

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 vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance,
- Do not touch any electrical switch; do not use any phone in your building,
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions,
- If you cannot reach your gas supplier, call the fire department.

Qualified installer, service agency or the gas supplier must perform installation and service.

FOR YOUR SAFETY:

Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

These instructions are available in English and French.

Please keep these instructions for future reference.

Gas Condensing Stainless Steel Boiler

BUDERUS SSB BOILER

SSB800 SA | SSB1000 SA | SSB1000 TL



BOSCH

Installation and Service Instructions for Contractors

6720866942 (2020/10) US



Contents

1	Key to symbols and safety instructions	3	5.1	Introduction	31
1.1	Key to symbols	3	5.2	Filling the condensate system	31
1.2	Safety instructions	3	5.3	Filling the boiler heating system	31
1.3	General warning	3	5.4	Warnings concerning the gas supply	32
			5.4.1	Confirming the Unit's Gas Type	32
			5.4.2	Gas Type Conversion	32
2	Product description	4	5.5	Boiler startup procedure	32
2.1	Introduction	4	5.5.1	Minimum Water Flow (Heat Exchanger Protection)	33
2.2	Scope of delivery	4	5.5.2	Heating System Pressure Test	33
2.3	Proper use	5	5.6	Boilers' cascade installation and start-up (FOR SSB 1000 TL ONLY)	34
2.4	Environmental responsibility / disposal	5	5.6.1	Boilers Cascade: Set Boiler Address	34
2.5	Dimensions and Connections	6	5.6.2	Boilers Cascade: Set Power switch S1	34
2.6	Technical data	7			
2.7	Main components	8	6	Operation	35
2.8	Efficiency Curves	9	6.1	Introduction	35
			6.2	Control panel description	35
3	Regulations	10	6.3	Touchscreen control panel menus	35
3.1	Compliance with standards and regulations	10	6.3.1	Splash/Home Screen	35
3.2	Operating limits of the boiler	10	6.3.2	Cascade Screen	35
3.3	Additional regulations for installation in Massachusetts	10	6.3.3	Boiler Screen	36
			6.3.4	Module Screen	36
4	Installation	11	6.3.5	Performance Screen	36
4.1	Packaging and product identification	11	6.3.6	Error Screen	37
4.2	Site preparation	11	6.3.7	Service Screen	37
4.2.1	Installation clearances	11	6.3.8	Module Test Screen	37
4.2.2	Setting the Unit	13			
4.2.3	Boiler location	15	Appendix A - Wiring diagram	38	
4.3	Water chemistry guidelines	15	Appendix B - Connection diagram	42	
4.4	Hydraulic connection	15	Appendix C - Maintenance	44	
4.4.1	Low water cutoff	16	Appendix D - Troubleshooting table	45	
4.4.2	No Flow test procedure	16	Appendix E - Boiler Installation (example drawings)	49	
4.4.3	High limit safety switch	16	Appendix F - Exhaust terminals and Air inlet Clearances	53	
4.4.4	Pressure relief valve installation	16	Appendix G - Sensor Resistance	55	
4.4.5	Expansion tank	17	Appendix H - De-rating for altitude installation	56	
4.4.6	Pump	17	Appendix I - Venting size data	57	
4.4.7	Condensate drain and piping	19			
4.4.8	Electrical Connection	20	7	Spare parts	58
4.4.9	Power supply cable connection	20			
4.5	Access to the electrical terminal strips	21			
4.5.1	Enable/Disable(Room Thermostat Connection)	21			
4.5.2	Outdoor Temperature Sensor	21			
4.5.3	Electrical wiring diagram	21			
4.6	Gas supply piping	22			
4.6.1	Gas Supply Specifications	22			
4.6.2	Manual Gas Shutoff Valve	22			
4.6.3	External Gas Supply Regulator	22			
4.6.4	Gas Type Conversion	22			
4.6.5	Adjusting and setting CO ₂ limits	23			
4.7	Venting and air piping system	24			
4.8	Combustion air	30			
4.8.1	Ducted combustion air	31			
5	Commissioning	31			

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 158 deg F (70°C) in its original packaging.
- ▶ 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 packaging material out of reach of children as it can be potentially dangerous. Dispose of packaging material 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 and two pipe. 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 or by a 0-10V input.
- An outdoor air temperature sensor must be connected to the boiler for an outdoor reset supply temperature control for increased fuel efficiency and comfort.

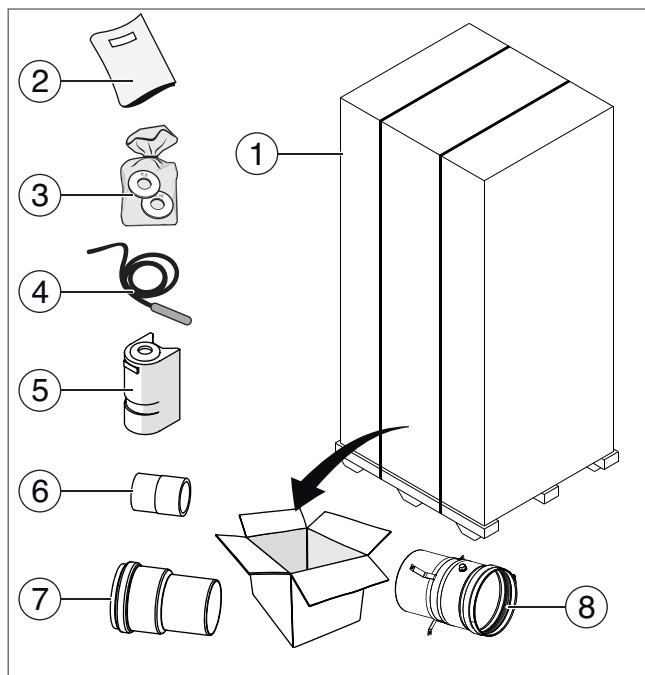
2.2 Scope of delivery

Fig. 1 SSB 800 SA - 1000 SA Scope of delivery

Component	Qty	Packaging method
[1] Gas condensing boiler	1	Pallet
[2] Set of documents for appliance	1	Plastic package
[3] LP conversion kit	1	Plastic package
[4] Sensor for DHW	1	Cardboard box on pallet
[5] Outdoor sensor	1	Cardboard box on pallet
[6] Adapter for condensate drain system (1")	1	Cardboard box on pallet
[7] Adapter for relief valves drain system (2")	1	Cardboard box on pallet
[8] Adapter for flue venting system (6" PP to CPVC)	1	Cardboard box on pallet

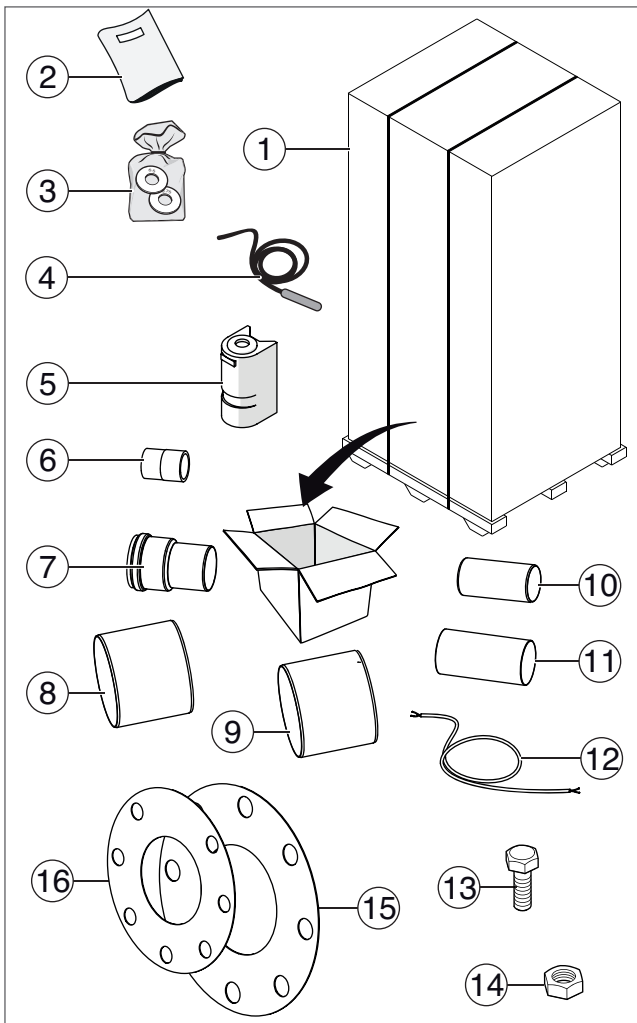


Fig. 2 SSB 1000 TL Scope of delivery

Component	Qty	Packaging method
[1] Gas condensing boiler	1	Pallet
[2] Set of documents for appliance	1	Plastic package
[3] LP conversion kit	1	Plastic package
[4] Sensor for DHW	1	Cardboard box on pallet
[5] Outdoor sensor	1	Cardboard box on pallet
[6] Adapter for condensate drain system (1")	1	Cardboard box on pallet
[7] Adapter for relief valves drain system (2")	1	Cardboard box on pallet
[8] Stub for cascade connection of air 10"	1	Cardboard box on pallet
[9] Stub for cascade connection of venting 10"	1	Cardboard box on pallet
[10] Stub for cascade connection of condensate	1	Cardboard box on pallet
[11] Stub for cascade connection of relief valves	1	Cardboard box on pallet
[12] Bus connecting cable	1	Cardboard box on pallet
[13] Bolts	20	Cardboard box on pallet
[14] Nuts	20	Cardboard box on pallet
[15] Gaskets 5"	2	Cardboard box on pallet
[16] Gaskets 3"	1	Cardboard box on pallet

2.3 Proper use

- ▶ The SSB boilers are designed for large residential, commercial and industrial applications.
- ▶ The SSB boilers are 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 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.

2.5 Dimensions and Connections

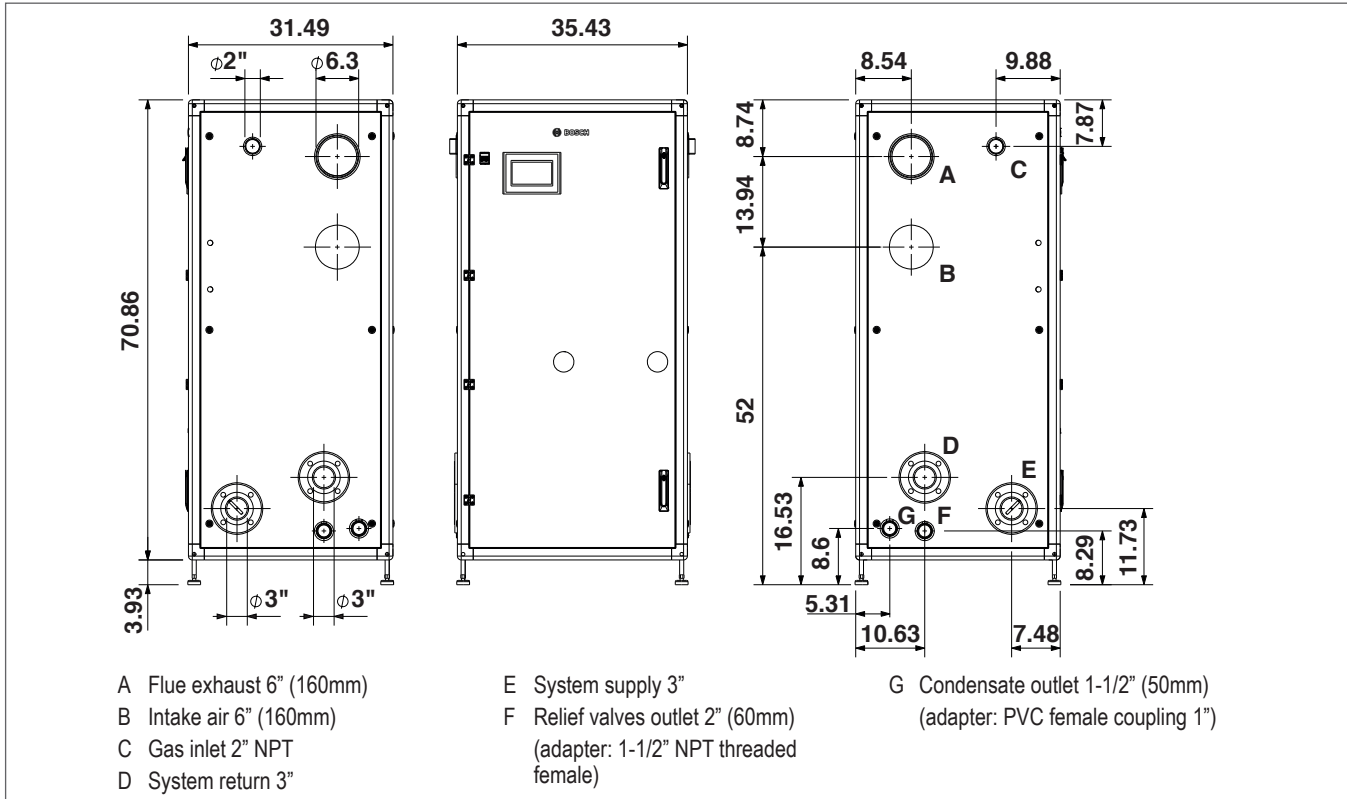


Fig. 3 SSB 800 SA, 1000 SA (dimension in inches)

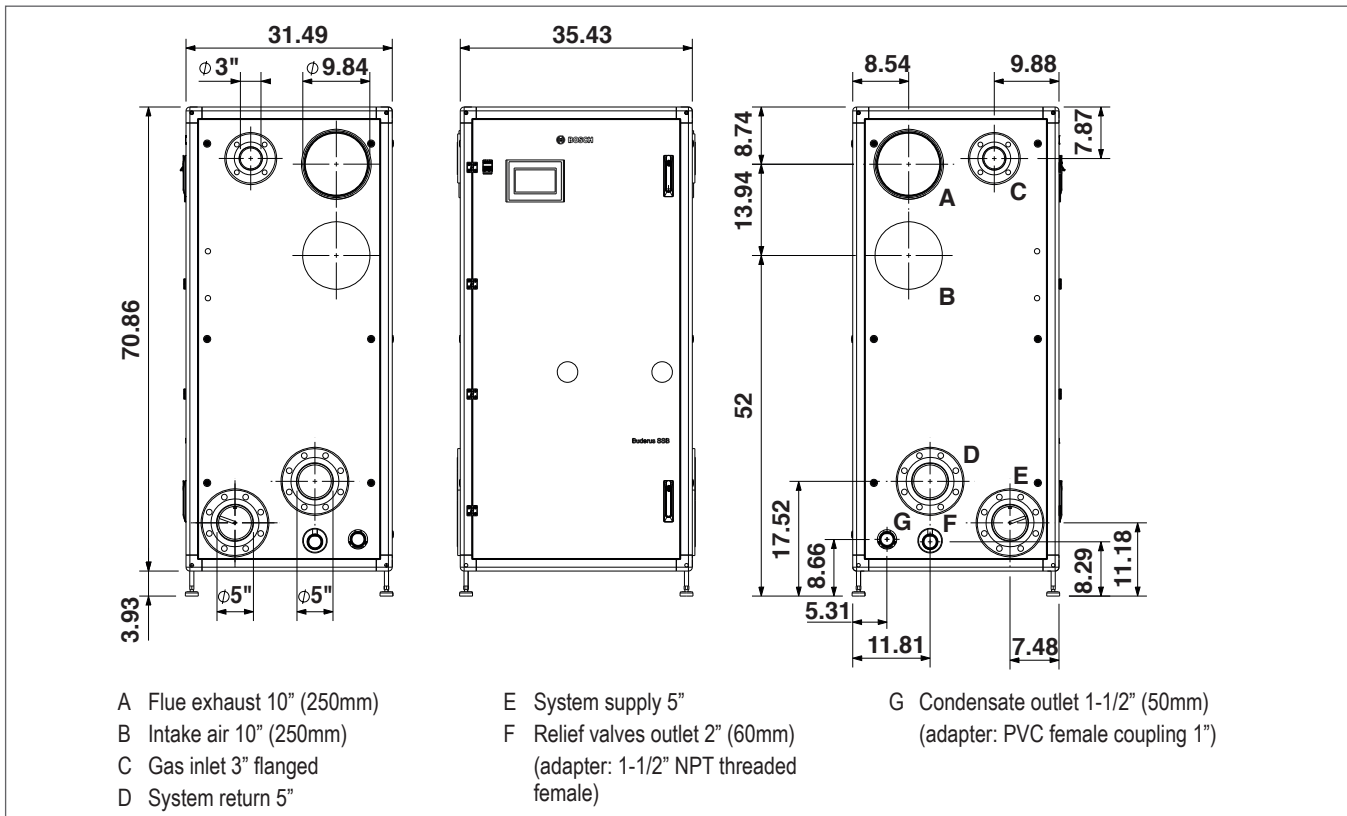


Fig. 4 SSB 1000 TL (dimension in inches)

2.6 Technical data

	Unit	SSB 800 SA	SSB 1000 SA	SSB 1000 TL
Boiler Category		ASME Sect.IV		
Type of Gas		Natural Gas, Propane*		
Max input rate	BTU/hr	798,000	1,024,000	1,024,000
	(kW)	(234)	(300)	(300)
Min input rate	BTU/hr	79,800	100,000	100,000
	(kW)	(23)	(29)	(29)
Turndown	Rate	10:1	10:1	10:1
Gas Connections	Ø Inch	2" (NPT)	2" (NPT)	3" (flanged)
Max. NG Pressure	Inch W.C.	20	20	20
	(mbar)	(50)	(50)	(50)
Recommended NG Pressure	Inch W.C.	8	8	8
	(mbar)	(20)	(20)	(20)
Min. NG Pressure	Inch W.C.	3.5	3.5	3.5
	(mbar)	(8.7)	(8.7)	(8.7)
Max. LPG Pressure	Inch W.C.	20	20	20
	(mbar)	(50)	(50)	(50)
Min. LPG Pressure	Inch W.C.	8	8	8
	(mbar)	(19.9)	(19.9)	(19.9)
CO ₂ Working Range (NG)	%	8.8 – 9.2	8.8 – 9.2	8.8 – 9.2
CO ₂ Working Range (LP)	%	10.3 - 10.7	10.3 - 10.7	10.3 - 10.7
Water Connections	Ø Inch	3 "	3 "	5"
Max. Allowable Working Pressure (MAWP)	PSI	80	80	80
	(bar)	(5.5)	(5.5)	(5.5)
Water Volume	Gallon	13	16	20
	(liter)	(50)	(60)	(75)
Vent/Air Intake Connections	Ø Inch	6	6	10
	(Ø mm)	(160)	(160)	(160)
Vent Materials		CPVC, PP, Stainless Steel AL29-4C		
Max operating temperature	°F	194	194	194
	(°C)	(90)	(90)	(90)
Max HE allowable temperature	°F	210	210	210
	(°C)	(98.9)	(98.9)	(98.9)
Ambient storage temperature	°F	5 to 158	5 to 158	5 to 158
	(°C)	(-15 to 70)	(-15 to 70)	(-15 to 70)
Ambient functioning temperature	°F	32 to 120	32 to 120	32 to 120
	(°C)	(0 to 49)	(0 to 49)	(0 to 49)
Surface heat exchanger per module	SQFT	27	43	43
	(m ²)	(2.5)	(4)	(4)
Standard Listings & Approvals		CSA, ASME, AHRI		
Electrical Req. 120V/1PH/60Hz		15.1 FLA*	15.1 FLA*	15.1 FLA*
Weight (dry)	lbs	860	992	1124
	(kg)	(390)	(450)	(510)
Dimension WxHxD	Inch	35.4x70.9x31.5	35.4x70.9x31.5	35.4x70.9x31.5
	(mm)	900x1800x800	900x1800x800	900x1800x800

(*) FLA (Full Load Amperage) – maximum current drawn by the boiler if all pumps reach rated horsepower

2.7 Main components

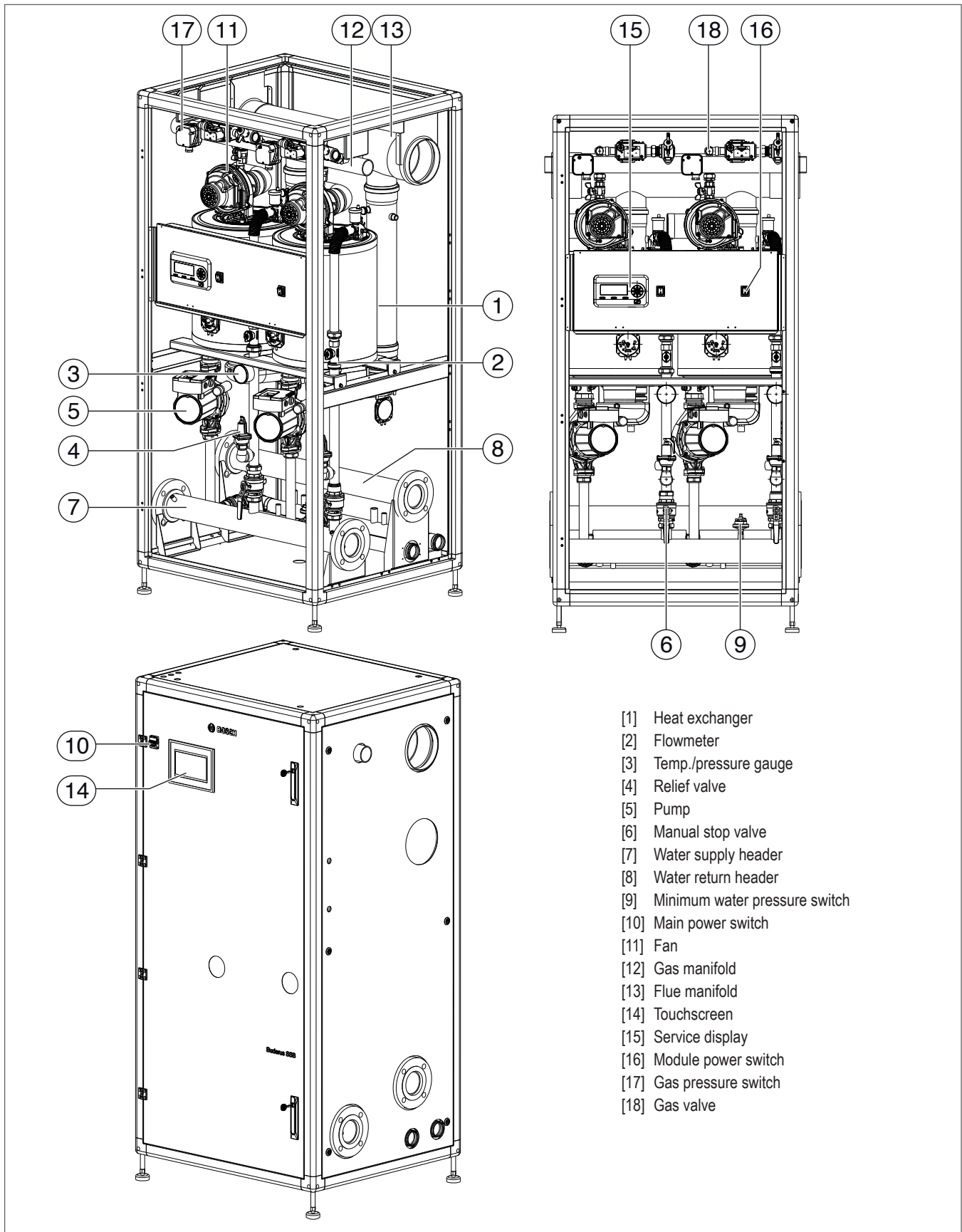


Fig. 5 SSB main components

2.8 Efficiency Curves

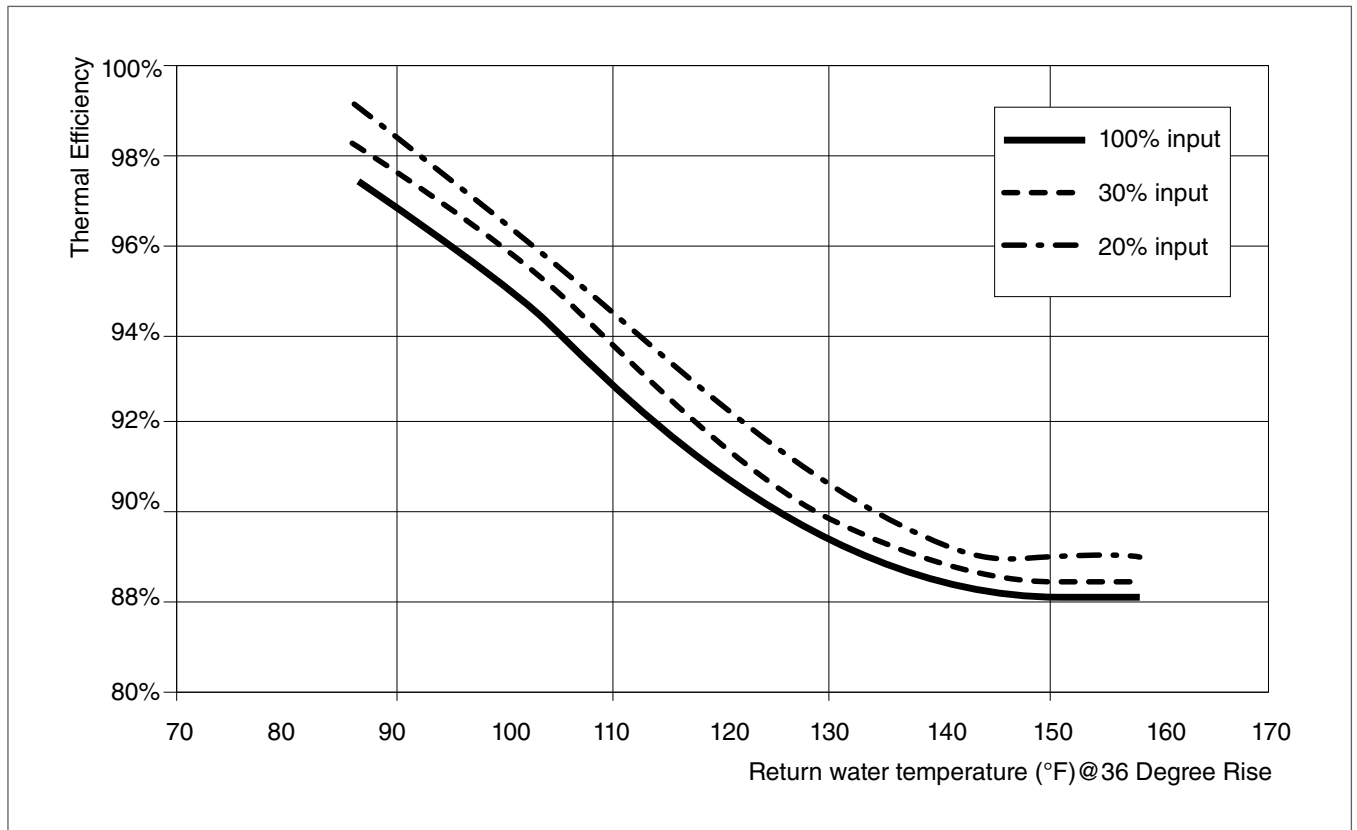


Fig. 6 Efficiency Curves SSB 800 SA, 1000 SA, 1000 TL

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 "Appendix C - 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 Site preparation

Ensure that the site selected for installation of the **SSB 800 SA, 1000 SA** and **1000 TL** Boiler includes:

- Access to AC Input Power at 120 VAC, Phase-Neutral, 60 Hz @ 15 FLA
- Access to Natural Gas line at a recommended pressure of 8 inches W.C. (or higher) for 798,000 BTU/hr energy input for the **SSB 800 SA**, 1,024,000 BTU/hr energy input for the **1000 SA** and **1000 TL**.

4.2.1 Installation clearances


The **SSB** models **800 SA, 1000 SA** and **1000 TL** are packaged in an enclosure having identical size.


The unit must be installed with the prescribed clearances for service as shown in Fig. 7. The minimum clearance dimensions, required by **BOSCH**, are listed below. However, if Local Building Codes require additional clearances, these codes shall supersede **BOSCH**'s requirements. Minimum acceptable clearances required are as follows:

Minimum acceptable clearances required are as follows:

800 SA - 1000 SA - 1000 TL			
	Recommended Service Clearances	Required Service Combustibles	
Side	24	12	inches
Front	40	40	inches
Rear	20	2	inches
Top	12	6	inches

All gas piping, water piping and electrical conduit or cable must be arranged so that they do not interfere with the removal of any panels, or inhibit service or maintenance of the unit.

 **WARNING:** Keep the unit area clear and free from all combustible materials and flammable vapors or liquids.

 **CAUTION:** While packaged in the shipping container, the unit must be moved by pallet jack or forklift from the **SIDE ONLY**.

FOR MASSACHUSETTS ONLY:

For Massachusetts installations: the installation must comply with all requirements specified.

RECOMMENDED SERVICE CLEARANCES

REQUIRED SERVICE COMBUSTIBLES

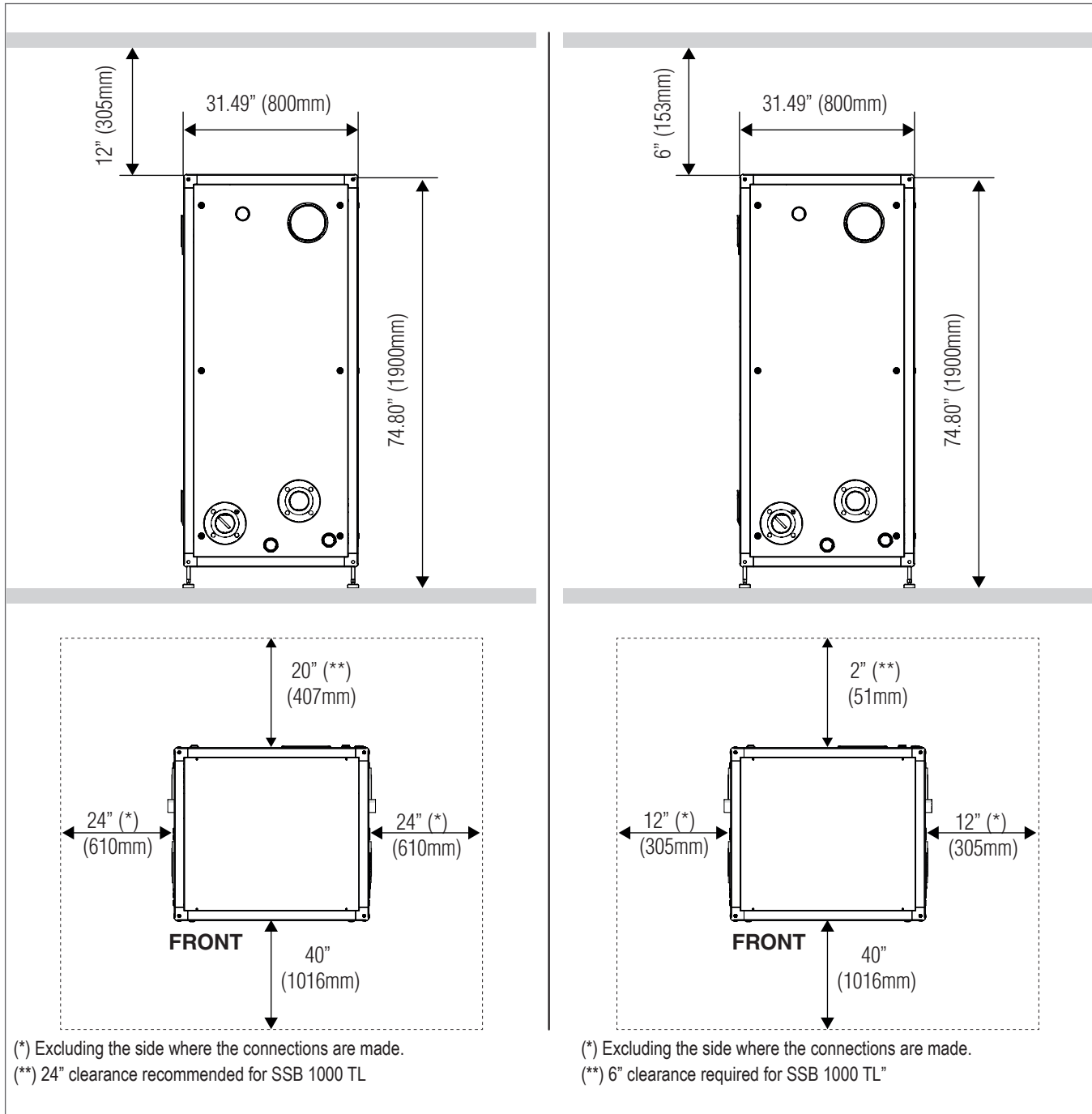


Fig. 7 SSB 800 SA, 1000 SA and 1000 TL Clearance

4.2.2 Setting the Unit

Remove the top and side cardboard panels and the plastic film. Lift the unit off the shipping skid with a forklift and position it on the floor in the desired location.



WARNING: When lifting or moving the boiler: do not attempt to manipulate the boiler using the top corner tripods or any other component of the boiler.



WARNING: When lifting or moving the boiler with a forklift: make sure the forks are longer than the boiler size (width or depth) so that forks stick out as per Fig. 8.

