



Slant/Fin®

VSL II QUICK START GUIDE

This Quick Start Guide must be left with owner and should be hung on or adjacent to the boiler for reference.

**DIRECT-VENT SEALED COMBUSTION CONDENSING BOILER
~ GAS-FIRED BOILER FOR NATURAL AND L.P. PROPANE GASES ~**



IMPORTANT
READ ALL OF THE FOLLOWING WARNINGS AND STATEMENTS BEFORE READING THE QUICK GUIDE INSTRUCTIONS.

CAUTION
This manual is only a quick reference guide and is not meant to replace or supplement the installation and maintenance manual supplied with the appliance. Before performing the installation or any service read the installation and maintenance instructions supplied with this boiler thoroughly!

WARNING
This manual must only be used by a licensed plumber, a licensed gas fitter, the gas supplier, or a qualified service technician/installer. Failure to comply could result in substantial property damage, severe personal injury, or loss of life. Slant/fin is not liable for any damages or defects resulting from improper installation or service of this boiler.

WARNING
The installation must comply with 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 the authority having jurisdiction, the installation must comply with the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

NOTICE
In the Commonwealth of Massachusetts this boiler must be installed by a licensed Plumber or Gas Fitter.

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Subject to technical changes

Changes may be made without notice to the illustrations, process steps, and technical data as a result of our policy of continuous improvement.

Required Clearances

The boiler requires certain clearances to combustibles, reference the tables below to ensure the location selected is suitable for installing the boiler. It is highly recommended that the boiler be provided with adequate clearances for ease of installation, service, and maintenance, these clearances are referenced below

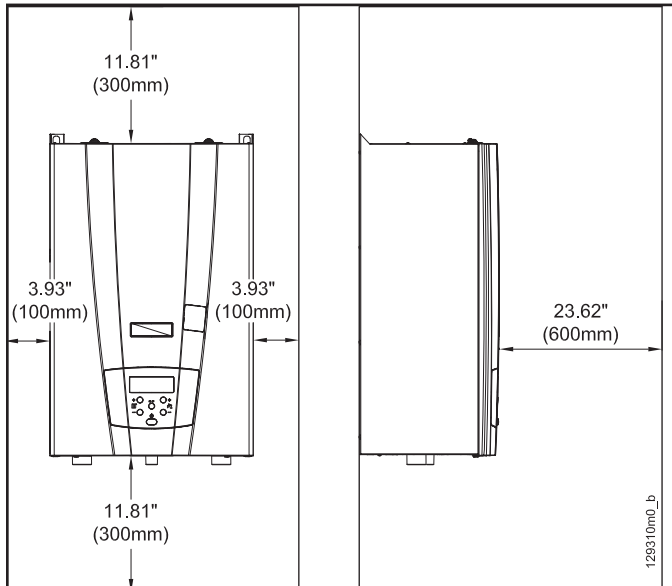


Figure 1. Service clearances

	Minimum Required Clearances to Combustibles	Recommended Service Clearances
Ceiling	2	12
Front	2	24
Rear	0	0
Left/Right side	2	4
Floor	2	12
Vent (first 3ft from the boiler)*	1	See vent manufacturer
Vent (Beyond 3ft from the boiler)*	1/4	See vent manufacturer
Supply/Return piping	1/4	N/A

Unpacking the Boiler

The boiler is packaged with the following list of parts and fittings. Please inspect the contents of the packaging and make sure everything on the list has been removed from the box before disposal.

Quantity	Description	Part number	Figure
1 of these kit depending on model	NAT to LP gas conversion kit for model 90A	62630201	
	NAT to LP gas conversion kit for models 130A and 150A	62630202	
	NAT to LP gas conversion kit for model 199A	62630203	
	NAT to LP gas conversion kit for model 250A	62630204	
1	Outdoor sensor	62110067	
1	Wall bracket	60411149	
4	Screw for wall bracket	60801097	
1	Brass connection 1"1/4G - 1"1/4G	60113010	
1	Copper pipe D28 F/F 1P1/4 H=126	62621191	
1	Drain valve 3/8P	61204029	
1	30PSI ASME Relief valve	61205010	
2	Calibrated straight tube D.28 L150	60303009	
2	Cap CH46X17	60109011	
4	1"1/4 Gasket	60701007	

Gas Type Selection

The boiler comes from the factory setup for natural gas. The boiler comes with a conversion kit that must be used if the boiler is to be installed and fired with propane gas. Instructions for the conversion of the boiler are located in the installation and maintenance manual.

Mounting the Boiler

The boiler bracket should be securely fixed to a wall that is sufficiently strong enough to bear the weight of the boiler when filled with water as well as the attached plumbing. The boiler should not be used to support the plumbing system, all piping attached to the boiler must be properly supported with appropriate support brackets. Do not install the boiler on drywall unless anchoring directly to the studs. Install the boiler bracket to the wall with the provided mounting materials. Ensure that it is level before hanging the boiler.

