

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

BUDERUS SSB BOILER

SSB255 | SSB399 | SSB512



BOSCH

Installation and Service Instructions for Contractors

6720818454 (2018/06) US



Contents

1	Key to symbols and safety instructions	3		
1.1	Key to symbols	3		
1.2	Safety instructions	3		
1.3	General warning	3		
2	Product description	4		
2.1	Introduction	4		
2.2	Scope of delivery	4		
2.3	Proper use	5		
2.4	Environmental responsibility / disposal	5		
2.5	Dimensions and Connections	6		
2.6	Main components	9		
2.7	Technical data	10		
2.8	Efficiency Curves	11		
3	Regulations	13		
3.1	Compliance with standards and regulations	13		
3.2	Operating limits of the boiler	13		
3.3	Additional regulations for installation in Massachusetts	13		
4	Installation	14		
4.1	Packaging and product identification	14		
4.2	Installation room	14		
4.3	Water Chemistry Guidelines	15		
4.4	Hydraulic connection	15		
4.4.1	Low water cut off	16		
4.4.2	No Flow test procedure	16		
4.4.3	High limit safety switch	16		
4.4.4	Pressure relief valve (PRV)	16		
4.4.5	Expansion tank	16		
4.4.6	Pump	17		
4.4.7	Condensate removal	19		
4.5	Electrical connection	19		
4.5.1	Power supply cable connection	19		
4.5.2	Access to the electrical terminal strip	20		
4.5.3	Room thermostat connection	20		
4.5.4	Outside temperature sensor	20		
4.5.5	Electrical wiring diagram	21		
4.6	Gas supply piping	22		
4.6.1	Connection of gas supply piping	22		
4.6.2	Gas type conversion	22		
4.7	Venting and air piping system	23		
4.7.1	General venting and combustion air piping system	24		
4.7.2	Connecting flue gas systems	25		
4.7.3	Installation of the exhaust and air intake system	25		
4.7.4	Vent and combustion air pipe length [For single boiler installations]	28		
4.7.5	Approved examples of horizontal and vertical venting installation	29		
4.7.6	Multiple boiler	33		
4.7.7	De-rating for altitude installation	34		
4.8	Venting and air piping system	34		
4.8.1	Multiple boiler cascade system	34		
4.8.2	Vent and combustion air pipe length for cascade system	35		
5	Commissioning (for single boiler application)	36		
5.1	Switching the appliance ON/OFF	36		
5.2	Setting date and time	36		
5.3	Setting CH and DHW setpoint	37		
5.4	Boiler information	37		
5.5	Parameters list	38		
5.6	Outdoor reset	38		
5.7	Adjusting and setting CO ₂ limits	41		
5.8	Setting frost protection	42		
6	Troubleshooting	42		
6.1	Error codes are shown on the display	42		
6.1.1	Lockout errors	43		
6.1.2	Blocking errors	44		
6.2	Errors not shown on display	46		
6.3	Sensor Resistance table	46		
7	Maintenance	47		
7.1	General	47		
7.2	Maintenance / inspection schedule for end user	47		
7.3	Maintenance / inspection schedule for licensed contractor / gas fitter	47		
7.3.1	Gas leaking inspection	47		
7.3.2	Check exhaust and combustion air pipe system	47		
7.3.3	Inspection of ignition electrode	47		
7.3.4	Checking for wiring and connections	47		
7.3.5	Burner gasket inspection	47		
8	Applications	48		
8.1	Multiple zone with indirect tank (pump for each zone)	48		
8.1.1	Settings	49		
8.2	Multiple zone with indirect tank (valve for each zone)	50		
8.2.1	Settings	51		
8.3	Cascade connection	52		
8.3.1	Settings	55		
9	Commissioning log for the appliance	56		
10	Spare parts	58		

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 equipment or vent damper leakage of flue gases may endanger the lives of people.

- ▶ Carefully observe proper operation of the vent damper. Do not start up the boiler unless the vent damper is operating properly.
- ▶ Use only original parts when replacing parts.
- ▶ When replacing the vent damper, install the new one in the specified position.

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 to life by poisoning by leakage of flue gases

- ▶ Make sure that the boiler is not equipped with a thermally controlled flue gas vent damper after the open draft hood.

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.
- ▶ Maintain a minimum distance of 15 inches from 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 must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA 54. In Canada, installation must be in accordance with the requirements of CAN/CSA B149.1, Natural Gas and Propane Installation Code.

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 deg F (-15°C) and 150 deg 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 install the unit outdoors.
- ▶ Do not leave any combustibles or containers of flammable substances in the room where the boiler is installed.
- ▶ Keep packing material out of reach of children as 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 authorized personal.
- ▶ It's prohibited to dispose the product as domestic waste. The separate disposal of a household appliance avoids possible negative consequences for the environment and human health deriving from inappropriate disposal and allows to recover the materials it is made of in order to achieve significant savings in energy and resources.

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.

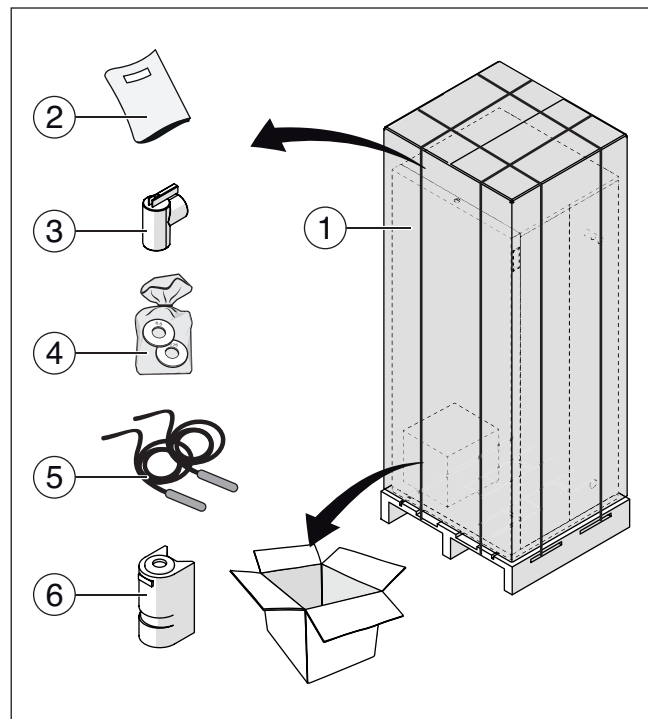
2.2 Scope of delivery

Fig. 1 Scope of delivery

Component	Qty	Packaging method
[1] Gas condensing boiler	1	Pallet
[2] Set of documents for appliance	1	Plastic package
[3] Safety relief valve	1	Cardboard box on pallet
[4] LP conversion kit	1	Plastic package
[5] Universal Sensor for LLH or DHW	2	Cardboard box on pallet
[6] Outdoor sensor	1	Cardboard box on pallet

2.3 Proper use

- ▶ The SSB Boilers are designed for large residential, commercial and light industrial applications.
- ▶ The SSB 512 is delivered in compliance with CSD-1 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 or process water heating a heat exchanger must to be installed.

2.4 Environmental responsibility / disposal

Environmental responsibility is one of the fundamental company policies of the Bosch Group.

We regard quality of performance, economy and environmental responsibility as equal objectives. Environmental protection laws and regulations are strictly adhered to.

To protect the environment, we use the best possible technology and materials taking into account economic points of view.

Packaging

All packaging materials used are environmentally-friendly and recyclable.

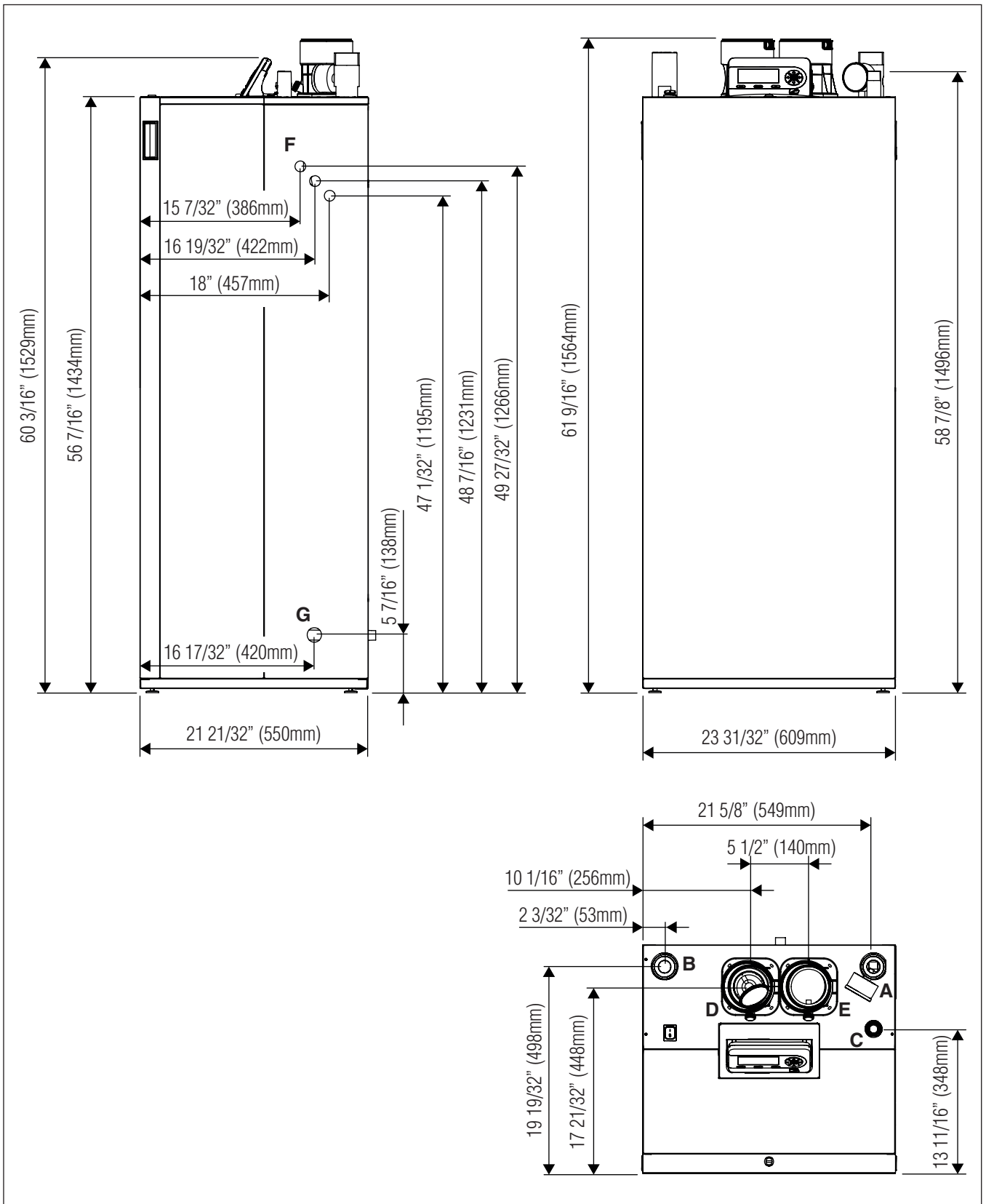


Fig. 3 SSB399 (dimension in inches [mm])

- A System supply - 1" 1/2 NPT
- B System return - 1" 1/2 NPT
- C Gas inlet - 1" NPT
- D Flue exhaust - 4" (110mm)
- E Intake air - 4" (110mm)

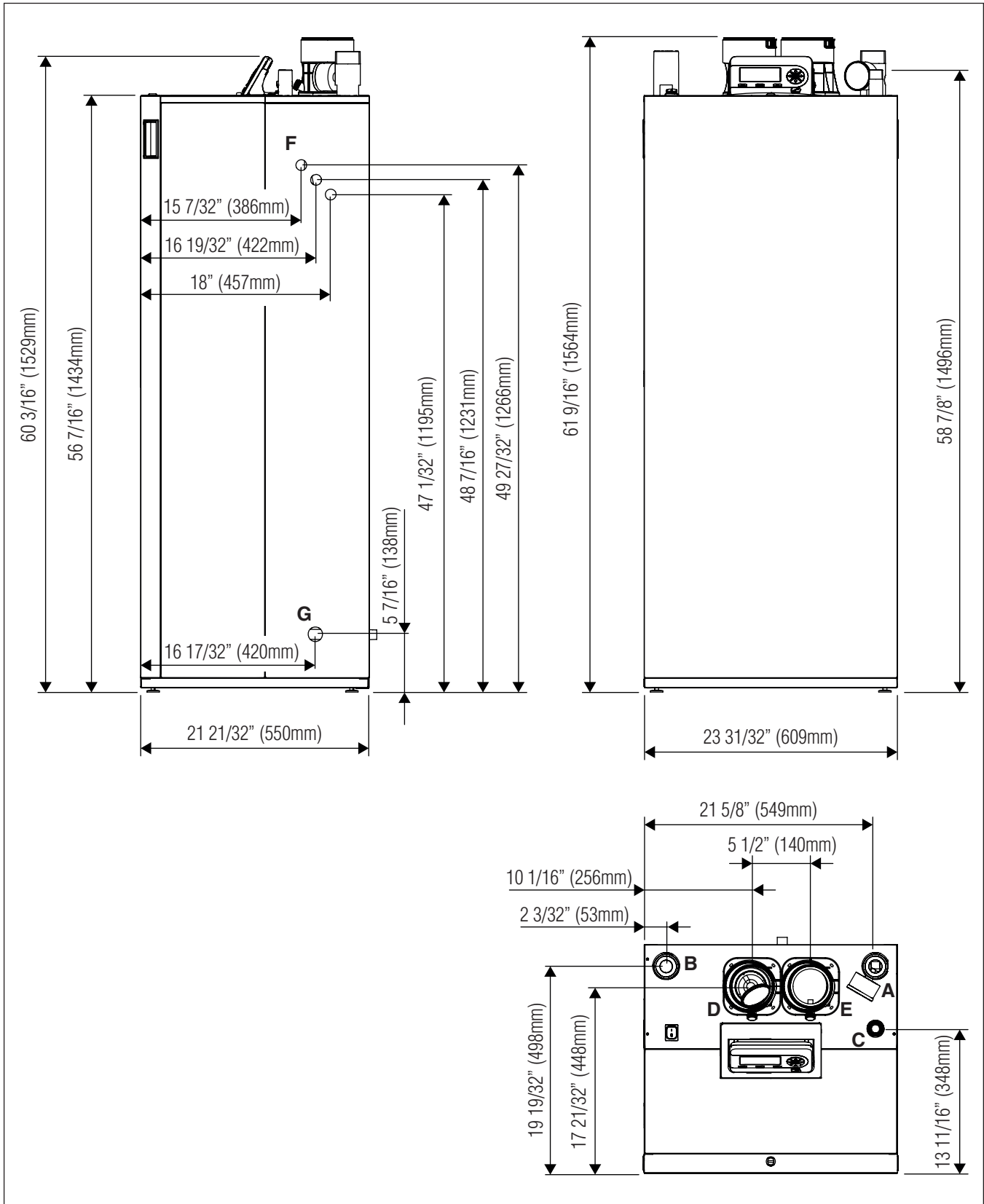


Fig. 4 SSB512 (dimension in inches [mm])

- | | | | |
|---|------------------------|---|---------------------------|
| A | System supply - 2" NPT | D | Flue exhaust - 4" (110mm) |
| B | System return - 2" NPT | E | Intake air - 4" (110mm) |
| C | Gas inlet - 1" NPT | | |

2.6 Main components

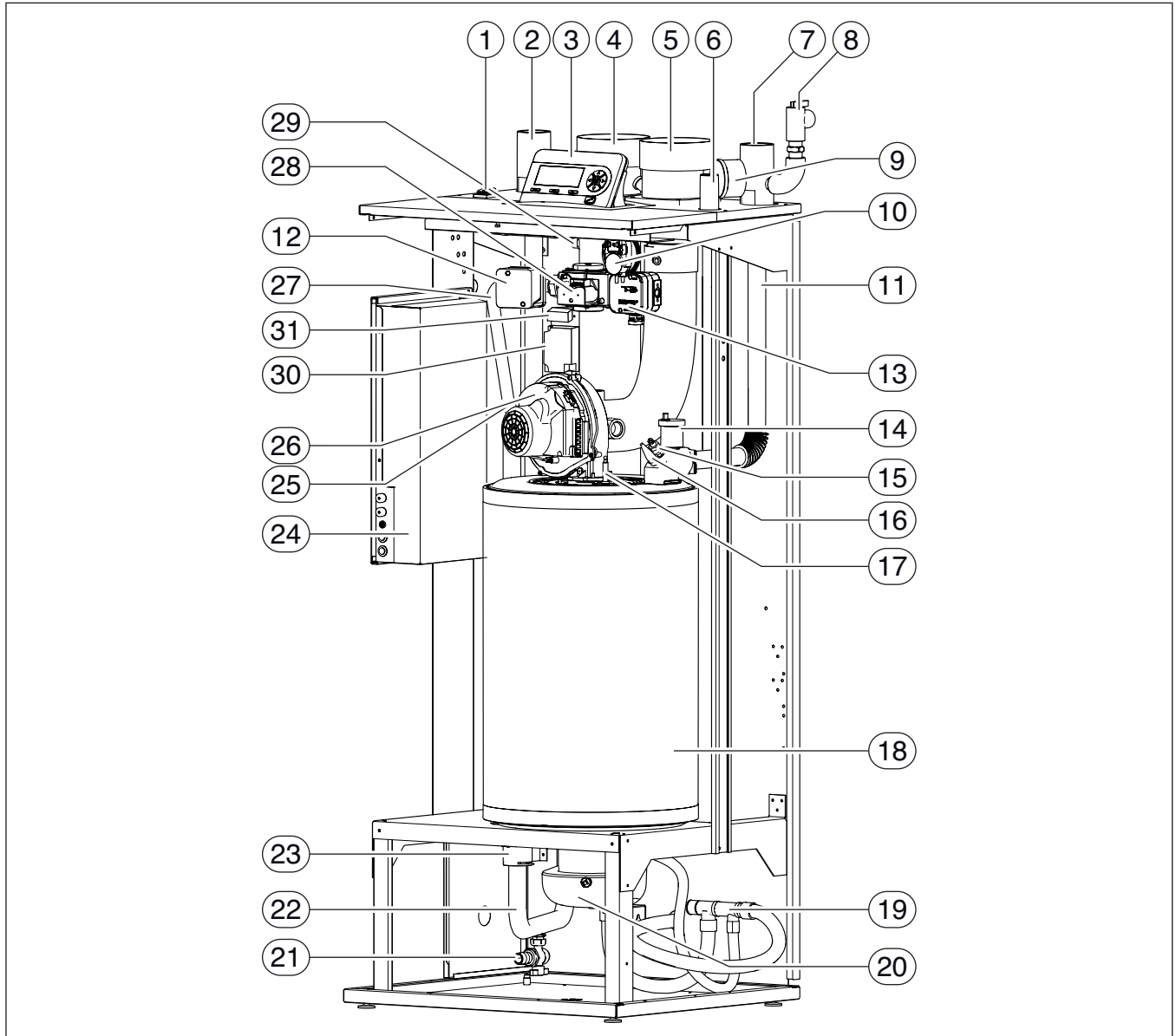


Fig. 5 SSB512 (main components)

- | | |
|---|-------------------------------------|
| [1] Main power switch | [16] High limit temp. safety switch |
| [2] System return | [17] Spark electrode |
| [3] Removable display | [18] Heat exchanger |
| [4] Flue exhaust | [19] Condensate manifold |
| [5] Intake air | [20] Air pressure switch connection |
| [6] Gas inlet | [21] Low point drain valve |
| [7] System supply | [22] Heat exchanger return pipe |
| [8] Pressure Relief Valve | [23] Return temperature probe |
| [9] Tridicator | [24] Wiring Control Panel |
| [10] Air pressure switch | [25] Main shut off gas valve |
| [11] Heat exchanger supply pipe | [26] Fan |
| [12] Max pressure switch [For SSB 512 Only] | [27] Gas pipe |
| [13] Min pressure switch [For SSB 512 only]. Location should be burner side of gas valve. | [28] Gas valve |
| [14] Automatic air vent | [29] Flue gas probe |
| [15] Low water cut off probe | [30] External igniter |
| | [31] Relay for external igniter |

2.7 Technical data

	Unit	SSB255	SSB399	SSB512
Boiler Category		ASME Sect.IV	ASME Sect.IV	ASME Sect.IV
Type of Gas		Natural Gas, Propane *	Natural Gas, Propane *	Natural Gas, Propane *
Max input rate	BTU/hr (kW)	255,900 (75)	399,000 (117)	512,000 (150)
Min input rate	BTU/hr (kW)	51,180 (15)	79,800 (23.4)	102,400 (30)
Turndown	Rate (%)	5:1 (20 %)	5:1 (20 %)	5:1 (20 %)
Gas Connections (NPT)	Ø Inch	1"	1"	1"
Max. NG Pressure	Inch W.C. (mbar)	10.5 (26.15)	10.5 (26.15)	10.5 (26.15)
Min. NG Pressure	Inch W.C. (mbar)	3.5 (8.72)	3.5 (8.72)	3.5 (8.72)
Max. LPG Pressure	Inch W.C. (mbar)	13 (32.3)	13 (32.3)	13 (32.3)
Min. LPG Pressure	Inch W.C. (mbar)	8 (19.9)	8 (19.9)	8 (19.9)
Water Connections	Ø Inch	1 ½ "	1 ½ "	2"
Max. Allowable Working Pressure (MAWP)	PSI (bar)	80 (5.5)	80 (5.5)	80 (5.5)
Recommended water flow @ max power (ΔT 36 °F / 20 °C)	GPM (m³/h)	14.2 (3.2)	22.2 (5.0)	28.4 (6.5)
Max water flow @ max power (ΔT 27 °F / 15 °C)	GPM (m³/h)	18.9 (4.3)	29.5 (6.7)	37.9 (8.6)
Min water flow @ max power (ΔT 54 °F / 30 °C)	GPM (m³/h)	9.5 (2.2)	14.8 (3.4)	18.9 (4.3)
Min water flow @ min power (ΔT 27 °F / 15 °C)	GPM (m³/h)	3.8 (0.9)	5.9 (1.3)	7.6 (1.7)
Water Pressure Drop @ recommended water flow	Feet Head (mbar)	3.8 (114)	8.3 (250)	21.7 (650)
Water Pressure Drop @ max water flow	Feet Head (mbar)	6.4 (190)	13.8 (410)	37.73 (1120)
Water Volume	Gallon (liter)	4.0 (15.2)	4.5 (17.0)	6.0 (23.0)
Vent/Air Intake Connections	Ø Inch (Ø mm)	3 (80)	4 (100)	4 (100)
Vent Materials		CPVC, PVC, PP, PP Flex, Stainless Steel AL29-4C IPEX type IIA & IIB	CPVC, PVC, PP, PP Flex, Stainless Steel AL29-4C IPEX type IIA & IIB	CPVC, PVC, PP, PP Flex, Stainless Steel AL29-4C IPEX type IIA & IIB
Max operating temperature	°F (°C)	194 (90)	194 (90)	194 (90)
Max HE allowable temperature	°F (°C)	210 (98.9)	210 (98.9)	210 (98.9)
Ambient storage temperature dry	°F (°C)	5 to 150 (-15 to 65)	5 to 150 (-15 to 65)	5 to 150 (-15 to 65)
Ambient functioning temperature	°F (°C)	32 to 120 (0 to 49)	32 to 120 (0 to 49)	32 to 120 (0 to 49)
Ambient Relative Humidity [RH]	% RH	Minimum 30%, Maximum 90%	Minimum 30%, Maximum 90%	Minimum 30%, Maximum 90%
Surface area heat exchanger	SQFT (m²)	22.0 (2.0)	27.2 (2.5)	43.0 (4.0)
Standard Listings & Approvals		CSA, ASME, AHRI	CSA, ASME, AHRI	CSA, ASME, AHRI
Electrical Req. 120VAC/1PH/60Hz		2 FLA**	2.5 FLA**	2.5 FLA**
Noise rating	dB	46	47	48
Weight (dry)	lbs (kg)	198 (90)	220 (100)	242 (110)
Min. clearance to combustibles ***	Inch (mm)	2" (50.8)	2" (50.8)	2" (50.8)
Dimension WxHxD	Inch (mm)	23 31/32" x 61 9/16" x 21 21/32" (609x1564x550)	23 31/32" x 61 9/16" x 21 21/32" (609x1564x550)	23 31/32" x 61 9/16" x 21 21/32" (609x1564x550)

AHRI certified ratings

	Unit	SSB255	SSB399	SSB512
Input	MBH	255	399	511.8
Heating Capacity	MBH	237.0	n/a	n/a
Gross Output	MBH	n/a	386.0	495.0
AFUE	%	96	n/a	n/a
Combustion Efficiency	%	n/a	97.6	95.4
Thermal efficiency	%	n/a	96.9	96.8
Net rating	MBH	206.0	336.0	430.0
CO ₂	%	10.2	10.1	9.5

(*) With conversion.

(**) FLA (Full Load Amperage) - maximum current drawn by the boiler without pumps.

(***) The 2" minimum clearance is required for all sides of the boiler. The boiler may be installed on combustible (wood) floors excluding carpets. See Fig. 9 for minimum clearance recommendation for serviceability.

2.8 Efficiency Curves

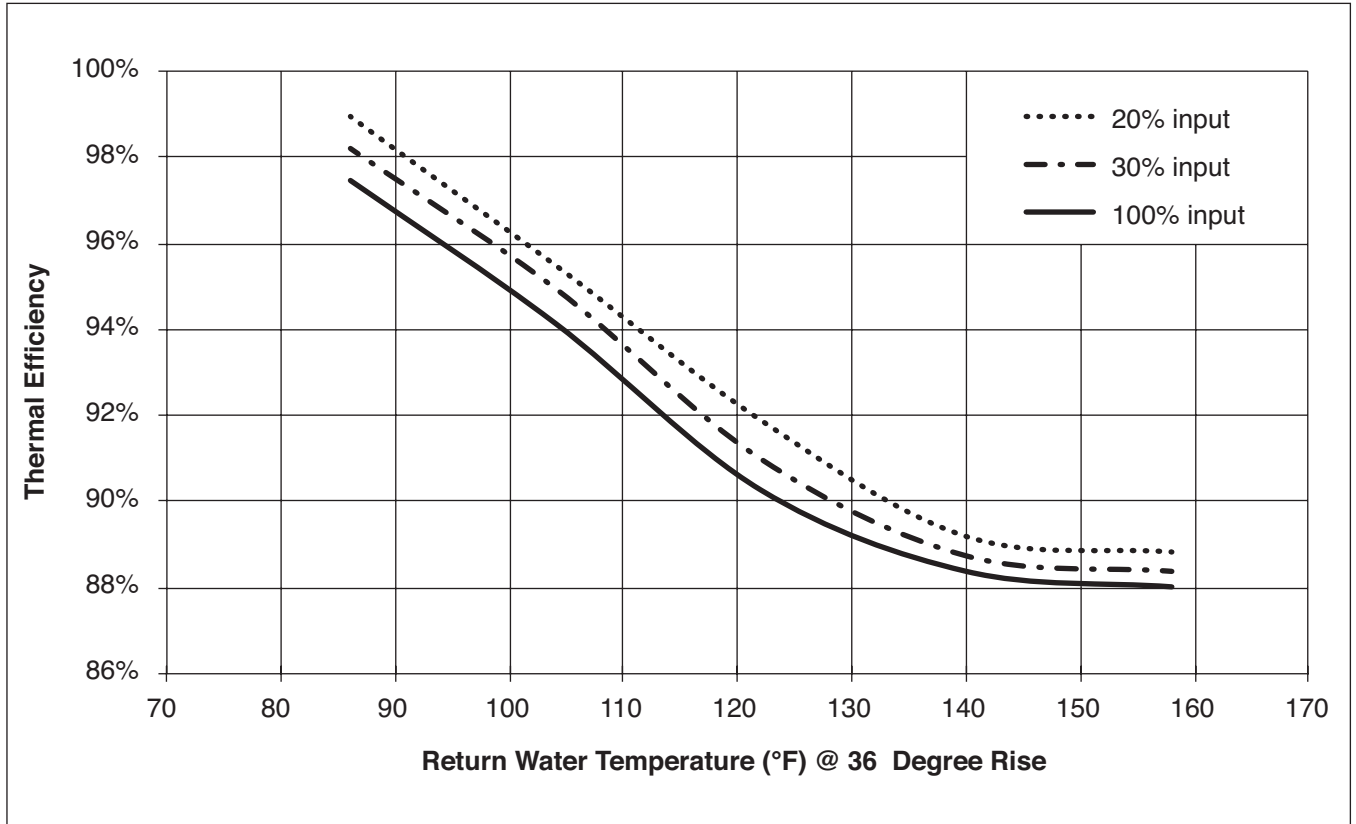


Fig. 6 Thermal Efficiency Curves SSB255*
 * Thermal Efficiency curve is for reference only as this is a residential boiler