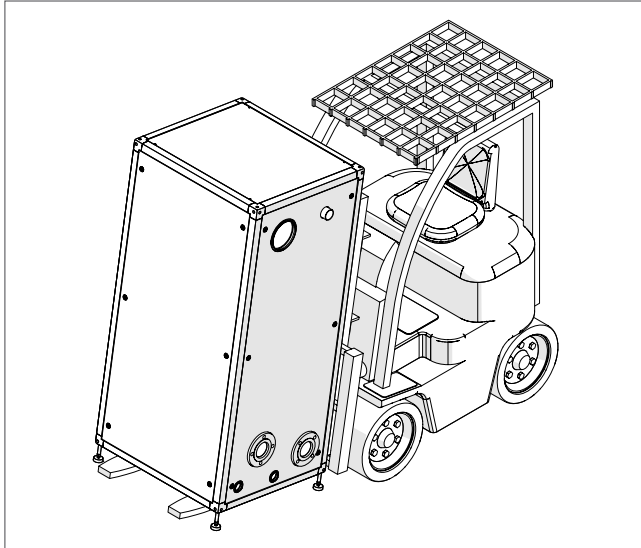


Fig. 8 SSB 800 SA, 1000 SA and 1000 TL Forklift Handling



WARNING: Always keep the boiler in the upright position.

If a crane is required, the boiler must be lifted through bands.



WARNING: When lifting the boiler with crane: use bands, no chains. Bands must comply with federal, state and local rules.



WARNING: When lifting the boiler with crane: the bands must be positioned according to the Fig. 9.

In multiple unit installations, it is important to plan the position of each unit in advance. Sufficient space for piping connections and future service/maintenance requirements must also be taken into consideration. All piping must include ample provisions for expansion.

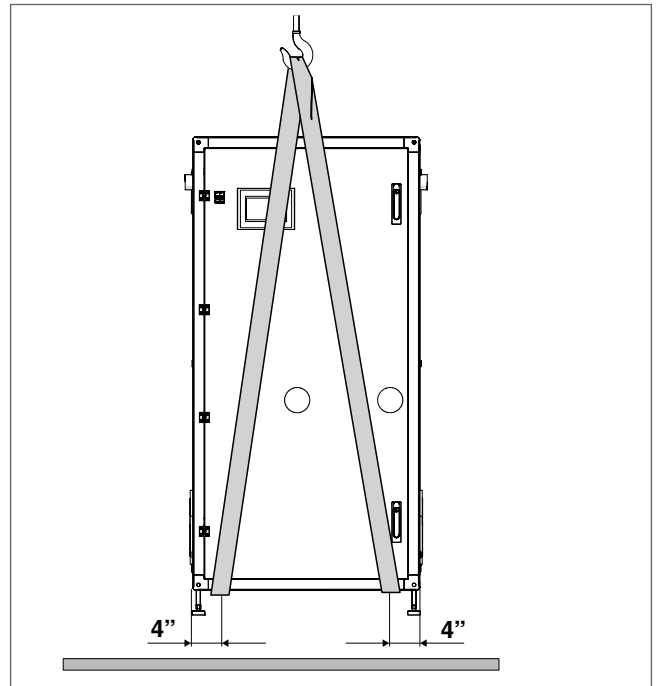


Fig. 9 SSB 800 SA, 1000 SA and 1000 TL Crane Lifting Handling

The unit must be installed on a concrete flat floor, with no gradient in any direction, to ensure proper condensate and water drainage (see Fig. 10).

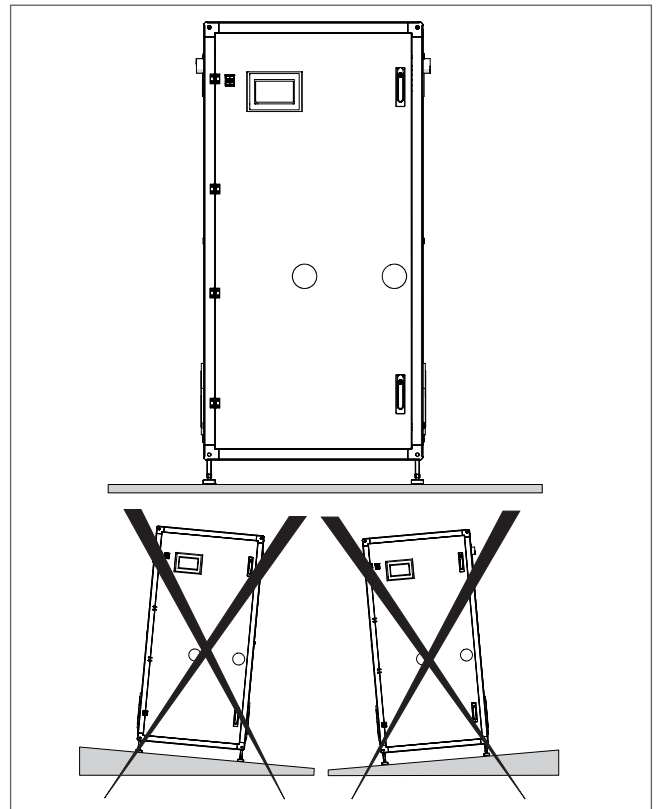


Fig. 10 SSB 800 SA, 1000 SA and 1000 TL Installation

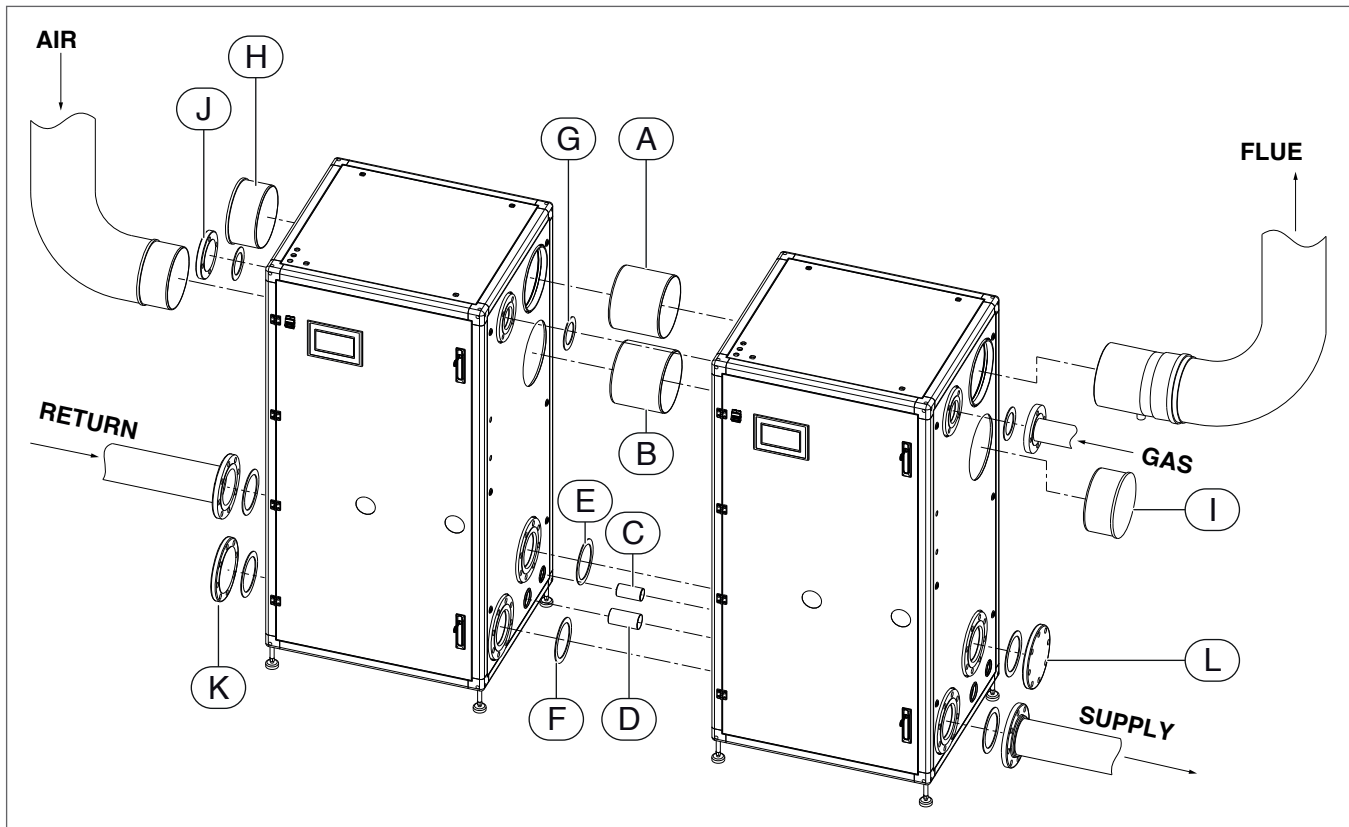


Fig. 11 SSB 1000 TL Cascade Installation

The cascade installation of TL boilers should be carried out according to the following procedure (example: 2 boilers):

- [1] Set the position of one of the two boilers, connecting it to the system supply/return pipe;
- [2] Using a jackpallet, move the second boiler close to the first one, with a gap not less than 4ft;
- [3] Insert the component A (item [9] on Fig. 2) on the venting manifold of the first boiler. Do the same with component B (item [8] on Fig. 2) on the air hole, only in case of sealed combustion installation type;
- [4] Insert the component C (item [6] on Fig. 2) on the condensate manifold of the first boiler. Do the same with component D (item [7] on Fig. 2) on the relief valves drain manifold;
- [5] Still using a jackpallet, move closer the second boiler, aligning it to the components just installed on the first boiler;
- [6] When the gap between the boilers is approximately 4 to 8in., insert two bolts in the lower holes of the 5" supply header, two bolts in the lower holes of the 5" return header and two bolts in the lower holes of the 3" gas manifold;
- [7] Put the seals E, F and G carefully, in vertical position, on top of the bolts;
- [8] Progressively close the gap between the boilers, using the jackpallet, checking the seals stay in proper position;
- [9] Push the second boiler against the first one until the gap is approximately 1in.;
- [10] Insert all remaining bolts and tighten them firmly with the relevant nuts;
- [11] Add all relevant caps and blank flanges on the free sides of the boilers (components H, I, J, K and L on Fig. 11), with their seals;
- [12] Insert the boiler supply temperature sensor (available pre-wired into the electrical box of each boiler) on one of the two wells available on each supply header (select the proper well according to the water flow direction);
- [13] Connect the bus cable (item [12] of Fig. 2) between the CASCADE LINK connections available on each Low voltage terminal strip;
- [14] Complete the installation connecting the water, gas venting, condensate, relief valves, air (in case of sealed combustion) pipes.

4.2.3 Boiler location

- This boiler is suitable for indoor installations.
- To operate properly and safely this boiler requires a continuous supply of air for combustion. Install this boiler in a clean, dry location with adequate air supply.
- Do not locate this boiler in an area where it will be subject to freezing.
- The boiler should be located close to a floor drain in an area where leakage from the appliance or connections will not result in damage to the adjacent area or to lower floors in the structure.
- DO NOT install this appliance in any location where gasoline or flammable vapors are likely to be present.
- DO NOT install this appliance on top of carpet flooring.
- Appliance must be installed on a level floor.
- Maintain required clearances from combustible surfaces.

4.3 Water chemistry guidelines

Excessive water hardness causing a lime buildup in the stainless steel coils or tubes is not a fault of the appliance and is not covered by warranty. Water hardness must fall within the following limits:

Parameters	Units	Value
General feature -		Colorless, no sediment
PH value	PH	Min 6.5; Max 9
Dissolved Oxygen	mg/l	< 0,05
Total iron (Fe)	mg/l	< 0,3
Total copper (Cu)	mg/l	< 0,1
Na ₂ SO ₃	mg/l	< 10
N ₂ H ₄	mg/l	< 3
PO ₄	mg/l	< 15
CaCO ₃	ppm	Min 50 ; Max 150
Trisodium Phosphate	ppm	absent
Chlorine	ppm	< 100
Pressure	PSI	Min 7.25; Max 80
Glycol	%	Max 40% (only propylene glycol)

- Before and during assembly, the system must be kept free of impurities, construction dust, sand, copper dust, grease, carbon deposits as well as welding flux residue.
- Before connecting the boiler to the heating system, flush the heating system to remove sediment, flux, dirt, and other foreign matter.
- 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.
- 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.
- Avoid an automatic water fill system.
- 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).
- Consult a local water treatment specialist for recommendations if any of the above table 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.
- Excessive flow can cause erosion damage to the heat exchanger.



CAUTION: For freeze protection use only propylene glycol, with scale inhibitors, with a maximum volume [concentration] of 40% of glycol. Frost protection and inhibitor level has to be checked annually during the regular scheduled maintenance of the condensing boiler.



CAUTION: The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.



CAUTION: The boiler piping system of a hot water boiler connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle. A minimum water pressure is required for optimum performance. Minimum water pressure required: 7.25 psi (0.5 bar).

4.4 Hydraulic connection

The SSB Boiler utilizes 3" flanges for models SSB 800 SA/ 1000 SA and 5" flanges for model SSB 1000 TL for the water system supply and return piping connections. The physical location of the supply and return piping connections is on the side of the unit as shown in Fig. 12 - Fig. 13.

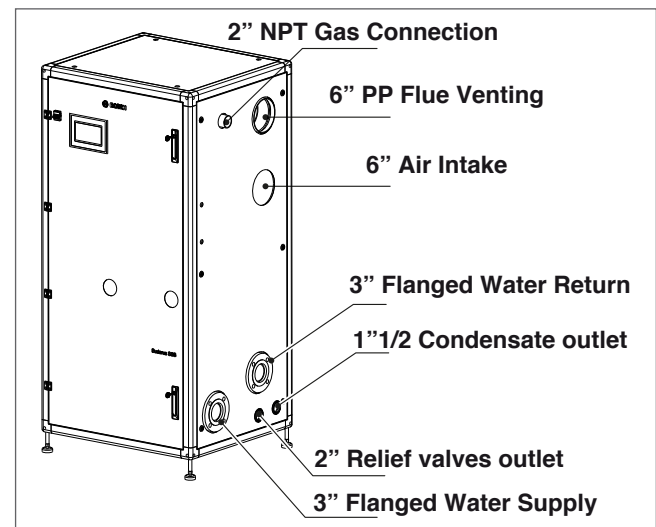


Fig. 12 SSB 800 SA and 1000 SA Connections

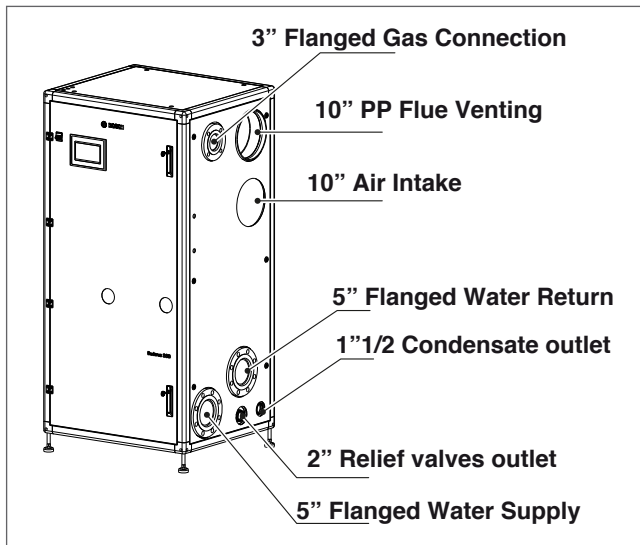


Fig. 13 SSB 1000 TL Connections



CAUTION: 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.



CAUTION: 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.



CAUTION: 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.



CAUTION: 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 cutoff

A low water cut off (LWCO) is installed on each module of the boiler.

To check the functionality of LWCO go to the Module Test screen on the Touchscreen (see section Operation) and then click on LWCO test. On the screen will appear the error "Low Water Cutoff Error". At this point press the reset button. The error 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 module 1 pump power
- Turn power on to boiler
- Press "Test mode" button on module 1 screen
- Select "high power"

Module 1 will subsequently shut down as a result of no flow error.

Repeat the same process for each module of the boiler / cascade.

4.4.3 High limit safety switch

A high limit safety switch is installed on each module of the boiler.

To test the High limit sensor functionality, there are two options available:

A Electronic test (default):

to simulate a high limit lockout go to the Module Test screen on the Touchscreen (see "6.3.8 Module Test Screen" pag. 37) and then click on High limit test button. The system generates a high limit lockout signal that shut the module down (and makes the reset button available on the screen). Pressing the reset button the module restarts;

B Physical test:

to trip the high limit sensor by increasing the water temperature up to 208°F, go to the Service display and enable the physical high limit test

Settings->Boiler Settings->Boiler Parameters->(183) High Limit Test

Then move to the Module Test screen on the Touchscreen (see "6.3.8 Module Test Screen" pag. 37) and click on High limit test button.

Follow the step by step procedure described below:

- Progressively close the return manual stop valve to reduce the flow into the module under test;
- Check the module supply temperature on the screen;
- Reduce the flow until the control will display "Max. Thermostat Lock" error and the module stops;
- At this point press the reset button to restart the module.



CAUTION: The Physical test is not recommended: forcing the boiler to a low water flow condition may expose the heat exchanger to potential overheating. The Manufacturer declines any responsibility on damages derived from this kind of test.

4.4.4 Pressure relief valve installation

ASME rated Pressure Relief Valves are factory installed in each module of SSB boilers. The pressure rating for the relief valves is 75 PSI. The relief valves are installed on each hot water supply pipe of the modules as shown in Fig.8. The relief valves drain pipes are connected to the manifold running at the bottom of the boiler. The manifold must be routed to a nearby floor drain.

Relief valves should be manually operated at least once a year.

If a relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system.

Contact the water supplier or local plumbing inspector on how to correct this situation.

Do not plug the relief valve.

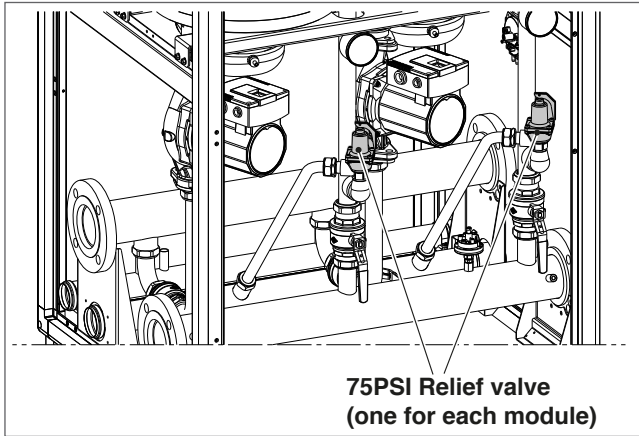


Fig. 14 Pressure Relief Valve Location

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

SSB800-1000 SA and 1000 TL are fitted with a circulator pump on each module. The graph in the following figure shows the head range of the pump depending on the flow rate compared to the relevant 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.

SSB800 SA

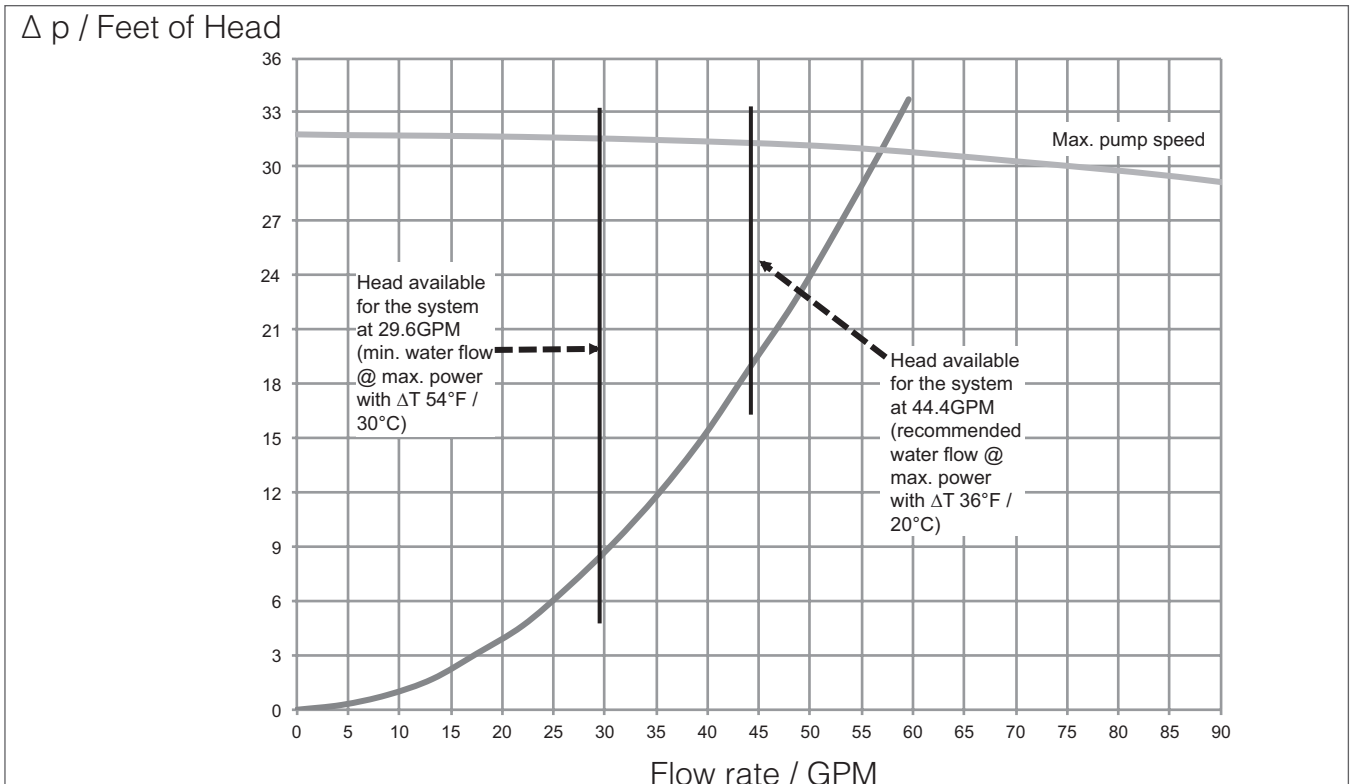


Fig. 15 SSB800 SA Pressure drop

SSB1000 SA

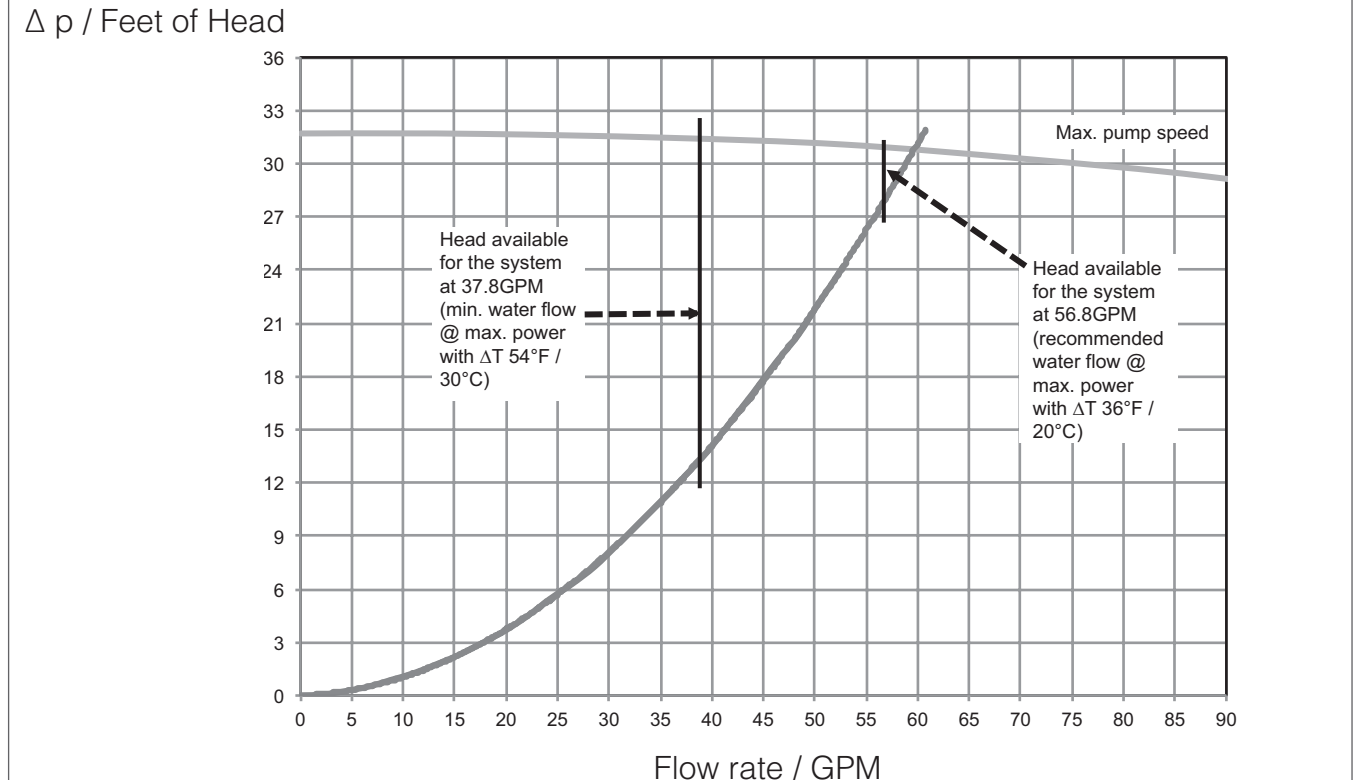


Fig. 16 SSB1000 SA Pressure drop

SSB/1000 TL

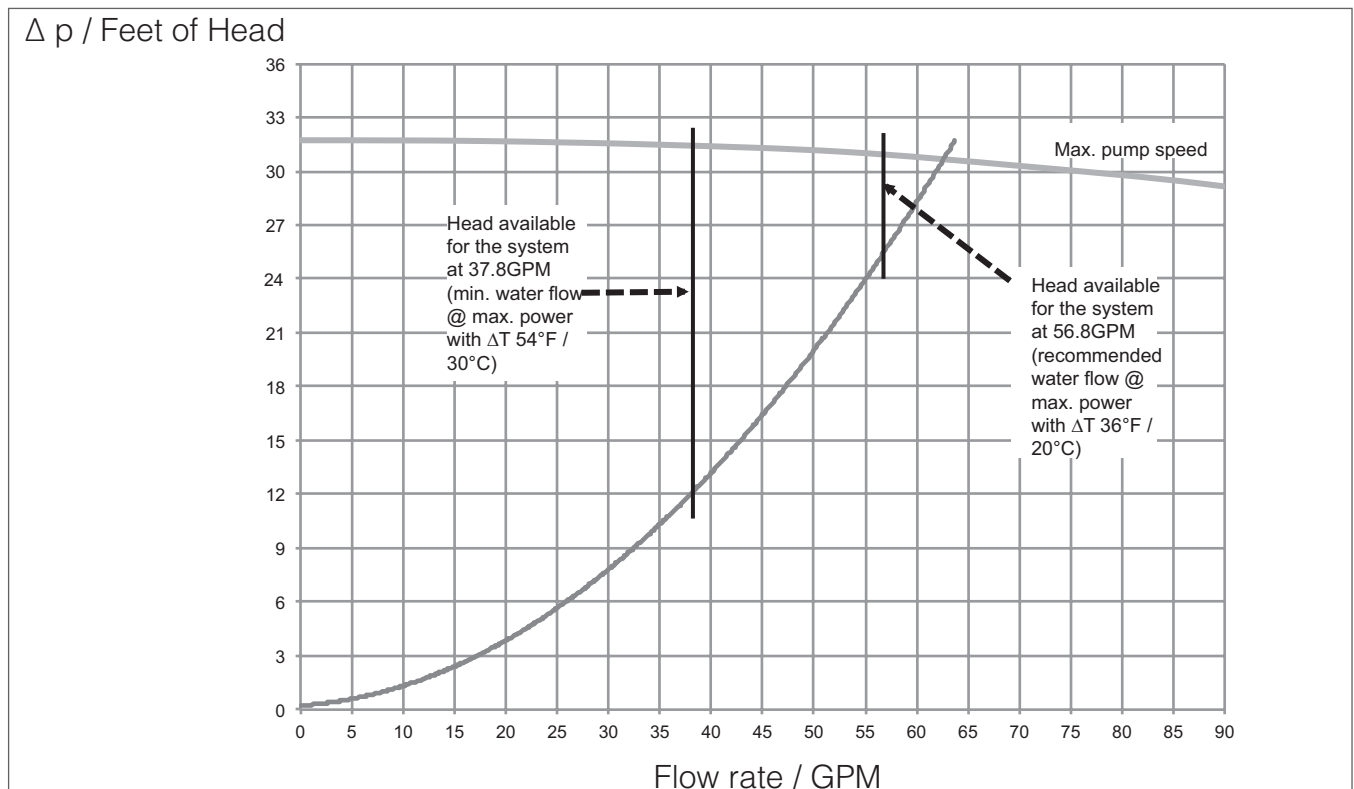


Fig. 17 SSB1000 TL Pressure drop

4.4.7 Condensate drain and piping

The SSB boiler is designed to condense water vapor from the flue products. Each module of the boiler is equipped with a condensate drain system (see Fig. 18), connected to the condensate horizontal manifold.

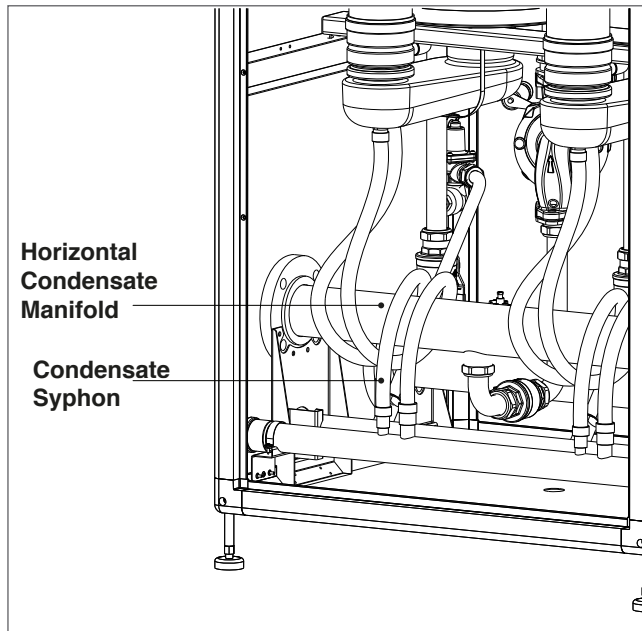


Fig. 18 Condensate Drain System



WARNING: At the Start-up and after prolonged shutdown of the boiler, the syphon must be filled with water prior to restart it, otherwise combustion gases will enter the room with a risk of an excessive level of carbon monoxide.

The procedure for filling the traps and syphon with water is shown on the Fig. 19:

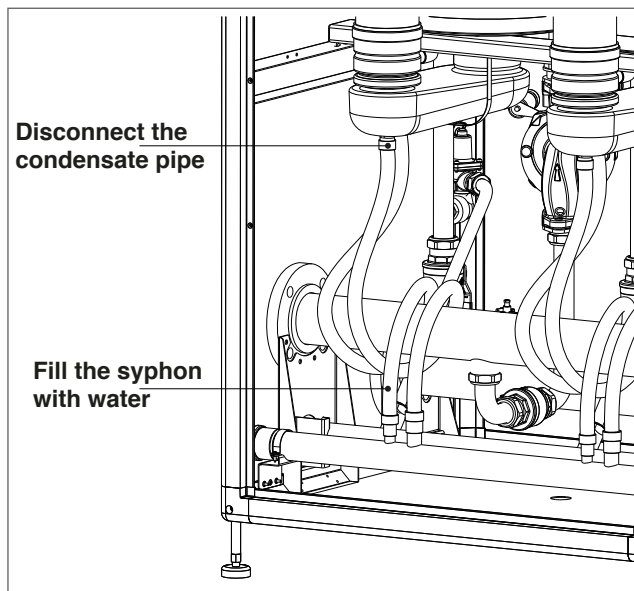


Fig. 19 Water Filling of Condensate System

- The installation must have provisions for suitable drainage or collection of the condensate out of the boiler traps.
- The condensate water shall be discharged at atmospheric pressure, by dripping into a suitable drain, and shall be neutralized prior to draining per local codes.
- The condensate drain tube must pitch away from the boiler (1/4" slope per foot) and must never reduce its diameter downstream.
- 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. The condensate pipe must be installed in such a way so as to avoid the freezing of the liquid.



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

If a floor drain is not available, a condensate pump can be used to remove the condensate to drain. The maximum condensate flow rate is 6.2 GPH for **SSB 800 SA** and 7.9 GPH for **SSB 1000 SA / 1000 TL**. The drain line must be removable for routine maintenance.



CAUTION: Use PVC, CPVC, stainless steel, aluminum or polypropylene for condensate drain piping (Fig. 20). DO NOT use carbon or copper components.

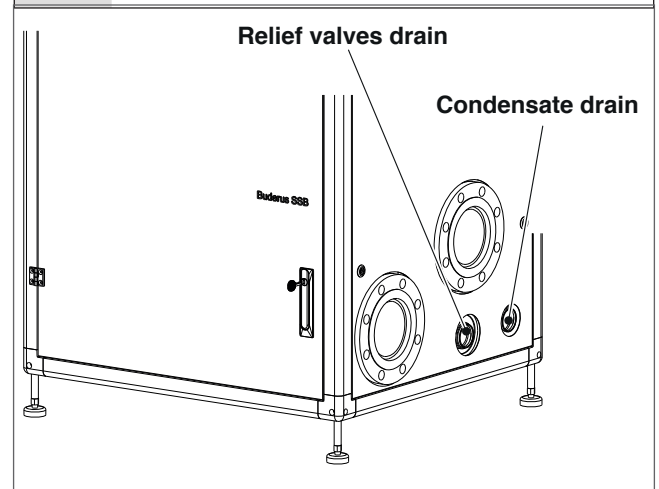


Fig. 20 Condensate Drain and Relief Valves Manifold Locations

4.4.8 Electrical Connection

The voltage configuration of **SSB 800 SA**, **1000 SA** and **1000 TL** is as follows:

- 120VAC, 1-Phase, 60 Hz

Each boiler must be connected to a dedicated electrical circuit.

