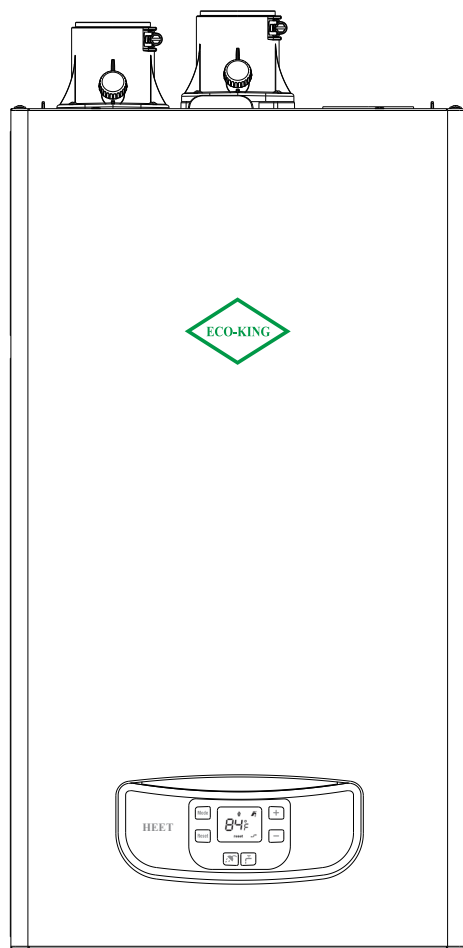




Heet 199

**Instantaneous gas fired
condensing water heater**

Installation and Operation Manual



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 DO YOU 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.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

Keep these instructions for future reference during maintenance and service, preferably adjacent to the appliance.

The installation must conform with local codes or, in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Code.

When applicable, the installation must conform with the Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 and/or CAN/CSA Z240 MH Series, Manufactured Home.



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The sections highlighted below in gray are intended for the end user as well. All other sections are solely intended for a qualified installer, service agency or the gas supplier. Failure to comply may result in substantial property damage, personal injury or death.

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1. Welcome

Thank you for purchasing your Eco-King Heet 199 instantaneous water heater. Before installing or operating your water heater please read the installation and operation manual in it's entirety.

Keep a copy of this installation and operation manual for your reference. If your installation and operation manual is ever lost or damaged please contact an Eco-King distributor to obtain a copy of a new one.

Please note sections highlighted in gray in the table of contents are intended for both the end user and installing technician, unhighlighted sections are intended for a qualified installing technician, service agency or gas utility only.

FOR YOUR SAFETY



Ensure you have read and understand the safety warnings and precautions outlined in the Section: 2. Safety.

Make sure the water heater is installed by a qualified and trained service technician.

Parts must be ordered by an authorized dealer through Eco-King's distribution network.

Warranty forms can be obtained from an Eco-King distributor and must be submitted by an authorized dealer to ensure accurate information is obtained for the safety of the end user and the longevity of the product.

If the product is being installed in the state of Massachusetts ensure you have read Appendix: Massachusetts State Gas Regulation.

To The Installer

The installation of this water heater must be performed by a qualified installer, service agency or the gas supplier.

Eco-King recommends that the installer has attended an Eco-King training class before installing this product.

The installer(s) must be knowledgeable and adhere to the local codes and regulations, in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Code.

The installer(s) must be qualified and trained to install gas piping, venting, electrical and plumbing piping.

Ensure the installation and operation manual has been read in it's entirety before beginning the installation.

If you do not understand the safety and warning precautions within this installation and operation manual contact Eco-King Technical Support before proceeding for clarification.

The water heater must be installed in accordance with this installation and operation manual. Where there is a discrepancy between this manual and local code the local code supersedes the installation and operation manual.

Leave a copy of this installation and operation manual adjacent to the product for the end user's reference. Ensure they are familiar with the product controls before leaving.

Improper installation of the water heater will null and void the warranty.

Upon Receipt of the water heater:

- Ensure there is no external damage to the box
- Report external damage to your shipping company immediately
- Check the contents of the box and ensure all components are listed in Section 1.1 Contents are there.

1.1 Contents

- Heet 199 water heater
- Contents of the envelope: installation and operation manual, documentation package, condensate drain spring clamp, LPG nozzle and gas conversion label
- Wall mounting bracket
- Water connection shutoff valves and pressure relief valve.

2. Safety

2.1 Safety Information and Symbols

The following terms are used synonymously with the hazard symbols and signify hazards that could be potentially fatal. Ensure you have read and understand the definitions below:

DANGER: Identifies the most serious hazards which will result in severe personal injury or death.

WARNING: Signifies a hazard which could result in personal injury or death.

CAUTION: Is used to identify hazards which may result in minor personal injury or product and property damage.

NOTE: Used to highlight suggestions which will result in enhanced installation, reliability, or operation.

	GENERAL HAZARD SYMBOL Comply with the indications described in the text. Indicates a risk to objects or persons that may result in minor or serious damage/injury to objects or persons.
	ELECTRIC HAZARDS SYMBOL Comply with the indications described in the text. The symbol identifies the presence of electrical components and the risk of electric shock.
	HOT SURFACES SYMBOL Comply with the indications described in the text. The symbol identifies the presence of very hot components with consequent burn hazards.
	GROUND CONNECTION SYMBOL The symbol identifies when a connection to ground must be made.

2.2 General Safety Precautions



NOTE: The installation and operation manual constitute an integral and essential part of the product equipment: it must be kept during the period of use and read carefully, because it contains information and warnings that must be complied with during installation, use and maintenance. In case of loss or damage, request a copy from the installing service agency. If the appliance is transferred to another user, always ensure that the booklet accompanies the appliance.



WARNING: Installation and service must be performed by a qualified installer, service agency or the gas supplier.



NOTE: Failure to comply with the recommendations set out in this manual will void the warranty and obligations of the manufacturer.



DANGER: Carbon Monoxide is invisible, odorless, and toxic! Install a carbon monoxide alarm in your home. Locate the carbon monoxide alarm in the living area of your home and away from gas appliances and doorways to attached garages. Follow the alarm manufacturer's instruction included with the alarm.



CAUTION: This appliance is used to heat water to a temperature lower than the boiling point; therefore, it must be connected to a heating system and/or a domestic hot water distribution network, compatible with its performance and power.



WARNING: The appliance must be used for its intended purpose as stated by the manufacturer. All other use must be considered improper and therefore hazardous.



WARNING: You are only allowed to operate the water heater with the combustion air/flue gas system that has been specifically designed and approved for this type of appliance.



WARNING: California Proposition 65: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.



WARNING: The water heater is fitted with safety devices that shut down the water heater if there are problems with it or the system. During the life span of the machine, these devices must not be decommissioned: in the case of repeated errors, contact a qualified service technician.



CAUTION: After installing the appliance, the installer must inform the end user about the functionality of the appliance, the basic safety standards and the main safety devices.



CAUTION: If there is a leak, close the water supply and promptly inform a qualified service agency.



WARNING: Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.



CAUTION: If the water heater breaks down and/or malfunctions, deactivate it, refrain from any attempt at repair.



WARNING: Maintenance on the appliance must be performed by qualified service technician in compliance with the installation and operation manual, local codes and the authority having jurisdiction. In order to maintain the safety, reliability and performance of the appliance, maintenance must be performed at least once per year.



CAUTION: In case of prolonged absence, close the gas supply. If there is a risk of freezing, empty the water in the appliance.



WARNING: Do not touch hot parts of the appliance that can reach high temperatures as there is a higher risk of burns.



WARNING: Water at temperatures exceeding 120°F (50°C) can cause scalding. Always check the temperature of the water before use.



DANGER: Do not touch the appliance with wet or damp parts of the body or with bare feet. Do not pull the electric cables. If the appliance power supply cable is damaged, contact a qualified service technician.



WARNING:

What do you do if you smell gas?

- Do not try to light the 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.



CAUTION: Check that the pressure relief valve drain is routed correctly to a suitable drain system and that it is not obstructed per the local code and the authorities having jurisdiction.

The manufacturer is not deemed liable in the event of damage caused by intervention of the safety valve.



DANGER: Parts of packaging (plastic bags, polystyrene etc.) must not be left within the reach of children, since they are a potential source of danger.



WARNING: Should overheating occur or the gas supply fails shut off, turn off the manual gas control to the valve to the appliance.



WARNING: Cleaning and maintenance to be performed by the user must not be carried out by a person who is not sound of mind or children.



WARNING: The condensate drain pipe must not be modified, check that there is no residue obstructing the condensate drain pipe.
If a condensate neutralizer is installed, consult the instructions for use and provide periodic cleaning and maintenance per the installation and operation manual.



WARNING: It is prohibited to block intake ventilation openings of the room where the appliance is installed using rags, paper or other materials.



WARNING: The user must not tamper or open sealed components.
Only qualified service technicians can remove the seals from the sealed components.



WARNING: Do not leave inflammable containers and substances in the room where the appliance is installed.



DANGER: Attempts by the user at repair are prohibited in the event of a fault and/or appliance malfunctioning. Failure to comply may result in severe personal injury or death.



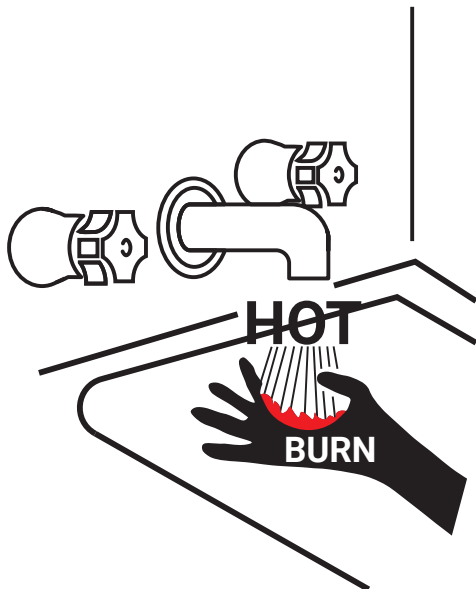
WARNING: Do not clean the appliance or parts using easily inflammable substances.



WARNING: Do not install above cook-tops.



DANGER



Water temperatures over 125°F (52°C) can cause severe burns or scalding resulting in death.
Hot water can cause first degree burns with exposure for as little as:

- 1 seconds at 155°F (68°C)
- 1-1/2 seconds at 150°F (66°C)
- 3 seconds at 145°F (63°C)
- 5 seconds at 140°F (60°C)
- 10 seconds at 135°F (57°C)
- 30 seconds at 130°F (54°C)
- 1-1/2 minutes at 125°F (52°C)
- 5 minutes at 120°F (49°C)

Children, disabled, or elderly are at highest risk of being scalded.

Feel water before bathing or showering.

See instructions for setting the water temperature in the installation and operation manual.

3. About The Water Heater

3.1 Rating Plate

The Heet 199 comes with a rating plate located on the left side of the unit.

Before installing the water heater, check the rating plate to ensure the water heater matches the gas type, gas pressure, water pressure and electrical rating of the application.

Do not install the water heater if it does not meet the ratings of the application. The unit is set for natural gas, for a propane installation please follow the conversion steps located on the side of the water heater or within this installation and operation manual.

 King Heating Products Inc 103-2567 192 St. Surrey, BC V3Z 3X1 Canada	
Heet 199 Cod. 80000150	MADE IN ITALY
S/N	2024
Direct Vent Automatic Instantaneous Water Heater For installation in a manufactured home (Mobile Home) Suitable for combination water (potable) heating and space heating applications only and is not suitable for space heating applications only Chauffe-eau instantané automatique à évent direct Pour installation dans une maison préfabriquée (mobile) Convient uniquement aux applications combinées de chauffage de l'eau (potable) et de chauffage des locaux et ne convient pas uniquement aux applications de chauffage des locaux.	
Type of Gas - Natural Gas - LPG Type de Gaz - Gaz Naturel - GPL	
Certified to / Certifié conforme aux normes: CSA / ANSI Z21.10.3 • CSA 4.3-2019; CSA 2.17-2017	
Maximum inlet gas pressure NG-LPG Pression de gaz d'entrée maximale:	10.5"-13.0" w.c. / 10.5-13.0 po C.E. (2.61-3.23 kPa)
Minimum inlet gas pressure NG-LPG Pression de gaz d'entrée minimale:	3.5"-8.0" w.c. / 3.5-8.0 po C.E. (0.87-1.39 kPa)
Gas Manifold Pressure Pression du collecteur de gaz	N/A
Gas Orifice Size Dimension de l'orifice:	NG 5/16"-8.0 mm LPG 1/4"-6.3mm
Input rating / Note d'entrée:	199,000 btu/h
Minimum input rating Puissance d'entrée minimale:	19,900 btu/h
Recovery rating / Taux de récupération:	235 gph
Maximum working water pressure (psi) Pression d'eau de travail maximale:	150 psi / 150 lb/po2
Voltage / Tension:	120 V
Frequency / Fréquence:	60 Hz
Amperes / Ampères:	1.70 A
Water heater Category Catégorie de chauffe-eau:	Category IV Catégorie IV
FOR YOUR SAFETY Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance. POUR VOTRE SECURITE Ne stockez pas et n'utilisez pas d'essence ou d'autres vapeurs et liquides inflammables à proximité de cet appareil ou de tout autre appareil.	
	

3.2 Specifications

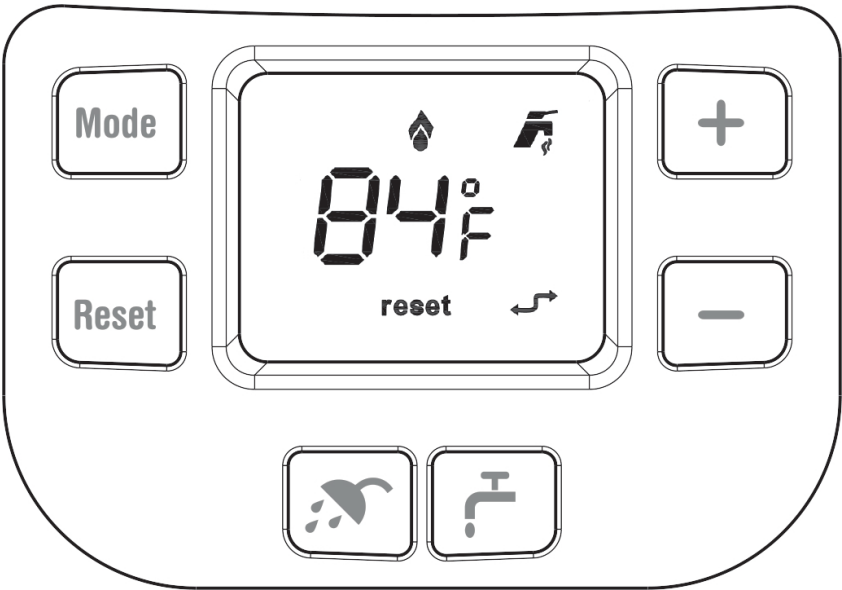
Description		u.m.	Heet 199
Height - Width - Depth		in. (mm)	29-1/8"x15-3/4"x15" (740x400x380)
Weight		lbs. (kg)	79 (36)
Sound Level		dB	63
Vent connection		in. (mm)	2" (51)
Maximum heat input		btuh (kW)	199,000 (58.3)
Minimum heat input		btuh (kW)	19,900 (5.8)
Maximum heat output		btuh (kW)	193,958 (56.8)
Minimum heat output		btuh (kW)	18,815 (5.5)
Electrical Ratings	Power supply voltage	V - Hz	120 - 60
	Overall electric power max	W	160
	Overall electric power min	W	65
	Electric power board in stand-by	W	5
	Fuse rating	A	3.15
DHW	Flow rate @ temperature rise Δt 35°F (19°C)	gpm (l/min)	11.3 (42.9)
	Flow rate @ temperature rise Δt 45°F (25°C)	gpm (l/min)	8.6 (32.6)
	Flow rate @ temperature rise Δt 67°F (37°C)	gpm (l/min)	5.8 (22.0)
	Flow Restrictor	gpm (l/min)	5.8 (22.0)
	Domestic hot water minimum flow rate	gpm (l/min)	0.8 (3)
	Recovery Rating	GPH (lph)	235
	Pressure relief valve rating	psi (bar)	150 (10.3)
	Minimum DHW pressure	psi (bar)	2.3 (0.16)
	Domestic hot water temperature (min-max)	°F (°C)	99 - 140 (37 - 60)
	Water Connections		
	Inlet	in.	3/4"
	Outlet	in.	3/4"
	Return	in.	3/4"
Gas Connection		in.	1/2"
Combustion	NG CO air free min - max lower than (*)	ppm	15 - 200
	CO ₂ min - max	%	9.0
	Exhaust temperature (min - max) (*)	°F (°C)	140 - 120 (60 - 49)
	Flue temperature high limit	°F (°C)	149 (65)
	LPG CO air free min - max lower than (*)	ppm	15 - 350
	CO ₂ min - max (*)	%	10.5
	Exhaust temperature (min - max) (*)	°F (°C)	140 - 104 (60 - 40)
	Flue temperature high limit	°F (°C)	149 (65)

Gas table		Natural Gas	Propane (LPG)
		Heet 199	Heet 199
Nominal supply pressure	in. w.c. (mbar)	7.0" w.c. (17.4)	11.0" w.c. (27.4)
Minimum supply pressure	in. w.c. (mbar)	3.5" w.c. (8.7)	8.0" w.c. (19.9)
Gas orifice diameter	in. (mm)	5/16" (8.0)	1/4" (6.3)
Maximum gas flow rate	cu. ft./hr (m³/h)	196.3 (5.56)	-
	lbs/hr (kg/h)	-	9.19 (4.17)
Minimum gas flow rate	cu. ft./hr (m³/h)	19.6 (0.56)	-
	lbs/hr (kg/h)	-	0.92 (0.42)
Nominal pressure hydrogen mixture (CH4=80%/H2=20%)	mbar	7.0" w.c. (17.4)	-