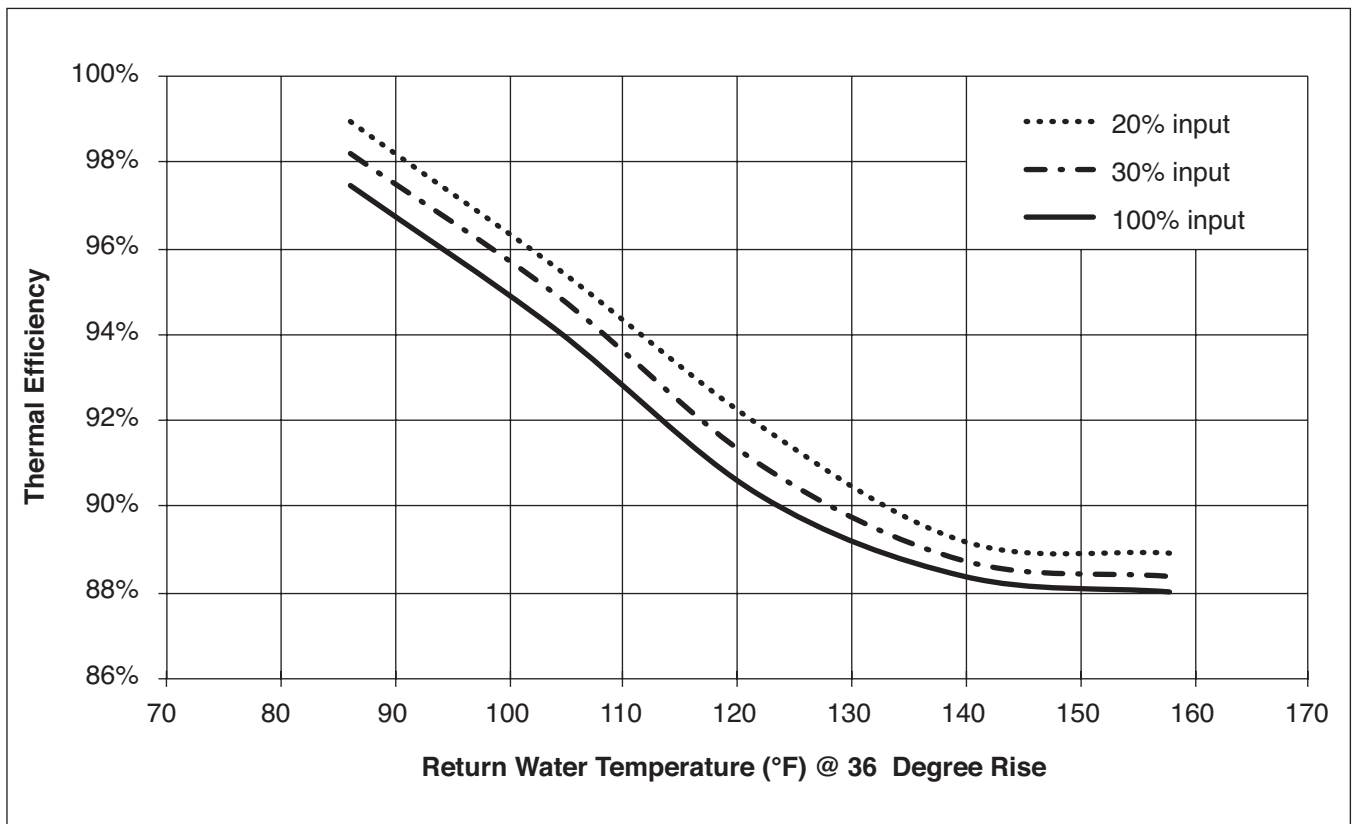


Fig. 7 Thermal Efficiency Curves SSB399

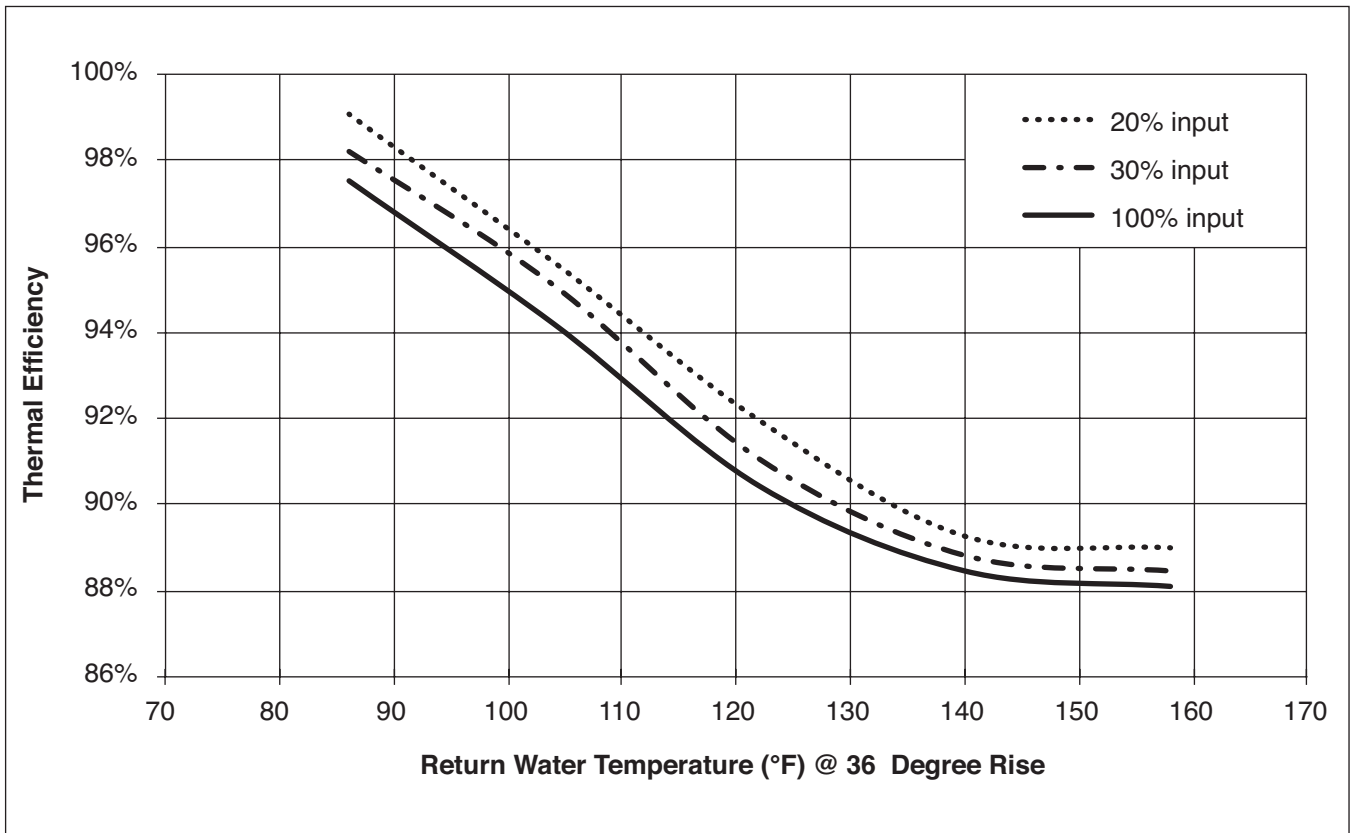


Fig. 8 Thermal Efficiency Curves SSB512

3 Regulations



Observe all rules, regulations, standards and guidelines applicable to the installation and operation of this appliance in your country.



Valves external to the boiler must be fitted with T-handles and condensate piping must be installed in accordance with the State Plumbing Code.

3.1 Compliance with standards and regulations

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA 54. In Canada, installation must be in accordance with the requirements of CAN/CSA B149.1, Natural Gas and Propane Installation Code.

This condensing gas boiler complies in its design and mode of operation with the American National Standard ANSI Z21.13/CSA4.9, latest edition for Gas Fired Low Pressure Steam and Hot Water Boilers.

Other confirmed approvals and certifications are indicated by labels on the boiler.

Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

Install CO detectors per local regulations. Boiler requires yearly maintenance (see section "7 Maintenance").

3.2 Operating limits of the boiler

The heat exchanger has been designed and certified in accordance with the ASME Boiler and Pressure Vessel Code, Section IV.

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. Common practice calls for inspecting an existing system in its entirety and bringing it up to code. All pipework should be properly cleaned and flushed.

3.3 Additional regulations for installation in Massachusetts

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet [2150 mm] above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

- **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.
 - In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

- In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

- **APPROVED CARBON MONOXIDE DETECTORS.** Each carbon monoxide detector as required in accordance with the above provisions shall comply with NPA 720 and be ANSI/UL 2034 listed and IAS certified.
- **SIGNAGE.** A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (.) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".
- **INSPECTION.** The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspections, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CRM 5.08(2)(a) 1 through 4.

(b) **EXEMPTIONS:** The following equipment is exempt from 248 CRM 5.08(2)(a) 1 through 4:

- The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the board; and
- Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) **MANUFACTURERS REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM REQUIRED.** When the manufacturer of Product Approved side wall horizontally mounted gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for the installation of the equipment and venting shall include:

- Detailed instructions for the installation of the venting system or the venting system components; and
- A complete parts list for the venting system design or venting system.

(d) **MANUFACTURERS REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.** When the manufacturer of Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for the venting of flue gases, but identifies special venting systems, the following requirements shall be satisfied by the manufacturer:

- The referenced special venting systems shall be included with the appliance or equipment installation instructions; and
- The special venting systems shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or venting design instructions shall remain with the appliance or equipment at the completion of the installation.

4 Installation

4.1 Packaging and product identification

The SSB is delivered strapped to a pallet, packed and protected in a cardboard carton.

NOTICE: The packaging shows the characteristics of the product: model, power, fuel type and version. In case of deviation from the order, contact your local dealer. After removing the packaging check the condition and completeness of delivery.



WARNING: Keep the packing material out of reach of children as it may be dangerous. Dispose of packaging in an environmentally responsible manner.



In order to ensure proper product identification do not remove or tamper with any product identification tags or labels.

4.2 Installation room

The boiler must be installed in rooms that comply with all local, state and federal codes and laws. Before commissioning the boiler verify exhaust flue and terminations are properly sealed and secured.

- Adequate combustion air and ventilation is required for safe and proper installation of the boiler, regardless whether the combustion air is taken from the outside (Direct Vent, sealed combustion) or inside (room air for combustion).



WARNING: Insufficient ventilation of the boiler room can lead to high air temperatures and lead to risk of personal injury or death from flue gas poisoning!

- Make sure that intake and exhaust openings are sufficiently sized and no reduction or closure of openings takes place. If these are not provided, do not operate the boiler (see section "4.7.2 Connecting flue gas systems").
- The heating units cannot be installed outdoors. NEVER place this appliance in a location that would subject it to temperatures at or near freezing or temperature that exceed 120°F (49°C) while in operation. Failure to properly locate this unit can result in premature failure.
- This appliance must be installed in a location so that any water leaking from the unit or piping connections or relief valve openings will not cause damage to the area surrounding the unit or any lower floors in the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the boiler. The pan must not restrict combustion air flow.
- When installed in a room with thin flooring, resonating noises may occur. Isolate the boiler from direct contact with the floor to minimize noise transmission.
- Do not allow excessive dust to collect on the appliance.



WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

- Do not store or use gasoline or other flammable vapors and liquids in the proximity of this or any other appliance.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Please consider the space needed for accessibility to safety and control devices and for performing maintenance operations.

The recommended clearance for ease of installation and service are illustrated in the following picture:

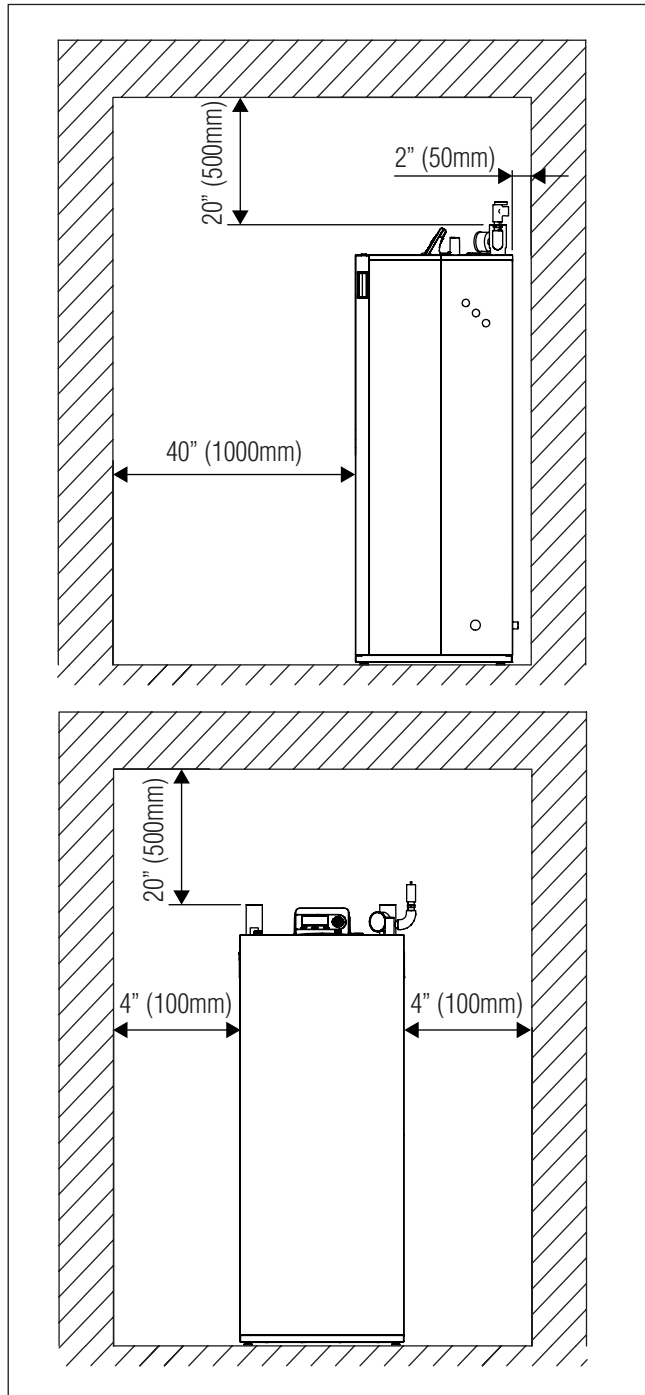


Fig. 9 Recommended minimum clearances for installation and servicing (dimension in inches [mm])

2" (50.8 mm) clearance from combustibles is permitted, but respect the clearance in Fig. 9 for serviceability". The boiler can be installed on a combustible (wood) floor excluding carpets.

NOTICE: This device is equipped with a freeze protection function. For further information see section "5.8 Setting frost protection".

4.3 Water Chemistry Guidelines

NOTICE: If using anti-freeze:

- ▶ Follow the boiler manufacturer's instructions on antifreeze concentration.
- ▶ Frost protection and inhibitor level has to be checked annually during the regular scheduled maintenance of the condensing boiler.

NOTICE: System damage!

- ▶ It is the installer's responsibility to ensure that the heating system is compatible with the boiler type and size installed.
- ▶ pH-value of the heating water to be kept between 6.5 and 9.

To avoid any presence of oxygen in the system, it is advised to prevent as little as possible air during installation. Usual spots where air is most likely to seep in are: gaskets, pumps, air vents and O-rings gaskets. Using an automatic water fill system exposes the system to fresh oxygenated water. In commercial applications it is recommended to install a water meter to measure the introduction of fresh water into the system.

A minimum water pressure is required for optimum performance. Minimum water pressure required: 7.25 psi (0.5 bar).

Before and during assembly, the system must be kept free of impurities, construction dust, sand, copper dust, grease, carbon deposits, etc., as well as welding flux residue. In any of these instances, the old system must be rinsed with clear water mixed with a highly concentrated rinse agent.

For freeze protection use only propylene glycol, with scale inhibitors, with a maximum volume [concentration] of 40% of glycol.

NOTICE: DO NOT use PVC for vent piping when using anti-freeze in the primary circuit of the boiler. Use CPVC, PP or stainless steel only!

Water hardness must fall within the following limits:

50 ppm of CaCO_3 < (alkali strength) < 150 ppm of CaCO_3 .

- ▶ Use only untreated water to fill the system.
- ▶ Do not use TSP (tri-sodium phosphate).
- ▶ Do not use fill water treated with salt bedding type exchangers (ion exchanger).
- ▶ Never introduce non-approved boiler treatment or similar additives.
- ▶ Only use fill water with a hardness below 7 grains.
- ▶ Filling with chlorinated water is acceptable if chlorine levels are below 100 ppm.
- ▶ Consult a local water treatment specialist for recommendations if any of the above is outside the stated ranges.
- ▶ When using oxygen permeable PEX, the system must be separated from the boiler by a heat exchanger.
- ▶ A correctly sized and working expansion vessel must be installed.
- ▶ Do not exceed the maximum permissible flow rate through the boiler.
- ▶ Excessive flow can cause erosion damage to the heat exchanger.
- ▶ **Eliminate System Leaks:**
Continuous addition of make-up water will constantly add oxygen to the system and lead to corrosion. All system leaks must be repaired.

In the following table are listed the chemical water specifications.

Parameters	Units	Value
General feature	-	Colorless, no sediment
Dissolved Oxygen	mg/l	< 0,05
Total iron (Fe)	mg/l	< 0,3
Total copper (Cu)	mg/l	< 0,1
Na_2SO_3	mg/l	< 10
N_2H_4	mg/l	< 3
PO_4	mg/l	< 15

Tab. 1 Water specification

4.4 Hydraulic connection

Hydraulic connection are shown in Fig. 2, Fig. 3 and Fig. 4. In the following table are listed the pipe dimension for each model:

Model	Ø Water supply connection	Ø Water return connection
SSB255	1-1/2" NPT male	1-1/2" NPT male
SSB399	1-1/2" NPT male	1-1/2" NPT male
SSB512	2" NPT male	2" NPT male

NOTICE: Before connecting the boiler to the heating system, flush the heating system to remove sediment, flux, dirt, and other foreign matter. The heat exchanger may be damaged by sediment or corrosion.

- Do not use cleaning fluids that are not compatible with the boiler materials, including acids (e.g. hydrochloric acid and similar ones) at any concentration
- Introducing fresh water to the system increases the oxygen presence and can cause corrosion of metallic components. Immediately repair any drips or leaks in the system to avoid constant introduction of air into the system.
- Do not use the water contained in the boiler for domestic use or as drinking water or within swimming pools.
- Excessive fluctuation in pressure changes in the system can cause fatigue and stress on the heat exchanger. This is detrimental to the integrity of the boiler and system components, it is mandatory to maintain a constant operating pressure.

4.4.1 Low water cut off

A low water cut off (LWCO) is installed in the boiler, the manual reset button is located on the front of the internal sliding wiring center.

To check the functionality of LWCO press the test button (the top button shown in Fig. 10). The LED on the block will light and in the screen will appear the error "MN: Low Water Cutoff Error". At this point press the reset button (the bottom button). The LED will turn off.

4.4.2 No Flow test procedure

To simulate a no water flow condition, the following steps should be followed:

- Turn power off to boiler
- Disconnect general pump power
- Turn power on to boiler
- Press "menu" button on display
- Select "system test"
- Select "high power"

The boiler will subsequently shut down as a result of overheat error.

4.4.3 High limit safety switch

A high limit safety switch is installed in the boiler. To simulate a high limit lockout at 208°F press the "MENU" and "OK" buttons simultaneously for 10 seconds. The control will display "MN: Max. Thermostat Lock Error". At this point press the reset button on the removable display to restart the boiler.

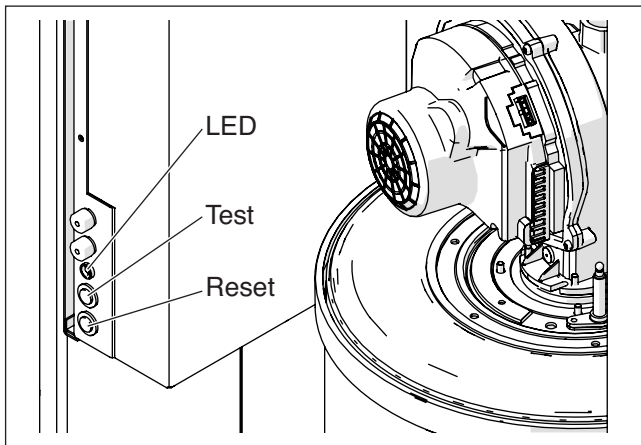


Fig. 10

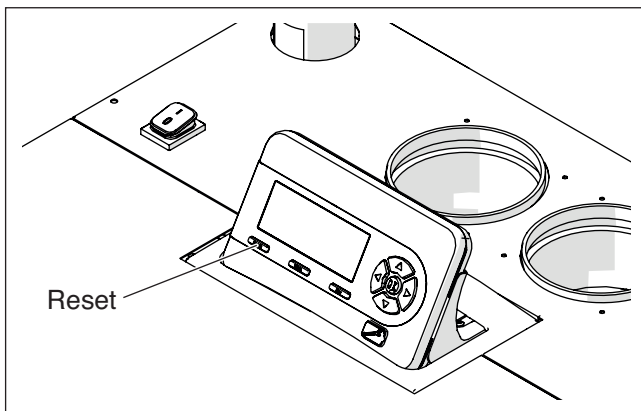


Fig. 11

4.4.4 Pressure relief valve (PRV)

The boiler is supplied with a pressure relief valve (PRV). The relief pressure for each valve for each model of the boiler is shown in the following table:

Boiler model	Relief Pressure
SSB255	30 psi (2.07 bar)
SSB399	30 psi (2.07 bar)
SSB512	75 psi (5.17 bar)

A 75psi pressure relief valve can be purchased separately and field installed.

The pressure relief valve (PRV) must be piped to a suitable drain to prevent injury if the valve releases. Use a pipe of the same diameter of the outlet of the valve

4.4.5 Expansion tank

An expansion tank must be installed in the hydraulic system. The expansion tank must be properly sized for the boiler and the system volume, temperature and pressure.



WARNING: An undersized expansion tank will cause leakage of water from the pressure relief valve and introduce fresh water into the system. Excessive addition of makeup water can cause corrosion of metallic components and compromise the functionality of the boiler.

Refer to instructions provided by the manufacturer of the expansion tank for details on its installation and sizing.

4.4.6 Pump

SSB boilers must be fitted with a circulator pump. The graph in the following figure shows the pressure drop through the boiler circuit depending on the flow rate.

SSB255

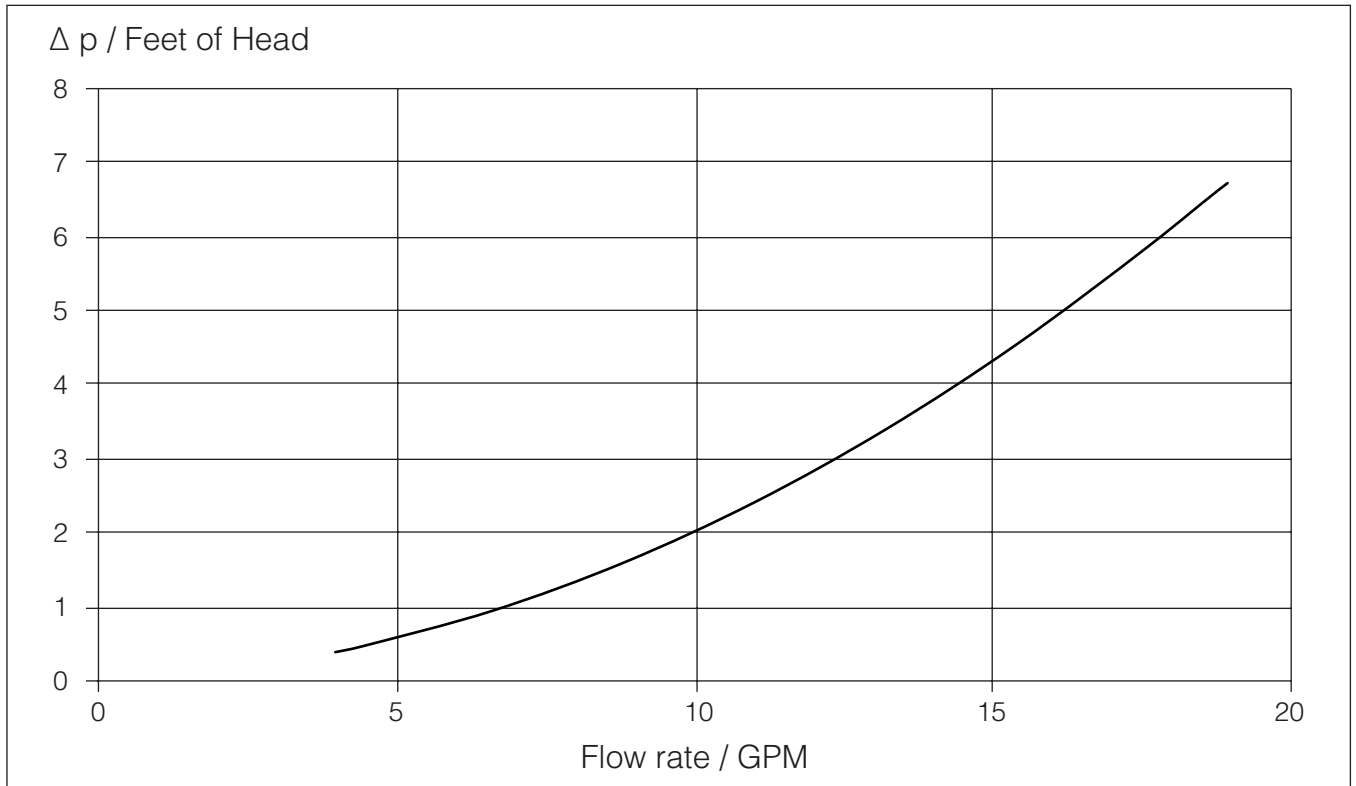


Fig. 12 SSB255 Pressure drop



It is important to ensure the pump has the correct flow rate for the system to avoid a low water circulation situation. In event of an inadequate flow rate, the safety devices of the boiler will automatically stop the burner.

SSB399

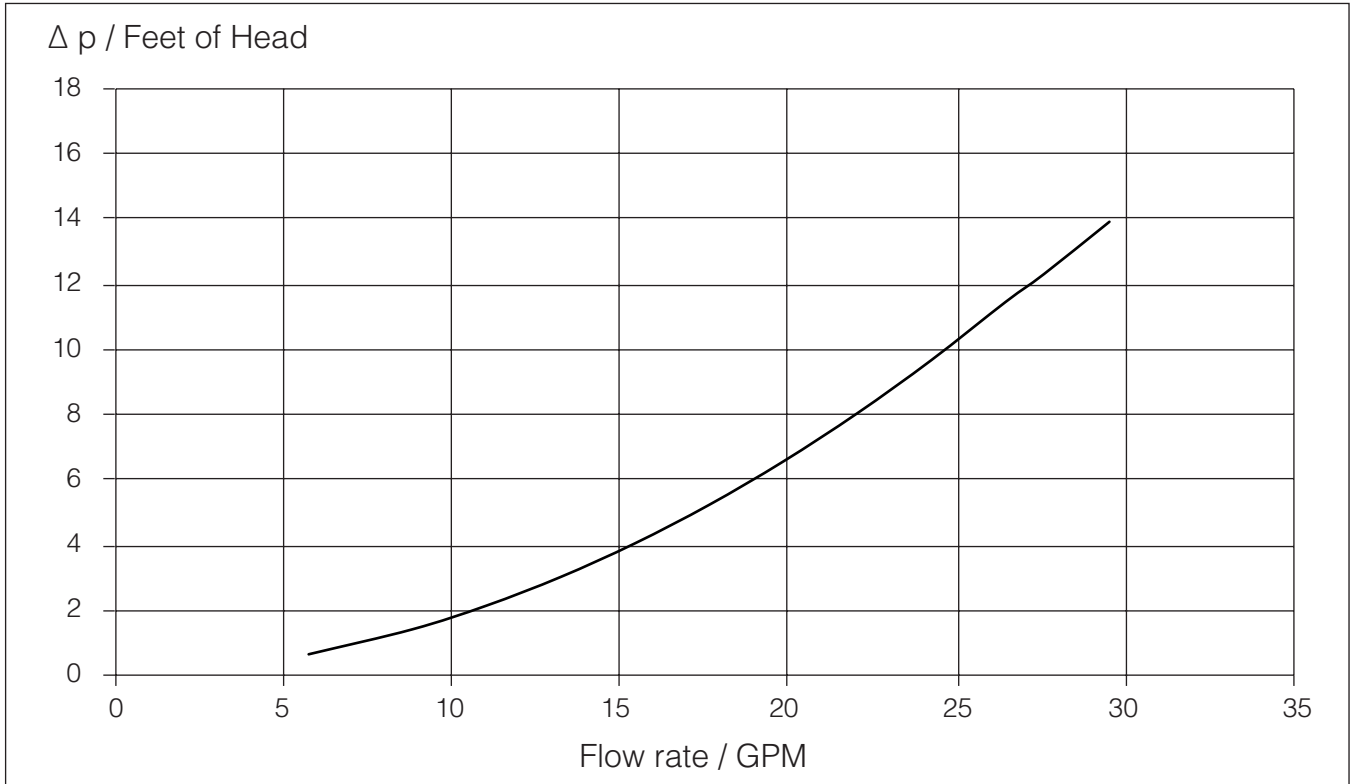


Fig. 13 SSB399 Pressure drop

SSB512

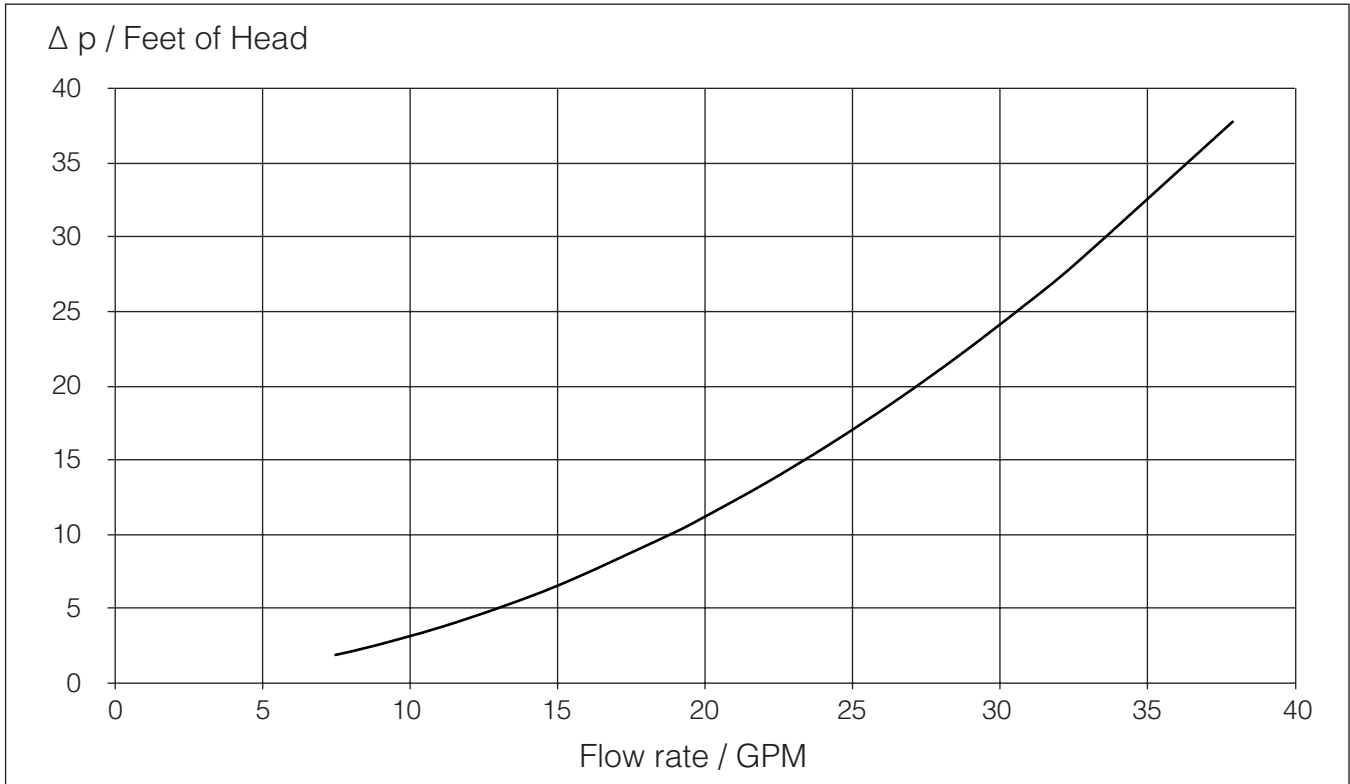


Fig. 14 SSB512 Pressure drop

4.4.7 Condensate removal

The condensate water produced by the boiler during its normal operation is collected by two plastic pipes (A and B) provided with the boiler and connected with a plastic collector inside the case. A third tube (C) collects the condensate output from the collector [Arrow is the direction of flow of condensate].