NO OTHER DEVICES SHOULD BE ON THE SAME ELECTRICAL CIRCUIT AS THE BOILER.

4.4.9 Power supply cable connection

The power supply cable can be inserted into the boiler using one of the three holes on the top panel (or one of the three holes on the back panel), as shown on fig. 18.

Each boiler is equipped with a main 2-pole service switch accessible on the front door, to quickly and safely disconnect electrical service

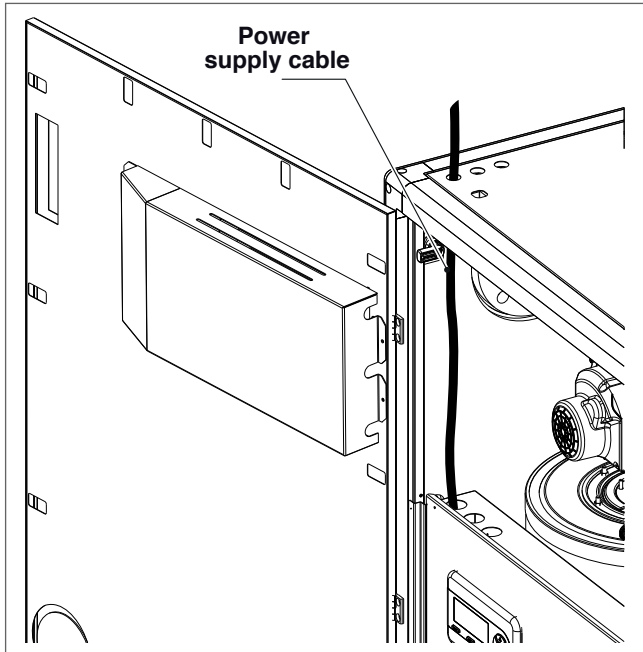


Fig. 21 Power supply cable connection

To access the electrical box, open the front door (see Fig. 22).

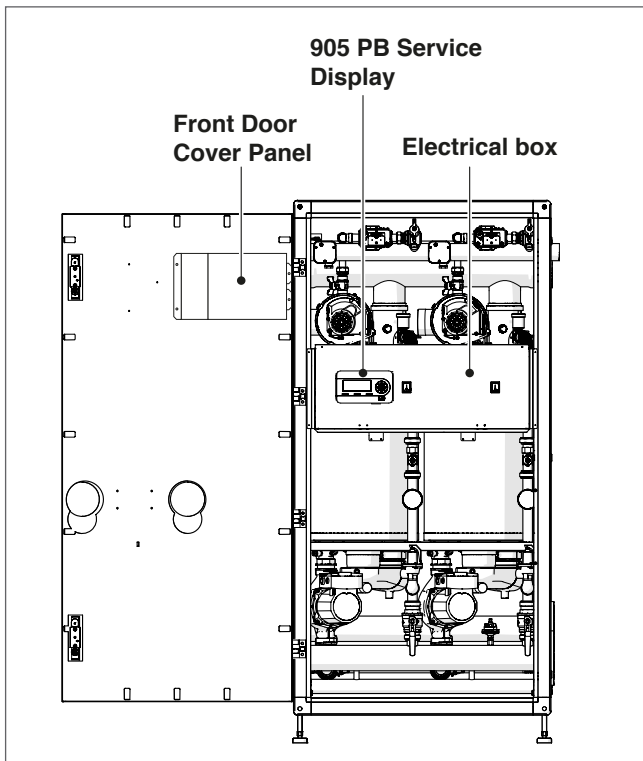


Fig. 22 Electrical Internal Layout

Loosen the screws of the cover and remove panel to access the internal connections shown in Fig. 23.

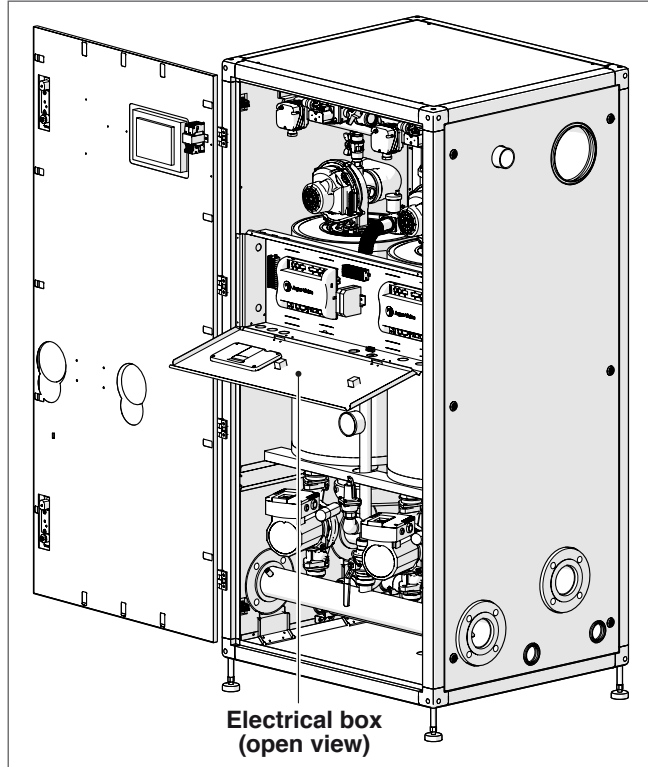


Fig. 23 Electrical box

The majority of the components are installed in the electrical box. Some of them are mounted on a DIN rail.

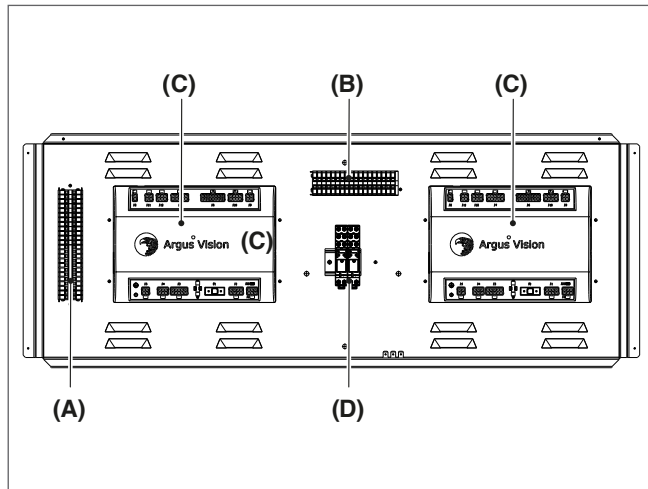


Fig. 24 Electrical Box Layout

- (A) = High Voltage Terminal Strip
- (B) = Low Voltage Terminal Strip
- (C) = 905 MN Controllers
- (D) = Pumps relays

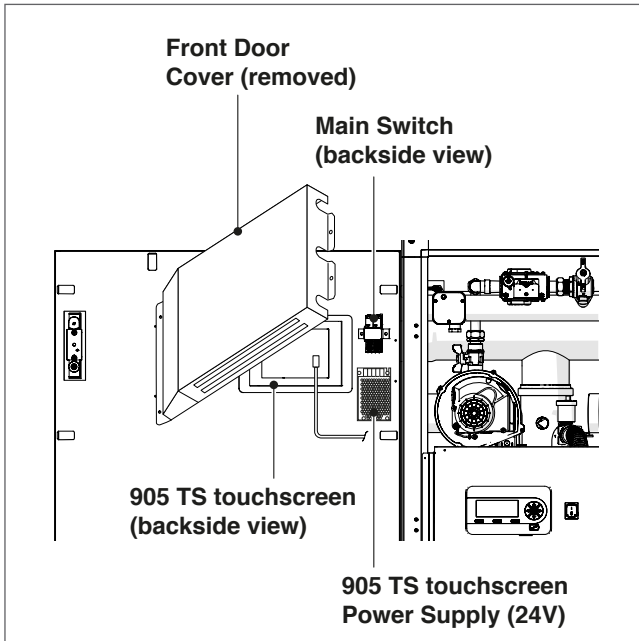


Fig. 25 Front Door: Backside layout

NOTE: All electrical conduit and hardware must be installed so that it does not interfere with the removal of any unit covers, inhibit service/maintenance, or prevent access between the unit and walls or another unit.

4.5 Access to the electrical terminal strips

Each unit is fully wired from the factory with an internal operating control system. No field control wiring is required for normal operation. However, the control system used with all **SSB** boilers does allow for some additional control and monitoring features. Wiring connections for these features are made on the Input / Output (I/O) terminal strips located behind the removable cover of the electrical box, as shown in Fig. 26.

NOTE: Any electrical load connected to the terminal strip (external pumps, air damper, alarm) must be powered through a relay, not included in the boiler, to be provided and wired by the installer.

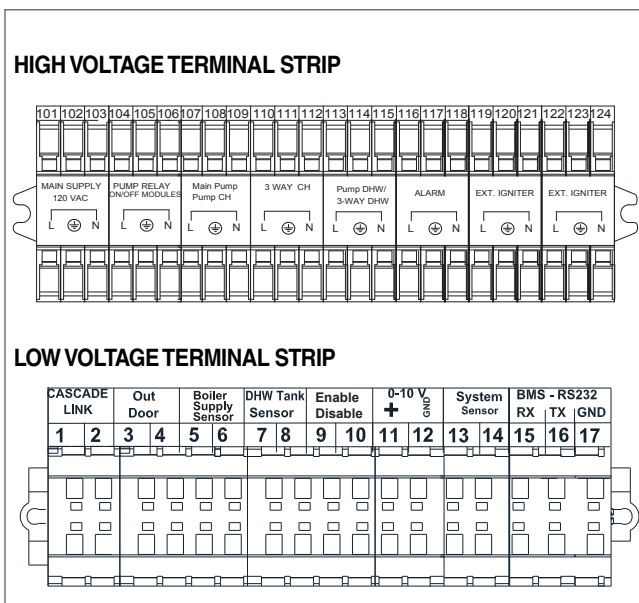


Fig. 26 I/O Terminal Strips

4.5.1 Enable/Disable(Room Thermostat Connection)

The Room Thermostat (Enable/Disable) terminals (dry contacts) come pre-wired closed (jumped) from the factory. For connecting a room thermostat, the jumper must be removed and the thermostat wires must be connected to terminals 9 and 10, as shown in Fig. 26.

4.5.2 Outdoor Temperature Sensor

If outdoor temperature sensor is to be used, the outdoor probe needs to be connected to terminals 3 and 4 as shown in Fig. 26. The outdoor 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 meters), if the cable length exceeds 32' (10 meters) a shielded cable is required and shall be connected to chassis ground.

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

4.5.3 Electrical wiring diagram

See "Appendix A - Wiring diagram"

4.6 Gas supply piping

SSB 800 SA and **1000 SA** boilers contain a 2 inch NPT gas inlet connection on the upper side of the unit as shown in Fig. 12.

SSB 1000 TL is equipped with 3 inch flanged connection, still on the upper side of the unit Fig. 13.



WARNING: The boiler and its gas connection must be leak tested before placing the boiler in operation. Never use matches, candles, flames or other sources of ignition to check for gas leaks.



CAUTION: Many of the soaps used for gas pipe leak testing are corrosive to metals. Therefore, piping must be rinsed thoroughly with clean water after leak checks have been completed.

NOTE: All gas piping must be arranged so that it does not interfere with removal of any covers, inhibit service/maintenance, or restrict access between the unit and walls, or another unit.

NOTE: The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.).

- Prior to installation, all pipes should be de-burred and internally cleared of any scale, metal chips or other foreign particles. Do Not install any flexible connectors or unapproved gas fittings. Piping must be supported from the floor, ceiling or walls only and must not be supported by the unit.
- A suitable piping compound, approved for use with natural gas, should be used. Any excess must be wiped off to prevent clogging of components.
- To avoid unit damage when pressure testing gas piping, isolate the unit from the gas supply piping. At no time should the gas pressure applied to the unit exceed 20" W.C. Leak test all external piping thoroughly using a soap and water solution or suitable equivalent. The gas piping used must meet all applicable codes.
- A sediment trap / drip leg must be installed on the gas supply piping.
- Installation of a union at the appliance gas line connection is required for ease of service.

4.6.1 Gas Supply Specifications

The gas supply input specifications to the unit for Natural Gas are as follows:

- The maximum static pressure to the unit must not exceed 20" W.C.
- The gas supply piping and pressure to the unit must be of sufficient capacity to provide 788 cfm for **SSB 800 SAA** and 1010 cfm for **SSB 1000 SA / 1000 TL**, while maintaining the recommended gas pressure at 8" W.C. (or higher) for burners operating at maximum capacity.

4.6.2 Manual Gas Shutoff Valve

A manual shut-off valve must be installed in the gas supply line upstream of the boiler. Maximum allowable gas pressure to the boiler is 20" W.C.

Should overheating occur or the gas supply fails to shut off, do not turn off or disconnect the electrical supply to the pump. Instead, shut off the gas supply at a location external to the appliance.

4.6.3 External Gas Supply Regulator

An external gas pressure regulator is required on the gas inlet piping under most conditions. Regulators must conform to the following specifications:

- The external natural gas regulator must be capable of regulating
 - a) 100,000 - 798,000 BTU/HR for **SSB 800 SA**
 - b) 100,000 - 1,024,000 BTU/HR for **SSB 1000 SA / 1000 TL** of natural gas while maintaining a recommended gas pressure of 8.0" W.C. (or higher) to the boiler.
- A regulator **MUST** be used when gas supply pressure will exceed 20" W.C.

The following are **BOSCH's** recommendations for installation of gas pressure regulator, unless superseded by state and local codes and the regulator manufacturer's specifications:

- Horizontal installation of gas pressure regulators is recommended unless stated otherwise by the regulator manufacturer. Consult the manufacturer for additional recommendations and installation options.
- For all **SSB** boilers, when installed horizontally the required distance between the gas pressure regulator and the nearest pipe fitting, elbow or valve is 10 feet.
- When pipe size reduction is required, use only bell reducers.

MASSACHUSETTS INSTALLATIONS ONLY

For Massachusetts installations, a mandatory external gas supply regulator must be installed. The gas supply regulator must be properly vented to outdoors. Consult the local gas utility for detailed requirements concerning venting of the supply gas regulator.

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

NOTE: It is the responsibility of the customer to source and purchase the appropriate gas regulator as described above.

4.6.4 Gas Type 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, on demand.

The kit (identified exteriorly by part number) consists of:

- two (2) orifices (one for each gas valve), marked to indicate their size;
- one (1) conversion label including the following:
 - boiler model number;
 - the gas to which the boiler has been converted;
 - minimum and maximum inlet gas pressures of the converted boiler;
 - manifold pressure;
 - input rating;
 - identification of the conversion kit by part number.
- one (1) step by step instruction document.



WARNING: The conversion kit shall be installed by a qualified service agency 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, a fire, an explosion or production of carbon monoxide may result causing property damage, personal injury or loss of life. The qualified service agency is responsible for the proper installation of the kit. The installation is not proper and complete until the operation of the converted appliance is checked as specified in manufacturer's instructions supplied with the kit.

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.

SWITCHING FROM NATURAL GAS TO LP

- Close the gas shutoff valve
- 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.

- Open the front panels
- Unscrew the swivel joint indicated in Fig. 27 to separate the valve from the connection pipe with the fan

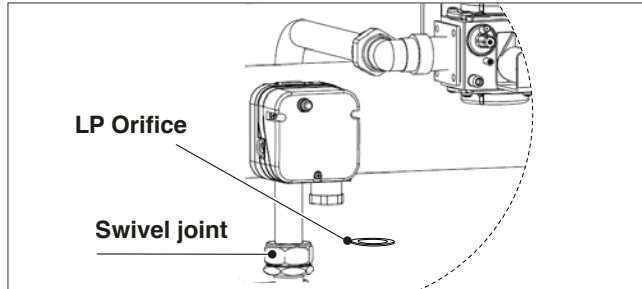


Fig. 27 Natural Gas to LP Gas Conversion

- Separating the two components, the hole where the gas passes with its gasket can be accessed
Place the provided metal orifice (Fig. 27) below the existing gasket.

Boiler Model	N° on orifice
SSB 800 SA	10,5
SSB 1000 SA	9,5
SSB 1000 TL	9,5

- Tighten the swivel joint and leak test the converted boiler prior to placing into operation.



WARNING: NEVER USE MATCHES, CANDLES, FLAMES OR OTHER SOURCES OF IGNITION TO CHECK FOR GAS LEAKS. Use very mild soap and rinse joints and piping thoroughly after leak checks have been completed.

- Switch the main power supply to ON
- Press Menu button on Service display, select Settings, then Appliance Configuration:
- Scroll to (98) Appliance Setting and modify the value according to the table below;

Model	Gas type	PARAMETER #98 SETTING
SSB 800 SA	NG	13
SSB 800 SA	LP	14
SSB 1000 SA / 1000 TL	NG	15
SSB 1000 SA / 1000 TL	LP	16

- Scroll down to Configuration Confirmed and change to Yes;
- Wait for Updating Appliance process completion, then move back to the Home screen;
- Wait 20secs (at least) for data transfer to Main controller.
- Reopen the gas shut-off valve
- Adjust the CO₂ parameter as explained in next chapter
- Affix the gas type label from the gas conversion kit to the appliance, as close as possible to existing rating label.

4.6.5 Adjusting and setting CO₂ limits

- Insert a combustion analyzer probe into the test port shown in Fig. 28
- Go to the Touchscreen and access the Module screen (as described on “6.3.4 Module Screen” pag. 36) relevant to the module under analysis;
- Press “MODULE TEST” button;
- Press “HIGH POWER” button.

Wait 2 or 3 minutes to reach steady state conditions and record the CO₂ value.

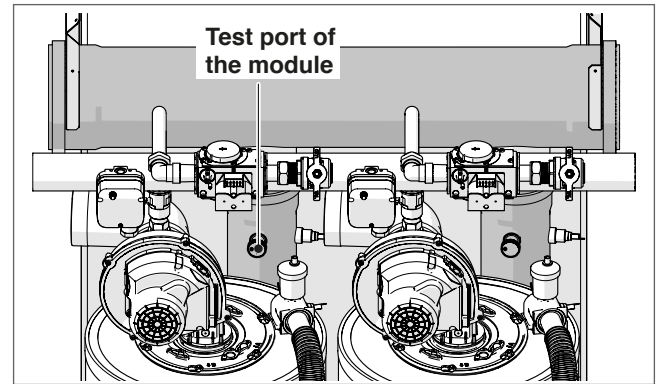


Fig. 28 Test Port for Combustion Analysis (available on each module)

To adjust the CO₂ value at the maximum power turn the screw “A” (rotate counter-clockwise to increase CO₂) shown in Fig. 28, allen type wrench is necessary for this adjustment.

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).

Press “LOW POWER”: the fan will run at the minimum speed.

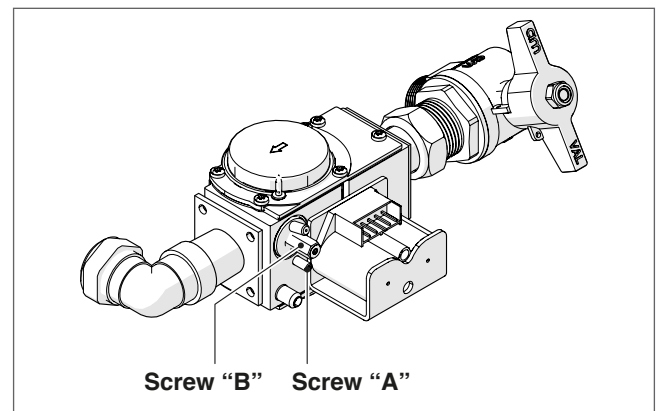


Fig. 29 CO₂ Adjustment

To adjust the CO₂ value at the minimum power turn the screw “B” (rotate clockwise to increase CO₂) shown in Fig. 29.

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).

Press “Reset” and the boiler returns to the “stand by” mode.

Gas Type	SSB Combustion Values	
	Max. Fire CO ₂ %	Min. Fire CO ₂ %
Natural Gas	8.8 - 9.2	8.8 - 9.2
LP Gas	10.3 - 10.7	10.3 - 10.7

4.7 Venting and air piping system

SSB boilers must be vented and supplied with combustion and ventilation air as described in this section.

Installation must comply with local requirements and with the National Fuel Gas Code ANSI Z223.1. **SSB** boilers vent and air piping can be installed through the roof or through a sidewall.

Any of the vent/air piping methods covered in this manual can be used. Do not attempt to install the boilers using any other means.

Suitable, UL approved, positive pressure, watertight vent materials **MUST** be used for safety and UL certification.

SSB 800 SA, 1000 SA and **1000 TL** boilers can use the following material for venting:

Approved Vent pipes

Material	Item	Standard [USA]	Standard [CANADA]	Max. Flue Temp. (°F)	Approved Manufacturers
ABS	Combustion air	ANSI/ASTM D1527			
PVC Schedule 40, 80	Combustion air	ANSI/ASTM D1785			
Single wall galvanized steel	Combustion air	26 gauge			
CPVC Schedule 40, 80	Flue gas or combustion air	ANSI/ASTM F441		194	
Polypropylene PP	Flue gas or combustion air	ANSI Cat IV Approved Polypropylene	BH Gas venting systems, ULC S636(1), Class IIB – CPVC, Class IIC - Polypropylene	230	Centrotherm Eco Systems (InnoFlue SW - 3+mm thick rigid polypropylene)
PP-Flex	Flue gas or combustion air	ANSI Cat IV Approved Polypropylene		230	
AL29-4C stainless steel	Flue gas or combustion air	UL 1738		300+, limited only by rating of seals	
PVC	pipe cement/ primer	ANSI/ASTM D2564		149	
CPVC	pipe cement/ primer	ANSI/ASTM F493		194	

(1) 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 installation in Canada, field supplied plastic vent piping must comply with CAN/CSA B149.1 (latest edition) and be certified by the local jurisdiction.






List of adapters provided with the boiler for connection to CPVC or stainless steel venting systems:

Model	Description	Manufacturer
SSB800/1000 SA	6" PP to CPVC flue adapter	Centrotherm

Roof/Wall terminal	Material	Manufacturer	Part Number
6" Pitched roof flashing	Stainless steel	Centrotherm Innoflue	IAPRF06
10" Pitched roof flashing	Stainless steel	Centrotherm Innoflue	IAPRF10
6" Flat roof flashing	Stainless steel	Centrotherm Innoflue	IAFRF06
10" Pitched roof flashing	Stainless steel	Centrotherm Innoflue	IAFRF10
6" Chimney cover SS with PPs gray end pipe	Stainless steel/ PPs	Centrotherm Innoflue	ISCM06
10" Chimney cover SS with PPs gray end pipe	Stainless steel/ PPs	Centrotherm Innoflue	ISCM10
6" End pipe PPs gray	PPs	Centrotherm Innoflue	ISEP0620 ISEP0639
10" End pipe PPs gray	PPs	Centrotherm Innoflue	ISEP106
6" Termination tee	Black PP	Centrotherm Innoflue	ISTT0620
10" Termination tee	Black PP	Centrotherm Innoflue	ISTT1020
6" PPs to PVC Termination kit	PPs	Centrotherm Innoflue	ISLTK06
6" Bird screen	PPs	Centrotherm Innoflue	IASPP06
10" Bird screen	Stainless steel	Centrotherm Innoflue	IASSS10

For specific venting components (terminals, fittings), contact the respective vent manufacturer.

SSB boilers are equipped with a flue/condensate pressure switch on each module, able to switch off the burner in case of vent or condensate blockage.

- 
WARNING: Do not attempt to restart the boiler in case of vent or condensate blockage, contact a qualified contractor. Failure to comply with this WARNING could result in the accumulation of carbon monoxide gas which can cause severe personal injury or death.
- 
DANGER: It is extremely important to follow these venting instructions carefully. Failure to do so will cause severe personal injury, death or substantial property damage.
- 
DANGER: Use of cellular core PVC (ASTM F891), cellular core CPVC or Radel® (polyphenosulfone) in venting systems is prohibited.
- 
DANGER: Covering non-metallic vent pipe and fittings with thermal insulation is prohibited. Failure to do so will cause severe personal injury, death or substantial property damage.
- 
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.

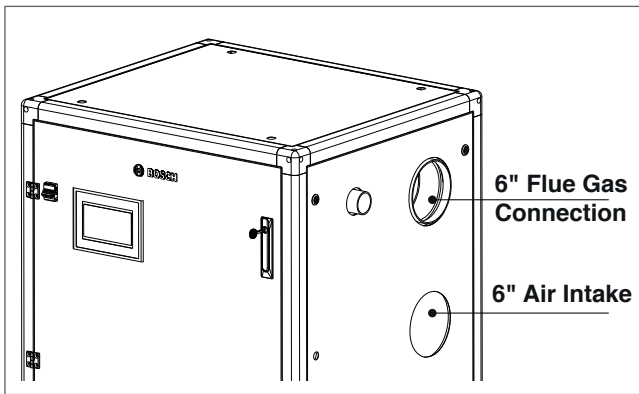


Fig. 30 SSB 800 SA, 1000 SA Combustion Air and Flue Gas Connections

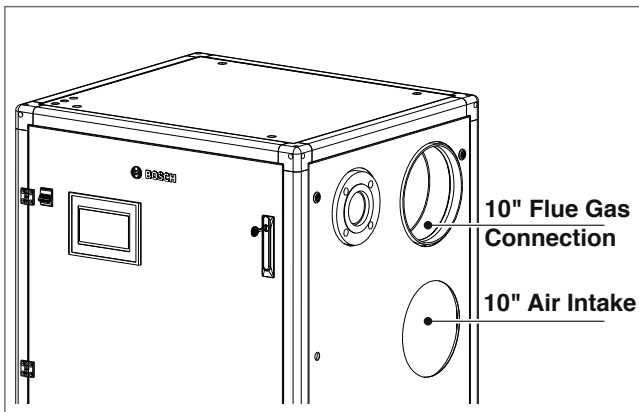


Fig. 31 SSB 1000 TL Combustion Air and Flue Gas Connections



DANGER: The condensate traps must be filled with water or combustion gases will enter the room with a risk of an excessive level of carbon monoxide.

- 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 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.
- 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.
- At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

- [1] Seal any unused openings in the common venting system.
- [2] Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- [3] Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- [4] Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
- [5] Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
- [6] After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous condition of use.
- [7] Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Chapter 13 of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1.

VENTING CONFIGURATIONS: The following figures show the acceptable piping installation for venting and combustion air for both, Stand Alone and Cascade configurations.

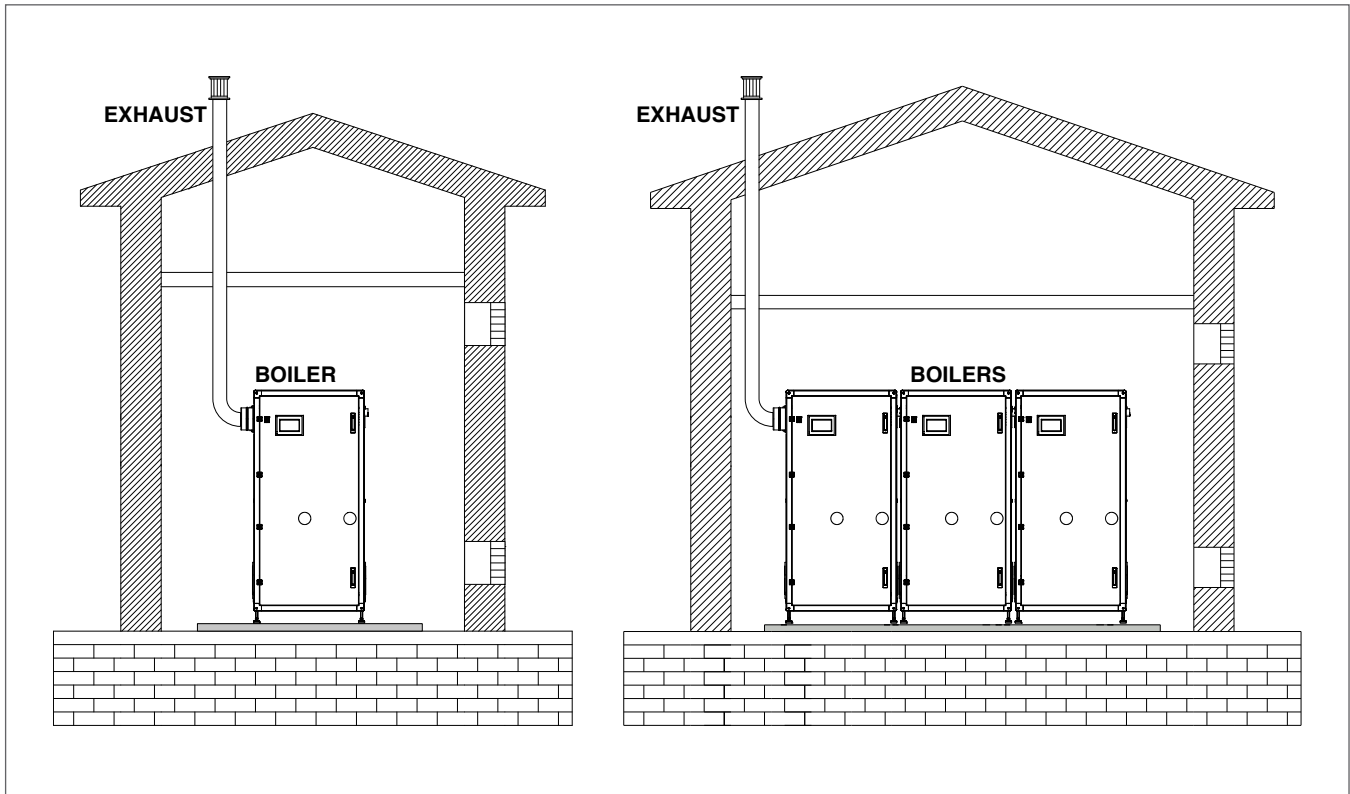


Fig. 32 All Combustion Air from Adjacent Indoor Spaces through indoor Combustion Air Openings

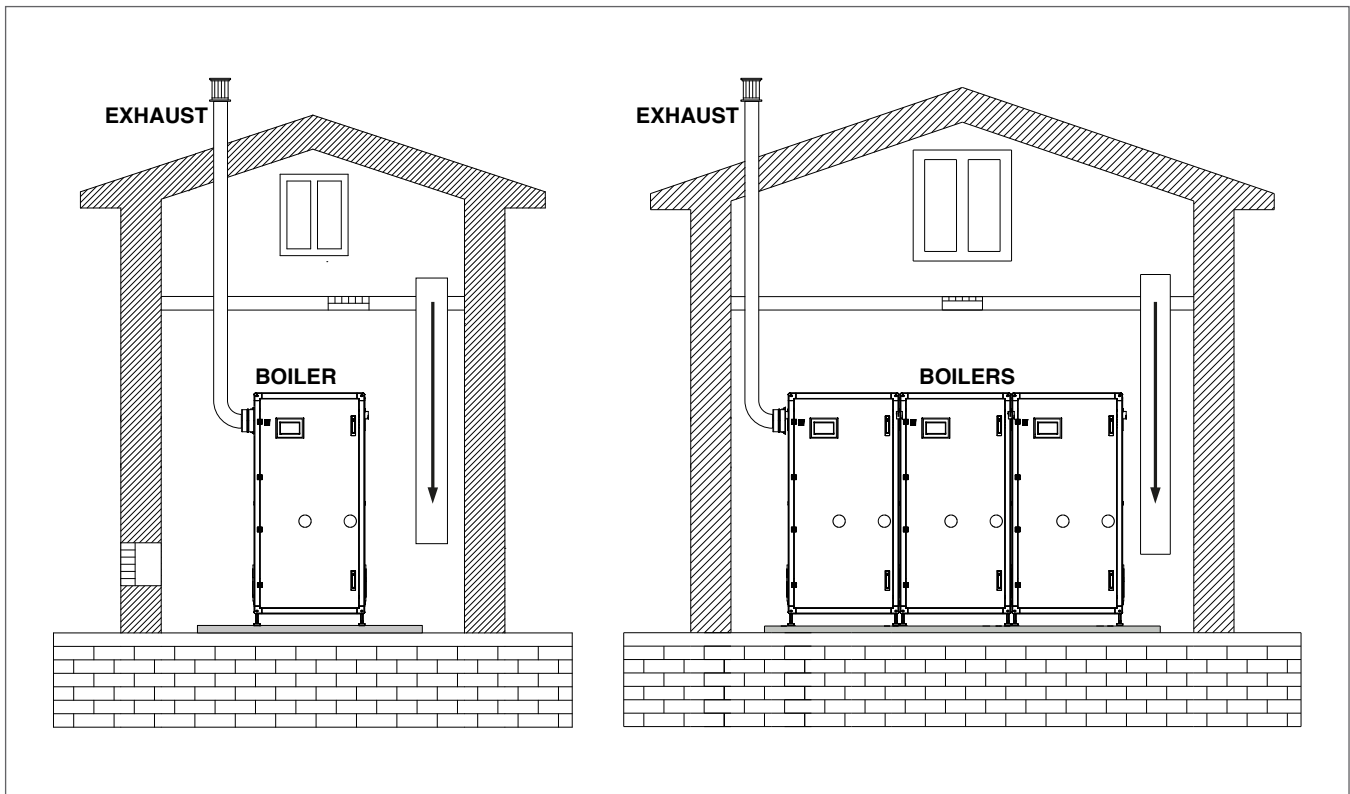


Fig. 33 All Combustion Air from Outdoors - Through Ventilated Attic

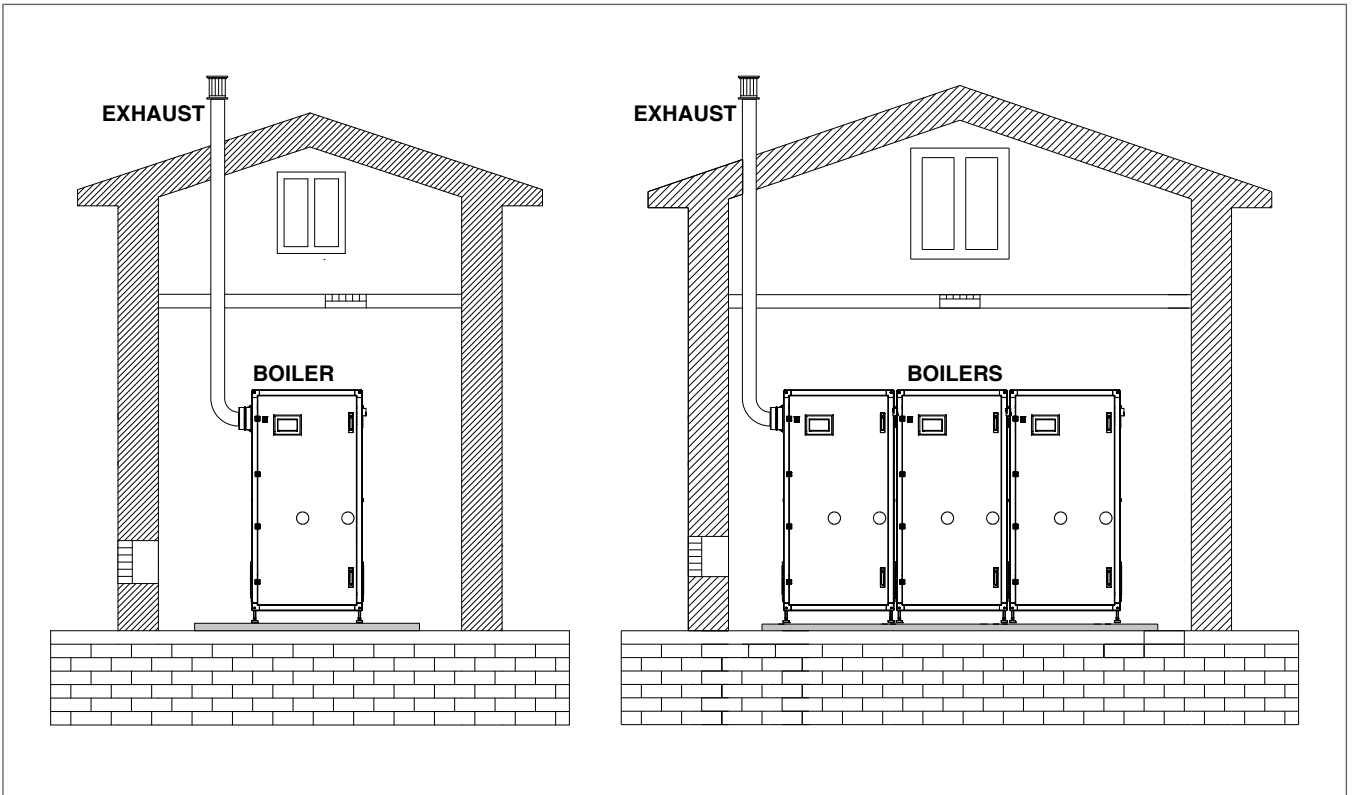


Fig. 34 All Combustion Air From Outdoors - Inlet Air From Ventilated Crawl Space and Outlet Air to Ventilated Attic

