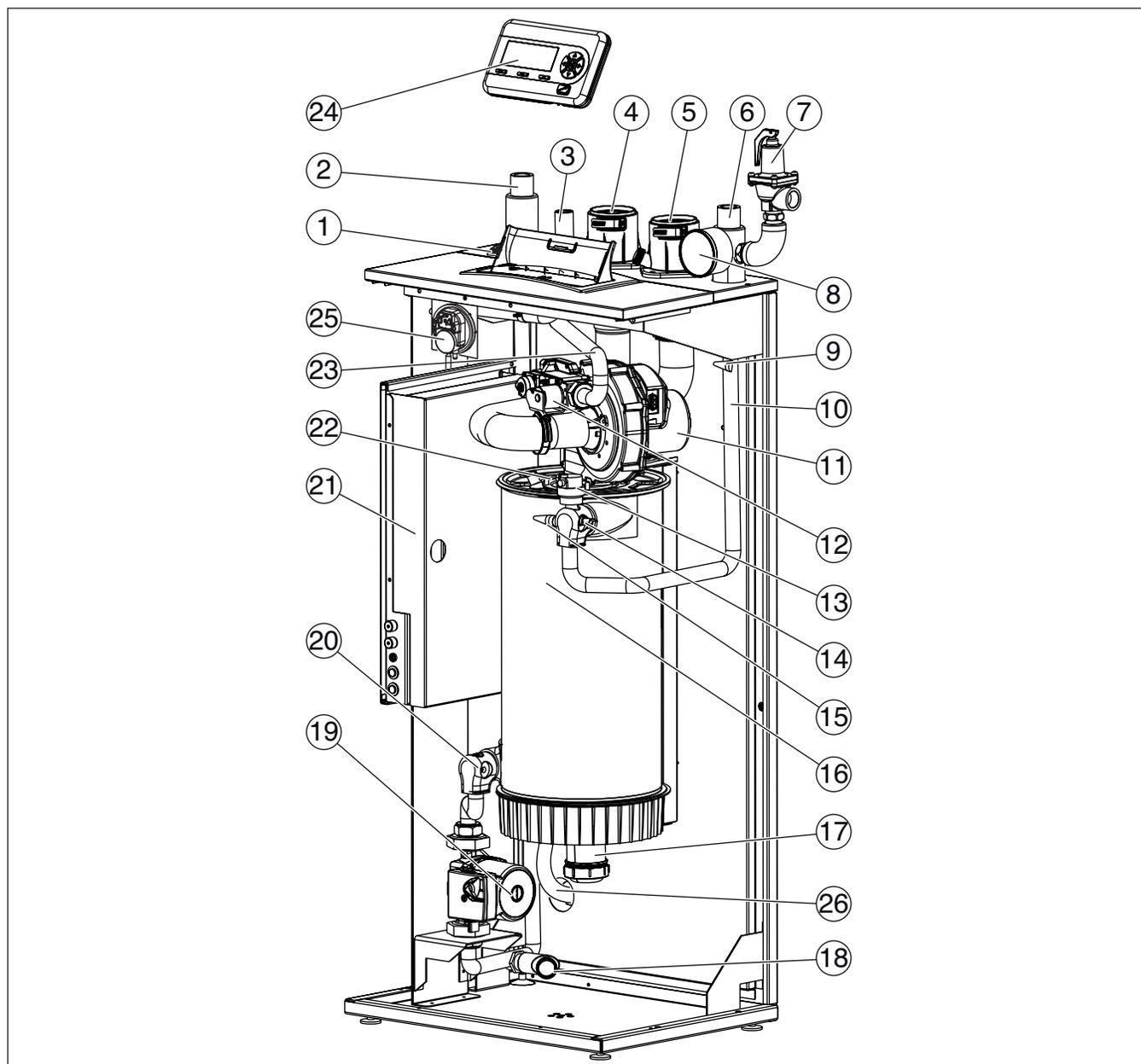


Fig. 3 Main components

- | | |
|---------------------------------|-------------------------------------|
| [1] Main power switch | [15] High limit temp. safety switch |
| [2] System return | [16] Heat exchanger |
| [3] Gas inlet | [17] Condensate trap |
| [4] Flue exhaust | [18] Low point drain valve |
| [5] Intake air | [19] Circulation pump |
| [6] System supply | [20] Return temperature probe |
| [7] Pressure Relief Valve | [21] Wiring Control Panel |
| [8] Tridicator | [22] Spark electrode |
| [9] Low water cut off probe | [23] Gas pipe |
| [10] Heat exchanger supply pipe | [24] Removable display |
| [11] Fan | [25] Pressure differential switch |
| [12] Gas valve | [26] Condensate discharge pipe |
| [13] Automatic air vent | |
| [14] Supply temperature probe | |

4.1 Burner head

The burner head (Fig. 4) is made of stainless steel, it supports a micro premix flame. The burner can be accessed by removing the larger four fan motor mounting nuts. (Fig. 5 - Fig. 6).



Fig. 4 Burner head



Fig. 5 Heat exchanger (fan motor removed - note location of green burner gasket)



Fig. 6 Burner head

4.2 Heat exchanger

The heat exchanger (Fig. 7) is a single coil design made of stainless steel.



Fig. 7 Heat exchanger & Burner cross-sectional view

4.3 Combustion chamber

The cylindrical combustion chamber (Fig. 7) has a top and bottom steel ring-bands that are removable for heat exchanger servicing.

4.4 Ignition electrode

The ignition electrode (Fig. 8) is a component inserted in the burner flange on the head of heat exchanger. It has 2 functions: ignition and flame detection.

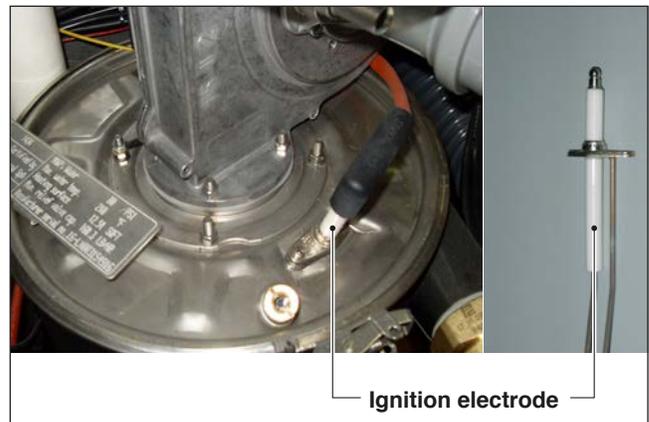


Fig. 8 Ignition electrode

4.5 Low Water Cut Off (LWCO)

The Low Water Cut off (LWCO) is installed on the supply pipe, at the highest position available. Using a dedicated wet sensor it checks the minimum level of water inside the boiler by way of an electrical signal ground. The electronic control board is located in the primary electrical enclosure. It includes a self-test and a manual reset button (Fig. 9) To check the functionality of LWCO, press the test button. The LED turns ON and the boiler will display the error "Low water cut off". At this point press the red reset button located just below the Test button. The LED will turn off and the error should clear from the boiler display.

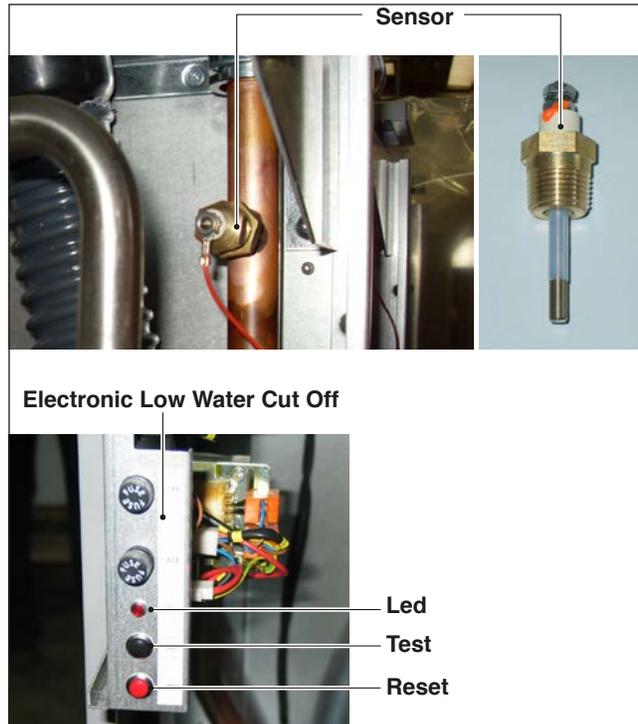


Fig. 9 FLow Water Cut Off (LWCO)

4.6 Supply and return temperature sensors

The supply (Fig. 10) and return (Fig. 11) temperature sensors are immersion type NTC's rated 10K Ω at 25°C(77°F).

See Tab. 12 for resistance values for NTC sensor.

The supply sensor is located at the outlet of the heat exchanger the return temperature sensor is located at the inlet of the heat exchanger.

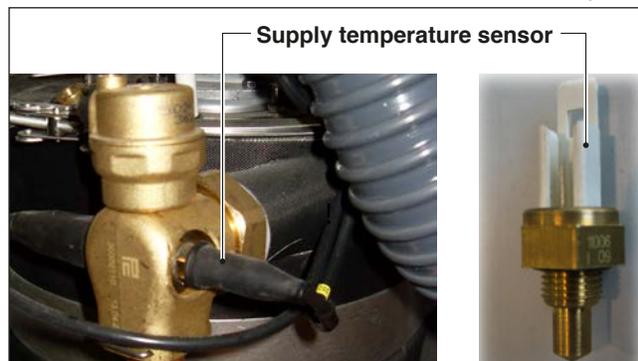


Fig. 10 Supply temperature sensors

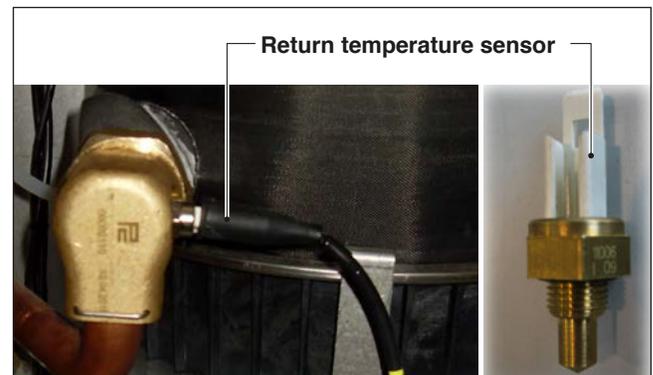


Fig. 11 Return temperature probes

4.7 Manual reset high limit

The safety thermostat (Fig. 12) is located near the supply sensor. It's an automatic reset type set at 194°F. Above this temperature the contact opens removing power to the gas valve. The display shows the "over-temperature" error code requiring manual reset. To test the functionality of the sensor hold for 10 sec both "Ok" & "Menu" buttons on display. It will appear the "High limit T max" error message. At this point press the reset button to restart the boiler.

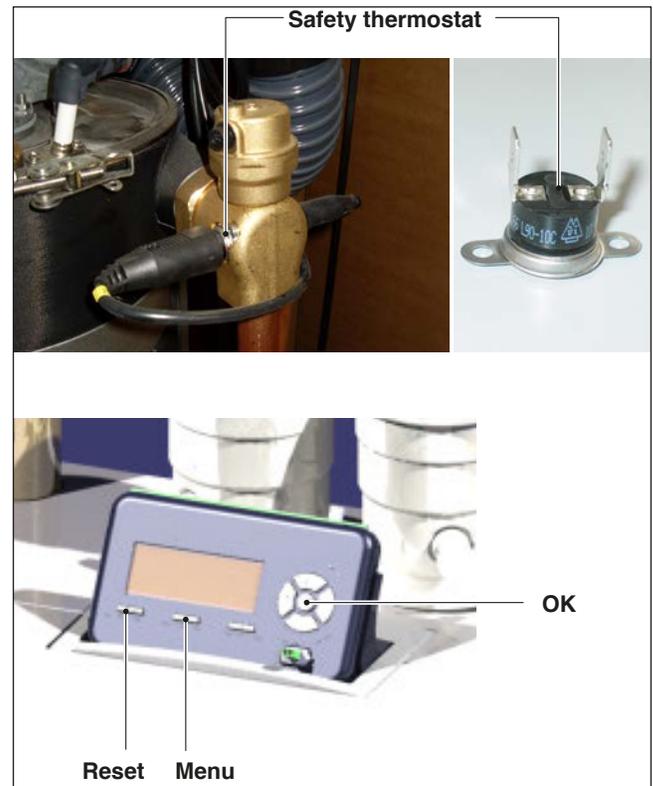


Fig. 12 Manual reset High Limit Safety Thermostat

4.8 Flue temperature sensor

The flue temperature sensor (Fig. 13) is located on the bottom of the heat exchanger. It's an immersion type NTC sensor rated at 10KΩ @ 77°F. It prevents flue gas temperatures in excess of 100°C (212°F).

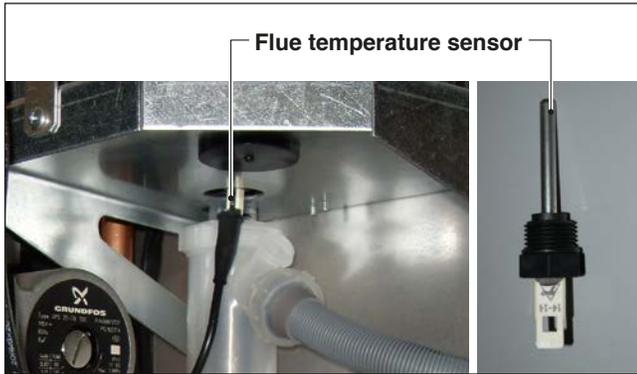


Fig. 13 Flue temperature sensor

4.9 Fan

The fan (Fig. 14) is located on the top of combustion chamber and fastened to the burner head. The fan has an integrated PWM speed control.



Fig. 14 Fan

4.10 Gas valve

The proportional gas valve (Fig. 15 - Fig. 16) is located above the fan and it's connected to the Venturi. The gas valve has 2 safety solenoid valves. The gas valve regulates the air/fuel ratio on the basis of combustion air delivery (the air/fuel ratio is 1:1).

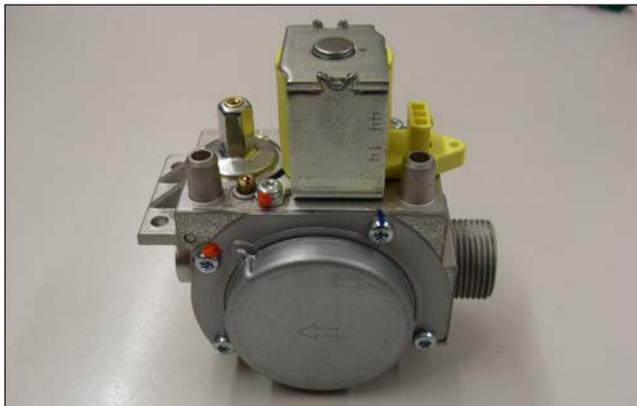


Fig. 15 Gas valve SSB85 - SSB120

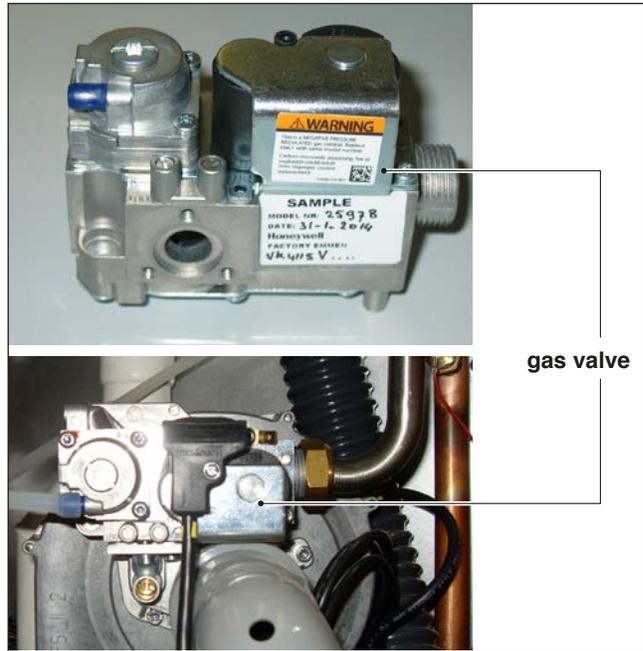


Fig. 16 Gas valve SSB160

4.11 Venturi

The Venturi (Fig. 17 - Fig. 18) is integrated in the fan for all models. Its function is to mix the air and fuel.

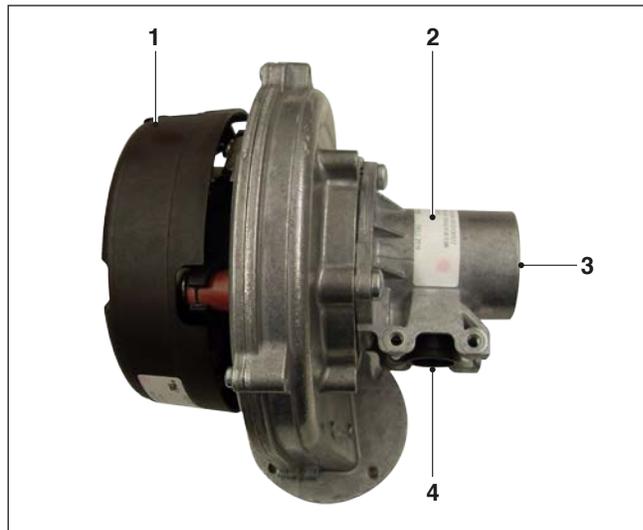


Fig. 17 Venturi SSB85 - SSB120

Component
[1] Fan
[2] Venturi
[3] Air inlet
[4] Gas inlet

Tab. 2 Venturi SSB85 - SSB120

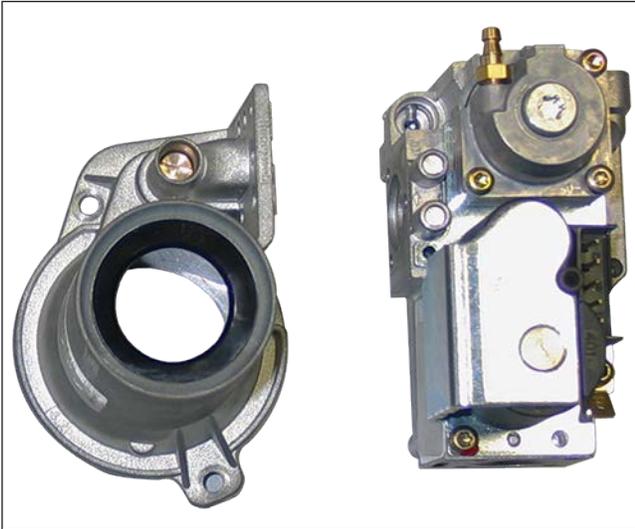


Fig. 18 Venturi SSB160

4.12 Condensate trap

The trap (Fig. 19) drains condensate discharged from the heat exchanger and flue pipe.