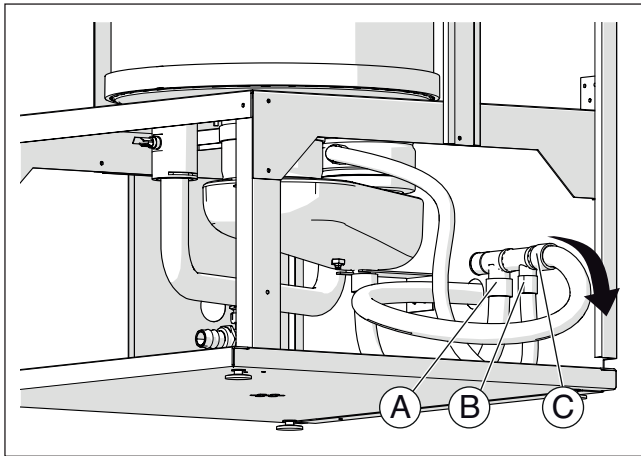


Fig. 15



DANGER: The condensate pipe A and B, shown in Fig. 15, must be filled with water or combustion gases will enter the room with a risk of an excessive level of carbon monoxide.

To fill the condensate discharge add water from the vent (1) until you see water come out of the condensate discharge pipe (2).

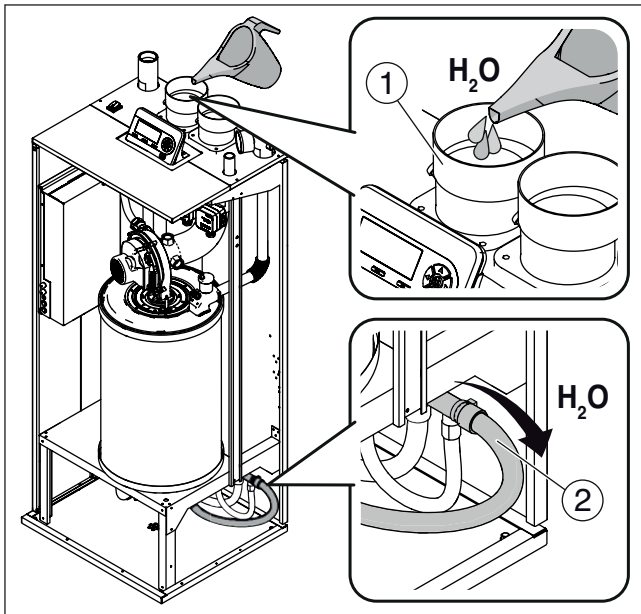


Fig. 16

The condensate water shall be discharged at atmospheric pressure, i.e. by dripping into a siphon-shaped container connected to the home sewage system or suitable drain, and shall be neutralized prior to draining per local codes.

The boiler is equipped with three holes (in the right, left and back side) to carry the condensate out the condensate drain tube.

Install the condensate drain tube through the appropriate hole and be sure to pitch away from the boiler.

- Do not reduce the diameter of the condensate drain pipe down

stream.

- Never use copper pipes or of other material not intended for the specific purpose, because the action of condensate will cause a rapid deterioration.
- Check that the condensate drain pipe is adequately sloping towards the discharge point avoiding high points, which can inhibit the flow of condensate.
- Install the condensate pipe in such a way so as to avoid the freezing of the liquid.

NOTICE: Verify condensate disposal / neutralization is in accordance with local, state and federal regulations.

A condensate removal pump is required if the boiler is below the drain. When installing a condensate pump, select one approved for use with condensing boilers and furnaces. The pump should have an overflow switch to prevent property damage from condensate leakage.

4.5 Electrical connection

4.5.1 Power supply cable connection

To connect the boiler to the electrical supply, as required by local, state and federal codes, provide and install a service switch (15 amp is recommended).

The power supply cable can be inserted into the boiler using one of the six knock out holes (A) on the sides as shown in Fig. 17.



WARNING: All the electrical wiring must be secured by appropriate strain reliefs.

To secure the supply cable inside of the boiler use the cable clamp shown in position B shown in Fig. 18.

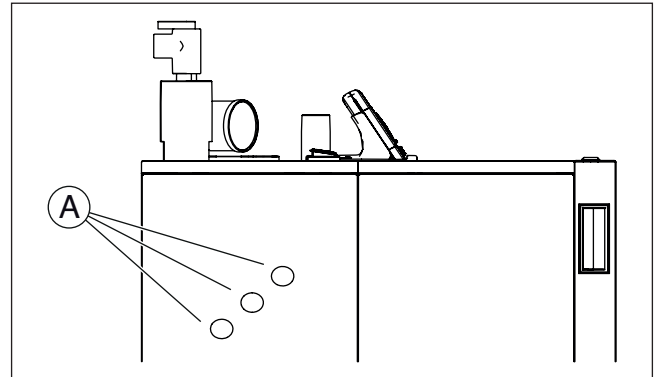


Fig. 17

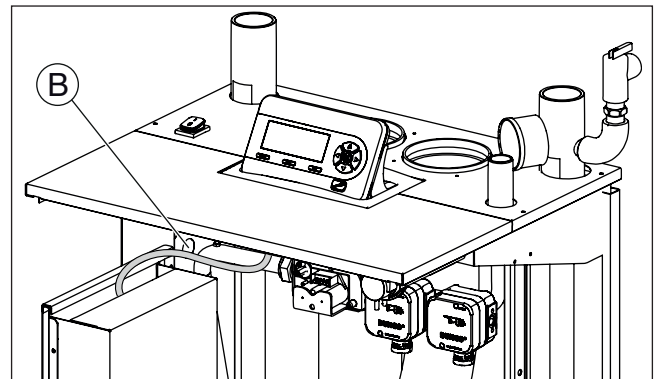


Fig. 18

The general electrical connection is shown in the following diagram :

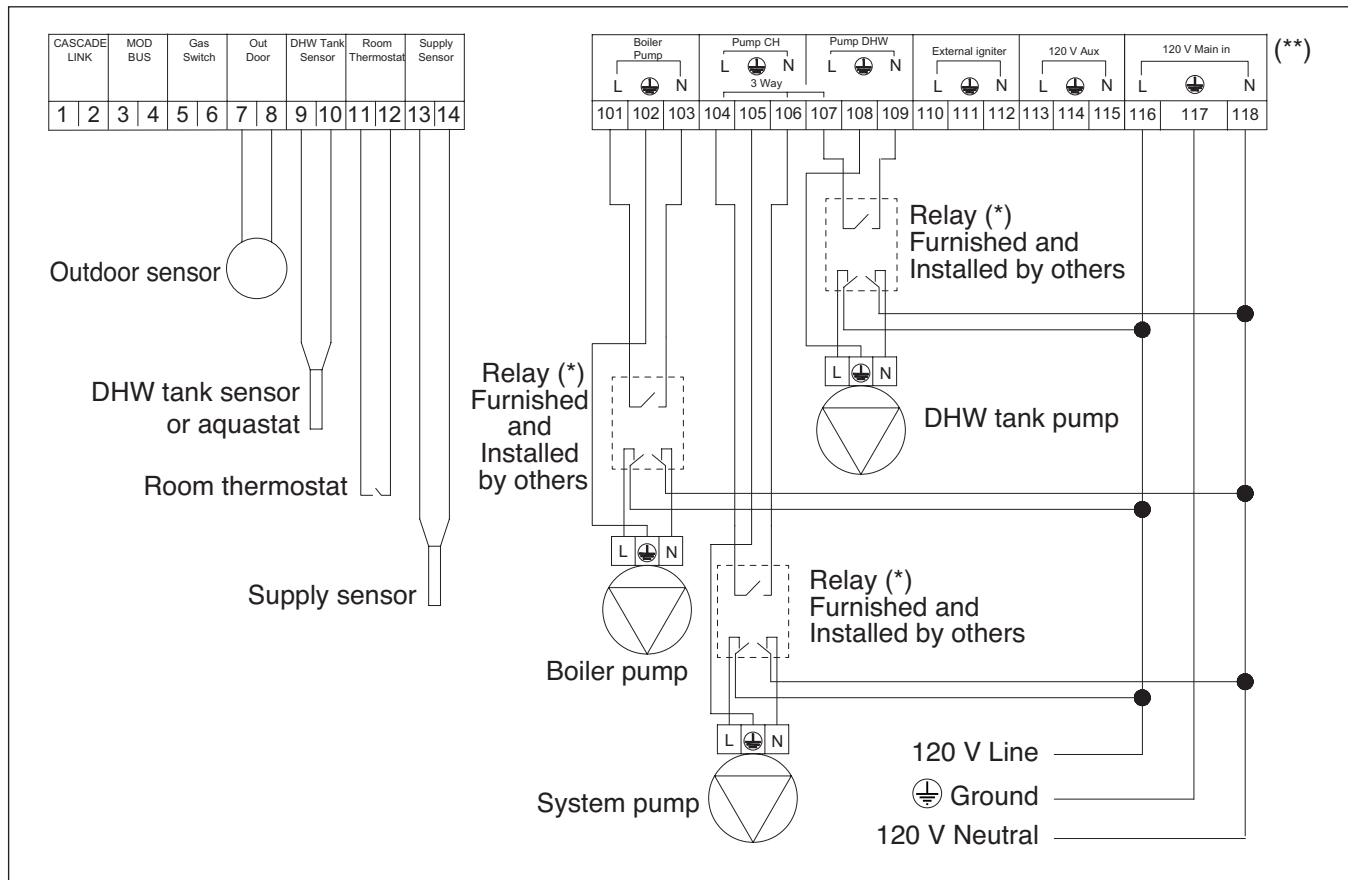


Fig. 19

(*) NOTICE: The maximum amp load for each pump is 1 A when 2 or 3 pumps are connected. For this reason, if the power consumption of each pump is higher than 84 watt, use a relay as shown in figure.

If just one pump is connected, the maximum amp load of this single pump is 2 A. For this reason if the power consumption of the pump is higher than 168 watt, use a relay as shown in figure Fig. 19.

() NOTICE:** line voltage.

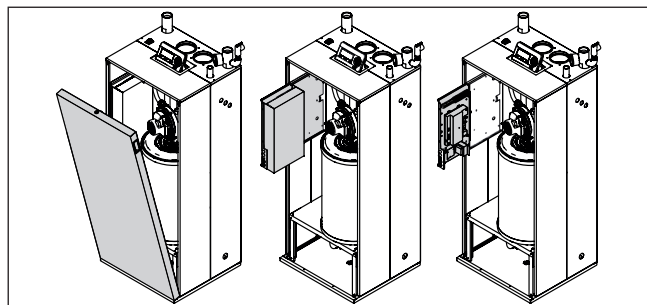


Fig. 20

4.5.2 Access to the electrical terminal strip

To have access to the internal terminal strip of the boiler follow the steps below (see Fig. 20).

- ▶ Rotate the lock at the top on the front panel and remove the front panel as shown.
- ▶ Slide out the electrical box and remove the two screw from the front.
- ▶ Remove the box cover to have access to the terminal strip.

4.5.3 Room thermostat connection

Connect the thermostat to terminals 11 and 12 as shown in Fig. 19.

4.5.4 Outside temperature sensor

If outside temperature control is to be used, the outside probe needs to be connected to terminals 7 and 8 as shown in Fig. 19. The outside probe shall be installed on an outer wall, North or North/East, away from windows, door, and ventilation grids. Never install the probe in a position exposed to the sun.

The maximum length is 300' (100 meter), if the cable length exceeds 32' (10 meters) a shielded cable is required and shall be connected to chassis ground.

NOTICE: All Sensors and low voltage wiring shall not be routed in direct contact or near high voltage power.

4.6 Gas supply piping

Verify that the type and the pressure of the gas supplied correspond with those required for the boiler. When field converting the boiler from Natural to LP gas be sure to adhere the new gas label on the boiler.

The minimum and maximum pressure for natural gas are 3.5" W.C. (8.72 mbar) and 10.5" W.C. (26.15 mbar) respectively.

The minimum and maximum pressure for LP gas are 8" W.C. (19.9 mbar) and 13" W.C. (32.3 mbar) respectively.

4.6.1 Connection of gas supply piping

Connect the gas supply to the unit as follows:

- ▶ Install a ground joint union for servicing as required.
- ▶ Install a manual shutoff valve in the gas supply piping
- ▶ Install a sediment trap/ drip leg
- ▶ Purge all air from the gas supply piping.
- ▶ Before placing the appliance in operation, check the appliance and its gas connection.
- ▶ Check the appliance and its gas connection with a leak test before placing in operation.



WARNING: Gas piping must be supported with proper hangers and not from the boiler itself or its devices and accessories.



DANGER: Never use an open flame to test for gas leaks. Always use an approved leak detection method.



WARNING: Failure to properly apply pipe sealing compound can result in severe personal injury, death, or substantial property damage.

The Commonwealth of Massachusetts prohibits the use of copper tubing for the gas line.

4.6.2 Gas type conversion



DANGER: Personal injury and property damage.

- ▶ This conversion shall only be performed by a trained and certified installer in accordance with the manufacturer's instructions and all applicable codes and requirements of the authority having jurisdiction.
- ▶ If the information in these instructions is not followed exactly, or the installation, adjustment, modification, operation or maintenance is carried out by an unqualified person, a fire, explosion or generation of large amounts of carbon monoxide may result causing property damage, personal injury or loss of life.
- ▶ Before carrying out electrical work: Disconnect the appliance from the power supply at the emergency shutoff switch or by disengaging the heating system circuit breaker. Take appropriate measures to prevent accidental reconnection.
- ▶ The installer is responsible for the proper conversion of this appliance.
- ▶ The conversion is not complete until the operation of the converted appliance is checked as specified in these instructions.

The gas-air ratio must always be set on the basis of a CO₂ or O₂ reading taken at maximum nominal output and minimum nominal output using an electronic flue gas analyzer.

LP conversion kit installation (SSB255)

Natural Gas to LP conversion

The heating unit is factory preset for operating with natural gas. This set-up can be changed using the conversion kits supplied by the manufacturer.

NOTICE: This change may only be performed by a qualified installer or service technician, according to the following procedure.

Switching from NATURAL GAS to LP

- ▶ Close the gas cock
- ▶ Disconnect the electric power supply from the boiler



WARNING: to avoid electrical shock, it is mandatory to disconnect the boiler from the power supply using a service disconnect external switch.

- ▶ Remove the front panel
- ▶ Unscrew the 3 screws 'A' and the swivel joint 'B' indicated in Fig. 22 to separate the valve from the fan
- ▶ Separating the two components, you can see the hole where the gas passes with its gasket
- ▶ Insert the provided metal orifice 'C' into the gasket "D" without removing the gasket itself
- ▶ Check the condition of the gasket 'E'. Replace if necessary
- ▶ Tighten the swivel joint 'B'
- ▶ Tighten the 3 screws 'A'
- ▶ Switch the main power supply to ON

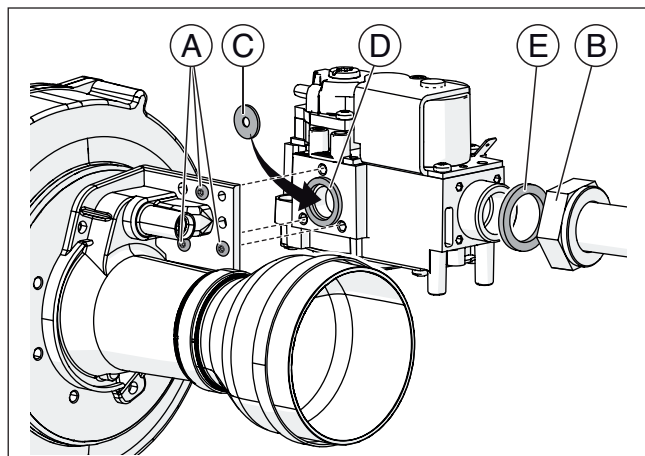


Fig. 22

NOTICE: Make sure there is no demand or call for heat.

- ▶ Use the control panel to enter in the parameter list and change the parameter N° 98 (Gas Type) from "NG" to "LPG"
- ▶ Reopen the gas shut-off cock
- ▶ Adjust the CO₂ parameter as explained in chapter "5.7 Adjusting and setting CO₂ limits"
- ▶ Affix the gas type label from the gas conversion kit to the appliance (Fig. 24).

LP conversion kit installation (SSB399 - SSB512)


Natural Gas to LP conversion

The heating unit is factory preset for operating with natural gas. This set-up can be changed using the conversion kits supplied by the manufacturer.

NOTICE: This change may only be performed by a qualified installer or service technician, according to the following procedure.

Switching from NATURAL GAS to LP

- ▶ Close the gas cock
- ▶ Disconnect the electric power supply from the boiler

 **WARNING:** to avoid electrical shock, it is mandatory to disconnect the boiler from the power supply using a service disconnect external switch.

- ▶ Remove the front panel
- ▶ Unscrew the swivel joint 'A' indicated in Fig. 23 to separate the valve from the connection pipe with the fan
- ▶ Separating the two components, you can see the hole where the gas passes with its gasket
- ▶ Place the provided metal orifice 'B' (Fig. 23) between the two gaskets
- ▶ Tighten the swivel joint
- ▶ Switch the main power supply to ON

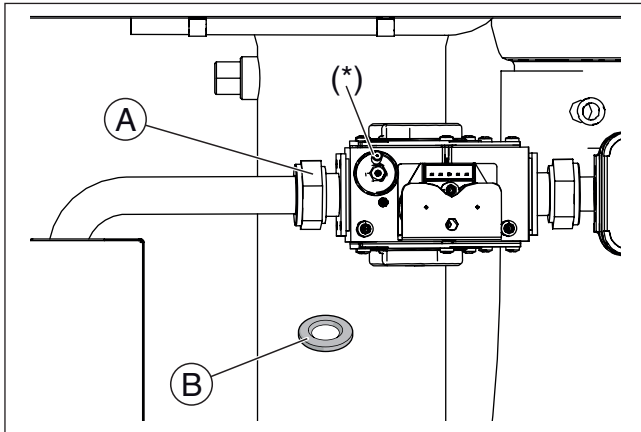


Fig. 23

(*) Balancing tube shown removed for clarity.

Boiler model	Orifice Diameter (mm)
SSB255	6.5
SSB399	10.5
SSB512	9.5

Tab. 2

NOTICE: Make sure there is no demand or call for heat.

- ▶ Use the control panel to enter in the parameter list and change the parameter N° 98 (Gas Type) from "NG" to "LPG"
- ▶ Reopen the gas shut-off cock
- ▶ Adjust the CO₂ parameter as explained in chapter "5.7 Adjusting and setting CO₂ limits"
- ▶ Affix the gas type label from the gas conversion kit to the appliance (Fig. 24).

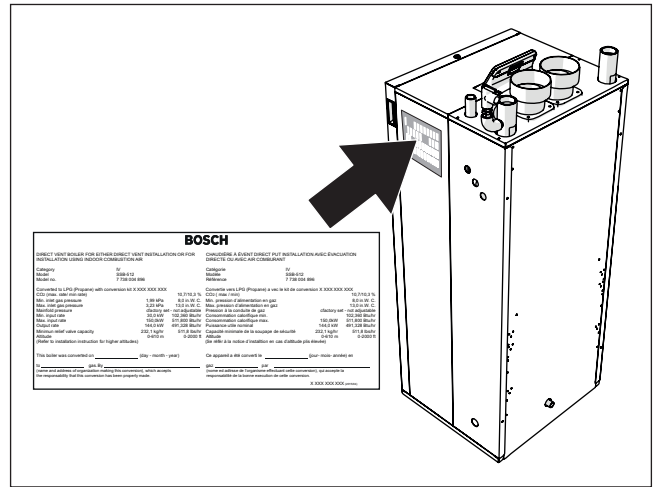




Fig. 24 Affixing the gas type label

4.7 Venting and air piping system

 **WARNING:** Do not connect this gas appliance with any other appliance unless approved by manufacturer. Failure to comply with this WARNING could result in the accumulation of carbon monoxide gas which can cause severe personal injury or death.

 **DANGER:** The condensate discharge must be filled with water or combustion gases will enter the room with a risk of an excessive level of carbon monoxide. For instruction see par 4.4.7.

NOTICE: DO NOT use PVC for vent piping when using anti-freeze in the primary circuit of the boiler. Use CPVC, PP or stainless steel only!

Make sure that the combustion air is not contaminated by:

- Permanent wave solutions;
- Chlorinated waxes/cleaners;
- Chlorine-based swimming pool chemicals;
- Calcium chloride
- Sodium chloride used for water softening;
- Refrigerant leaks;
- Paint or varnish removers;
- Hydrochloric acid/muriatic acid;
- Cements and glues;
- Antistatic fabric softeners used in clothes dryers;
- Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms;
- Adhesives used to fasten building products and other similar products.

To prevent contamination do not connect the combustion air inlet and exhaust near:

- Dry cleaning/laundry areas and establishments;
- Swimming pools;
- Metal fabrication plants;
- Beauty shops;
- Refrigeration repair shops;
- Photo processing plants;
- Auto body shops;
- Plastic manufacturing plants;
- Furniture refinishing areas and establishments;

- Remodeling areas;
- Garages with workshops.

4.7.1 General venting and combustion air piping system

The SSB boilers require an approved vent system—designed for positive pressure.

Vent connectors serving appliances vented by natural draft shall not be connected to any portion of mechanical draft systems operating under positive pressure.

Ensure that the flue pipes and seals are not damaged.

Use only primer and glue compounds approved for use with the vent material used.

Never install a barometric or a thermally controlled vent damper with this boiler.

Do not route the flue system piping through or inside another duct that is used for exhausting air or other flue gases.

The condensate trap must be primed at all times. Failure to do so may allow combustion gases to escape into boiler room.

The unit is to be used for either direct vent installation or for installation using room air for combustion. When room air is used, it is necessary to provide an adequate opening for the fresh air intake.

You must use any of the vent/air piping methods shown in this manual.

Be sure to locate the unit such that the vent and combustion air piping can be routed through the building and properly terminated.

The boiler / vent installation must be in accordance with Venting of Appliances, of the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or section, Venting Systems and Air Supply for Appliances, of the CAN/CSA B149.1, Natural Gas and Propane Installation code or applicable provisions of the local, state and federal building codes.

All vent pipes must be installed according to the vent manufacturer's

instructions.

The exhaust vent and the combustion air inlet lines must be supported to prevent sagging per the vent manufacturer's instructions.

Do not mix components from different systems. The vent system could fail, causing leakage of flue products into the living space. Use only approved materials.

Use of cellular core PVC and CPVC for venting system is not allowed.



WARNING: Improper venting due to failure to comply with the warnings above can result in excessive levels of carbon monoxide!

The exhaust pipe must be pitched a minimum of a 1/4 inch per foot back to the boiler (to allow drainage of condensate).

The vent system shall be installed so as to prevent the accumulation of condensate.

Consult local and state codes pertaining to special building code and fire department requirements. Adhere to national code requirements.

Observe the listed maximum lengths of vent system, which are boiler model dependent

To avoid moisture and frost build-up and to maintain clearances to openings on adjacent structures, 45 ° and 90 ° elbows or tees may be attached to the end of the vent termination pipe to direct exhaust plumes away from the adjacent structure. The total allowable vent length, maximum number of elbows and distance to air intake restrictions must be adhered to.

Due to the high efficiency of the unit it may discharge what looks like white smoke especially when the outside air temperature is cold. This is due to the presence of water vapor, normally present in the exhaust gases.

The following figure shows the acceptable piping installation for venting and combustion air.

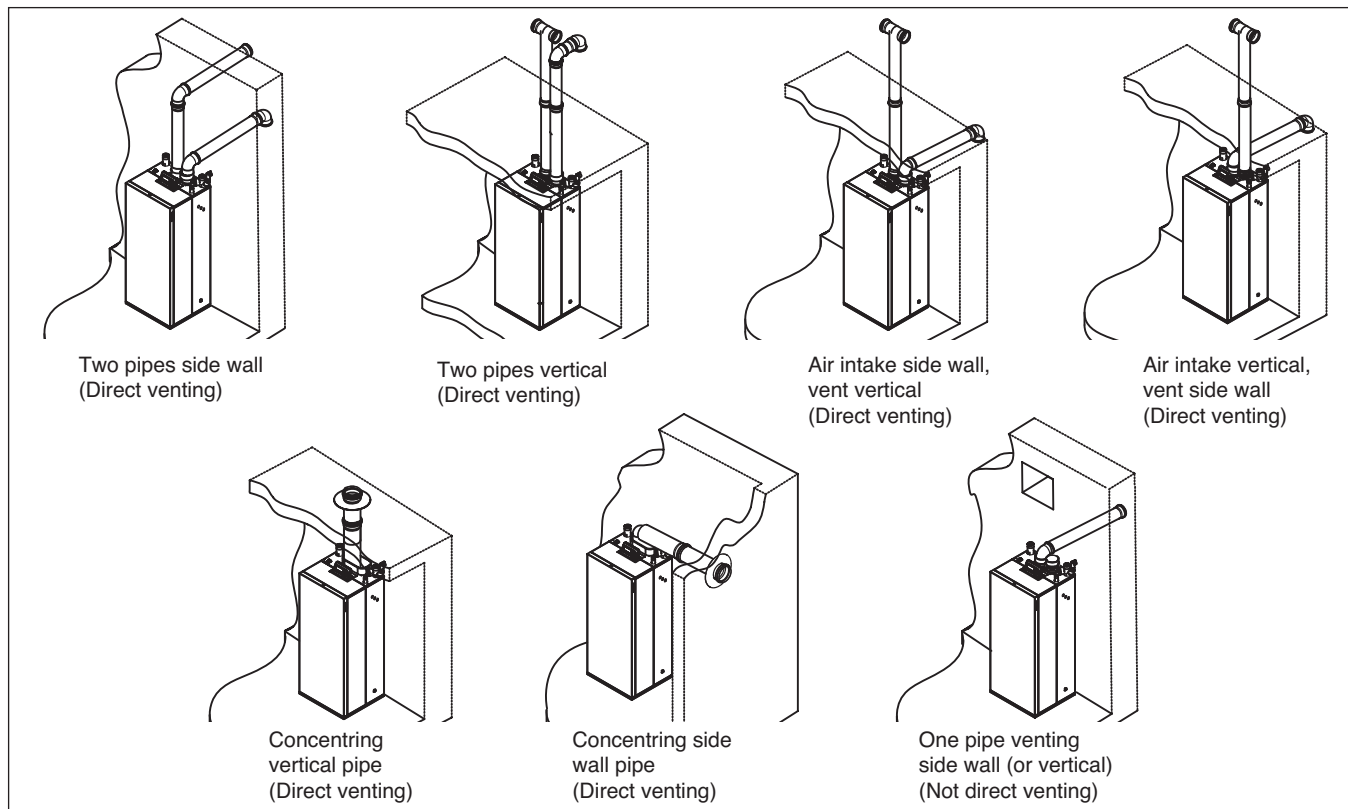


Fig. 25

4.7.2 Connecting flue gas systems

Optional vent systems are:

- Twin pipe, concentric pipe and 1 pipe using room air
- Approved materials PVC, CPVC, Stainless Steel, PP and PP-Flex (M&G Duravent PolyPro and Centrotherm InnoFlue)
- Sealed combustion or room air intake
- Terminations can be either horizontal or vertical
- The diameters of the flue outlet and combustion air intake inlet are designed to fit standard PP, PVC, CPVC and stainless steel pipes. The following table gives the diameter of the flue adapter on the boiler.