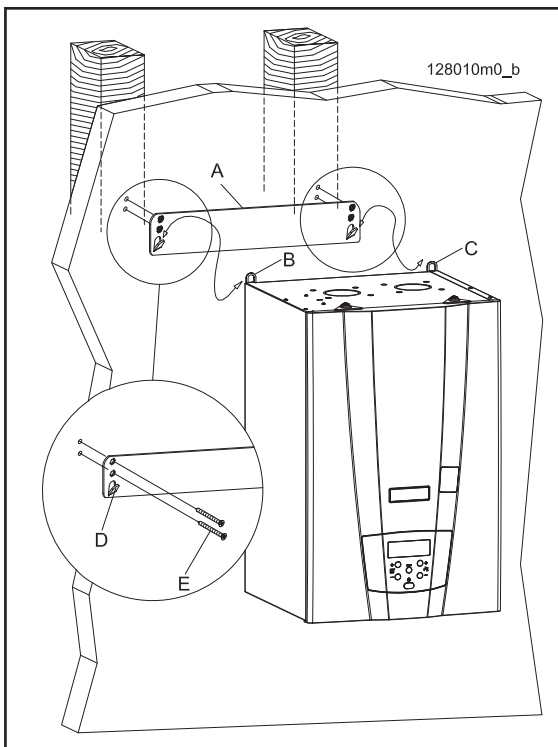


Figure 2. Mounting boiler illustration

Gas Piping

The boiler gas piping must be sized to accommodate the full load of the boiler in addition to all the other gas appliances in the building. The boiler should be the first appliance connected to the gas supply line. Never use a 1/2" corrugated appliance adapter for connecting the boiler. If using propane contact your propane supplier to size gas piping, tanks, and 100% lockup gas pressure regulator. Install a manual gas shutoff valve below the boiler following all local and national code. This valve should be a full port gas ball valve. Install a drip leg/sediment trap as well as a union to facilitate servicing of the unit. See the installation and maintenance manual for complete instructions. The nominal natural gas pressure is 7" W.C. The nominal propane gas pressure is 11 W.C.

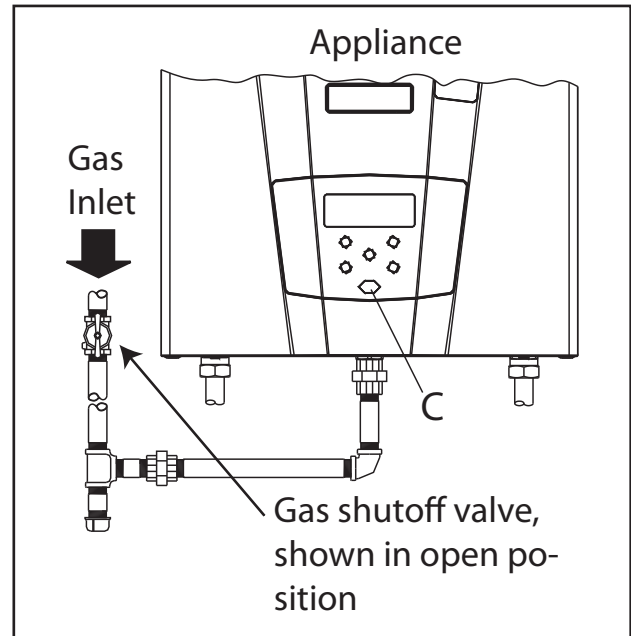


Figure 1. Service clearances

Water Piping

The heating system should be flushed before fitting the boiler to the system, see the installation and maintenance manual for system flushing instructions.

The boiler must be connected to the heating system utilizing primary secondary piping to hydraulically separate it from the system. Piping can be accomplished in two ways either through the use of a Low Loss Header (LLH) or through Closely Spaced Tees (CST). When using a low loss header please refer to the header manufacturer for sizing and installation information. When using closely spaced Tees they must be sized and pipe according to standard design practices based on the btu output of the boiler and the flow rate. Follow the two piping illustrations below for valve and pump placement. The PRV must be installed directly below the boiler before any shutoff valves. Install unions as shown in the drawing as well as ball valves for boiler isolation to allow for service and maintenance of the boiler. **Important:** Primary boiler loop piping must be a minimum diameter for each model

VSL II-90: 1"

VSL II-150: 1" 1/4"

VSL II - 200: 1 1/4"

VSL II - 250: 1 1/2"

Primary Secondary Piping:

Primary secondary piping must be used at all times with this boiler. Failure to properly size and install primary secondary piping may cause damage to the boiler and void the warranty. There are two standardized methods for primary secondary piping, the first is to use Closely Spaced Tees here after referred to as CST. The second method is to use a third party Low Loss Header also called a Hydraulic separator.

Option 1 Closely Spaced Tees Design

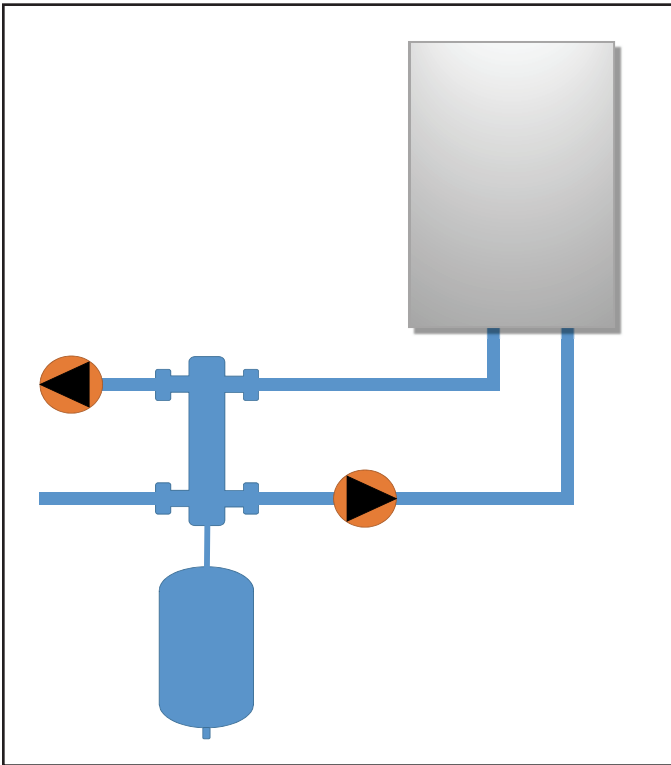
In order to properly design a CST system there are three main rules: The distance between the centerline of the two tees should not be greater than four times the pipe diameter of the primary loop. Nor shall it exceed 12 inches.

The return side of the system entering the first tee must have a minimum straight length before the first tee of eight times the pipe diameter of the primary loop. This minimum shall not be less than 8 inches.

The supply side of the system exiting the second tee must have a minimum straight length after the second tee of four times the pipe diameter of the primary loop. This minimum shall not be less than 4 inches.