Fig. 19 Condensate trap

4.13 Flue pressure switch

Flue pressure switch is a safety device designed to turn off the burner in case of block vent (for example due to obstruction of condensate drain). The silicon pipe is connected on one end to the "+" port of pressure switch (Fig. 20), and on the other end to the bottom of the heat exchanger (Fig. 21).

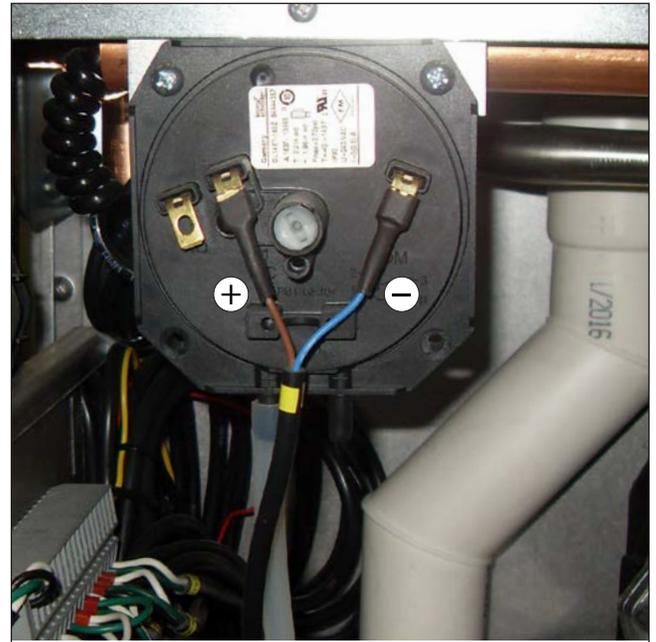


Fig. 20 Flue pressure switch

Inch W.C.	mbar
1.4	3,5

Tab. 3 Flue gas pressure switch setpoint value

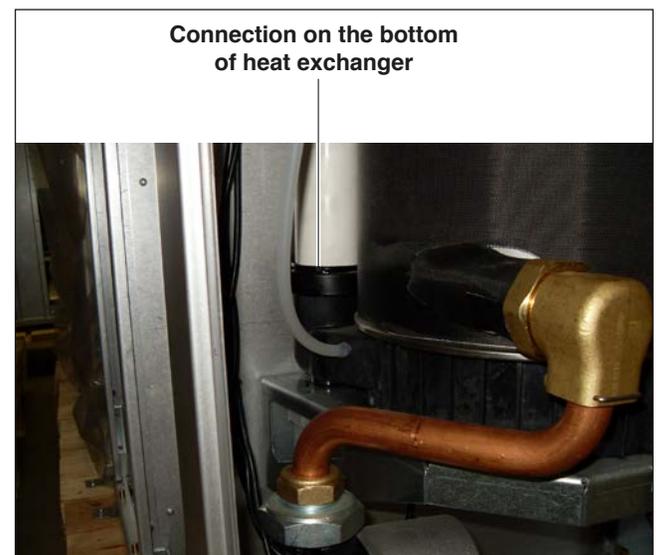


Fig. 21 Flue pressure switch

4.14 Pressure relief valve

The boiler is protected by a relief valve against overpressure. The 3/4" discharge outlet must be piped per local code requirements.

Boiler model	Pressure value
SSB85	30 psi (2,07 bar)
SSB120	30 psi (2,07 bar)
SSB160	30 psi (2,07 bar)

Tab. 4 Max. Setpoint values of relief valve



Fig. 22 Pressure relief valve (pipe connection from boiler supply to relief valve is field supplied and does not come with the boiler).

5 Control Panel (LCD Display)

The homepage on the display shows the basic status of the boiler.

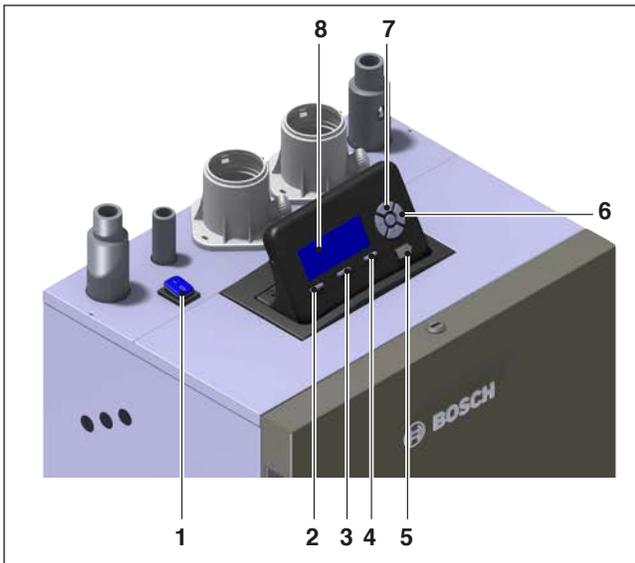


Fig. 23 Control Panel

No.	Description
[1]	ON/OFF button
[2]	Reset button
[3]	Menu button
[4]	ESC button
[5]	PC service connection
[6]	OK button
[7]	Up/Down/Right/Left button
[8]	Display

Tab. 5 Control panel description

5.1 LCD Display description

Switch the appliance ON using the ON/OFF switch. The display will appear as follow:

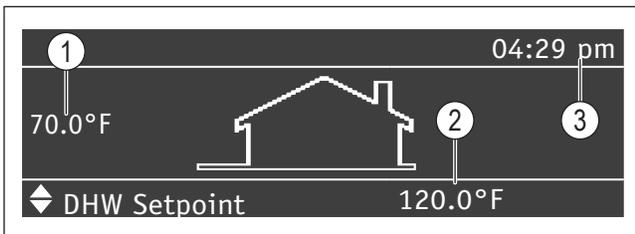


Fig. 24

On the left of the display is shown the external temperature (1) is shown (if the outdoor sensor is connected). On the right the set setpoint value is shown. The top right corner shows the time (3).

5.2 Date and time setting

Press the "menu" button and select "Settings" using the arrow buttons ▲ / ▼ to select "Settings".

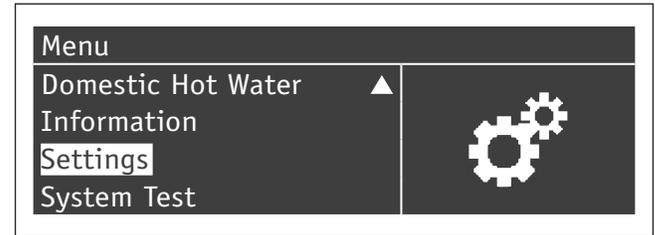


Fig. 25

Press the "OK" button and select "General Settings" using the arrow buttons (▲/▼).



Fig. 26

Press the "OK" button, select "Date & Time" using the arrow buttons (▲ / ▼).

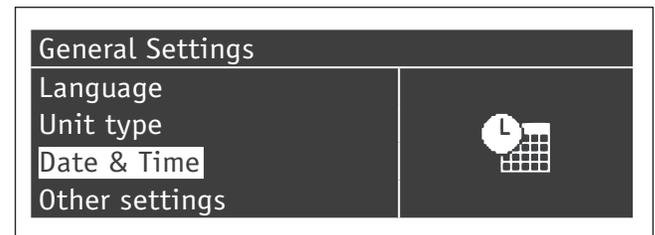


Fig. 27

Press "OK". The display will show the following information:

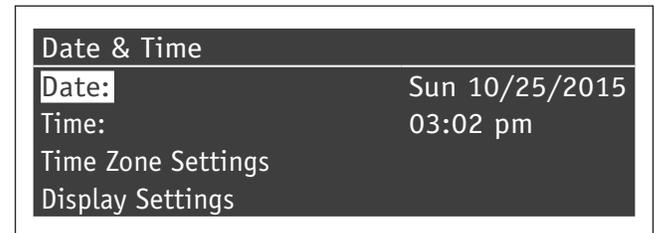


Fig. 28

Press the "OK" to highlight the values. Values can be modified using the "UP"/"DOWN" keys button "▲/▼".

When finished press "OK" to save the changes.

Entering the "Time Zone Settings" menu it is possible to set the time zone parameter as shown on the following figure:

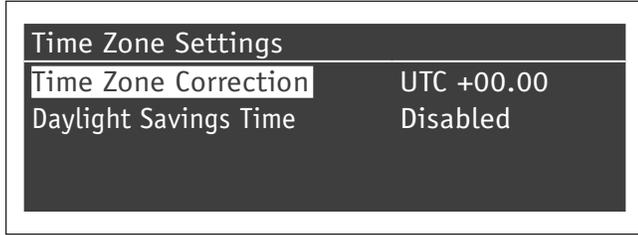


Fig. 29

To modify the visualization of the date and time value, entering in the "Display Settings" menu it is possible to change the following features:

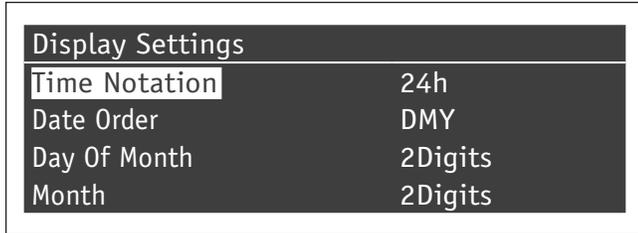


Fig. 30

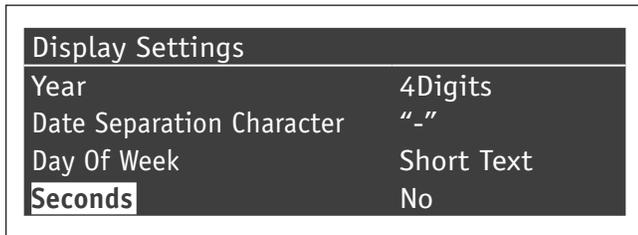


Fig. 31

5.3 Setting Central Heating CH and DHW setpoint

To change the Central Heating (CH) and DHW setpoint through menu screen, press "menu" select use UP/DOWN "▲/▼" arrows to choose the parameter and select by pressing the "OK". Once selected, use the right "▶" arrow key to highlight the temperature and use the UP/DOWN arrow to change selected temperature. Press "OK" to confirm/save new temperature.

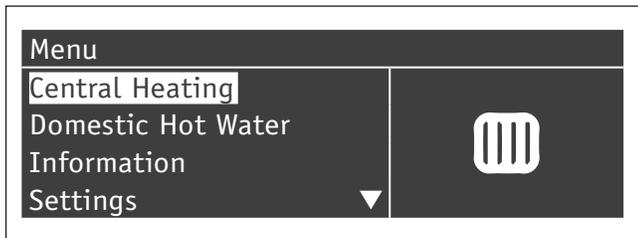


Fig. 32

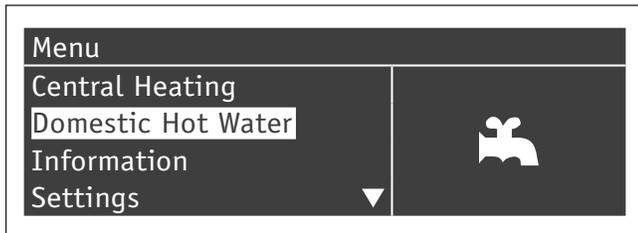


Fig. 33

CH and the DHW setpoint can be edit directly from the homepage of the display.

When the text on the bottom left side is "CH Setpoint" press the right "▶" button. The value shown in the bottom right side will be highlighted; using the "UP/DOWN" keys it is possible to change the value. Once assigned the desired value press the right "▶" button. The new value will be stored.

To change the DHW setpoint press the "UP/DOWN" buttons. The text in the bottom left side will change to "DHW Setpoint". Now it is possible to change the DHW setpoint using the same procedure which we described before.

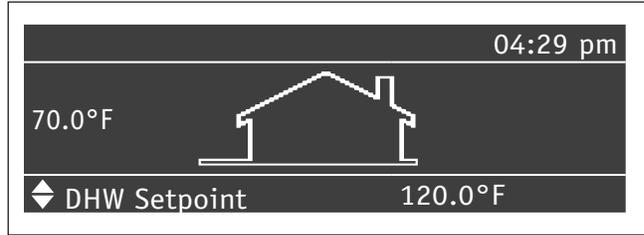


Fig. 34



CH setpoint cannot be changed when outdoor reset function is enabled. DWH setpoint can only be changed, when the DHW function is enabled (see parameter #35 within Boiler Settings).

5.4 Boiler information

To access the main information about the boiler press "menu" button and select "Information" using the "UP/DOWN" keys "▲/▼".

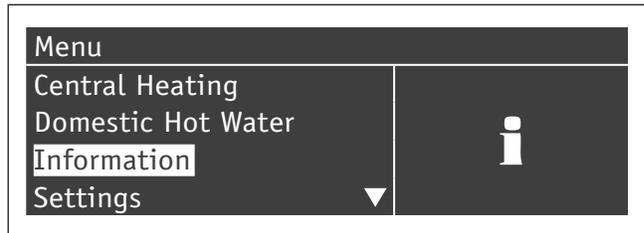


Fig. 35

Press "OK" and display will show:



Fig. 36

Press "OK" and the display will show the following information:

- Supply Temperature
- Return Temperature
- DHW Temperature [Sensor must be connected to show a value. If not, the default value will appear]
- Outside Temperature
- Flue Temperature [Sensor must be connected to show a value. If not, the default value of 14°F will appear]
- System Temperature [Sensor must be connected to show a value. If not, the default value will appear]
- Fan Speed
- Ionization
- State
- Error

The display shows four lines at a time:

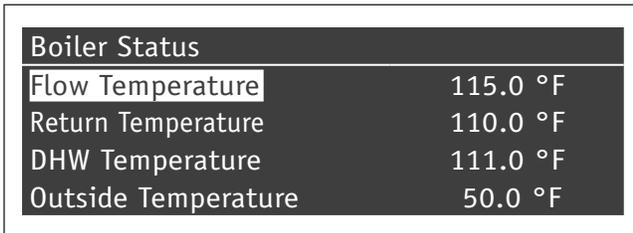


Fig. 37

To scroll the screen use the "UP/DOWN" keys "▲▼".

5.5 Outdoor reset (Climatic compensation)

To set the outdoor reset curve enter "Central Heating (CH)" menu and press "OK".

The display will appear as follow:

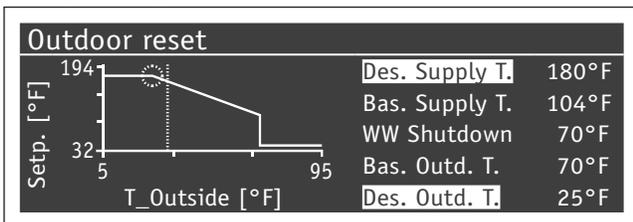


Fig. 38

"Des. Supply T" and "Des. Outd T" will be highlighted, to change either value press "OK".

- Use UP/DOWN arrows to change the "Des. Supply T". Use the LEFT/RIGHT arrows to change the "Des Outd. T"
- Press "OK" to save changes
- Use the LEFT/RIGHT arrows to select the other values

Repeat steps to make additional changes

Once set the parameters press "ESC" to exit the menu.

5.6 Parameters list

To have access to the parameter list press "menu" button and select "Settings" using the "UP/DOWN" keys "▲▼".

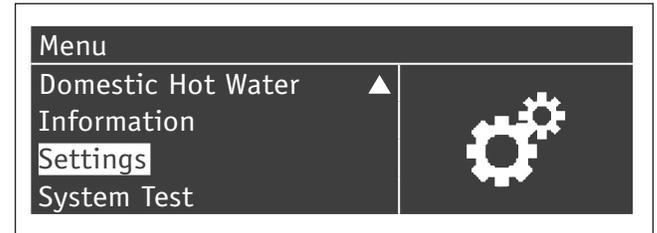


Fig. 39

Press the "OK" button and select "Boiler Settings" using the "UP/DOWN" keys "▲▼".

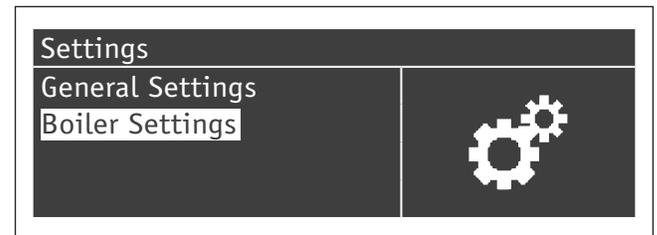


Fig. 40

Press the "OK" button. At this point a password is requested [Password is required for boiler settings only]:



Fig. 41

Enter one digit at a time using the UP/DOWN" keys "▲▼" to increase/decrease the value. When the value is correct then press "OK".