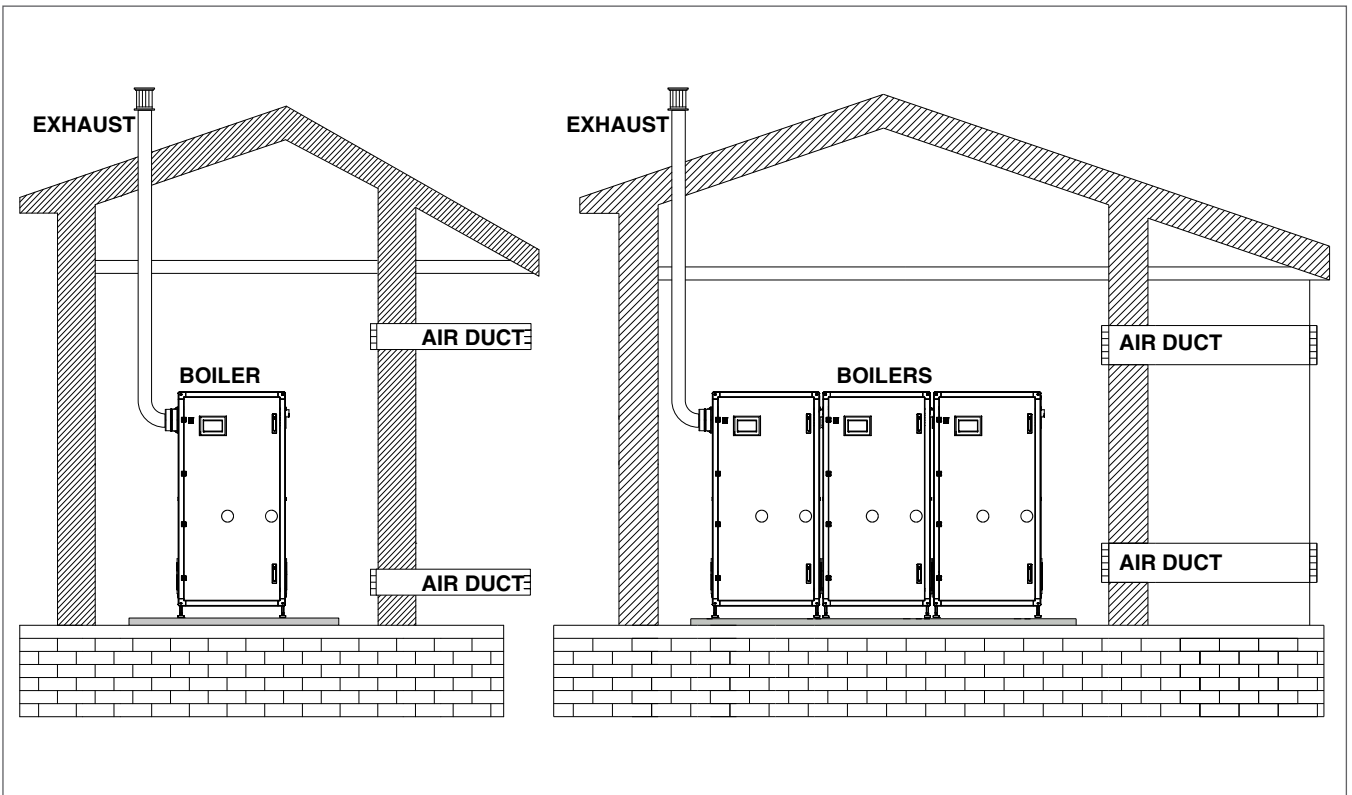


Fig. 35 All Combustion Air from Outdoors through Horizontal Ducts

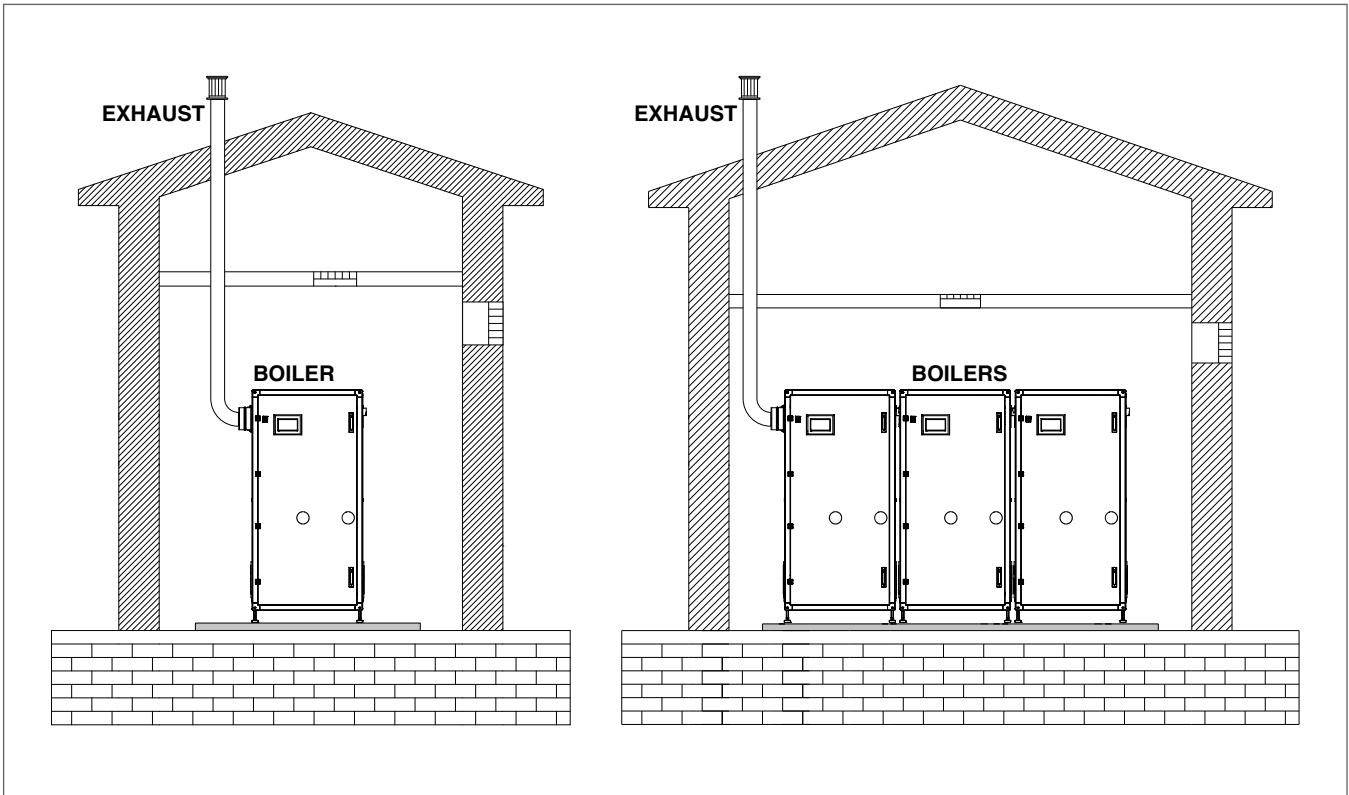


Fig. 36 All Combustion Air from Outdoors through Single Combustion Air Opening

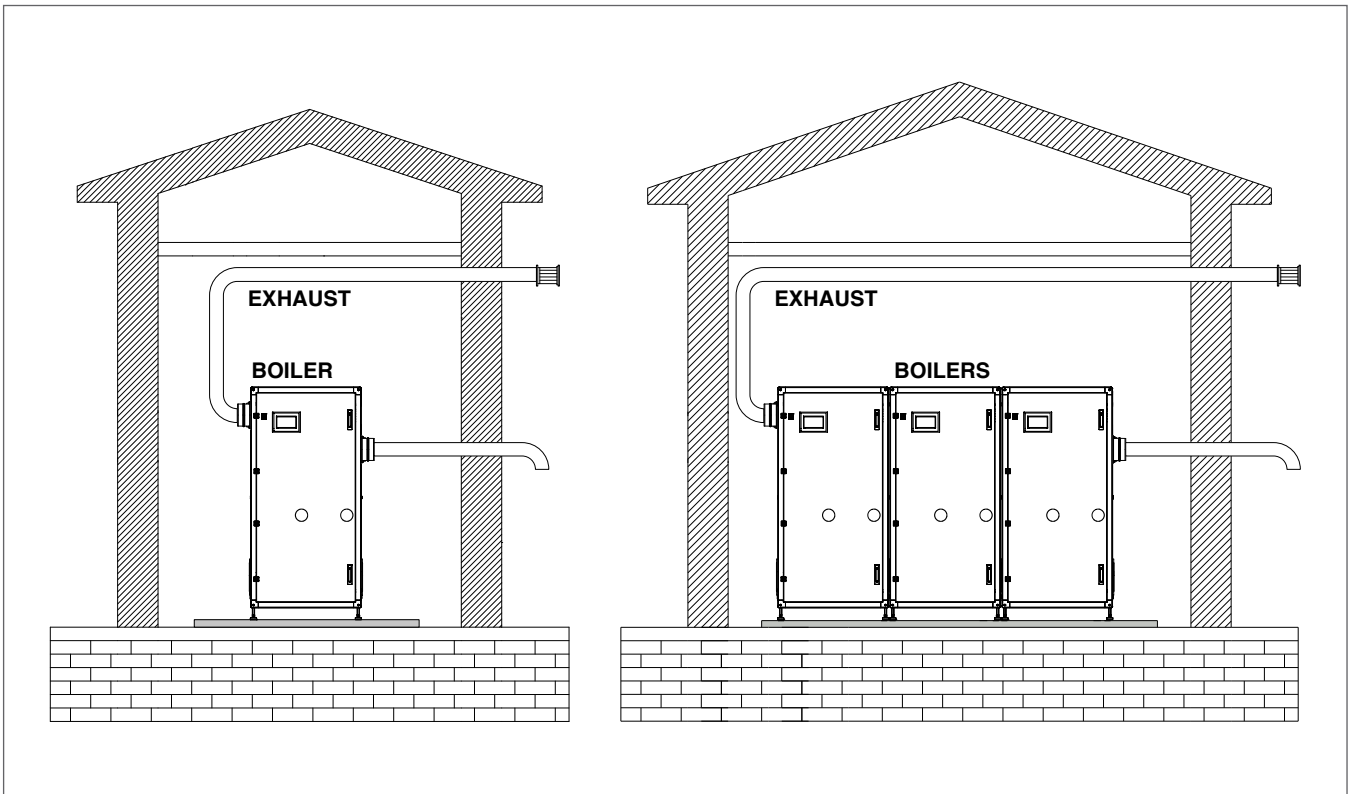


Fig. 37 Sealed Combustion located on same side with Exhaust (horizontal)

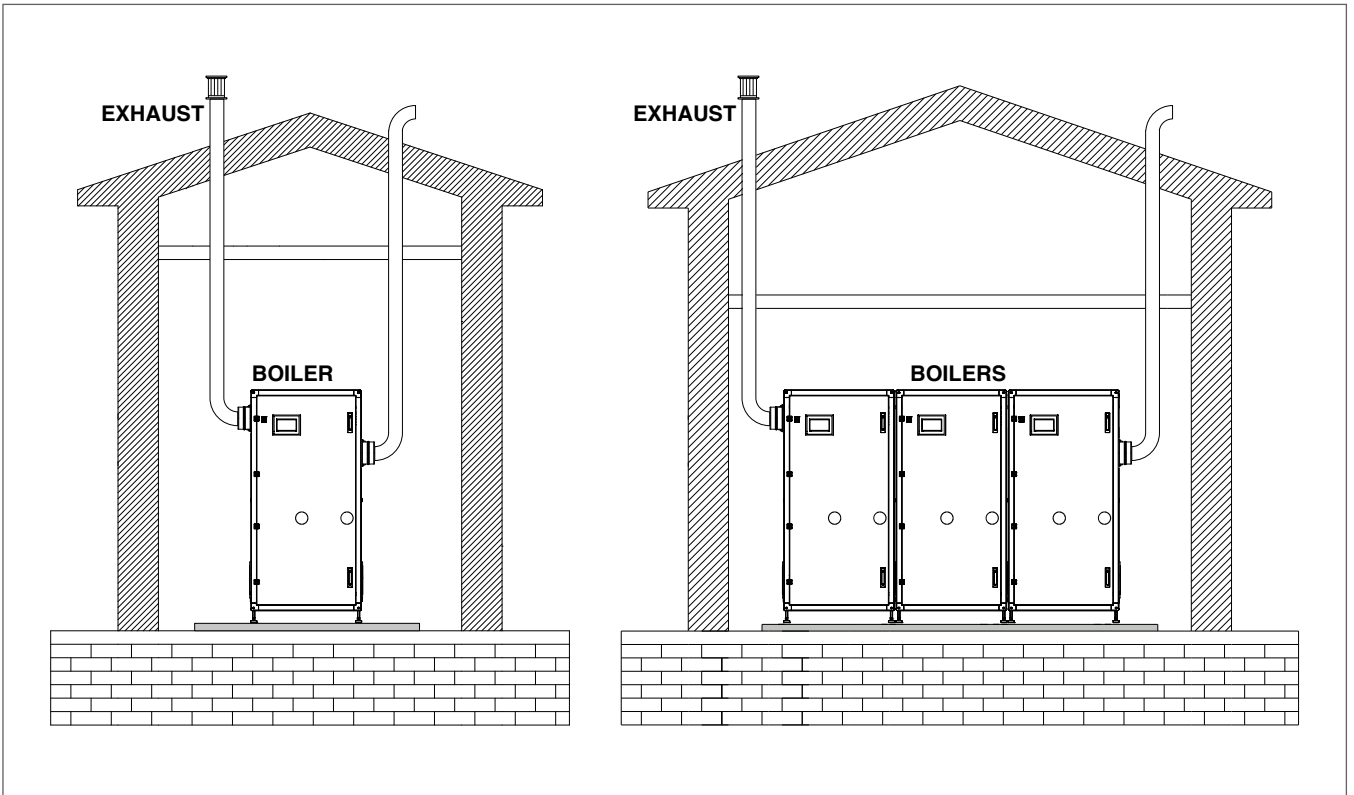


Fig. 38 Sealed Combustion located on same side with Exhaust (vertical)

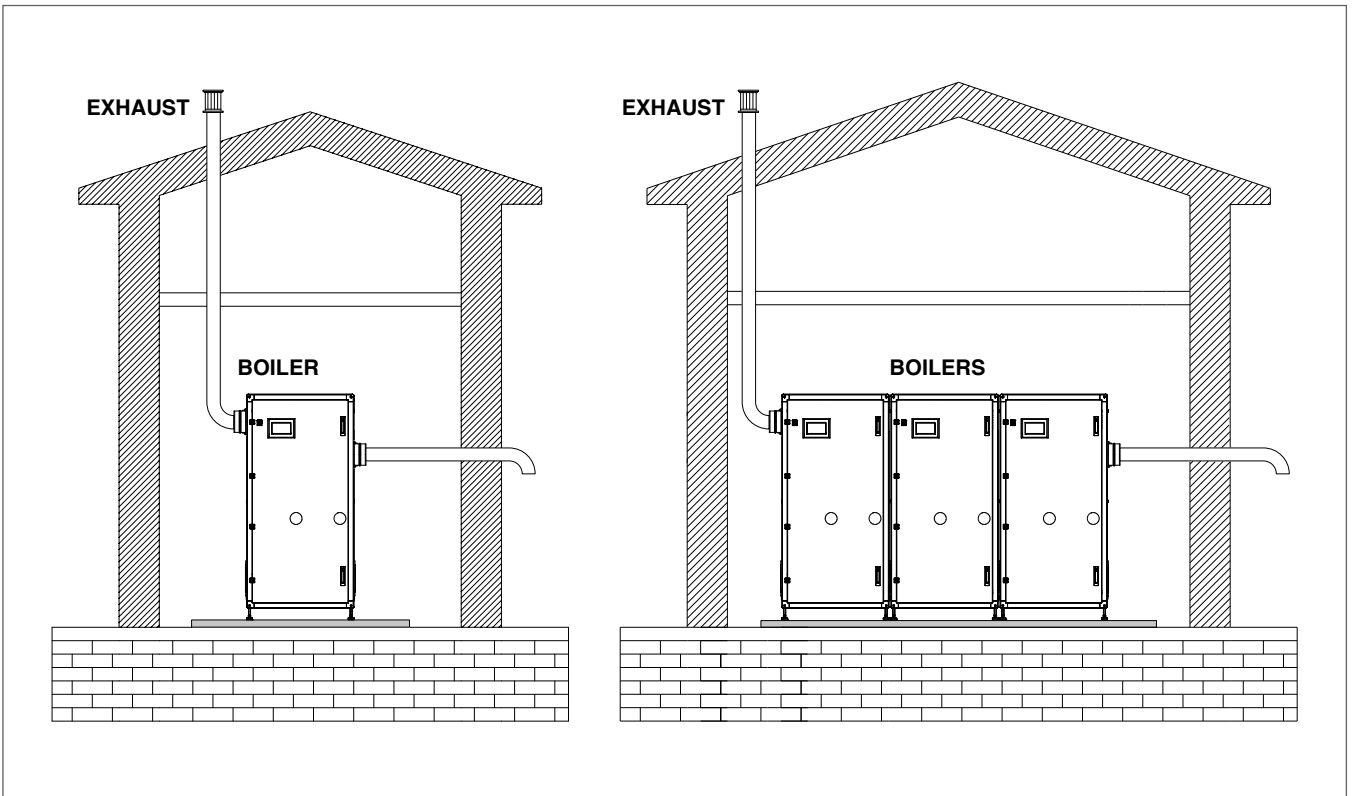


Fig. 39 Sealed Combustion located on side wall

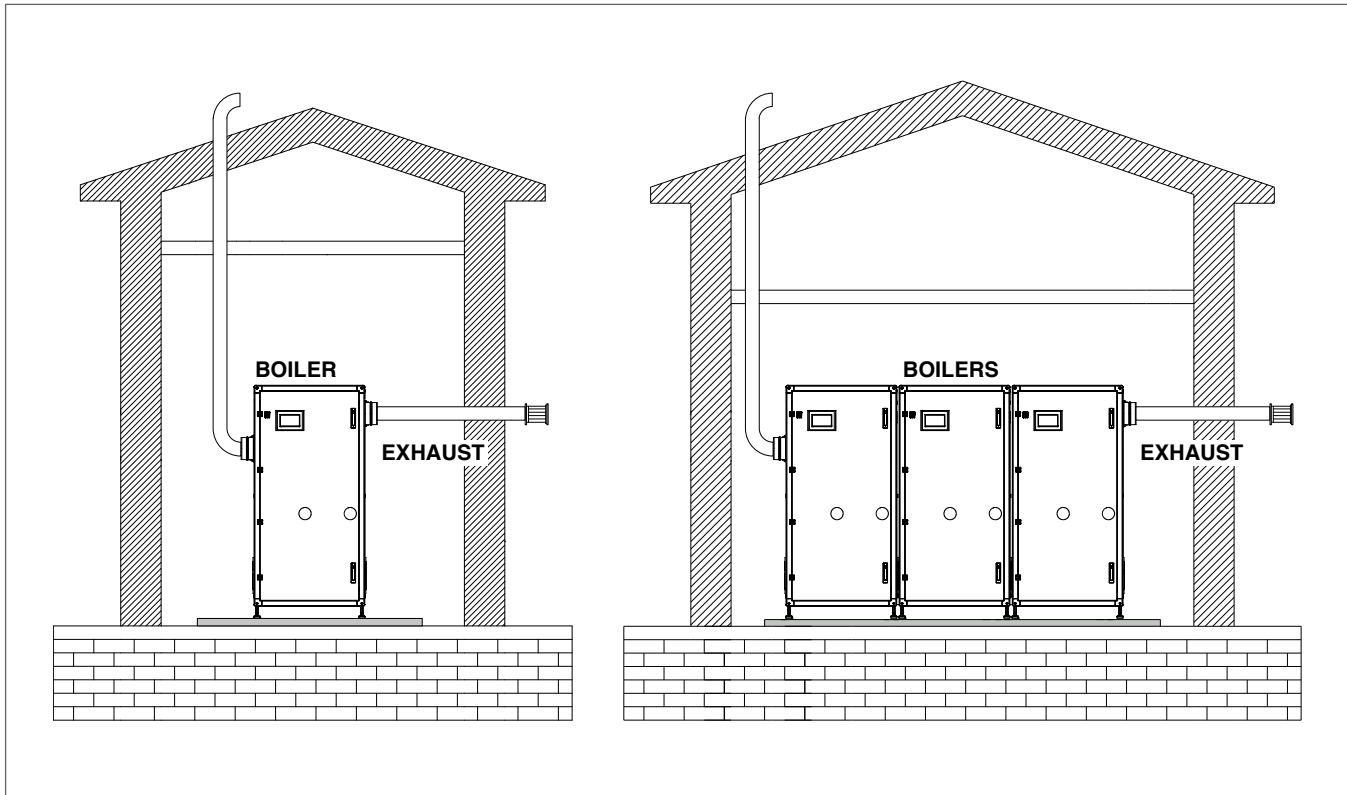


Fig. 40 Exhaust located on side wall

- 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.
- Because the unit is capable of discharging low temperature exhaust gases, horizontal runs must slope upwards not less than ¼ in/ft (21 mm/m) from the boiler to the vent terminal. Also, the horizontal portions of the venting system shall be supported to prevent sagging at intervals in accordance with and components used per vent manufacturer’s installation instructions.
- While there is a positive flue pressure during operation, the combined pressure drop of vent and combustion air systems must not exceed the following equivalent length:

Model	PIPE SIZE - 6"		PIPE SIZE - 10"	
	MAX. equiv. (m)	MAX. equiv. (ft)	MAX. equiv. (m)	MAX. equiv. (ft)
800 SA	30	100	-	-
1000 SA	30	100	-	-
1000 TL	-	-	30	100

Fittings as well as pipe lengths must be calculated as part of the equivalent length, according to the following table:

Model	45° ELBOW - 6"		45° ELBOW - 10"	
	equiv. (m)	equiv. (ft)	equiv. (m)	equiv. (ft)
800 SA	1.5	5	-	-
1000 SA	1.5	5	-	-
1000 TL	-	-	1.5	5

Model	90° ELBOW - 6"		90° ELBOW - 10"	
	equiv. (m)	equiv. (ft)	equiv. (m)	equiv. (ft)
800 SA	1.8	6	-	-
1000 SA	1.8	6	-	-
1000 TL	-	-	1.8	6

- These factors must be planned into the vent installation. If the maximum allowable equivalent lengths of piping are exceeded, the unit will not operate properly or reliably.
- For Massachusetts installations, contact companies able to provide vent systems which conform to all applicable requirements for installations within the Commonwealth of Massachusetts.
- For multiple boilers installation, common venting shall be done according to examples on "Appendix E - Boiler Installation (example drawings)".

4.8 Combustion air

Provisions for combustion and ventilation air in accordance with the section "Air for Combustion and Ventilation," of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or Clause 8.2, 8.3 or 8.4 of Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes. These codes should be consulted before a permanent design is determined.

SSB boilers can take combustion air from the space in which are installed, or the combustion air can be ducted directly to the unit. Ventilation air must be provided in either case.

In cold climates it is recommended to provide a motorized air inlet damper to control the supply of combustion air and prevent nuisance condensation.

The combustion air must be free of:

- 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

Whenever the environment contains these types of chemicals, combustion air **MUST** be supplied from a clean area outdoors for the protection and longevity of the equipment and warranty validation.

The more common methods of combustion air supply are outlined in the following sections.

4.8.1 Ducted combustion air

For ducted combustion air installations, the air ductwork must then be attached directly to the air inlet connection on the sheet metal enclosure.

When combustion air is taken through the roof, a field-supplied rain cap or an elbow arrangement must be used to prevent entry of rain water.

The ducts must be routed to the boiler as directly as possible, with all joints sealed, and supported by adequate hangers.

In a ducted combustion air application, the combustion air ducting pressure losses must be taken into account when calculating the total maximum allowable venting run (see table on page "Venting Configurations: The following figures show the acceptable piping installation for venting and combustion air for both, Stand Alone and Cascade configurations." page 26).

For additional details, see "Appendix F - Exhaust terminals and Air inlet Clearances".

5 Commissioning

5.1 Introduction

Before starting the boiler, the user must be correctly instructed by the installer, on how to operate the heater, in particular:

- Make sure that the user understands that combustion air and ventilation openings must not be restricted, closed, or modified in any way.
- Make sure that the user is informed of all the special measures to be taken for combustion air inlet and discharging flue gases, and that these must not be modified in any way.
- Make sure that the user keeps this manual and all other documentation included with the boiler.
- Make sure that the user understands never to tamper with gas control settings and the risk of CO poisoning should an unauthorized individual do so.
- Make sure that the user knows how to adjust temperatures and controls.



WARNING: Do not attempt to dry fire the unit. Starting the unit without a full water level can seriously damage the unit and may result in injury to personnel or property damage. This situation will void any warranty.



CAUTION: All of the installation procedures in "Installation" page 11 must be completed before attempting to start the unit.

5.2 Filling the condensate system

The condensate system must be filled with water according to the Section "Pressure relief valve installation" page 16.



WARNING: At the Start-up and after prolonged shutdown of the boiler, the condensate traps and the syphon must filled with water prior to restart it, otherwise combustion gases will enter the room with a risk of an excessive level of carbon monoxide.

5.3 Filling the boiler heating system

To fill the heating system, proceed as follows:

- Open any automatic air vents in the heating system.
- Open the fill valve and proceed to fill the heating system and boiler until the pressure gauge (shown on Fig. 48), reads the pressure for which the heating system is sized. The heating system water pressure must be higher than 7.5 PSI.
- Check that there is no water leaking from the fittings. If there is, the leaks must be repaired.
- Close all water shutoff valves in the boiler.
- Open return valve in system header to allow the water to fill the return header in the boiler.
- Starting at one module, open the return shutoff valve allowing the water to fill the pump and heat exchanger. The automatic vent valve should start to release the air from the heat exchanger.
- Once air has stopped, open the supply valve on the outlet of the heat exchanger allowing the water to fill the supply header in the boiler.
- Move up to the next module and repeat this process.
- Once both modules have been done, open the supply valve on the system header.
- Check the pressure gauge during the purging process. If the pressure has dropped, re-open the fill valve to bring the pressure back to the desired value.

5.4 Warnings concerning the gas supply

When starting up the unit for the first time the following must be checked:

- That the unit is supplied with the type of fuel that it is configured to use.
- That the gas supply system is provided with all the safety devices and controls required under current national and local codes.
- The ignition system shutoff device must be tested by closing manual gas valve and having ignition system cycle until unit goes into safety shutoff.
- That the vent and combustion air terminals are properly connected and free from any blockages.
- That the condensate drain tube is properly connected.

5.4.1 Confirming the Unit's Gas Type

The type of gas and the gas supply pressure that the unit is set up for is listed on the rating label. The **SSB** Series boilers can operate using one of the following two gases:

NATURAL GAS

- Maximum supply pressure = 20" W.C. (50.0 mbar).
- Minimum supply pressure = 3.5" W.C. (8.7 mbar).

PROPANE (LP) GAS

- Maximum supply pressure = 20" W.C. (50.0 mbar).
- Minimum supply pressure = 8" W.C. (19.9 mbar).

5.4.2 Gas Type Conversion

If the gas available at the installation site is not the type the boiler is configured to use, the boiler must be converted. Special conversion kits are available for this purpose inside the boiler. The gas conversion procedure may be found in Section "4.6.4 Gas Type Conversion" pag. 22. Conversion must be carried out by a qualified technician.

5.5 Boiler startup procedure

To start the boiler, do the following:

- Open the manual gas shut-off valve.
- Turn ON the main power switch.
- Push all Module power switches to ON ("Electrical box" page 20).
- To help removing the air from the hydraulic circuit, the De-airing function can be started for each module. When activated, the "De-Air" sequence starts at every power ON and consists of a controlled cycling of the pumps OFF and ON that takes 14 minutes, during which no demand will be served. If the water pressure is too low and the water pressure switch is in error, the sequence will be suspended until the pressure switch is ON again. This function can be started through the Service display, connecting it to each module and switching the De_Air_Config parameter from 0 to 1. More details are available on the Control System Manual.