Option 2 Low Loss Header

The use of a third party prefabricated low loss header eliminates the need to field assemble and design primary secondary piping. If using a low loss header use the sizing information of the manufacturer to correctly match its size to the size of the boiler.



Drawing 1. LLH

Purging the boiler/primary loop

The boiler loop and boiler must be purged of air before the boiler is put into operation. The boiler can be purged of air by running water through it in the same manner as a zone is purged. When piping the boiler loop ensure there is way to purge it with the necessary drain connections and shut-off valves.

Condensate Disposal

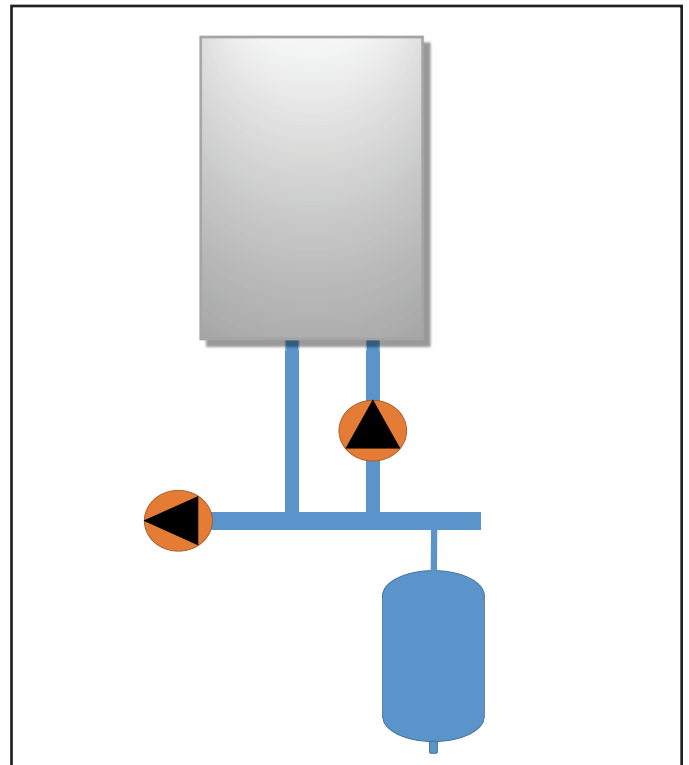
The condensate from the boiler must be disposed of. Connect the condensate drain on the bottom of the boiler to a drain line, this line should be sloped down and away from the boiler.

There must be an air gap between the drain line connected to the bottom of the boiler and the drain connect to the buildings pumping.

A condensate pump may be required in some installations if the boiler is lower than the drain.

A condensate neutralizer should be installed, but is not always required check local code.

Use materials approved by the authority having jurisdiction. In absence of such authority, PVC and CPVC pipe must comply with ASTM D1785, F441 or D2665. Cement and primer must comply with ASTM D2564 or F493. For Canada, use CSA or ULC certified PVC or CPVC pipe, fittings and cement. Never use copper, galvanized, or black iron pipe to drain the condensate. See the installation and maintenance manual for complete instructions.



Drawing 2. CST

Water pressure and water flow.

The VSL II boilers have a built-in water pressure sensor and water flow meter. The minimum water pressure is 9 psi and the recommended water pressure is 15 psi minimum. The boilers are supplied with 30 psi pressure relief valves.