(*) The concentration of CO in the exhaust gases must ALWAYS comply with local codes and the authorities having jurisdiction where the product is installed. This value is to be understood as the maximum permitted concentration of CO for verifying the correct installation of a new appliance or for the verification of the correctness of a maintenance and/or repair operation

3.3 Control Panel

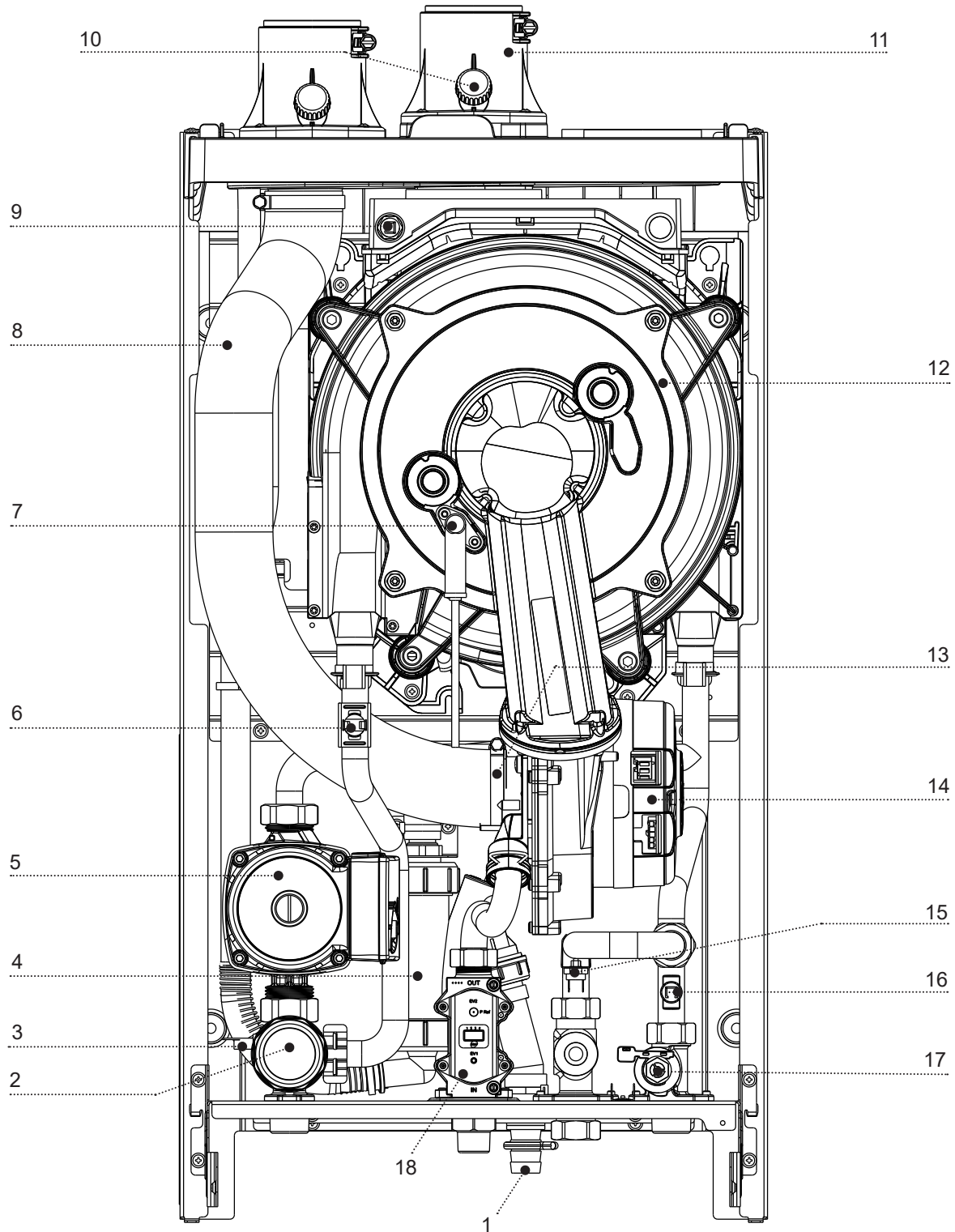
fig.1



	ON / OFF Operation Mode		Increase value adjustment
	Reset Button – press to restore operation of the appliance after an error		Indicates a flame is present
	Activates Comfort Function		Indicates the unit is in the ON mode. When call for DHW is made, the icon flashes.
	Activates adjustment of the DHW temperature	reset	An error is present
	Decrease value adjustment		Remote control connected

3.4 Components

fig.2



- | | |
|-----------------------------------|--|
| 1 Condensate drain | 11 Exhaust Vent |
| 2 Water hammer damper | 12 Combustion unit (burner + heat exchanger) |
| 3 DHW output temperature sensor | 13 Air/gas mixer |
| 4 Condensate collector trap | 14 Fan |
| 5 Circulator | 15 Recirculation return temperature sensor |
| 6 Water high-limit thermostat | 16 DHW input temperature sensor |
| 7 Ignition electrode/flame sensor | 17 Flow meter |
| 8 Intake air pipe | 18 Gas valve |
| 9 Flue high-limit probe | |
| 10 Combustion analysis port | |

3.5 Dimensions

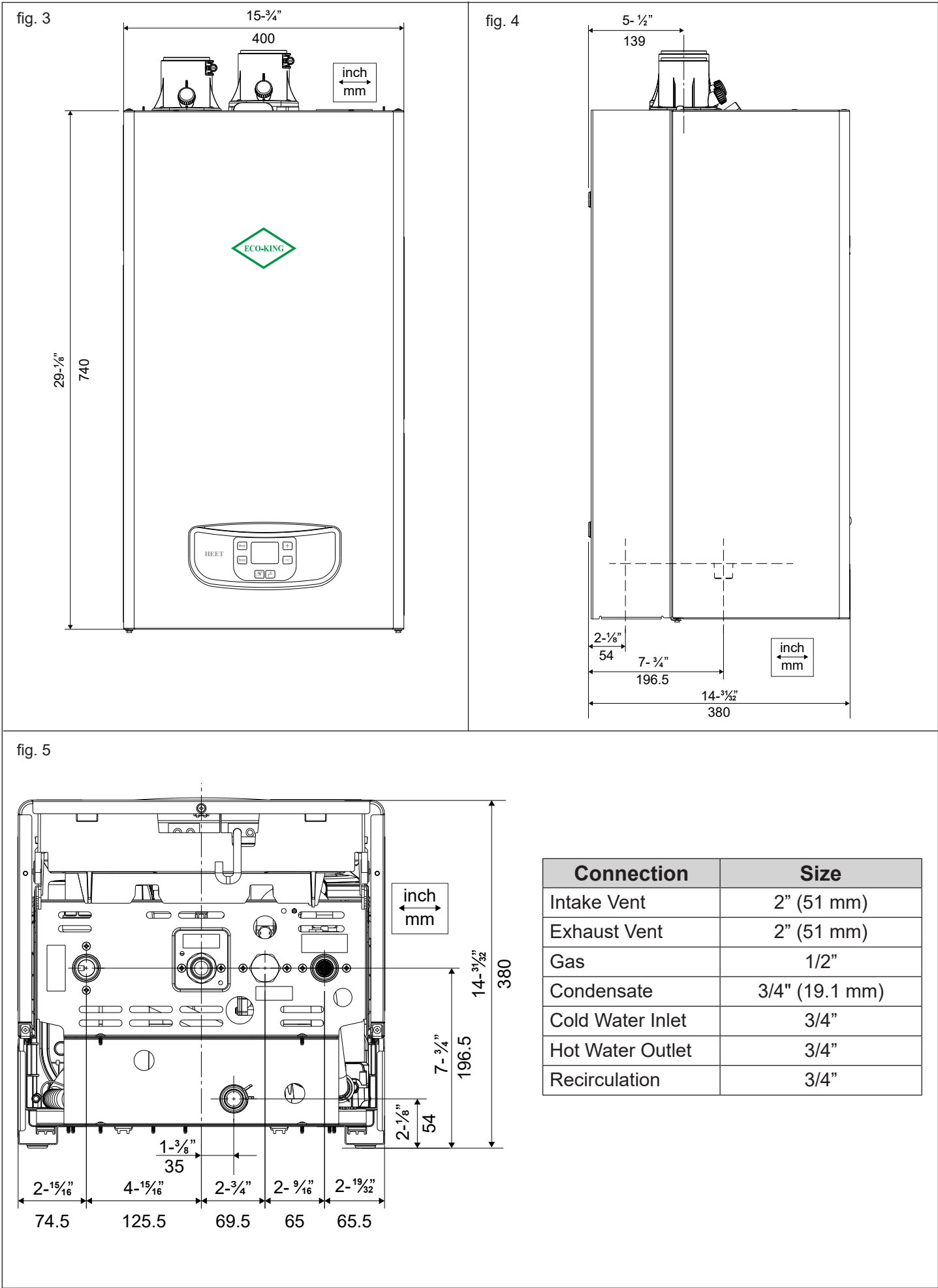


fig. 6

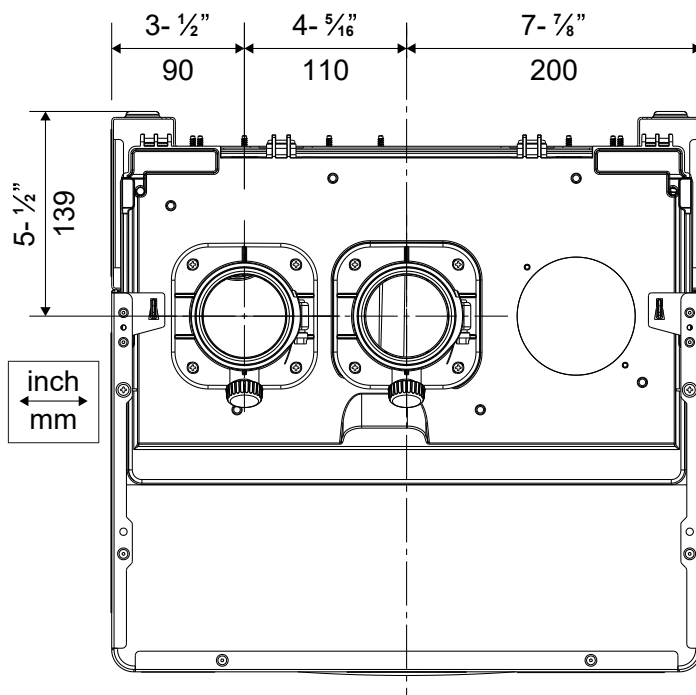
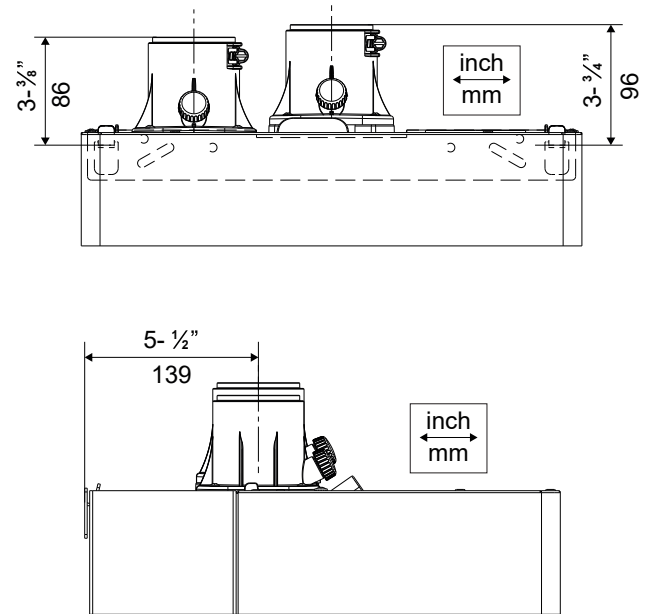


fig. 7



4. Installing the water heater

4.1 Location

The installation must conform with local codes or, in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Code.

When applicable, the installation must conform with the Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 and/or CAN/CSA Z240 MH Series, Manufactured Home.

Heet 199 is designed to be installed in environments that meet the necessary ventilation requirements.

**CAUTION:** The appliance must be installed in environments with ambient temperatures between 32°F (0°C) and 104°F (40°C).

The appliance should be located in an area where leakage of the appliance or connections will not result in damage to the area adjacent to the appliance or to lower floors of the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance. The pan must not restrict combustion air flow.

The location of the water heater must be free from dust, objects or inflammable materials or corrosive gases and must have characteristics to allow for the installation of the water heater, maintenance, of any type, and the removal/replacement of the water heater.

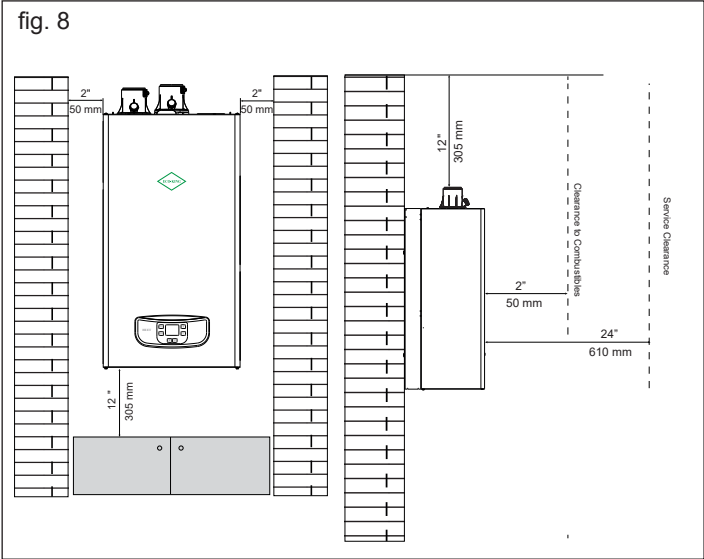
When choosing an installation location for the water heater you must ensure the location meets proper service and combustible clearances, access to gas, water and electrical supplies, and allow for the water heater to be properly vented and drained.

DO NOT:

- Install the water heater outdoors
- Install the water heater in a recreational vehicle, boat or trailer.
- Install in common areas of an apartment building such as an indoor stairway or other areas that are part of an escape route (e.g. landings, hallways).
- Install in common areas of an apartment building if not located inside mechanical rooms pertaining to each individual unit and accessible only by the user.

4.1.1 Clearances

**NOTE:** Ensure the location provides adequate space for a combustion analyzer to be used.



Location	Clearance to Combustibles
Top	9" (229 mm)
Bottom	12"(305 mm)
Back	0" (0 mm)
Front	2" (51 mm)
Sides (Left & Right)	2" (51 mm)

Location	Service Clearances
Top	9" (229 mm)
Bottom	12"(305 mm)
Back	0" (0 mm)
Front	24" (610 mm)
Sides (Left & Right)	2" (51 mm)

4.1.2 Air Quality

The water heater, intake air vent and exhaust vent must be free from dust, detergents, aerosols, bleaches, cleaning solvents, and paints.

Do not install the water heater where flammable vapors or gasoline may be stored.

The following areas may produce high concentrations of products that could damage the water heater. Consider separating the water heater from the environment, if possible:

- Laundry facilities
- Dry cleaning facilities
- Farms / areas with livestock or manure
- Woodworking or furniture refinishing shops
- Swimming pools/ hot tubs
- Auto-body/ metal shops
- Refrigeration repair shops
- Beauty/ hair salons
- Photo labs, chemical/ plastic processing plants
- Concrete plant/ construction sites

Poor air quality is not considered a manufacturer defect and may void warranty.

4.1.3 Water Quality



The water should be tested for hardness and contamination. Eco-King recommends **a water softener if the water hardness exceeds 5.8 grains per gallon (100 mg/l).**



WARNING: If you suspect your water is contaminated contact a service technician to test it immediately.



WARNING: The water pH must be within 7.5 - 9.

In cases where a softener is not used a minimum annual flushing is recommended with either white vinegar or a suitable water treatment product designed to be used on instantaneous water heaters.

The following table illustrates the water quality guidelines per the EPA National Secondary Drinking Water Regulations (40 CFR part 143.3).

Contaminant	Maximum Limit
Total Hardness	Up to 200 mg/l (12 grains/ gallon)
Aluminum	0.05 to 0.2 mg/l
Chloride	Up to 250 mg/l
Copper	Up to 1.0 mg/l
Iron	Up to 0.3 mg/l
Manganese	Up to 0.05 mg/l
pH	6.5 to 8.5
Sulfate	Up to 250 mg/l
Total Dissolved Solids (TDS)	Up to 500 mg/l
Zinc	Up to 5 mg/l
Chlorine	Up to 4 mg/l

4.2 Mounting The Water Heater

The Heet 199 water heater comes with a wall-mounting bracket pre-drilled to mount to standard 16" on center studs.



WARNING: The water heater is heavy, lift with assistance.

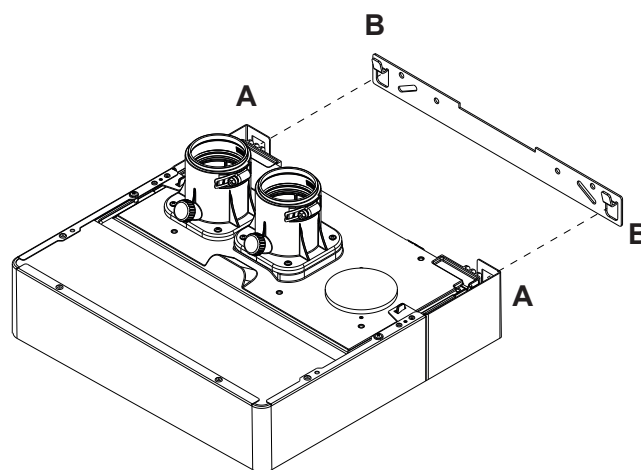


CAUTION: Reinforce the wall if it is incapable of supporting the weight of the water heater and water within it.