In the system there is a password for the two levels:

- Level 1 USER: no password needed (0000)
- Level 2 INSTALLER: password "0300"

Below is a list of parameters:

Number	Description	Unit	Default	Min	Max	Step
3	CH Setpoint	°C / °F	176 °F	68 °F	194 °F	0.9 °F
19	Design Supply Temp	°C / °F	176 °F	68 °F	194 °F	1.8 °F
21	Baseline Supply Temp	°C / °F	104 °F	68 °F	194 °F	1.8 °F
48	DHW/Tank Setpoint	°C / °F	120.2 °F	104 °F	140 °F	0.9 °F
64	Preheat Mode	-	Comfort	Eco	Comfort	-
72	Permit emergency mode	-	Yes	No	Yes	-

Tab. 6 Level 1 parameters (USER)

Number	Description	Unit	Default	Min	Max	Step
1	Central Heating (CH) Mode	-	1	0	5	1
2	Pump Mode	-	0	0	4	1
4	System Pump Overrun	Seconds	300	0	900	10
5	Boiler Pump Overrun	Seconds	300	0	900	10
7	CH Hysteresis	°C / °F	5.4 °F	0	36 °F	0.9 °F
9	Anti Cycle Period	Seconds	180	10	900	10
10	Anti Cycle Temp Diff	°C / °F	12.6 °F	0 °F	36 °F	0.9 °F
11	Ramp Delay Step Mod.	On / Off	Disabled			
14	Max Power CH	%	100	50	100	1
15	Min Power CH/DHW	%	1	1	30	1
20	Design Outdoor Temp	°C / °F	24.8 °F	-13 °F	77 °F	1.8 °F
22	Baseline Outdoor Temp	°C / °F	69.8 °F	35.6 °F	86 °F	1.8 °F
23	Design Supply Min Limit	°C / °F	68 °F	39.2 °F	179.6 °F	1.8 °F
24	Design Supply Max Limit	°C / °F	194 °F	80.6 °F	194 °F	1.8 °F
25	Warm Weather Shutdn	°C / °F	69.8 °F	35.6 °F	95 °F	1.8 °F
26	Boost Temp Increment	°C / °F	0 °F	0 °F	54 °F	0.9 °F
27	Boost Time Delay	Minutes	20	1	120	1
28	Night Setback Temp.	°C / °F	18 °F	0 °F	90 °F	0.9 °F
29	Weather Setpoint	°C / °F	68 °F	32 °F	122 °F	0.9 °F
35	DHW Mode	-	0	0	2	1
36	DHW Tank Hyst. Down	°C / °F	7.2 °F	0 °F	36 °F	0.9 °F
37	DHW Tank Hyst. Up	°C / °F	0 °F	0 °F	36 °F	1.8 °F
38	DHW Tank Supply Extra	°C / °F	54 °F	0 °F	54 °F	0.9 °F
42	DHW Priority	-	0	0	2	1
43	DHW Max Priority Time	Minutes	30	1	255	1
44	DHW Pump Overrun	Seconds	15	0	255	1
73	Boiler Address	-	0	0	16	1
74	Emergency Setpoint	°C / °F	113 °F	68 °F	149 °F	0.9 °F
75	Delay Per Start Next Dep.	Seconds	15	5	300	5
76	Delay Per Stop Next Dep.	Seconds	15	5	300	5
77	Hyst Down Start Boiler	°C / °F	9 °F	0 °F	36 °F	0.9 °F
78	Hyst Up Stop Boiler	°C / °F	3.6 °F	0 °F	36 °F	0.9 °F
79	Max Setp Offset Down	°C / °F	7.2 °F	0 °F	36 °F	0.9 °F
80	Max Setp Offset Up	°C / °F	18 °F	0 °F	36 °F	0.9 °F
81	Start Mod Delay Fact	Minutes	5	0	60	1
82	Next Boiler Start Rate	%	80	10	100	1
83	Next Boiler Stop Rate	%	30	10	100	1
84	Boiler Rotation Interval	Days	1	0	30	1
85	DHW Boiler Assign	-	0	0	16	1

Tab. 7 Level 2 parameters (INSTALLER)

(*) Depend on appliance type

(**) The value for this parameter is:

- 4 for SSB160
- 5 for SSB120
- 6 for SSB85

6 Parameters description

6.1 Central Heating (CH)

Par.1 CH_Mode

CH_Mode=0 Request for Heat from Room Thermostat or a zone relay end-switch.

If the room thermostat closes, the "Main" and "CH" pump contacts on the boiler are energized. If the supply temperature drops **CH_Hysteresis** (boiler settings parameter #7) below the **CH_Setpoint** the burner is switched ON. If the room thermostat opens, the burner is switched OFF and the CH and general pumps run ON for a time equal to **CH_Post_Pump_Period** (boiler settings parameter #4 and #5).

Anti-cycling time

(Also applicable to all other CH Modes) When the burner is switched OFF because the supply temperature reaches **CH_Setpoint + CH_Hysteresis**, the control will wait a period of time, **Anti_Cycle_Period** (180 sec. settable), before it is allowed to be switched ON again. This function is to prevent short cycling of the burner.

However when during the anti-cycle wait time the differential between setpoint and supply temperature may become greater than **Anti_Cycle_T_Diff**, anti-cycle will be aborted and the burner is allowed to start.

Maximum CH power

(Also applicable to all other CH Modes)

The maximum burner power during CH operation can be limited with parameter **P_CH_Max**.

Minimum CH and DHW power

(Also applicable to all other CH and DHW Modes)

The minimum burner power during operation can be limited with parameter **P_Min**.

CH_Mode=1 Request for Heat with Outdoor Sensor and Room thermostat.

If the parameter **CH_Mode** is set to 1 "Outdoor temperature reset with room thermostat" mode is selected. This mode will only function when an outdoor temperature sensor is connected, but default setting can be customer specific for production series. If the outdoor sensor is connected the boiler automatically uses the Max Supply Temp.

The setpoint is calculated depending on the outdoor temperature as indicated in the graph below ("Fig. 42") and the burner will react on the room thermostat. The outdoor reset curve can be changed by adjusting the design and mild weather reference temperatures.

The outdoor temperature used for the **CH_Setpoint** calculation is measured once a minute and averaged with the previous measurement. This is done to avoid commuting when the outside temperature changes quickly. If an "open" outdoor sensor is detected the **CH_Setpoint** will be equal to the Design Supply Temp.

Par.19: Design Supply Temp.

Sets the maximum supply temperature when the outdoor temperature is equal to Par. 20 "Design Outdoor Temp."

Par.20: Design Outdoor Temp.

Represents the minimum outside temperature setable to calculate the maximum set point of CH.

Par.21: Baseline Supply Temp.

Represents the minimum settable supply temperature targeted when the outdoor temperature exceeds parameter 22. "Baseline Outdoor Temp".

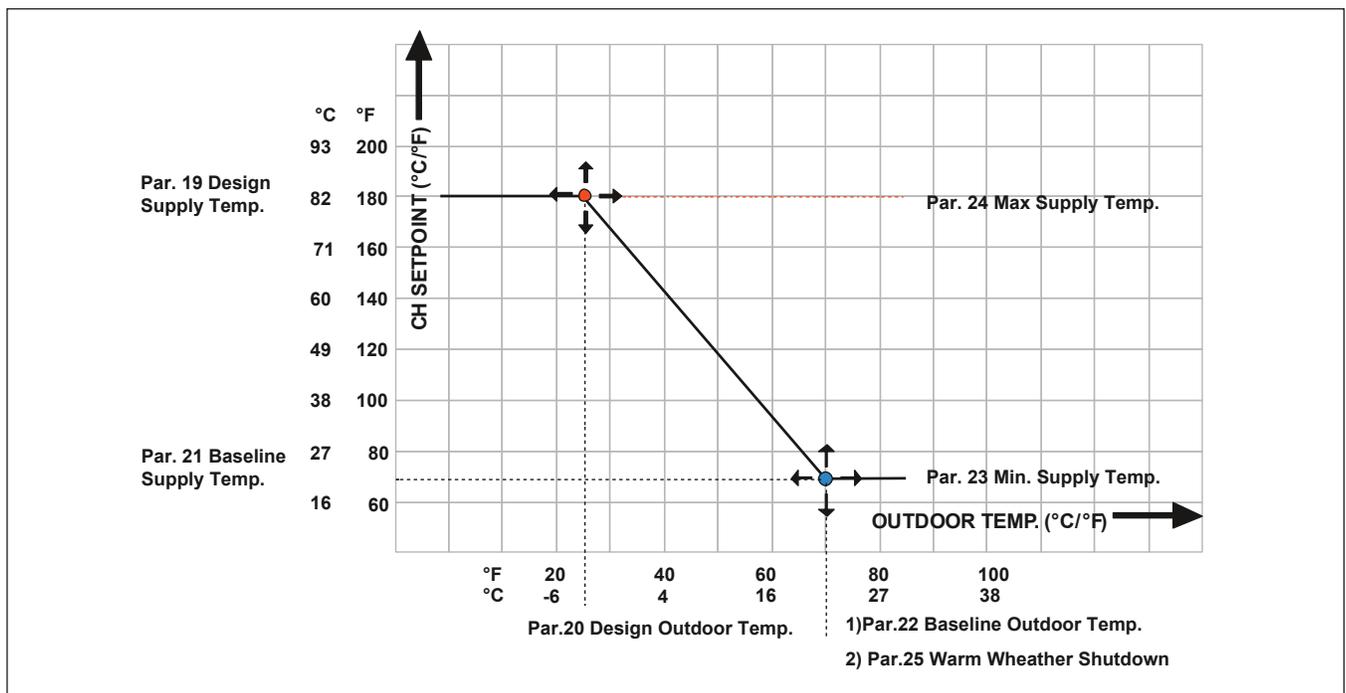


Fig. 42

Par.22: Baseline Outdoor Temp.

Defines the maximum outdoor temperature to calculate the minimum supply temperature for CH

Par.23: Min Supply Temp.

Sets the minimum supply temperature of the boiler.

Par.24: Max Supply Temp.

Sets the maximum supply temperature of the boiler.

Par.25: Warm Weather Shutdown

When the outdoor temperature rises above **Warm_Weather_Shutdown**, the call for heat is blocked and the pumps stop

Par. 26/27 Boost function

The outdoor reset boost function increases the **CH_Setpoint** by a prescribed increment (**Boost_Temperature_Incr**) if a call for heat continues beyond the pre-set time limit (**Boost_time_Delay**). **CH_Setpoint** increases again if the call for heat still is not satisfied in another time increment.

CH_Mode=2 Request for Heat with Outdoor Sensor only.

For this mode an outdoor sensor has to be connected. The **CH_Setpoint** is calculated in the same way as described for **CH_Mode 1**. However the demand does not depend on the room thermostat (terminals 11 & 12) input but on the outdoor temperature and the outdoor reset setpoint. When the outdoor temperature is below this weather setpoint (settable) CH demand is created. During the night an input signal from an external clock can lower the **CH_Setpoint**. When the room thermostat input closes **CH_Setpoint** will be decreased with **Night_Setback_Temp**. The room thermostat input does not influence the CH demand directly.

Par.28: Night Setback Temp.

Sets the decrease in supply temperature when the room thermostat is closed.

Par.29: Weather Setpoint

Defines the outside temperature below which the CH is active.

CH_Mode=3 Permanent Call for Heat.

For this mode the CH mode should be set to 3 and no outdoor sensor is needed. The supply temperature is kept constantly at the setpoint temperature. When the room thermostat contact closes **CH_Setpoint** will be decreased by the value of **Night_Setback_Temp**.

CH_Mode=4 CH request with analogue input control of Temperature. Available only with an additional 0-10V device.

CH_Mode=5 CH Request with analogue input control of Power. Available only with an additional 0-10V device.

6.2 Domestic Hot Water**Par.35 DHW_Mode**

Mode=0 No Domestic Hot Water

Mode=1 External DHW tank with temperature probe.

In this Mode (1) DHW is produced by heating a domestic indirect tank. Either a DHW pump or 3-way valve can be used to switch to DHW mode.

The DHW temperature in the tank is measured with a sensor **T_Store** and set with parameter **DHW_Store_Setpoint**. When this sensor drops below "**DHW_Store_Setpoint-DHW_Store_Hyst_Down**" the control detects a demand for the store and starts the general and DHW pump. If the supply temperature **T_Supply** is below "**DHW_Store_Setpoint+DHW_Store_Supply_Extra-DHW_Supp_Hyst_Down**" the burner is started as well (**DHW_Request**). The burner stops when the supply temperature rises above "**DHW_Store_Setpoint+DHW_Store_Supply_Extra+DHW_Supp_Hyst_Up**". The demand for the tank is ended when the tank-sensor rises above "**DHW_Store_Setpoint+DHW_Store_Hyst_Up**". The pump continues **DHW_Post_Pump_Period**.

Example (°F):

DHW Store Setpoint = 120

DHW Store Hyst Down = 5

DHW Store Supply Extra = 54

DHW Store Hyst UP = 2

Both boiler pump and DHW pump "ON" when tank sensor measures = 115

Burner "ON" when boiler supply sensor measures less than = 169

Burner "OFF" when boiler supply sensor measures less than = 176

Par.48 DHW Setpoint

Set the requested setpoint for the domestic hot water.

DHW Priority Setting

Standard DHW demand has priority over CH demand but the priority period is limited up to **CH_DHW_Switching_Time**. The priority timer starts when both CH and DHW demand are present. After the **CH_DHW_Switching_Time** is achieved, the control will switch from DHW to CH operation. CH has priority now for a maximum period of **CH_DHW_Switching_Time**.

Par.42 DHW Priority

Different DHW Priority types can be chosen

Mode=0

When parameter **DHW_Priority** is set to 0 (TIME), DHW has priority to CH during **CH_DHW_Switching_Time**.

Mode=1

When parameter **DHW_Priority** is set to 1 (OFF), CH always has priority to DHW

Mode=2

When parameter **DHW_Priority** is set to 2 (ON), DHW always has priority to CH

Default the **DHW_Priority** is set to 0.

Store warm hold function

Because of the presence of the store sensor (**T_Store**) the control can detect demand for holding the store warm. If **T_Store** drops below "**DHW_Store_Setpoint-DHW_Store_Hold_Warm**" the burner starts at minimum power. The burner stops if **T_Store** is higher than "**DHW_Store_Setpoint+DHW_Store_Hyst_Up**".

Par.36 DHW Tank Hyst Down

The differential for the DHW tank load. If the temperature decrease below "Par.48 **DHW_Setpoint**"–Par. 36 **DHW_Hist_Down**", the call for heat is activated igniting the burner.

Par.37 DHW Tank Hyst Up

Differential setpoint for shutting off the call for heat. If the DHW tank exceeds "Par.48 **DHW_Setpoint** +

Par. 37 **DHW_Hist_Up**" the call for heat turns off.

Par. 38 DHW Tank Supply Extra

Increases the supply temperature based on the DHW tank load up to the value sum of: "**DHW_Setpoint**" + **DHW_Tank_Supply_Extra**". The default increase is 54°F.

Ex.: **DHW_Setpoint** 122°F + **DHW_Tank_Supply_Extra** 54°F = the supply temperature is 176°F.

Par.39 DHW Tank Supply Hyst Down

Differential to turn on the burner in DHW configuration, "**DHW_Supply_Setpoint-DHW_Supp_Hyst_Down**".

Par.40 DHW Tank Supply Hyst Up Level3

Differential to turn off the burner. Condition: temperature above "**DHW_Supply_Setpoint+DHW_Supp_Hyst_Up**".

Par.41 DHW Tank Hold Warm

This function keeps the temperature of the DHW tank by maintaining the burner at minimum firing rate. The default temperature is 3.6°F (2°C).

Par.43 DHW Max Priority Time

Imposes a timelimit for DHW priority and CH.

Par.44 DHW Pump Overrun Time

Sets the delay off for DHW pump.

Par.91 DHW max Setpoint

Sets the temperature limit for the DHW tank.

Mode=2 DHW tank with thermostat control (dry contact)

In **DHW_Mode** 2, DHW is prepared by warming up a store. Either a DHW pump or 3-way valve can be used to switch to DHW mode (for explanation see section "6.3 Pump mode and connections"). The temperature of the DHW in the store is regulated by a thermostat (instead of a sensor), which should provide only an open/closed signal to the control. When the thermostat closes the control detects a demand for the tank and starts the DHW pump. If the supply temperature **T_Supply** is below "**DHW_Store_Setpoint-DHW_Supp_Hyst_Down**" the burner starts. When the burner is ON the power is PID-controlled based on **T_Supply** toward **DHW_Store_Setpoint**. The burner is stopped when the supply temperature rises above "**DHW_Store_Setpoint + DHW_Supp_Hyst_Up**". The demand for the store ends when the store thermostat opens. The pump continues **DHW_Post_Pump_Period** after DHW demand stopped.