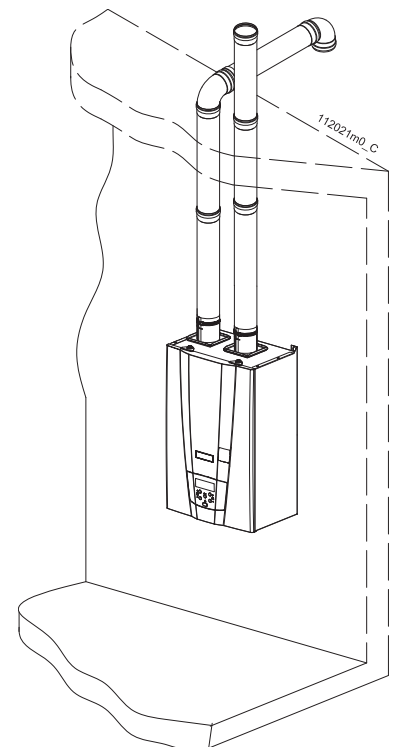
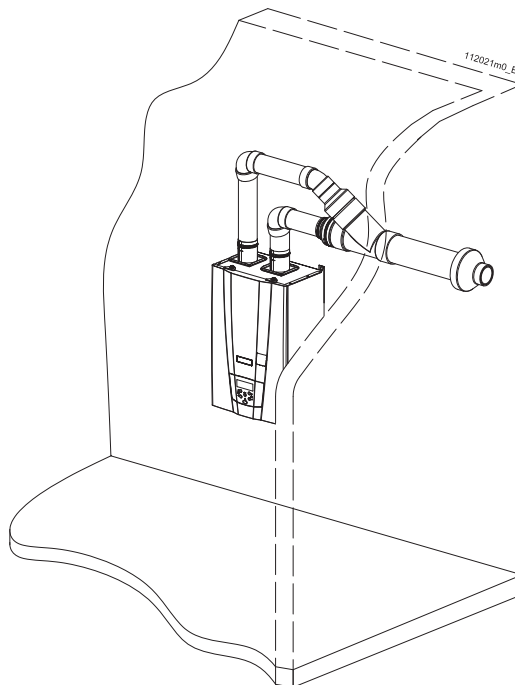
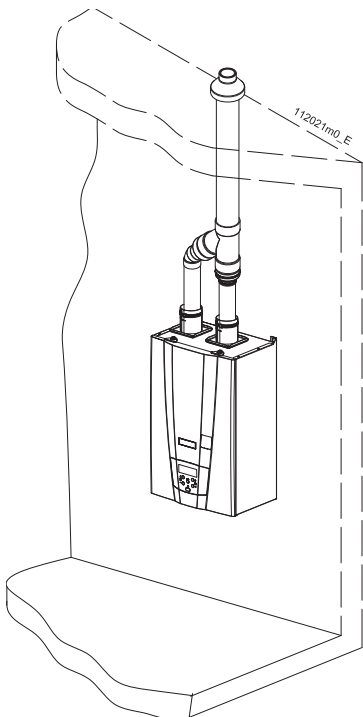
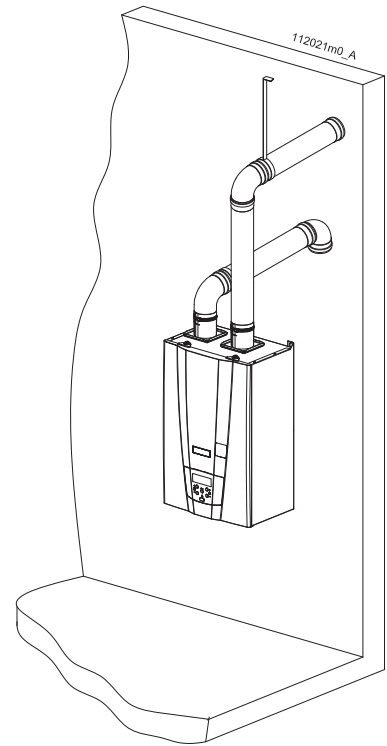
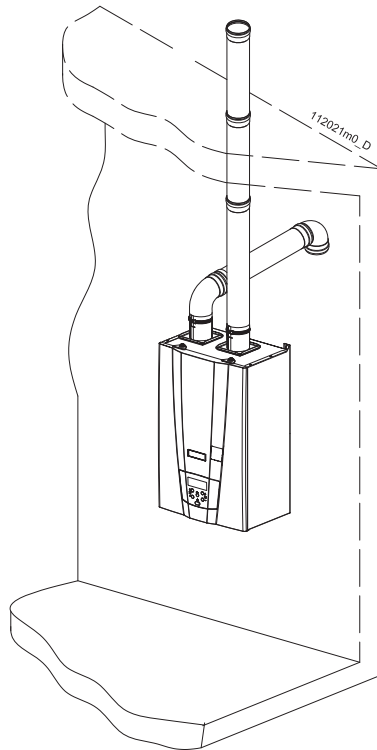
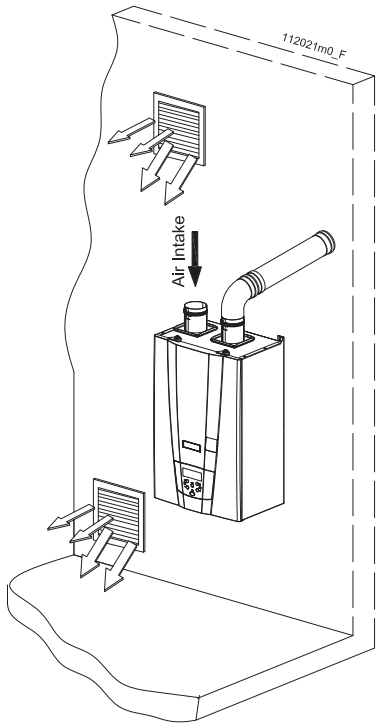
The minimum water flows are as follows:

- VSL II-90 minimum water flow = 1.4 GPM
- VSL II-150 minimum water flow = 2 GPM
- VSL II-200 minimum water flow = 4 GPM
- VSL II-250 minimum water flow = 4 GPM

Venting Flue Exhaust and Combustion Air

This boiler may be vented in a number of different configurations utilizing both direct vent sealed combustion venting systems and single pipe room air venting systems. All vent material and configurations must be approved. See the installation and maintenance manual for complete instructions. Below are examples of possible

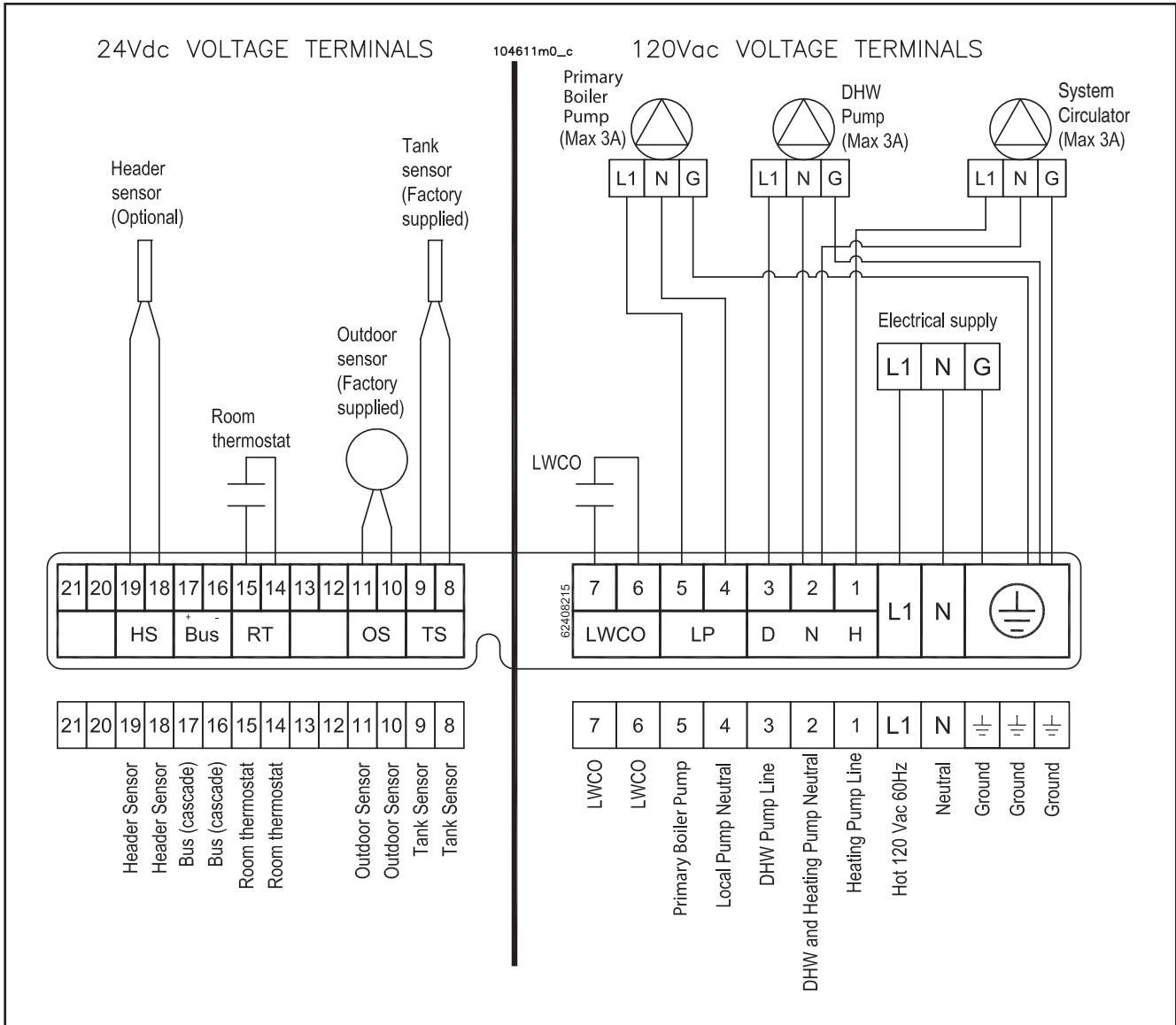
venting configurations. Additional venting information can be found in the manual for both direct vent and room air installations. Multiple venting material options are available for use with the boiler including: solid core PVC, CPVC, Polypropylene PP, and stainless steel.