Boiler	SSB255	SSB399	SSB512
Diameters	3" - 80mm	4" - 100mm	4" - 100mm

Tab. 3

Insert the exhaust pipe and the air intake pipe as shown in the following figure:

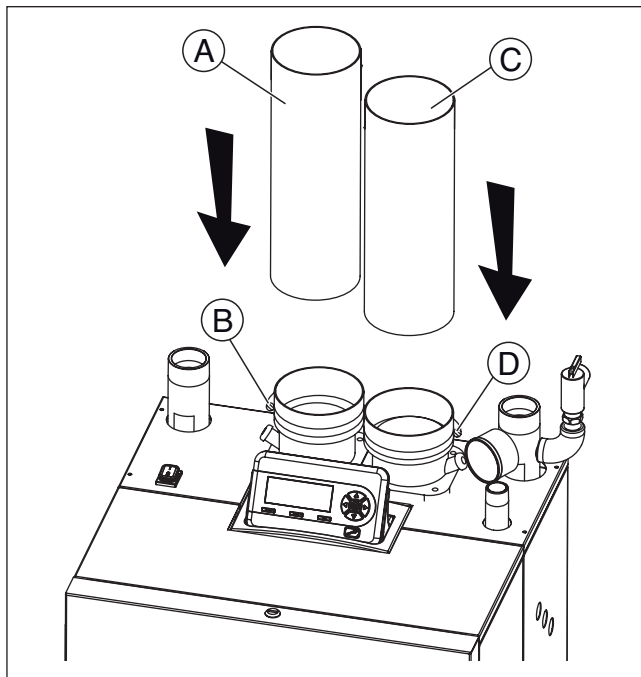


Fig. 26

Insert the flue exhaust pipe "A" completely into the adapter and tighten the clamp "B" present in the flue exhaust adapter.

Insert the air intake pipe "C" completely into the adapter and tighten the clamp "D" present in the air intake adapter.

The correct flow direction into two pipes is shown in Fig. 27.

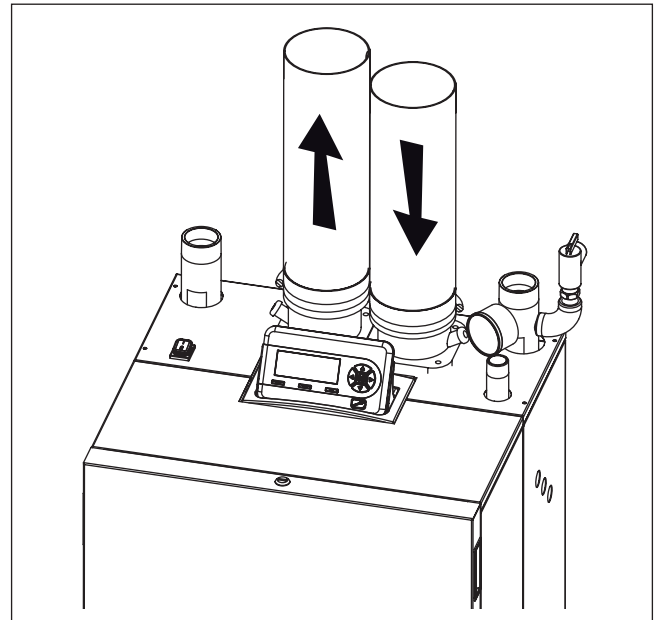


Fig. 27

4.7.3 Installation of the exhaust and air intake system

NOTICE: Do not extend exposed vent pipe outside the building beyond recommended distance of 39" or 1 meter. Condensate could freeze and block vent pipe

Vent should terminate at least 3 feet (915 mm) away from adjacent walls, inside corners and 5 feet (1525 mm) below roof overhang ([X2], [X4], see Fig. 28)

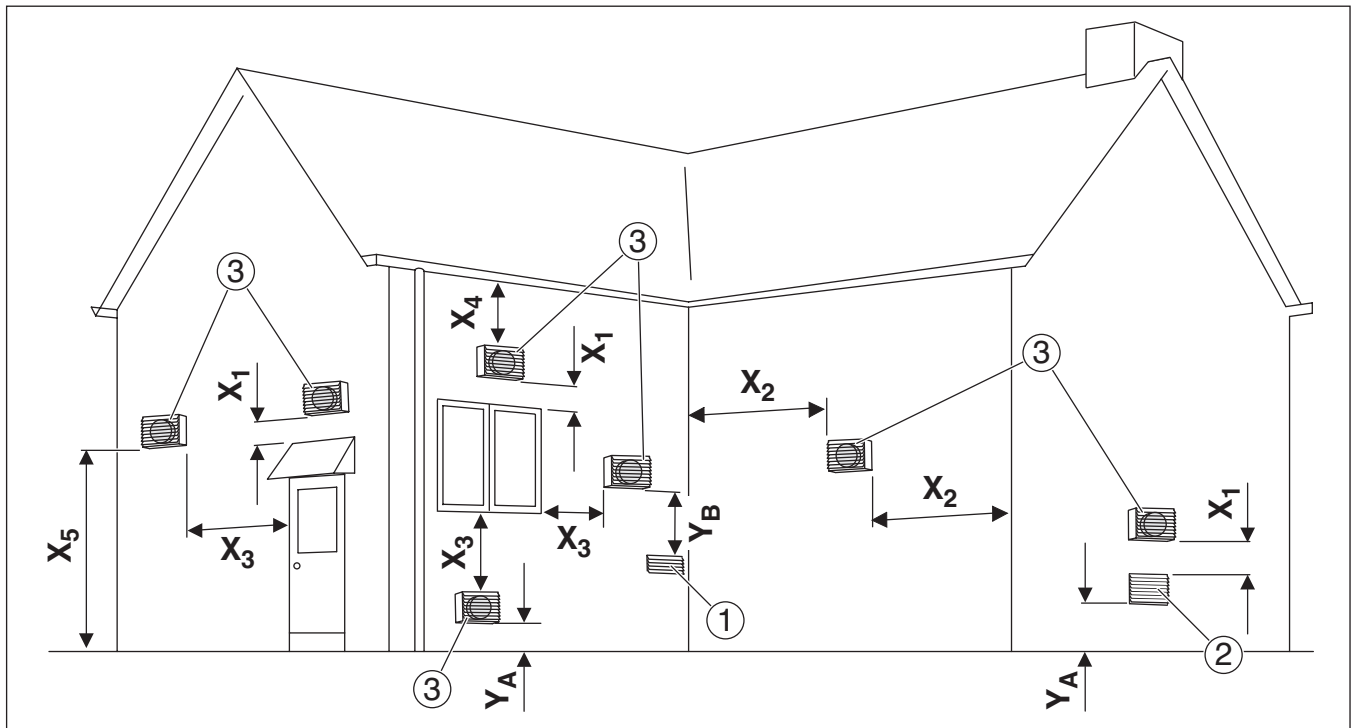


Fig. 28

Direct vent (sealed combustion)

- [1] Forced air inlet
- [2] Gravity air inlet
- [3] Exhaust terminal
- X1 1 foot (305 mm)
- X2 3 feet (915 mm) see Note 2)
- X3 1 foot (305 mm) USA
3 feet (915 mm) Canada
- X4 See Note 1)
- X5 7 feet (2135 mm) see Note 2)
- YA At least 1 foot (305 mm) above grade or snow line
- YB Exhaust terminal must be at least:
3 feet (915 mm) above forced air inlet within
10 feet (3050 mm) horizontally – USA
6 feet (915 mm) above forced air inlet - Canada

Fan assisted appliance (Room air for combustion)

- [1] Forced air inlet
- [2] Gravity air inlet
- [3] Exhaust terminal
- X1 1 foot (305 mm)
- X2 See Note 1)
- X3 1 foot (305 mm) USA
3 feet (915 mm) Canada
- X4 See Note 1)
- X5 7 feet (2135 mm) see Note 2)
- YA At least 1 foot (305 mm) above grade or snow line
- YB Exhaust terminal must be at least:
3 feet (915 mm) above forced air inlet within
10 feet (3050 mm) horizontally – USA
6 feet (915 mm) above forced air inlet - Canada

It is not recommended to terminate vent above any door or window, condensate can freeze causing ice formations.

Do not use chimney as a raceway if another boiler or fireplace is vented into or through chimney.

All PVC/CPVC vent pipes must be glued, except for the flue gas adapter pipe connection.

NOTICE: DO NOT use PVC for vent piping when using anti-freeze in the primary circuit of the boiler. Use CPVC, PP or stainless steel only!

Vent terminations must keep the following minimum clearances from electric meters, gas meters, regulators and relief equipment: 4 feet (1220 mm) [Canada 6 feet (1830 mm)] horizontally and in no case above and below, unless a horizontal distance of 4 feet (1220 mm) [Canada 6 feet (1830 mm)] is maintained.

NOTES:

- 1) For Clearances not specified in ANSI Z223.1 / NFPA 54 or CSA B149.1 Clearance in accordance with local installation codes and the requirements of the gas supplier including the Authority having jurisdiction.
- 2) A vent shall not terminate directly above a sidewalk or paved driveway that is located between 2 single family dwellings and serves both dwellings.

Material	Item	Standard [USA]	Standard [Canada]	Pipe diameter per boiler		
				SSB 255	SSB 399	SSB 512
PVC schedule 40, 80 ¹	Flue gas or combustion air	ANSI/ASTM D1785	BH Gas venting systems, ULC S636 ² , Class IIA - PVC, Class IIB - CPVC, Class IIC - Polypropylene	3" (80mm) 4" (100mm)	3" (80mm) 4" (100mm)	4" (100mm)
PVC-DWV	Flue gas or combustion air	ANSI/ASTM D2665		3" (80mm) 4" (100mm)	4" (100mm)	4" (100mm)
CPVC schedule 40, 80	Flue gas or combustion air	ANSI/ASTM F441		3" (80mm) 4" (100mm)	4" (100mm)	4" (100mm)
PP	Flue gas or combustion air	ANSI Cat IV Approved Polypropylene		3" (80mm) 4" (100mm)	4" (100mm) 5" (130mm)	4" (100mm) 5" (130mm)
PP-Flex	Flue gas or combustion air	ANSI Cat IV Approved Polypropylene		3" (80mm) 4" (100mm)	4" (100mm) 5" (130mm)	4" (100mm) 5" (130mm)
Stainless Steel AL29-4C	Flue gas or combustion air	UL1738		3" (80mm) 4" (100mm)	4" (100mm) 5" (130mm)	4" (100mm) 5" (130mm)
PVC	Pipe cement/ primer	ANSI/ASTM D2564		X	X	X
CPVC	Pipe cement/ primer	ANSI/ASTM F493		X	X	X

Tab. 4 Approved Flue gas or combustion air materials and fittings per boiler

- 1 PVC must not be used for vent material when a glycol mixture is used in the boiler circuit.
- 2 Components of the certified vent systems must not be interchanged with other vent systems or unlisted pipe fittings. Plastic components, and specified primers and glues of the certified vent system must be from a single system manufacturer and not intermixed with other system manufacturer's vent system parts. For installations in Canada, field supplied plastic vent piping must comply with CAN/CSA B149.1 (latest edition) and be certified to the Standard for Type BH Gas Venting systems. ULC S636.

The supplied vent connector and separate available vent terminations are certified as a part of the boiler.

Standard straight pipes, 90°-elbows or Tees are approved as roof or wall terminations in all the approved materials. Furthermore the following terminations are approved. For details please refer to the supplier's information.

Roof Terminal	Material	Supplier	Part Number
3" (125 mm) 4" (100mm) Concentric kits	PVC or CPVC	IPEX System 636 Type Ila & Iib	196006 (PVC), 197009 (CPVC) 196021 (PVC), 197021 (CPVC)
3" / 5" (80/125 mm) concentric	PP	M&G Duravent PolyPro or Centrotherm InnoFlue	3PPS-VKL (M&G Duravent) or ICRT3539 (Centrotherm)
4"/6" (100/150 mm) Concentric	PP	M&G Duravent PolyPro or Centrotherm InnoFlue	4PPK-VKL (M&G Duravent) or ICRT 4679 (Centrotherm)
3" (80 mm) Chimney Cap	PP Flex	M&G Duravent PolyPro or Centrotherm InnoFlue	3PPS-FKL (M&G Duravent) or ISCP03 (Centrotherm)
4" (100 mm) Chimney Cap	PP Flex	M&G Duravent - PolyPro Centrotherm - Innoflue SW Flex	4PPS-FKL (M&G Duravent) or ISCP04 (Centrotherm)
5" (130 mm) 6" (150 mm) 8" (200 mm) Vertical termination for commercial systems	PP	M&G Duravent - PolyPro	5PPS-VTM 6PPS-VTM 8PPS-VTM

Tab. 5 Roof terminals

Wall Terminal	Material	Supplier	Part Number
3" (80 mm)	parallel stainless steel	Flex-L	46546901
3" (125 mm) 4" (100mm) Concentric kits	PVC or CPVC	IPEX IIa	196006 (PVC), 197009 (CPVC) 196021 (PVC), 197021 (CPVC)
3" (125mm) Wall termination kit	PVC	IPEX IIa	081219
3" (125 mm) 4" (100mm) Low profile termination kit	PVC	IPEX IIa	196985 196986
3" (80 mm) twin pipe termination	PVC/parallel stainless steel	ANSI/ASTM D1785 or Field Controls	46600203
4" (100 mm) twin pipe termination	PVC/parallel stainless steel	ANSI/ASTM D1785 or Field Controls	46600204
3" (80 mm) twin pipe termination	PP	M&G Duravent PolyPro or Centrotherm InnoFlue	3PPS-HTP (M&G Duravent) or ISLPT0303 (Centrotherm)
4" (100 mm) twin pipe termination	PP	M&G Duravent PolyPro	4PPS-HTP (M&G Duravent)
3" (80 mm) single pipe termination	PP	M&G Duravent PolyPro	3PPS-HST (M&G Duravent)
3" / 5" (80/125 mm) concentric termination	PP	M&G Duravent PolyPro or Centrotherm InnoFlue	3PPS-HKL (M&G Duravent) or ICWS3539 (Centrotherm)
4" / 6" (100/150 mm) concentric termination	PP	M&G Duravent PolyPro or Centrotherm InnoFlue	4PPS-HK (M&G Duravent) or ICWS4639 (Centrotherm)

Tab. 6 Wall terminals

4.7.4 Vent and combustion air pipe length [For single boiler installations]

The maximum length for vent and combustion air pipes can be found in the following table. Please note the length is for each vent / combustion air pipe and not combined.

	SSB255	SSB399	SSB512
3" (80 mm)	100 ft (30 m)	20 ft (6 m)	20 ft (6 m)
4" (110 mm)	165 ft (50 m)	100 ft (30 m)	100 ft (30 m)
5" (130 mm)	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)

Tab. 7 Equivalent length for PVC and CPVC pipes

In the following tables are listed the equivalent length for PVC/CPVC pipes and PP pipes:

	3" (80 mm)	4" (100mm)
1 ft vent pipe	1 ft	1 ft
45° elbows	2.5 ft	4 ft
90° elbows	5 ft	7 ft

Tab. 8 Equivalent length for PVC and CPVC pipes

	3" (80 mm)	4" (110 mm)	5" (130 mm)	6" (150 mm)	8" (200 mm)
1 ft vent pipe	1 ft	1 ft	1 ft	1 ft	1 ft
1 ft flex pipe	2 ft	2 ft	2 ft	N/A	N/A
45° elbows	3 ft	5 ft	6 ft	6 ft	13 ft
90° elbows	7 ft	12 ft	14 ft	14 ft	19 ft
Tee	12 ft	19 ft	21ft	22 ft	29 ft

Tab. 9 Equivalent length for PP pipes

For the equivalent vent length of Stainless Steel AL29-4C venting material and the roof and wall terminals please refer to the installation manual of the vent system supplier.

To calculate the allowed length of a vent and combustion air system follow this example:

When using a SSB255 with 3" (80 mm) PP system with 3 x 45° -elbows and a 90° -elbow as termination, the total venting equivalent length for each pipe [vent or combustion air] may not exceed 100 ft. (30 m).

$3 \times 45^\circ\text{-elbow} = 3 \times 3 \text{ ft. } (0.91 \text{ m}) = 9 \text{ ft. } (2.7 \text{ m})$

$1 \times 90^\circ\text{-elbow terminal} = 7 \text{ ft. } (2.1 \text{ m}).$

Total friction loss equivalent = 16 ft. (4.8m)

Total venting length for this example is:

$SSB255 = 100 \text{ ft. } (30 \text{ m}) - 16 \text{ ft. } (4.8\text{m}) = 84 \text{ ft. } (25.60 \text{ m})$ each for the intake and exhaust piping.

When the total flue system equivalent length is verified it is necessary to set the par N° 99 "Flue length range" according to the total length of the installed flue system as defined in the following tables:

SSB255			
Value for par 99	3" System with Max. eq. length of	4" System with Max. eq. length of	5" System with Max. eq. length of
1	0 to 50 ft	0 to 82 ft	0 to 82 ft
2	51 to 100 ft	83 to 165 ft	83 to 165 ft
3	101 to 150 ft	166 to 248 ft	166 to 248 ft
4	151 to 200 ft	249 to 330 ft	249 to 330 ft

Tab. 10 Value for the par N° 99 depending on the sum of equivalent length of vent and combustion air pipe for SSB255

SSB399			
Value for par 99	3" System with Max. eq. length of	4" System with Max. eq. length of	5" System with Max. eq. length of
1	0 to 10 ft	0 to 50 ft	0 to 82 ft
2	11 to 20 ft	51 to 100 ft	83 to 165 ft
3	21 to 30 ft	101 to 150 ft	166 to 248 ft
4	31 to 40 ft	151 to 200 ft	249 to 330 ft

Tab. 11 Value for the par N° 99 depending on the sum of equivalent length of vent and combustion air pipe for SSB399

SSB512			
Value for par 99	3" System with Max. eq. length of	4" System with Max. eq. length of	5" System with Max. eq. length of
1	0 to 10 ft	0 to 50 ft	0 to 82 ft
2	11 to 20 ft	51 to 100 ft	83 to 165 ft
3	21 to 30 ft	101 to 150 ft	166 to 248 ft
4	31 to 40 ft	151 to 200 ft	249 to 330 ft

Tab. 12 Value for the par N° 99 depending on the sum of equivalent length of vent and combustion air pipe for SSB512

Defining the correct value to assign to par N° 99 follow this example:

When using a SSB399 with 4" (110 mm) PP venting material the maximum equivalent length is 100 feet for both vent and combustion air piping. Consider the equivalent length of vent pipe is 56 ft. and the combustion air pipe is 42 ft. First step is to verify that both the vent and combustion air pipe is less than 100 ft:

56 < 100 : verified

42 < 100 : verified

The sum of equivalent length of vent and combustion air pipe is: 56+42=98 ft. See Tab. 10 - Tab. 11 - Tab. 12 for defining parameter 99.

Row 2 - System with Max eq. length of 100 ft + 100 ft. The example provided a total equivalent length of 98 ft. which falls in between 51 - 100 ft found on row 2. So par N° 99 = 2.

4.7.5 Approved examples of horizontal and vertical venting installation



Place pipe supports every 5 feet (1,525 mm) of horizontal and vertical run, beginning with support near boiler.

- The condensate must be disposed of in accordance with applicable rules.
- Periodic cleaning of the vent terminal and air-intake screens is mandatory.
- Avoid locating vent terminals near equipment or building features which can be subject to degradation from exhaust gases.
- If multiple boilers are installed in a row, allow at least 1 foot (305 mm) clearance between the vent termination of one and the combustion air intake of the other.

In the following figures (Fig. 29 to Fig. 41), the combustion air intake pipe is indicated with the number 1 (one) and the exhaust vent pipe with the number 2 (two)

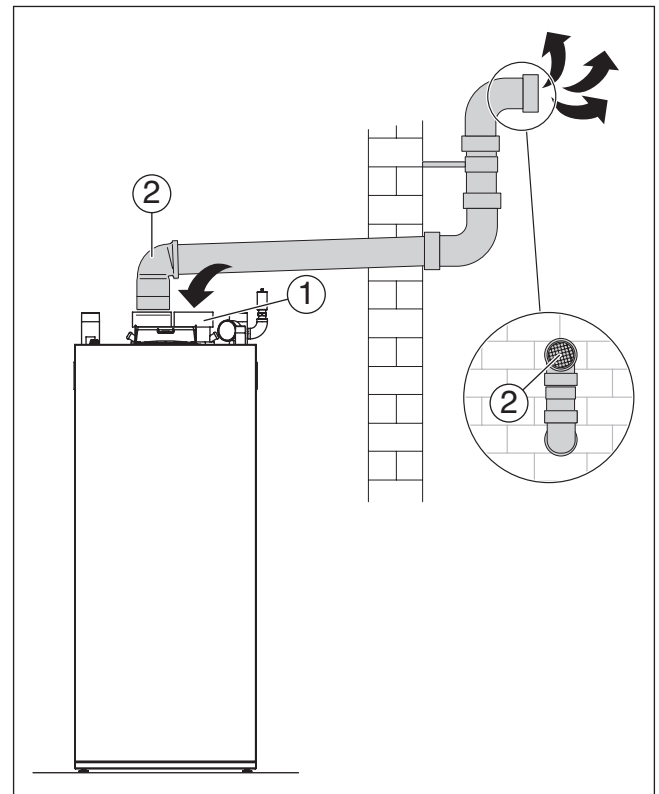


Fig. 29 Horizontal venting system (room air only)

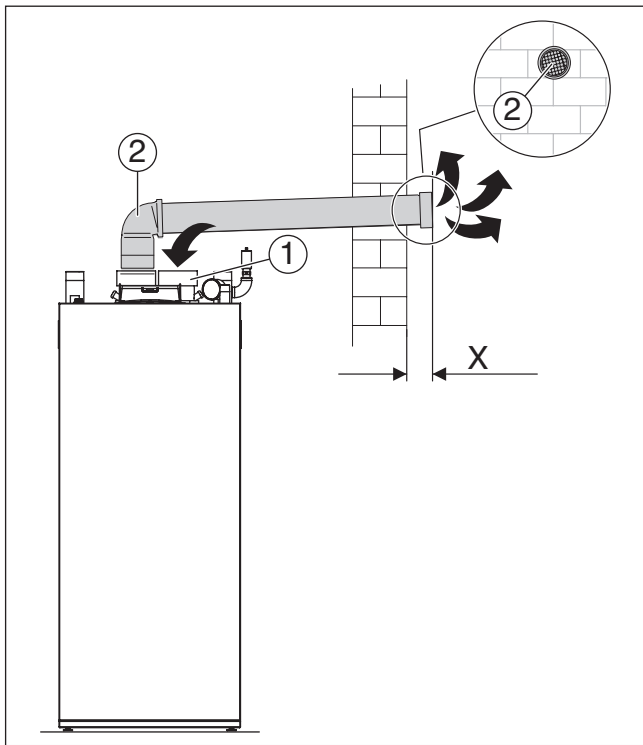


Fig. 30 Horizontal venting system (room air only); $X \geq 4"$ (102 mm)

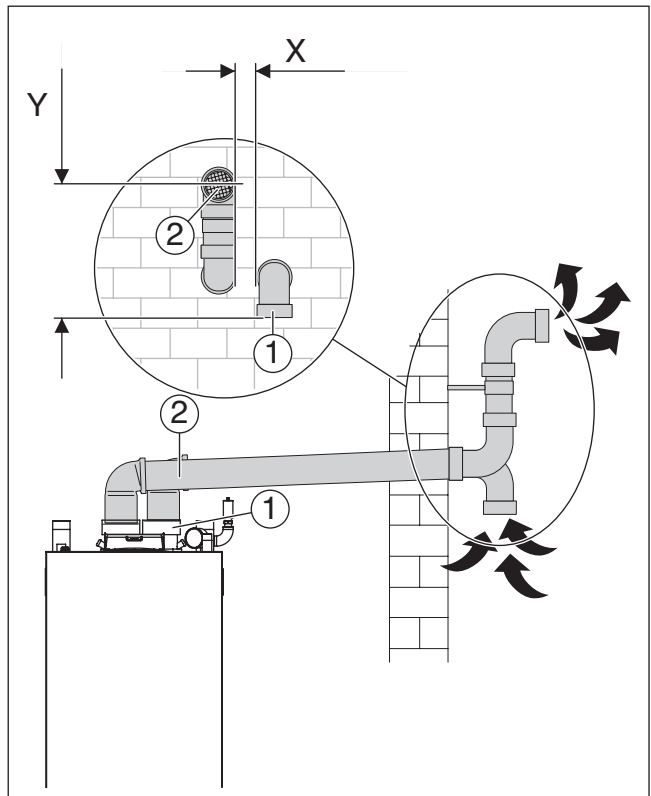


Fig. 32 Horizontal venting system (sealed combustion); $X \geq 4"$ (102 mm); $Y \geq 12"$ (305 mm)

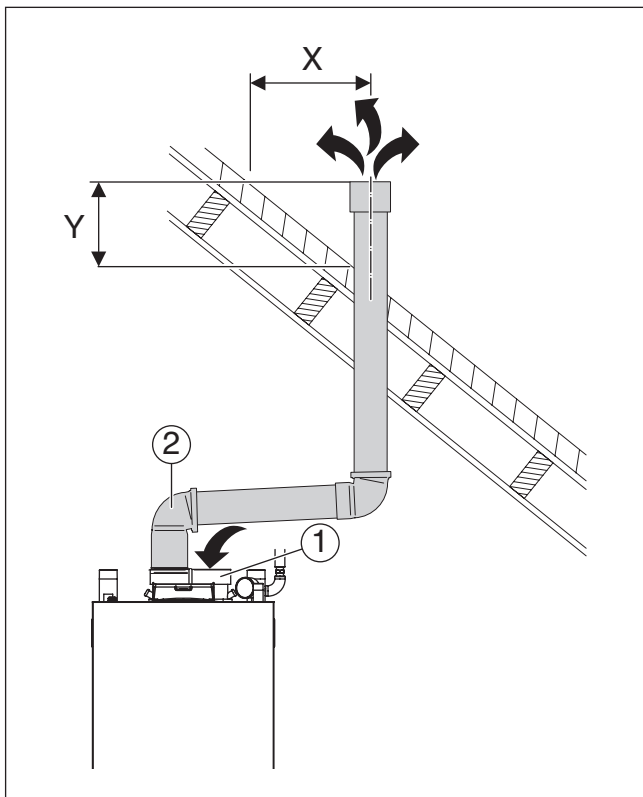


Fig. 31 Vertical venting system (room air only); $X > 12"$ (305 mm); $Y 12"$ above maximum snow level or at least 24" whichever is greater

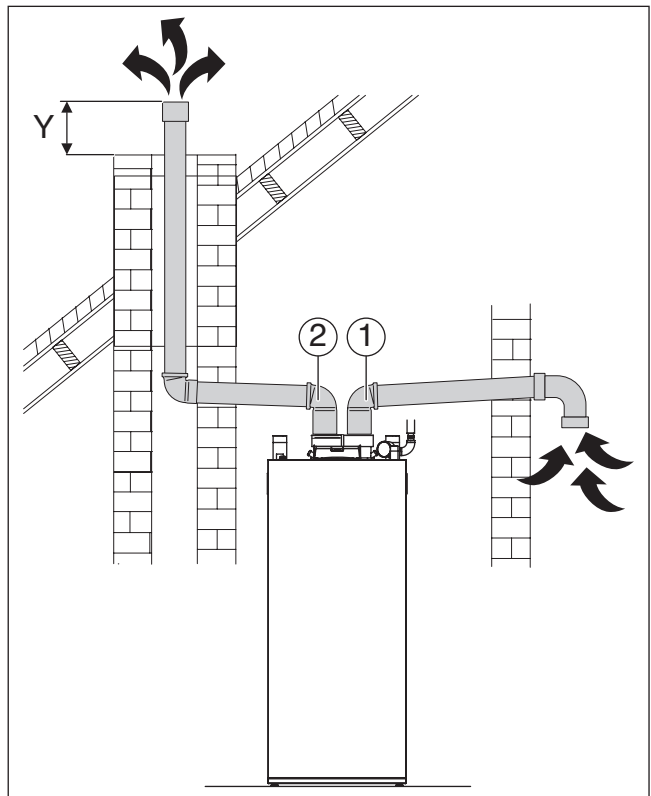


Fig. 33 Vertical venting system (sealed combustion); $Y 12"$ above maximum snow level or at least 24" whichever is greater

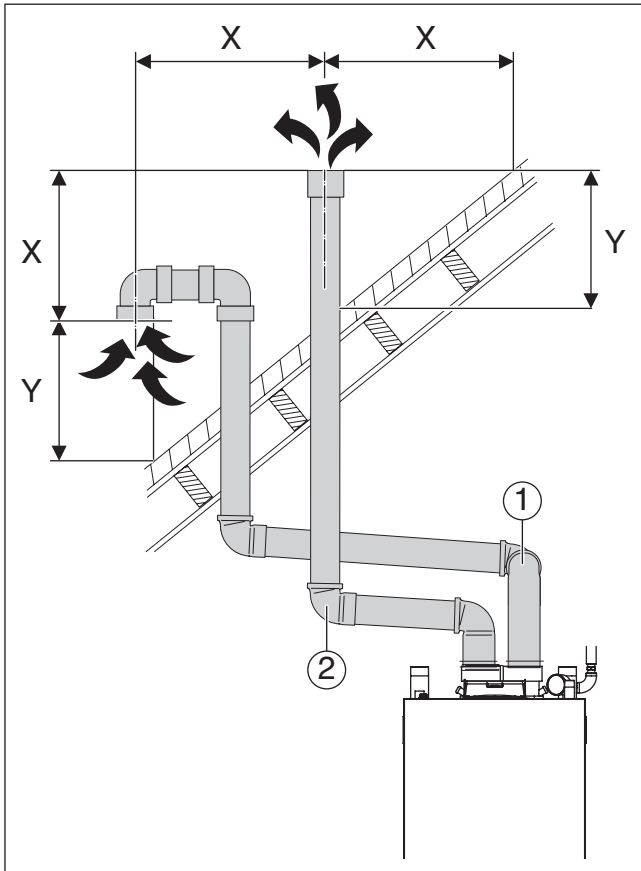


Fig. 34 Vertical venting system (sealed combustion); $X > 12''$; $Y 12''$ above maximum snow level or at least 24'' whichever is greater