6.3 Pump mode and connections

Pump mode = 2 (default) Boiler with a manifold and two pump circuits CH/DHW

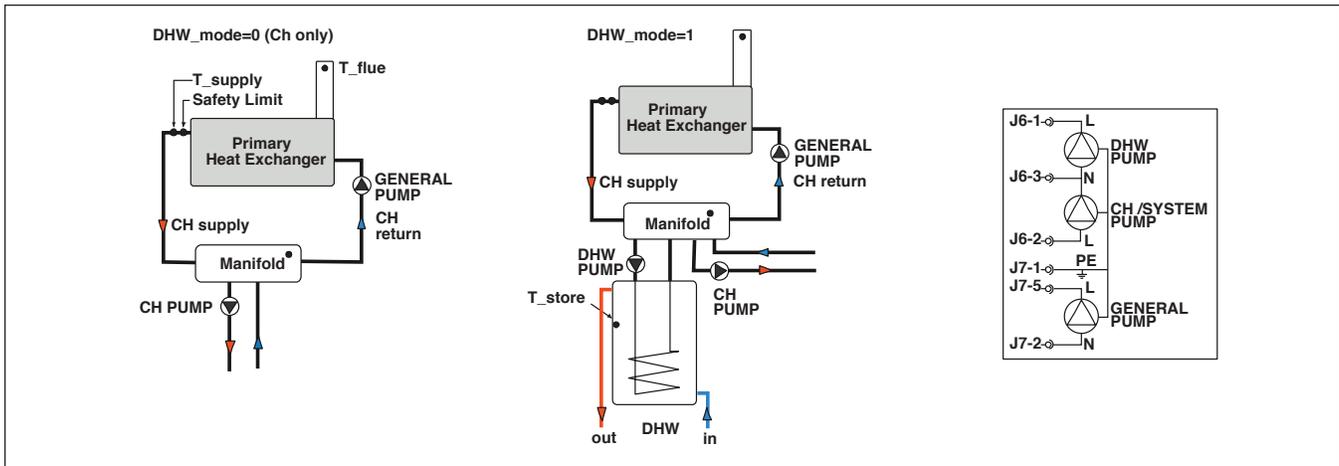


Fig. 43

Pump mode = 0 Boiler with two pump circuits Ch/DHW (move the internal pump wiring to the CH terminal)

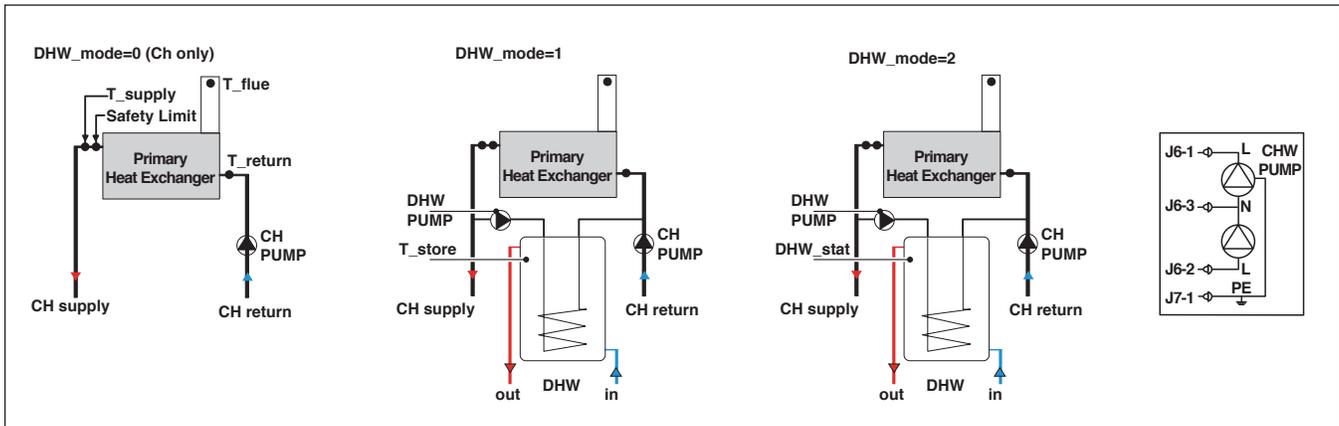


Fig. 44

Pump mode = 1 Boiler with one primary pump and 3-way valve for DHW (move the internal pump wiring to the CH terminal)

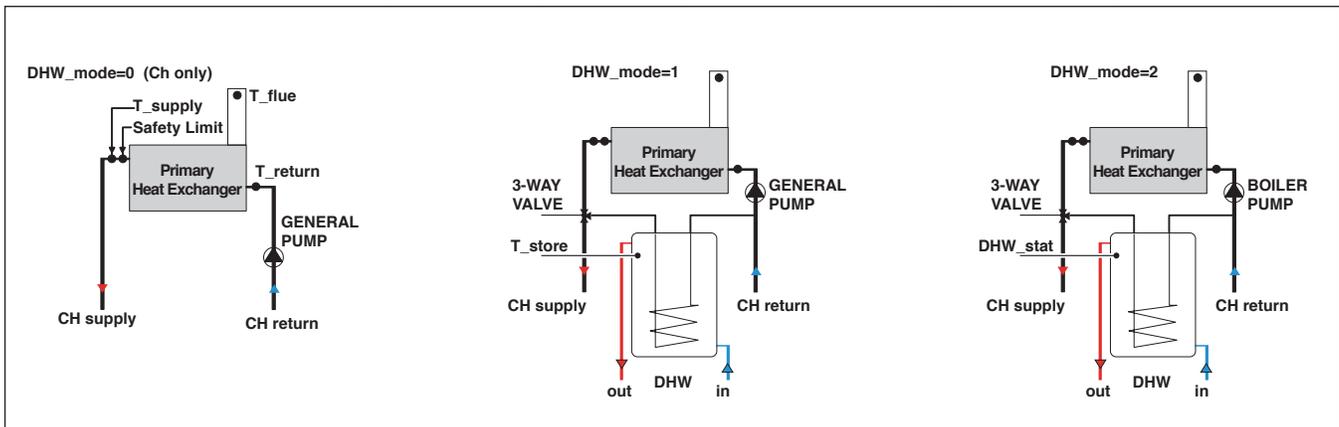


Fig. 45

7 Commissioning

7.1 First operation

Before commissioning the boiler the following steps must be verified:

- [1] Verify the gas type and pressure match the boiler name plate rating. When converting the boiler to operate on LP, the LP conversion sticker or decal must be applied. When operating with NG the min. gas pressure should be 3.5" w.c. (8,72 mbar), while max. gas pressure 10,5" w.c. (26.15 mbar). For LP the min. and max. gas pressures are 8" w.c. (19.9 mbar) and 13" w.c. (32,3 mbar);
- [2] Open the manual gas valve
- [3] Check water circuit is clean and a water filter on return line;
- [4] Verify all shut-off valves are open;
- [5] Verify the water fill pressure is correct,
- [6] Verify that the intake and exhaust pipes are free from obstruction;
- [7] If necessary bleed the gas supply line of air by using the supply pressure port ("P IN") see Fig. 46 - Fig. 47;

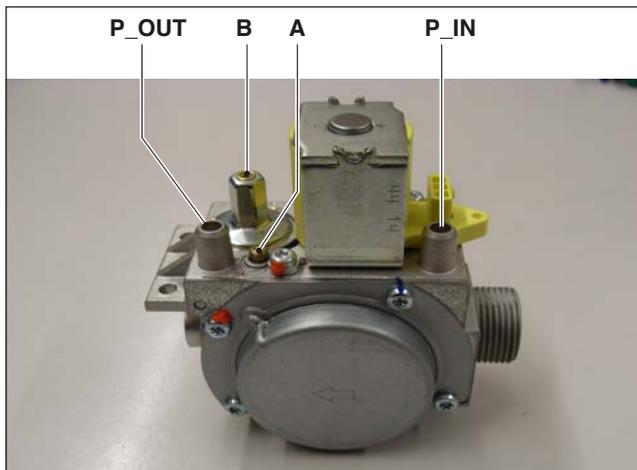


Fig. 46 Gas supply line SSB85 - SSB120

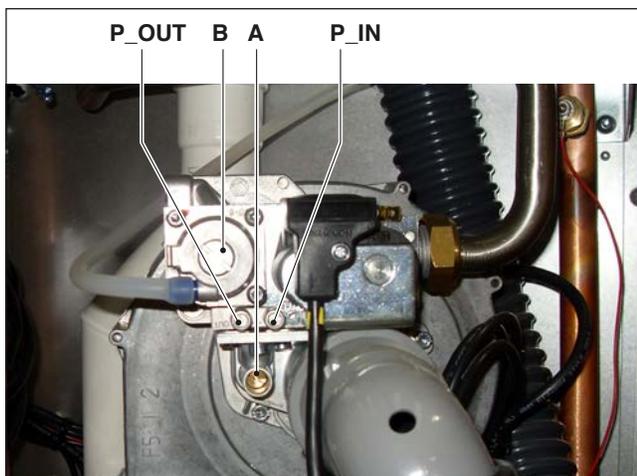


Fig. 47 Gas supply line SSB160

- [8] Verify all electrical connections are correct;
- [9] Verify no electrical components were removed or tampered with;
- [10] Fill the condensate trap with water and ensure a continuous downward slope exists in the outlet tube.

Only after verifying steps 1 to 10 should commissioning of the boiler be performed.

7.2 Inlet Gas Pressure

It is necessary to check the gas pressure at the inlet of the gas valve remains steady. With the burner operating the inlet gas pressure should not decrease more than 2" W.C., if a large fluctuation is detected a regulator must be used to stabilize the supply pressure.

7.3 Switching from NG to LPG

The unit comes from factory set for Natural Gas. The unit can be converted to LPG using the conversion kit supplied by the factory.



WARNING: Conversion of the unit must be performed by a authorized service technician.

Preliminary Operation

The electrical supply to the boiler must be turned off and the gas supply must be disconnected from the boiler.

Boiler Model SSB85 - SSB120

The picture below shows the fasteners to access the installation location for the LPG orifice.

Disconnect the union fitting and insert the LPG orifice and gaskets.



Fig. 48 Gas fitting - model SSB85 - SSB120

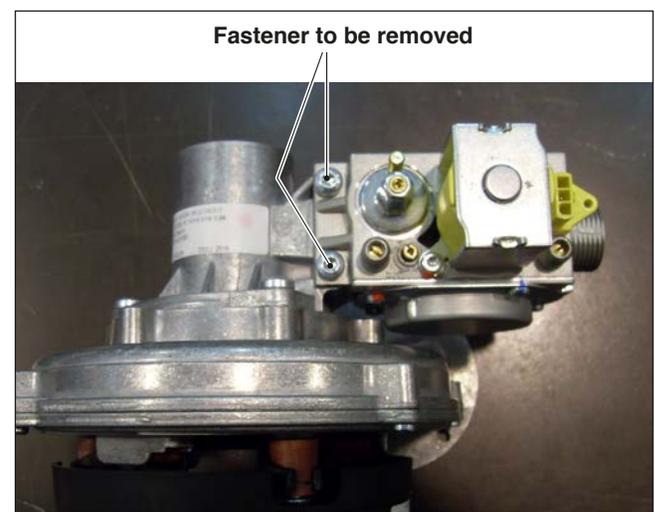


Fig. 49 Installation location for the LPG orifice - model SSB85 - SSB120

The orifice must be located into the gasket.

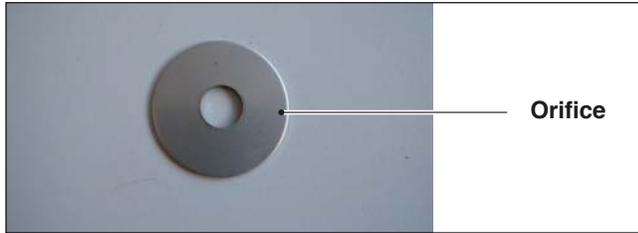


Fig. 50 Orifice - model SSB85 - SSB120

The configuration for the valve, orifice, gaskets and pipe is as shown below. Re-assemble the components.

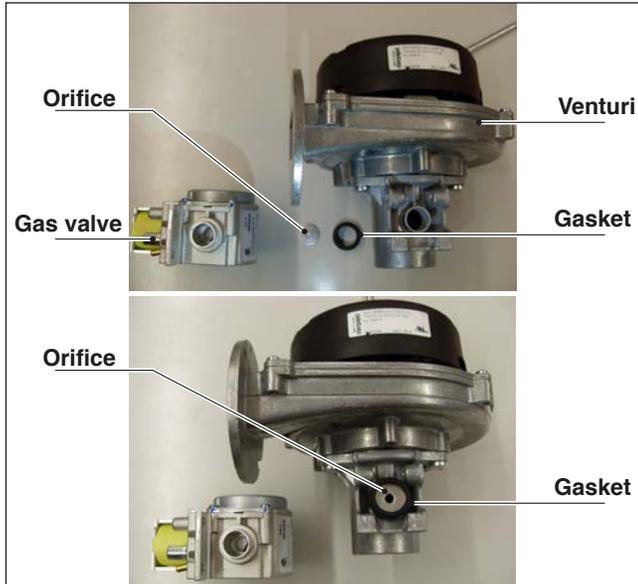


Fig. 51 Valve configuration - model SSB85 - SSB120

Use the control panel to enter in the parameter list and change the parameter no. 98 (Gas Type) from "NG" to "LPG".

Adjust the CO₂ level according to the values shown in Tab. 9.

Boiler Model SSB160

In Fig. 52 The components indicated must be disassembled to access the LPG orifice installation location.



Fig. 52 Gas fitting - model SSB160

Separate the Venturi from the gas valve to access the orifice installation location.

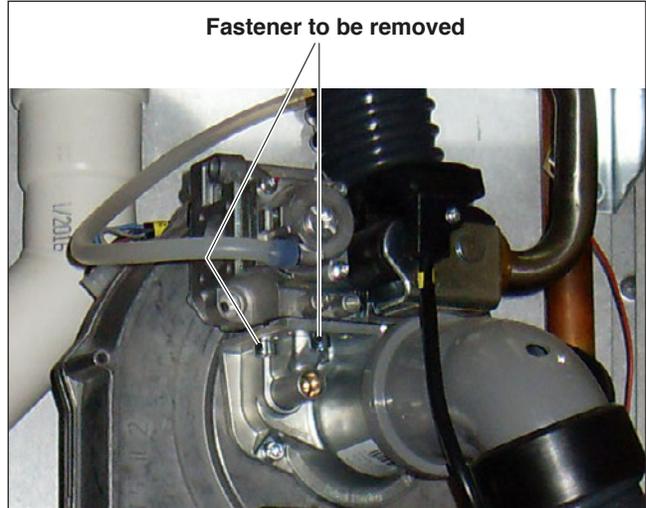


Fig. 53 Installation location for the LPG orifice - model SSB160

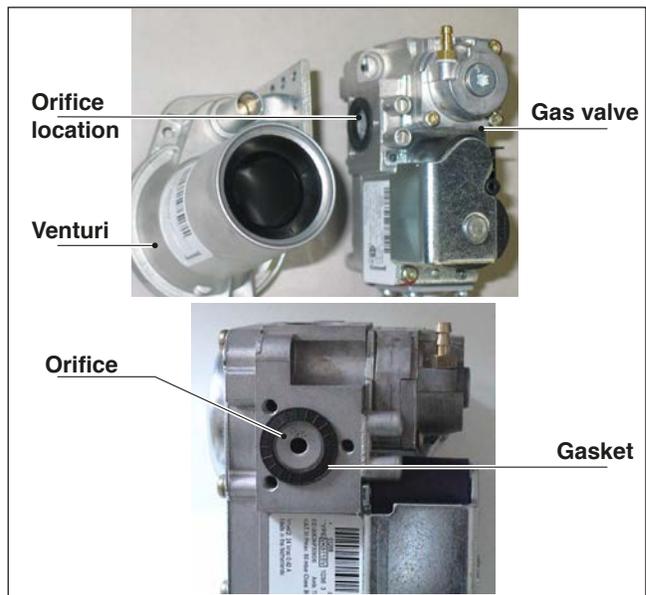


Fig. 54 Venturi and gas valve - model SSB160

Insert the orifice as shown in Fig. 55 and reassemble the components. The orifice must be inserted in the gasket seal.

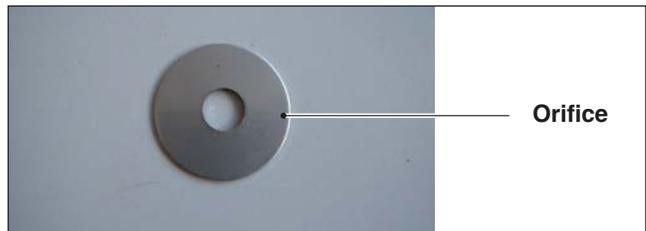


Fig. 55 Orifice - model SSB160

Reassemble the components and connect the gas supply line. Use the control panel to enter in the parameter list and change the parameter no.98 (Gas Type) from "NG" to "LPG". Adjust the CO₂ level according to the values shown in Tab. 9.

Inner Diameter LPG Orifices (mm)

Boiler model	Inner diameter LPG orifices (mm)
SSB85	5.5 Ø
SSB120	5.0 Ø
SSB160	6.25 Ø

Tab. 8 Gas Orifice Diameter

7.4 CO₂ Setting

Begin adjustment of the boiler as per instructions below:

- [1] Insert the combustion analyzer probe inside the flue access port. (Fig. 56);

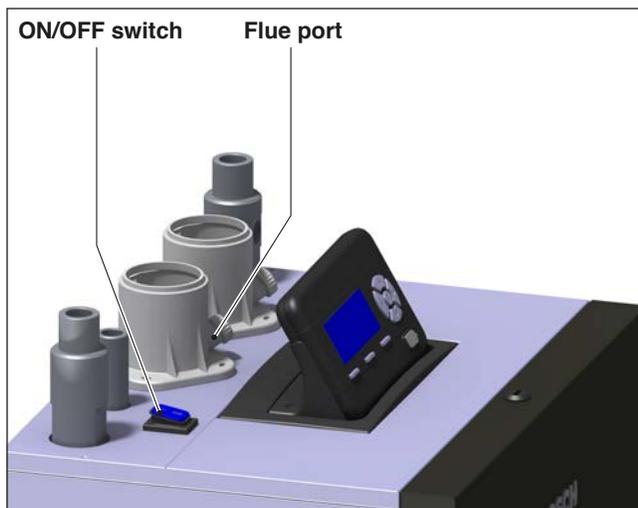


Fig. 56 Flue access port.