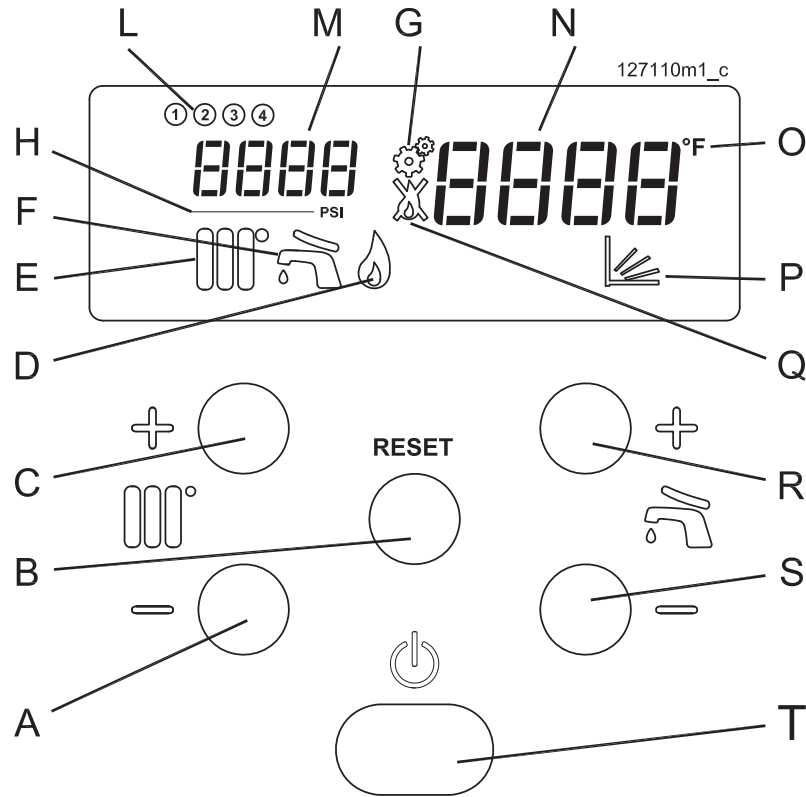


Electrical Connections

The boiler has both 24V and 120V terminal strips, pay special attention to properly identify both types of wiring in the system. The boiler has the ability to power and control three separate pumps: boiler loop pump, DHW indirect tank pump, and system pump. The boiler also utilizes an outdoor NTC sensor as well as an indirect tank NTC sensor when controlling DHW production. These sensors are supplied with the boiler. External alarm contacts as well

as external safety devices may be connected to the boiler. A room thermostat or TT connection from a zone valve/ pump relay control must always be connected to the boiler to generate a call for heat. Additional information about the wiring of the boiler and functionality may be found in the installation and maintenance manual supplied with the boiler.





Boiler Programming

The boiler should always be programmed by the installer during startup. The outdoor reset curve should be set as well as the minimum and maximum water temperatures that correspond to the type of heat emitters installed in the dwelling. Complete programming information may be found in the installation and maintenance manual supplied with the boiler.

To enter the Installer’s Menu level for boiler programming follow the steps outlined below.

1. Press and hold the RESET and buttons together for 5 seconds until the is displayed, then release both buttons.
2. Use the + and - buttons to move up and down through the parameter list.
3. To change a parameter press the RESET button until the parameter is flashing and then use the + and - buttons to change the value.
4. Press and release the RESET button to store the value of the changed parameter.
5. To exit the installer’s menu press and hold the RESET button for 5 seconds until the is no longer visible.