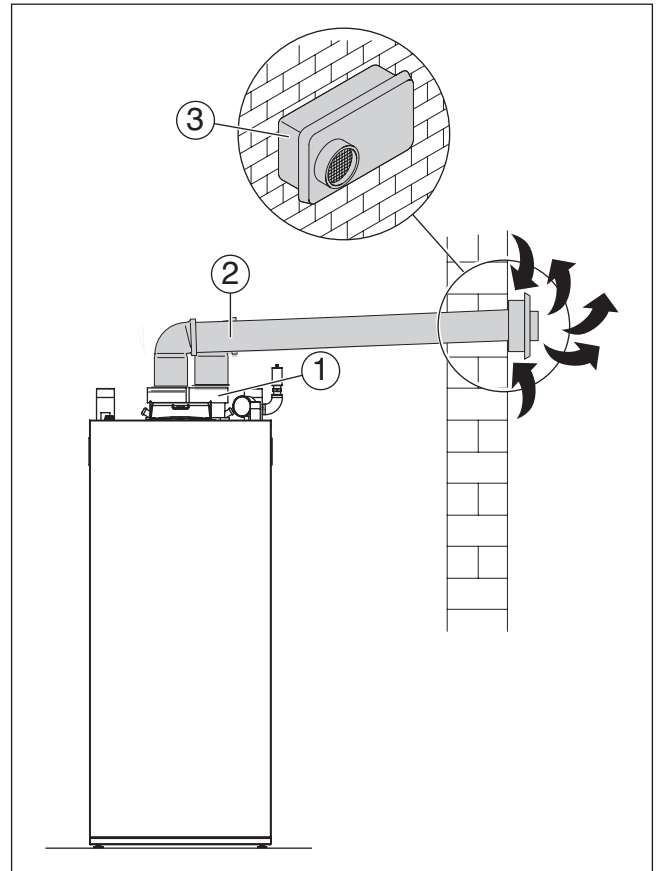


Fig. 36 Horizontal venting system (sealed combustion); 3 is a wall termination

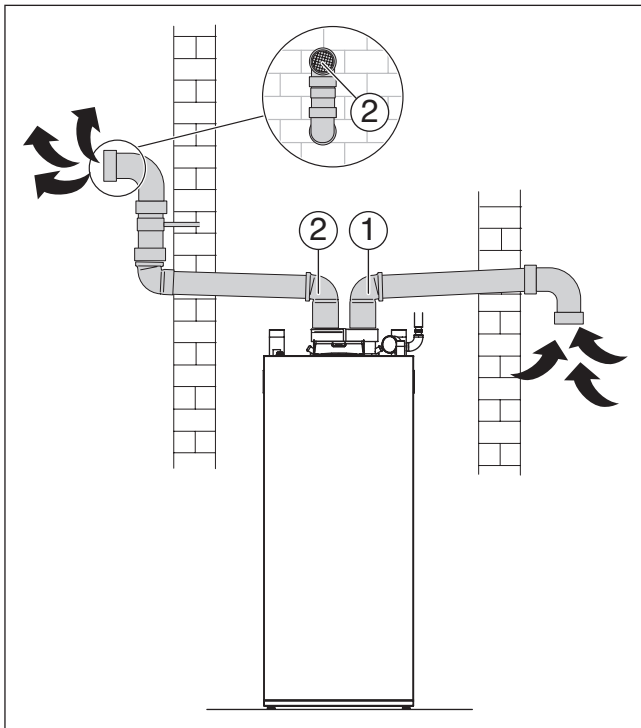


Fig. 35 Horizontal venting system (sealed combustion)

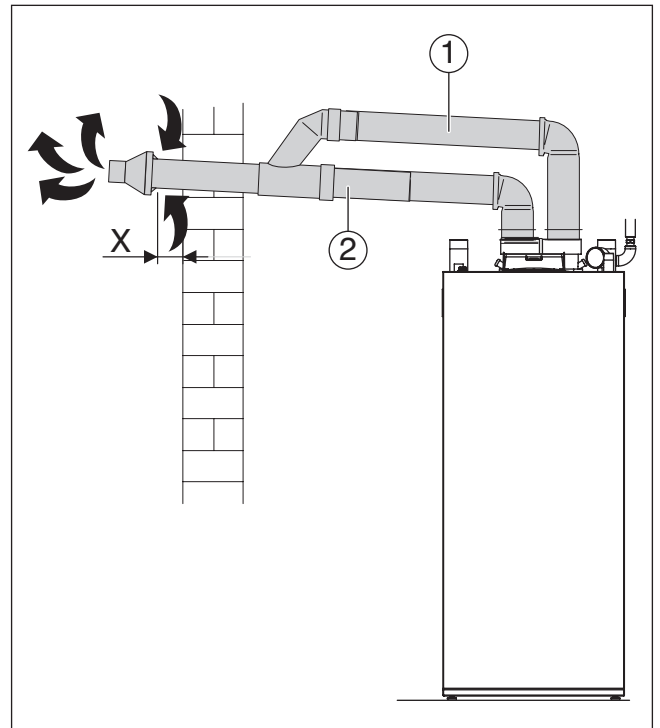


Fig. 37 Horizontal venting system (sealed combustion); $X \geq 4''$ (102 mm)

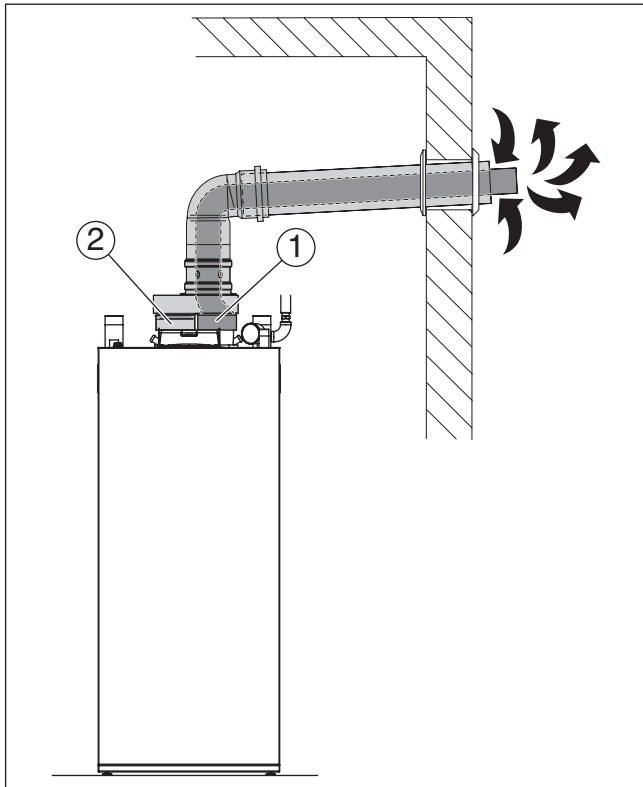


Fig. 38 Horizontal concentric system (sealed combustion)

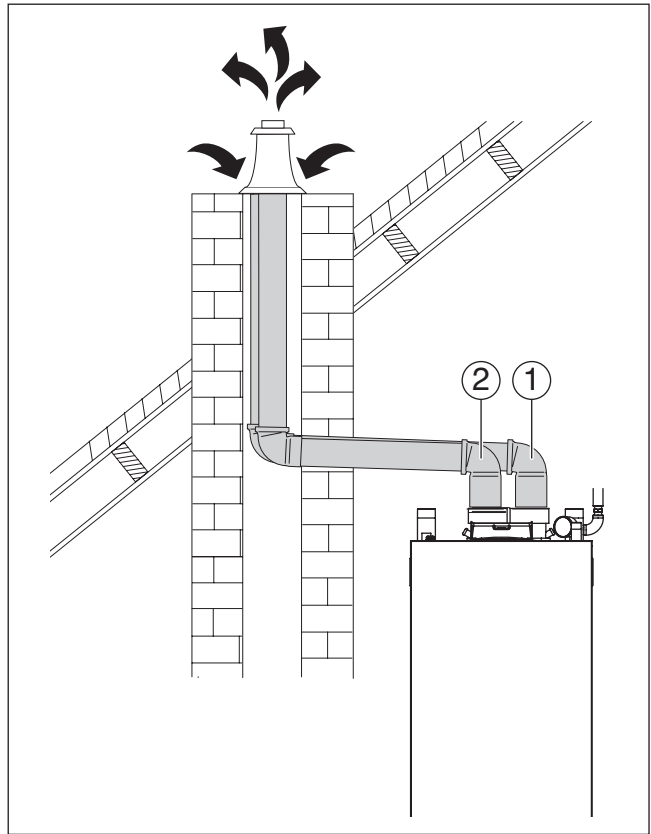


Fig. 40 Vertical venting system (sealed combustion)

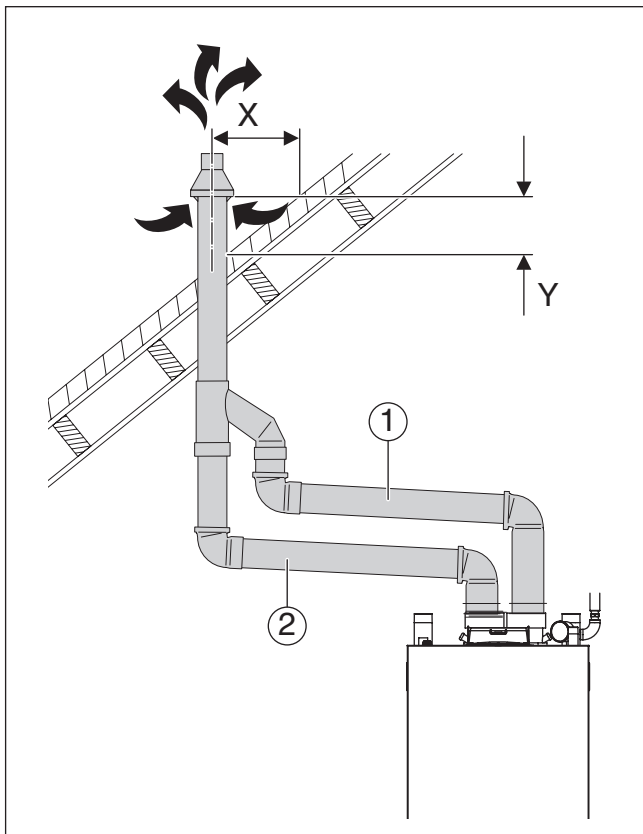


Fig. 39 Vertical venting system (sealed combustion) ; $X > 12''$ (305 mm); Y 12" above maximum snow level or at least 24" whichever is great

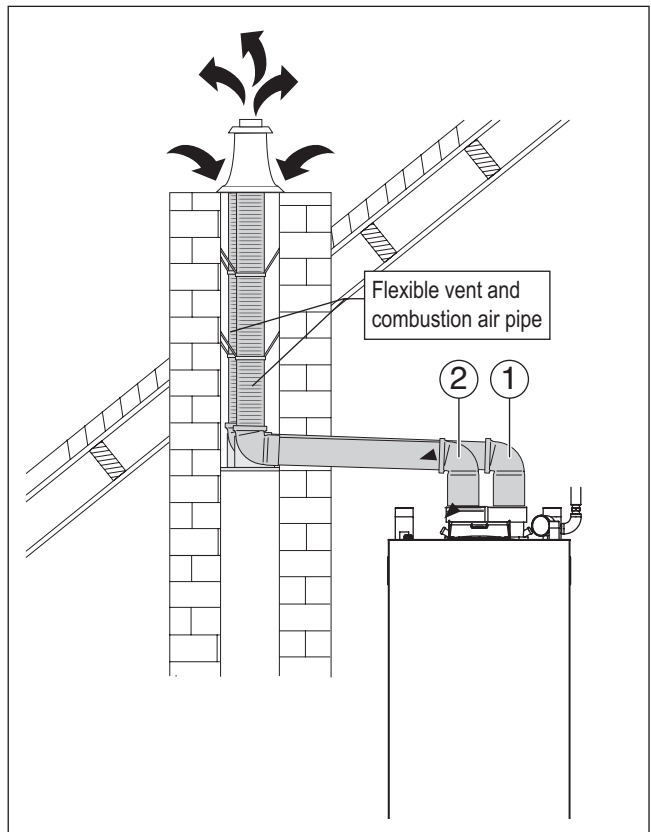


Fig. 41 Vertical venting system (sealed combustion)

4.7.6 Multiple boiler

When installing multiple air and vent terminations, be sure that:

- The clearance between the vent and air termination are in accordance with the figures shown in this chapter
- All vent pipes and air inlet must terminate at the same height

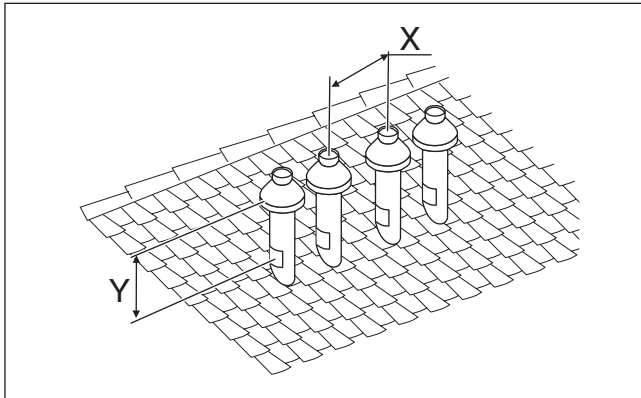


Fig. 42 Concentric vent and combustion air vertical termination; $X \geq 12''$; $Y \geq 12''$ (18" for Canada and/or per CAN/CSA B149.1) above highest snow level. Maximum 24" above roof

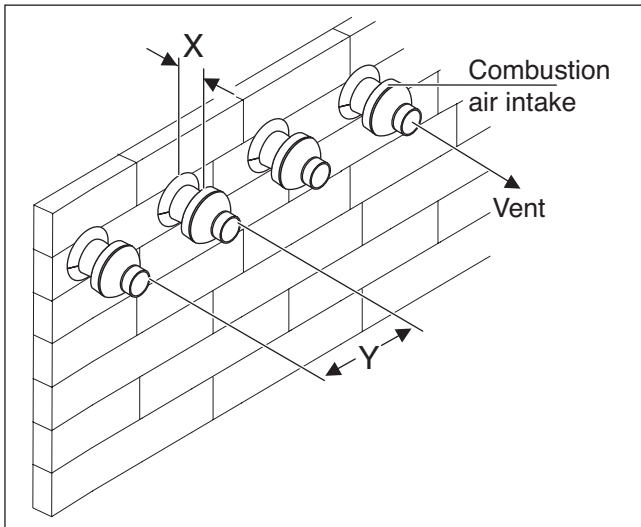


Fig. 43 Concentric vent and combustion air horizontal termination; $X \geq 1''$ min or 2"max; $Y \geq 24''$; Note: the level of the termination must be the same at 12" min from grade or snow line

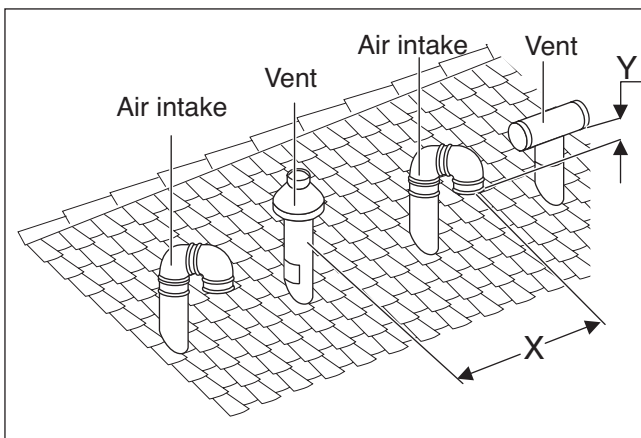


Fig. 44 Multiple air and vent vertical termination; $X \geq 12''$; $Y \geq 12''$

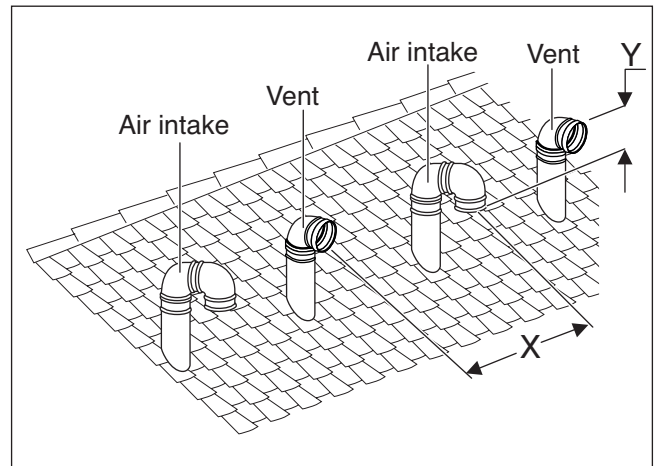


Fig. 45 Multiple air and vent vertical termination; $X \geq 12''$; $Y \geq 12''$

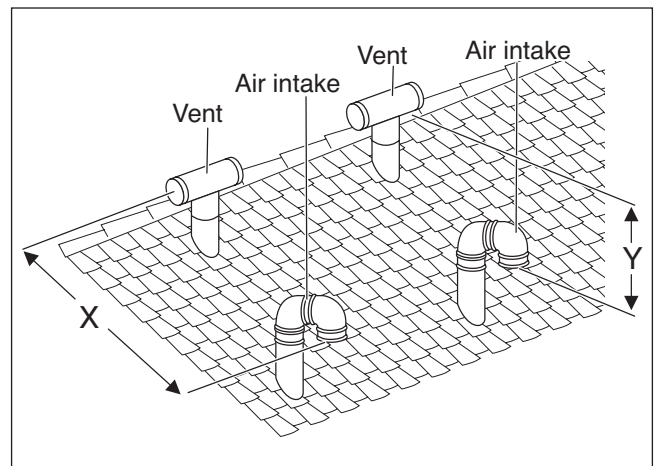


Fig. 46 Multiple air and vent vertical termination; $X \geq 12''$; $Y \geq 12''$

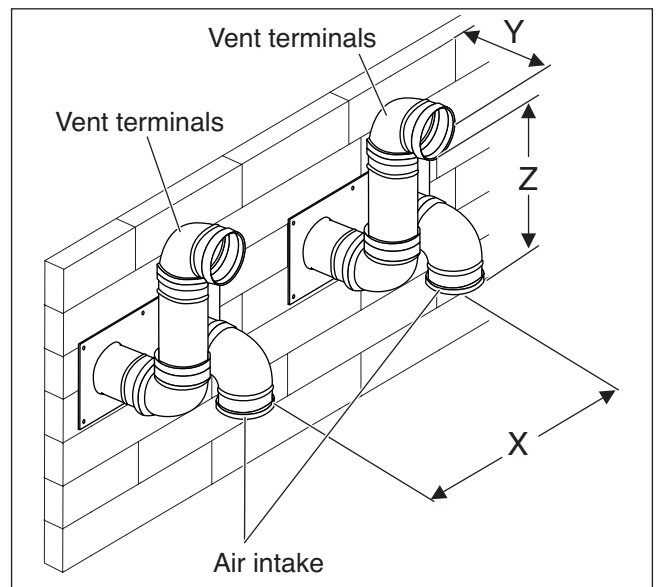


Fig. 47 Multiple air and vent vertical termination ; $X \geq 12''$; $Y \leq 25''$; $Z = 12''$ to 16"

4.7.7 De-rating for altitude installation

When the appliance is installed at an altitude higher than 2000 ft, the par 99 must be set at 4 in any case and a de-rating of the input capacity must be considered in function of the altitude combined with the total length of the vent and combustion air pipe as reported in the following tables:

Altitude (ft)	% range of the length of the vent and combustion air pipe installed referred to the maximum equivalent length*			
	From 0% to 25%	From 25% to 50%	From 50% to 75%	From 75% to 100%
0-2000	255900	255900	255900	255900
3000	247685	243608	239531	235455
4000	239469	235527	231586	227645
5000	231254	227447	223641	219835
6000	223038	219367	215696	212025
7000	214823	211287	207751	204215
8000	206607	203206	199806	196405
9000	198391	195126	191861	188595
10000	190176	187046	183915	180785

Tab. 13 De-rating table for SSB255 (input BTU/hr)

Altitude (ft)	% range of the length of the vent and combustion air pipe installed referred to the maximum equivalent length*			
	From 0% to 25%	From 25% to 50%	From 50% to 75%	From 75% to 100%
0-2000	399000	399000	399000	399000
3000	386191	379834	373478	367122
4000	373381	367235	361090	354944
5000	360571	354637	348702	342767
6000	347761	342037	336314	330590
7000	334952	329439	323926	318413
8000	322142	316840	311538	306235
9000	309333	304241	299150	294059
10000	296522	291642	286762	281881

Tab. 14 De-rating table for SSB399 (input BTU/hr)

Altitude (ft)	% range of the length of the vent and combustion air pipe installed referred to the maximum equivalent length*			
	From 0% to 25%	From 25% to 50%	From 50% to 75%	From 75% to 100%
0-2000	512000	512000	512000	512000
3000	495563	487407	479250	471094
4000	479125	471239	463353	455467
5000	462688	455073	447457	439842
6000	446250	438905	431560	424215
7000	429813	422739	415664	408590
8000	413375	406571	399767	392964
9000	396938	390405	383872	377338
10000	380500	374237	367975	361712

Tab. 15 De-rating table for SSB512 (input BTU/hr)

(*) To calculate the de-rating of the input capacity follow this example:

- ▶ We have a SSB255 boiler installed at 5400 ft with a 3" flue system. The equivalent length of the vent pipe installed is 55 ft. The equivalent length of the air combustion pipe installed is 35 ft. The total equivalent length of the flue system is 55+35 = 90 ft. The maximum equivalent length for this type of installation is (see tab 7) 100 + 100 = 200 ft. The % range is 90/200 = 45%. This value is within the 25% and 50%. Now the correct de-rating value is given from the value of the second column (From 25% to 50%) that crosses the row with 6000 ft: 219367 BTU/hr)

4.8 Venting and air piping system

4.8.1 Multiple boiler cascade system

It is possible to connect up to 16 boilers in a cascade system. However the vent system is not recommended to be connected with more than eight boilers. If the number of cascade boilers is greater than eight then separate vent systems should be used.

The following images show the different systems to link the boilers in cascade.

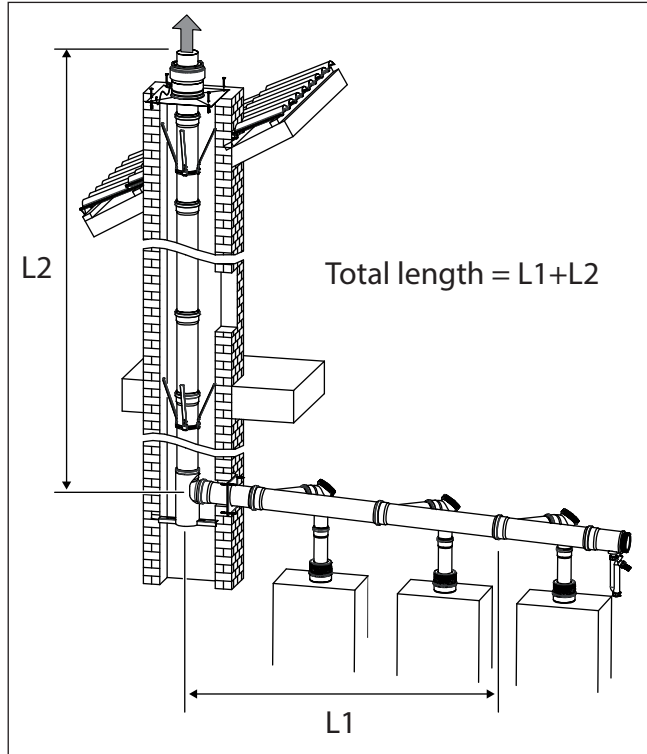


Fig. 48 Room air intake and common exhaust system (room air only)

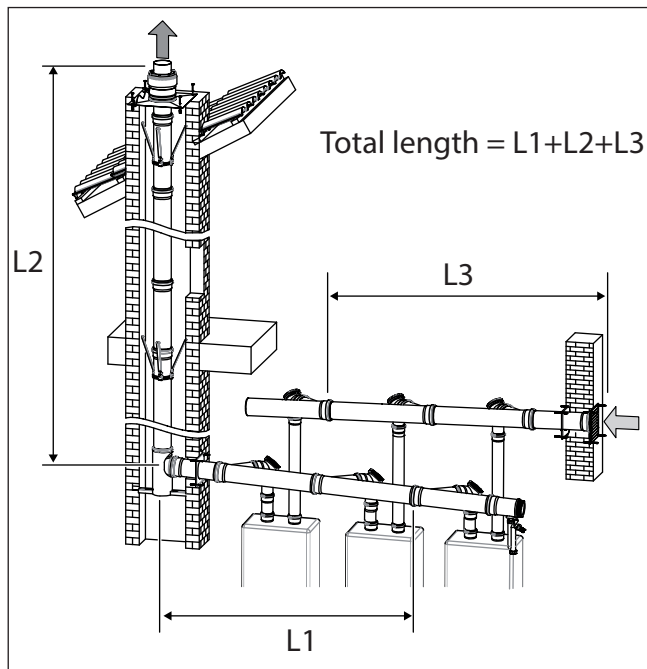


Fig. 49 Both common air intake and exhaust system (sealed combustion)

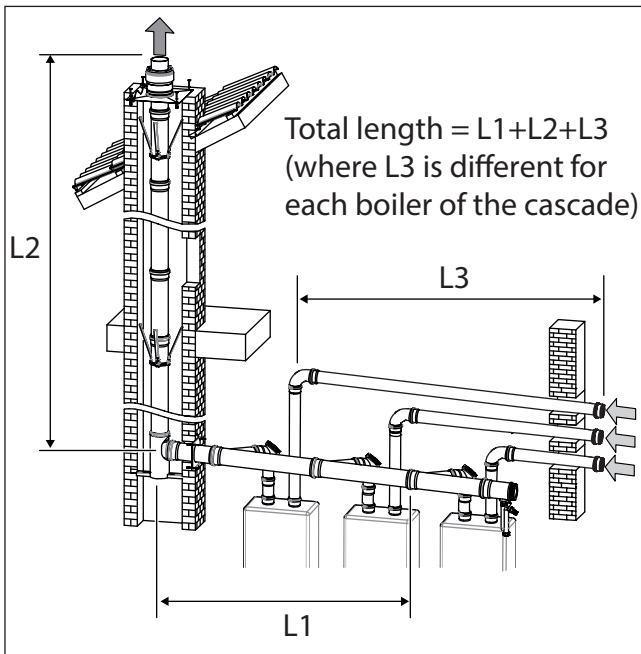


Fig. 50 Common exhaust with individual air inlet (sealed combustion)

4.8.2 Vent and combustion air pipe length for cascade system

In the following tables are the maximum allowed length for flue pipe cascade system. The length is for each intake and exhaust system.

In system shown in Fig. 48 the length is referred only to exhaust pipe. In a system as shown in Fig. 49 it is necessary to verify the max. length for intake pipe of each boiler installed.

	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
SSB255x2	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB255x3	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB255x4	100 ft (30 m)	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB255x5	x	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB255x6	x	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB255x7	x	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB255x8	x	100 ft (30 m)	165 ft (50 m)	165 ft (50 m)

Tab. 16 Maximum length for air and combustion pipe for cascade of SSB255

	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
SSB399x2	100 ft (30 m)	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB399x3	x	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB399x4	x	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB399x5	x	100 ft (30 m)	165 ft (50 m)	165 ft (50 m)
SSB399x6	x	x	165 ft (50 m)	165 ft (50 m)
SSB399x7	x	x	165 ft (50 m)	165 ft (50 m)
SSB399x8	x	x	100 ft (30 m)	165 ft (50 m)

Tab. 17 Maximum length for air and combustion pipe for cascade of SSB399

	6" (150 mm)	8" (200 mm)	10" (250 mm)	12" (300 mm)
SSB512x2	100 ft (30 m)	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB512x3	x	165 ft (50 m)	165 ft (50 m)	165 ft (50 m)
SSB512x4	x	100 ft (30 m)	165 ft (50 m)	165 ft (50 m)
SSB512x5	x	x	165 ft (50 m)	165 ft (50 m)
SSB512x6	x	x	165 ft (50 m)	165 ft (50 m)
SSB512x7	x	x	100 ft (30 m)	165 ft (50 m)
SSB512x8	x	x	x	165 ft (50 m)

Tab. 18 Maximum length for air and combustion pipe for cascade of SSB512

For each boiler installed in a cascade system it is necessary to set the par. N° 99 using Tab. 10 - Tab. 11 - Tab. 12 as described in the paragraph "4.7.5 Approved examples of horizontal and vertical venting installation".

5 Commissioning (for single boiler application)

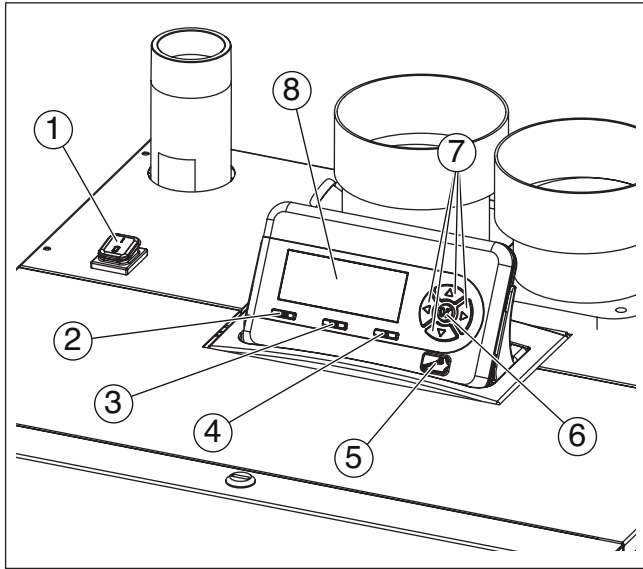


Fig. 51

No.	Description
1	ON/OFF power switch
2	Reset button
3	Menu button
4	ESC button
5	PC service connection
6	OK button
7	UP/DOWN/LEFT/RIGHT button
8	Display

5.1 Switching the appliance ON/OFF

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

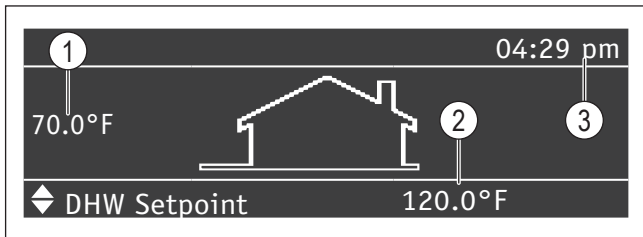


Fig. 52

In the left of the display is shown the external temperature 1. This value is only displayed on a single boiler system or with the primary boiler in a cascade system when the outdoor sensor is installed.