- [2] Turn the unit on using the ON/OFF switch located on the top panel
- [3] To run the burner at high fire. Press "Menu" select "System Test" using the arrow keys, then press "OK"

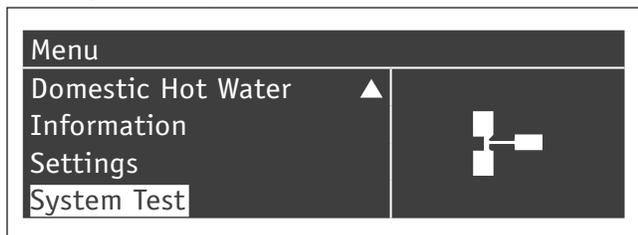


Fig. 57 System test menu

- [4] Select "High Power" using the up/down arrow keys ▲ / ▼. The burner will start and run at maximum rpm. Adjust the CO₂ value until it is between the range reported in table 7. To increase the CO₂ turn the proportional control screw, "A" (Fig. 46 - Fig. 47), counter-clockwise ↺ (all models);



Fig. 58 System test menu

- [5] Select "Low Power" using the up/down arrow keys ▲ / ▼. The burner will modulate and run at minimum rpm. Adjust the CO₂ value until it is between the range reported in table 7. To increase the CO₂ turn the proportional control screw, "B" (Fig. 46 - Fig. 47), clockwise ↻ (all models).



Fig. 59 System test menu

- [6] Select "OFF" using "Up/Down" button ▲ / ▼ and press "OK". The "Test State" switches to OFF and the boiler goes back to the "stand by" mode.



Fig. 60 System test menu

Gas Type	Max. power CO ₂ %	Min. power CO ₂ %
Natural gas	8.8-9.2	8.8-9.2
LP gas	10.3-10.7	10.3-10.7

Tab. 9 CO₂ value for gas valve calibration

8 Maintenance schedule & procedures

To maintain proper functionality, operation and efficiency it is required to perform the specific maintenance operations at the specified regular intervals.



Before carrying out any maintenance operation turn off the boiler and close the gas supply using the manual ball valve

Time interval	Maintenance
Annually	Verify the cleanliness of the area around the boiler
Annually	Check the pressure of the hydraulic system
Annually	Check vent piping and verify if leaks are present
Annually	Check air piping and verify if leaks are present
Annually	Check relief valve
Monthly (follow local, state, federal or local authority having jurisdiction guidelines)	Verify the condensate discharge system
Every two months	Test low water cut off
Every two months	Verify the reset button of low water cut off
Every six months	Check all piping (gas and water) for leaks
End of heating season	Shut off the boiler

Tab. 10 User maintenance/inspection schedule

Time interval	Maintenance
Annually *	Combustion test
Annually *	Verify condition of flue and air system (including Venturi and fan)
Annually *	Check ignition electrode
Annually *	Cleaning the combustion chamber (including the burner tube)
Annually *	Clean condensate discharge
Annually *	Safety block check, modulation range check, gas valve closing after burner stop
Annually *	Check control parameters
Annually *	Check for gas piping leak
Annually *	Check wiring and connection
Annually *	Verify startup
Annually *	Verify the flame
Annually *	Check relief valve
Annually *	Inspect the burner gasket

(*) Annually or every 2000 hours. Which occurs first.

Tab. 11 Licensed contractor / gas fitter maintenance / inspection schedule

8.1 Gas Leak Inspection

Inspect all gas piping for leaks.



WARNING: To guarantee no leaks are present utilize a soap-water mixture or gas detector. Do not use any method which could result in an explosion.

8.2 Flue / Combustion air piping inspection

Clear vent system of any obstructions, corrosion, water stains, rust. Verify the connection between the single components. Verify the outside terminations are clear. Clean the screens and the louvers if there is any debris.

8.3 Checking for Wiring and connections

Check that all wiring is securely fastened and in good condition without any cracking or alteration of insulation or presence of corrosion in metallic connection.

8.4 Burner Head Cleaning

To clean the burner head it is enough to brush the combustion surface with a paint brush or other soft bristle brush.

[1] Disconnect the boiler from electrical supply. Disconnect the electrical connectors from fan and gas valve as shown below;

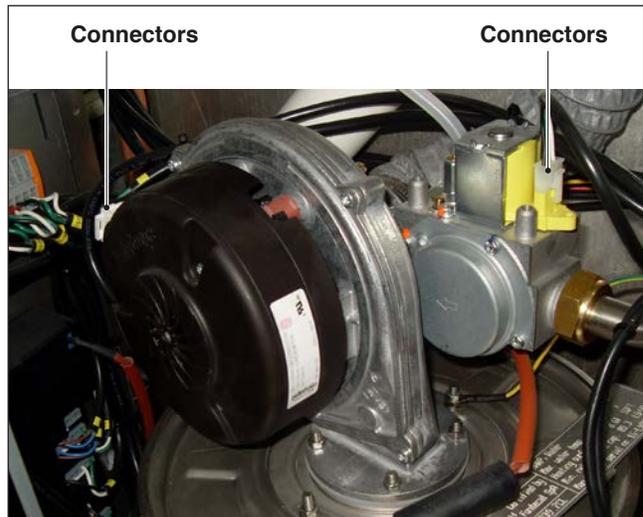


Fig. 61 Connectors SSB85 - SSB120

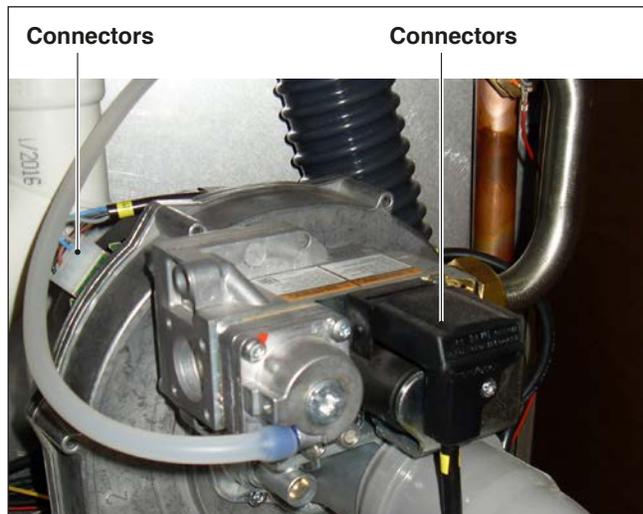


Fig. 62 Connectors SSB160

[2] Disconnect the air inlet hose from Venturi of fan as shown below;



Fig. 63 Air inlet hose SSB85 - SSB120



Fig. 64 Air inlet hose SSB160

[3] Close the manual gas valve upstream to the boiler and then disconnect the fitting on gas pipe as follows;

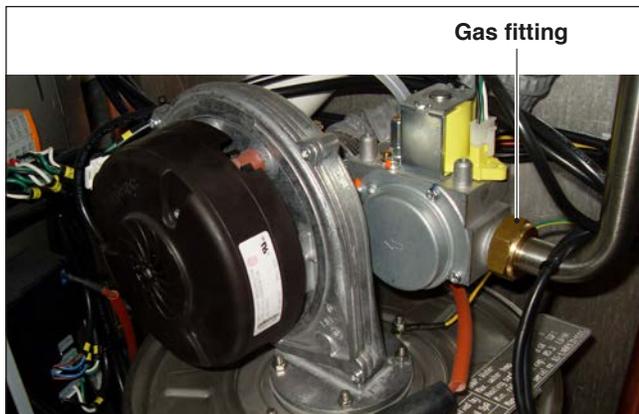


Fig. 65 Gas fitting SSB85 - SSB120

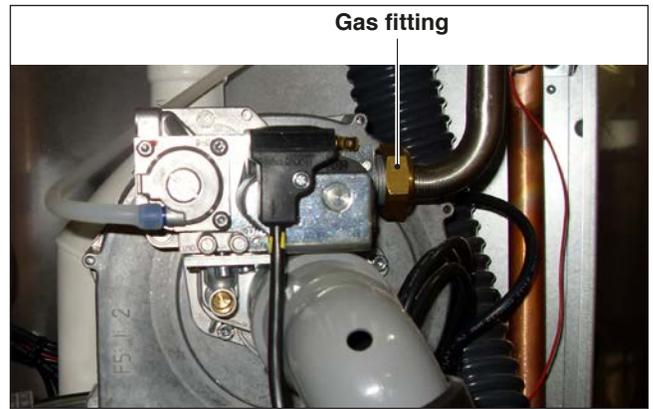


Fig. 66 Gas fitting SSB160

[4] Remove the fan unscrewing the 4 nuts that fix it to the heat exchanger (see picture below showing 3 out of 4 nuts);

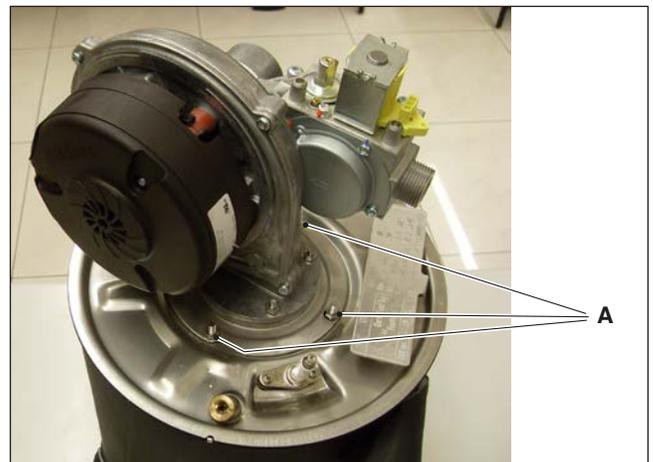


Fig. 67 Fan - 4 nuts

[5] Remove the fan;

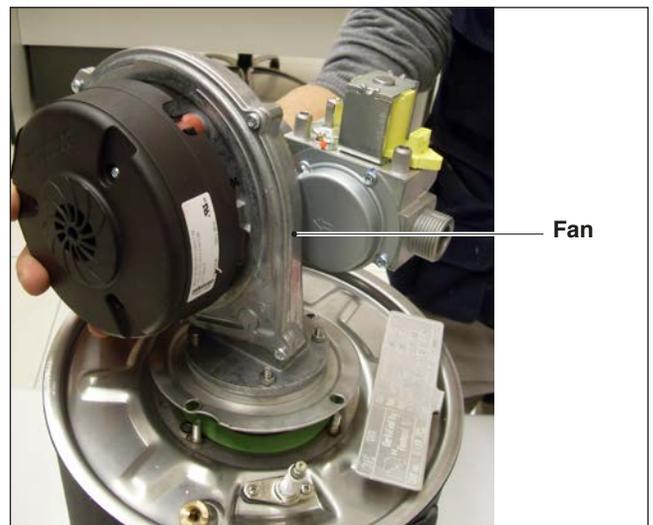


Fig. 68 Fan

[6] Remove the gasket;



Fig. 69 Gasket

[7] Pull out the burner head. Rotate the burner head to align the mark (A) to the igniter (B);

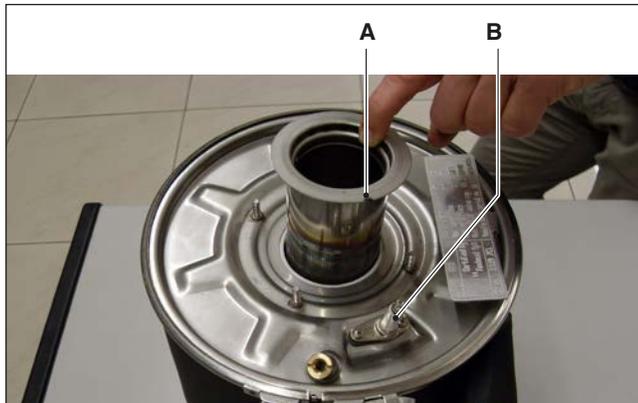


Fig. 70 Burner head

 **WARNING:** After cleaning the burner head reassemble with a new gasket. Replace the gas valve gasket.

8.5 Cleaning the Heat Exchanger

It is necessary to clean the interior surface of the heat exchanger. Carefully perform all steps below:

- [1] To access the combustion chamber repeat the burner head removal process then proceed to step 2;
- [2] Unscrew bolt (A) partially, open the clamp (B) fastening the top cap to the heat exchanger body;

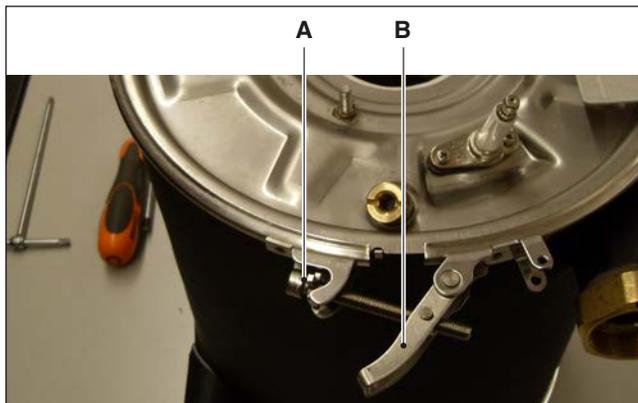


Fig. 71 Clamp fastening

[3] Remove the exchanger top cap (including the insulation);



Fig. 72 Exchange top cap

[4] The opening provides access to the combustion chamber;



Fig. 73 Combustion chamber

[5] To clean the combustion chamber utilize the cleaning kit;

Kit Contents:

- 1 x Manual water pump and wand
- 1 x Calorite disc protector plate
- 1 x Bottle Atomizer
- 1 x Cleaning Brush
- 2 x 1 Litre bottle of CLEAN F9A (decalcifier).



Fig. 74 Cleaning kit

- [6] Wait until the heat exchanger has cooled enough to proceed;
 [7] Insert the protection disc through the opening in the heat exchanger;



Fig. 75 Protection disc

- [8] Using the brush remove debris from the spiral tubes, vacuum the debris from the heat exchanger, without damaging the calorite disc;

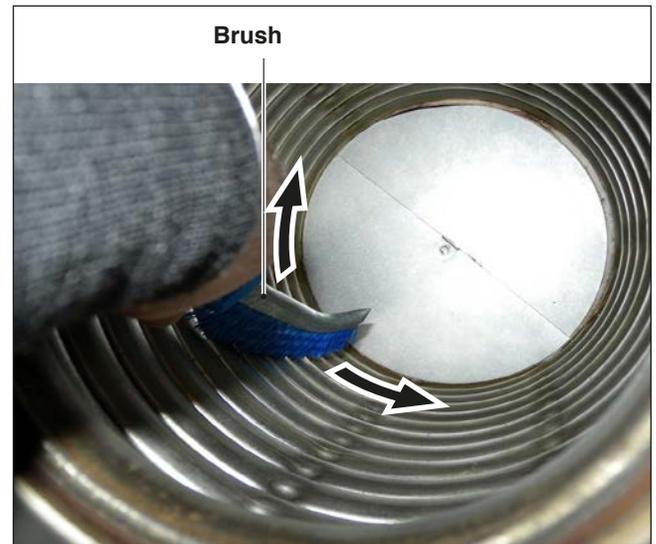


Fig. 76 Brush remove debris

- [9] Apply the CLEAN F9A decalcifier using the manual spray bottle and let stand for 10 (minimum) to 20 (maximum) minutes;
 [10] Rinse the heat exchanger using water and the manual water pump. Care should be taken to avoid flooding the heat exchanger. If the tubes are heavily obstructed repeat the cleaning and rinsing process;
 [11] Remove the calorite protection disc and reassemble the top cap minding carefully to the position of the metal mark;

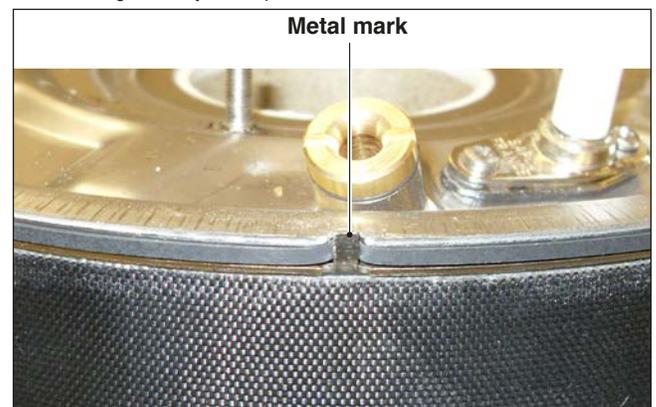


Fig. 77 Metal mark

- [12] Reassemble the burner head, fan and gas system. Operate the burner normally for 5 – 10 minutes.



WARNING: In instances of heavy dirty deposits repeat the cleaning procedure. Do not use any chemical cleaner other than the one listed on this manual. Cleaners designed for aluminum heat exchangers should never be used.

8.6 Cleaning the Ignition Electrode

The ignition electrode requires annual maintenance to remove any potential oxide layer that may be generated during normal operation. Check the high voltage cable for cracks and oxidation on the plug.

- [1] Remove the ignition cable plug and check for oxidation;



Fig. 78 Ignition plug

In case of oxidation replace the entire cable;

- [2] Remove the two fasteners retaining the electrode and extract the electrode from the heat exchanger;

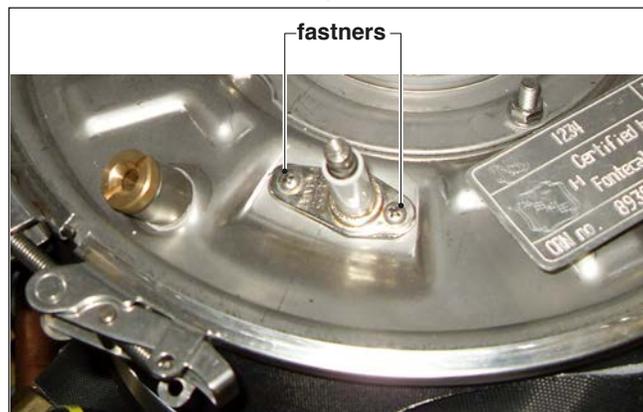


Fig. 79 Electrode fasteners

- [3] Examine the electrode, if oxidation is found remove it with fine sandpaper;
- [4] Check the electrode spacing

Note: The distance must be between 3 and 5 mm;

- [5] Re-insert the electrode with a new seal.