The following list of parameters must be programmed at startup of the boiler

- A - Key to reduce the supply water temperature;
- B - Multifunctional key: reset any lockouts; access to user and installer menu.
- C - Key to increase the supply water temperature;
- D - Flame icon, is present when the flame is present;
- E - Radiator icon. Present when heating is enabled to work. Blinking when heating is active;
- F - Faucet icon. Present when an indirect water heater is enabled to work. Blinking when an indirect water heater (coil water heater) is in load;
- H - Unit of measure of the water system pressure;
- L - Cascade boiler indicators: Light when boiler is burning; blinking when boiler is in lockout or in blocking error:
 - ① = Boiler 1 (manager)
 - ② = Boiler 2 (dependent)
 - ③ = Boiler 3 (dependent)
 - ④ = Boiler 4 (dependent)
- M - Water pressure gauge and indicator of the parameters
- G - Icon indicating access to the installer menu
- N - Supply water temperature gauge and indicator of the parameters value
- O - Unit of measure of the temperature
- P - Icon displayed when the outdoor sensor is active
- Q - Flame crossed icon: is present when the appliance is in lockout or blocking error condition
- R - Multifunctional key: increase the indirect water heater temp; scroll the parameters; increase the parameters’ value;
- S - Multifunctional key: decrease the indirect water heater temp; scroll the parameters; decrease the parameters’ value;
- T - On-Off Main power switch

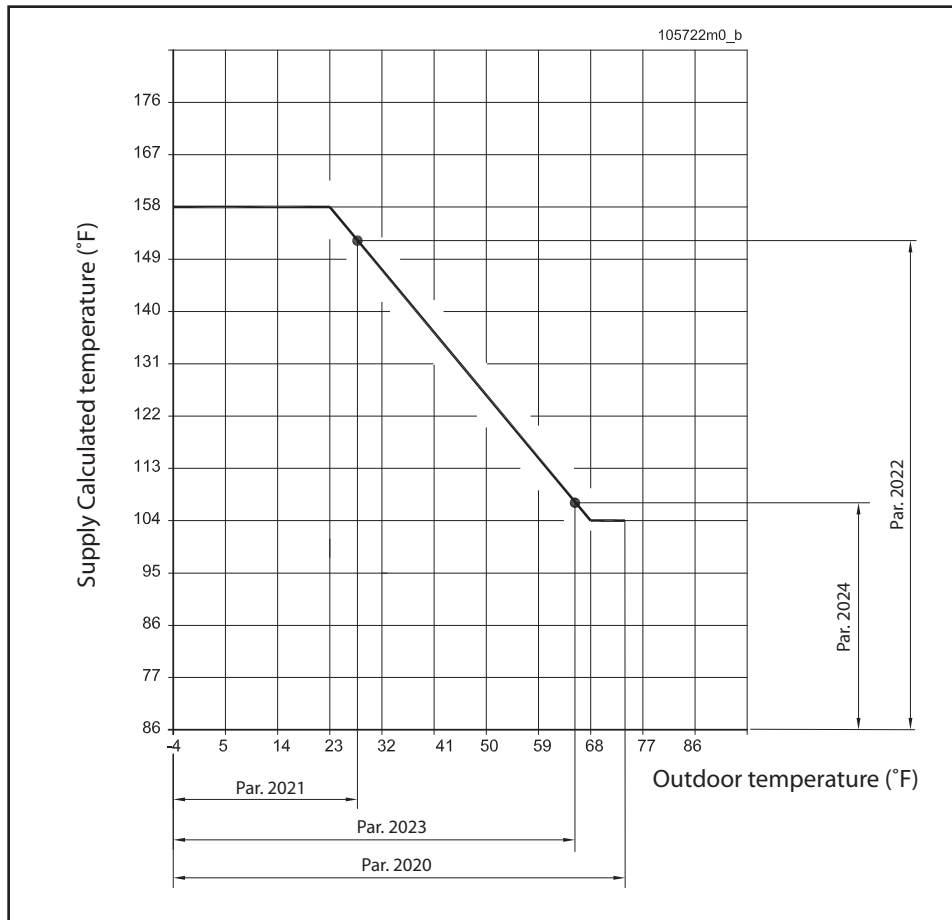
PARAMETER	DESCRIPTION	FACTORY SETTINGS
2020	Warm Weather shutdown temperature	69°F
2021	Design day temperature outdoor temperature	24°F
2022	Design day supply water temperature	176°F
2023	Spring /Fall outdoor temperature corresponding to parameter 2024	69°F
2024	Minimum supply water temperature	104°F