In the right of the display is shown the set setpoint value 2.

In the top right side is displayed the time 3.

To switch off the appliance use the ON/OFF switch.

5.2 Setting date and time

Press the “menu” button and select “Settings” using the UP/DOWN button.

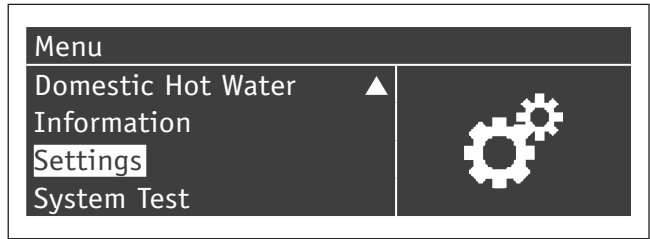


Fig. 53

Press the “OK” button and select “General Settings” using the UP/DOWN button.



Fig. 54

Press the “OK” button and select “Date & Time” using the UP/DOWN button.

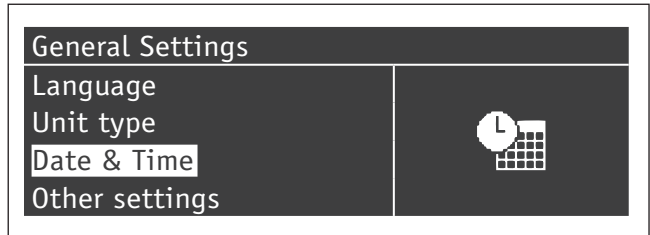


Fig. 55

Press the “OK” button. The display will appear as follow:

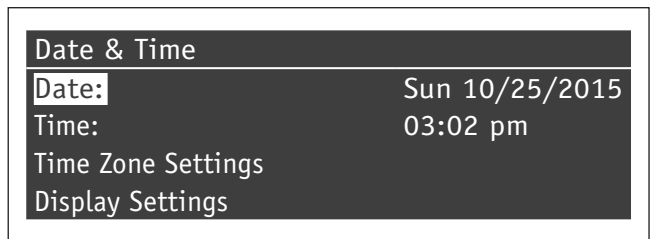


Fig. 56

Press the “OK” button to highlight the values. The values can be changed using the “UP/”DOWN” keys. When the value entered is correct then press “OK” to insert the next value.

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

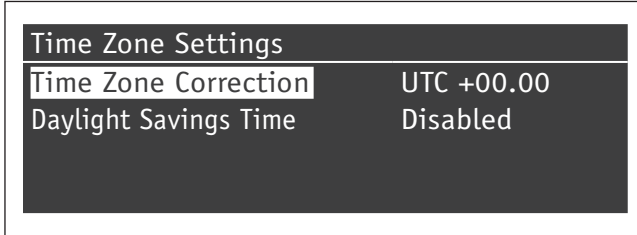


Fig. 57

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

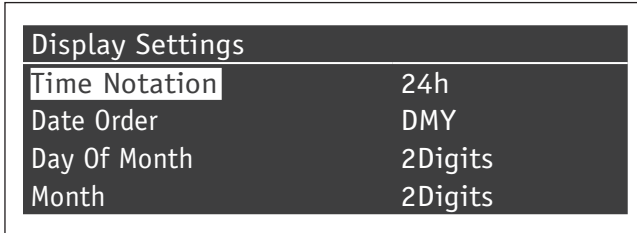


Fig. 58

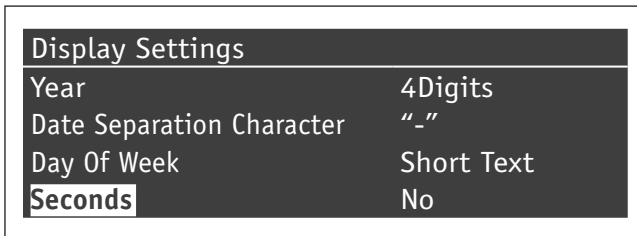


Fig. 59

5.3 Setting CH and DHW setpoint

To change the CH and DHW setpoint in the "Central Heating" and "Domestic Hot Water" menu, press "menu" select [see "Fig. 60" below] use UP/DOWN arrows to choose parameter and select by pressing the "OK" button. Once selected use the right arrow key to highlight the value, and use the UP/DOWN arrow to change selected value. Press "OK" to confirm/save new value.

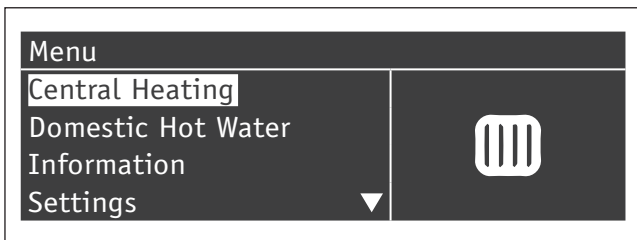


Fig. 60

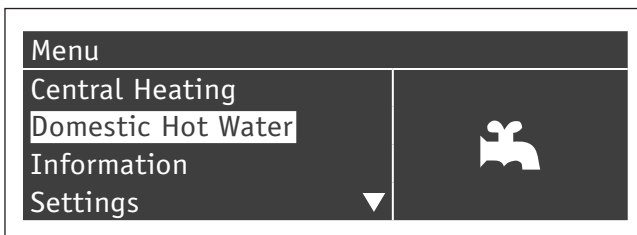


Fig. 61



CH setpoint cannot be changed when outdoor reset function is enabled. See section "5.5 Parameters list" for detailed instructions regarding outdoor reset.

The DHW setpoint can only be changed, when the DHW function is enabled. See section "5.5 Parameters list".

It is possible to change the CH and the DHW setpoint directly from the first display page; logically the change of the two setpoint must to be enabled: when the text in the lower left side is "CH Setpoint" press the "RIGHT" button. The value shown in the lower right side will be highlighted; using the "UP/DOWN" keys it is possible to change the value. Once assigned the value desired press the "RIGHT" button. The new value will be stored. To change the DHW setpoint press the "UP/DOWN" keys. The string in the lower left side will change in "DHW Setpoint". Now it is possible to change the DHW setpoint in the same way in which we described the other operation.

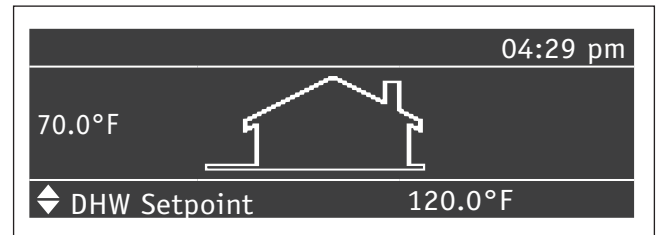


Fig. 62

5.4 Boiler information

To show in the screen the most important system information press "menu" button and select "Information" using the "UP/DOWN" keys.

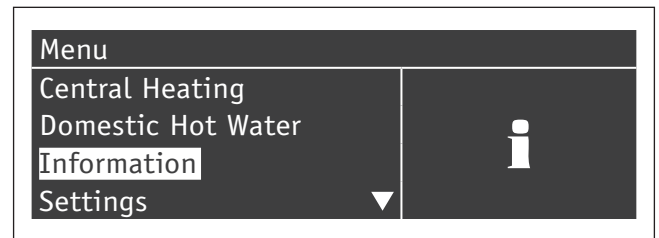


Fig. 63

Press "OK" and the screen below will appear:



Fig. 64

Selecting "Boiler Status" and pressing "OK" for the following values:

- Flow Temperature
- Return Temperature
- DHW Temperature [Sensor must be connected to show a value. If not, the default value will appear]
- Outside Temperature
- Flue Temperature
- 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:

Boiler Status	
Flow Temperature	115.0 °F
Return Temperature	110.0 °F
DHW Temperature	111.0 °F
Outside Temperature	50.0 °F

Fig. 65

Using the “UP/Down” button it is possible to scroll list.

5.5 Parameters list

To have access to the parameter list press “menu” button and select “Settings” using the UP/DOWN button:

Menu	
Domestic Hot Water	▲
Information	
Settings	⚙️
System Test	

Fig. 66

Press the “OK” button and select “Boiler Settings” using the UP/DOWN button.

Settings	
General Settings	
Boiler Settings	⚙️

Fig. 67

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

Password
0 * * *

Fig. 68

Enter one digit at a time using the UP/DOWN button to increase/decrease the value. When the value is correct then press “OK”.

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

- Level 1: (no password needed i.e. password N° 0000) USER
- Level 2: (password “0300”) INSTALLER

5.6 Outdoor reset

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

The display will appear as follow:

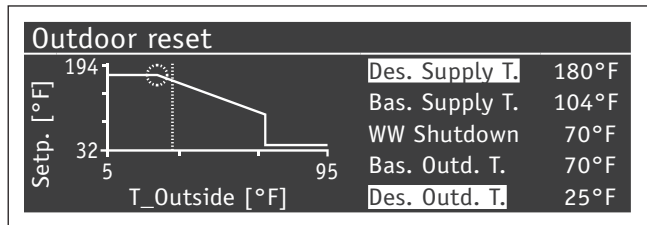


Fig. 69

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
- 2 Press ok to save changes
- 3 Use the left/right arrows to select the other values

Repeat steps 1 thru 3 to make additional changes

Once set the parameters press “Esc” to exit the menu.

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. 19 Level 1 parameters

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
89	Frost Protection	Off / On	Disabled	Disabled	Enabled	-
90	Frost Protection Setpoint	°C / °F	50 °F	33.8 °F	68 °F	0.9 °F
91	DHW Max Limit	°C / °F	140 °F	104 °F	158 °F	0.9 °F
92	Fan Speed Maximum	RPM	*	*	*	60

Tab. 20 Level 2 parameters

Number	Description	Unit	Default	Min	Max	Step
93	Fan Speed Minimum	RPM	*	*	*	60
94	Fan Speed Ignition	RPM	*	*	*	60
97	Appliance Model **	-	*	1	6	1
98	Gas Type	-	NG	NG	LPG	
99	Flue length range	-	1	1	4	1

Tab. 20 Level 2 parameters

(*) Depend on appliance type

(**) The value for this parameter is:

- 1 for SSB512
- 2 for SSB399
- 3 for SSB225

5.7 Adjusting and setting CO₂ limits

NOTICE:

Please verify parameter 99 is to be set first.

Insert a combustion analyzer probe into the test port "A" as shown in Fig. 70.

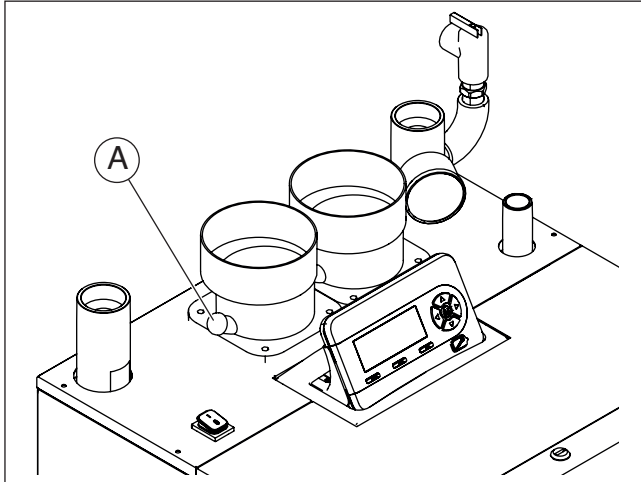
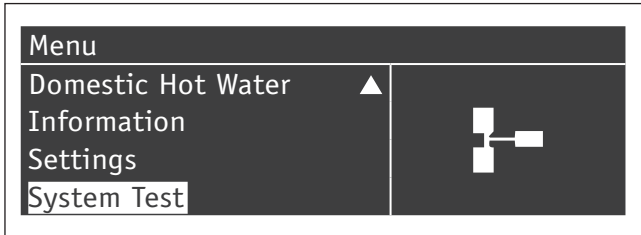


Fig. 70

- ▶ Press "Menu" key.
- ▶ Select "System Test":



- ▶ In "System test" menu select "High Power" using "Up/Down" keys and press "OK":



To adjust the CO₂ value at the maximum power turn the screw "A" shown in Fig. 72 (for SSB255) and in Fig. 73 (for SSB399 and SSB512), allen type wrench is necessary for this adjustment.

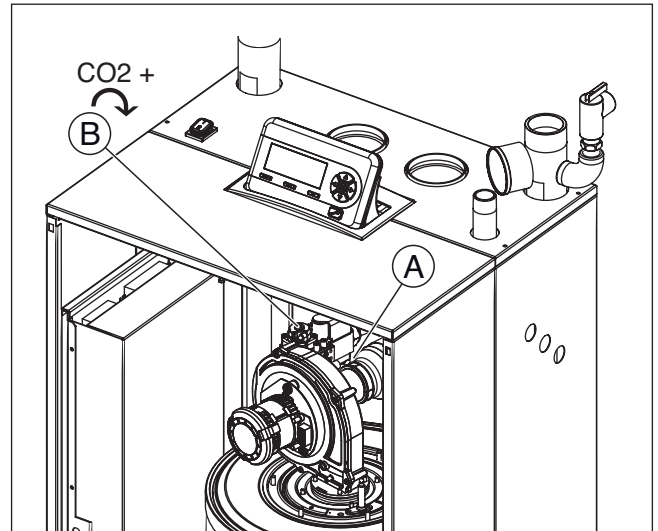


Fig. 71 Gas valve screw regulation for SSB255

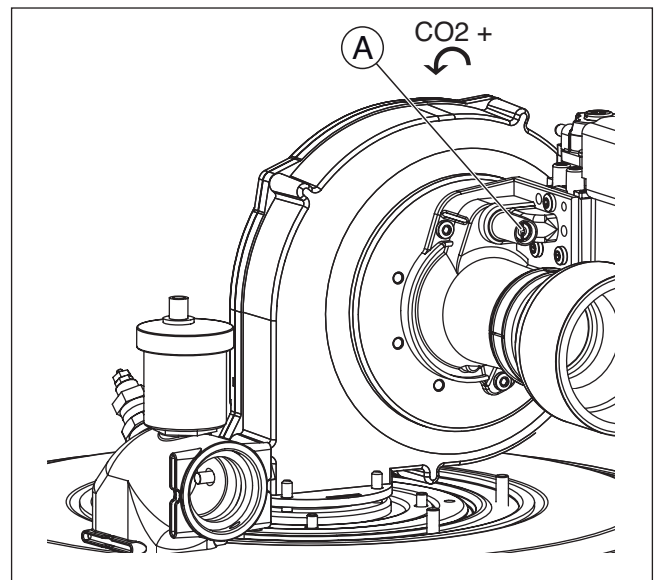


Fig. 72 Gas valve screw regulation for SSB255

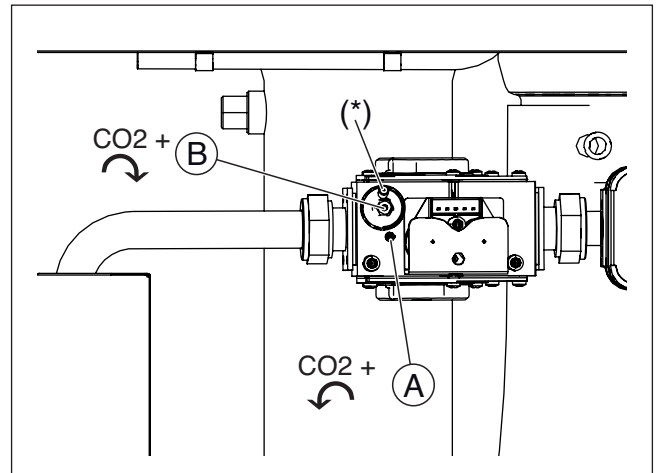


Fig. 73 Gas valve screw regulation for SSB399 and SSB512

(*) Balancing tube shown removed for clarity.

Verify that the value of CO2 is stable and is within the range indicated in the following table (be careful to make small changes and confirm that the value is stable before making additional adjustment).

Select "Low Power" using "UP/Down" button and press "OK":

System Test	
Test State	Low Power
Fan Speed	0 rpm
Ionisation	0.0 µA

The fan will run at the minimum speed.

To adjust the CO2 value at the minimum power turn the screw "B" shown in Fig. 71 and in Fig. 73.

Verify that the value of CO2 is stable and is within the range indicated in the following table (be careful to make small changes and confirm that the value is stable before making additional adjustment).

Select "OFF" using "UP/Down" button and press "OK":

System Test	
Test State	Off
Fan Speed	0 rpm
Ionisation	0.0 µA

The "Test State" switches to OFF and the boiler return to the "stand by" mode.

Gas Type	Max. power CO2%	Min. power CO2%
Natural gas	8.8-9.2	8.8-9.2
LP gas	10.3-10.7	10.3-10.7

Tab. 21 CO2 value for gas valve calibration

A combustion analyzer must be used to set maximum and minimum CO2 as listed in table Tab. 21.

5.8 Setting frost protection

The boiler is equipped with a system frost protection function, see section "5.5 Parameters list" for a list of all parameters and settings.

The factory default setting Frost Protection (parameter # 89) is "DISABLED". To enable frost protection simply adjust parameter # 89 to "ENABLE". When the frost protection is enabled, Parameter #90 (Frost Protection Setpoint) has to be set. Parameter #90 has a default setting of 50°F and can be adjusted from 33-68 °F.

When the supply temperature falls below the value set by the parameter #90, the boiler pump starts.


If the supply temperature continues to fall and reaches 9 °F (5 °C) below the value set by the parameter #90 the burner will switch on at minimum power.


When the supply temperature increases to a temperature of 9 °F (5°C) greater than the value of the parameter # 90 the burner will switch off. Then after the post circulation time has elapsed the pump will stop (parameter #5 adjustable from 300-900 seconds. Default is 300 seconds).


For example, parameter #90 is set at 50 °F (10 °C), when the Supply temperature is lower than 50 °F (10 °C) the pump starts. If the supply temperature is lower than 41 °F (5 °C) the burner starts at the minimum power. The burner switches off when a temperature of 59 °F (15 °C) is achieved.


NOTICE: This sequence protects the boiler only from freezing. Be sure adequate measures are in place to protect the system.


6 Troubleshooting

 **WARNING:** Close the gas cock prior to working on the gas train or "boiler".


 **WARNING:** Check for gas leaks after carrying out work on the gas train.

 **WARNING:** Check for leaks after carrying out work on the venting system.

 **DANGER:** Always disconnect the appliance from the main power before performing any work. Disconnect the emergency shutoff switch or disengage the heating system circuit breaker. Take measures to prevent accidental reconnection.

 **WARNING:** Hot water can scald. Drain the appliance before working on components that are filled with water.

6.1 Error codes are shown on the display

If the symbol  appears on the screen as follow:

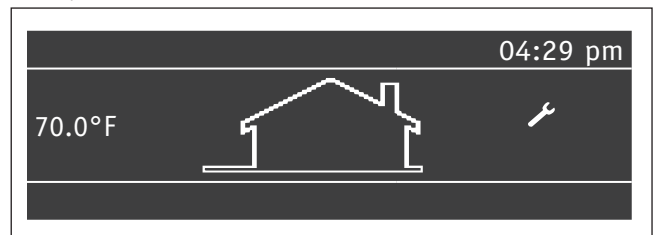


Fig. 74

an error has occurred in the system that is displayed on the screen. The bottom row in the display will show the description of the error occurred.

6.1.1 Lockout errors

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. 10", section 4.4.3	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. 22 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. 22 Lockout codes

6.1.2 Blocking errors

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
"Refhi Too Lo Error"	50	Internal software error		Replace the power control board
"Refhi 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. 23 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. 23 Blocking errors

6.2 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. 24

6.3 Sensor Resistance table

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. 25 Resistance table for: Supply temperature sensor, Return sensor, Flue sensor, DHW tank temperature sensor, LLH sensor, Outdoor temperature sensor

7 Maintenance

7.1 General

NOTICE: The installer must inform the user about the contents of this section. The user must make the necessary arrangements with qualified service agency for the care and periodic maintenance of the boiler.

CAUTION: Lack of care and maintenance of this boiler and equipment may cause an unsafe condition.

i A qualified and adequately trained technician must perform the inspection as specified in these instructions and in the Service Manual (provided separately) before each heating season and at regular intervals.

WARNING: Servicing, inspection and adjustment must be done by a trained technician in accordance with all applicable local and national codes. Improper servicing or adjustment could damage the boiler and result in equipment damage or a dangerous condition!

7.2 Maintenance / inspection schedule for end user

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. 26 User maintenance / inspection schedule

7.3 Maintenance / inspection schedule for licensed contractor / gas fitter

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 or every 2000 hours. Which occurs first.

Tab. 27 Licensed contractor / gas fitter maintenance / inspection schedule

Time interval	Maintenance
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. 27 Licensed contractor / gas fitter maintenance / inspection schedule

7.3.1 Gas leaking inspection

Verify all gas piping to ensure that there are no leaks.

DANGER: To verify the gas leaks use a soap solution or a gas leak detector. Do not use methods that can cause explosions!

7.3.2 Check exhaust and combustion air pipe system

Clear vent systems of any obstructions, corrosion, physical damage, 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.

7.3.3 Inspection of ignition electrode

Verify that the electrode is clean of deposits and use a dollar bill or other material to remove deposits as required.

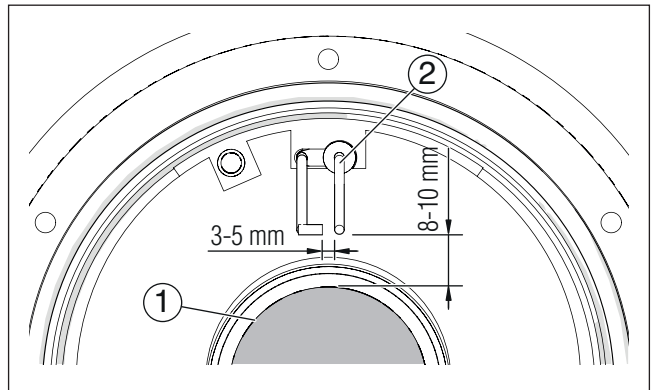


Fig. 75 Inspection of ignition electrode

No.	Description
1	Burner tube
2	Ignition electrode

7.3.4 Checking for wiring and connections

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

7.3.5 Burner gasket inspection

You must maintain the boiler as outlined in this manual and have the boiler started up and serviced at least annually by a qualified service technician to ensure boiler/system reliability. This includes a combustion test and the cleaning of the combustion chamber.

When disassembling the heat exchanger it is crucial to inspect the Burner Gasket (green: part number 7738004985) for damage.

It is a must to replace the burner gasket when servicing and required if there is any signs of wear, deformity or discoloration of the gasket and in any case not later than every two years.

8 Applications

The following shows possible system diagrams.

NOTICE: Application drawings in this manual are conceptual only and do not purport to address all design, installation, code, or safety considerations. The diagrams in this manual are for reference only for code officials, designers and licensed installers. It is expected that installers have adequate knowledge of national and local codes, as well as accepted industry practices, and are trained on equipment, procedures, and applications involved. Drawings are not to scale. Refer to the boiler, control and module installation manuals for additional detailed information.

The following system diagrams are showing primary/secondary piping. As alternative a appropriate sized low loss header can also be used. When using primary/secondary piping please follow the following guidelines:

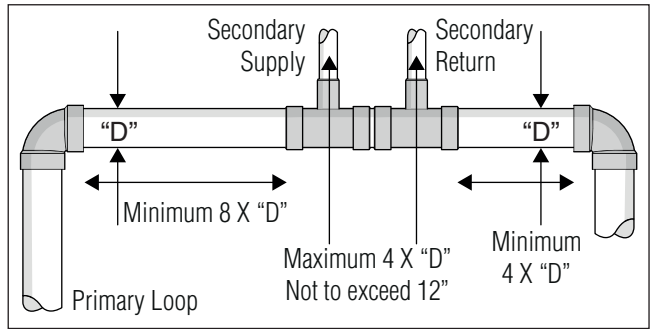


Fig. 77

8.1 Multiple zone with indirect tank (pump for each zone)

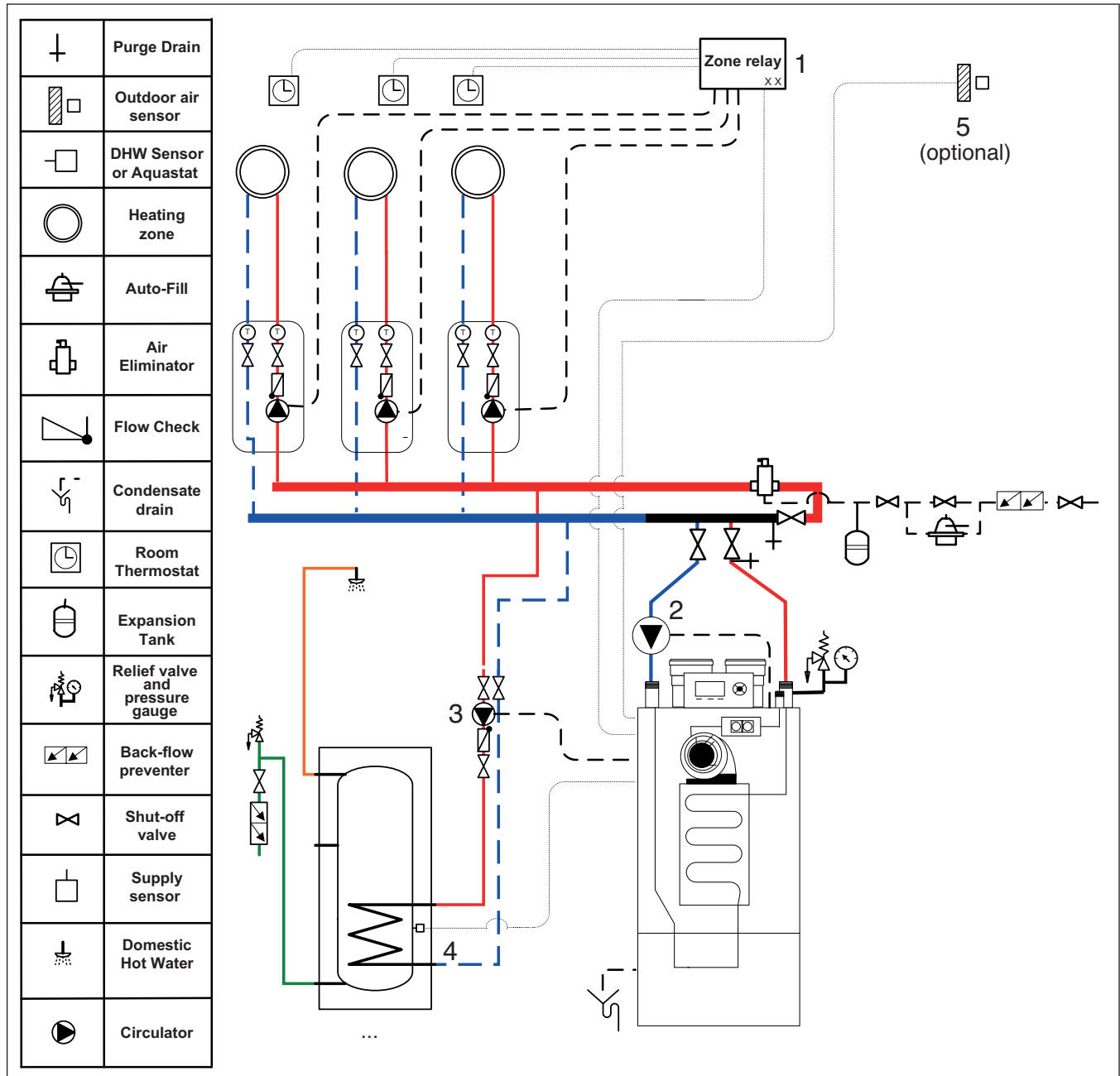


Fig. 76

Wiring diagram for multiple zone with indirect tank (pump for each zone):

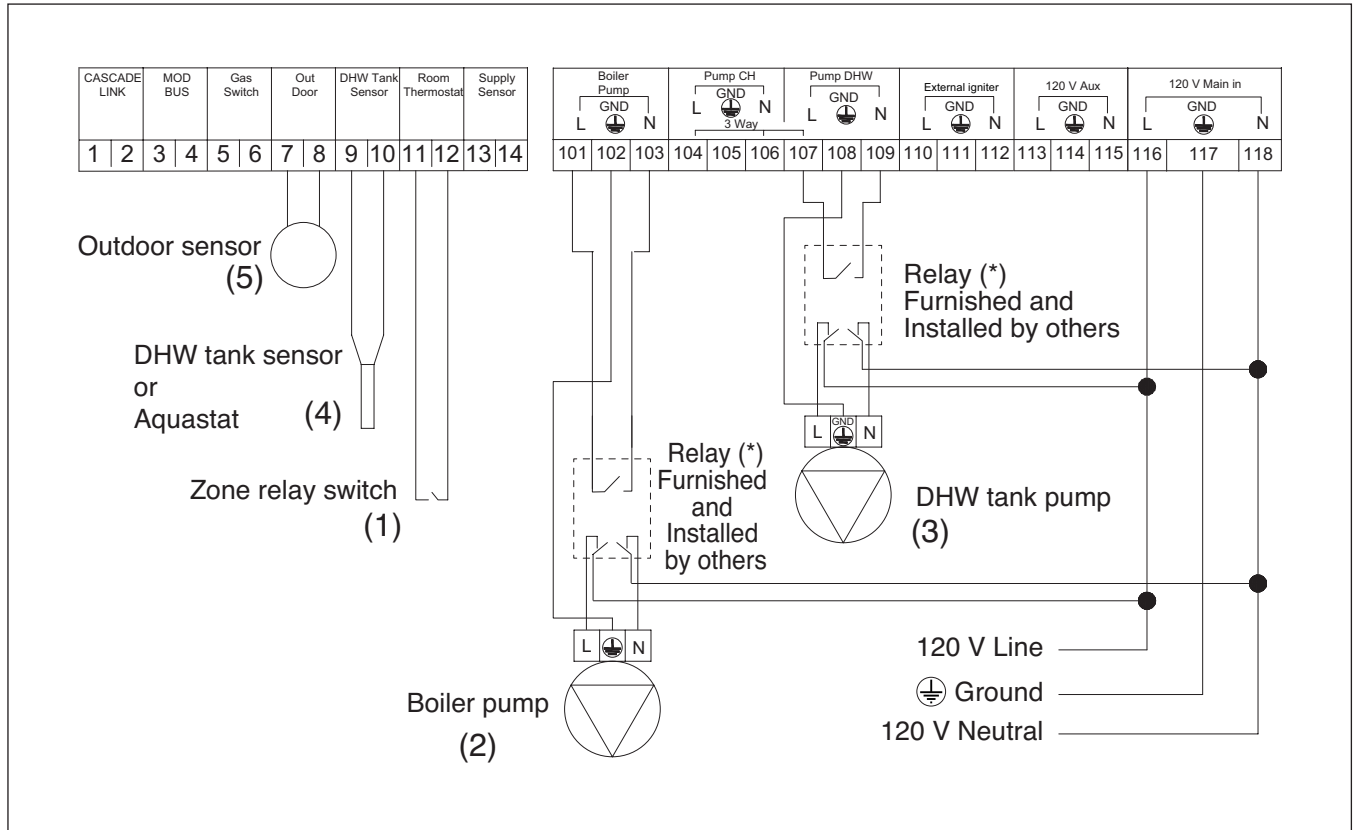


Fig. 78

(*) NOTICE: The maximum amp load for each pump is 1 A (with a $\cos\phi$ 0.7) when 2 or 3 pumps are connected. For this reason, if the power consumption of each pump is higher than 84 watt, use a relay as shown in figure. If just one pump is connected, the maximum amp load of this single pump is 2 A with a $\cos\phi$ 0.7. For this reason if the power consumption of the pump is higher than 168 watt, use a relay as shown in figure.