Instructions to mount the water heater to the wall:

1. Tape the wall template to the desired location of the water heater.
2. Hold the wall-mount bracket in place and use a torpedo level to ensure the bracket is level.
3. Affix the level bracket to the wall.
4. Lift the water heater up and align the openings (A) on the back of the water heater with the tongues (B) on the wall-mount bracket.

fig. 9



4.3 Connecting the Water Lines

The hot water heater must be adequately sized for domestic hot water system it is being connected to.

Piping and components connected to the water heater shall be suitable for use with potable water. This includes fittings, valves, and solder.



WARNING: The appliance must not be connected to a system that was previously used with a non-potable water heating appliance.



WARNING: Toxic chemicals, such as those used for boiler treatment, shall not be introduced into the potable water used for space heating.



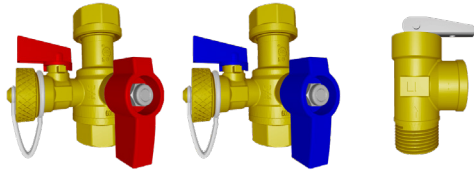
DANGER: No valve is to be placed between the temperature/ pressure relief valve and the water heater. Failure to comply may result in personal injury, substantial property damage or death.



CAUTION: When using the water heater in conjunction with a storage vessel, the storage vessel must have its own temperature and pressure relief valve. The relief valve shall comply with the standard *Relief Valves for Hot Water Supply Systems*, ANSI Z21.22 • CSA 4.4

The unit comes with a 3/4" connection kit and pressure relief valve in the box:

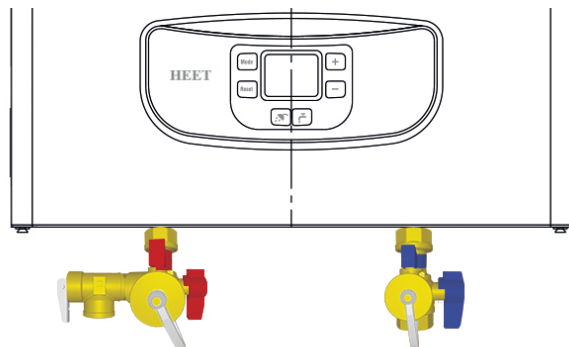
fig. 10



When connecting the water heater to the buildings piping:

1. Connect the blue handled cold water isolation valve to the inlet port of the water heater by placing the supplied 3/4" rubber gasket between the swivel nut and the inlet port and hand-tighten the swivel nut.
2. Connect the red handled hot water isolation valve to the outlet port of the water heater by placing the supplied 3/4" rubber gasket between the swivel nut and the outlet port and hand-tighten the swivel nut.
3. Position both valves so the drain ports are facing forward and tighten the swivel nuts with a wrench.
4. Connect the cold water supply line to the blue handled cold water isolation valve.
5. Connect the hot water supply line to the red handled hot water isolation valve.
6. Connect the supplied pressure relief valve into the side port of the red handled hot water isolation valve.

fig. 11



NOTE: Do not remove the factory installed recirculation inlet port cap unless using the recirculation line.



WARNING: If the water heater is installed in a closed water supply system, such as one having a backflow preventer in the cold water supply line, means shall be provided to control thermal expansion. Contact the water supplier or local plumbing inspector on how to control this situation.

4.4 Routing the Pressure Relief Valve



WARNING: Do not plug or restrict the pressure relief valve.

The pressure relief valve shall be accessible for servicing and replacement and shall comply with the standard for *Relief Valves for Hot Water Supply Systems*, ANSI Z21.2 • CSA 4.4, or the ANSI/ ASME *Boiler and Pressure Vessel Code*, Section IV "Heating Boilers".



CAUTION: Check that the pressure relief valve drain is routed correctly to a suitable drain system and that it is not obstructed per the local code and the authorities having jurisdiction.
The manufacturer is not deemed liable in the event of damage caused by intervention of the safety valve.

The pressure relief valve discharge line shall be as short as possible and must be the same size or larger diameter of the pressure relief valve outlet through out the entire length.

The discharge line shall be installed to allow complete drainage of both the valve and line.

Do not install a reducing coupling or other restriction in the discharge line.

The discharge line from the pressure relief valve should pitch downward and terminate 6 in. (152 mm) above drains where discharge will be clearly visible.



WARNING: Do not route the discharge to any area that freezing may occur.

Do not plumb the pressure relief valve and condensate drain together, they need to be routed independently.

The pressure relief valve must have a minimum pressure rating of 150 psi and be rated for the maximum btu/h rating of the appliance.

If the 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.

The pressure relief valve must be manually operated once a year to check for correct operation.

4.5 Connecting the Condensate Drain

The appliance produces condensation water, which must be conveyed away and disposed of via the sewage network through pipes capable of handling acidic condensate.



CAUTION: Refer to local codes and the authorities having jurisdiction for disposal of the condensate and the possible installation of a condensate neutralizer.

The appliance must be connected to the sewer system in a way to prevent obstructions or freezing of the condensate.



DANGER: Ensure that combustion products do not escape from the condensate drain and that it is installed properly per the manufacturer instructions.

The built-in condensate trap has a closing device that intervenes in dry conditions; however, sealing is only guaranteed when the trap contains liquids. Therefore, on completion of commissioning, make sure that the trap is primed and contains liquids. Ensure liquid escapes from the appliance condensate drain.

If a condensate neutralizer is installed, consult the user instructions of the neutralizer for cleaning and periodic maintenance information.

Use only non-corrosive materials for the condensate drain such as plastic tubing.

Ensure there is an air gap between the external drain and the condensate drain tubing that is open to the atmosphere.



CAUTION: When connecting the drain, avoid horizontal sections of pipe, always guarantee a minimum slope to ensure correct drainage of the condensate products.

The condensate trap can be routed in one of the following ways:

TO THE EXTERNAL DRAIN

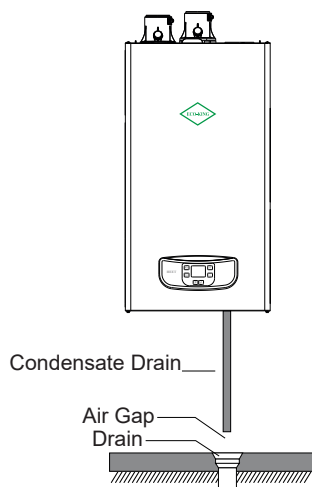


fig. 12



NOTE: The medium used in a condensate neutralizer must be changed periodically. Please consult the manufacturer's instructions for proper maintenance scheduling and procedures.

TO CONDENSATE NEUTRALIZER

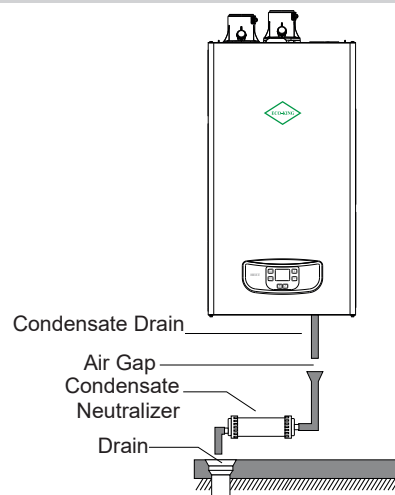


fig. 13

TO CONDENSATE PUMP

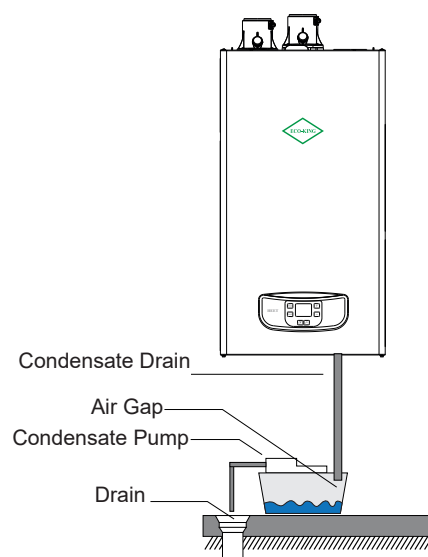


fig. 14

TO LAUNDRY SINK

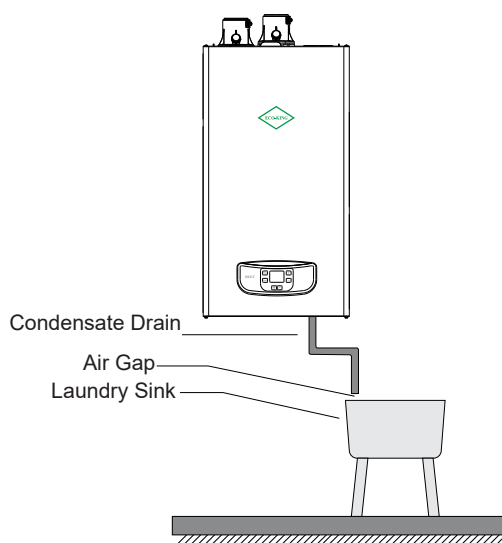
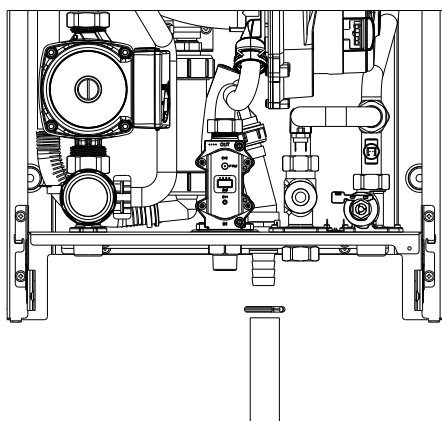


fig. 15

To connect the condensate trap:

1. Connect the condensate trap to the bottom of the unit using 5/8" OD tubing and the spring clamp.

fig. 16



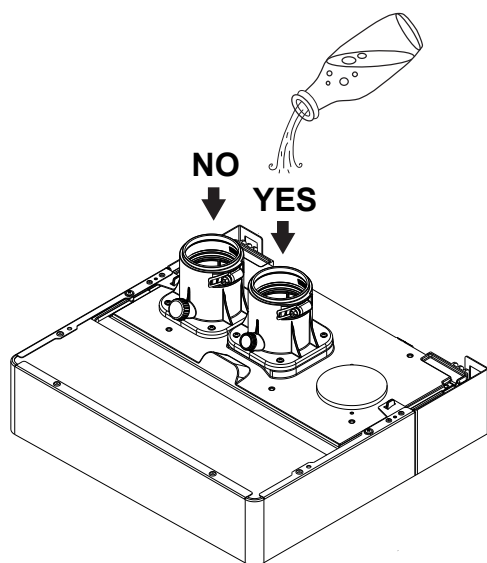
2. Route the drain pipe to the appropriate drain. Ensure a downward slope of 1/4" per ft. (21 mm/m) pitched away from the condensate trap.



CAUTION: If using a condensate pump, ensure the pump is capable of pumping 2 gallons per hour of condensate.

3. Prime the condensate trap in the water heater by pouring water into the exhaust vent until water pours into the external drain.

fig. 17



4.6 Gas Connection



WARNING: The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.5 kPa). The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa).



WARNING: The appliance and its gas connection must be leak tested before placing the appliance in operation.



WARNING: The maximum inlet gas pressure must not exceed the value specified by the manufacturer. The minimum inlet gas pressure listed is for the purposes of input adjustment.



CAUTION: The appliance is not intended for connection to gas networks where the quality of the gas distributed is likely to vary to a large extent during the life of the appliance. The appliance is suitable for the use of mixtures of natural gas and hydrogen up to 20% by volume.



WARNING: Incorrect installation of the gas line can compromise the operational safety of the appliance and cause personal injury and property damage or death.



WARNING: The gas installation must only be carried out by a qualified technician, service agency or the gas utility. The installation shall comply local codes and the authorities 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



WARNING: It is important to pay attention to the quality of the gas. If the annual average sulphur percentage in the gas exceeds 30 mg/m³, it is suggested to increase the maintenance intervals of the boiler.

The following checks must be performed before making the gas connection:

- Check pre-existing internal and external gas piping to ensure there are no leaks.
- Check that the gas type corresponds to that for the appliance (see rating plate on the appliance)
- The gas supply pressure must be within the values stated on the rating plate
- For Propane Gas (LPG): the appliance has been designed to operate with gas free from impurities; if this is not the case, it is good practice to introduce filters upstream from the appliance in order to ensure the purity of the gas.

After installation, pressure test the system per local codes and the authorities 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 before putting the water heater into operation.



CAUTION: If the water heater is not being used for long periods of time such as during a vacation, close the main shut-off valve to the gas appliance.



WARNING: Do not obstruct ventilation openings to the room where gas appliance(s) are installed in order to prevent hazardous situations such as the formation of toxic and explosive mixtures resulting in personal injury, property damage or death.



WARNING: Do not use the gas pipes as a ground for electric appliances.

Properly support the piping using hangers. Do not allow the water heater to support the weight of the gas piping.



DANGER: Use a soap and bubble test to check the gas piping for leaks. Do not use a flame to check for leaks.

The water heater can be converted from natural gas to propane (LPG).

Go to Section 6.2 Gas Conversion for further instructions on converting the type of gas.

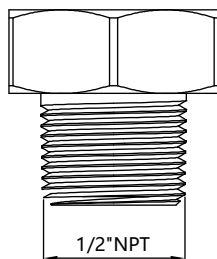
4.6.1 Connecting The Gas Supply



NOTE: Use two wrenches when tightening gas connections to the water heater to avoid damage to the water heaters gas connection.

1. Purge the gas line of any debris before connecting to the water heater.
2. Determine the proper gas line size.
3. Ensure the supplied appliance adapter (25 mm BSP to 1/2" NPT reducer), already attached to the water heater, is tight before connecting any piping to it.

fig. 18



CAUTION: Do not remove the supplied adapter and attach 3/4" NPT gas piping directly to the gas valve the gas valve uses BSP threading not commonly used in North America.

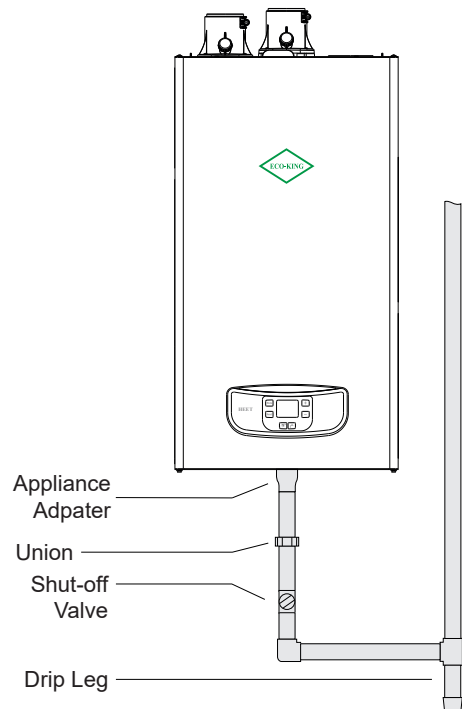
4. Install all other shut-off valves, unions and components per your local codes and the authorities having jurisdiction.
5. Perform a pressure test and check for leaks using a soap and bubble test.



NOTE: Rigid and flexible 1/2" gas piping can be used on the water heater. Ensure the internal diameter of the flexible gas pipe and it's connectors are large enough to handle the required input btu's of the water heater.

Do not use corrugated appliance connectors with the water heater as they may have large pressure drops across them that may affect the performance of the water heater and result in nuisance noises.

fig. 19



4.7 Electrical

The water heater must be electrically grounded in accordance with local codes or, in the absence of the local codes, with the *National Electrical Code*, ANSI/NFPA 70, and/or, *CSA C22.1, Canadian Electrical Code, Part I*.

The water heater is supplied with a 3 prong plug from the factory. That must be connected to a properly grounded electrical receptacle.

Do not cut or remove the grounding terminal from the plug.

The water heater is 120V single phase 60Hz.



CAUTION: The manufacturer declines all liability for injury/damage to persons or objects deriving from the lack of appliance ground connection and failure to comply with local code and the authorities having jurisdiction.



WARNING: The appliance power supply cord must not be replaced by the user; this type of service must be carried out by qualified service technician.



The appliance power supply cord must be connected to a 120V - 60Hz wall outlet, respecting the L-N polarity and the ground connection.



WARNING: It is prohibited to use the water and gas pipes for the appliance as a ground connection.



WARNING: Ensure the breaker is off and there is no voltage to the circuit when working on the electrical circuit.



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



Verify proper operation after servicing.

To access the control board:

- Loosen the case screws and remove them (fig. 20)
- Move the control board down (fig. 21)
- Open the control panel by depressing the fixing clips (A - fig. 22)
- Disconnect the electrode connection cable
- Make the connection as indicated in fig. 22 and in the wiring diagram.