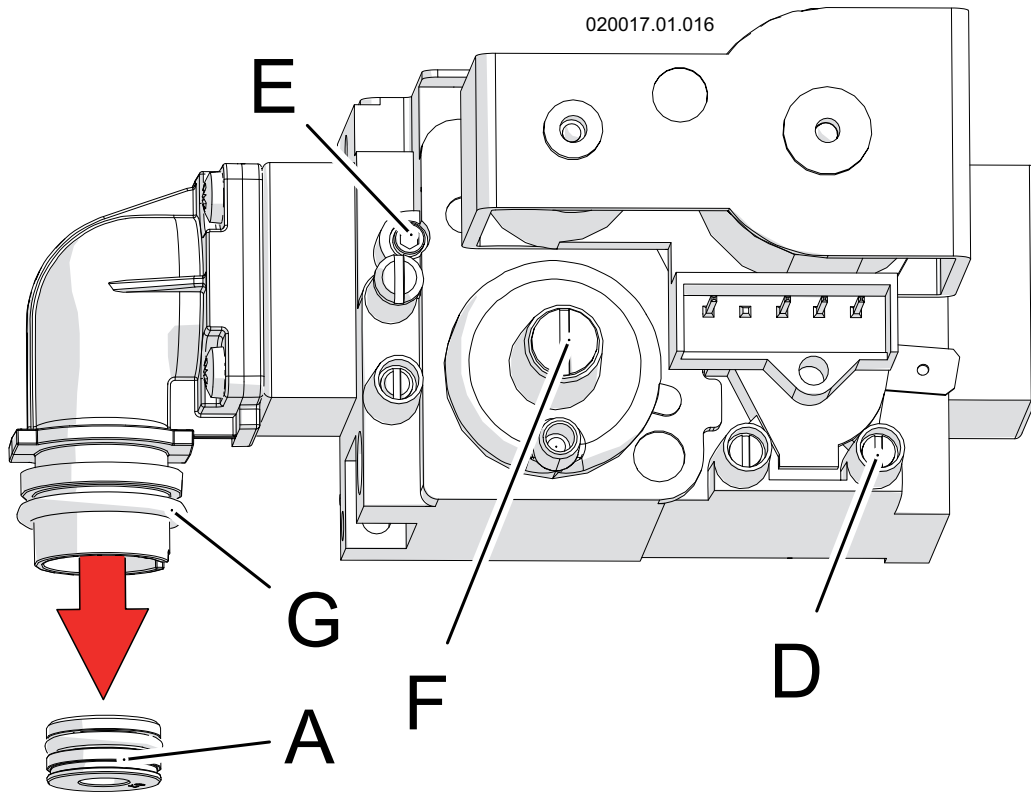
Boiler Startup and Combustion Analysis

Before placing the boiler into service the combustion must be properly adjusted. Setting the combustion requires a combustion analyzer in working order that has been calibrated. A digital manometer should also be available for testing incoming gas pressure. Once the boiler has had the combustion set, a test report should be generated and left with the boiler as proof of correct startup and for reference for future maintenance. An explanation of complete combustion analysis and start up procedures can be found in the installation and maintenance manual supplied with the boiler.

The combustion analysis must be done by a qualified technician. Ensure there is a sufficient way to emit the heat generated by the boiler to allow for combustion testing, this can be accomplished by creating a call for heat in all the zones or if using an indirect tank by running the DHW at a faucet.

1. Enter the installers menu.
2. Scroll to parameter 2010 and set to High. Boiler will run for 20 minutes on High Fire.
3. Wait for the boiler to stabilize this may take a few minutes.
4. Insert the combustion analyzers probe into the test port on the exhaust vent.
5. Wait till the readings stabilize and then check there range against the table below.
6. If the combustion must be adjusted use a 2.5mm Allen wrench to turn screw E on the gas valve. Turning the screw clockwise will reduce the CO2 reading, while turning the adjustment screw counter clockwise will increase the CO2 level. Turn the screw in quarter turn increments waiting for the readings to stabilize between each turn.
7. Once the reading on high fire matches the desired level change parameter 2010 to Low. Boiler will run for 20 minutes on Low Fire.
8. Ensure that the reading at low fire match the range in the table given below, if they fall outside the given range contact technical support.
9. Set parameter 2010 to Off, close and seal the combustion probe port. The commissioning of the boiler is now complete.





- A - Gas orifice
- B - Gas orifice gasket
- C - Gas orifice nut
- D - Inlet gas pressure probe
- E - CO2 adjusting screw
- F - Factory adjusted regulator (Should never be touched)
- G O-ring gasket

Boiler Model	CO2 at High Fire	CO2 at Low Fire	O2 at High Fire	CO2 at Low Fire
NG	8.6% - 8.9%	8.5% - 9%	5.6% - 5.1%	5.8% - 4.9%
LP	9.6% - 9.8%	9.5% - 11.5%	6.3% - 6%	6.4% - 3.4%

WARNING!!!

DO NOT adjust screws “E” and/or “F” (Figure 12-1). These screws are factory-set for the correct gas flow and outlet pressure. Attempting to alter the gas valve setting could result in excessive levels of carbon monoxide that can cause severe personal injury, death, or substantial property damage.

20°F Δ T System					
Boiler Model	GPM	Feet of Head	Grundfos Model	Taco Pump Model	Wilo Model
90A	8	21.3	UPS26-99 (Speed 3)	0011	Star 30 F
150A	13	13	UPS26-99 (Speed 2)	0011	Star 17 FX
199A	18	28	UPS26-150 (Speed 3)	2450	Top-S 1.5x40
250A	22	NA	NA	NA	NA

25°F Δ T System					
Boiler Model	GPM	Feet of Head	Grundfos Model	Taco Pump Model	Wilo Model
90A	7	17	UPS26-99 (Speed 2)	0014	Star 30 F
150A	11	11	UPS26-99 (Speed 2)	0012	Star 17 FX
199A	14	19	UPS26-99 (Speed 3)	0013	Top-S 1.25x25
250A	18	28	UPS26-150 (Speed 3)	2450	Top-S 1.5x40

30°F Δ T System					
Boiler Model	GPM	Feet of Head	Grundfos Model	Taco Pump Model	Wilo Model
90A	5	9	UPS15-58 (Speed 2)	008	Star 21 F
150A	9	7	UPS15-58 (Speed 3)	0010	Star 21 F
199A	12	15	UPS26-99 (Speed 2)	0011	Star 30 F
250A	15	22	UPS26-150 (Speed 2)	2450	Top-S 1.25x35

Circulator Sizing Chart for Systems with Glycol

When sizing pressure drop through the boiler using glycol an additional 19% pressure drop will occur with a 30% glycol system and an additional 35% pressure drop will occur with a 50% glycol system. The maximum amount of glycol used with the VSL II boiler must be limited to a concentration of 50%.

30°F Δ T Boiler Loop with Glycol Pressure Drops				
Boiler Model	GPM	Feet of Head 100% Water	Feet of Head 30% Glycol	Feet of Head 50% Glycol
90A	5	9	11	12
150A	9	7	8	10
199A	12	15	18	20
250A	15	22	26	30

30 Gallon Superstor Ultra Indirect Tank Pump Sizing

20°F Δ T System					
Boiler Model	GPM	Feet of Head	Feet of Head 30 Gallon Indirect Water Heater	Grundfos Model	Taco pump Model
90A	8	21.3	27.3	UPS43-100 (Speed 2)	0011
150A	13	13	19	UPS26-99 (Speed 3)	0011
199A	18	28	34	UPS26-150 (Speed 3)	2450
250A	22	NA	NA	NA	NA