► Connect the following low voltage connection:

Terminal Number.	Device
11-12	Zone relay end switch
9-10	DHW tank sensor or Tank Thermostat (Aquastat)
7-8	Outdoor air sensor (optional)

► Connect the following high voltage pin:

Terminal Number.	Device
101-102-103	Boiler pump
107-108-109	DHW tank pump

8.1.1 Settings

Set the parameters as indicated in the following table (for the parameter list see section "5.5 Parameters list"):

No.	Description	Value	Comment
1	Central Heating Mode	0	Outdoor air sensor not present
		1	Outdoor air sensor present. Reset curve activated
2	Mod Pump Mode	2	Enabled CH pump and DHW pump
35	DHW mode	0	No indirect sanitary water installed
		1	Indirect sanitary water with sensor
		2	Indirect sanitary water with tank thermostat

If CH mode is set to 1 and an outdoor air sensor is present, set the reset curve parameter as follows (to set these values see also section "5.6 Outdoor reset"):

No.	Description	Value (°F)
19	Design Supply Temp	180
20	Design Outdoor Temp	25
21	Baseline Supply Temp	104
22	Baseline Outdoor Temp	70
23	Design Supply Min Limit	40
24	Design Supply Max Limit	180
25	Warm Weather Shutdn	68

8.2 Multiple zone with indirect tank (valve for each zone)

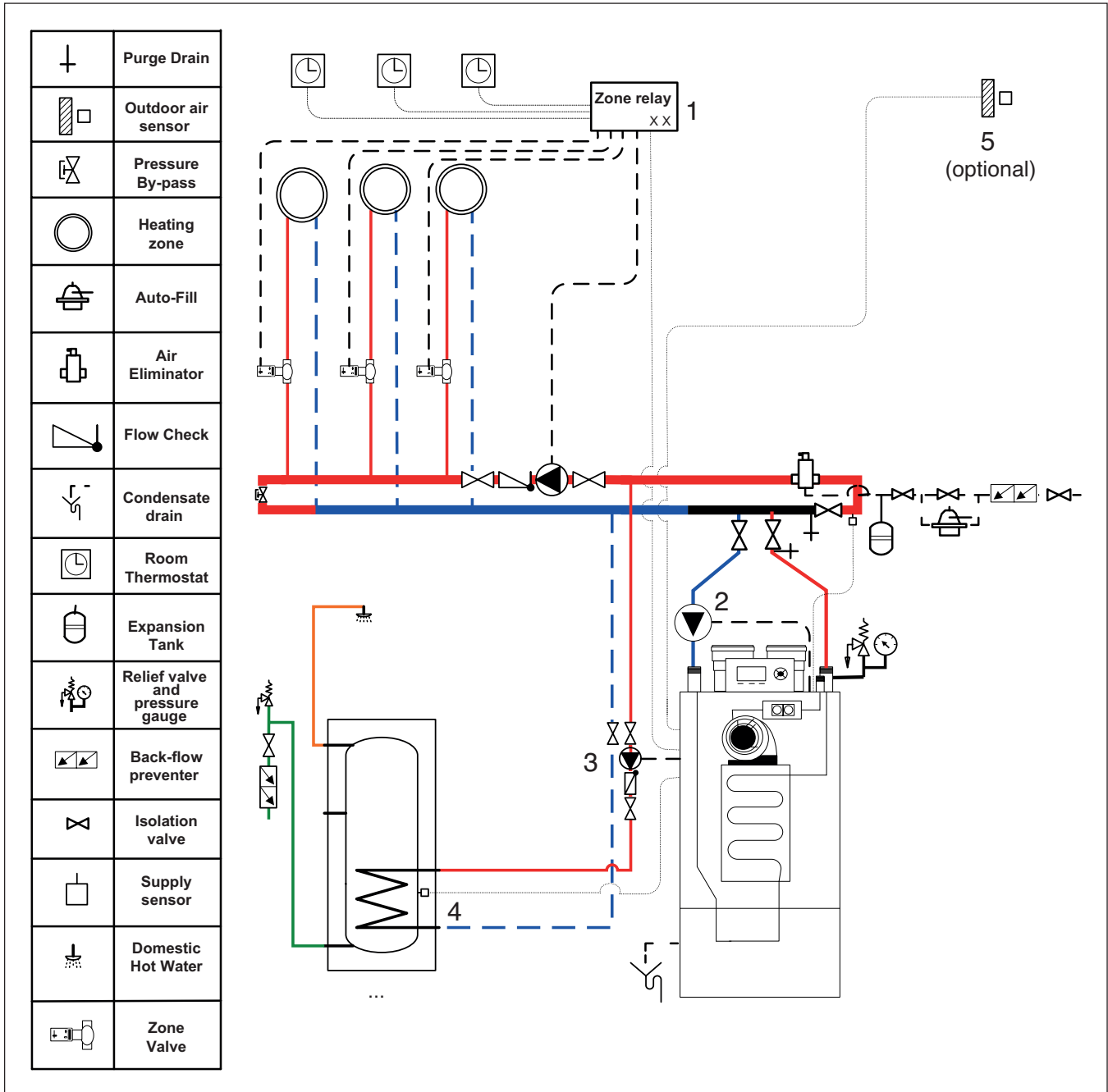


Fig. 79

Wiring diagram for multiple zone with indirect tank (valve for each zone):

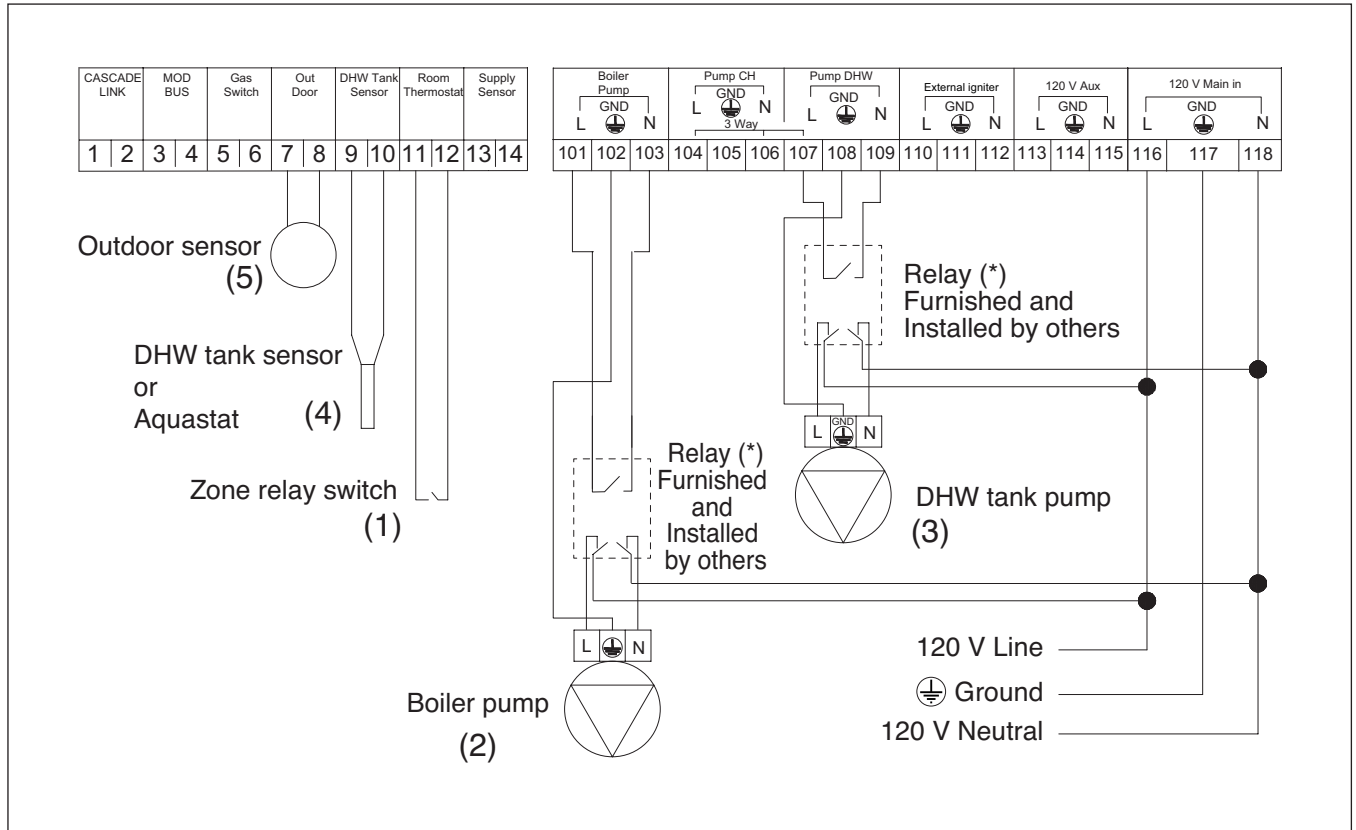


Fig. 80

(*) NOTICE: The maximum amp load for each pump is 1 A (with a $\cos\phi$ 0.7) when 2 or 3 pumps are connected. For this reason, if the power consumption of each pump is higher than 84 watt, use a relay as shown in figure. If just one pump is connected, the maximum amp load of this single pump is 2 A with a $\cos\phi$ 0.7. For this reason if the power consumption of the pump is higher than 168 watt, use a relay as shown in figure.

► Connect the following low voltage connection:

Terminal Number.	Device
11-12	Zone relay end switch
9-10	DHW tank sensor or Tank Thermostat (Aquastat)
7-8	Outdoor air sensor (optional)

► Connect the following high voltage pin:

Terminal Number.	Device
101-102-103	Boiler pump
107-108-109	DHW tank pump

8.2.1 Settings

Set the parameters as indicated in the following table (for the parameter list see section "5.5 Parameters list"):

No.	Description	Value	Comment
1	Central Heating Mode	0	Outdoor air sensor not present
		1	Outdoor air sensor present. Reset curve activate
2	Mod Pump Mode	2	Enabled CH pump and DHW pump
35	DHW mode	0	No indirect sanitary water installed
		1	Indirect sanitary water with sensor
		2	Indirect sanitary water with tank thermostat

If CH mode is set to 1 and an outdoor air sensor is present, set the reset curve parameter as follows (to set these values see also section "5.6 Outdoor reset"):

No.	Description	Value (°F)
19	Design Supply Temp	180
20	Design Outdoor Temp	25
21	Baseline Supply Temp	104
22	Baseline Outdoor Temp	70
23	Design Supply Min Limit	40
24	Design Supply Max Limit	180
25	Warm Weather Shutdn	68

8.3 Cascade connection

The SSB boilers can be connected together to form a cascade with a maximum of 16 boilers. In this case, one boiler will be the manager of the other boilers connected. This boiler is named "Primary". The other one(s) are named "Secondary".

To have a cascade it is necessary to connect together the boilers using the "Cascade link" (pin 1-2) in parallel as shown in the following figure:

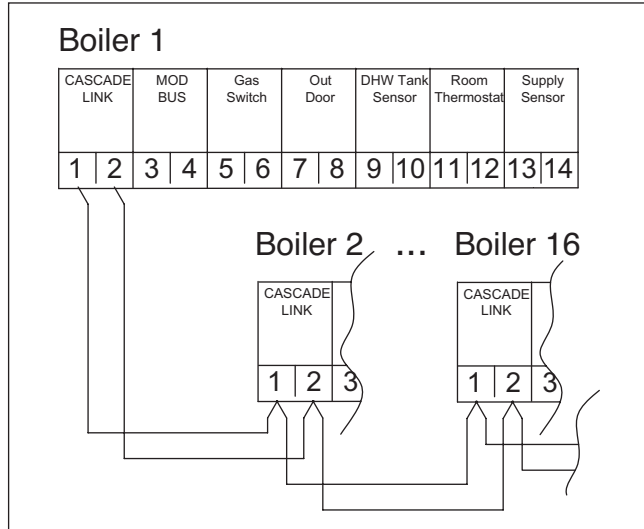


Fig. 81

To define the "Primary" boiler of the cascade set to "ON" the "S4 switch". This switch has to be set "OFF" in all the "Secondary" boilers (see the following figure).

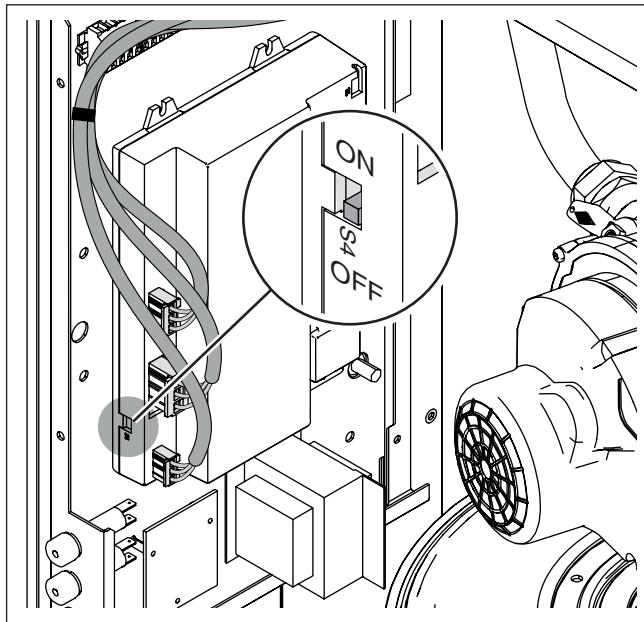


Fig. 82



CAUTION: Change the position of the S4 switch only when the boiler is off.

Each cascade boiler has to be identified by an address (parameter N° 73 "Boiler Address") different from the others. To define these address follow the steps below:

- ▶ Switch on the "Primary boiler" and set the parameter N°73 ("Boiler Address") to 1
- ▶ Switch off the "Primary boiler"
- ▶ Switch on the second boiler and set the parameter N°73 to 2.
- ▶ Switch off the second boiler
- ▶ Continue with steps 3 and 4 for each boiler (each "Secondary" boiler has to be a different number from 2 to 16 and the "Primary" must be number 1)
- ▶ Switch on all boilers starting with the "Primary boiler"

A recommended scheme for cascade installation is as follow:

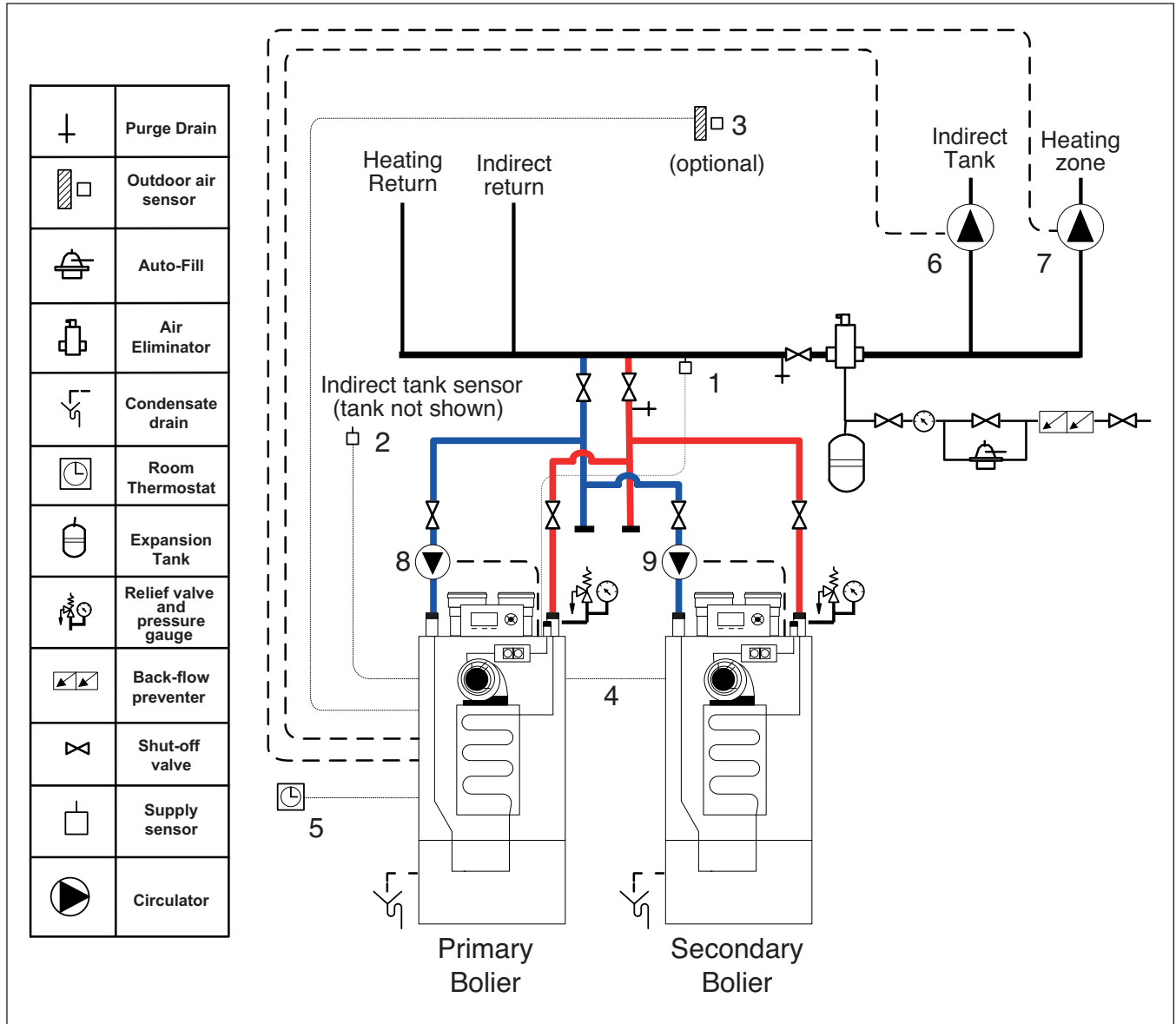


Fig. 83

For this installation the wiring is shown in figure below:

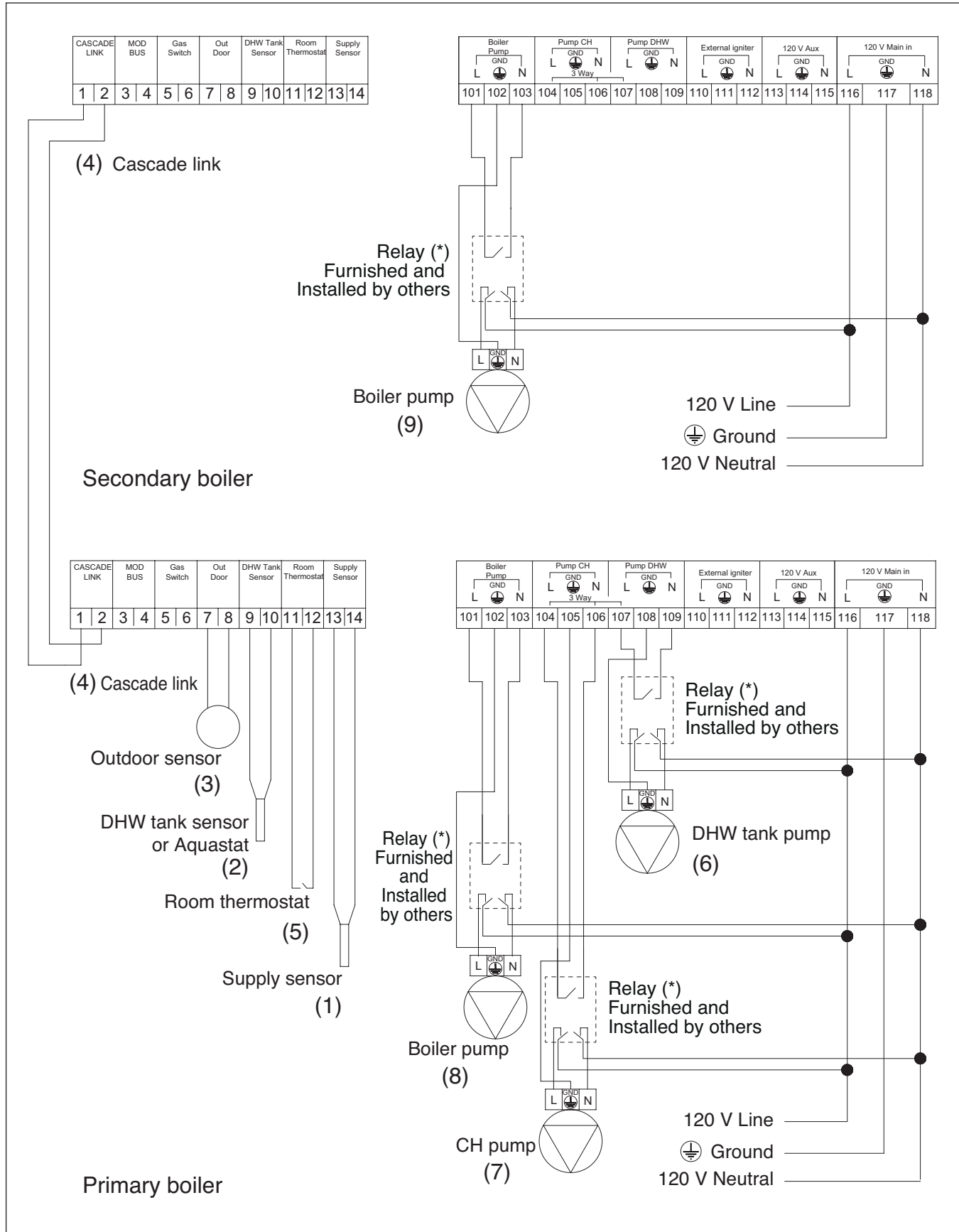


Fig. 84

(*) NOTICE: The maximum amp load for each pump is 1 A when 2 or 3 pumps are connected. For this reason, if the power consumption of each pump is higher than 84 watt, use a relay as shown in figure.

If just one pump is connected, the maximum amp load of this single pump is 2 A. For this reason if the power consumption of the pump is higher than 168 watt, use a relay as shown in Fig. 84.

- The low voltage connections for “Primary boiler” are:

Terminal Number.	Device
1-2	Cascade link
7-8	Outdoor air sensor (optional)
9-10	DHW tank sensor or Tank Thermostat (Aquastat)
11-12	Room thermostat
13-14	Supply sensor

- The low voltage connections for “Secondary boiler” are:

Terminal Number.	Device
1-2	Cascade link

- The high voltage connections for “Primary boiler” are:

Terminal Number.	Device
101-102-103	Boiler pump
104-105-106	CH pump
107-108-109	DHW tank pump

- The high voltage connections for “Secondary boiler” are:

Terminal Number.	Device
101-102-103	Boiler pump

8.3.1 Settings

Set the parameters as indicated in the following table (for the parameter list see section “5.5 Parameters list”):

No.	Description	Value	Comment
1	Central Heating Mode	0	Outdoor air sensor not present
		1	Outdoor air sensor present. Reset curve activate
2	Mod Pump Mode	2	Enabled CH pump and DHW pump
35	DHW mode	0	No indirect sanitary water installed
		1	Indirect sanitary water with sensor
		2	Indirect sanitary water with tank thermostat

If CH mode is set to 1 and an outdoor air sensor is present, set the reset curve parameter as follows (to set these values see also section “5.6 Outdoor reset”):

No.	Description	Value (°F)
19	Design Supply Temp	180
20	Design Outdoor Temp	25
21	Baseline Supply Temp	104
22	Baseline Outdoor Temp	70
23	Design Supply Min Limit	40
24	Design Supply Max Limit	180
25	Warm Weather Shutdn	68

9 Commissioning log for the appliance



Please complete a separate log for each appliance.