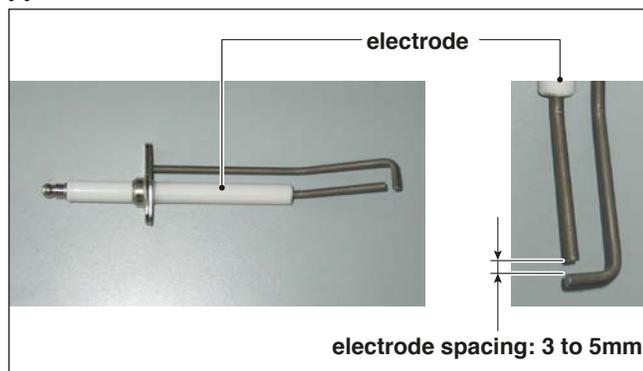


Fig. 80 Electrode

8.7 Inspection, replacement and features of supply, return and flue NTC temperature sensors

The NTC sensor transduces a temperature value into an electrical resistance. The characteristics of NTC sensor are reported on Tab. 12 below.

The supply, return and flue temperature sensors are immersion type and have the same electrical characteristic (= 10 kΩ at 25°C).

To remove and replace the NTC probes turn off the boiler and follow the procedure below:

- [1] Disconnect the electrical plug from the sensor;
- [2] Drain the water from the boiler before removing the water temperature sensor. To verify proper functionality use an Ohm meter to measure the resistance across the terminals with reference to Table 12.

If the resistance is low the NTC sensor is in short circuit, while if the resistance is very high the sensor is open. In both cases the sensor must be replaced.

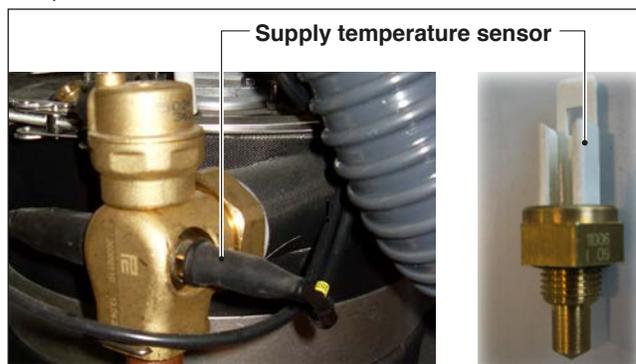


Fig. 81 Supply temperature sensor

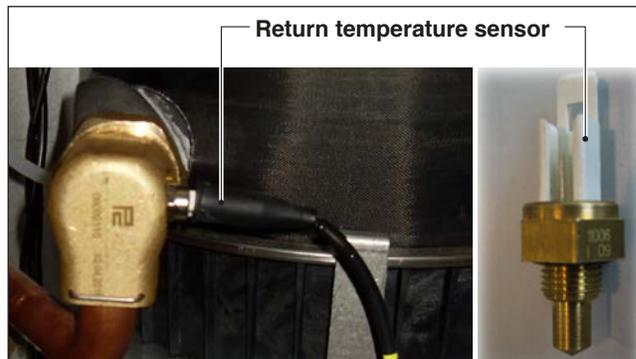


Fig. 82 Return temperature sensor

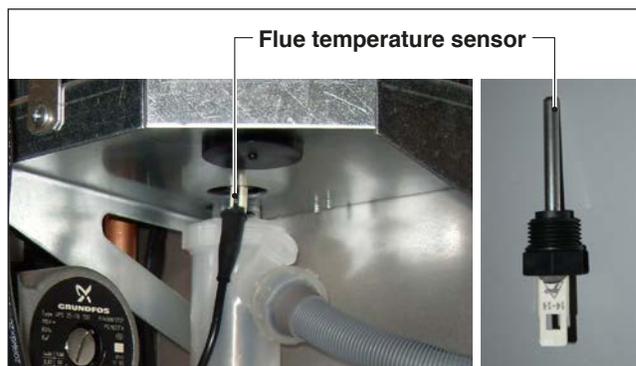


Fig. 83 Flue temperature sensor

Temperature °F (°C) Testing tolerance ±10%	Resistance [Ω]
32 (0)	27396
41 (5)	22140
50 (10)	17999
59 (15)	14716
68 (20)	12099
77 (25)	10000
86 (30)	8308
95 (35)	6936
104 (40)	5819
113 (45)	4904
122 (50)	4151
131 (55)	3529
140 (60)	3012
149 (65)	2582
158 (70)	2221
167 (75)	1918
176 (80)	1663
185 (85)	1446
194 (90)	1262
203 (95)	1105
212 (100)	970
221 (105)	855
230 (110)	755
239 (115)	669
248 (120)	594
257 (125)	529

Tab. 12 Resistance values for NTC sensor

9 Electrical supply

9.1 Electrical supply wiring

Connect the boiler to the main electrical supply, as required by local, state and federal codes.

The power supply cables can be inserted into the boiler using one of the three knock out holes (A) located on each side of the cabinet.

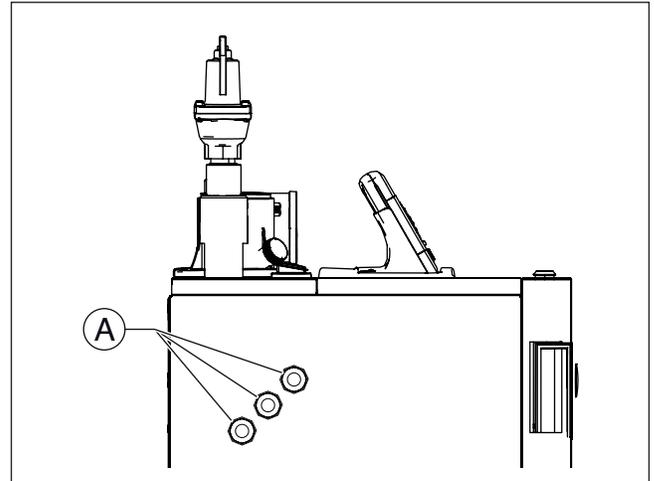


Fig. 84 Knock out holes

9.2 Access to the electrical terminal strip

To have access to the internal terminal strip of the boiler follow the procedure below:

- [1] Rotate the lock at the top of the front panel and remove the front panel
- [2] Slide out the electrical box and remove the two screws from the front
- [3] Remove the box cover to have access to the terminal strip.

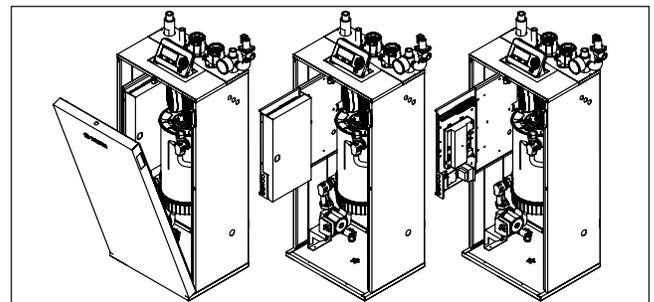


Fig. 85 Access to electrical terminal strip

Electrical connection:

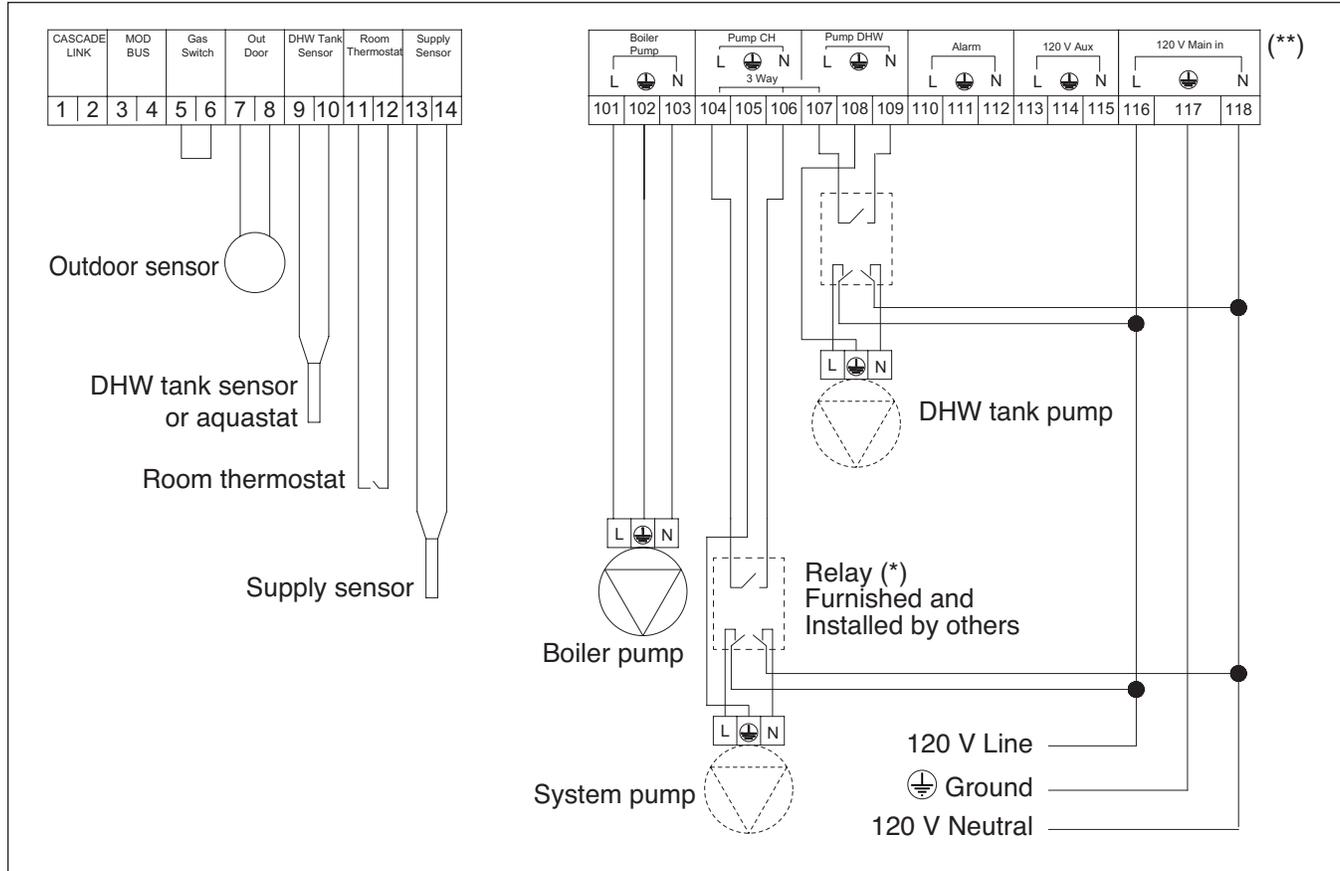


Fig. 86 Electrical connection

9.3 Main electrical supply

Connect the electrical supply and ground to terminals 116-117-118.

9.4 Room thermostat connection

Connect the room thermostat to terminals 11-12.

9.5 DHW tank sensor connection

Connect the DHW tank sensor to terminals 9-10.

9.6 Outdoor temperature sensor

If outside temperature control is to be used, the outside probe needs to be connected to terminals 7-8. The probe shall be installed on an outer wall, North or North/East, away from windows, doors and ventilation grids. Never install the probe in a position exposed to the sun. The maximum cable length is 300' (100 meters), if the cable length exceeds 32' (10 meters) a shielded cable is required and shall be connected to chassis ground.

9.7 Supplementary circulating pump relay

The maximum amp load for each pump (in addition to the boiler pump) is 2Amps when 1 pump is connected. For this reason, if the power consumption of each pump is higher than 84 watt, a relay (*) must be used as shown on the diagram above.

WARNING: Route the sensor cable away from High Voltage cables.

9.8 Electrical wiring diagram

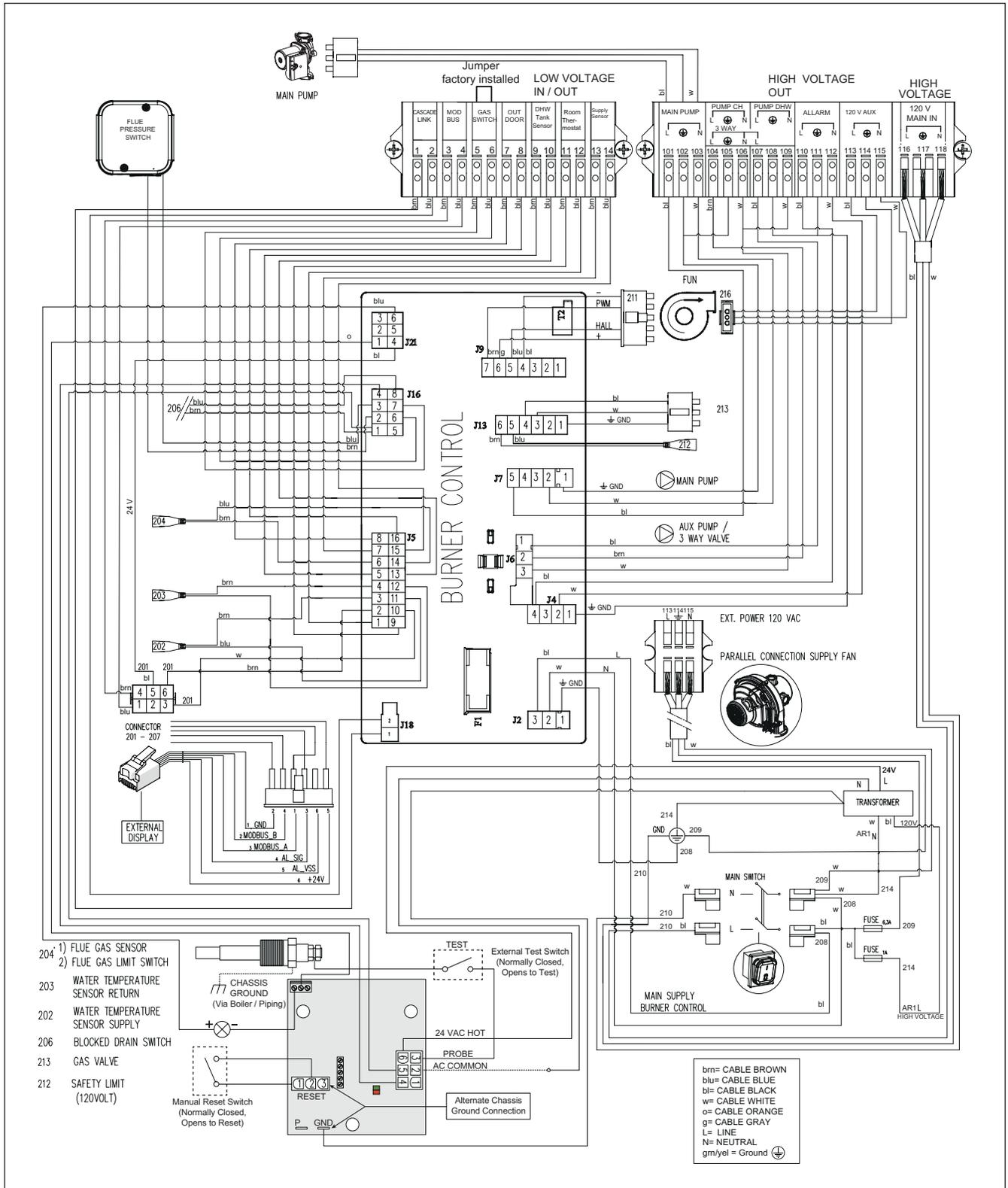


Fig. 87 Wiring diagram

9.9 Lockout errors list

If an error is a "Lockout" error, it is necessary to press "RESET" button (after eliminating the reason for the failure) to restart the boiler.