25°F Δ T System					
Boiler Model	GPM	Feet of Head	Feet of Head 30 Gallon Indirect Water Heater	Grundfos Model	Taco pump Model
90A	7	17	23	UPS26-99 (Speed 3)	0014
150A	11	11	17	UPS26-99 (Speed 3)	0012
199A	14	19	25	UPS26-150 (Speed 2)	0013
250A	18	28	34	UPS26-150 (Speed 2)	2450

30°F Δ T System					
Boiler Model	GPM	Feet of Head	Feet of Head 30 Gallon Indirect Water Heater	Grundfos Model	Taco pump Model
90A	5	9	15	UPS26-99 (Speed 1)	008
150A	9	7	13	UPS26-99 (Speed 2)	0010
199A	12	15	21	UPS26-99 (Speed 3)	0011
250A	15	22	28	UPS26-150 (Speed 3)	2450

40 and 60 Gallon Superstor Ultra Indirect Tank Pump Sizing

20°F ΔT System					
Boiler Model	GPM	Feet of Head	Feet of Head 30 Gallon Indirect Water Heater (7.9)	Grundfos Model	Taco pump Model
90A	8	21.3	29.2	UPS43-100 (Speed 3)	0011
150A	13	13	20.9	UPS26-99 (Speed 3)	0013
199A	18	28	35.9	UPS26-150 (Speed 3)	2400-50
250A	22	NA	NA	NA	NA

25°F ΔT System					
Boiler Model	GPM	Feet of Head	Feet of Head 30 Gallon Indirect Water Heater (7.9)	Grundfos Model	Taco pump Model
90A	7	17	24.9	UPS26-99 (Speed 3)	0011
150A	11	11	18.9	UPS26-99 (Speed 3)	0011
199A	14	19	26.9	UPS26-150 (Speed 2)	2400-45
250A	18	28	35.9	UPS26-150 (Speed 2)	2400-50

30°F ΔT System					
Boiler Model	GPM	Feet of Head	Feet of Head 30 Gallon Indirect Water Heater (7.9)	Grundfos Model	Taco pump Model
90A	5	9	16.9	UPS26-99 (Speed 2)	0014
150A	9	7	14.9	UPS26-99 (Speed 2)	0014
199A	12	15	22.9	UPS26-99 (Speed 3)	0013
250A	15	22	29.9	UPS26-150 (Speed 3)	2400-45

Commissioning Check List

Gas input rate		btuh
Static gas pressure		in. W.C.
Dynamic gas pressure		in. W.C.
Gas type		
Central Heating supply temperature		F
Central heating return temperature		F
CO2 reading at high fire		%
CO2 reading at low fire		%
Ionization current		µA
System water pressure		psi
Has the system been properly flushed?	Yes / No	
If flushed what agent was used?	Yes / No	
Is there an inhibitor in the system?	Yes / No	
What inhibitor have been used?		
Is there glycol in the system?	Yes / No	
What percentage of glycol?		
What brand and type of glycol?		
What is the pH of the fluid in the system?		
Has the boiler been programmed to match the heating system it is paired with?	Yes / No	
Is the outdoor reset sensor installed?	Yes / No	
Is the boiler paired with an indirect tank?	Yes / No	
If paired with an indirect tank has a sensor been installed and wired to the boiler control?	Yes / No	
Has the boiler been programmed for DHW operation?	Yes / No	
Have all the venting joints been properly sealed?	Yes / No	
Has a CO detector been installed?	Yes / No	
Has the piping system been tested for leaks?	Yes / No	

Technical Data

Boiler MODEL		90A	130A	150A	199A	250A
Category of discharge chimney		IV				
Maximum Heat input	Btu/hr	90,000	130,000	150,000	198,000	250,000
Minimum heat input	Btu/hr	20,000	36,000	36,000	43,000	50,000
Turndown ratio		4.5 : 1	3.6 : 1	4.2 : 1	4.6 : 1	5 : 1
Number of burners		1				
Gas flow rate (Natural gas)	ft ³ /hr	90	130	150	198	250
Gas flow rate (LP gas)	ft ³ /hr	36	52	60	79.2	100
Min / Max gas pressure (Nat. and LP)	In.W.C.	3 / 13				
Min / Max heating water temperature	°F	68 / 180				
Min / Max indirect water heater temperature	°F	68 / 140				
Min / Max water pressure	PSI	8 / 130	8 / 160	8 / 160	8 / 160	8 / 160
Minimum water flow	GPM	1.4	2	2	4	4
Content of water	gal	1	1.5	1.5	2	2
Supply voltage / Frequence		120Vac / 60Hz				
Absorbed electric power	W	60	75	80	130	250
Air intake / Flue gas pipes diameter	inch	3				
Max. length venting system flue exhaust	ft	160				
Max. length venting system air intake	ft	160				
CO (Carbon monoxide) with natural gas	ppm	<150				
CO (Carbon monoxide) with LP gas	ppm	<250				
NOx (0% O ₂ with natural gas)	ppm	<30				
CO ₂ (Carbon dioxide) for Natural gas at high fire	%	8.6 to 8.9				
CO ₂ (Carbon dioxide) for Natural gas at low fire	%	8.5 to 9				
CO ₂ (Carbon dioxide) for LP gas at high fire	%	9.6 to 9.8				
CO ₂ (Carbon dioxide) for LP gas at low fire	%	9.5 to 11.5				
O ₂ (Oxygen) for Natural gas at high fire	%	5.6 to 5.1				
O ₂ (Oxygen) for Natural gas at low fire	%	5.8 to 4.9				
O ₂ (Oxygen) for LP gas at high fire	%	6.3 to 6.0				
O ₂ (Oxygen) for LP gas at low fire	%	6.4 to 3.4				
Ionisation current	uA (Micro Amps)	4 to 7				
Maximum flue gas temperature	°F	203				
Maximum water condensate flow	GPM	0.013	0.019	0.022	0.029	0.036
Average acidity of condensation	PH	4				
Boiler weight (empty of water)	lb	77	93	93	99	99



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