- The Touchscreen Control Panel will switch on. The Splash/Home screen consists of the **BOSCH** logo:

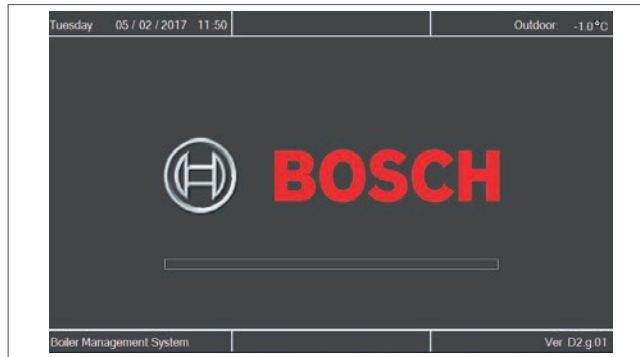


Fig. 41 Touchscreen Control Panel Splash/Home screen

By touching the logo, the Cascade screen will be accessed:

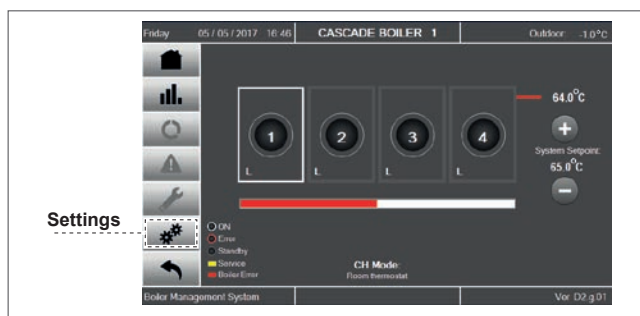


Fig. 42 Cascade Screen

- Pushing the Settings button, the Settings screen will show up:

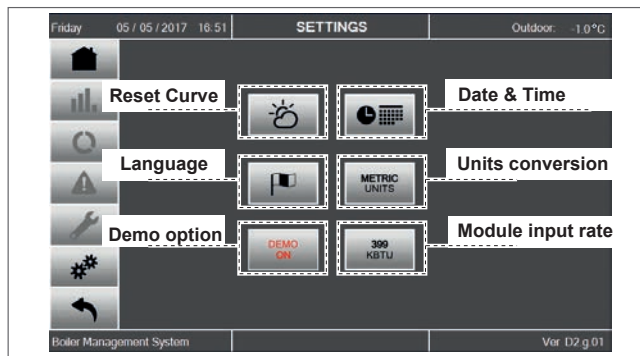


Fig. 43 Settings screen

- Date and Time can be adjusted through the screen below:

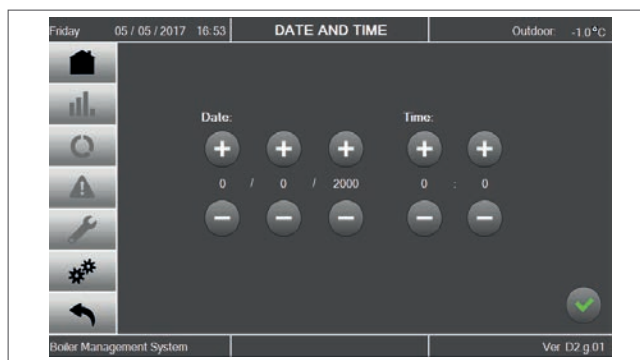


Fig. 44 Date & Time screen

- After the Date & Time setting, if an outdoor probe is connected, the Reset Curve screen must be accessed (through the Settings screen) to set the curve parameters:

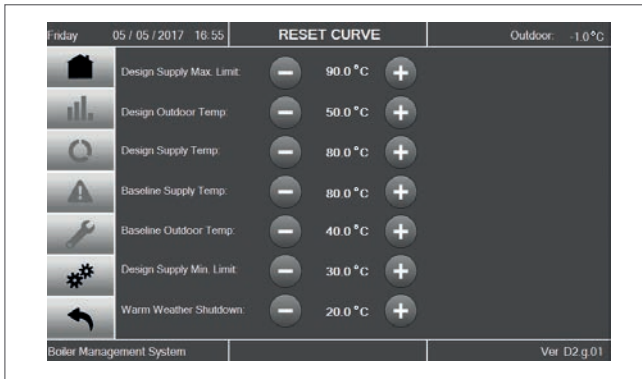


Fig. 45 Reset Curve screen

Adjusting the parameters on that screen, the reset curve below will modify shape and slope to meet the needs of the specific application.

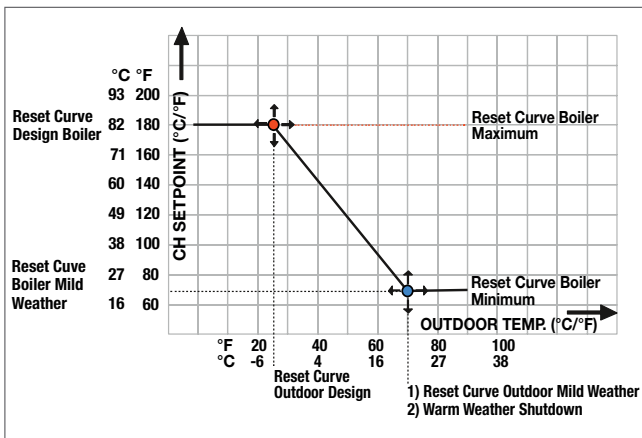


Fig. 46 Reset Curve

- The boiler will fire only when there is a call for heat and the heating temperature setting is higher than the actual supply temperature. Hold buttons “+” or “-” on the Cascade screen (Fig. 53) to select the desired heating temperature. If the external temperature sensor is connected (see Section “4.5.2 Outdoor Temperature Sensor” pag. 21), check that the calculated temperature is higher than the actual boiler temperature and that the outdoor temperature is lower than “warm weather shut down” temperature.
- The boiler CH setpoint can be controlled by an analog input signal provided by a remote means such as a Building Management System or a system controller. The analog input 0-10 VDC, is used to adjust the boiler setpoint between the CH_Setpoint_Min and the CH_Setpoint_Max settings (Fig. 47). To enable this operation mode, the parameter CH mode must be set to 4 (see **SSB Control System Manual** for accessing the parameter list).

NOTE: to enable CH mode 4, terminals 9 and 10 (Enable/Disable) on Low voltage strip must be jumpered.

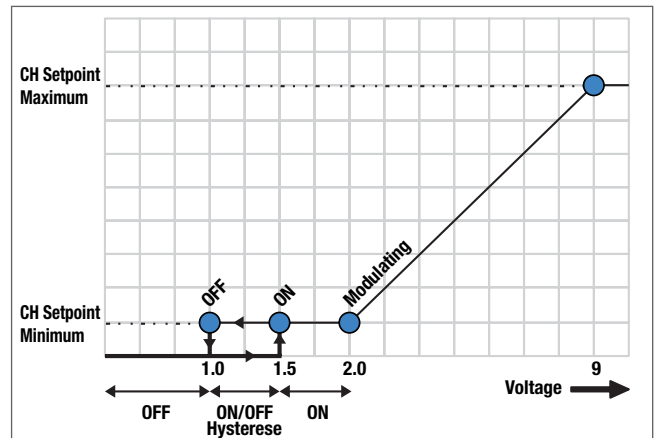


Fig. 47 10VDC Control mode

The CH setpoint Min and CH setpoint Max parameters can be adjusted to provide the desired temperature adjustment band. A heat request will be generated by an input of 1.5 volts or higher. The setpoint modulation will occur between 2 and 9 volts. The request for heat will be removed when the voltage drops below 1 volt.

All other safety and control functions associated with the boiler will react normally to adverse condition and override control of the analog signal to prevent an upset condition.

5.5.1 Minimum Water Flow (Heat Exchanger Protection)

This unit is self-protected against low water flow. A flow meter continuously monitors the water flow to each module. If the water flow decreases below the minimum stated (default threshold: 50l/min = 13.2GPM), the burner automatically shuts off.

5.5.2 Heating System Pressure Test

If the pressure inside the heating circuit falls below the minimum pressure for the system (7.5 PSI), the appliance switches off and the 905PB inner display shows “Low water pressure” to indicate that it is necessary to restore the correct pressure.

Open the filling valve and check the pressure on the temperature/pressure gauge of Fig. 48.

The error will disappear when the pressure is back at the right value. To prevent accidental relief valve openings, fill the heating circuit slowly.

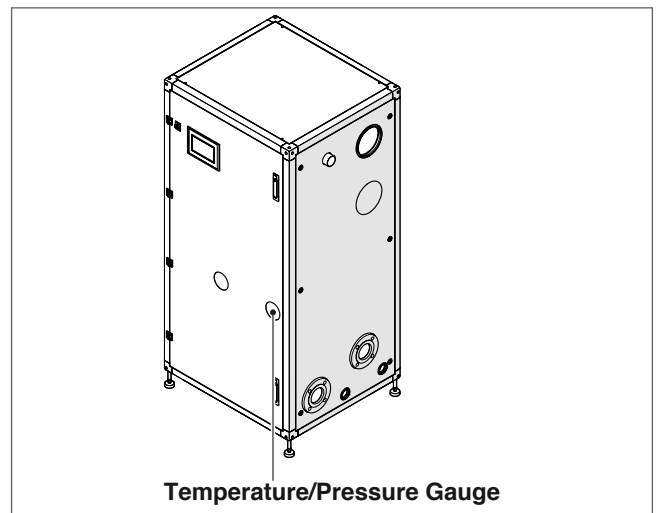


Fig. 48 Temperature/Pressure Gauge location

5.6 Boilers' cascade installation and start-up (FOR SSB 1000 TL ONLY)

Appendix E shows an example of **SSB 1000 TL** boilers installed in a cascade of three units. The built-in control system is capable to manage up to 4 boilers as a single, coordinated heating system. The logical scheme is:

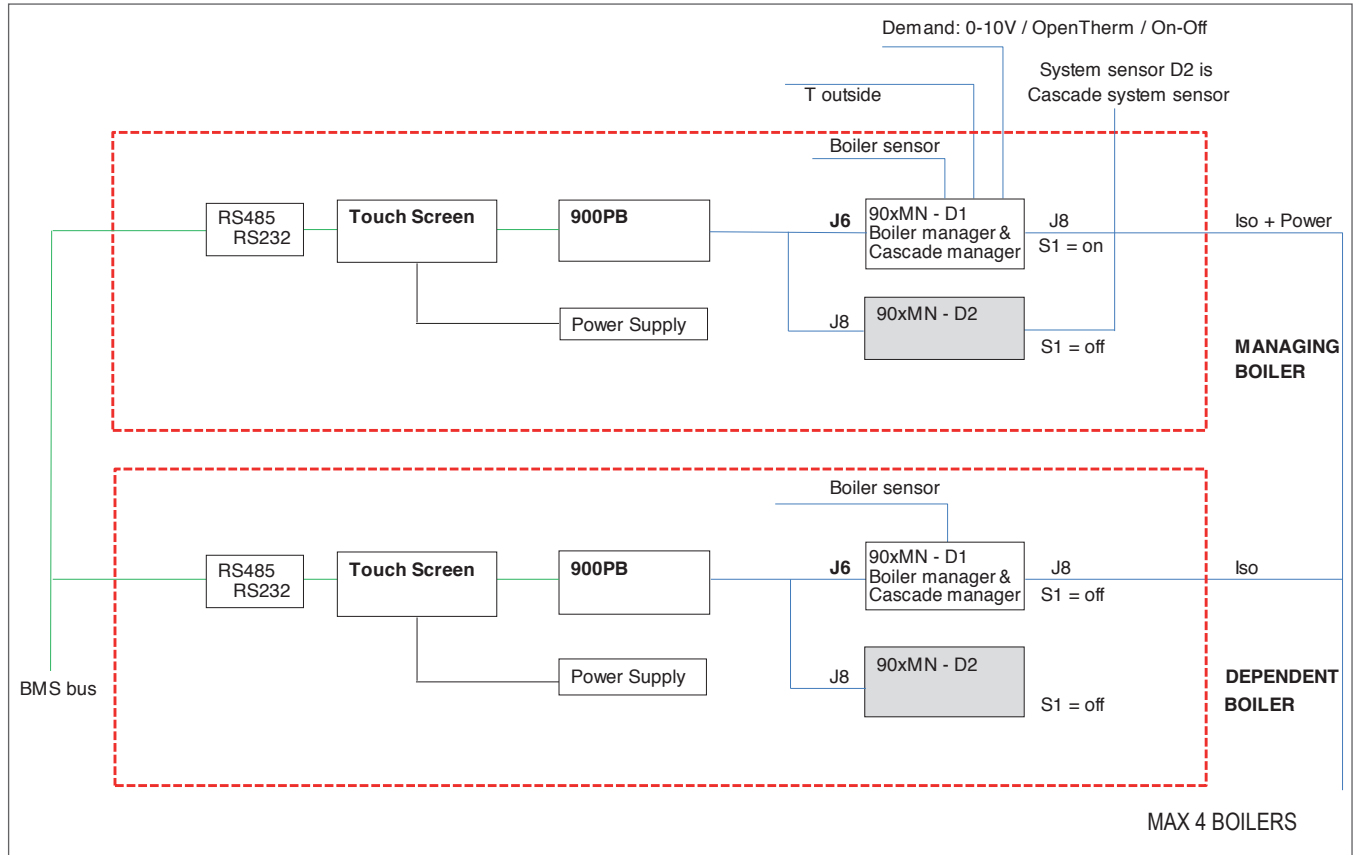


Fig. 49 Cascade installation scheme

After the electrical wiring of the Managing controllers of each boiler of the cascade (through the “Cascade link” connections on the Low voltage terminal strips), the following steps must be done:

5.6.1 Boilers Cascade: Set Boiler Address

Assign the Boiler Address in the Managing boards of each boiler of the cascade, following the path below on the Service display:

Menu->Setting->Boiler Settings->Boiler Cascade Settings->(73) Boiler Address

BOILER	(73) Boiler Address
Managing	Managing
Dependent 1	Dep. 1

5.6.2 Boilers Cascade: Set Power switch S1

On the Managing controller of the Cascade Managing boiler, the Power Switch S1 must be in ON position (see picture below).

The S1 switch must be in OFF position on all other controllers of the boilers in the cascade.

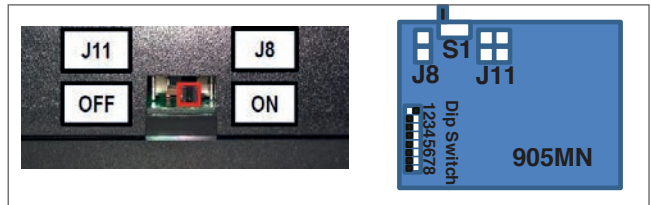


Fig. 50 Set Power switch S1

6 Operation

6.1 Introduction

The information in this Chapter provides a guide to the operation of the **SSB** Boiler using the Control Panel mounted on the front of the unit. It is imperative that the initial startup of this unit be performed by factory trained personnel. Operation prior to initial startup by factory trained personnel may void the equipment warranty. In addition, the following **WARNINGS** and **CAUTIONS** must be observed at all times.



WARNING: Electrical voltages in this system include 120 and 24 volts AC. It must be serviced only by factory certified service technicians.



WARNING: Do not attempt to dry fire the unit. Starting the unit without a full water level can seriously damage the unit and may result in injury to personnel or property damage. This situation will void any warranty.



CAUTION: All of the installation procedures in Chapter “4 Installation” pag. 11 must be completed before attempting to start the unit.

6.2 Control panel description

All **SSB** Series Boilers utilize the Touchscreen Control Panel shown in Fig. 52. This Touchscreen panel contains the basic controls for monitoring the boiler. All other controls, indicators and displays necessary to operate, adjust and troubleshoot the boiler are available on the 905PB inner display shown in Fig. 22.

Additional information on these items is provided in the individual operating procedures and menu descriptions provided in this Chapter.

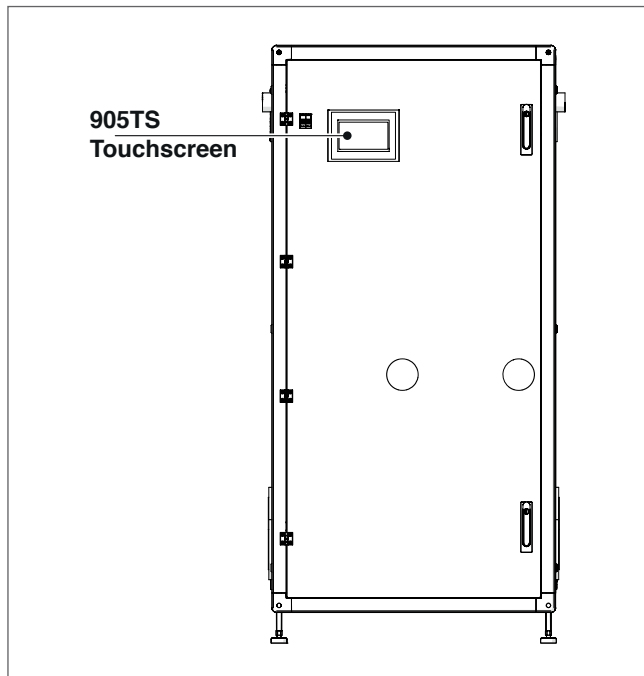


Fig. 51 Touchscreen Control Panel

6.3 Touchscreen control panel menus

The Touchscreen Control Panel incorporates a menu structure which permits the operator to monitor and set up (basic settings only) the unit. The menu structure consists of four major screens and four secondary ones.

6.3.1 Splash/Home Screen

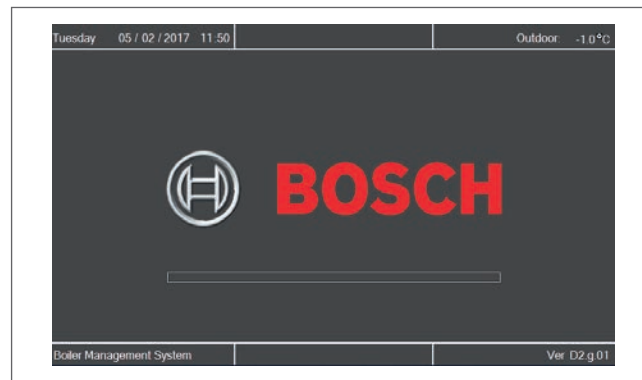


Fig. 52 BOSCH Screen

The **BOSCH** logo is the entry point of the Control System. Just touching it, the system moves to the first operating screen, the Cascade one.

6.3.2 Cascade Screen

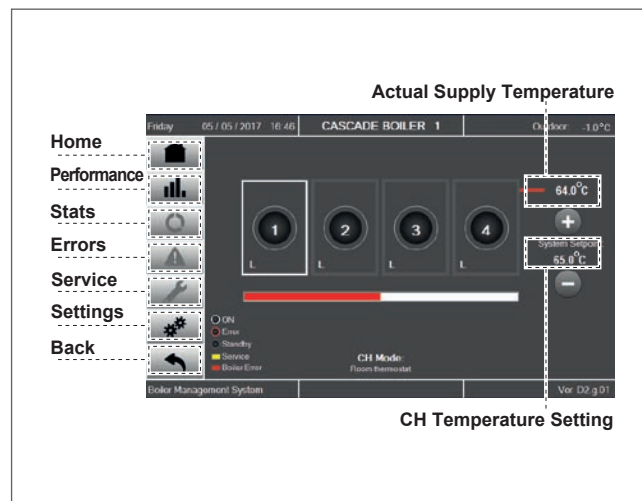


Fig. 53 Cascade Screen

The Cascade screen shows the current configuration of the plant, made by one or more cascaded boilers.

Through this screen, the following actions can be done:

- Adjust the temperature setpoint using the “+” and “-” buttons;
- Access the Boiler screen of the desired boiler, just touching it on the screen;
- **Home button:** move back to the **BOSCH** screen;
- **Performance button:** move to the Performance screen of the cascade;
- **Stats button:** not active;
- **Errors button:** move to the Errors screen;
- **Service button:** move to Service screen;
- **Settings button:** move to Settings screen;
- **Back button:** move to the previous screen.

6.3.3 Boiler Screen

Through this screen, the following actions can be done:

- Check the status of the modules (ON, OFF, in error);
- See the current supply temperature at the boiler header;
- Access the Module screen of the desired module, just touching it on the screen;

Use the side buttons to perform the actions listed below:

- **Home button:** move back to the **BOSCH** screen;
- **Performance button:** move to the Performance screen of the boiler;
- **Stats button:** not active;
- **Errors button:** move to the Errors screen;
- **Service button:** move to Service screen;
- **Settings button:** move to Settings screen;
- **Back button:** move to the previous screen.

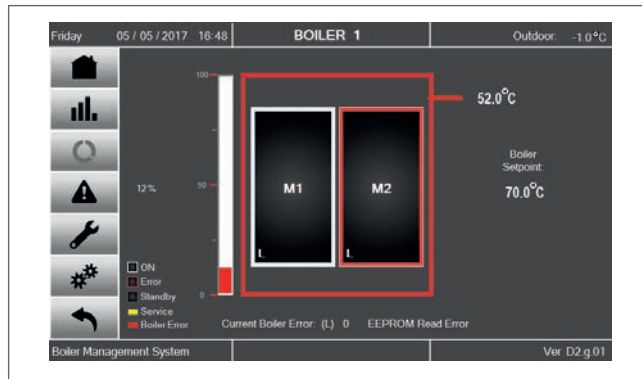


Fig. 54 Boiler screen

6.3.4 Module Screen

Through this screen, the following actions can be done:

- See the current value of many parameters: water supply&return temperature, flue temperature, water flowrate, fan speed, ionization current, burner and pump status, any error ON or service required;

Use the side buttons to perform the actions listed below:

- **Home button:** move back to the **BOSCH** screen;
- **Performance button:** move to the Performance screen of the module;
- **Stats button:** not active;
- **Errors button:** move to the Errors screen;
- **Service button:** move to Service screen;
- **MODULE TEST button:** move to the Module test screen;
- **Reset button:** clean any Locking error relevant to the module;
- **Back button:** move to the previous screen.

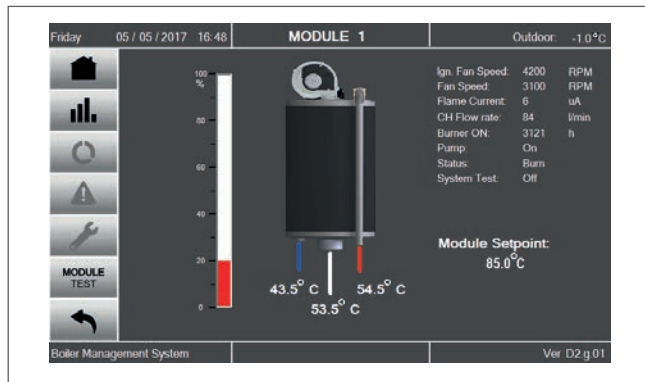


Fig. 55 Module screen

IMPORTANT: When resetting a Locking error of the Managing module, the whole boiler will be switched OFF and then restarted.

6.3.5 Performance Screen

The Control system is able to show the “real time” performance of the plant, starting from 12 hours before the current time. The screen shows different information according to the context.

The Cascade Performance screen includes the trend of:

- Current power input;
- Targeted temperature setpoint;
- Current supply temperature.

The Boiler Performance screen includes the trend of:

- Current power input;
- Targeted temperature setpoint;
- Current supply temperature.

The Module Performance screen includes the trend of:

- Current power input;
- Targeted temperature setpoint;
- Current supply temperature.
- Current return temperature;
- Current fan speed;
- Current ionisation current;
- Current flue temperature.

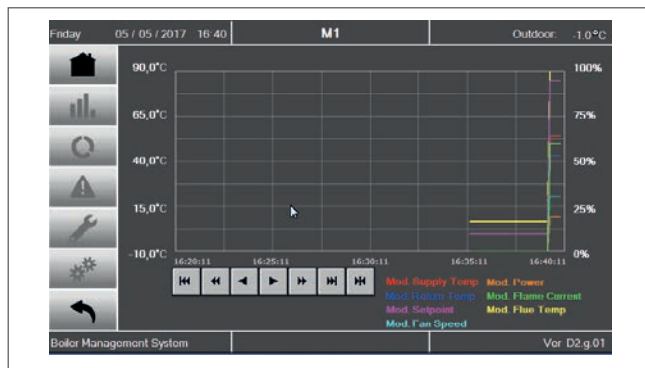


Fig. 56 Service screen

6.3.6 Error Screen

For each boiler, the Error screen shows the list of the last 48 errors occurred on its own modules.

The errors are listed in chronological order.

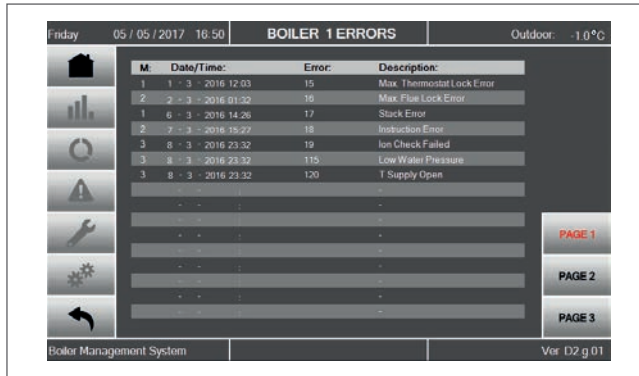


Fig. 57 Error screen

6.3.7 Service Screen

The Service screen shows the main parameters of the Service Reminder function.

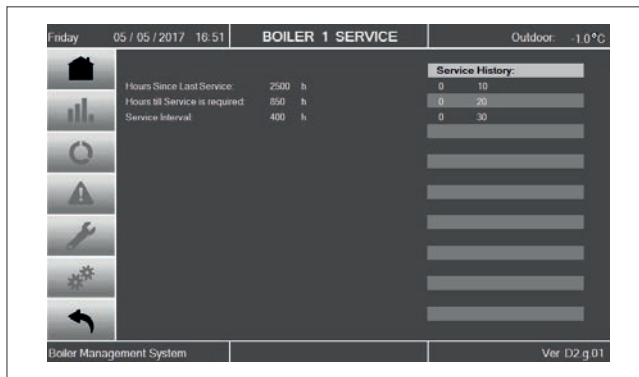


Fig. 58 Service screen

The **Service Reminder** will remind the owner/user of the appliance to service the appliance at a specified **Service_Interval** (factory setting). When service is not done within the specified time, a service reminder will be shown on the screen, alternating with the normal status display. The **Service_Interval** can be set as the number of burn hours or the number of operational (appliance is powered) hours. This can be done by setting the **Service_Hour_Counter** (factory) parameter.

When the Service Reminder is active, the time before service is actually done is logged by the 900PB (in hours). This time is called the Service Overdue time. With this log the factory can read back how long service was overdue on the system/appliance which can be useful when handling warranty claims.

A maximum of 15 Service moments can be logged by the 900PB, when the log is full it will overwrite the oldest log entry.

Each time the Service Reminder is being reset, a new service moment is counted and the Service Overdue counter will be stored in the log/history.

There are two types of service reminders: **(Normal) Service Reminder and Service Shutdown.**

The **(normal) Service Reminder** will only show the service reminder message on the screen and will log how many hours the service is overdue, and the appliance will remain fully operational.

The **Service Shutdown** has the same functionality as the Service Reminder but will shut-down the appliance after the specified **Service_**

Shutdown_Period (factory setting) after the service reminder became active (message is displayed).

The owner/user has a warning before the appliance will actually shutdown. Re-enabling the appliance is only possible by resetting the Service Reminder (Shutdown) which is done by the installer.

6.3.8 Module Test Screen

This screen is designed to support the installer and service activities. When pushing the Module Test button on Module screen, a new set of buttons appears on the left side of the screen.

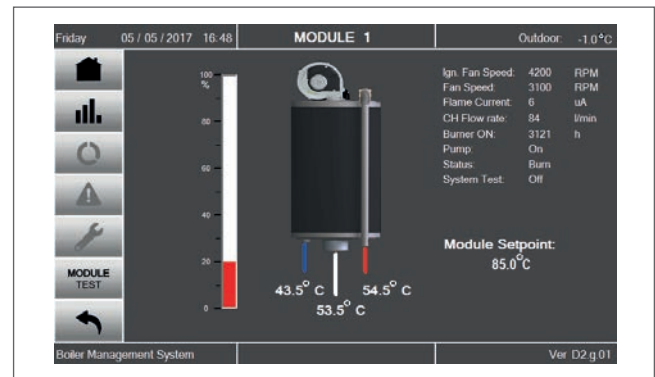


Fig. 59 Module Test Screen

Setup, adjustments and checks of combustion parameters can be done using the Low Power, Ignition Power and High Power buttons. Pushing the LWCO test button the system carries out the Low Water Cut Off functionality test.

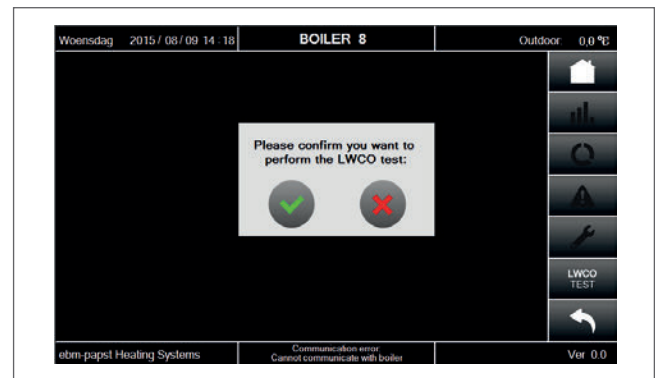
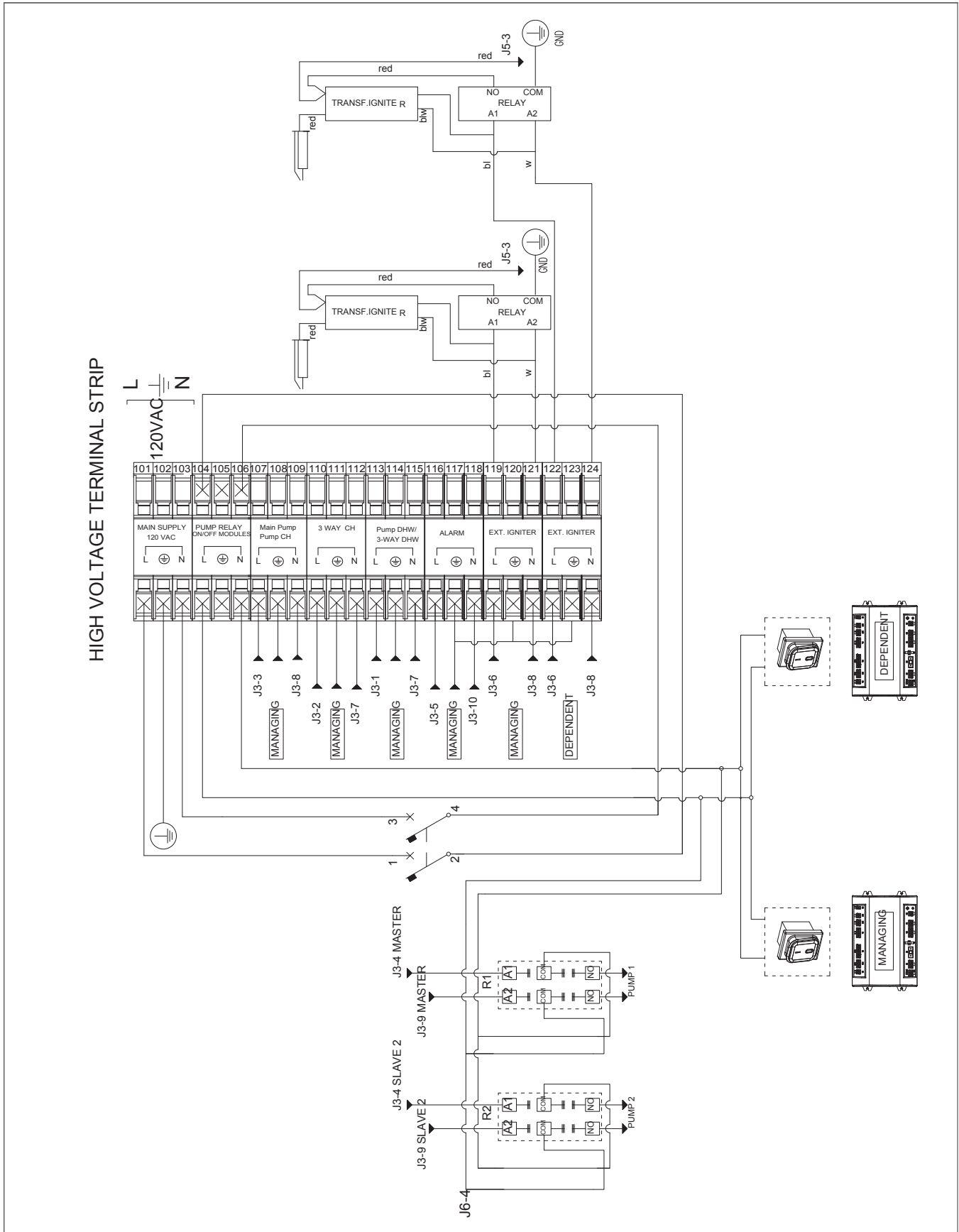


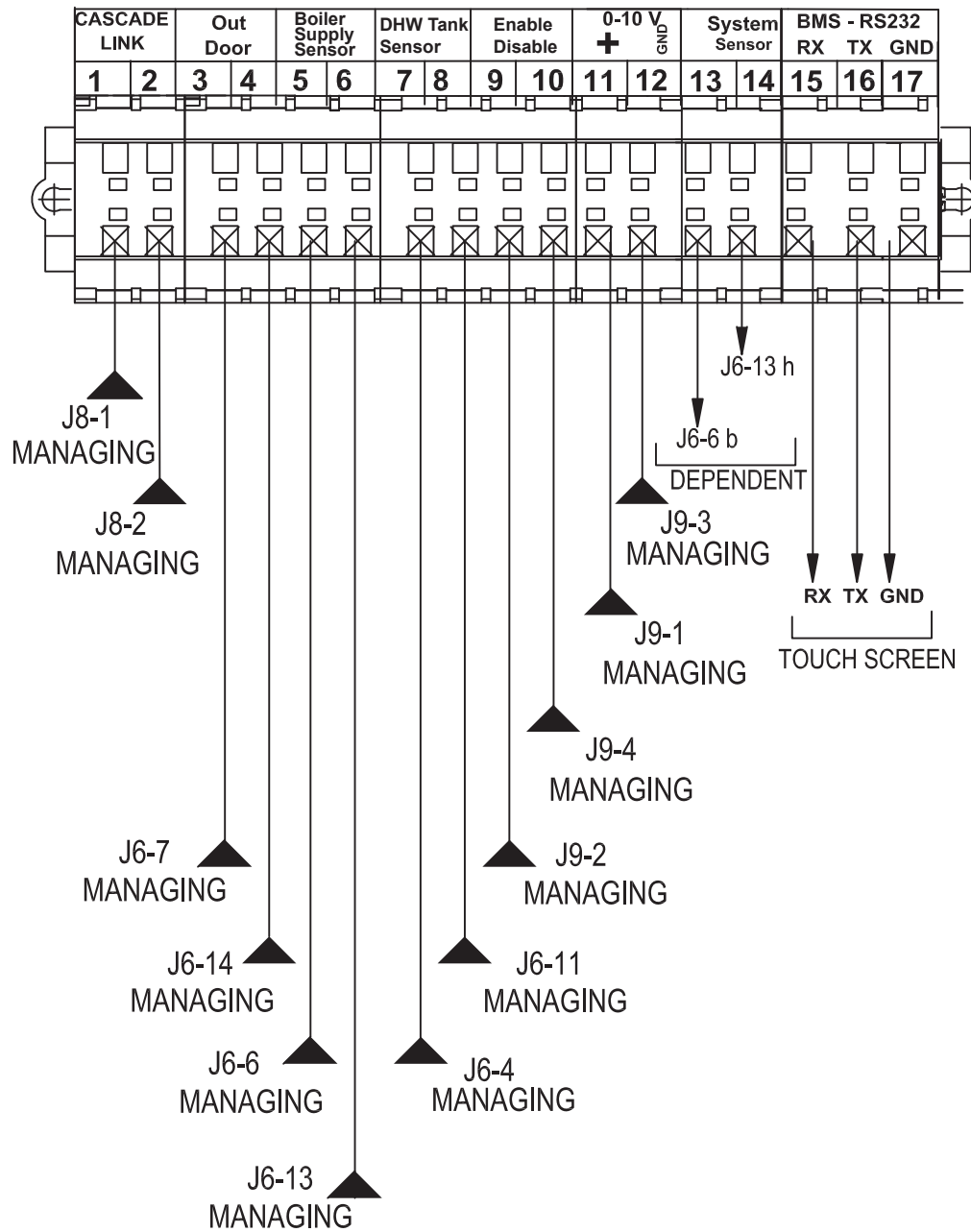
Fig. 60 LWCO test button Screen

In addition, the High Limit button allows to carry out the high limit temperature switch functionality test.