In the following table the "Lockout" errors are listed:

Error	Int. nr.	Description	Checks	Solutions
"Ignit Error"	1	Three unsuccessful ignition attempts in a row	a- Check gas supply pressure; b- Check ignition spark c- Correct amount of gas; d- Check for 120VAC at the gas valve;	a- If the gas supply pressure is incorrect, it must be adjusted to the correct pressure; b- If spark is not present check for correct ignition electrode position; c- If the combustion air pressure is incorrect, inspect the vent system and eliminate any obstructions; d- If the voltage to the gas valve is not 120Vac the power control board must be replaced.
"Gv Relay Error"	2	Failure detected in the GV (gas valve) Relay	a- Check the integrity of the wire connections between gas valve and control board.	a- If wires are damaged, replace them b- If wires are ok, replace the gas valve or the power control board.
"Gv Relay Not Open"	3	Failure detected in the GV (gas valve) Relay	a- Check the integrity of the wire connections between gas valve and control board.	a- If wires are damaged, replace them; b- If wires are ok, replace the gas valve or the power control board.
"Gv Relay Not Close"	4	Failure detected in the GV (gas valve) Relay	a- Check the integrity of the wire connections between gas valve and control board.	a- If wires are damaged, replace them; b- If wires are ok, replace the gas valve or the power control board.
"Safety Relay Error"	5	Failure detected in the Safety Relay		Replace the power control board
"Safety Relay Open"	6	Failure detected in the Safety Relay		Replace the power control board
"Safety Relay Closed"	7	Failure detected in the Safety Relay		Replace the power control board
"Blocking Too Long Error"	11	Control had a blocking error for more than 20 hours in a row	Press RESET button to display the Blocking error description	Remove the cause of the Blocking error
"Fan Error"	12	Fan MF deviation for more than 60 sec	a- Check for 120 Vac power connection of the fan. b- Check PWM connection of the fan.	a- If no 120 VAC voltage is present, replace the power control board. b- If no PWM signal is present, replace power control board. c- Replace the fan
"Ram Error"	13	Internal software error		Replace the power control board
"Wrong E2prom Signature"	14	Contents of E2prom is not up-to-date		Replace the power control board
"X Ram Error"	15	Internal software error		Replace the power control board
"E2Prom Error"	16	No communication with E2prom		Replace the power control board
"E2Prom Error C"	17	Wrong safety parameters in E2prom		Replace the power control board
"E2Prom Error Cal Table"	18	Wrong calibration table parameters		Replace the power control board
"State Error"	19	Internal software error		Replace the power control board
"Rom Error"	20	Internal software error		Replace the power control board
"Rom Error C"	21	Internal software error		Replace the power control board
"Air Sw Not Open"	22	Air pressure switch not working		
"15Ms Xrl Error"	23	Internal software error		Replace the power control board
"Air Sw Not Closed"	24	Air pressure switch not working		
"Max. Thermostat Lock Error"	25	The external overheat protection is activated	a- Check the pump to verify the flow circulation b- Check if the valves on hydraulic circuit are open c- Check the high limit switch d- To reset - see Fig. 9	a- Change the pump or restart it b- Open the valves on hydraulic circuit c- Change the high limit switch
"Stack Error"	26	Internal error		Replace the power control board
"Flame Out Too Late Error"	27	Flame still present 10 sec. after closing the gas valve		Replace the gas valve
"Flame Error 1"	28	Flame is detected before ignition		Replace the gas valve
"20Ms Xrl Error"	29	Internal software error		Replace the power control board
"41Ms Error"	30	Internal software error		Replace the power control board

Tab. 13 Lockout codes

Error	Int. nr.	Description	Checks	Solutions
"Too Many Flame Failures"	31	Three times flame lost during one demand	a- Check the integrity of the wire connections of the spark and the earth on heat exchanger	a- If wires are damaged, replace them
"Flow Switch Not Closed Error"	32	Flow switch not working / No flow		
"Flow Switch Not Open Error"	33	Flow switch not working / No flow		
"Flag Byte Integrity Error"	34	Internal software error		Replace the power control board
"Ad Hi Cpl Error"	35	Internal software error		Replace the power control board
"Ad Lo Cpl Error"	36	Internal software error		Replace the power control board
"Register Error"	37	Internal software error		Replace the power control board

Tab. 13 Lockout codes

9.10 Blocking errors list

If it is "Blocking" error the boiler will go back to normal operation, with no need to press the "RESET" button, once the reason for the failure has been eliminated.

In the following table the "Blocking" errors are listed:

Error	Int. nr.	Description	Checks	Solutions
"WD Error Ram"	45	Internal software error		Replace the power control board
"WD Error Rom"	46	Internal software error		Replace the power control board
"WD Error Stack"	47	Internal software error		Replace the power control board
"WD Error Register"	48	Internal software error		Replace the power control board
"WD Error Xrl"	49	Internal software error		Replace the power control board
"Refni Too Lo Error"	50	Internal software error		Replace the power control board
"Refni Too Hi Error"	51	Internal software error		Replace the power control board
"Reflo Too Lo Error"	52	Internal software error		Replace the power control board
"Reflo Too Hi Error"	53	Internal software error		Replace the power control board
"Flame Error 2"	54	Flame is detected in a state in which no flame is allowed to be seen		Replace the power control board
"Water Level Detect"	55	Low water level detected		
"Water Level Meas"	56	Low water level measurement error		
"Low Water Cutoff Error"	57	Low water sensor error	Check the LWCO	If the LWCO is in alarm, try to reset it.
"Low Water Pressure Error"	58	Low water pressure error		
"Low Water Pressure Sensor"	59	Low water pressure		
"Flue Gas Error"	60	Flue gas pressure error	a- Check the flue gas pressure switches b- Check the gas pressure	a- If the flue gas pressure switches don't work, replace them b- If the gas supply pressure is incorrect, it must be adjusted to the correct pressure
"Return Temp Error"	61	Return temperature is higher than stay burning temperature	a- Check the return temperature sensor b- Verify the pump for flow circulation	a- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced. b- Change the pump or restart it
"Blocked Drain Error"	62	Block drain switch is active		
"Wd Freq Error"	64	Incorrect Frequency signal or no communication with the WD	Verify the supplied 120 V ac current	a- If the supplied 120 V ac current has a frequency of 60HZ +/- 2% , replace the power control board b- If the frequency is out of range, consult electrician
"Phase Error"	65	Hot neutral reversed	Check the supply 120 V ac connection	Reverse the supply voltage polarity
"Net Freq Error"	66	Net freq. error detected in the main	Check the frequency of the supply 120 V ac connection	a- If the supplied 120 V ac current has a frequency of 60HZ +/- 2% , replace the power control board b- If the frequency is out of range, consult electrician
"Faulty Earth Error"	67	Faulty earth connection	Check the earth connection to the appliance	Restore the earth connection
"WD Communication Error"	68	Watchdog communication error		Replace the power control board

Tab. 14 Blocking errors

Error	Int. nr.	Description	Checks	Solutions
"Overheat Error"	70	Supply temp exceed the limit	a- Check the pump to verify the flow circulation b- Check if the valves on hydraulic circuit are open c- Check the supply temperature sensor	a- Change the pump or restart it b- Open the valves on hydraulic circuit c- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced.
"T Supply Open"	72	Supply sensor open	a- Check the integrity of the wire connections b- Check the supply temperature sensor	a- If the wiring is damaged, replace it b- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced.
"T Return Open"	73	Return sensor open	a- Check the integrity of the wire connections b- Check the return temperature sensor	a- If the wiring is damaged, replace it b- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced.
"T Dhw Out Open"	76	DHW sensor open	a- Check the integrity of the wire connections b- Check the DHW temperature sensor	a- If the wiring is damaged, replace it b- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced.
"T Supply Shorted"	80	Supply sensor shorted	a- Check the integrity of the wire connections b- Check the supply temperature sensor	a- If the wiring is damaged, replace it b- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced.
"T Return Shorted"	81	Return sensor shorted	a- Check the integrity of the wire connections b- Check the return temperature sensor	a- If the wiring is damaged, replace it b- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced.
"T Dhw Out Shorted"	84	DHW sensor shorted	a- Check the integrity of the wire connections b- Check the DHW temperature sensor	a- If the wiring is damaged, replace it b- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced.
"T Flue Shorted"	86	Flue sensor shorted	a- Check the integrity of the wire connections b- Check the flue temperature sensor	a- If the wiring is damaged, replace it b- Verify that the temperature sensor has the correct resistance values. If values are incorrect sensor must be replaced.
"Reset Button Error"	87	Reset button error	Too many reset button pushes in a 60 sec period	
"Appliance Selection"	93	Appliance selection error		Replace the power control board
"Gas Pressure Error"	107	Gas pressure too low or too high		
"Flue Press Error"	108	Flue gas pressure error	a- Check for any obstruction in the exhaust system b- Check the condensate discharge	a- Remove any obstructions from the exhaust system b- Remove any obstruction from condensate discharge and verify if the condensate can flow freely

Tab. 14 Blocking errors

9.11 Errors not shown on display

Symptoms	Possible solutions
Combustion noise too loud; rumbling noises	Check gas type. Check inlet gas pressure; adjust as needed. Check flue gas system; clean or repair as needed. Check gas/air ratio in the combustion air and flue gas; replace gas valve as needed.
Flow noises	Set pump speed correctly to match maximum output. Set pump mode. Purge system.
Heating-up takes too long	Set pump speed correctly to match maximum output. Set pump mode.
Flue gas readings incorrect; CO levels too high	Check gas type. Check inlet gas pressure; adjust as needed. Check flue gas system; clean or repair as needed. Check gas/air ratio in flue gas; replace gas valve as needed.
Hard ignition, poor ignition	Check gas type. Check inlet gas pressure; adjust as needed. Check power supply. Check electrodes for visual damage; replace as needed. Check flue gas system; clean or repair as needed. Check gas/air ratio; replace gas valve as needed. Check gas valve; replace as needed. Check burner; replace if required.

Tab. 15

10 Spare parts

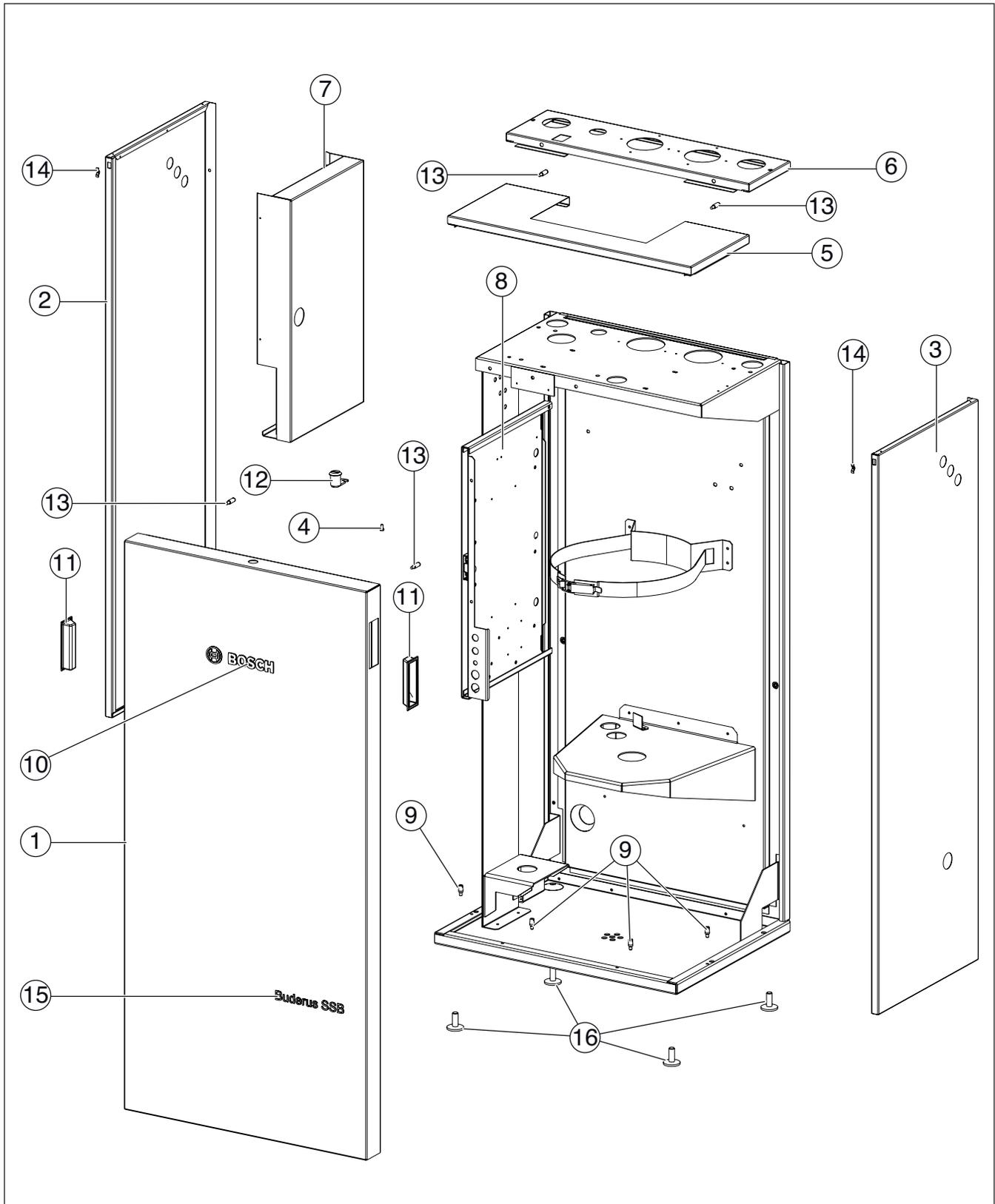


Fig. 88

Item (→ Fig. 88)	Description	SSB85	SSB120	SSB160	Order number
1	Panel front	■			7-738-005-108
1	Panel front		■	■	7-738-005-109
2	Panel left side	■			7-738-005-110
2	Panel left side		■	■	7-738-005-111
3	Panel right side	■			7-738-005-112
3	Panel right side		■	■	7-738-005-113
4	Lock pin panel top front	■	■	■	7-738-004-923
5	Panel top front	■	■	■	7-738-005-116
6	Panel top rear	■	■	■	7-738-005-117
7	Cover control board	■	■	■	7-738-004-907
8	Mounting bracket control board panel	■	■	■	7-738-004-908
9	Alignment pin front side panels	■	■	■	7-738-004-924
10	Logo Bosch front door	■	■	■	7-738-005-176
11	Handle front panel	■	■	■	7-738-004-920
12	Lock and lever front panel	■	■	■	7-738-004-921
13	Alignment pin front panel	■	■	■	7-738-004-944
14	Receiver alignment pin front panel	■	■	■	7-738-004-945
15	Logo Buderus SSB	■	■	■	7-738-005-177
16	Adjustable leveling leg	■	■	■	7-738-004-910

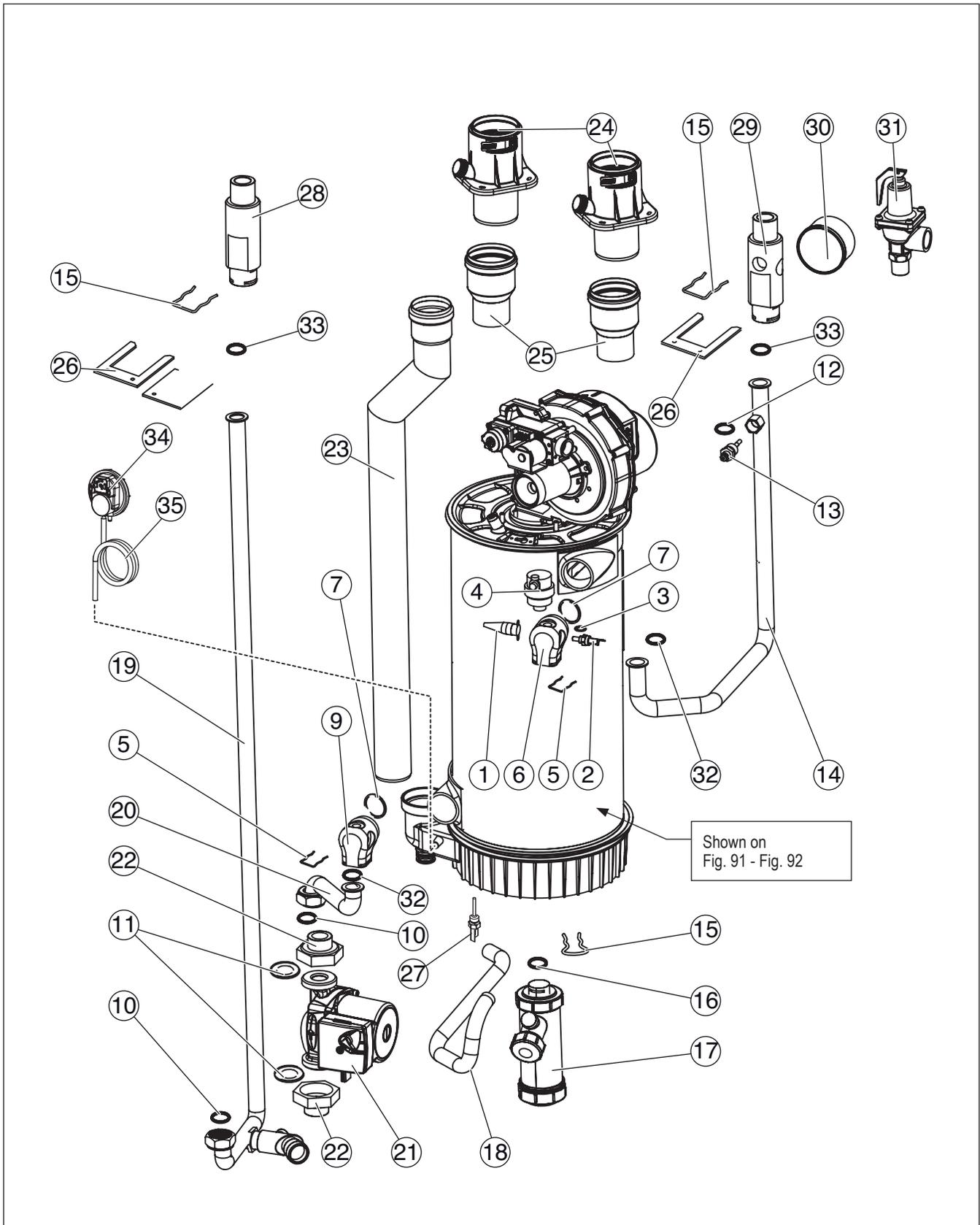


Fig. 89

Item (→ Fig. 89)	Description	SSB85	SSB120	SSB160	Order number
1	High limit sensor and screws	■	■	■	7-738-004-926
2	Universal temperature detector and washer	■	■	■	7-738-004-930
3	O-ring temperature detector 0.51x0.1in 13x2.62mm	■	■	■	7-738-004-931
4	Automatic air vent 3/8"	■	■	■	7-738-005-385
5	U-clip boiler supply/return manifold 1.67x1.02in 42.5x26mm AISI302	■	■	■	7-738-005-122
6	Boiler supply manifold	■	■	■	7-738-005-123
7	O-ring on HE connection 1.11x0.07 in 28,3x1,78 mm NBR	■	■	■	7-738-005-386
9	Boiler return manifold	■	■	■	7-738-005-387
10	Washer 3/4"	■			7-738-005-023
10	Washer 1"		■	■	7-738-005-014
11	Pump washer 1"1/2		■	■	7-738-005-388
12	Washer LWCO adapter 3/8"	■	■	■	7-738-004-929
13	LWCO probe	■	■	■	7-738-004-927
14	Boiler supply pipe 0.79in 20mm	■	■	■	7-738-005-135
15	U-clip condensate trap 1.61x0.96in 41x24.5mm AISI302	■	■	■	7-738-005-131
16	O-ring condensate trap 0.71x0.14in 18x3.53mm	■	■	■	7-738-005-129
17	Condensate trap	■	■	■	7-738-005-130
18	Condensate discharge pipe 0.71in 18mm	■	■	■	7-738-005-126
19	Boiler Return pipe 0.79in 20mm	■			7-738-005-144
19	Boiler Return pipe 0.79in 20mm		■	■	7-738-005-145
20	Pump return pipe	■		■	7-738-005-389
20	Pump return pipe		■		7-738-005-390
21	Pump UPS15/58	■			7-738-005-134
21	Pump UPS25-78		■	■	7-738-005-391
22	Adapter 1"1/2 F/ 1" M		■	■	7-738-005-392
23	PP boiler combustion pipe 1.97in 50mm	■			7-738-005-148
23	PP boiler combustion pipe 1.97in 50mm		■		7-738-005-149
23	PP boiler combustion pipe 1.97in 50mm			■	7-738-005-150
24	PP PVC vent / air intake adapter 2in/60 mm	■	■	■	7-738-005-140
25	PP Flue gas reducer 2-1.97in 60-50mm	■	■	■	7-738-005-147
26	Frame support system supply / return adapters	■	■	■	7-738-005-143
27	Flue gas temperature sensor	■	■	■	7-738-005-125
28	System return adapter 1"	■	■	■	7-738-005-141
29	System supply adapter 1"	■	■	■	7-738-005-139
30	T&P Gauge 0 – 105 psi	■	■	■	7-738-004-940
31	Safety relief valve 30psi 2.07bar	■	■	■	7-738-004-946
32	O-ring on pipe HE connection 0.79x0.12 in 20x3 mm NBR	■	■	■	7-738-005-393
33	O-ring 0.86x0.14in 21.82x3.53mm NBR	■	■	■	7-738-005-138
34	Pressure differential switch	■	■	■	7-738-005-410
35	Silicone hose for pressure differential switch	■	■	■	7-738-005-411