OPTIONAL CONNECTIONS

M1 Terminal Block

RT - RECIRCULATION TIMER (ON/OFF) CONNECTION

RC - REMOTE CONTROL CONNECTION

BP - 10K STORAGE TANK SENSOR CONNECTION $\beta = 3435$

M3 Terminal Block

CE - EXTERNAL 120V RECIRCULATION PUMP CONNECTION

3WV - EXTERNAL 120V THREE- WAY VALVE

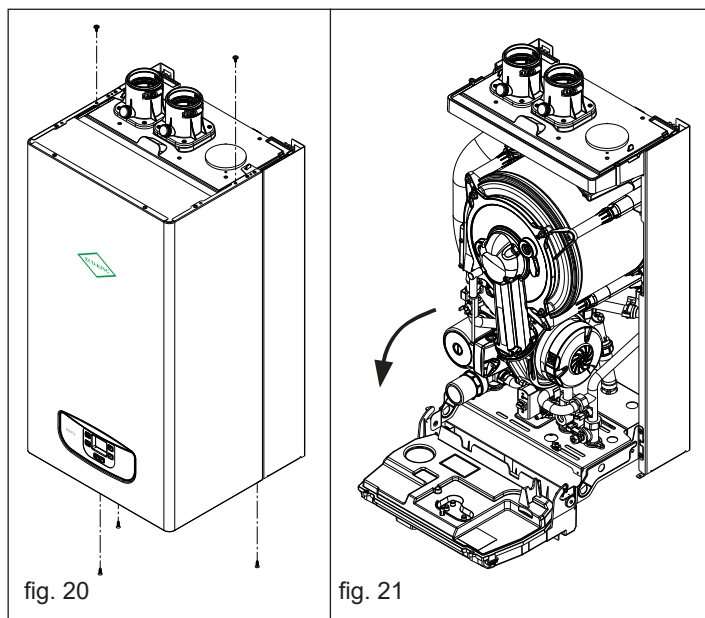


fig. 20

fig. 21

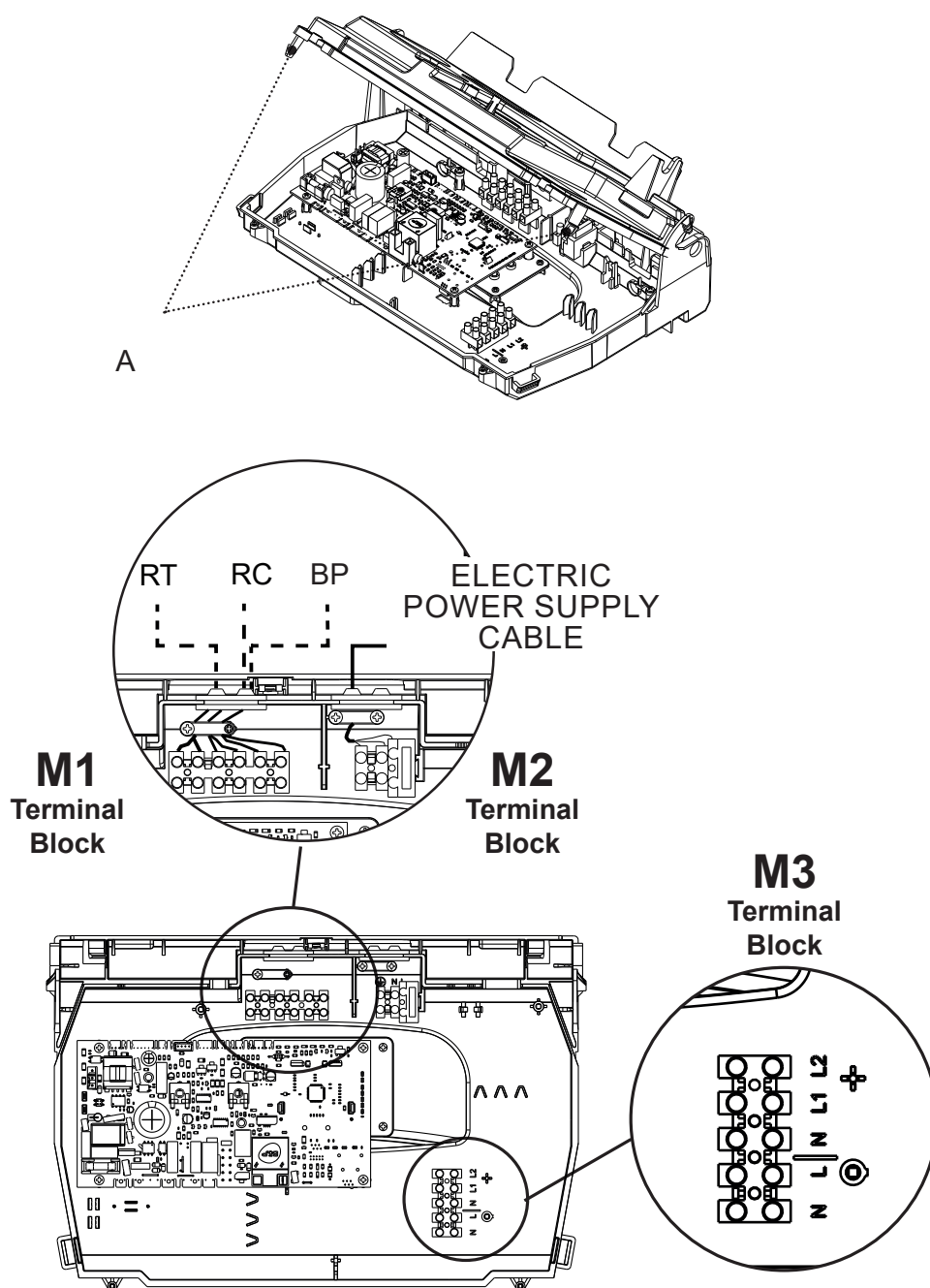


fig. 22



WARNING: 3/8" Cable clamp system NOT supplied with water heater.

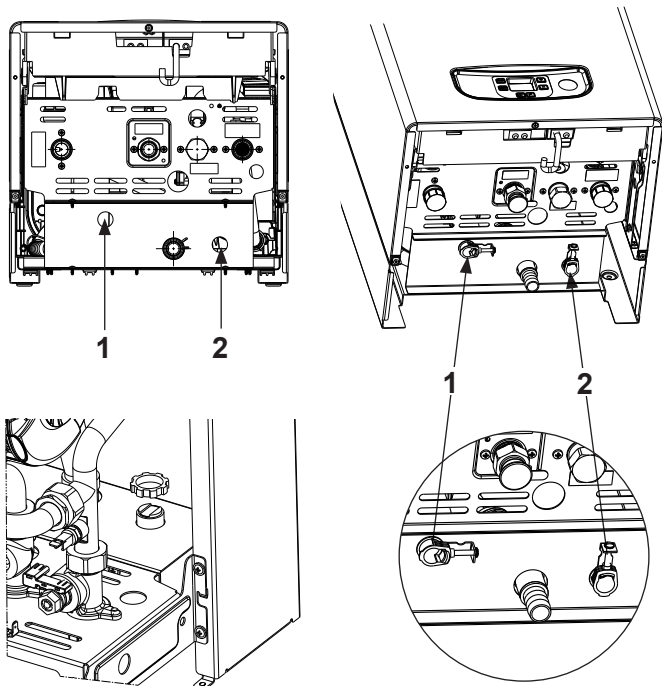


fig. 23

4.8 Venting

This water heater must be vented in accordance with the latest edition of the ANSI Z223.1/NFPA 54 *Natural Fuel Gas Code* in the USA and/or the latest version of the CAN/CGA B149.1 *Natural Gas and Propane Installation Code* in Canada, as well as all applicable local building codes and regulations.

The venting system shall be installed in accordance with this installation and operation manual and the venting system manufacturer's instructions.

The water heater can be vented either direct vent or non-direct vent. Combustion air must be provided from the outside in direct vent applications, and from the room in non-direct vent applications.

For non-direct (room air) applications, ensure the required volume of indoor air is available according to ANSI Z223.1/NFPA 54 *Natural Fuel Gas Code* in the USA and/or the latest version of the CAN/CGA B149.1 *Natural Gas and Propane Installation Code* in Canada.

When venting the water heater in a non-direct vent application, it must be located as close as practical to a chimney or gas vent.

The water heater is a Category IV appliance and requires a special vent system and operates under positive pressure.



WARNING: Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited.

Venting shall be supported per the vent manufacturers instructions and local code requirements. In the absence of the aforementioned, venting shall be supported horizontally every 4 ft (1.2m) and vertically every 6 ft. (1.83m).



WARNING: Horizontal portions of the venting system shall be supported to prevent sagging. Failure to comply may lead to severe personal injury, substantial property damage or death.

Venting is to be supported at every elbow to ensure it cannot separate. If using a push-fit gasket system support the venting at every pipe joint.



WARNING: Risk of carbon monoxide poisoning or fire due to joint separation or pipe breakage. Ensure all of the venting system is properly supported and secured. Failure to do so may result in substantial property damage, severe personal injury or death.

Ensure the venting is fixed and sealed gas tight so it cannot separate. When using glues and solvents ensure they are within the expiration date.

Ensure supports allow for expansion per the vent manufacturer's instructions and local code requirements.

Slope the exhaust venting 1/4" / ft. (21mm / m) towards the water heater to promote the proper drainage of condensate. Do not slope the combustion air pipe towards the water heater.



DANGER: Improper venting of the water heater can result in excessive levels of carbon monoxide (CO) which can lead to severe personal injury or death.



WARNING: Do not mix manufacturers vent components.



WARNING: Do not cover the non-metallic vent pipe and fittings with thermal insulation.



DANGER: Exhaust gases must be piped to the outdoors. Failure to do so may result in carbon monoxide (CO) poisoning causing substantial property damage, severe personal injury, or death.



WARNING: Do not connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure.



WARNING: Do not connect the water heater to a chimney flue serving a another appliance.



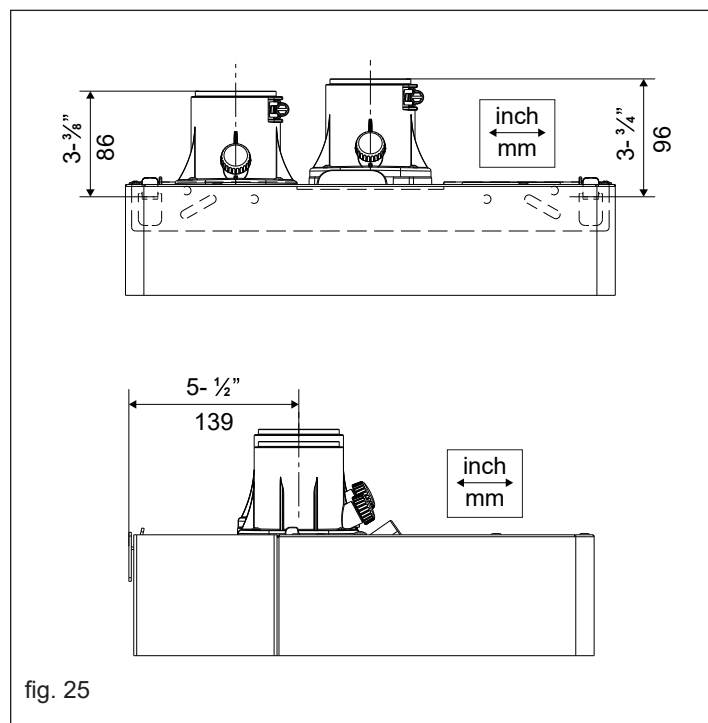
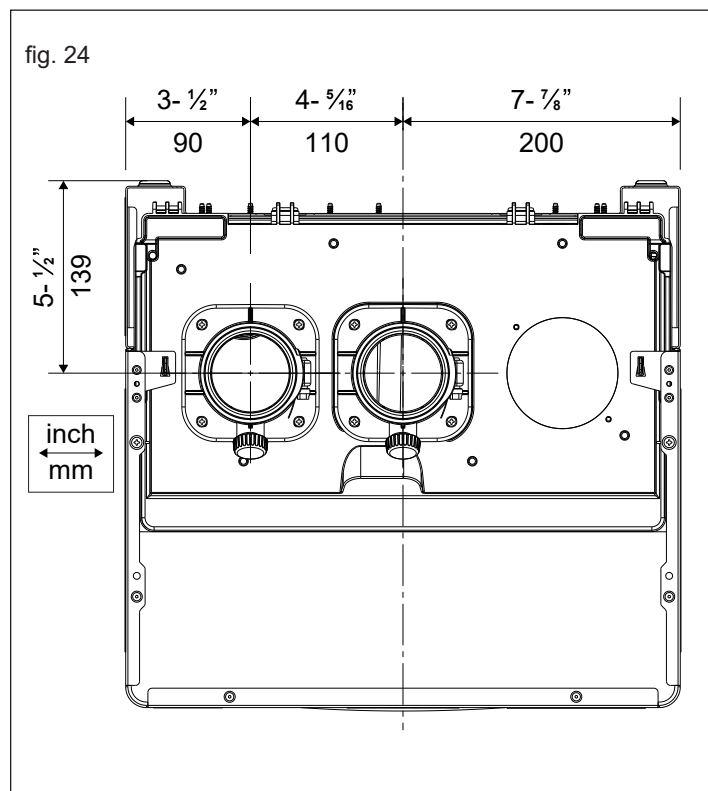
WARNING: The air for combustion shall be free of all the external agent (chlorine, ammonia, alkaline agents, halogen, hydrocarbons, dust) which can damage the appliance.

The vent for this appliance shall not terminate:

- Over public walkways; or
- Near soffit vents, crawl spaces vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage; or
- Where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

The water heater can be vented using either 2" (51 mm), 3" (76 mm) single pipe, or 2"4" (51/102 mm) concentric pipe.

The water heater combustion air and exhaust flue connections are 2" (51 mm).



4.8.1 Connecting The Vent Pipe To The Appliance



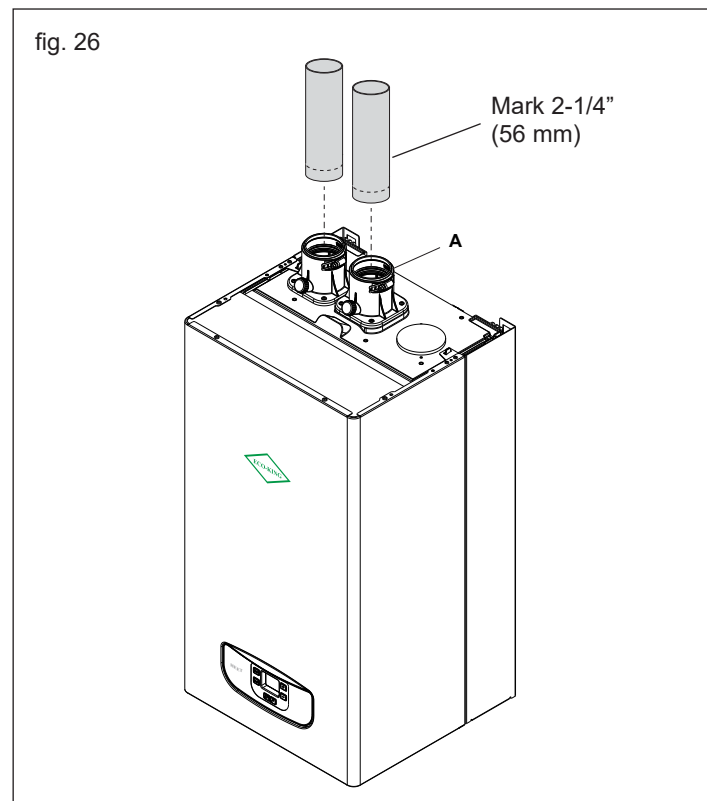
WARNING: Do not use primer or cement on the water heater vent collar.

1. Measure 2-1/4" and draw a perpendicular line on the vent pipe.
2. Insert the vent pipe into the exhaust flue connector until the line drawn in step 1 is flush with the top of the exhaust flue connector and the vent pipe makes contact with the bottom of the vent connector.



NOTE: Ensure the end of the pipe is cut perpendicular to the pipe and not angled to assure a proper seal.

3. Tighten the clamp (A) on the vent connector.
4. Repeat steps 1-3 for the combustion air pipe.

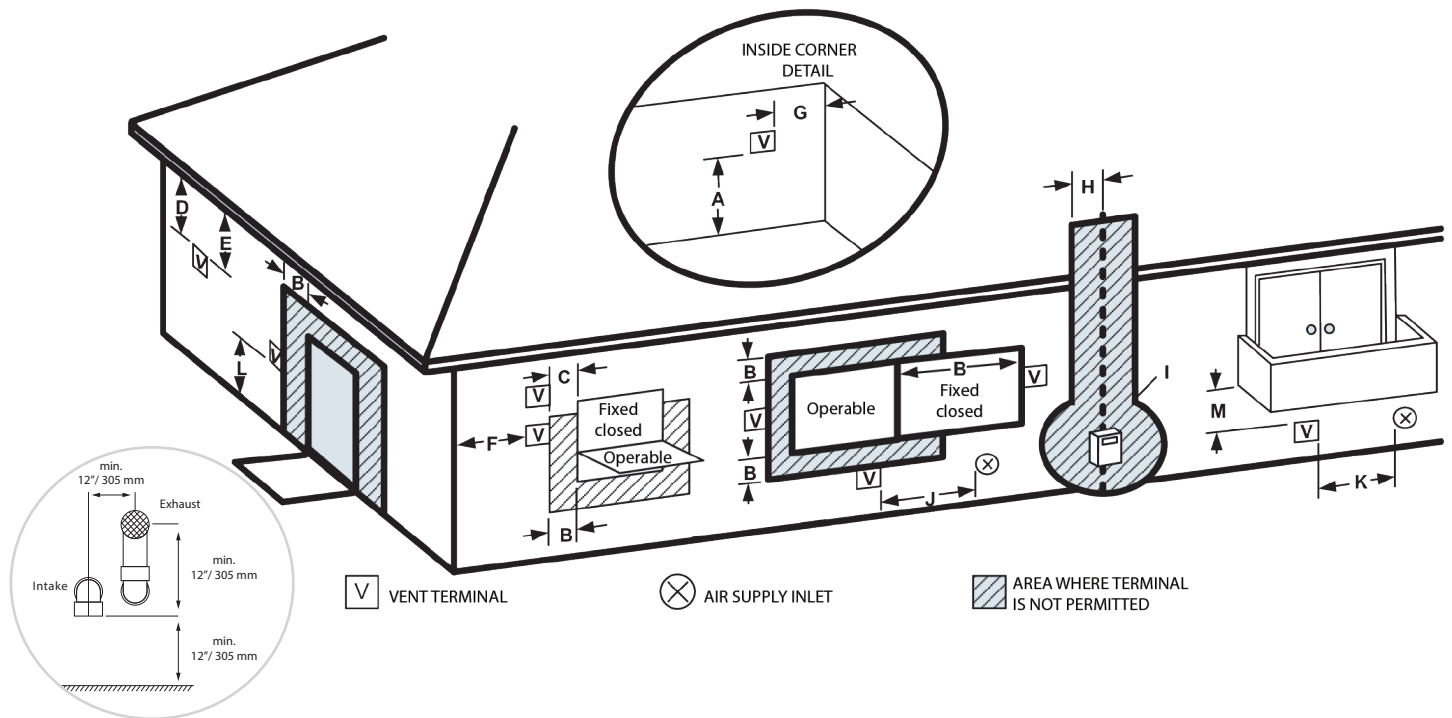


WARNING: Do not use a street elbow to begin the vent run. Use a straight piece of pipe when connecting to the water heater before transitioning to an elbow.