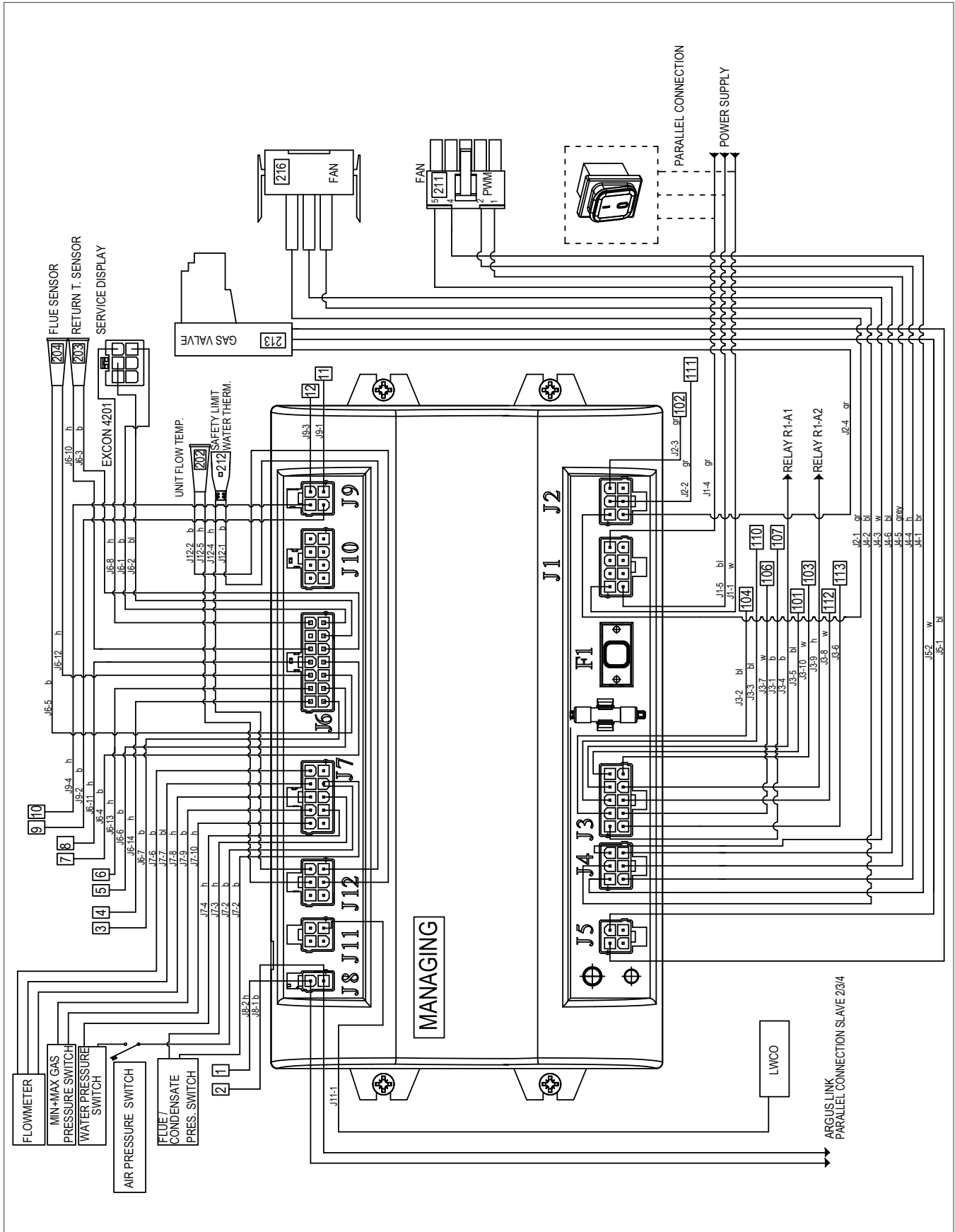
Appendix A - Wiring diagram



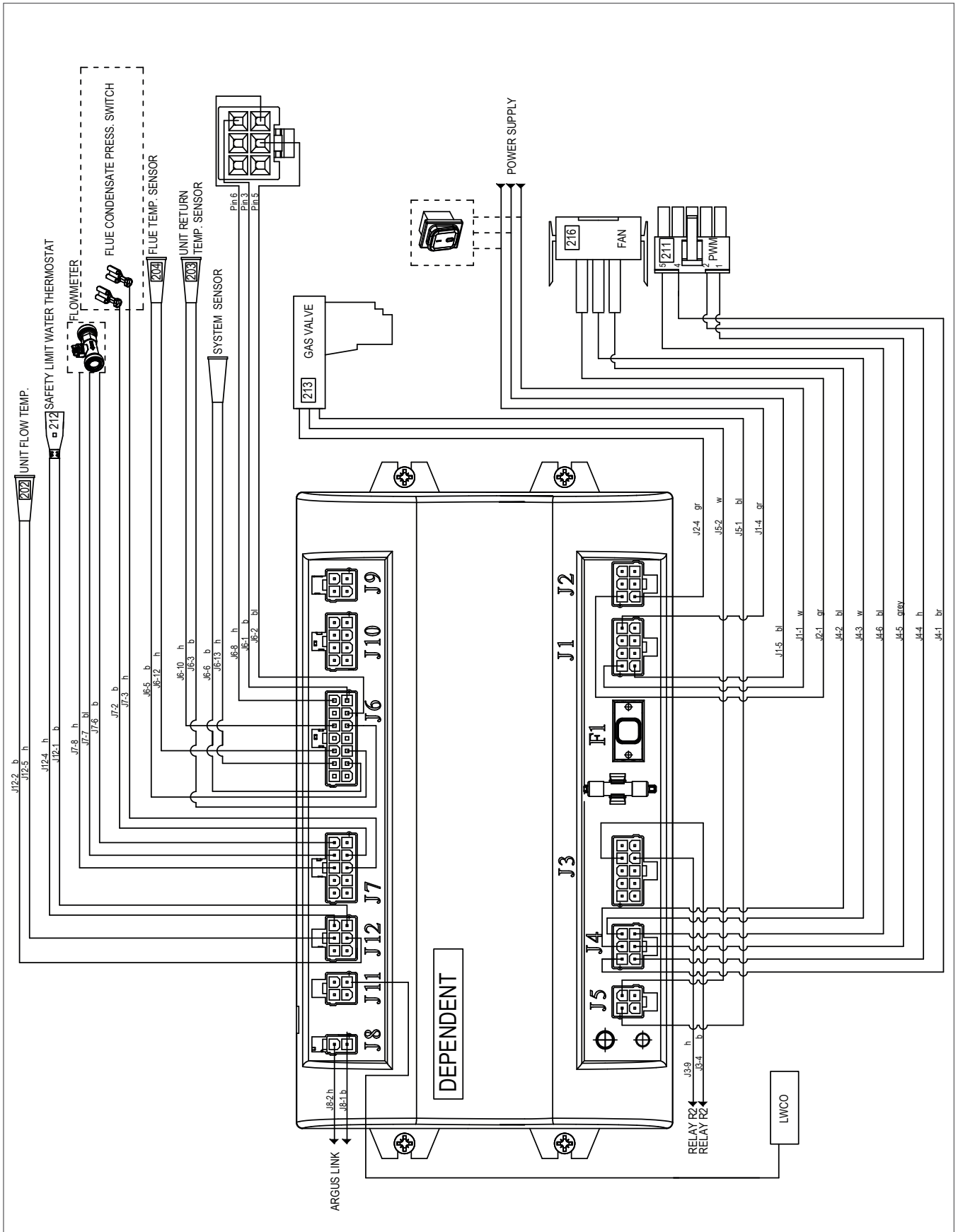
LOW VOLTAGE TERMINAL STRIP



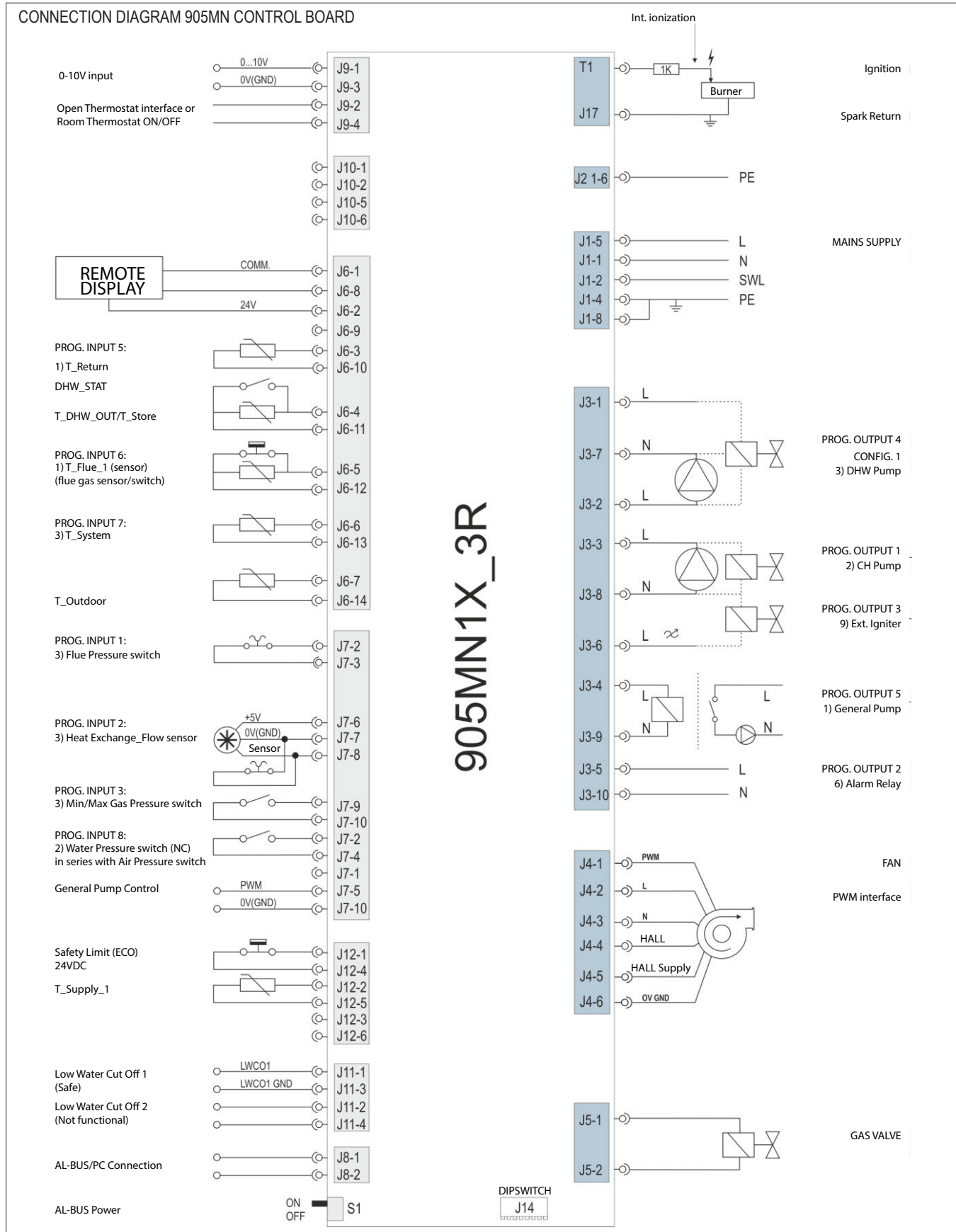
WIRING DIAGRAM - MANAGING



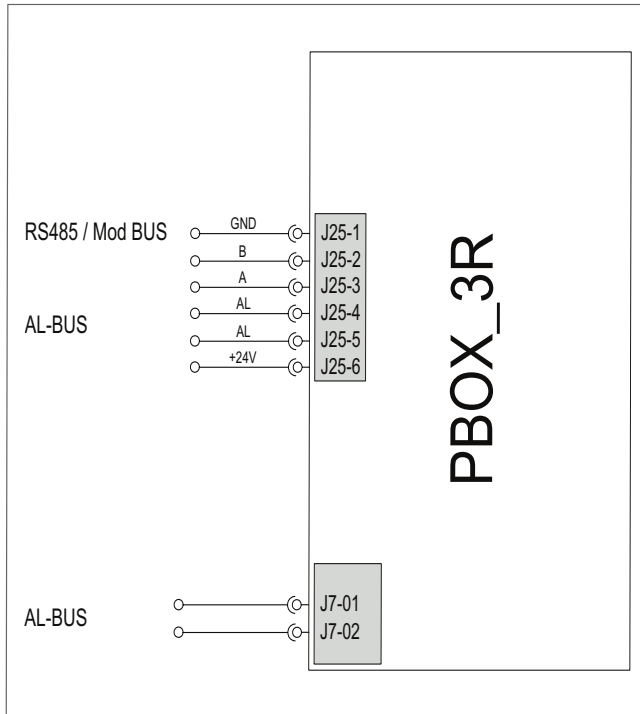
WIRING DIAGRAM - DEPENDENT



Appendix B - Connection diagram

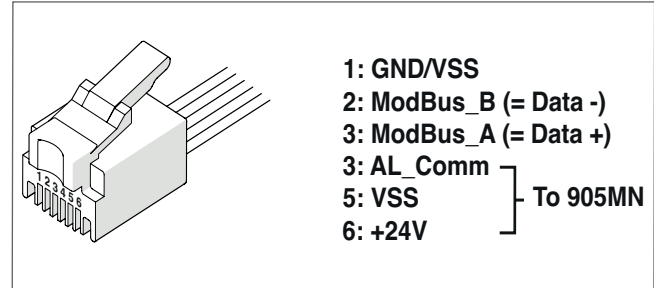


CONNECTION DIAGRAM 905PB DISPLAY



905PB05_3R	
Connector	Function
J7	PC interface
J25	Connection to MN control/Modbus

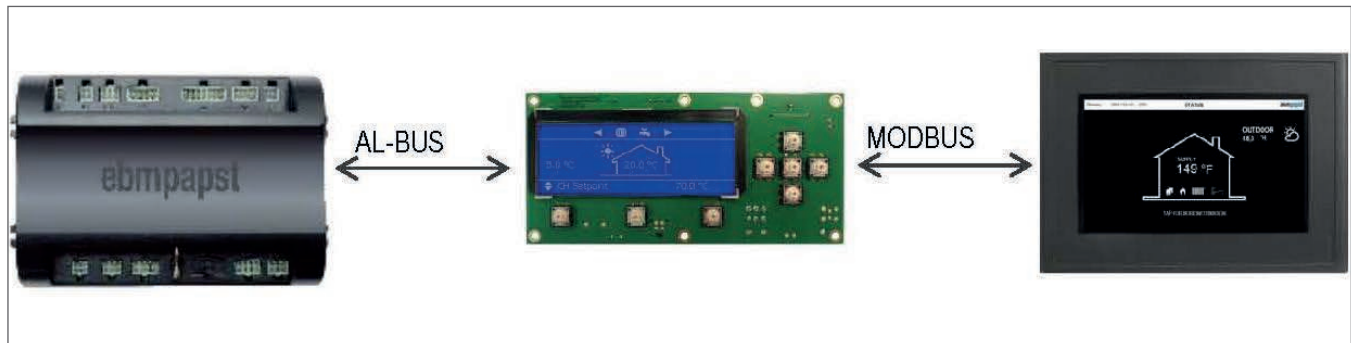
905PB05_3R Display: RJ-11 Connector:



J25 Wire Colors:

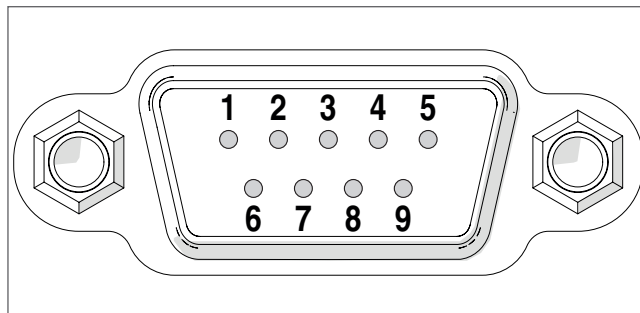
- J25-1: Grey
- J25-2: Black
- J25-3: Green
- J25-4: Yellow
- J25-5: Red
- J25-6: Blue

CONNECTION DIAGRAM 905TS (Touchscreen) AND 905PB DISPLAY



Modbus connection diagram between the 900PB and 900TS

Pins on connector COM1 of the 900TS:



Primary connection to 900PB:

Communication	Pin	Function	Connect to
COM2 (Master)	5	GND	900 PB (J25-1)
	7	RS 485 +	900 PB (J25-3)
	8	RS 485 -	900 PB (J25-2)

Optional secondary interface:

Communication	Pin	Function	Connect to
COM1 (Slave)	2	RS 232 RXD	External Adapter RS 485
	3	RS 232 TXD	External Adapter RS 485
	5	GND	

Appendix C - Maintenance

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.

Servicing, inspection and adjustment must be done by a trained technician in accordance with all applicable local and national codes.



WARNING: Improper servicing or adjustment could damage the boiler and result in equipment damage or a dangerous condition!

MAINTENANCE / INSPECTION SCHEDULE

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

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

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!

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.

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.

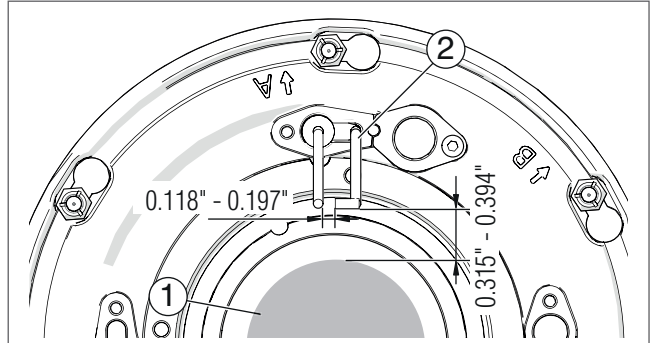


Fig. 61 Inspection of ignition electrode

No.	Description
1	Burner tube
2	Ignition electrode

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.

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.

WATER QUALITY

Check water quality according to 4.3 Water chemistry guidelines.

WATER FLOW

Verify the check valves functionality. It is possible to do it, without removing them, using the following procedure:

- Assuming both modules of the boilers are in stand-by, start one of them;
- Check the water flow of the Off module on its module screen;
- If the value is lower than 3 l/min (0.8 GPM), check valve is OK;
- If it is higher, remove the valve and check/clean it;
- Repeat the same procedure for the other module.

Spare parts list is available at **BOSCH** boilers website: (www.bosch-climate.us).



CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing

Appendix D - Troubleshooting table

Lockout Codes

Error no.	Error	Description	Checks	Solutions
0	E2PROM_READ_ERROR	Internal software error		Replace the power control board
1	IGNIT_ERROR	Three unsuccessful ignition attempts in a row	a- Check gas supply pressure; b- Check ignition spark; c- Correct amount of air; d-Check for120VAC 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.
2	GV_RELAY_ERROR	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.
3	SAFETY_RELAY_ERROR	Failure detected in the Safety relay		Replace the power control board
4	BLOCKING_TOO_LONG	Control had a blocking error for more than 20 hours	Press RESET button to display the Blocking error description	Remove the cause of the Blocking error
5	FAN_ERROR_NOT_RUNNING	Fan is not running for more than 60 seconds	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.
6	FAN_ERROR_TOO_SLOW	Fan runs too slow for more than 60 seconds		
7	FAN_ERROR_TOO_FAST	Fan runs too fast for more than 60 seconds		
8	RAM_ERROR	Internal software error		Replace the power control board
9	WRONG_EEPROM_SIGNATURE	Contents of E2PROM is not up to date		Replace the power control board
10	E2PROM_ERROR	Wrong safety parameters in E2PROM		Replace the power control board
11	STATE_ERROR	Internal software error		Replace the power control board
12	ROM_ERROR	Internal software error		Replace the power control board
13	APS_NOT_OPEN	Air pressure switch not working		
14	APS_NOT_CLOSED	Air pressure switch not working		
15	MAX_TEMP_ERROR	The external overheat protection is enabled or the T_Supply sensor measures a temperature of over 100°C (212°F)	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.	a- Change the pump or restart it; b- Open the valves on hydraulic circuit; c- Change the high limit switch.
17	STACK_ERROR	Internal software error		Replace the power control board
18	INSTRUCTION_ERROR	Internal software error		Replace the power control board
19	ION_CHECK_FAILED	Internal software error		Replace the power control board
20	FLAME_OUT_TOO_LATE	Flame still present 10 seconds after closing the gas valve		Replace the gas valve
21	FLAME_BEFORE_IGNIT	Flame is detected before ignition		Replace the gas valve
22	TOO_MANY_FLAME_LOSS	Three times flame lost during 1 demand	a- Check the integrity of the wire connections of the spark and the earth on heat exchanger b- check ionisation signal while running	a- If wires are damaged, replace them b- check for proper combustion settings - if correct replace spark/flamerod.
23	CORRUPTED_ERROR_NR	Error code RAM byte was corrupted to an unknown error code		
24	FLUE_SWITCH_NOT_CLOSING	The blocked flue sensor is not closed within 10 minutes		

Error no.	Error	Description	Checks	Solutions
25	TSUPPLY_DIFF_ERROR	The 2 supply sensors deviate too much for more than 60 seconds		
26	TFLUE_DIFF_ERROR	The 2 flue sensors deviate too much for more than 60 seconds		
27	FILLING_TOO_MUCH	Too many automated filling attempts in a short time period		
28	FILL_TIME_ERROR	Filling takes too long		
29	PSM_ERROR	Internal software error		
30	REGISTER_ERROR	Internal software error		Replace the power control board
31	T_EXCHANGE_LOCK_ERROR	Exchange temperature exceeded the maximum temperature		
32	T_EXCHANGE_DIFF_ERROR	The 2 exchange sensors deviate too much for more than 60 seconds		
33	LWCO_1_ERROR	Low Water Cut Off 1 error	Check the LWCO	a- Verify water is in the boiler. b- Verify good connection between control module and low water probe.
34	LWCO_2_ERROR	Low Water Cut Off 2 error	NA	NA
35	GAS_PRESSURE_ERROR	Gas switch is open		
37	FLUE_PRESSURE_LOCKING	Flue pressure switch is closed for the fourth time.		

Blocking errors

Error no.	Error	Description	Checks	Solutions
100	WD_ERROR_RAM	Internal software error		Replace the power control board
101	WD_ERROR_ROM	Internal software error		Replace the power control board
102	WD_ERROR_STACK	Internal software error		Replace the power control board
103	WD_ERROR_REGISTER	Internal software error		Replace the power control board
104	WD_ERROR_XRL	Internal software error		Replace the power control board
105	HIGH_TEMP_ERROR	Supply temperature exceeds 110°C (230°F) with gas valve closed	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.
106	REFHI_TOO_HIGH	Internal software error		Replace the power control board
107	REFHI_TOO_LOW	Internal software error		Replace the power control board
108	REFLO_TOO_HIGH	Internal software error		Replace the power control board
109	REFLO_TOO_LOW	Internal software error		Replace the power control board
110	REFHI2_TOO_HIGH	Internal software error		Replace the power control board
111	REFHI2_TOO_LOW	Internal software error		Replace the power control board
112	REFLO2_TOO_HIGH	Internal software error		Replace the power control board
113	REFLO2_TOO_LOW	Internal software error		Replace the power control board
114	FALSE_FLAME	Flame is detected in a state in which no flame is allowed to be seen		Replace the power control board
115	LOW_WATER_PRESSURE_ERROR	Low water pressure error		
116	LOW_WATER_PRESSURE_SENSOR	Low water pressure		
117	BLOCKED_DRAIN	Blocked drain switch is active		
118	WD_COMM_ERROR	Watchdog communication error		Replace the power control board
119	RETURN_OPEN	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.

Error no.	Error	Description	Checks	Solutions
120	SUPPLY_OPEN	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.
121	SUPPLY2_OPEN	Supply2 sensor open		
122	DHW_OPEN	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.
123	FLUE_OPEN	Flue sensor open		
124	FLUE2_OPEN	Flue2 sensor open		
125	OUTDOOR_OPEN	Outdoor sensor open	a- Check the integrity of the wire connections; b- Check the Outdoor 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.
126	RETURN_SHORTED	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.
127	SUPPLY_SHORTED	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.
128	SUPPLY2_SHORTED	Supply2 sensor shorted		
129	DHW_SHORTED	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.
130	FLUE_SHORTED	Flue sensor shorted		
131	FLUE2_SHORTED	Flue2 sensor shorted		
132	OUTDOOR_SHORTED	Outdoor sensor shorted	a- Check the integrity of the wire connections; b- Check the Outdoor 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.
133	RESET_BUTTON_ERROR	Too many resets in a short time period		
135	T_EXCHANGE_BLOCK_ERROR	Exchange temperature exceeded 90°C		
136	T_CHIMNEY_OPEN	Chimney sensor open		
137	T_EXCHANGE1_OPEN	Exchange 1 sensor open		
138	T_EXCHANGE2_OPEN	Exchange 2 sensor open		
139	T_SELECTION1_OPEN	Selection 1 sensor open		
140	T_SELECTION2_OPEN	Selection 2 sensor open		
141	T_SELECTION3_OPEN	Selection 3 sensor open		
142	T_OPTIONAL1_OPEN	Optional 1 sensor open		
143	T_OPTIONAL2_OPEN	Optional 2 sensor open		
144	T_AMBIENT_OPEN	Ambient sensor open		
145	T_CHIMNEY_CLOSED	Chimney sensor shorted		
146	T_EXCHANGE1_CLOSED	Exchange 1 sensor shorted		

Error no.	Error	Description	Checks	Solutions
147	T_EXCHANGE2_CLOSED	Exchange 2 sensor shorted		
148	T_SELECTION1_CLOSED	Selection 1 sensor shorted		
149	T_SELECTION2_CLOSED	Selection 2 sensor shorted		
150	T_SELECTION3_CLOSED	Selection 3 sensor shorted		
151	T_OPTIONAL1_CLOSED	Optional 1 sensor shorted		
152	T_OPTIONAL2_CLOSED	Optional 2 sensor shorted		
153	T_AMBIENT_CLOSED	Ambient sensor shorted		
154	WD_CONFIG_ERROR	Watchdog fan configuration setting error		
155	FLUE_PRESSURE_ERROR	Flue pressure switch is closed	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.
157	T_SECONDARY_SUPPLY_OPEN	Secondary circuit supply sensor open		
158	T_SECONDARY_RETURN_OPEN	Secondary circuit return sensor open		
159	T_SECONDARY_SUPPLY_CLOSED	Secondary circuit supply sensor shorted		
160	T_SECONDARY_RETURN_CLOSED	Secondary circuit return sensor shorted		
161	FILL_WARNING	Pressure is too low, demand has stopped but no error needed to be stored at this time		
162	FLUE_BLOCKED	Flue is blocked, demand needs to be stopped with fan at ignition speed but no error needed to be stored at this time		
163	LOWEXFLOW_PROTECTION	Flow is too low, demand needs to be stopped with fan at ignition speed but no error needed to be stored at this time		

Warnings

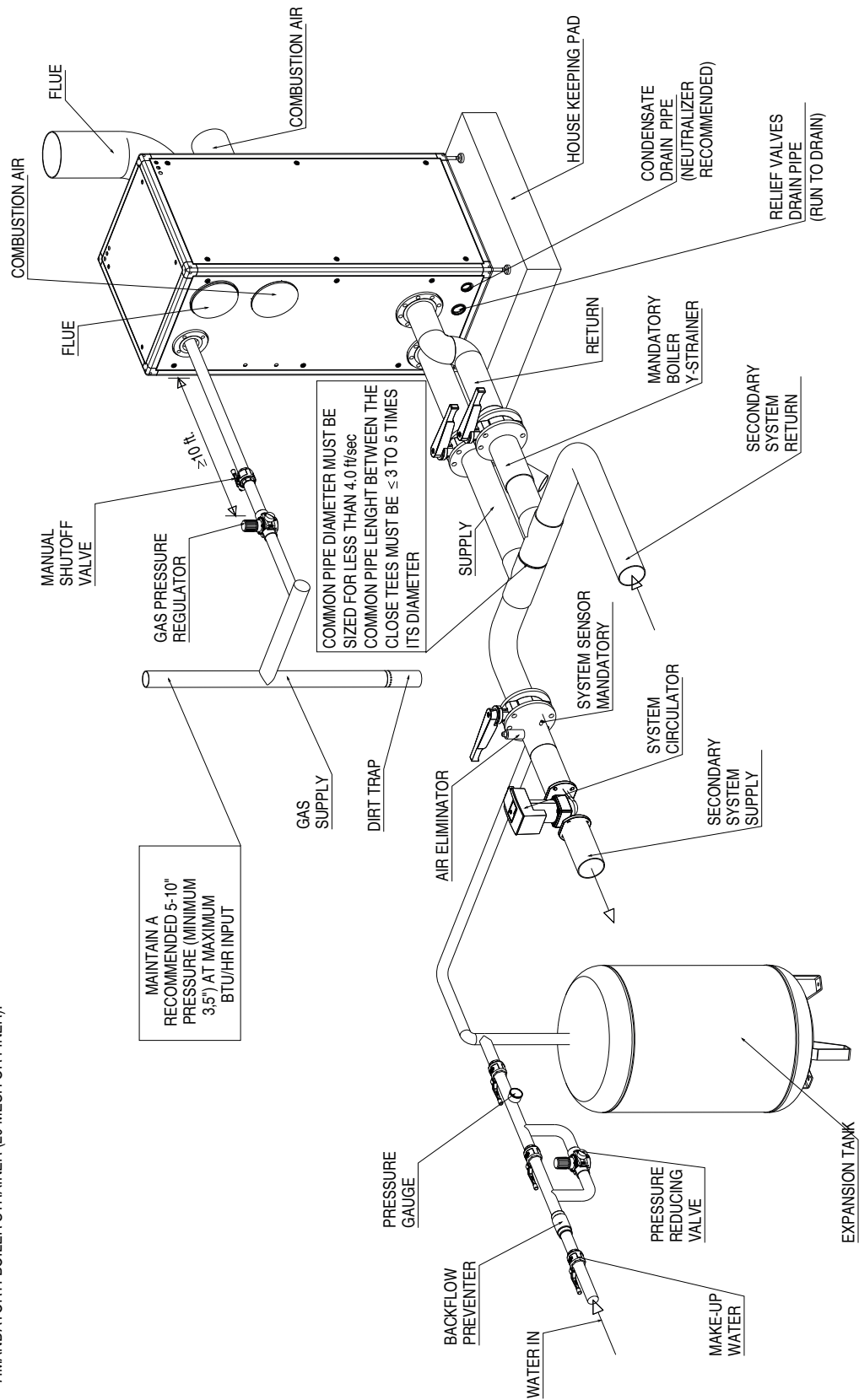
Error no.	Error	Description	Checks	Solutions
200	CC_LOSS_COMMUNICATION	Cascade System: Leading burner lost communication with one of the depending burners		
201	CC_LOSS_BOILER_COMM	Cascade System: Leading boiler lost communication with one of the depending boilers		
202	OUTDOOR_WRONG	Outdoor sensor is open or shorted		
203	T_SYSTEM_WRONG	T_System sensor is open or shorted		
204	T_CASCADE_WRONG	T_Cascade sensor is open or shorted		

Appendix E - Boiler Installation (example drawings)