Home owner/operator:

Last name, first name Number, Street

Telephone/fax ZIP code, town

System installer:

Order number:

Appliance type

FD (Date of manufacture):

Date commissioned:

Individual appliance

Installation location: Basement | Garage | other:

Room air only: Number and size of ventilation openings

Vent pipe routing: Twin pipe system (Rigid) | Twin pipe system (Flex) | Concentric pipe system | Room air | Sealed combustion

PVC | CPVC | PP | 2" | 3" | 4" | other:

Total length: Approx. ft (m) | Elbows 90°: Qty | Elbows 15 - 45°: Qty

Flue tightness test completed: yes | no

CO₂ value in the combustion air at maximum nominal output:

O₂ value in the combustion air at maximum nominal output:

Notes regarding under or over pressure operation:

Get setting and flue gas test:

Gas conversion: NG | LPG (propane)

Gas pressure	"W.C. (mbar)	Gas static supply pressure:	"W.C. (mbar)
Selected maximum output:	MBH (KW)	Selected minimum output:	MBH (KW)
Flow rate at maximum nominal output:	gpm (l/min)	Flow rate at minimum nominal output:	gpm (l/min)
Net calorific value H ₁₈ (per gas supplier):	MBTU/ft ³ (kwh/m ³)		
CO ₂ at maximum nominal output:	%	CO ₂ at minimum nominal output:	%
O ₂ at maximum nominal output:	%	O ₂ at minimum nominal output:	%
CO at maximum nominal output:	ppm	CO at minimum nominal output:	ppm
Flue gas temperature at maximum nominal output:	°F (°C)	Flue gas temperature at minimum nominal output:	°F (°C)
Maximum measured supply temperature:	°F (°C)	Minimum measured supply temperature	°F (°C)

System hydraulics:

Low-loss header, type:

Heating pump:

Primary secondary piping

DHW tank/type/number/heating surface output:

System hydraulics checked, notes:

Additional expansion vessel

Size/pre-charge pressure:

Automatic air vent present?

yes | no

10 Spare parts

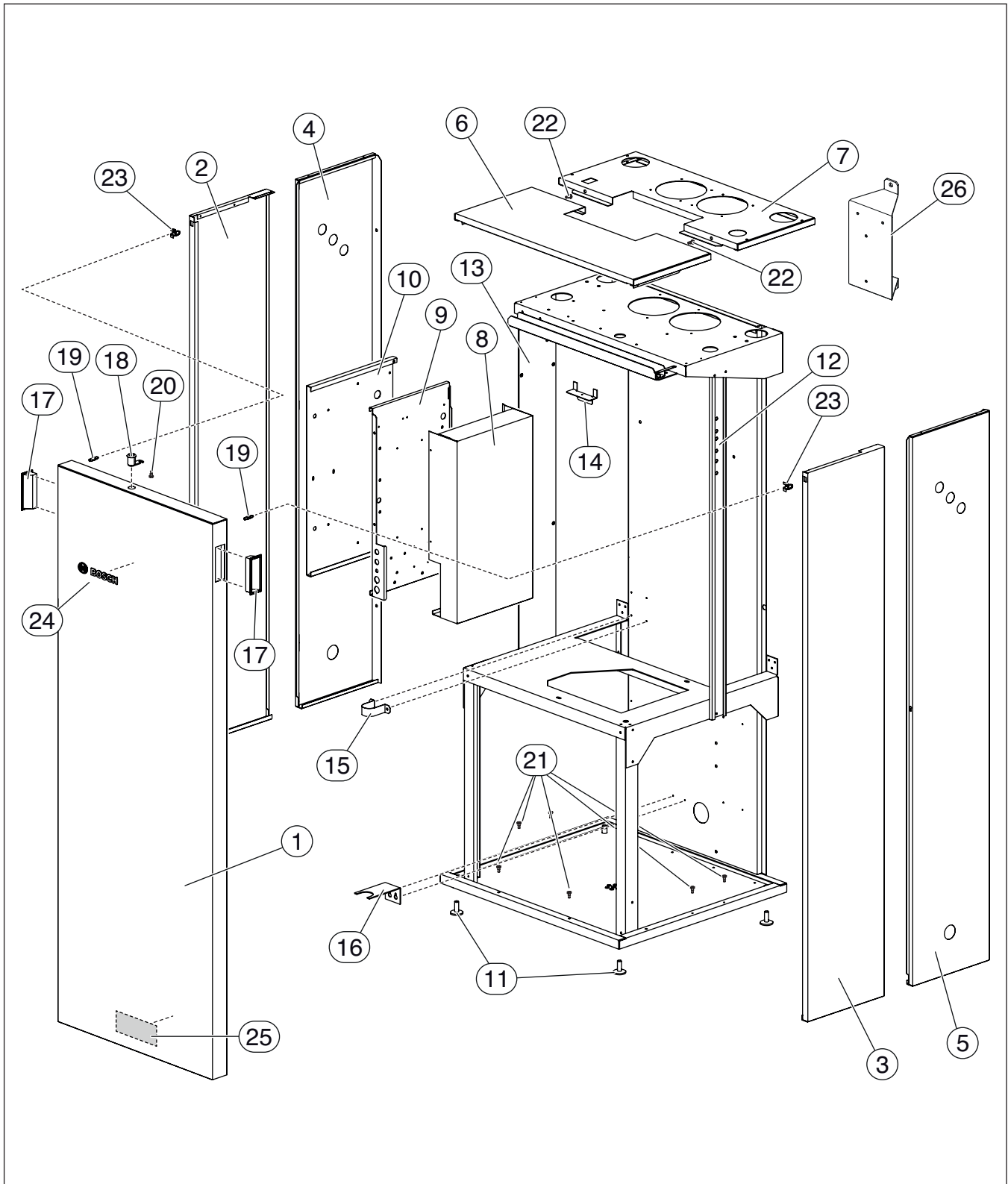
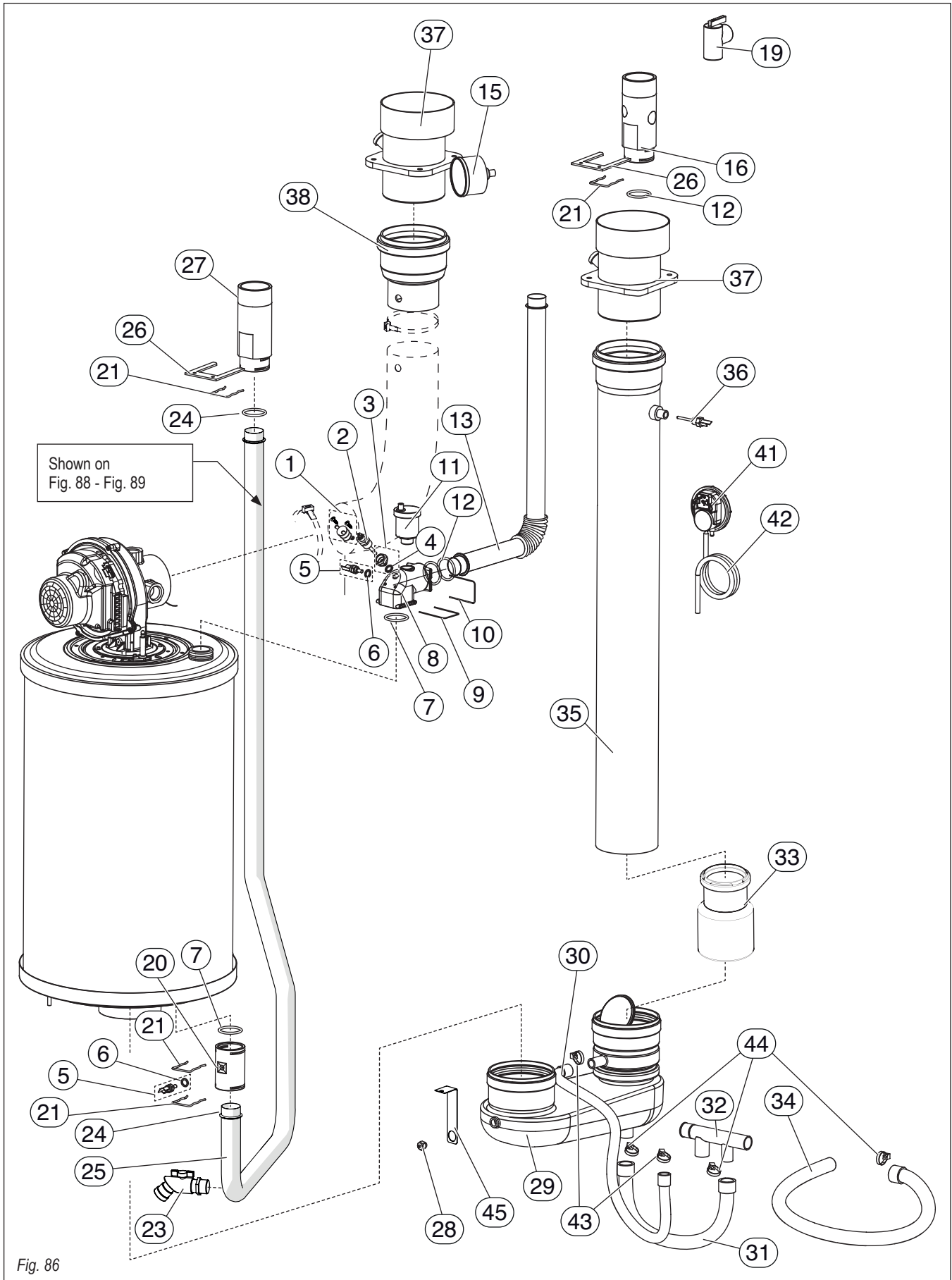


Fig. 85

Item (→ Fig. 85)	Description	SSB255	SSB399	SSB512	Order number
1	Panel front	■	■	■	7-738-004-899
2	Panel left side front	■	■	■	7-738-004-900
3	Panel right side front	■	■	■	7-738-004-901
4	Panel left side rear	■	■	■	7-738-004-902
5	Panel right side rear	■	■	■	7-738-004-903
6	Panel top front	■	■	■	7-738-004-904
7	Panel top rear	■			7-738-004-906
7	Panel top rear		■	■	7-738-004-905
8	Cover control board	■	■	■	7-738-004-907
9	Mounting bracket control board panel	■	■	■	7-738-004-908
10	Panel control board	■	■	■	7-738-004-909
11	Adjustable leveling leg	■	■	■	7-738-004-910
12	Right frame			■	7-738-004-911
12	Right frame		■		7-738-004-912
12	Right frame	■			7-738-004-913
13	Left frame			■	7-738-004-914
13	Left frame		■		7-738-004-915
13	Left frame	■			7-738-004-916
14	Mounting bracket pressure differential switch	■	■	■	7-738-004-917
15	Mounting bracket return pipe	■	■	■	7-738-004-918
16	Mounting bracket condensate collector	■	■	■	7-738-004-919
17	Handle Front Panel	■	■	■	7-738-004-920
18	Lock and lever front panel	■	■	■	7-738-004-921
19	Alignment pin front panel	■	■	■	7-738-004-944
20	Lock pin panel top front	■	■	■	7-738-004-923
21	Alignment pin front side panels	■	■	■	7-738-004-924
22	Alignment pin top panels	■	■	■	7-738-004-925
23	Receiver alignment pin front panel	■	■	■	7-738-004-945
24	Logo Bosch Front door	■	■	■	7-738-005-176
25	Logo Buderus SSB	■	■	■	7-738-005-177
26	Bracket for external igniter	■	■	■	7-738-006-267



Item (→ Fig. 86)	Description	SSB255	SSB399	SSB512	Order number
1	High limit sensor and screws	■	■	■	7-738-004-926
2	LWCO probe	■	■	■	7-738-004-927
3	LWCO adapter and O-ring	■	■	■	7-738-004-928
4	O-ring LWCO adapter	■	■	■	7-738-004-929
5	Universal temperature detector and washer	■	■	■	7-738-004-930
6	Washer temperature detector	■	■	■	7-738-004-931
7	O-ring HX supply manifold and return adapter 1.42x0.14in 36,1x3,5mm EPDM	■	■	■	7-738-004-932
8	Boiler Supply manifold	■	■	■	7-738-004-933
9	U-clip boiler supply manifold hx side 2.12x1.65in 54x42mm AISI 302	■	■	■	7-738-004-934
10	U-clip boiler supply manifold supply pipe side 2.12x1.5in 54x38mm AISI 302	■	■	■	7-738-004-935
11	Automatic air vent ½" BSP	■	■	■	7-738-004-936
12	O-ring 1.23x0.14in 31.3x3.5mm NBR	■	■	■	7-738-004-937
13	Boiler supply pipe Ø1.25in Ø32mm	■	■	■	7-738-004-938
15	T&P Gauge 0 - 105 psi	■	■	■	7-738-004-940
15	T&P Gauge 0 - 260 psi	■	■	■	7-738-004-941
16	System supply adapter 2" 50mm	■	■	■	7-738-004-942
16	System supply adapter 1-1/2" 38mm	■	■	■	7-738-004-943
19	Safety Relief Valve 30psi 2.07bar	■	■	■	7-738-004-946
19	Safety Relief Valve 75psi 5.17bar	■	■	■	7-738-004-947
20	HX return adapter	■	■	■	7-738-004-948
21	U-clip hx return adapter 2.1x1.57in 53x40 AISI 302	■	■	■	7-738-004-949
23	Boiler drain valve ¾" NPT	■	■	■	7-738-004-951
24	O-ring hx return adapter tube side 1.36x0.14in 34.5x3.5mm NBR	■	■	■	7-738-004-952
25	Boiler Return pipe	■	■	■	7-738-004-953
25	Boiler Return pipe	■	■	■	7-738-004-954
25	Boiler Return pipe	■	■	■	7-738-004-955
26	Frame support system supply return adapters	■	■	■	7-738-004-956
27	System return adapter 2" 50mm	■	■	■	7-738-004-957
27	System return adapter 1-1/2" 38mm	■	■	■	7-738-004-958
28	Male adapter Ø 0.27 inch hose barb x ¼" thread	■	■	■	7-738-004-959
29	PP Condensate Collector	■	■	■	7-738-004-960
30	Flex condensate drain exhaust Ø0.55in Ø24mm PP	■	■	■	7-738-004-961
31	Flex condensate drain collector Ø0.94in Ø24mm PP	■	■	■	7-738-004-962
32	PP Condensate manifold 5.12x0.94in 130x24mm	■	■	■	7-738-004-963
33	PP Vent Pipe Reducer 4-3in 110-80mm	■	■	■	7-738-004-964
34	Flex condensate drain discharge Ø0.94in Ø24mm PP	■	■	■	7-738-004-965
35	PP boiler combustion pipe 4in 110mm	■	■	■	7-738-004-966
35	PP boiler combustion pipe 4in 110mm	■	■	■	7-738-004-967
35	PP boiler combustion pipe 3in 80mm	■	■	■	7-738-004-968
36	Flue gas temp sensor ¾"	■	■	■	7-738-004-969
37	PP PVC vent / air intake adapter 3in 80mm	■	■	■	7-738-004-970
37	PP PVC vent / air intake adapter 4in 110mm	■	■	■	7-738-004-971
38	PP Air Intake Reducer 4-3.5in 110-90mm	■	■	■	7-738-004-972
38	PP Air Intake Reducer 3in 80mm	■	■	■	7-738-004-973
41	Pressure differential switch	■	■	■	7-738-004-974
42	Silicone hose for pressure differential switch	■	■	■	7-738-004-975
43	Hose clamp 5/8" - 1" 16-27mm	■	■	■	7-738-004-976
44	Hose clamp 1 - 1.5" 25-40mm	■	■	■	7-738-004-977
45	Condensate collector bracket	■	■	■	7-738-005-278

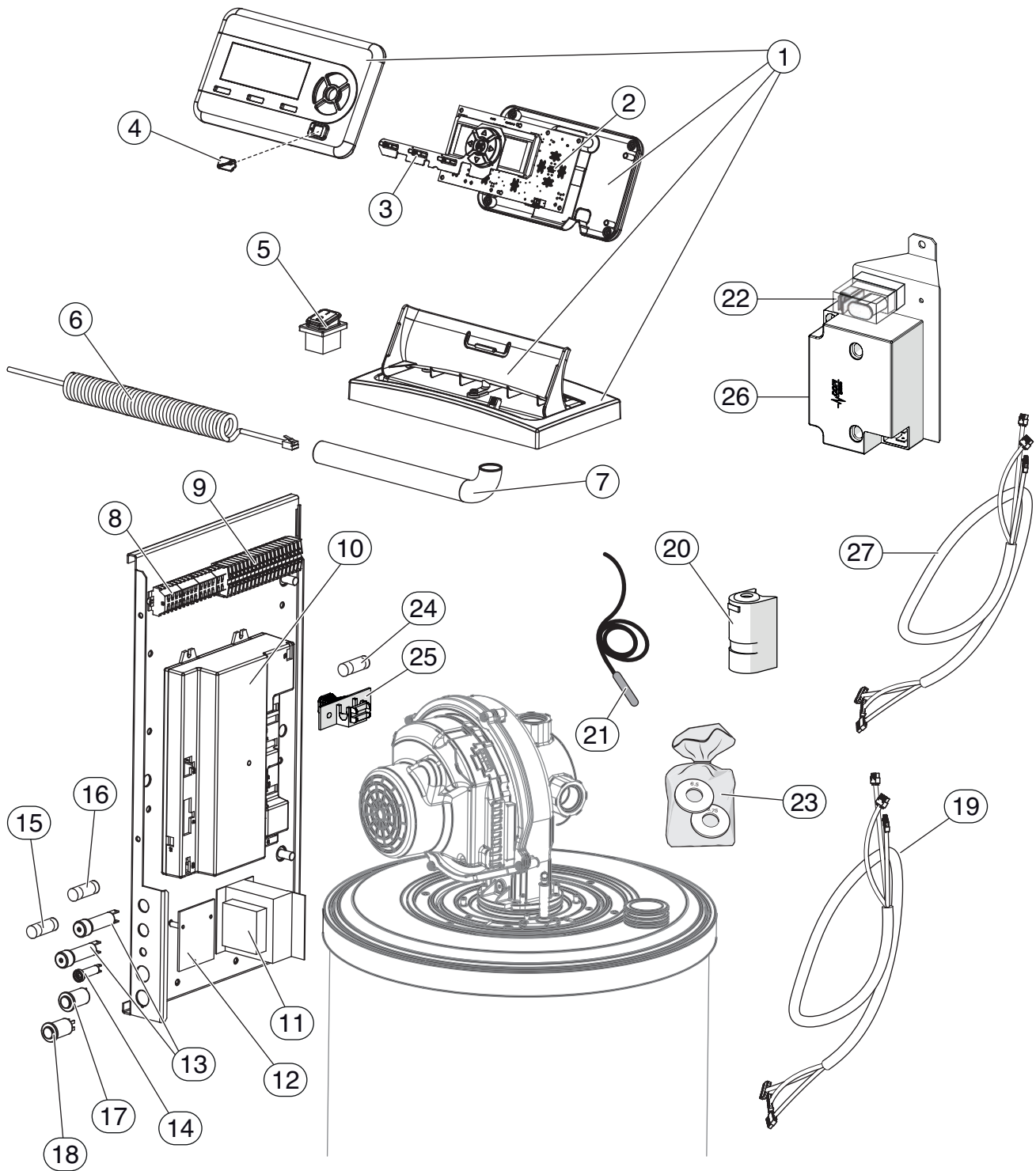


Fig. 87

Item (→ Fig. 87)	Description	SSB255	SSB399	SSB512	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
10	Control Board (*)	■	■	■	7-738-006-268
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 SSB	■			7-738-005-055
19	Wiring harness SSB		■		7-738-005-108
19	Wiring harness SSB			■	7-738-005-056
20	Outdoor Sensor 10K ohm	■	■	■	7-738-005-057
21	Universal Sensor for LLH, or DHW 10K ohm	■	■	■	7-738-005-058
22	Relay and screws	■	■	■	7-738-006-269
23	LPG gas conversion kit	■			7-738-005-061
23	LPG gas conversion kit		■		7-738-005-062
23	LPG gas conversion kit			■	7-738-005-063
24	Fuse 3.15 A	■	■	■	7-738-005-059
25	Fuse holder	■	■	■	7-738-005-060
26	External igniter and screws	■	■	■	7-738-006-270
27	Wiring for external igniter	■	■	■	7-738-006-271

(*) For model SSB255 boilers with serial number higher than 3520-655-000018-7738004894

(*) For model SSB399 boilers with serial number higher than 3520-655-000018-7738004895

(*) For model SSB512 boilers with serial number higher than 3520-657-000036-7738004896

SSB255 ONLY

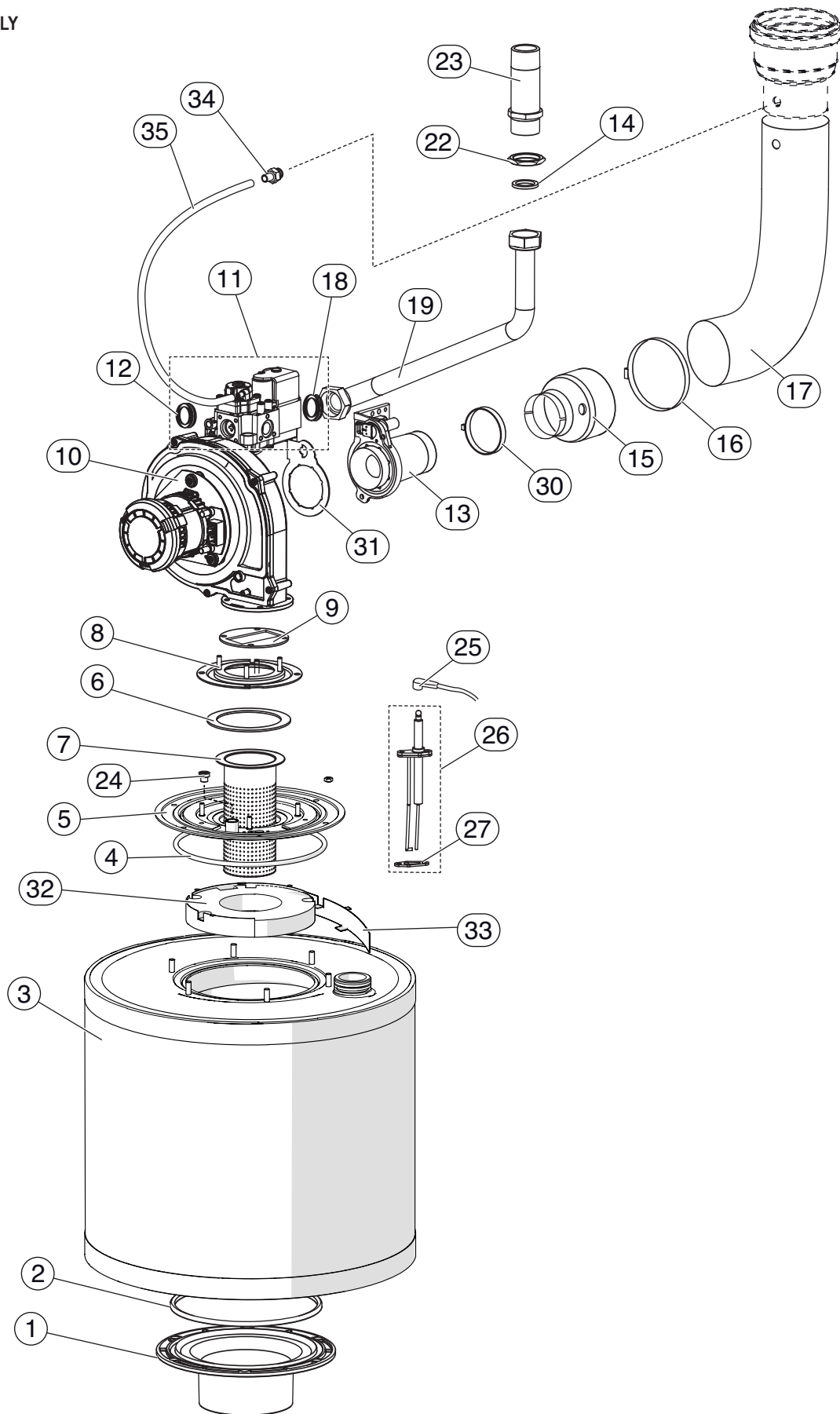


Fig. 88

Item (→ Fig. 88)	Description	SSB255	Order number
1	Flanged exhaust connector	■	7-738-004-978
2	O-ring flanged exhaust connector 6.5x0.23in 165x6mm EPDM	■	7-738-004-979
3	Heat Exchanger SSB255	■	7-738-004-980
4	O-ring burner flange 6.60x0.20in 167.7x5.33mm NBR	■	7-738-004-983
5	Burner Flange (outer ring)	■	7-738-004-984
5	Burner Flange (outer ring)(*)	■	7-738-005-407
6	Gasket premix burner tube	■	7-738-004-985
7	Premix burner tube	■	7-738-004-986
7	Premix burner tube mesh type (*)	■	7-738-006-272
8	Burner Flange (inner ring)	■	7-738-004-989
9	Gasket burner flange inner ring to fan	■	7-738-004-990
10	Fan SSB-255	■	7-738-005-007
11	Gas valve SSB-255 and washers	■	7-738-005-009
12	Venturi tube / gas valve washer	■	7-738-005-011
13	Venturi SSB-255	■	7-738-005-013
14	Washer gas pipe 1" 25 mm	■	7-738-005-014
15	Adapter air intake tube SSB 255	■	7-738-005-017
15	Adapter air intake tube SSB 255 with hole (*)	■	7-738-006-273
16	Clamp for flex pipe air intake	■	7-738-005-019
17	Flexible pipe air intake SSB-255	■	7-738-005-021
18	Washer gas pipe 3/4" 19.05mm	■	7-738-005-023
19	Gas pipe SSB-255	■	7-738-005-025
22	Frame support gas pipe	■	7-738-005-029
23	Gas connection 1"	■	7-738-005-030
24	Sight glass for combustion	■	7-738-005-031
25	Ignition cable red	■	7-738-005-032
25	Ignition cable red for external igniter (*)	■	7-738-006-274
26	Ignition electrode with washer	■	7-738-005-033
27	Gasket for ignition electrode	■	7-738-005-034
30	Circular clamp 1-1/2" - 2-3/8" 40-60mm	■	7-738-005-015
31	Gasket venturi tube /Fan	■	7-738-004-950
32	Refractory disc	■	7-738-005-175
32	Refractory disc (*)	■	7-738-005-408
33	Refractory disk retainer	■	7-738-005-174
34	Male adapter Ø 0.2 inch hose barb x M5 thread	■	7-738-005-270
35	Balancing tube	■	7-738-005-269

(*) For model SSB255 boilers with serial number higher than 3520-655-000018-7738004894

SSB399 - SSB512

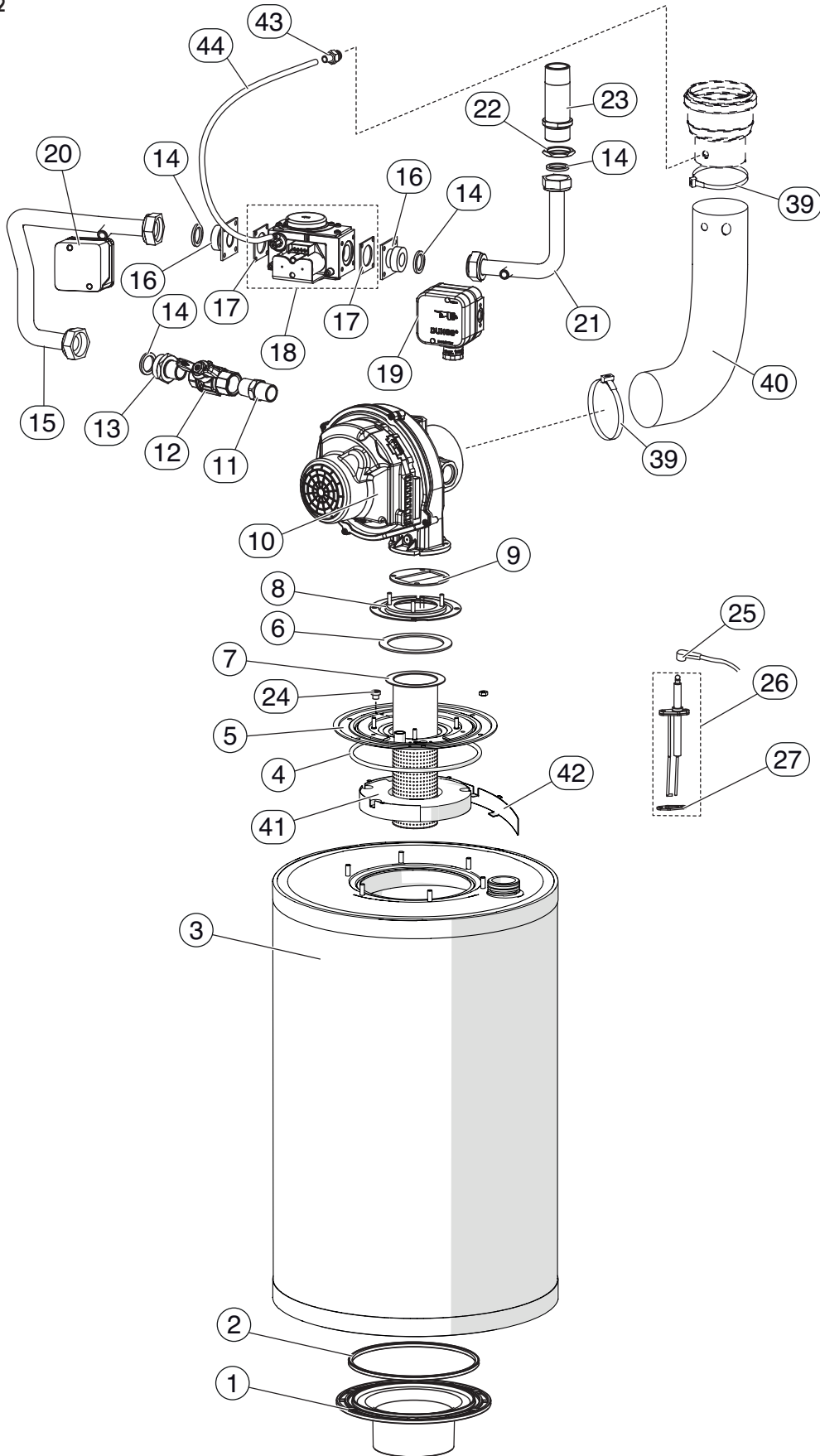


Fig. 89

Item (→ Fig. 89)	Description	SSB399	SSB512	Order number
1	Flanged exhaust connector	■	■	7-738-004-978
2	O-ring flanged exhaust connector 6.5x0.23in 165x6mm EPDM	■	■	7-738-004-979
3	Heat exchanger SSB-399	■		7-738-004-981
3	Heat exchanger SSB-512		■	7-738-004-982
4	O-ring burner flange 6.60x0.20in 167.7x5.33mm NBR	■	■	7-738-004-983
5	Burner Flange (outer ring)	■	■	7-738-004-984
5	Burner Flange (outer ring)	■ ⁽⁴⁾	■ ⁽³⁾	7-738-005-407
6	Gasket premix burner tube	■	■	7-738-004-985
7	Premix burner tube SSB-399	■		7-738-004-987
7	Premix burner tube SSB-399 mesh type	■ ⁽⁴⁾		7-738-006-275
7	Premix burner tube SSB-512		■	7-738-004-988
7	Premix burner tube SSB-512 mesh type		■ ⁽³⁾	7-738-005-406
8	Burner Flange (inner ring)	■	■	7-738-004-989
9	Gasket burner flange inner ring to fan	■	■	7-738-004-990
10	Fan SSB-399/512	■	■	7-738-005-006
11	Nipple SSB-399/512	■	■	7-738-005-008
12	Ball valve SSB-399/512	■	■	7-738-005-010
13	Nipple SSB-399/512	■	■	7-738-005-012
14	Washer gas pipe 1" 25mm	■	■	7-738-005-014
15	Gas pipe outlet side of gas valve	■	■	7-738-005-016
15	Gas pipe outlet side of gas valve		■ ⁽⁶⁾	7-738-006-413
16	Gas valve adapter	■	■	7-738-005-018
17	Gas valve washer SSB-399/512	■	■	7-738-005-020
18	Gas valve SSB-399/512 and washers	■	■	7-738-005-022
19	Gas Pressure Switch (low) SSB-512		■	7-738-005-024
20	Gas Pressure Switch (high) SSB-512		■	7-738-005-026
20	Gas Pressure Switch (high) SSB-512		■ ⁽⁶⁾	7-738-006-414
21	Gas pipe inlet side of gas valve		■	7-738-005-027
21	Gas pipe inlet side of gas valve	■		7-738-005-028
21	Gas pipe inlet side of gas valve		■ ⁽⁶⁾	7-738-006-415
22	Frame support gas pipe	■	■	7-738-005-029
23	Gas connection system side 1" 25mm	■	■	7-738-005-030
24	Sight glass combustion	■	■	7-738-005-031
25	Ignition cable red	■	■	7-738-005-032
26	Ignition electrode with washer	■	■	7-738-005-033
27	Gasket for ignition electrode	■	■	7-738-005-034
39	Clamp for Flex pipe air intake SSB-399/512	■	■	7-738-005-035
40	Flexible pipe air intake SSB-399/512	■	■	7-738-005-036
40	Flexible pipe air intake SSB-399/512 with hole	■ ⁽⁴⁾	■ ⁽⁵⁾	7-738-006-276
41	Refractory disc	■	■	7-738-005-175
41	Refractory disc	■ ⁽⁴⁾	■ ⁽³⁾	7-738-005-408
42	Refractory disk retainer	■	■	7-738-005-174
43	Male adapter Ø 0.2 inch hose barb x M5 thread	■ ⁽¹⁾	■ ⁽²⁾	7-738-005-270
44	Balancing tube	■ ⁽¹⁾	■ ⁽²⁾	7-738-005-269

(1) For model SSB399 boilers with serial number higher than 3520-556-000019-7738004895

(2) For model SSB512 boilers with serial number higher than 3520-556-000008-7738004896

(3) For model SSB512 boilers with serial number higher than 3520-619-000010-7738004896

(4) For model SSB399 boilers with serial number higher than 3520-655-000018-7738004895

(5) For model SSB512 boilers with serial number higher than 3520-657-000036-7738004896

(6) For model SSB512 boilers with serial number higher than 3520-755-000014-7738004896



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