WARNING: Do not store flammable or hazardous material by the vent termination.

4.8.2 Direct Vent Termination Clearances



		Canadian Installations	US Installations
A	Clearance above grade, veranda, porch, deck, or balcony	12 in. (30 cm)	12 in. (30 cm)
B	Clearance to window or door that may be opened	36 in. (91 cm)	12 in. (30 cm)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit, located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	3 ft (91 cm) within a height of 15 ft (4.6 m)	*
I	Clearance to service regulator vent outlet	3 ft (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	36 in. (91 cm)	12 in. (30 cm)
K	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) †	Vents for Category IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard.
M	Clearance under veranda, porch, deck, or balcony	12 in. (30 cm) ‡	*

* Clearances are in accordance with local installation codes and the requirements of the gas supplier.

i) The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/ NFPA 54, and/or the National Gas and Propane Installation Code, CSA B149.1;

ii) Information on preventing blockage by snow; and

iii) Information on protecting building materials from degradation by flue gases.

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

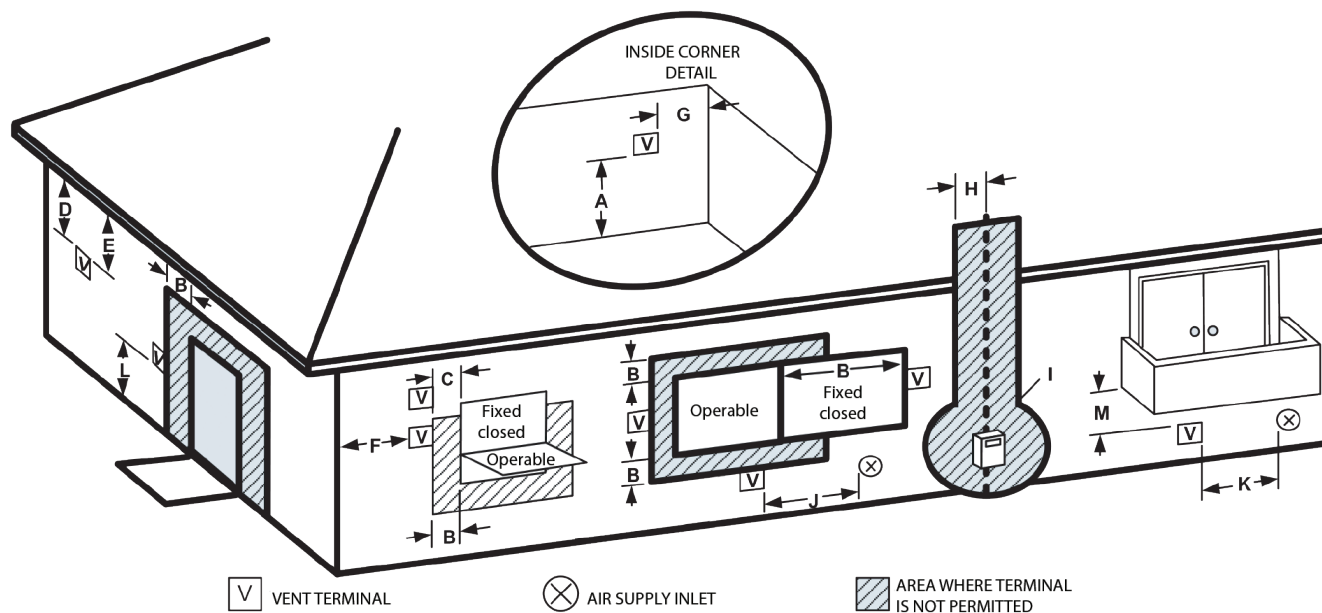
Notes:

1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

2) In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code.

3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.

4.8.3 Non-Direct Vent termination Clearances



		Canadian Installations	US Installations
A	Clearance above grade, veranda, porch, deck, or balcony	12 in. (30 cm)	12 in. (30 cm)
B	Clearance to window or door that may be opened	36 in. (91 cm)	4' (1.2 m) below or to side of opening; 1 ft (300 mm) above opening
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit, located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	3 ft (91 cm) within a height of 15 ft (4.6 m)	*
I	Clearance to service regulator vent outlet	3 ft (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	36" (91 cm)	4 ft (1.2 m) below or to side of opening; 1 ft (300 mm) above opening
K	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) †	Vents for Category II appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard.
M	Clearance under veranda, porch, deck, or balcony	12" (30 cm) ‡	*

* Clearances are in accordance with local installation codes and the requirements of the gas supplier.

i) The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the National Gas and Propane Installation Code, CSA B149.1;

ii) Information on preventing blockage by snow; and

iii) Information on protecting building materials from degradation by flue gases.

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

Notes:

1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

2) In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code.

3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.

4.8.4 Non-Direct Combustion Air Requirements



NOTE: For installations in manufactured homes (mobile homes), combustion air shall not be supplied from occupied spaces.



WARNING: Do not block combustion air openings to a room the water heater is installed in.

Combustion air requirements are based on the latest edition of the National Fuel Gas Code, NFPA 54/ANSI Z223.1; In Canada, refer to the latest edition of the National Gas and Propane Installation Code, CSA B149.1.

Heet 199 (199,000 Input)	Outdoor Make Up Air (50 in ²)	Indoor Make Up Air (199 in. ²)
Square Opening	10" x 5"	14-1/4" x 14-1/4"
Round	8"	16"

For Mobile home applications, when only a screened opening(s) is utilized, the type of screen to be used shall be metal with no less than 1/4" (6.4 mm) mesh.

4.8.5 Approved Venting Materials By Manufacturer

Manufacturer	Vent Material
Centrotherm	Polypropylene / Flexible Polypropylene
IPEX	PVC/ CPVC
DuraVent	Polypropylene/ Flexible Polypropylene
Royal	PVC/ CPVC
Diversitech	Polypropylene
FasNSeal	Stainless Steel
Z-Flex	Polypropylene/ Flexible Polypropylene / Stainless Steel

4.8.6 Approved Venting Terminations

Material	Manufacturer	Manufacturer Part Number	Description
PVC	IPEX	196984	2" FGV PVC Low Profile Termination Kit
		196985	3" FGV PVC Low Profile Termination Kit
		081216	2" FGV PVC Wall Termination Kit
		081219	3" FGV PVC Wall Termination Kit
		196005	2" FGV PVC Concentric Vent Kit Length 16"
		196105	2" FGV PVC Concentric Vent Kit Length 28"
		196125	2" FGV PVC Concentric Vent Kit Length 40"

Material	Manufacturer	Manufacturer Part Number	Description
PVC	IPEX	196006	3" FGV PVC Concentric Vent Kit Length 20"
		196106	3" FGV PVC Concentric Vent Kit Length 32"
		196116	3" FGV PVC Concentric Vent Kit Length 44"
	Royal	52SWVKGVS6502	2" PVC Side Wall Vent Kits
		52WTVKGVS6502	2" PVC Wall Vent Kits
		52SWVKGVS6503	3" PVC Side Wall Vent Kits
		52WTVKGVS6503	3" PVC Wall Vent Kits
		52CVKGS6502	2" PVC Concentric Vent Kit Length 16"
		52CVKGVS6502-28	2" PVC Concentric Vent Kit Length 28"
		52CVKGVS6502-40	2" PVC Concentric Vent Kit Length 40"
		52CVKGVS6503	3" PVC Concentric Vent Kit Length 20"
		52CVKGVS6503-32	3" PVC Concentric Vent Kit Length 32"
		52CVKGVS6503-44	3" PVC Concentric Vent Kit Length 44"
	Diversitech	HVENT-2	2" Low Profile Horizontal Vent Kit
		HVENT-3	3" Low Profile Horizontal Vent Kit
		CVENT-2	2" x 4" Concentric Horizontal Termination
		CVENT-3	3" x 5" Concentric Horizontal Termination
	Misc.	Tee, 90° Elbow, 45° Elbow, Vent Screen	Misc. fittings in 2" & 3" schedule 40 PVC for Terminations
CPVC	IPEX	197040	2" FGV CPVC Concentric Vent Kit Length 16"
		197033	2" FGV CPVC Concentric Vent Kit Length 28"
		197009	3" FGV CPVC Concentric Vent Kit Length 20"
		197107	3" FGV CPVC Concentric Vent Kit Length 32"
		197117	3" FGV CPVC Concentric Vent Kit Length 44"
	Royal	52CVKGVSF9003	3" CPVC Concentric Vent Kit Length 20"
		52CVKGVSF9003-32	3" CPVC Concentric Vent Kit Length 32"
		52CVKGVSF9003-44	3" CPVC Concentric Vent Kit Length 44"
	Misc.	Tee, 90° Elbow, 45° Elbow, Vent Screen	Misc. fittings in 2" & 3" schedule 40 CPVC for Terminations

Material	Manufacturer	Manufacturer Part Number	Description
Polypropylene	Centrotherm	ISELL0287UV	2" 87° Long PPS-UV
		ISELL0387UV	3" 87° Long PPS-UV
		ISTT0220	2" Termination Tee
		ISTT0320	3" Termination Tee
		ISLPT0202	2" Low Profile Wall Termination
		ISLPT0303	3" Low Profile Wall Termination
	DuraVent	2PPS-HTPL	2" Twin Pipe Termination
		3PPS-HTPL	3" Twin Pipe Termination
		2PPS-HSTL	2" Single Horizontal Termination
		3PPS-HSTL	3" Single Horizontal Termination
		2PPS-TBL	2" Black UV Resistant Tee
		3PPS-TBL	3" Black UV Resistant Tee
	Z-Flex	2ZDCTH24	Z-DENS Concentric Termination Horizontal 2"/4" (51/101 mm) L = 31.5"
		2ZDCTV24	Z-DENS Concentric Termination Vertical 2"/4" (51/101 mm) H1 = 21.4" H2 = 45.3"
		2ZDE287UV	Z-DENS 90° Elbow 2" (51 mm) UV Black
		2ZDE387UV	Z-DENS 90° Elbow 3" (76 mm) UV Black
		2ZDE245UV	Z-DENS 45° Elbow 2" (51 mm) UV Black
		2ZDE345UV	Z-DENS 45° Elbow 3" (80 mm) UV Black
		2ZDCTH35	Z-DENS Concentric Termination Horizontal 3"/5" (76/127 mm) L = 30.9"

Material	Manufacturer	Manufacturer Part Number	Description
Polypropylene	Z-Flex	2ZDCTV35	Z-DENS Concentric Termination Vertical 3"/5" (76/127 mm) H1 = 21.7" H2 = 45.6"
		FSRC3	3" Rain Cap
	FasNSeal	FSBS3	3" 23° Bird Screen
		FSTT3	3" Termination Tee
	Stainless Steel	2SVSTPX03	Z-VENT Termination Coupling 3" (80 mm)
		2ZDCT2	Z-DENS Termination Tee with Screen 2" (60 mm) - Stainless Steel
		2ZDHLKP2	Z-DENS Horizontal kit low profile 2" (60 mm) - Stainless Steel
		2ZDCT3	Z-DENS Termination Tee with Screen 3" (80 mm) - Stainless Steel
		2ZDHLKP3	Z-DENS Horizontal kit low profile 3" (80 mm) - Stainless Steel
		2SVSRC(F,X)03	3" Rain Cap w/ Wind Band
		2SVSHRC03	3" Extreme Weather Rain Cap
		2SVSTT(F,X)03	3" Termination Tee
		2SVSTEX0345	3" x 45° Elbow Termination
		2SVSTEX0390	3" x 90° Elbow Termination
		2ZB2.4TS	Z-VentBLU Termination Screen 2.4"
		2ZB2.4TB	Z-VentBLU Termination Box 2.4"
		2ZB2.4TRCBE	Z-VentBLU Rain Cap Band Extreme 2.4"

Wall Thickness: Direct vent terminations are designed to work with any standard wall thickness. Installation guidelines for min/max wall thickness are as follows: Min. = 1 in., Max. = 36 in.

4.8.7 Approved Venting Materials

Material	Approved Use	Standard Approved To	
		United States	Canada
PVC Sch. 40	Both Combustion Air & Exhaust Vent	ANSI/ASTM D1785	Exhaust vent must be certified to ULC S636. Intake pipe may be any of the materials list in the table.
PVC DWV	Combustion Air Only	ANSI/ASTM D2665	
CPVC Sch. 40	Both Combustion Air & Exhaust Vent	ANSI/ASTM F441	
AL29-4C Stainless Steel	Both Combustion Air & Exhaust Vent	UL 1738 / ULC S636	
Polypropylene (pp)	Both Combustion Air & Exhaust Vent	UL 1738 / ULC S636	
ABS Sch. 40	Combustion Air Only	ASTM-D2661 or CSA B181.1	
PVC Cement & Primer	Both Combustion Air & Exhaust Vent	ANSI/ASTM D2564	ULC S636
CPVC Cement & Primer	Both Combustion Air & Exhaust Vent	ANSI/ASTM F493	ULC S636

4.8.8 Maximum Vent Lengths

Two Pipe System

Vent Ø	Maximum Length (Rigid)	Maximum Length (Flexible)
2" (51 mm)	65.5 ft (20 m)	N/A
3" (76 mm)	230 ft (70 m)	115 ft (35 m)

Fitting	Equivalent Length Ø	
	2"	3"
90° Elbow	8 ft (2.4 m)	5 ft (1.5 m)
45° Elbow	4 ft (1.2 m)	3 ft (0.9 m)



NOTE: The water heater is not equipped with a pressure switch allowing for longer vent runs; however, this reduces power rating (btuh output) of the water heater when utilizing long vent runs. Refer to Section: 4.8.8 Power Output Reduction (Long Vent Runs 2") for more information.

Concentric Pipe System

Vent Ø	Maximum Length
2"/4" (51/101 mm)	20.0 ft (6 m)
3"/5" (76/127 mm)	49.2 ft (15 m)

Fitting	Equivalent Length Ø	
	2"/4" (51/101 mm)	3"/5" (76/127 mm)
90° Elbow	5 ft (1.5 m)	5 ft (1.5 m)
45° Elbow	4 ft (1.2 m)	3 ft (0.9 m)



NOTE: Concentric terminations have an equivalent length of 5 ft (1.5 m).

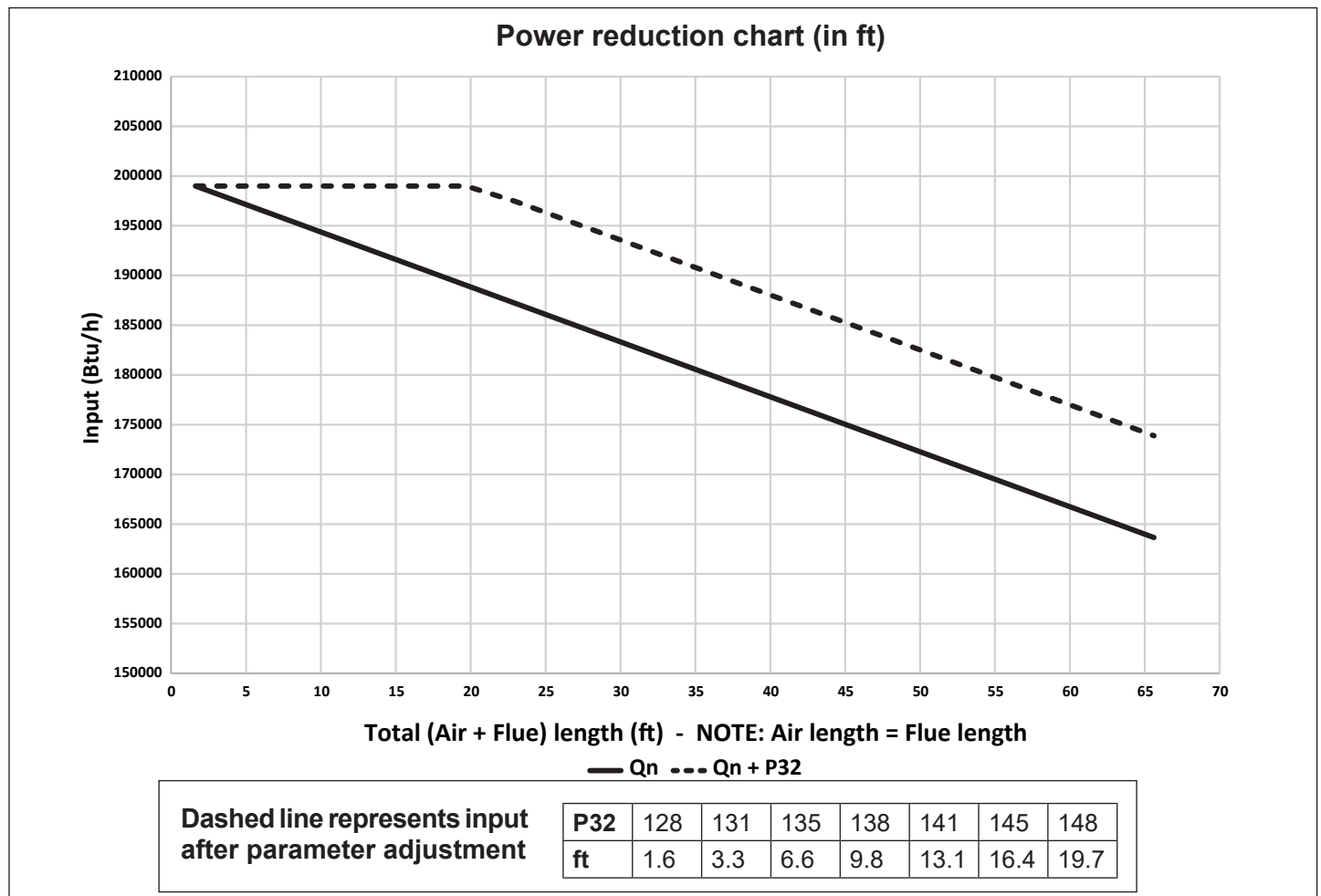


NOTE: The maximum lengths do not include elbows. The elbows equivalent lengths must be added to the length of the vent run.