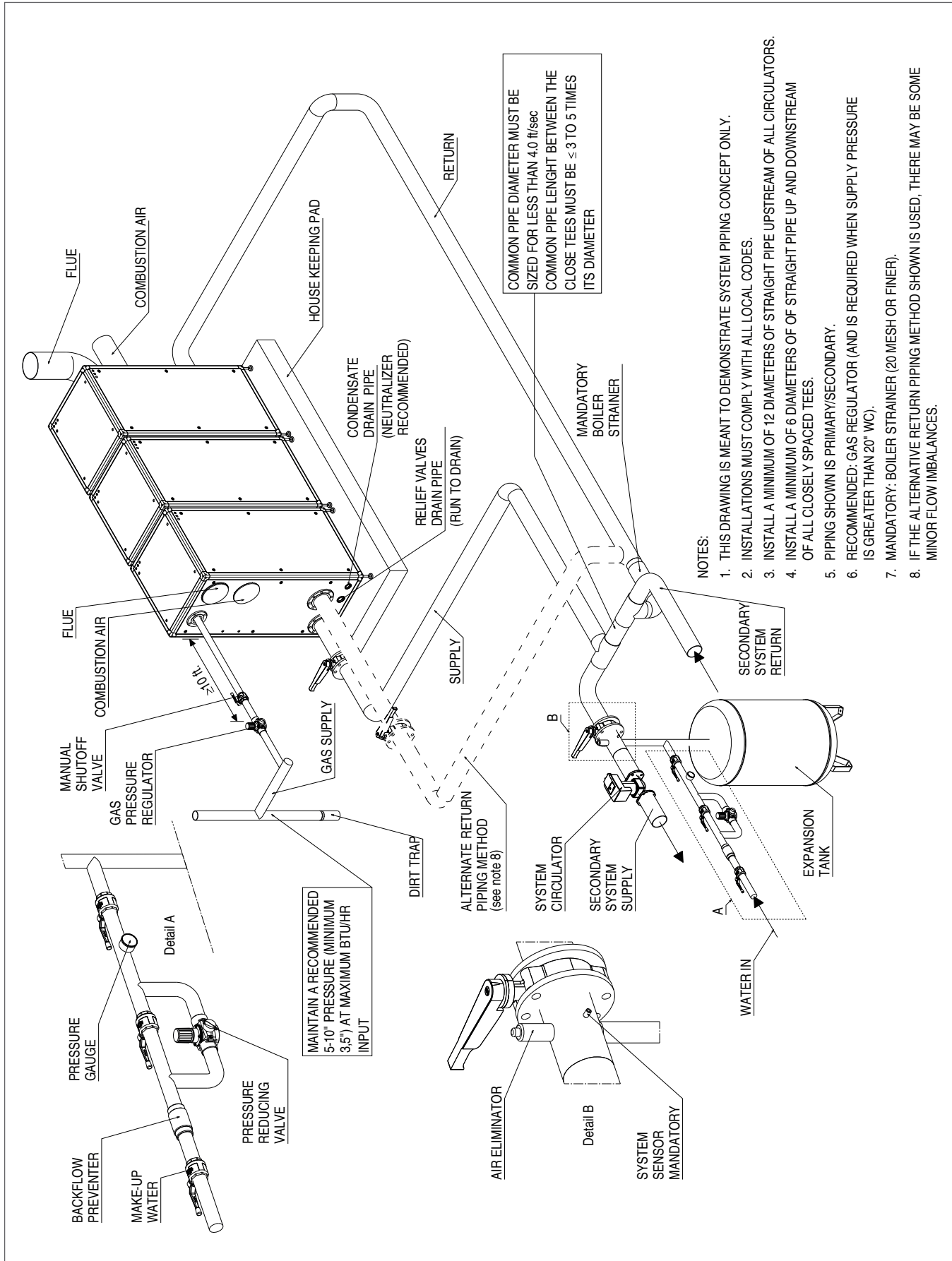
SSB 800 SA, 1000 SA Stand Alone Installation

NOTES:

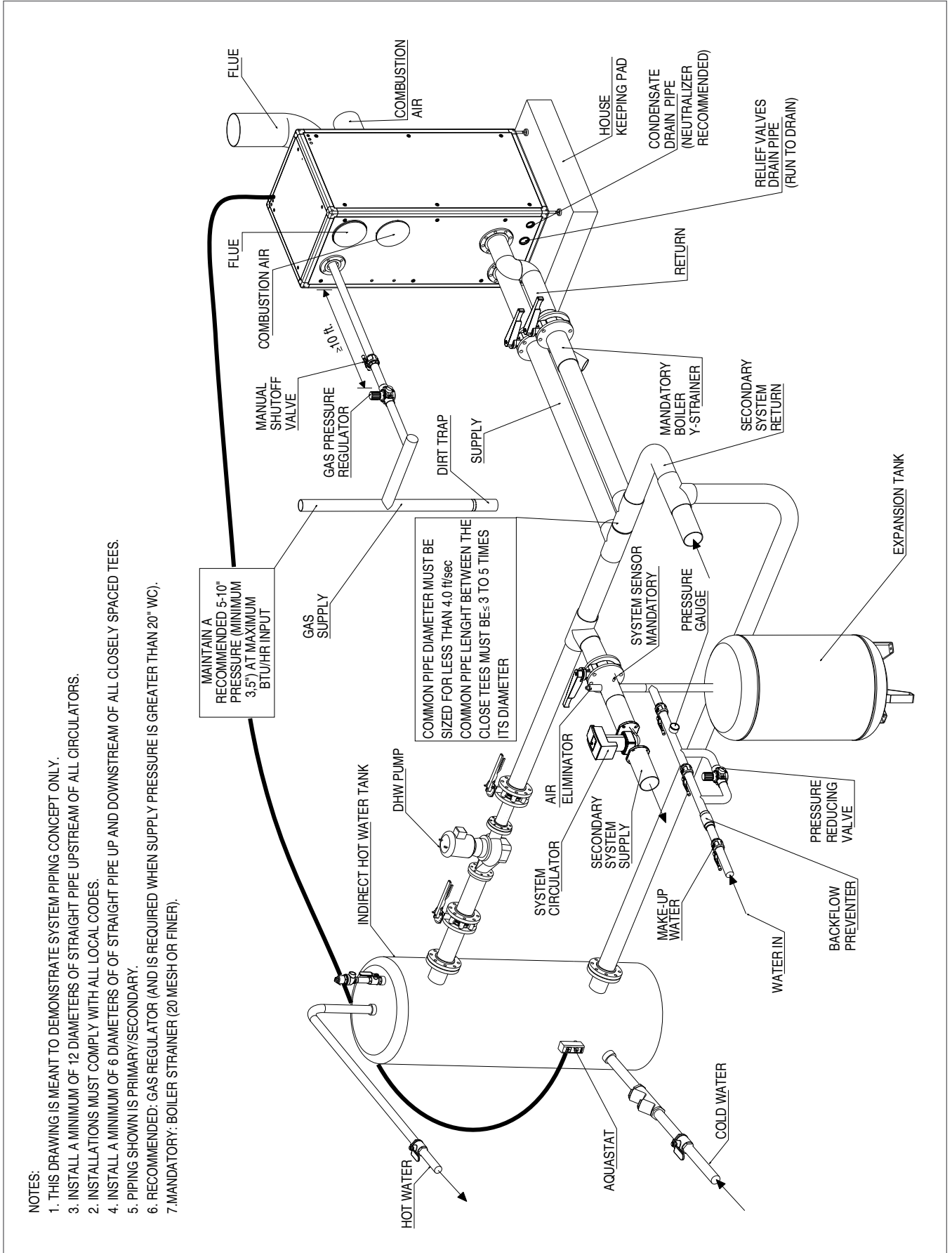
1. THIS DRAWING IS MEANT TO DEMONSTRATE SYSTEM PIPING CONCEPT ONLY.
2. INSTALLATIONS MUST COMPLY WITH ALL LOCAL CODES.
3. INSTALL A MINIMUM OF 12 DIAMETERS OF STRAIGHT PIPE UPSTREAM OF ALL CIRCULATORS.
4. INSTALL A MINIMUM OF 6 DIAMETERS OF STRAIGHT PIPE UP AND DOWNSTREAM OF ALL CLOSELY SPACED TEES.
5. PIPING SHOWN IS PRIMARY/SECONDARY.
6. RECOMMENDED: GAS REGULATOR (AND IS REQUIRED WHEN SUPPLY PRESSURE IS GREATER THAN 20" WC).
7. MANDATORY: BOILER STRAINER (20 MESH OR FINER).



SSB 1000 TL3 Cascade (3 units) Installation



SSB 800 SA, 1000 SA Stand Alone Installation with Hot Water Storage Tank



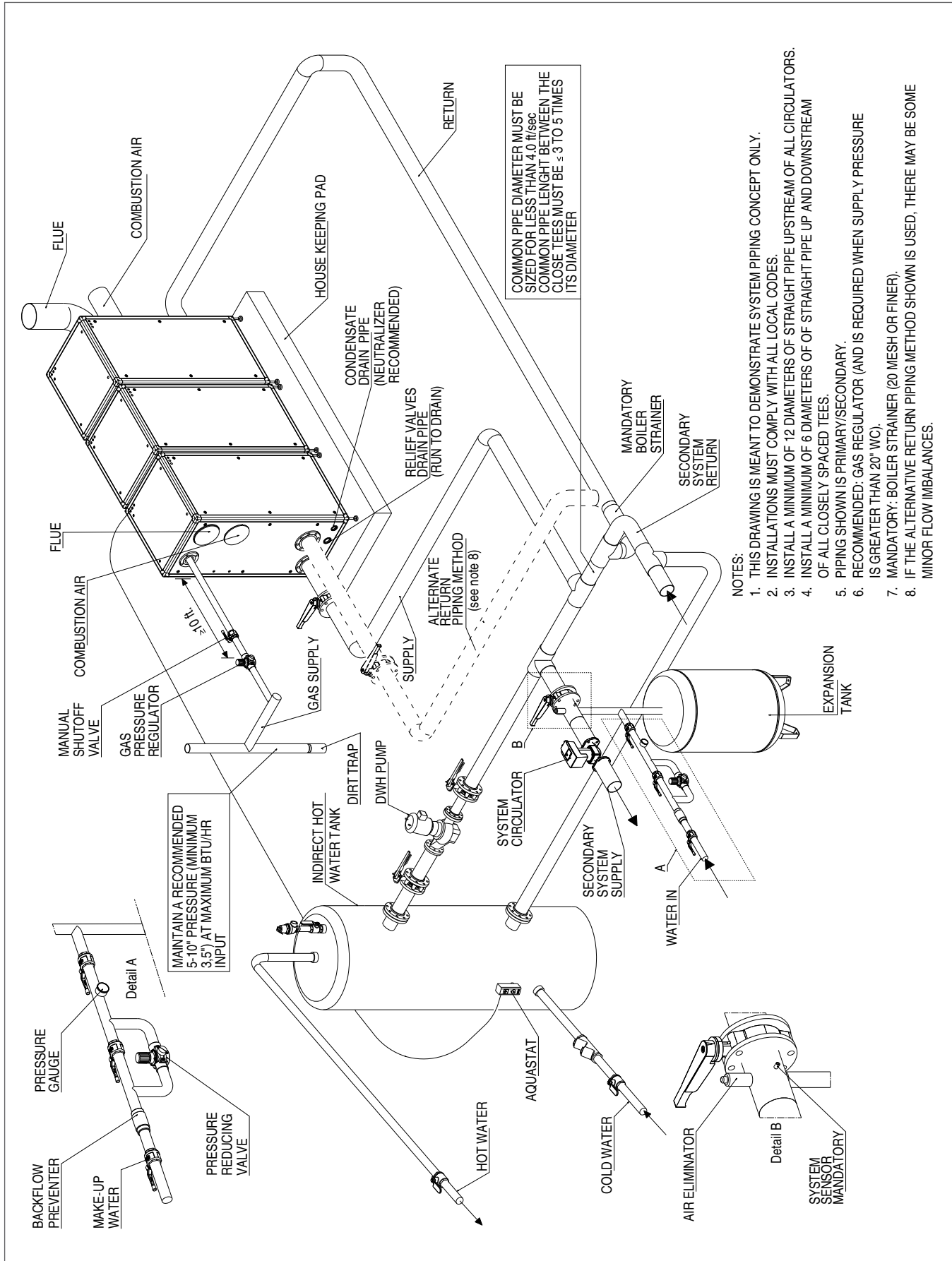
NOTES:

1. THIS DRAWING IS MEANT TO DEMONSTRATE SYSTEM PIPING CONCEPT ONLY.
3. INSTALL A MINIMUM OF 12 DIAMETERS OF STRAIGHT PIPE UPSTREAM OF ALL CIRCULATORS.
2. INSTALLATIONS MUST COMPLY WITH ALL LOCAL CODES.
4. INSTALL A MINIMUM OF 6 DIAMETERS OF STRAIGHT PIPE UP AND DOWNSTREAM OF ALL CLOSELY SPACED TEES.
5. PIPING SHOWN IS PRIMARY/SECONDARY.
6. RECOMMENDED: GAS REGULATOR (AND IS REQUIRED WHEN SUPPLY PRESSURE IS GREATER THAN 20" WC).
7. MANDATORY: BOILER STRAINER (20 MESH OR FINER).

MAINTAIN A RECOMMENDED 5-10" PRESSURE (MINIMUM 3.5") AT MAXIMUM BTU/HR INPUT

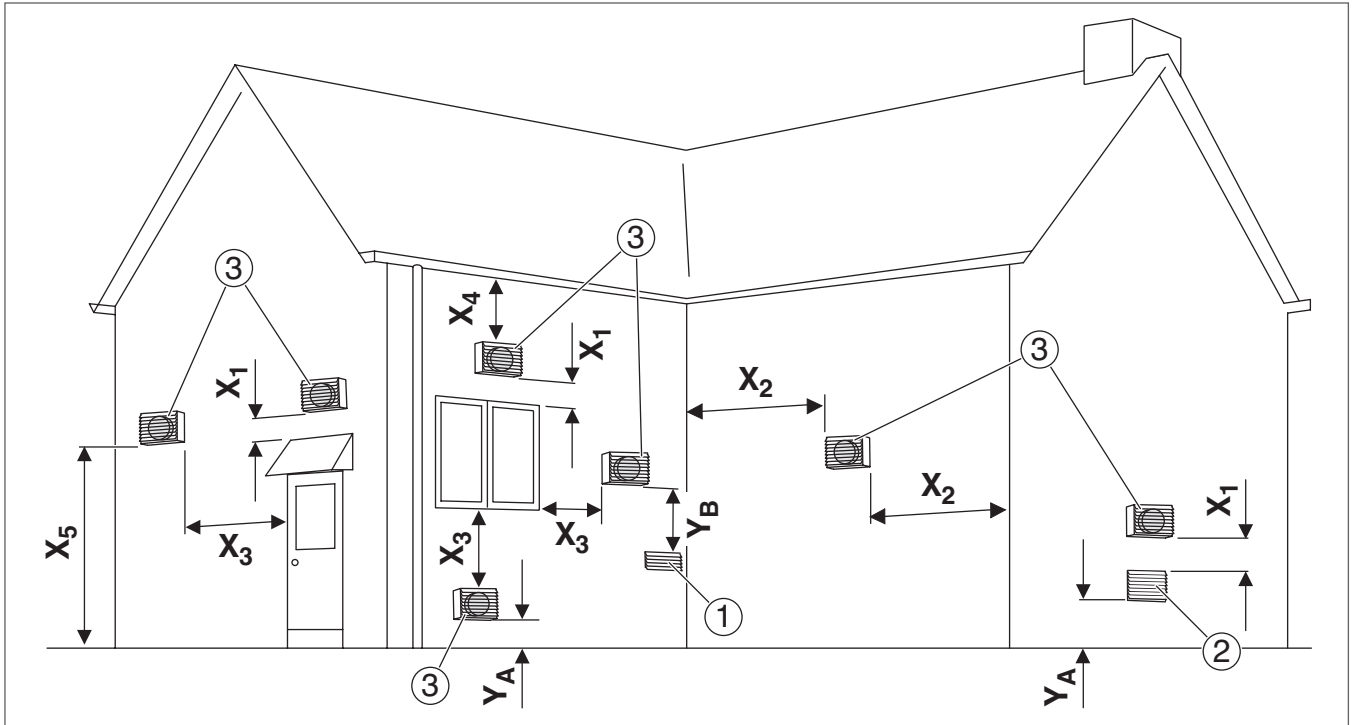
COMMON PIPE DIAMETER MUST BE SIZED FOR LESS THAN 4.0 ft/sec
COMMON PIPE LENGTH BETWEEN THE CLOSE TEES MUST BE \leq 3 TO 5 TIMES ITS DIAMETER

SSB 1000 TL3 Cascade (3 units) Installation with Hot Water Storage Tank



- NOTES:
1. THIS DRAWING IS MEANT TO DEMONSTRATE SYSTEM PIPING CONCEPT ONLY.
 2. INSTALLATIONS MUST COMPLY WITH ALL LOCAL CODES.
 3. INSTALL A MINIMUM OF 12 DIAMETERS OF STRAIGHT PIPE UPSTREAM OF ALL CIRCULATORS.
 4. INSTALL A MINIMUM OF 6 DIAMETERS OF STRAIGHT PIPE UP AND DOWNSTREAM OF ALL CLOSELY SPACED TEES.
 5. PIPING SHOWN IS PRIMARY/SECONDARY.
 6. RECOMMENDED: GAS REGULATOR (AND IS REQUIRED WHEN SUPPLY PRESSURE IS GREATER THAN 20" WC).
 7. MANDATORY: BOILER STRAINER (20 MESH OR FINER).
 8. IF THE ALTERNATE RETURN PIPING METHOD SHOWN IS USED, THERE MAY BE SOME MINOR FLOW IMBALANCES.

Appendix F - Exhaust terminals and Air inlet Clearances

**Direct vent (sealed combustion) / Fan assisted appliance (Room air for combustion). See Note 1)**

- | | |
|--|--|
| [1] Forced air inlet | X4 See Note 1) |
| [2] Gravity air inlet | X5 7 feet (2135 mm) |
| [3] Exhaust terminal | YA At least 1 foot (305 mm) above grade or snow line |
| X1 1 foot (305 mm) | YB Exhaust terminal must be at least: |
| X2 At least 3 feet (915mm) | 3 feet (915 mm) above forced air inlet within |
| X3 1 foot (305 mm) USA - Direct vent (sealed combustion) | 10 feet (3050 mm) horizontally – USA |
| 4 foot (1220mm) USA - Fan assisted appliance (room air combustion) | 6 feet (915 mm) above forced air inlet - Canada |
| 3 feet (915 mm) Canada | |

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

Locate vent termination minimum 7' (2.1 m) above any public walkway, with consideration to condensate.

Position termination so it will not be effected by wind eddy, air born leaves, snow, or recirculated vent gases. Give consideration to excessive wind and locate away from windward side of building.

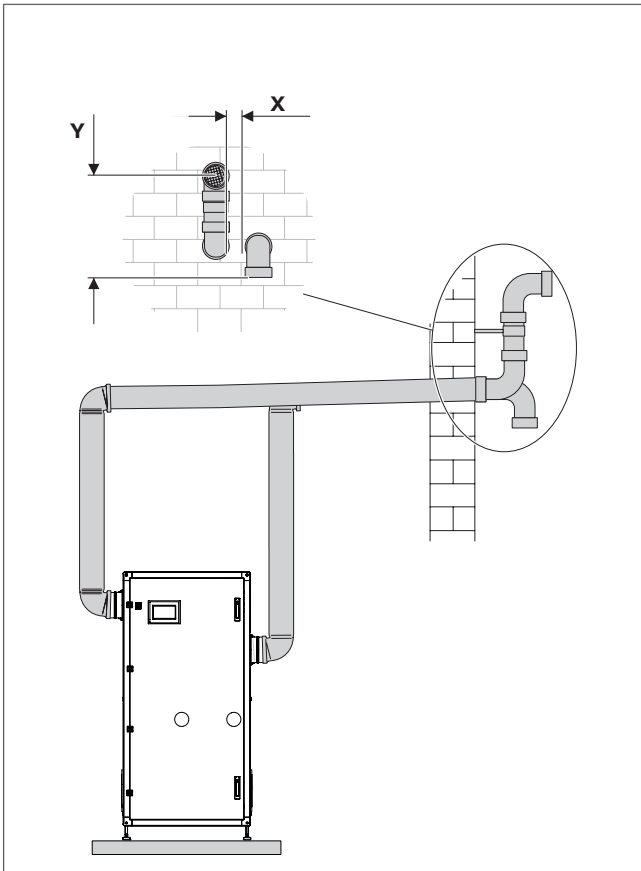
Do not use chimney as a raceway if another boiler or fireplace is vented into or through chimney.

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

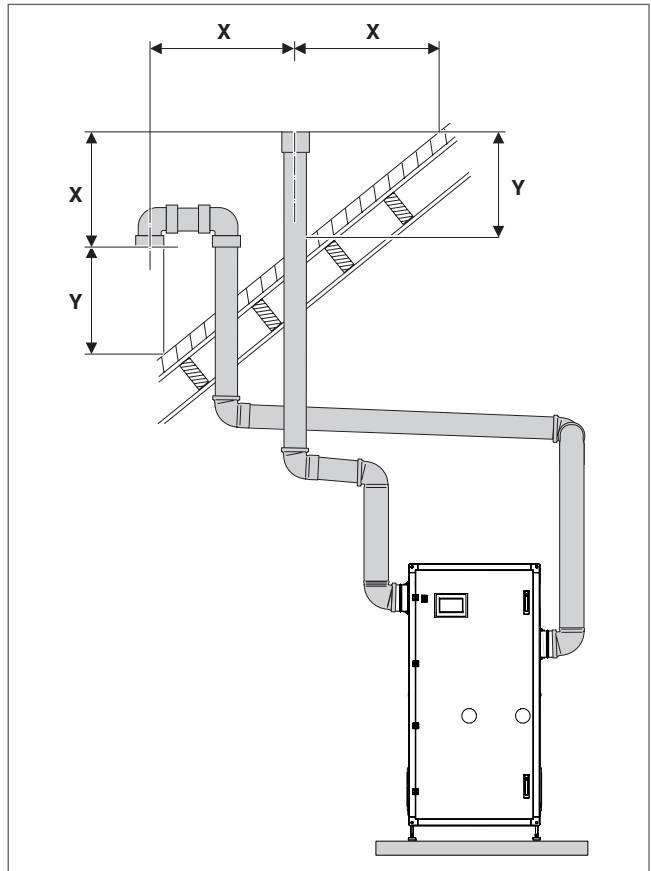
Vent terminations must keep the following minimum clearances from electric meters, gas meters, regulators and relief equipment: 4 feet (1220 mm) [Canada 6 feet (1830 mm)] horizontally and in no case above and below, unless a horizontal distance of 4 feet (1220 mm) [Canada 6 feet (1830 mm)] is maintained.

NOTE

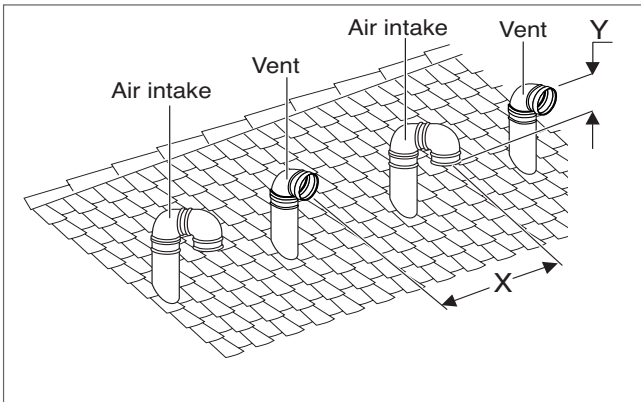
1) For Clearances not specified in ANSI Z223.1 / NFPA 54 or CSA B149.1 Clearance in accordance with local installation codes and the requirements of the gas supplier including the Authority having jurisdiction.



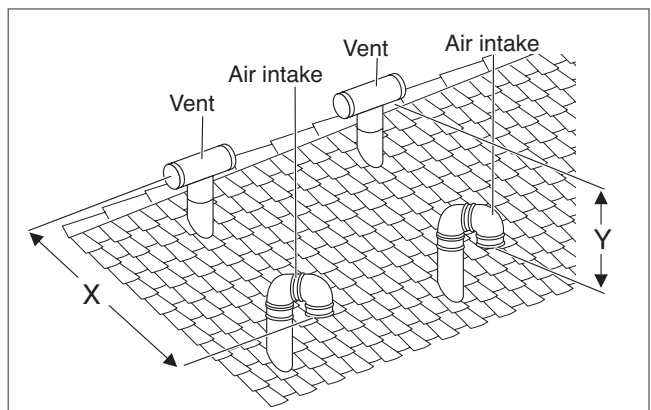
Horizontal venting system (sealed combustion):
 $X \geq 4''$ (102 mm);
 $Y \geq 12''$ (305 mm)



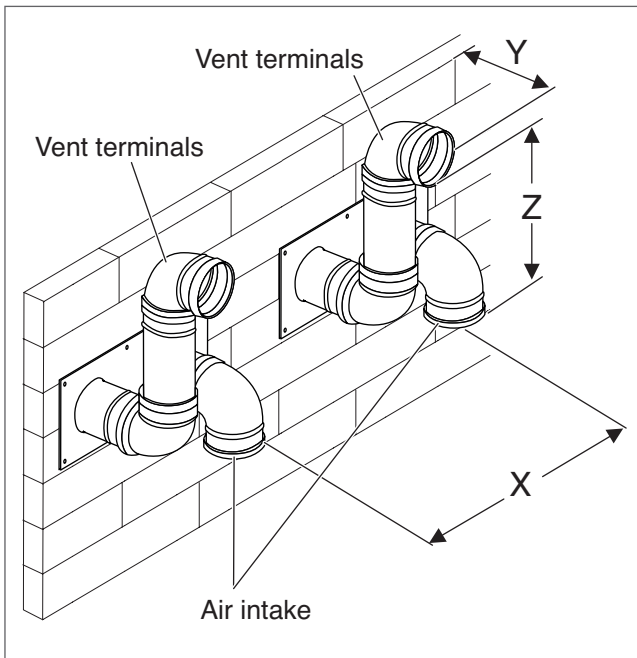
Vertical venting system (sealed combustion):
 $X > 12''$ (305 mm)
 $Y = 12''$ (305 mm) above maximum snow level or at least 24'' whichever is greater



Multiple air and vent vertical termination:
 $X \geq 12''$ (305 mm);
 $Y \geq 12''$ (305 mm)



Multiple air and vent vertical termination:
 $X \geq 12''$ (305 mm);
 $Y \geq 12''$ (305 mm)



Multiple air and vent horizontal termination:
 $X \geq 12'' (305 \text{ mm})$;
 $Y \leq 25'' (635 \text{ mm})$
 $Z \geq 12'' (305 \text{ mm})$

Appendix G - Sensor Resistance

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

Resistance table for:

- Module supply temperature sensor
- Module return sensor
- Module flue sensor
- Boiler supply sensor
- System temperature sensor
- Outdoor temperature sensor

Appendix H - De-rating for altitude installation

When the appliance is installed at an altitude higher than 2000 ft, the fan speed must be set to the top of the available range 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 table (input BTU/hr):

SSB 800 SA

Altitude (ft)	From 0% to 25%	From 25% to 50%	From 50% to 75%	From 75% to 100%
0-2000	798000	798000	798000	798000
3000	732482	719768	707056	694344
4000	708185	695893	683603	671312
5000	683889	672021	660151	648281
6000	659592	648144	636698	625250
7000	635298	624272	613246	602220
8000	611001	600397	589793	579187
9000	586707	576523	566341	556159
10000	562408	552648	542888	533126

SSB 1000 SA / 1000 TL

Altitude (ft)	From 0% to 25%	From 25% to 50%	From 50% to 75%	From 75% to 100%
0-2000	1000000	1000000	1000000	1000000
3000	917896	901967	886035	870105
4000	887450	872047	856645	841243
5000	857004	842131	827256	812383
6000	826557	812212	797866	783520
7000	796112	782296	768478	754661
8000	765665	752376	739087	725800
9000	735220	722461	709701	696939
10000	704773	692541	680310	668078

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

We have an **SSB 1000 SA** boiler installed at 5400 ft with a 6" 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 IOM manual) 100 ft.

The % range is $90/100 = 90\%$. This value is within the 75% and 100%.

Now the correct de-rating value is given from the value of the fourth column (From 75% to 100%) of the **SSB 1000 SA / 1000 TL** table that crosses the row with 6000 ft: 783520 BTU/hr.

Appendix I - Venting size data

SSB 800 SA

	Unit	T supply / return (°F): 176 / 140		T supply / return (°F): 104 / 86	
		Maximum Input	Minimum Input	Maximum Input	Minimum Input
CO ₂	%	9	9	9	9
Exhaust gas mass (weight)	lb/s	0,21	0,02	0,21	0,02
Flue temperature	°F	167	147,2	104	89,6
Max. pressure at boiler exit	in. wc	0,83	0,04	0,72	0,03

SSB 1000 SA

	Unit	T supply / return (°F): 176 / 140		T supply / return (°F): 104 / 86	
		Maximum Input	Minimum Input	Maximum Input	Minimum Input
CO ₂	%	9	9	9	9
Exhaust gas mass (weight)	lb/s	0,26	0,02	0,26	0,02
Flue temperature	°F	176	152,6	104	91,4
Max. pressure at boiler exit	in. wc	0,91	0,05	0,83	0,03

SSB 1000 TL

	Unit	T supply / return (°F): 176 / 140		T supply / return (°F): 104 / 86	
		Maximum Input	Minimum Input	Maximum Input	Minimum Input
CO ₂	%	9	9	9	9
Exhaust gas mass (weight)	lb/s	0,26	0,02	0,53	0,02
Flue temperature	°F	176	152,6	104	91,4
Max. pressure at boiler exit	in. wc	0,96	0,05	0,86	0,03

SSB 1000 TL2

	Unit	T supply / return (°F): 176 / 140		T supply / return (°F): 104 / 86	
		Maximum Input	Minimum Input	Maximum Input	Minimum Input
CO ₂	%	9	9	9	9
Exhaust gas mass (weight)	lb/s	0,53	0,02	0,53	0,02
Flue temperature	°F	176	152,6	104	91,4
Max. pressure at boiler exit	in. wc	0,91	0,05	0,82	0,03

SSB 1000 TL3

	Unit	T supply / return (°F): 176 / 140		T supply / return (°F): 104 / 86	
		Maximum Input	Minimum Input	Maximum Input	Minimum Input
CO ₂	%	9	9	9	9
Exhaust gas mass (weight)	lb/s	0,79	0,02	0,79	0,02
Flue temperature	°F	176	152,6	104	91,4
Max. pressure at boiler exit	in. wc	0,79	0,05	0,71	0,03

SSB 1000 TL4

	Unit	T supply / return (°F): 176 / 140		T supply / return (°F): 104 / 86	
		Maximum Input	Minimum Input	Maximum Input	Minimum Input
CO ₂	%	9	9	9	9
Exhaust gas mass (weight)	lb/s	1,06	0,02	1,06	0,02
Flue temperature	°F	176	152,6	104	91,4
Max. pressure at boiler exit	in. wc	0,59	0,05	0,51	0,03

7 Spare parts

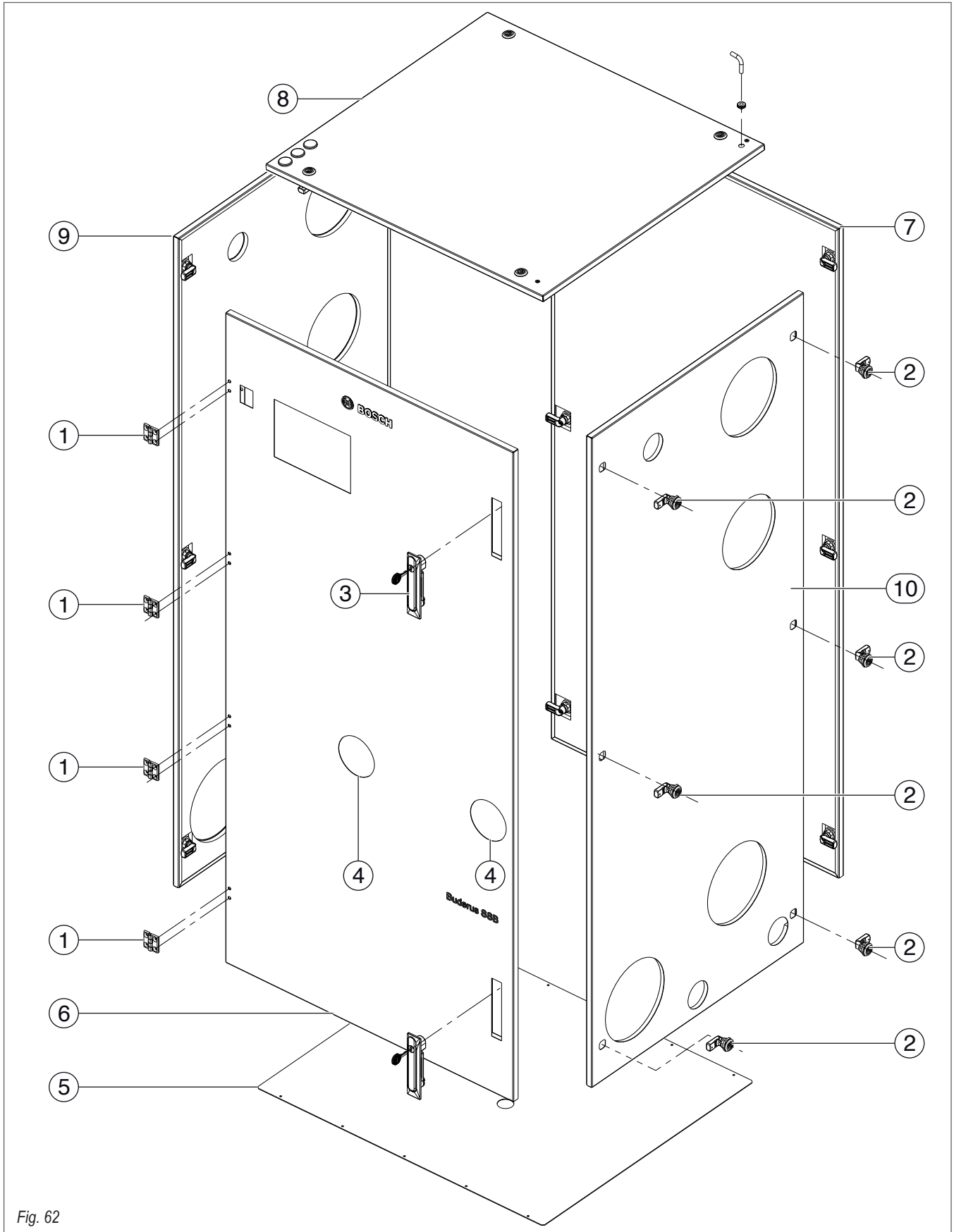


Fig. 62

Item (→ Fig. 62)	Description	Q.ty per boiler	SSB 800 SA	SSB 1000 SA	SSB 1000 TL	Order number
1	Plastic hinge	4	■	■	■	7-738-006-397
2	Lock 90° turn for non-hinged panels	22	■	■	■	7-738-006-395
3	Lock with handle for hinged panels	2	■	■	■	7-738-006-396
4	Plastic disc	2	■	■	■	7-738-006-394
5	Bottom panel	1	■	■	■	7-738-006-376
6	Front panel	1	■	■	■	7-738-006-369
7	Rear panel	1	■	■	■	7-738-006-370
8	Top panel	1	■	■	■	7-738-006-371
9	Left side panel	1	■	■		7-738-006-372
9	Left side panel	1			■	7-738-006-373
10	Right side panel	1	■	■		7-738-006-374
10	Right side panel	1			■	7-738-006-375