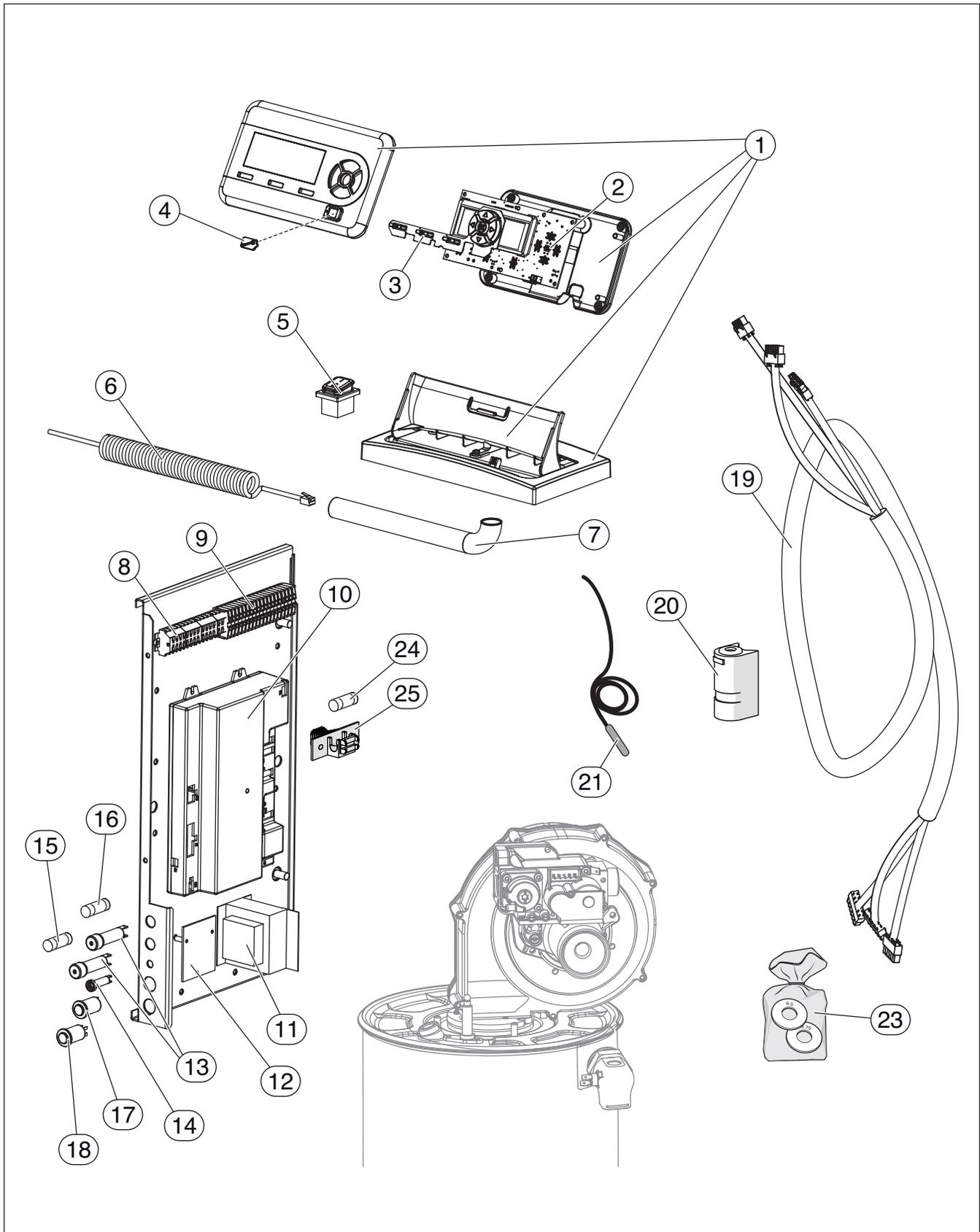


Fig. 90

Item (→ Fig. 90)	Description	SSB85	SSB120	SSB160	Order number
1	Enclosure user interface	■	■	■	7-738-005-037
2	Circuit Board user interface	■	■	■	7-738-005-038
3	Keypad	■	■	■	7-738-005-039
4	Service plug cover	■	■	■	7-738-005-040
5	On Off power switch	■	■	■	7-738-005-041
6	Display cable	■	■	■	7-738-005-042
7	Conduit for display cable	■	■	■	7-738-005-043
8	Terminal block low voltage	■	■	■	7-738-005-044
9	Terminal block line voltage	■	■	■	7-738-005-045
10	Control Board	■	■	■	7-738-005-046
11	Transformer 24V 0.6 amps	■	■	■	7-738-005-047
12	LWCO circuit board	■	■	■	7-738-005-048
13	Fuse carrier	■	■	■	7-738-005-049
14	Red LED light	■	■	■	7-738-005-050
15	Fuse 6 A	■	■	■	7-738-005-051
16	Fuse 0.125 A	■	■	■	7-738-005-052
17	Test push button	■	■	■	7-738-005-053
18	Manual reset push button	■	■	■	7-738-005-054
19	Wiring harness	■	■	■	7-738-005-151
19	Wiring harness			■	7-738-005-153
20	Outdoor sensor 10 k ohm	■	■	■	7-738-005-057
21	Universal sensor for LLH or DHW 10 k ohm	■	■	■	7-738-005-058
23	LPG gas conversion kit	■			7-738-005-394
23	LPG gas conversion kit		■		7-738-005-395
23	LPG gas conversion kit			■	7-738-005-396
24	Fuse 3.15 A	■	■	■	7-738-005-059
25	Fuse holder	■	■	■	7-738-005-060

SSB85 - SSB120

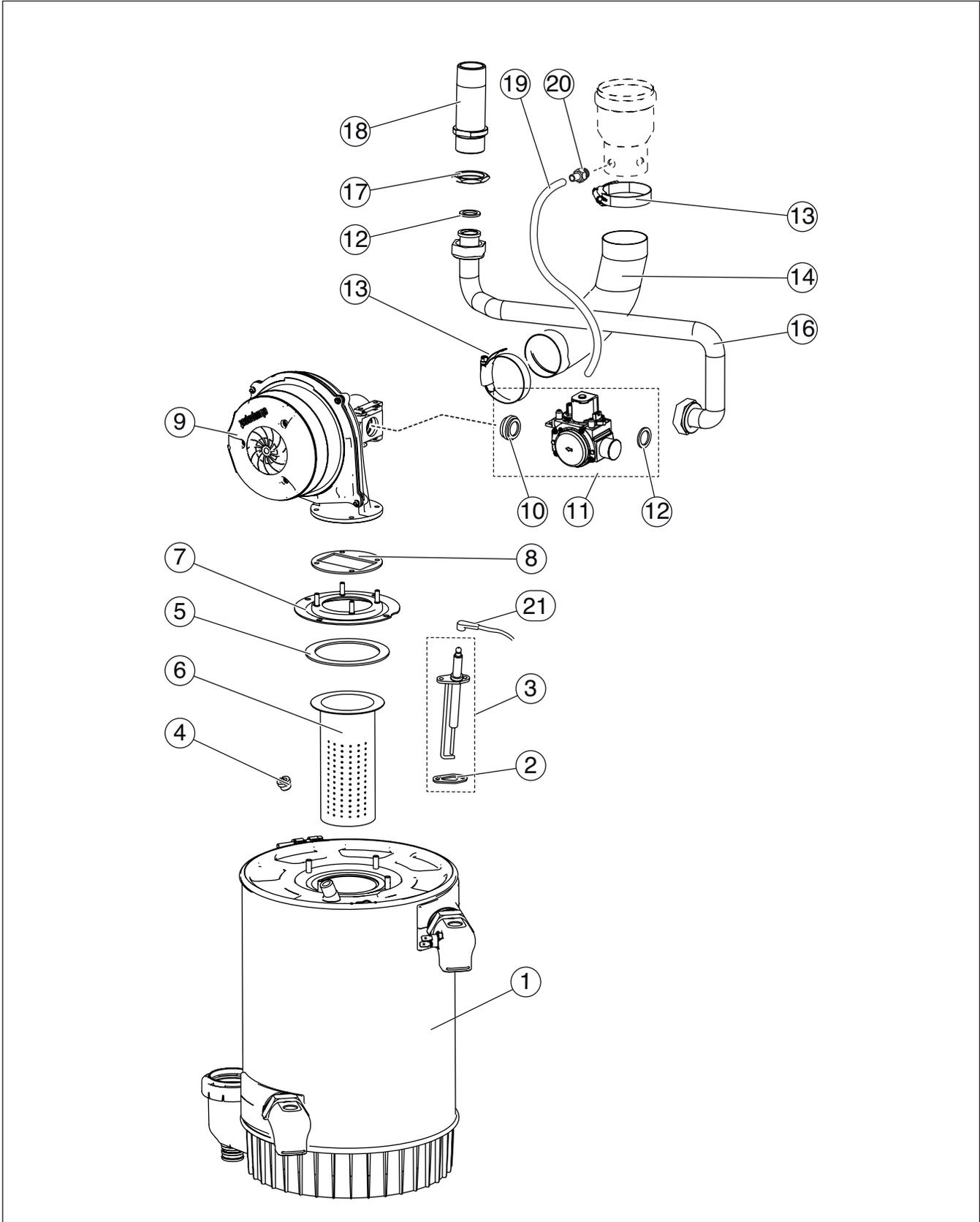


Fig. 91

Item (→ Fig. 91)	Description	SSB85	SSB120	Order number
1	Heat exchanger SSB85	■		7-738-005-154
1	Heat exchanger SSB120		■	7-738-005-155
2	Washer for ignition electrode	■	■	7-738-005-034
3	Ignition electrode with washer	■	■	7-738-005-397
4	Sight glass for combustion	■	■	7-738-005-031
5	Gasket premix burner tube	■	■	7-738-004-985
6	Premix burner tube	■		7-738-005-398
6	Premix burner tube		■	7-738-005-399
7	Burner flange (inner ring)	■	■	7-738-005-400
8	Gasket burner flange inner ring to fan	■	■	7-738-004-990
9	Fan + Venturi	■	■	7-738-005-159
10	Gasket venturi tube / gas valve SSB85/120	■	■	7-738-005-409
11	Gas valve and washers	■	■	7-738-005-160
12	Washer gas pipe 3/4" 19.05mm	■	■	7-738-005-023
13	Circular clamp 1.97in 50mm	■	■	7-738-005-015
14	Flexible pipe air intake	■	■	7-738-005-166
16	Gas pipe	■	■	7-738-005-414
17	Frame support gas pipe	■	■	7-738-005-172
18	Gas connection 3/4"	■	■	7-738-005-173
19	Balancing tube	■	■	7-738-005-401
20	Male adapter Ø 0.2 inch hose barb x M5 thread	■	■	7-738-005-270
21	Ignition cable red	■	■	7-738-005-032

SSB160 ONLY

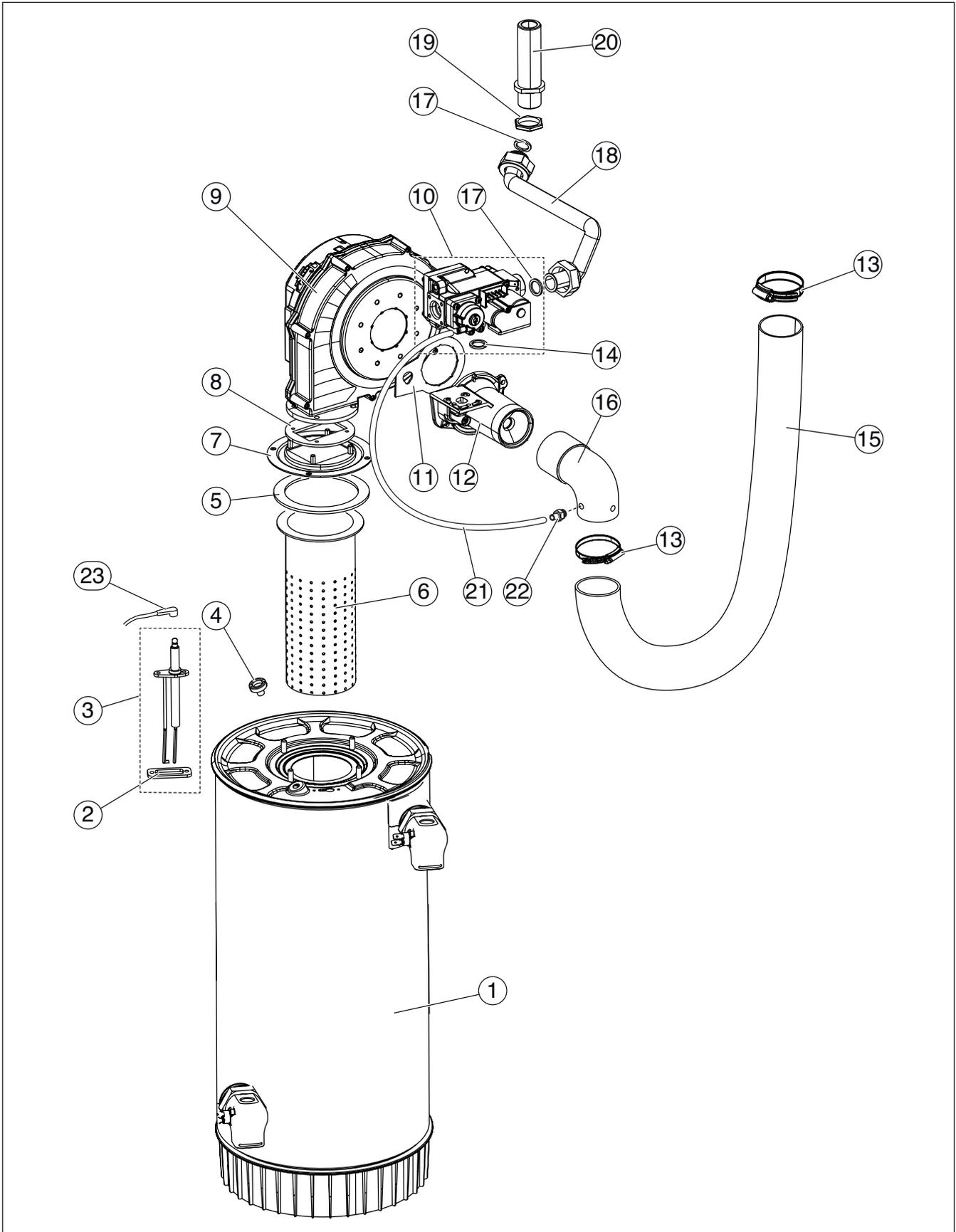
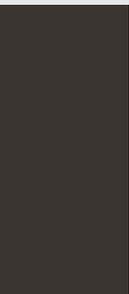


Fig. 92

Item (→ Fig. 92)	Description	SSB160	Order number
1	Heat exchanger SSB160	■	7-738-005-156
2	Washer for ignition electrode	■	7-738-005-034
3	Ignition electrode with washer	■	7-738-005-397
4	Sight glass for combustion	■	7-738-005-031
5	Gasket premix burner tube	■	7-738-004-985
6	Premix burner tube	■	7-738-005-157
7	Burner flange (inner ring)	■	7-738-005-403
8	Gasket burner flange inner ring to fan	■	7-738-004-990
9	Fan	■	7-738-005-007
10	Gas valve and washers	■	7-738-005-009
11	Gasket venturi tube / fan	■	7-738-004-950
12	Venturi	■	7-738-005-163
13	Circular clamp 1.97in 50mm	■	7-738-005-015
14	Venturi tube / gas valve washer	■	7-738-005-011
15	Flexible pipe air intake	■	7-738-005-167
16	90° PP air intake elbow	■	7-738-005-404
17	Washer gas pipe 3/4" 19.05mm	■	7-738-005-023
18	Gas pipe	■	7-738-005-171
19	Frame support gas pipe	■	7-738-005-172
20	Gas connection 3/4"	■	7-738-005-173
21	Balancing tube	■	7-738-005-401
22	Male adapter Ø 0.2 inch hose barb x M5 thread	■	7-738-005-270
23	Ignition cable red	■	7-738-005-032

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