4.8.9 Power Output Reduction (Long Vent Runs 2")

The water heater is not equipped with a pressure switch allowing for longer vent runs; however, this reduces the power output rating (btuh output) of the water heater as vent runs become longer.

The graph below illustrates the expected power reduction with longer vent runs.

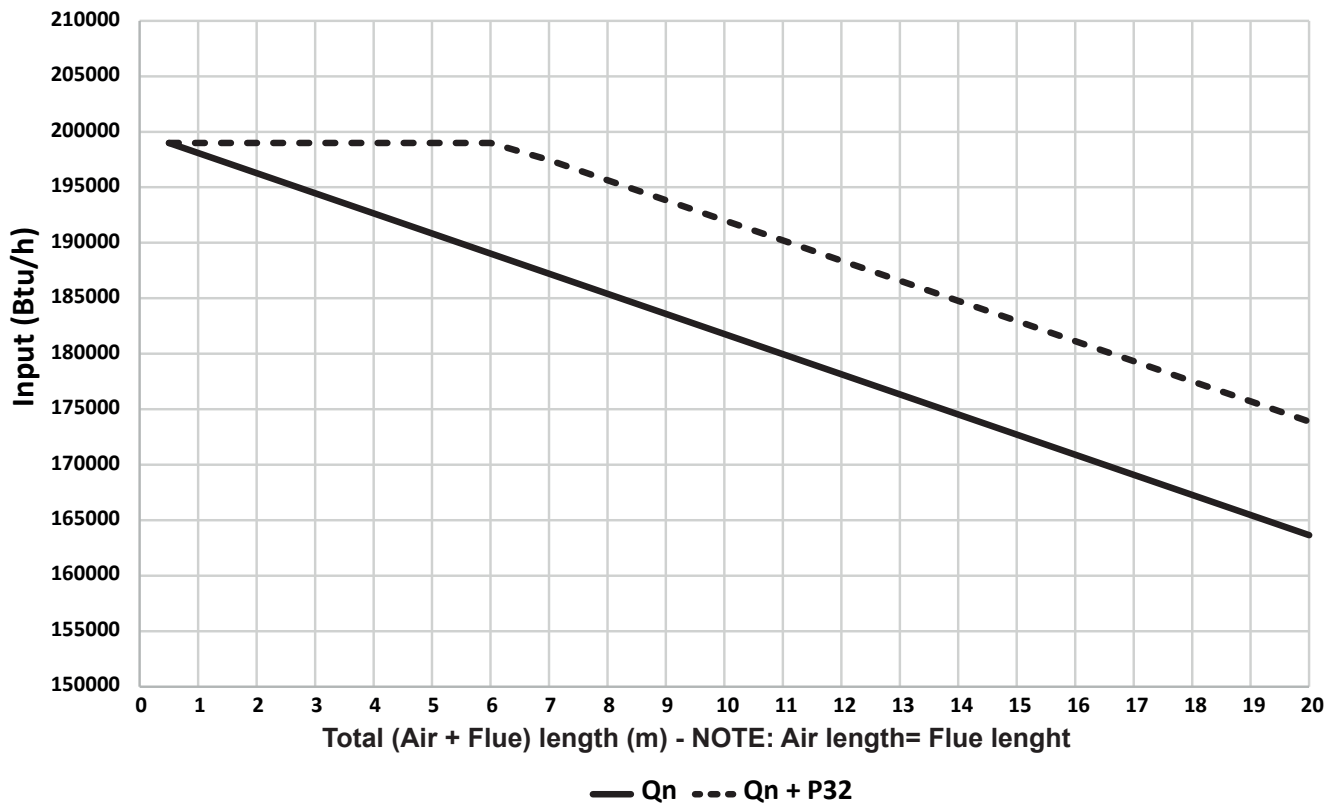


CAUTION: For flue + air lengths longer than 20+20 ft adjust parameter 32 = 148



CAUTION: Dependant on application long vent runs may result in a power reduction which may lower the temperature of the hot water. Refer Appendix: 8.5.10 DHW Flow Chart (Temperature Rise vs. Flow rate) for calculating your flow rate.

Power reduction chart (in m)

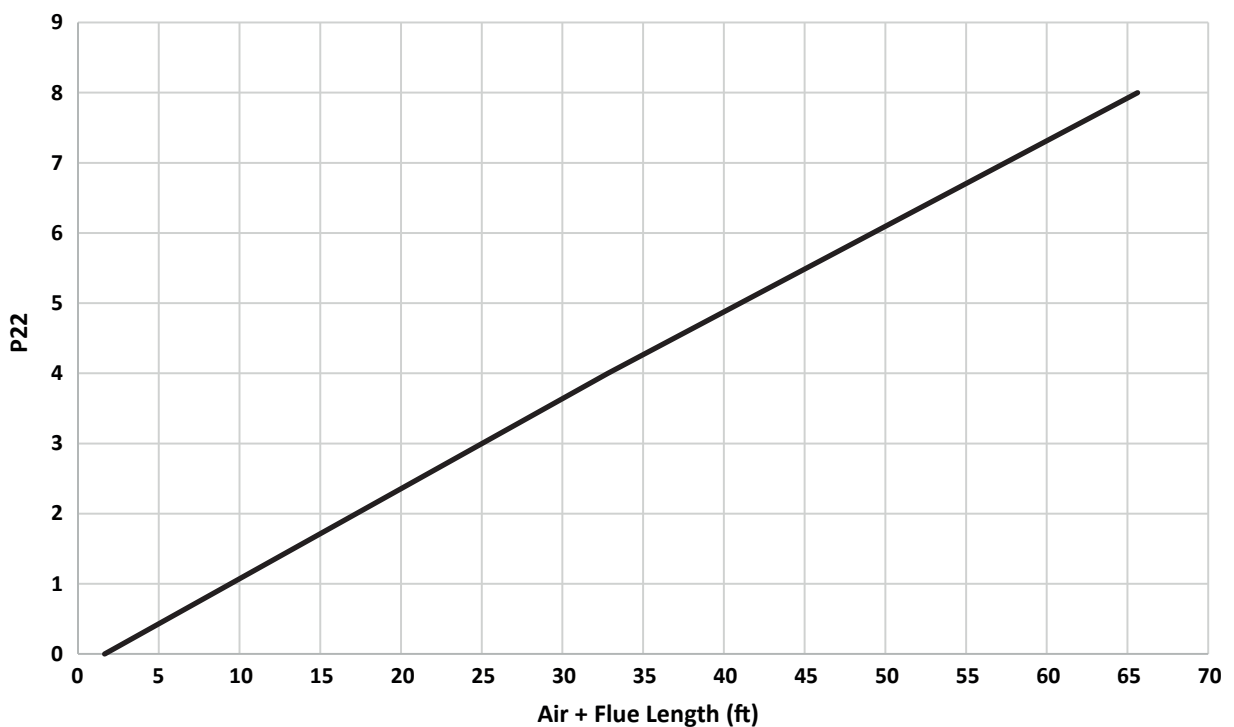


Dashed line represents input after parameter adjustment

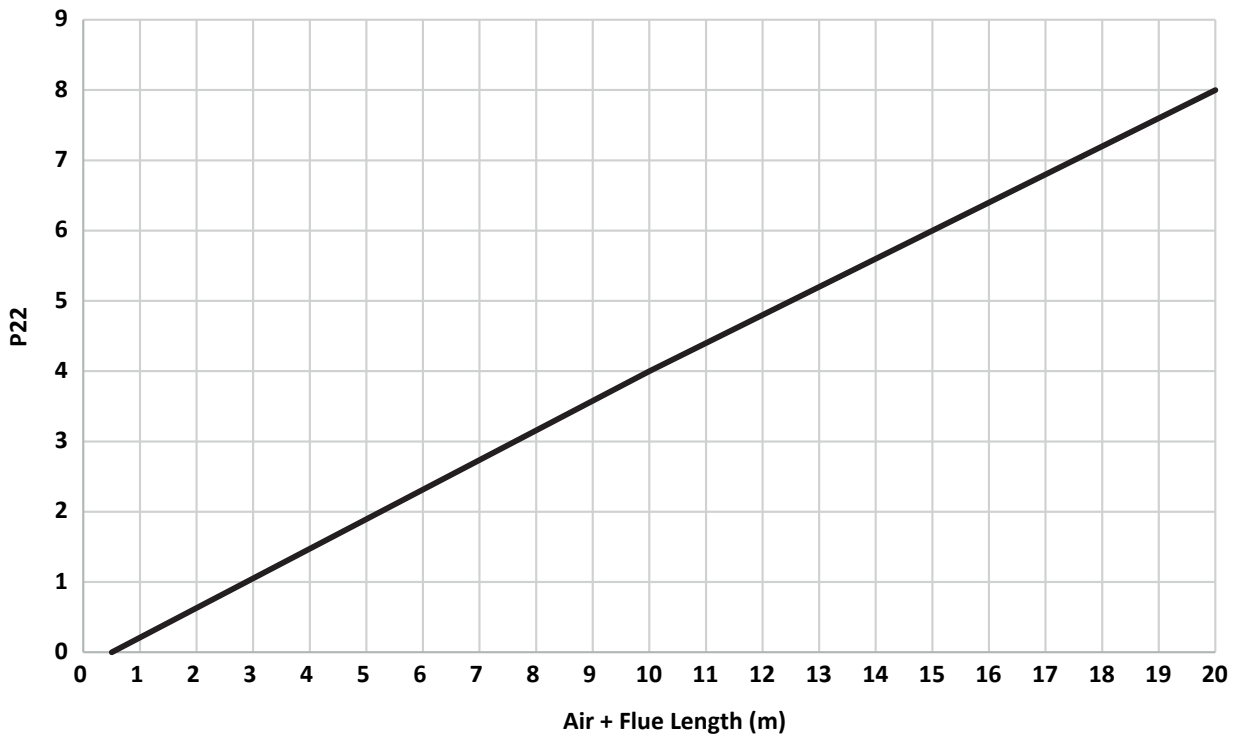
P32	128	131	135	138	141	145	148
m	0.5	1	2	3	4	5	6

It is necessary to change the value of parameter P22 in relation to the length of the exhaust and intake pipes.
Refer to Section: 9 Parameters for instructions on accessing parameters.
Refer to the graph below.

P22 - Minimum Fan Speed increasing (in ft)

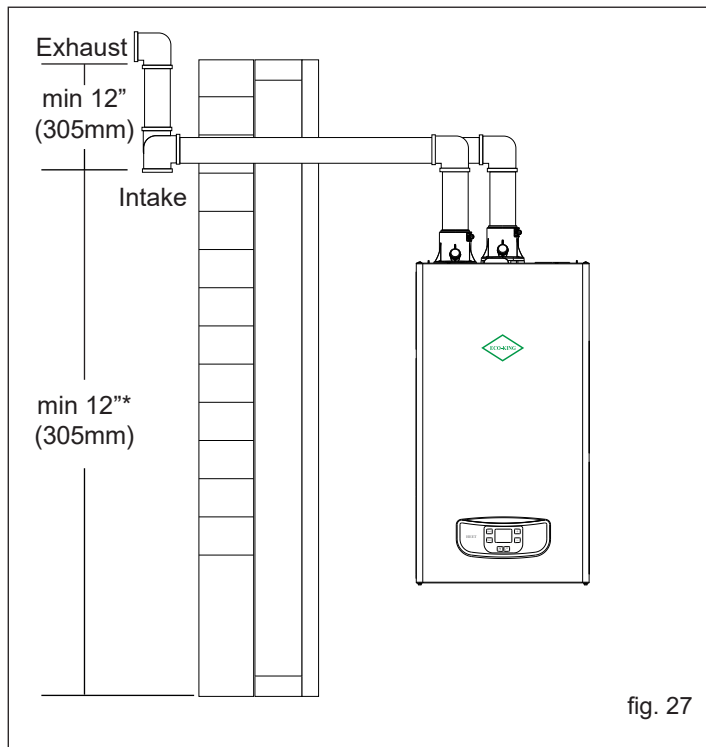


P22 - Minimum Fan Speed increasing (in m)

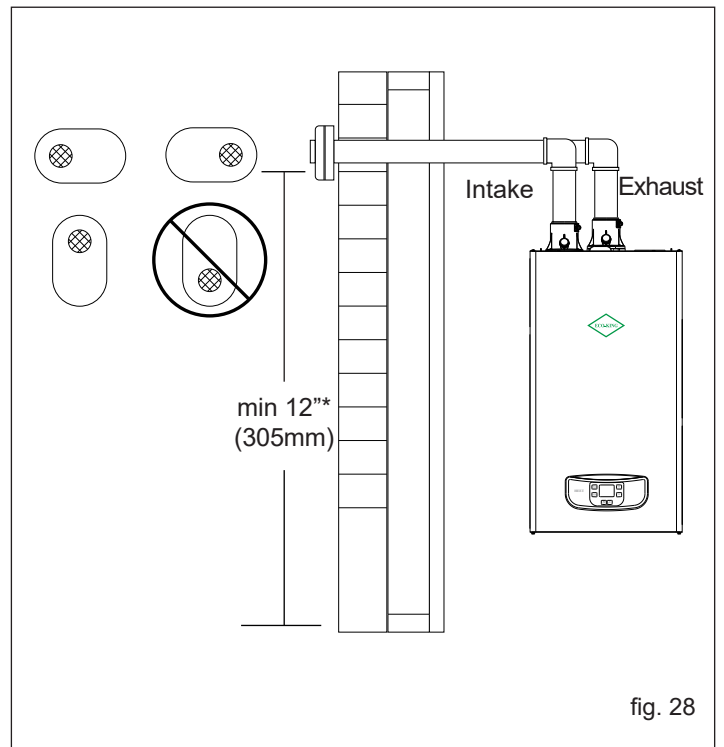


4.8.10 Venting Examples

Two Pipe Horizontal Application
2" or 3"

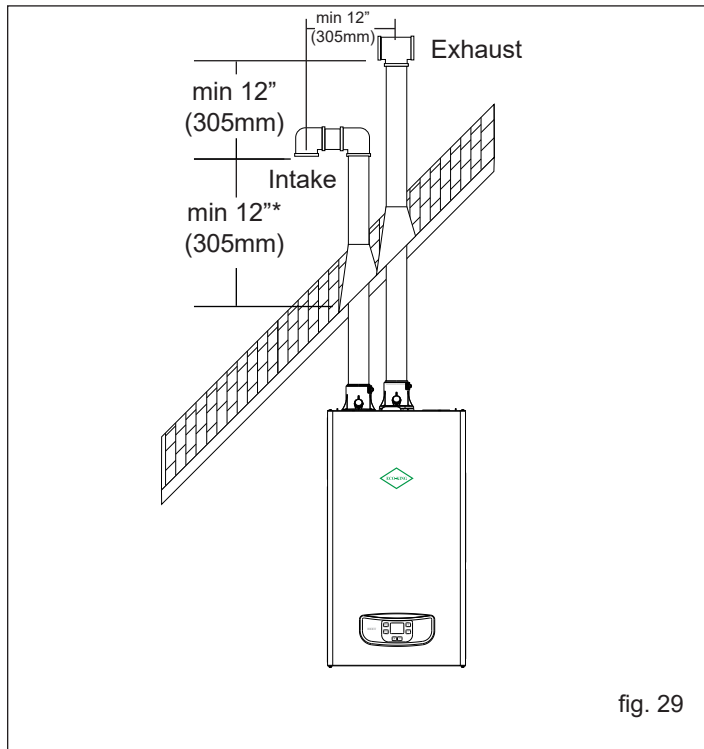


Low Profile Two Pipe Horizontal Application
2" or 3"

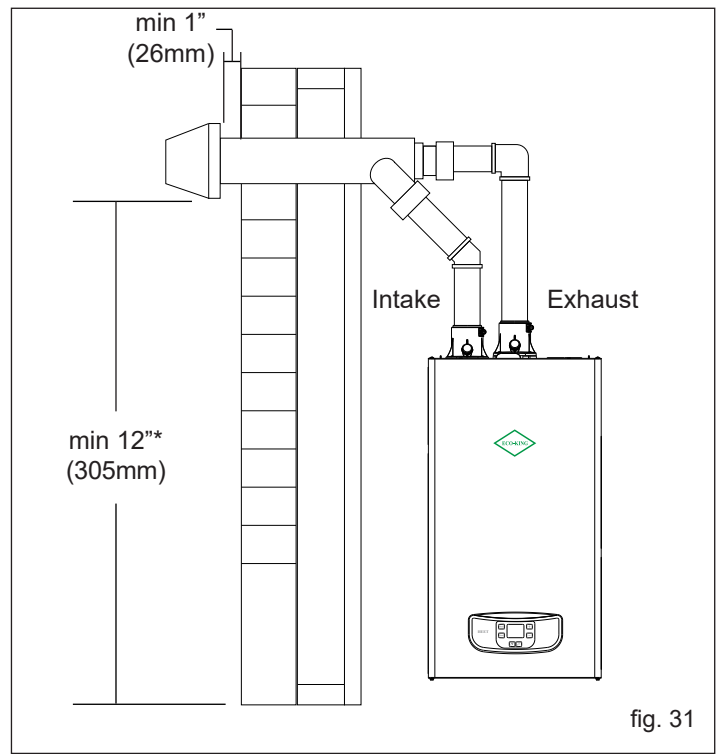


CAUTION: Only install low profile kits as shown above. Do not install with the intake combustion air above the exhaust vent.