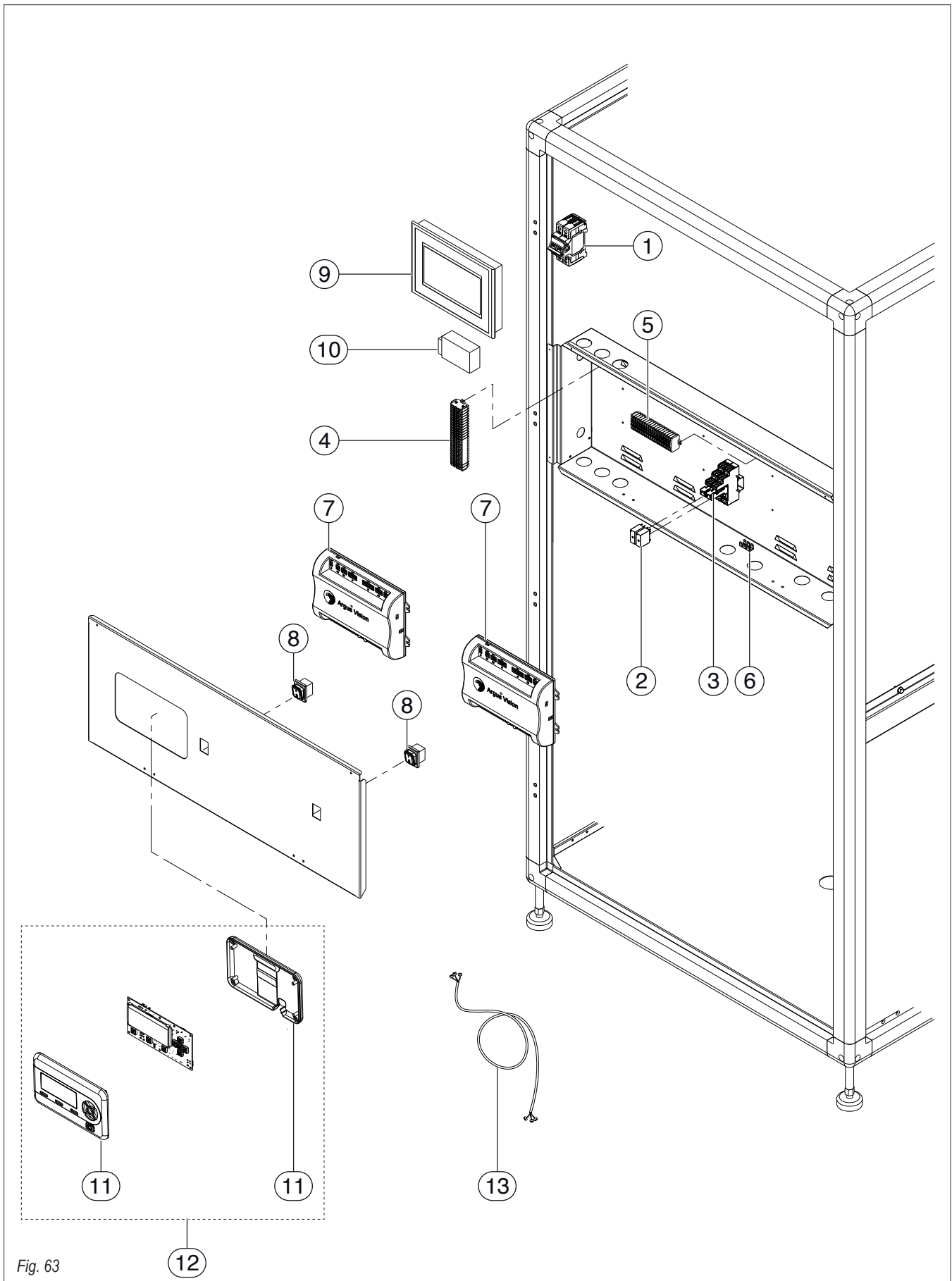


Fig. 63

Item (→ Fig. 63)	Description	Q.ty per boiler	SSB 800 SA	SSB 1000 SA	SSB 1000 TL	Order number
1	Boiler power main switch ABB S202 32A	1	■	■	■	7-738-006-402
2	Relay	2	■	■	■	7-738-006-400
3	Relay holder	2	■	■	■	7-738-006-399
4	Terminal strip (24 connections - high voltage)	1	■	■	■	7-738-006-368
5	Terminal strip (18 connections - low voltage)	1	■	■	■	7-738-005-045
6	Ground terminal strip	1	■	■	■	7-738-006-401
7	905MN controller	2	■	■	■	7-738-006-398
8	ON/OFF Module Power switch	2	■	■	■	7-738-005-041
9	905TS touchscreen display	1	■	■	■	7-738-006-390
10	905TS power supply	1	■	■	■	7-738-006-393
11	Plastic enclosure of the Service display and screws	1	■	■	■	7-738-006-391
12	905PB service display and screws	1	■	■	■	7-738-006-392
13	Cascade bus wiring harness	1			■	7-738-006-419

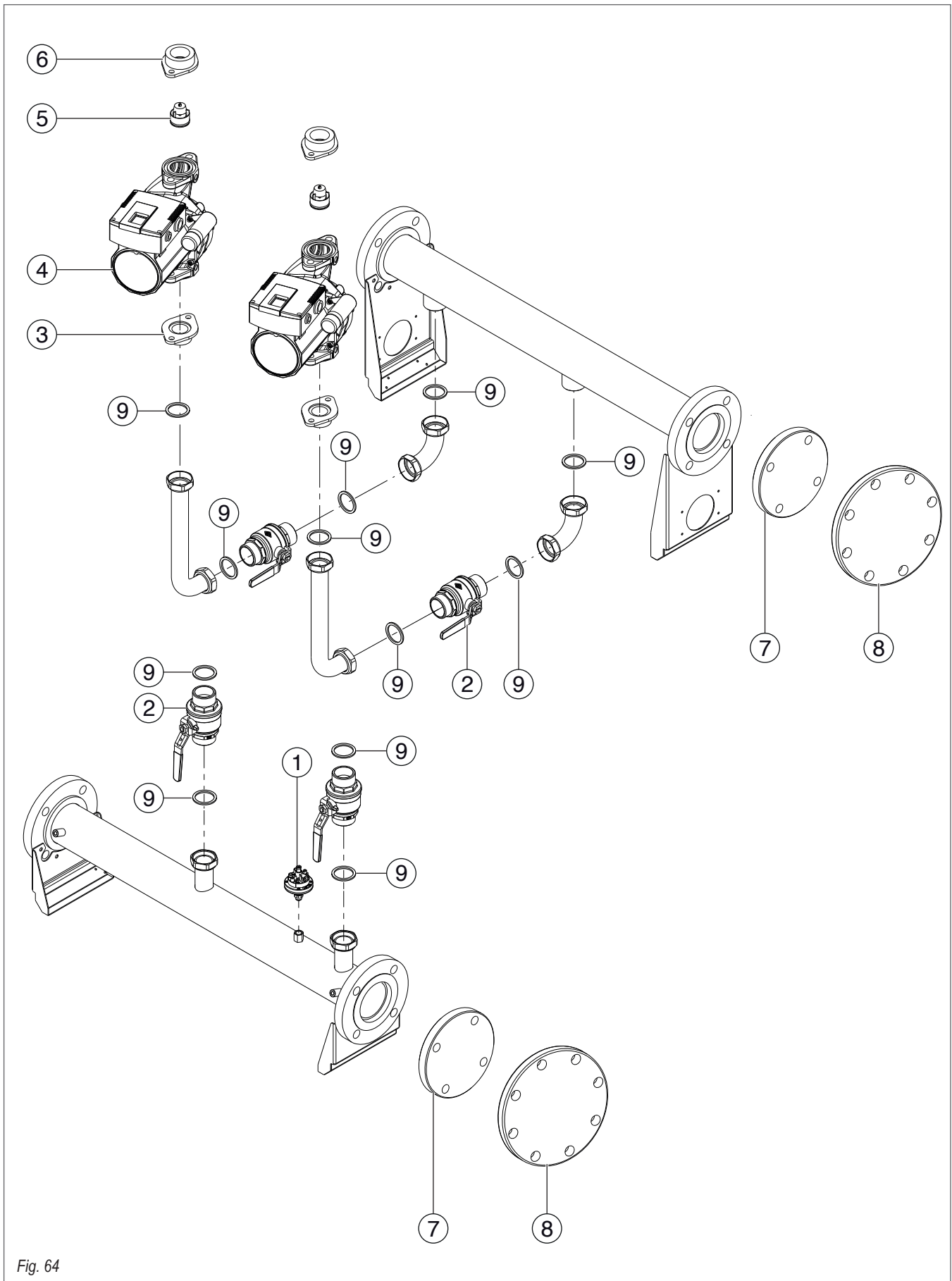


Fig. 64

Item (→ Fig. 64)	Description	Q.ty per boiler	SSB 800 SA	SSB 1000 SA	SSB 1000 TL	Order number
1	Water minimum pressure switch	1	■	■	■	7-738-006-383
2	Ball valve 1"1/2 MM	4	■	■	■	7-738-006-380
2	Ball valve 1"1/2 FF	4	■ ⁽¹⁾	■ ⁽¹⁾	■ ⁽¹⁾	7-738-006-435
3	Flanged adapter 1"1/2 M for pump	2	■	■	■	7-738-006-382
3	Flanged adapter 1"1/2 M for pump	2	■ ⁽¹⁾	■ ⁽¹⁾	■ ⁽¹⁾	7-738-006-437
4	Pump	2	■	■	■	7-738-006-281
5	Check valve	2	■	■	■	7-738-006-385
6	Flanged adapter 2" M for pump	2	■	■	■	7-738-006-381
6	Flanged adapter 2" M for pump	2	■ ⁽¹⁾	■ ⁽¹⁾	■ ⁽¹⁾	7-738-006-436
7	Blind flange 3"	2	■	■		7-738-006-432
8	Blind flange 5"	2			■	7-738-006-433
9	Washer 1"1/2 EPDM	12	■	■	■	7-738-007-212

(1) For all boilers with serial number higher than 3520-759-000001-7738004897

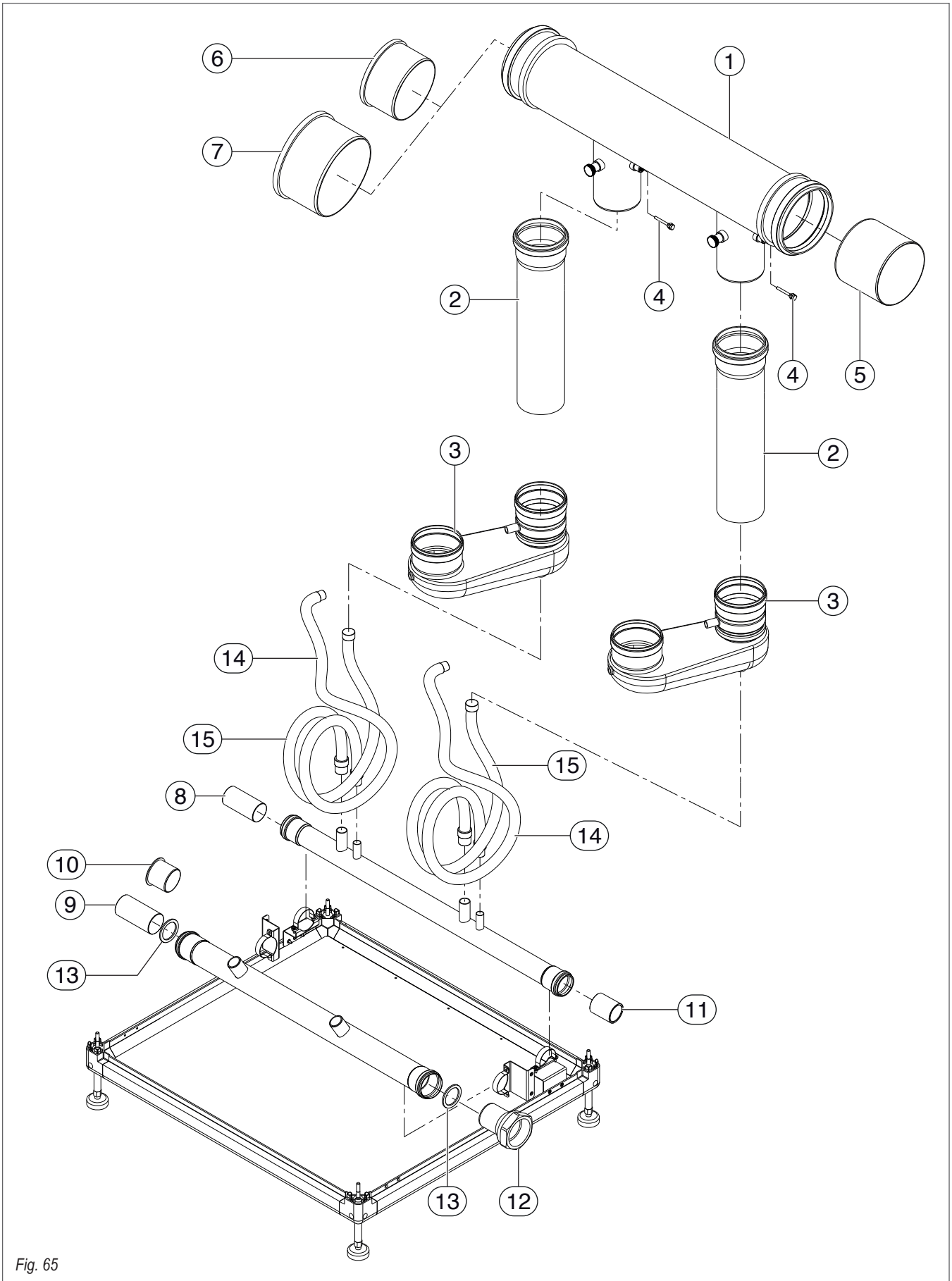


Fig. 65

Item (→ Fig. 65)	Description	Q.ty per boiler	SSB 800 SA	SSB 1000 SA	SSB 1000 TL	Order number
1	PP Flue manifold (6")	1	■	■		7-738-006-362
1	PP Flue manifold (10")	1			■	7-738-006-363
2	Exhaust pipe (4")	2		■	■	7-738-006-360
2	Exhaust pipe (4")	2	■			7-738-006-361
3	PP Condensate collector	2	■	■	■	7-738-006-364
4	Flue temperature sensor	2	■	■	■	7-738-004-969
5	Flue stub 10" PP	1			■	7-738-006-420
6	Flue cap (6" PP)	2	■	■		7-738-006-430
7	Flue cap (10" PP)	2			■	7-738-006-431
8	Condensate manifold stub (PP)	1			■	7-738-006-427
9	Relief valves manifold stub (stainless steel)	1			■	7-738-006-422
10	Relief valves manifold cap (stainless steel)	1	■	■	■	7-738-006-428
11	Condensate manifold adapter	1	■	■	■	7-738-006-423
12	Relief valves manifold adapter	1	■	■	■	7-738-006-421
13	Washer for pipe DN60	2	■	■	■	7-738-006-493
14	Flexible pipe	2	■	■	■	7-738-007-120
15	Flexible pipe	2	■	■	■	7-738-007-119

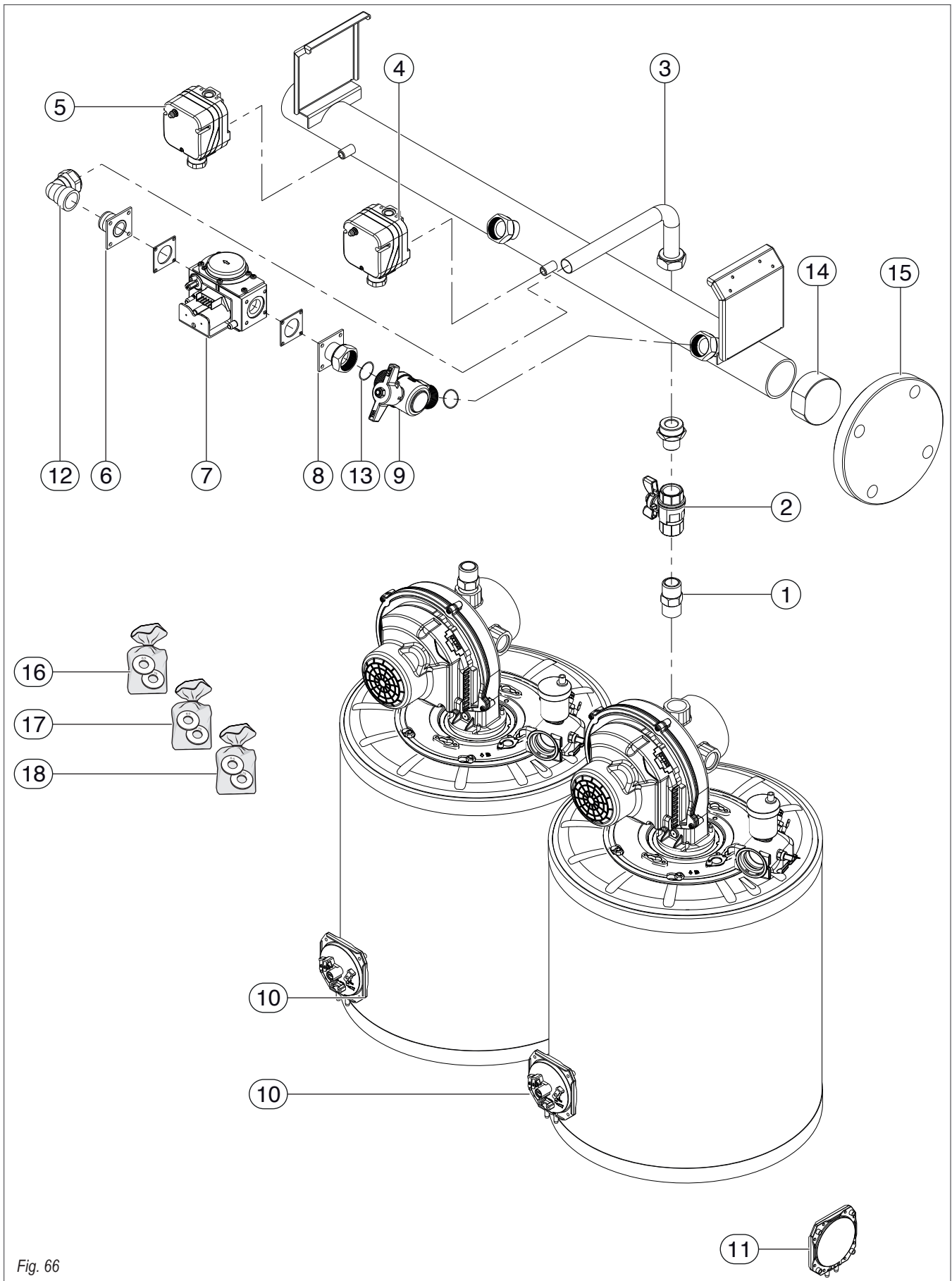


Fig. 66

Item (→ Fig. 66)	Description	Q.ty per boiler	SSB 800 SA	SSB 1000 SA	SSB 1000 TL	Order number
1	Nipple 3/4"-3/4" MM NPT	2	■	■	■	7-738-005-008
2	Ball valve 3/4" FF	2	■	■	■	7-738-005-010
3	Stainless steel gas pipe	2	■	■	■	7-738-006-367
4	Gas high pressure switch 1/4"	1	■	■	■	7-738-006-389
5	Gas low pressure switch 1/4"	1	■	■	■	7-738-005-026
6	Gas valve flange	2	■	■	■	7-738-006-378
7	Gas valve	2	■	■	■	7-738-005-022
8	Flange for gas valve 1" F	2	■	■	■	7-738-006-379
9	90° Ball valve 1" MM	2	■	■	■	7-738-006-388
10	Flue pressure switch	2	■	■	■	7-738-004-974
11	Air differential pressure switch	1	■	■	■	7-738-005-410
12	90° Brass elbow 3/4" F	2	■	■	■	7-738-006-387
13	Gas valve washer	2	■	■	■	7-738-005-020
14	Gas header 2" threaded cap	1	■	■		7-738-006-429
15	Blind flange 3"	1			■	7-738-006-432
16	LP gas conversion kit	1	■			7-738-006-424
17	LP gas conversion kit	1		■		7-738-006-425
18	LP gas conversion kit	1			■	7-738-006-426

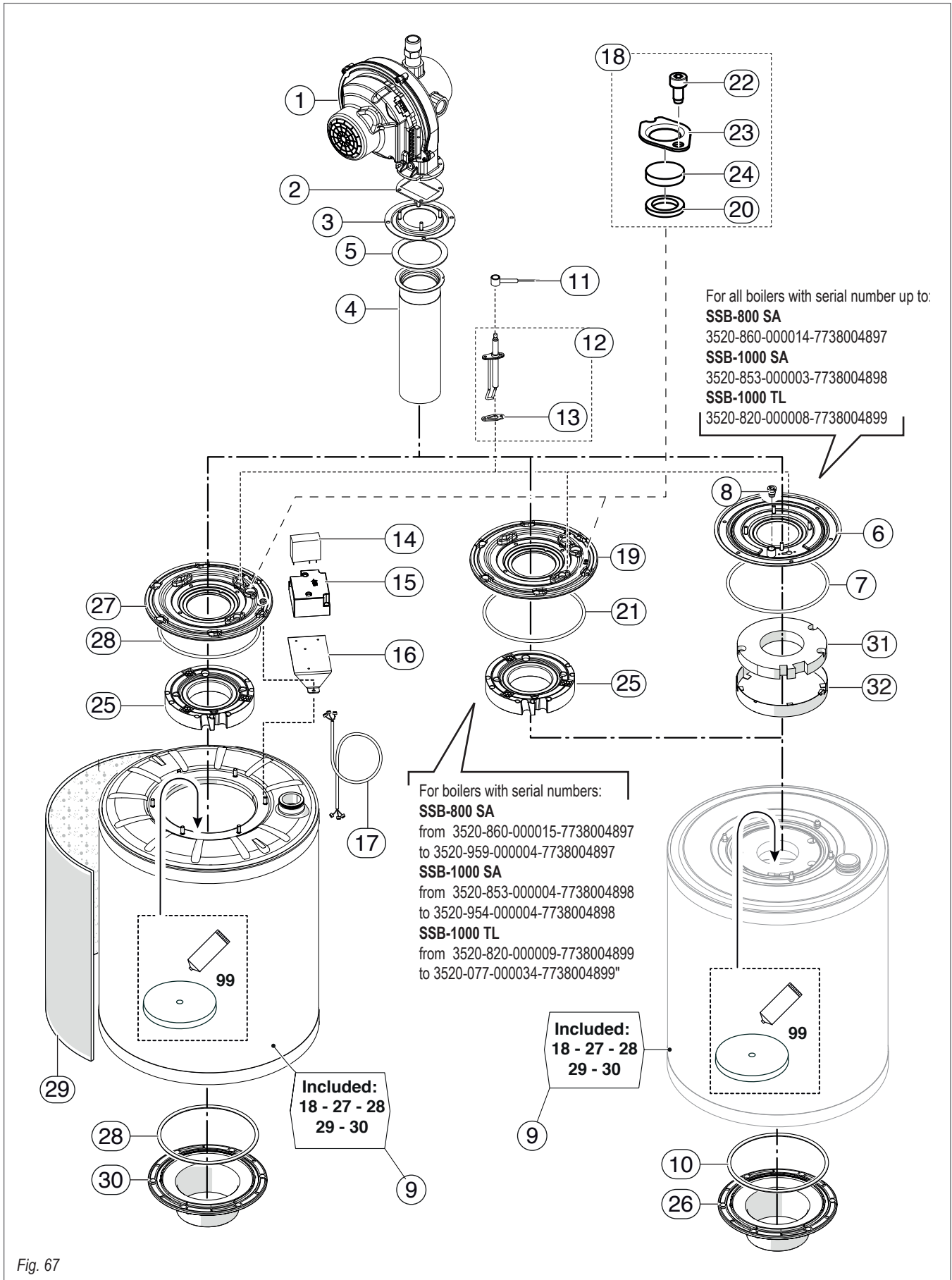


Fig. 67

Item (→ Fig. 67)	Description	Q.ty per boiler	SSB 800 SA	SSB 1000 SA	SSB 1000 TL	Order number
1	Fan	2	■	■	■	7-738-005-006
2	Silicone seal Fan/Burner head	2	■	■	■	7-738-004-990
3	Burner tube flange	2	■	■	■	7-738-005-403
4	Premix burner tube	2		■	■	7-738-005-406
4	Premix burner tube	2	■			7-738-006-275
5	Gasket premix burner tube	2	■	■	■	7-738-004-985
6	Burner flange (outer ring)	2	■	■	■	7-738-005-407
7	ORING D.167,7 x 5,33 NBR70	2	■	■	■	7-738-004-983
8	Sight glass for combustion	2	■	■	■	7-738-005-031
9	Heat exchanger	2	■			7-738-004-981
9	Heat exchanger	2		■	■	7-738-004-982
10	ORING EPDM D:165x6 for flanged exhaust connector	2	■	■	■	7-738-004-979
11	Ignition cable red for external igniter	2	■	■	■	7-738-006-274
12	Ignition electrode with washer	2	■	■	■	7-738-005-033
13	Graphite washer for ignition electrode	2	■	■	■	7-738-005-034
14	Relay for external igniter and screws	2	■	■	■	7-738-006-269
15	Transformer for external igniter and screws	2	■	■	■	7-738-006-270
16	Bracket for external igniter	2	■	■	■	7-738-006-267
17	Wiring for external igniter	2	■	■	■	7-738-006-271
18	Sight glass kit	1	■	■	■	7738006474
19	Burner head Aluminum flange	1	■	■	■	7738006475
20	Seal for sight glass	1	■	■	■	7738006476
21	ORING D.164,47 x 6,99 NBR70	1	■	■	■	7738006477
22	Screw M4x8	2	■	■	■	7738006478
23	Sight glass holder ø16	1	■	■	■	7738006479
24	Sight glass ø16	1	■	■	■	7738006480
25	Refractory ring	1	■	■	■	7738006481
26	Flue flange	2	■	■	■	7-738-004-978
27	Burner head Aluminum flange	2	■	■	■	7-738-006-475
28	ORING D.167,7 x 5,33 EPDM70	4	■	■	■	7-738-006-477
29	Heat exchanger insulation	2	■			7-738-007-165
29	Heat exchanger insulation	2		■	■	7-738-007-166
30	Flue flange	2	■	■	■	7-738-007-144
31	Refractory disk	2	■	■	■	7-738-005-408
32	Fiber support	2	■	■	■	7-738-005-174
99	Kit refractory disc	1	■	■	■	7-738-006-357

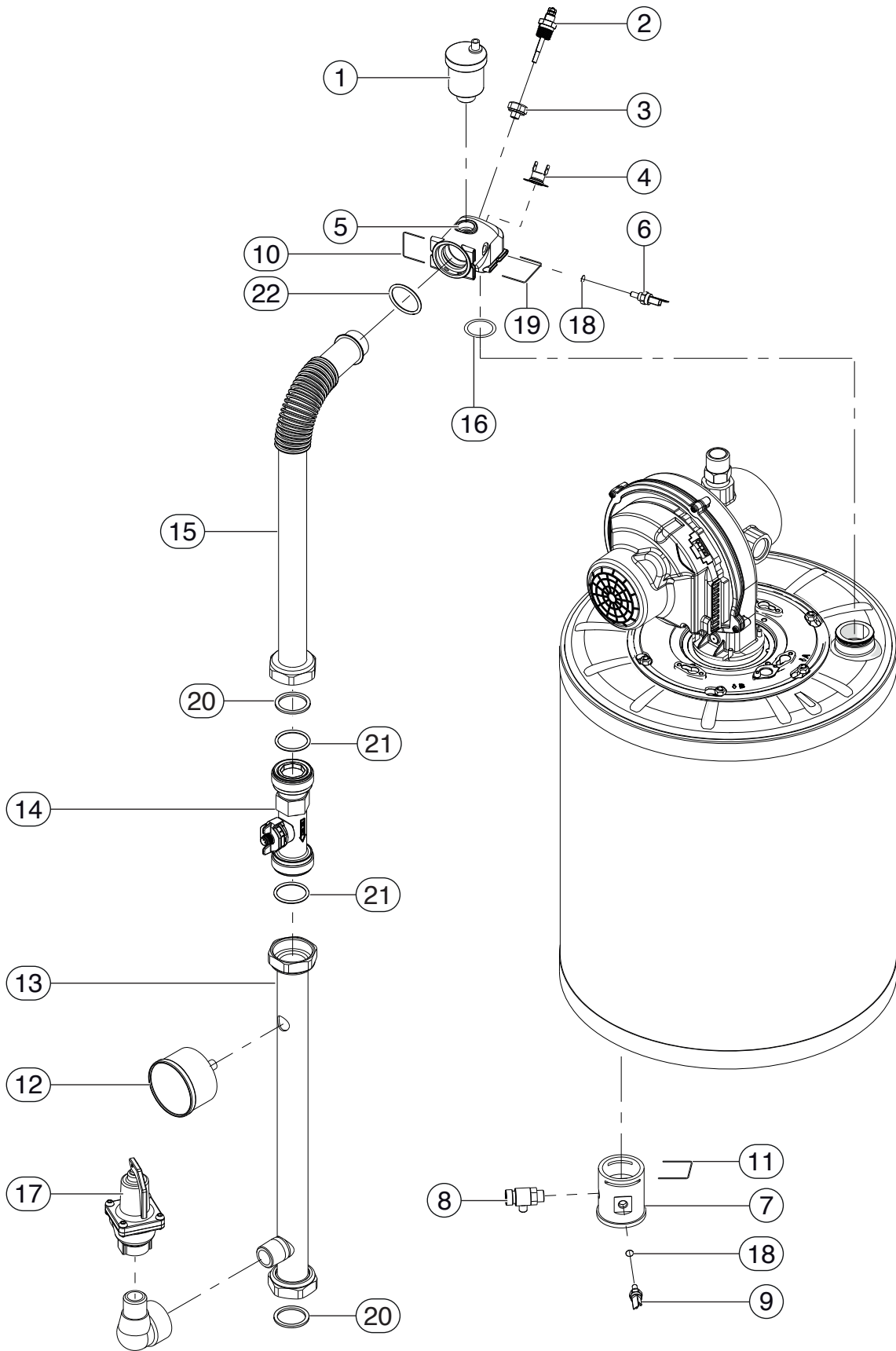


Fig. 68

Item (→ Fig. 68)	Description	Q.ty per boiler	SSB 800 SA	SSB 1000 SA	SSB 1000 TL	Order number
1	Air vent valve 1/2"	2	■	■	■	7-738-004-936
2	LWCO sensor	2	■	■	■	7-738-004-927
3	LWCO adapter	2	■	■	■	7-738-004-928
4	High limit sensor	2	■	■	■	7-738-004-926
5	Boiler supply manifold	2	■	■	■	7-738-004-933
6	Supply water temperature sensor	2	■	■	■	7-738-004-930
7	HX return adapter	2	■	■	■	7-738-006-377
8	Manual drain valve 1/4"	2	■	■	■	7-738-006-386
9	Return water temperature sensor	2	■	■	■	7-738-004-930
10	U-clip boiler supply manifold supply pipe side	2	■	■	■	7-738-004-935
11	U-clip hx return adapter	2	■	■	■	7-738-004-949
12	T&P gauge 0-260psi	2	■	■	■	7-738-004-941
13	Supply pipe 1"	2	■	■	■	7-738-006-366
13	Supply pipe 1"	2	■ ⁽¹⁾	■ ⁽¹⁾	■ ⁽¹⁾	7-738-006-434
14	Flowmeter	2	■	■	■	7-738-006-384
15	Stainless steel supply pipe	2	■	■	■	7-738-006-365
16	ORING D.36,10 x 3,53 EPDM 70	2	■	■	■	7-738-004-932
17	Safety relief valve 75psi	2	■	■	■	7-738-004-947
18	EPDM seal for temperature sensor	2	■	■	■	7-738-004-931
19	U-clip boiler supply manifold hx side	2	■	■	■	7-738-004-934
20	Washer 1"1/2 EDPM	2	■	■	■	7-738-007-212
21	O-ring	2	■	■	■	7-738-004-952
22	O-ring	2	■	■	■	7-738-004-937

(1) For all boilers with serial number higher than 3520-759-000001-7738004897



United States and Canada

Bosch Thermotechnology Corp.
50 Wentworth Avenue
Londonderry, NH 03053
Tel. 603-552-1100
Fax 603-965-7581
www.boschheatingandcooling.com
U.S.A.

Bosch Thermotechnology Corp. reserves the right to make changes without notice due to continuing engineering and technological advances.