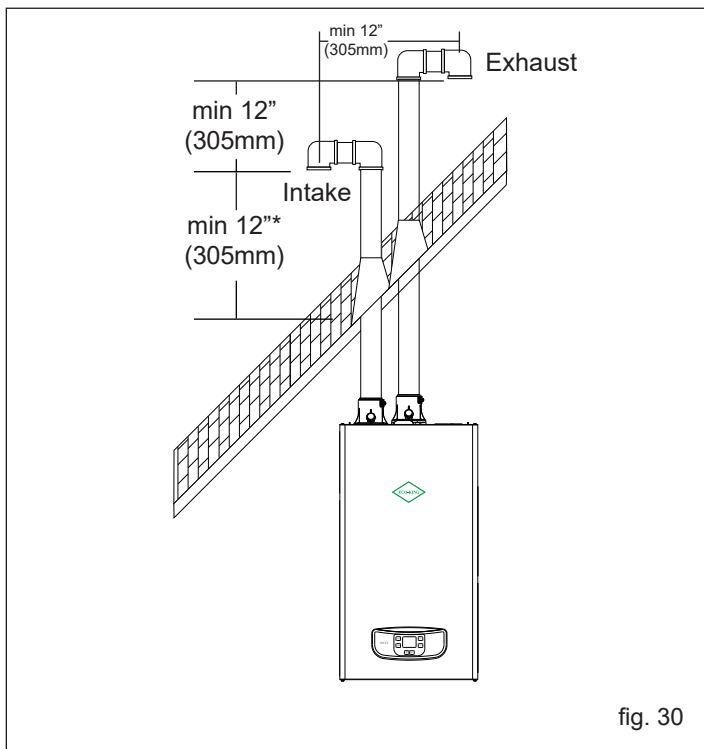
Two Pipe Vertical Application
2" or 3"



Two Pipe Horizontal with Concentric Termination Application
2 1/4" or 3 5/8"



Two Pipe Vertical Application
2" or 3"

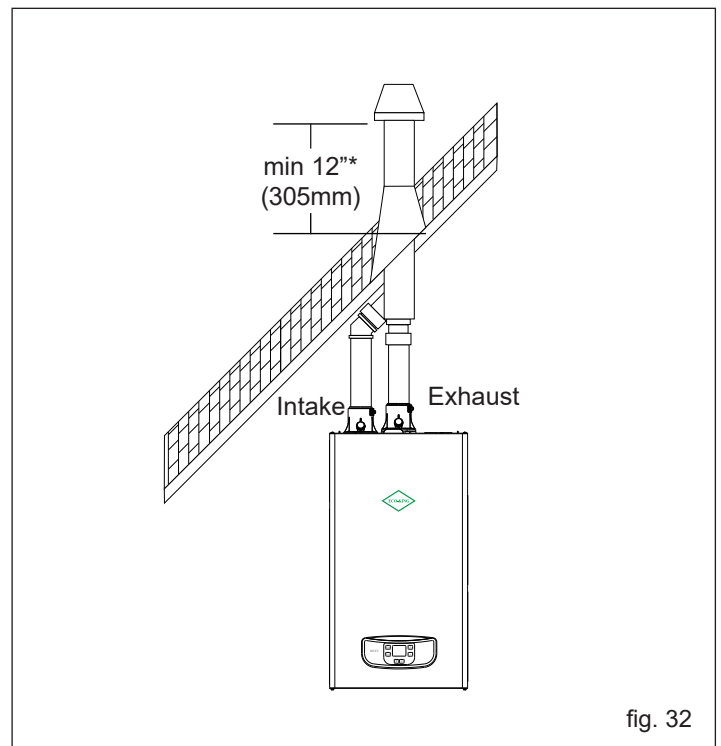


* Maintain a minimum 12" (305 mm) above the highest anticipated snow level or as required by local code and the authorities having jurisdiction; whichever is greater.



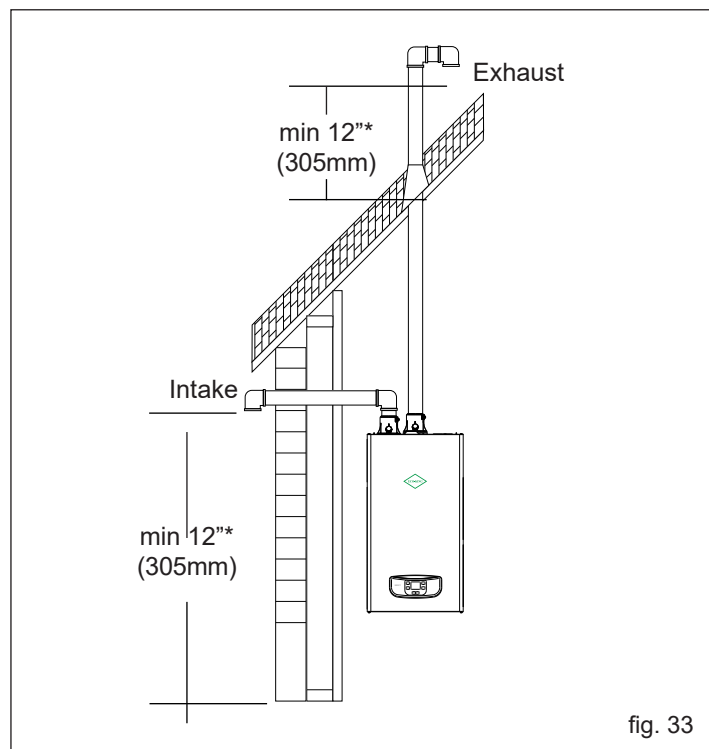
WARNING: Ensure 2 to 1 concentric kits used for connecting concentric vent to the boiler pushes in past the gasket in the vent connector to the bottom of the vent connector to ensure a proper seal. Failure to do so may result in substantial property damage, severe personal injury or death.

Two Pipe Vertical with Concentric Termination Application
2 1/4" or 3 5/8"

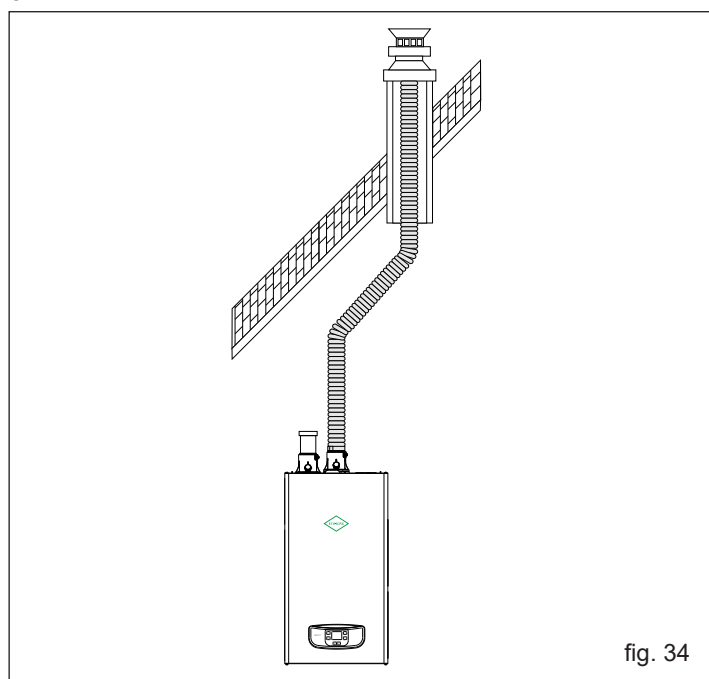


* Maintain a minimum 12" (305 mm) above the highest anticipated snow level or as required by local code and the authorities having jurisdiction; whichever is greater.

Two Pipe Different Pressure Zone Application 2" or 3"



Flexible Vertical Vent Application 3"



WARNING: Flexible vent is for vertical runs only. Do not use when terminating horizontally.



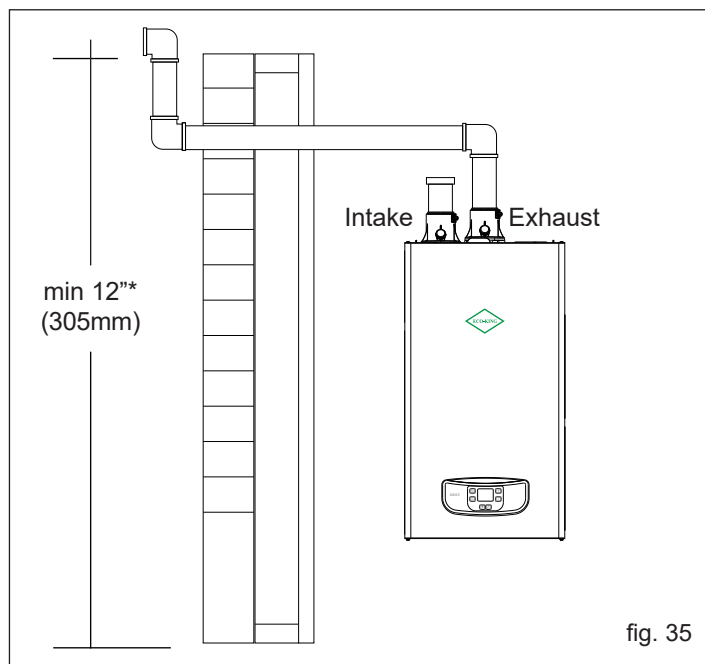
WARNING: The maximum flexible pipe length must be 50% of standard pipe max vent run length.



WARNING: When using flexible vent proper supports and adapters are required. Refer to the venting manufacturers instructions for proper installation guidelines. Failure to do so may result in severe injury or death.

* Maintain a minimum 12" (305 mm) above the highest anticipated snow level or as required by local code and the authorities having jurisdiction; whichever is greater.

Non-Direct Venting Application 2" or 3"



When using a non-direct application ensure a piece of pipe is used on the combustion air side and terminated with a vent screen to avoid debris falling into the combustion air intake.



WARNING: Ensure there is adequate combustion air in the room. Combustion air requirements are based on the latest edition of the National Fuel Gas Code, NFPA 54/ANSI Z223.1; In Canada, refer to the latest edition of the National Gas and Propane Installation Code, CSA B149.1. Refer to Section 4.8.4 Non-Direct Combustion Air requirements for more information.

4.9 High Altitude

The water heater is self-calibrating and does not require any additional adjustments for high altitude applications.

4.10 Space Heating



WARNING: Toxic chemicals, such as those used for boiler treatment, shall not be introduced into the potable water used for space heating.

Parameter P76 shall be set to 1 for PVC or 0 for CPVC/polypropylene dependant on the pipe material used, refer to Section 9 Parameters.

The appliance must not be connected to a system that was previously used with a non-potable water heating appliance. Piping and components connected to the water heater for the space heating application shall be suitable for use with potable water.

When the system requires water for space heating at temperatures higher than required for other uses, a means such as a mixing valve shall be installed to temper the water for those uses in order to reduce scald hazard potential.

Water heaters for combination water/space cannot be used in space heating applications only.

Refer to Appendix 8.5.4 Space Heating w/ AHU Application for a piping example.

5. Using The Water Heater



NOTE: Check that the gas shut-off valve is open.



WARNING: Ensure there is water in the water heater before turning it on.

Proceed as follows to turn on the water heater:

- Plug the water heater into an electrical outlet.
- The display will show:
 - The type of gas it is set-up to:
NG = natural gas LPG = liquid propane gas
 - The size of the water heater (199)

5.1 Turning the Water Heater ON

ON FUNCTION

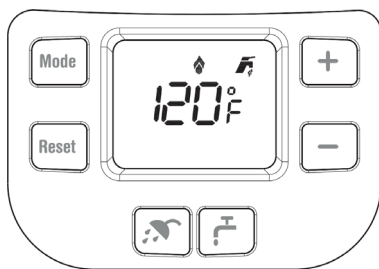


fig. 36

- Press and hold the  button down until all the LED symbols are shown in succession on the display.
- The appliance is in the ON MODE. The display shows the temperature of domestic hot water.
- Following a request for DHW, the  symbol flashes and, if the burner switches ON, the  icon will be displayed on the screen as well.

5.2 Turning the Water Heater OFF

OFF FUNCTION

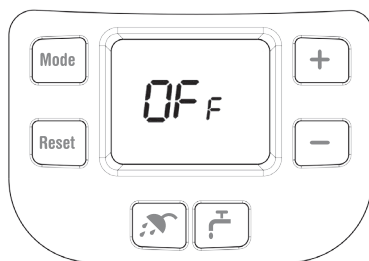


fig. 37

- To activate the OFF MODE, hold the  button until all the LED symbols have been shown in succession, the display shows OFF.
- In this mode, both the freeze protection and the pump seize protection are active:
 - Freeze protection: the appliance is protected from freezing by using built-in logic that switches the burner and pump on in case of low temperatures.
 - Pump seize protection: the appliance automatically activates

the pump to prevent it from seizing due to the presence of water and lime scale.

For these functions to be active the appliance must be powered electrically, and the gas shut-off valve must be open.

5.3 COMFORT Function

COMFORT FUNCTION

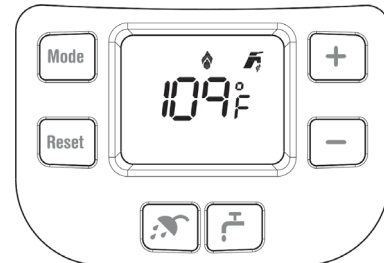


fig. 38

The comfort function allows the water heater to keep the water temperature at 109°F (43°C) for one hour. After one hour it will revert back to the domestic hot water set point.

To activate the COMFORT function:

- Hold the  button down until all the LED symbols are shown in succession on the display.
- The water heater will bring the water temperature to 109°F (43°C) for 60 minutes, afterwards the temperature will return to the set temperature.
- The display shows the  symbol and the temperature 109°F (43°C) flashing.
- Press and hold the  button down until all the LED symbols are shown in succession to cancel the COMFORT function.



NOTE: The activation and deactivation of the COMFORT function can also take place if a domestic hot water call is already in progress.

5.4 Adjusting DHW Temperature

To adjust the temperature of the domestic hot water, press the  button, the display shows the temperature of the domestic hot water. To modify it, press + or - buttons.

The maximum domestic hot water set point can be locked on parameter P16.

By setting P08 to 0 (Factory Default) the water heater will shut-off if its temperature reaches 70°C (70°C=158°F).

When P08 is set to 1 the water heater will shut-off if the water temperature reaches 5°C above the user's setpoint (i.e. user setpoint 120°F (49°C)= 129°F (54°C)).



WARNING: If maximum hot water delivery temperature cannot exceed 120°F (49°C) it is necessary to set P16 to 44 (i.e. maximum user setpoint 111°F =44°C) and P08 to 1.



WARNING: This should only be carried out by a qualified installer, service agency or gas supplier. Failure to comply may result in severe third-degree burns.

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT DO YOU DO IF YOU SMELL GAS**
- Do not try to light the appliance.
 - Do not touch any electric 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.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

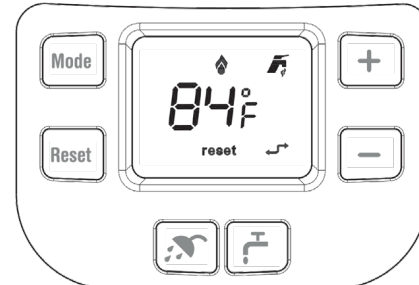
OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
3. Turn the external gas cock to the on position.



4. Plug the water heater into the electrical outlet.
5. The display will show the type of gas the water heater is set to.

NG = Natural Gas LPG = Liquid Propane Gas



7. Open a hot water faucet to create a demand for hot water.
When a demand is created the  symbol flashes.
8. The  symbol indicates the burner is on.
9. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call you service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Turn off any hot water demands.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn the external gas cock to the off position.

6. Commissioning

Once installation is complete by finalizing the following:

- Plumbing connections
- Condensate connection
- Venting connection
- Electrical connection(s)
- Gas connection

Commissioning can be carried out by:

1. Bleeding the air out of the plumbing system.



NOTE: When bleeding air start at the highest and furthest fixture, bleeding every fixture, working back towards the water heater.

2. Ensure the condensate trap has been primed.
3. Ensure the gas line has been purged.
4. Verifying the venting is connected, supported and installed per the installation and operation manual, the venting manufacturer's installation manual and local codes.
6. Verify power is 120 V and polarity is correct:
Line to Ground = 120 V
Neutral to Ground = 0 V
Line to Neutral = 120 V
5. Refer to Section 5.1 Lighting Instructions to start the water heater.
6. Verify the gas pressure, refer to Section 6.1 Verify Gas Pressure.
7. The water heater comes pre-set for natural gas, to convert to propane refer to Section 6.2 Gas Conversion.
8. The water heater is self-calibrating and adjusts it's combustion to optimize efficiency; however, a combustion analysis should be performed, refer to Section 6.3 Combustion Analysis.

6.1 Verify Gas Pressure



WARNING: The gas pressure should only be tested by a qualified installer, service agency or gas utility. Failure to comply may result in substantial property damage, severe injury or death.

To check the inlet gas pressure:

1. Shut the power to the water heater off.
2. Close the gas shut-off valve.



3. Remove the front cover.

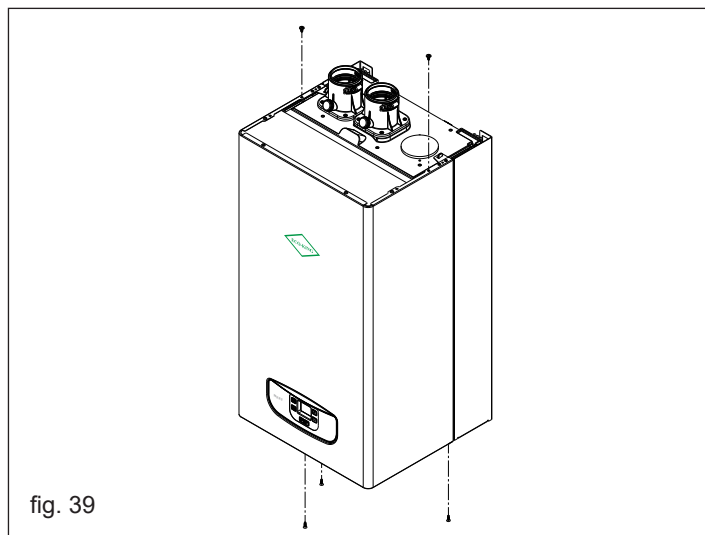


fig. 39

4. Turn the screw in inlet test port (A) counter-clockwise 2-3 turns.
5. Connect the manometer to inlet test port (A).

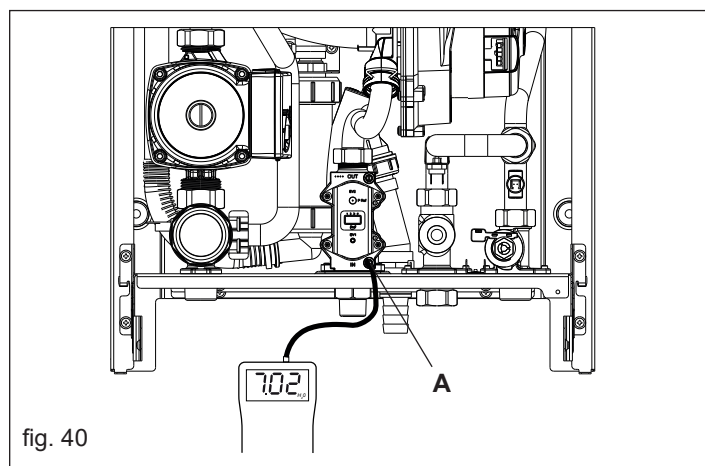


fig. 40

6. Open the gas shut-off valve, power ON the water heater, open the hot water tap and generate a request of DHW. The water heater must work to the maximum load.
7. Use the table below to check the dynamic inlet gas pressure:

	Nominal inlet gas pressure (in. w.c.)	Permitted inlet gas pressure range (in. w.c.)
Natural Gas	7.0	3.5 - 10.5
Propane (LPG)	11.0	8.0 -13.0

8. Close the DHW tap and turn the gas shut-off valve to the off position.
9. Disconnect the manometer from the inlet test port and tighten the inlet test port screw.
10. Turn the gas shut-off valve to the on position.
11. Soap and bubble test the inlet test port to ensure there are no leaks.

6.2 Gas Conversion



WARNING: The following procedure shall only be performed by a qualified installer, service agency or the gas supplier. Failure to adhere to these instructions as well as reading the installation manual in its entirety may result in a fire or explosion causing property damage, personal injury or loss of life.

1. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. Turn the external gas cock to the ON position.



3. Replace the natural gas orifice (5/16" / 8.0mm) with the LPG orifice (1/4" / 6.3mm) (Refer to section 12.3 Parts breakdown - Remove the burner door and gas orifice)
4. Re-tighten the gas connection and soap and bubble test the connection for leaks



WARNING: Failure to perform a leak test for soundness after replacing the gas orifice may result in a leak and possible explosion causing property damage, severe personal injury or death.

5. Plug the water heater into the electrical outlet.
6. The display will show the type of gas the water heater is set to.
NG = Natural Gas LPG = Liquid Propane Gas

7. Simultaneously press and hold the  (comfort) and  buttons until the display has shown all the LEDs in succession. The display will alternately show ts (for 1s), the parameter number (for 1s) and the parameter value (for 3s).
8. Use the + and - buttons to scroll through the parameters.
9. Select parameter P49 and press the  button to confirm.
10. Insert password: scroll to 49, and press the  button to confirm.
11. Scroll to parameter P02 and press  button to change P02 and confirm.
0 = Natural Gas 1 = LPG
12. Confirm the selection by pressing the  button.



WARNING: After a gas conversion an AUTOMATIC combustion adjustment and then a MANUAL combustion adjustment must be performed per the instructions in the installation and operation manual.

13. Affix the gas conversion label to the rating plate over the type of gas indicated on the rating plate.

This water heater was
converted on _____
d/m/y

to LPG by:

Name and Address making this
conversion, who takes responsibility
for the correctness of this conversion.

6.3 Combustion Analysis



WARNING: The following procedure shall only be performed by a qualified installer, service agency or the gas supplier. Failure to adhere to these instructions as well as reading the installation manual in its entirety may result in a fire or explosion causing property damage, personal injury or loss of life.

1. Remove the exhaust combustion test port by unscrewing the test port cap counter-clockwise.

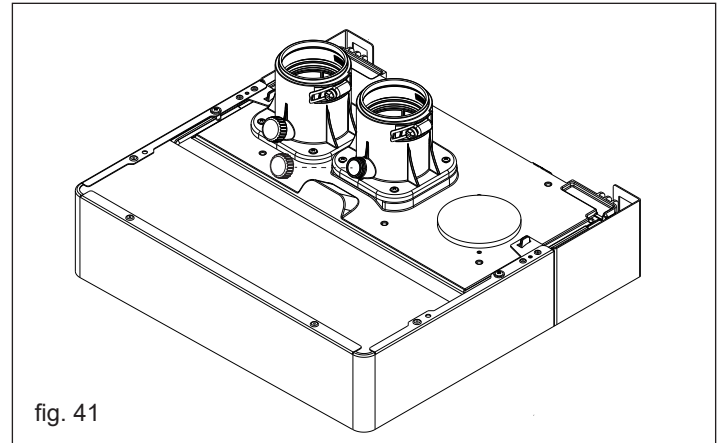


fig. 41

2. With the water heater off, fully insert the combustion analyzer probe into the combustion test port and then extract it approximately 1-1/4" (3cm) so the tip of the probe is in the center of the flue.

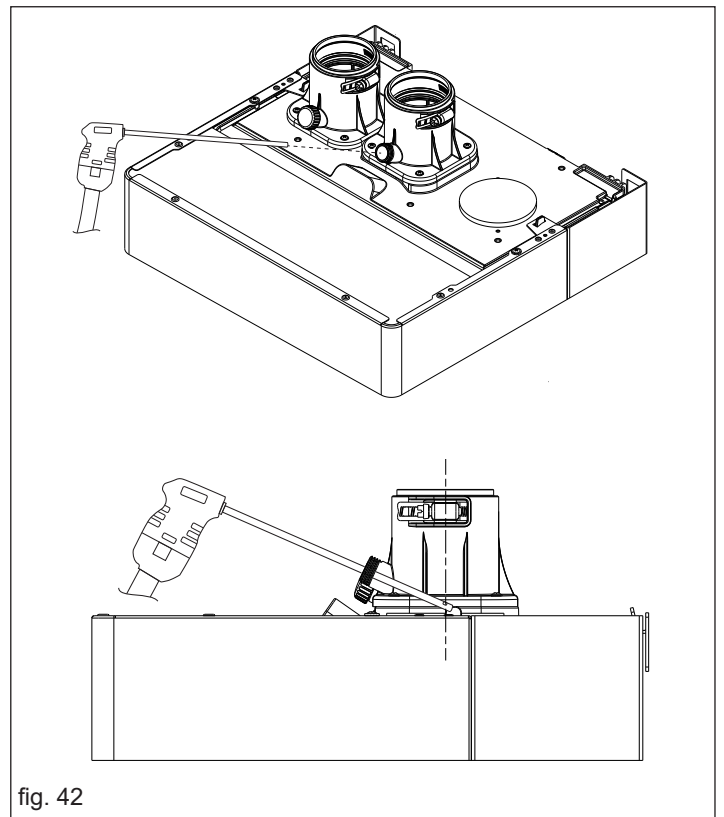
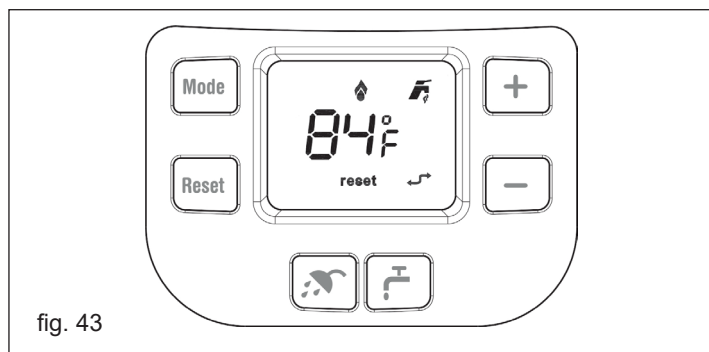


fig. 42

3. Power the unit, the display will show:

- The type of gas it is set to: NG for Natural Gas, LPG for Propane
- The size of the appliance (199)

4. With the appliance in the OFF mode, hold the  button down until the display begins to show all the LED symbols in succession on the display.



5. Press and hold the  and  simultaneously, until all the LED symbols display in succession.

6 Press the + button, the display shows “HI”

7 Fully open a hot water tap. The appliance should turn on and is now operating at maximum power.



NOTE: If the water heater keeps turning off due to reaching temperature, open multiple hot water taps or a large volume tap such as a bathtub to ensure enough flow to keep the water heater firing in high fire.

8. Wait approx. 60 seconds and check the CO₂ value on the combustion analyzer.

	Natural Gas	LPG (Propane)
CO ₂ max-min	9.0% ±0.5	10.5% ±0.5

9. Press the - button, the display shows LO. The appliance is now functioning at minimum power.

10. Wait approx. 60 seconds and check the CO₂ value on the combustion analyzer.

	Natural Gas	LPG (Propane)
CO ₂ max-min	9.0% ±0.5	10.5% ±0.5

11. To exit the combustion analysis mode, press the  and  buttons simultaneously.

12. Close the hot water tap.



NOTE: If the high-fire or low-fire combustion values are not within the permitted ranges a manual adjustment can be made. Refer to Section 6.4 Combustion Adjustment for further instruction.

6.4 Combustion Adjustment



WARNING: The following procedure shall only be performed by a qualified installer, service agency or the gas supplier. Failure to adhere to these instructions as well as reading the installation manual in it's entirety may result in a fire or explosion causing property damage, personal injury or loss of life.



CAUTION: If a combustion component has been replaced, e.g. circuit board, gas valve, fan, ignitor/flame sensor; the automatic and then the manual combustion adjustment must be performed.

The appliance can control the CO₂ values during normal operation, check the correct combustion and make small variations, if necessary.

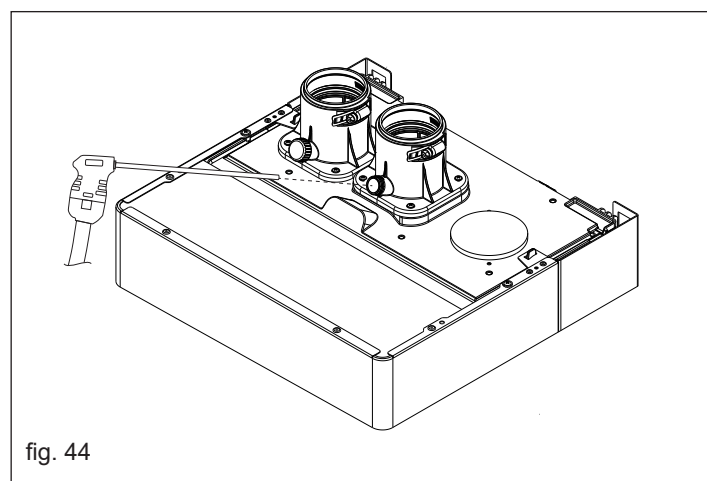
6.4.1 MANUAL COMBUSTION ADJUSTMENT:

By setting P17 to a value of 0 a combustion adjustment can be made manually.

The manual calibration includes a verification cycle of the automatic adjustment performed in the factory during production.

This calibration is useful for correcting the CO₂ values, as a percentage, if they are slightly out of tolerance. An adjustment -3 to +3 can be made with variation of 0.2% CO₂ for every step made.

1. With the appliance in stand-by, fully insert the combustion analyzer probe into the combustion test port and then extract it approximately 1-1/4" (3cm) so the tip of the probe is in the center of the flue.



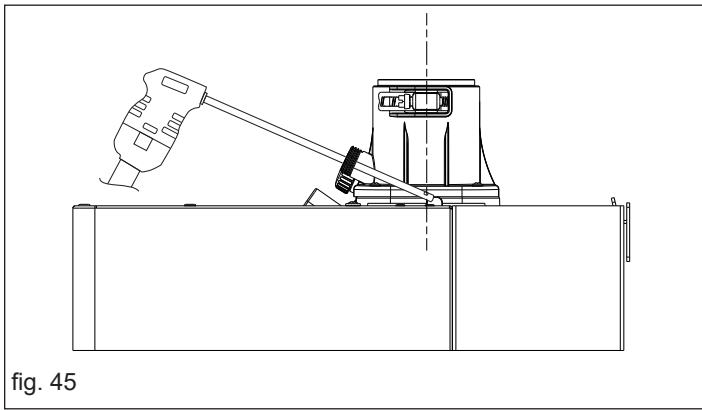


fig. 45

2. Set the parameter P17=0. Refer to Section 9 Parameters for instructions on accessing parameters.

3. Press and hold the **Reset** and **Mode** buttons simultaneously, until the display shows all the LED symbols in succession.

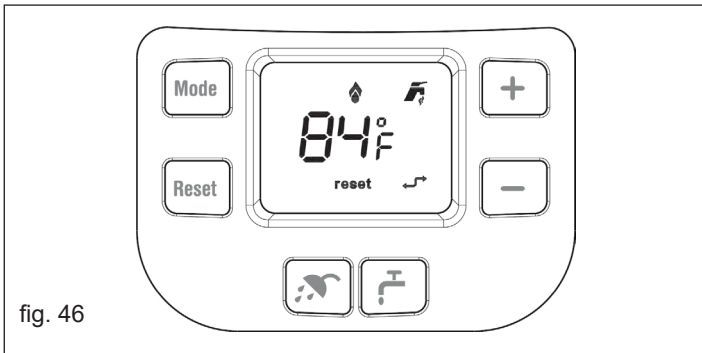


fig. 46

4. Within 5 seconds, after all the LED symbols display in succession press button. **Ma nu** appears on the display.

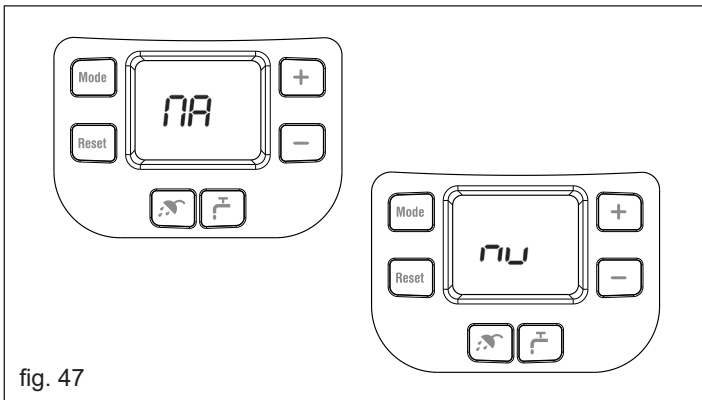


fig. 47

5. Fully open a hot water tap. The water heater should turn on and is now operating at maximum power.

NOTE: If the water heater keeps turning off due to reaching temperature, open multiple hot water taps or a large volume tap such as a bathtub to ensure enough flow to keep the water heater firing in high fire.

A calibration cycle at maximum power (high-fire), ignition power and minimum power (low-fire) will be performed for the next 5 minutes. The CO₂ values can be corrected at the end of the cycle.

6. At the end of the cycle, the display shows P0 (Minimum Power), Press the button, the display shows 00.

7. Read the CO₂ value on the combustion analyzer (Minimum Power).

	Natural Gas	LPG (Propane)
CO ₂ max-min	9.0% ±0.5	10.5% ±0.5

8. When the CO₂ value is stable, if it needs to be adjusted, use the + and - buttons.

9. Press the button to confirm the adjustment. The display shows P0.

10. Press key + to move to ignition power, the display shows P1.

11. Press key, the display shows 00.

12. Read the CO₂ value on the combustion analyzer (Ignition Power)

	Natural Gas	LPG (Propane)
CO ₂ max-min	9.0% ±0.5	10.5% ±0.5

13. When the CO₂ value is stable, if it needs be adjusted use the + and - buttons.

14. Press the button to confirm the adjustment. The display shows P1.

15. Press the + button to move to the Maximum Power, the display shows P2.

16. Press the button, the display shows 00.

17. Read the CO₂ value on the combustion analyzer (Maximum Power). When the CO₂ value is stable, if it needs to be adjusted, use the + and - buttons.

	Natural Gas	LPG (Propane)
CO ₂ max-min	9.0% ±0.5	10.5% ±0.5

18. Press the button to confirm the adjustment.

19. To exit the Manual Adjustment Combustion Analysis, press the **Mode** button.

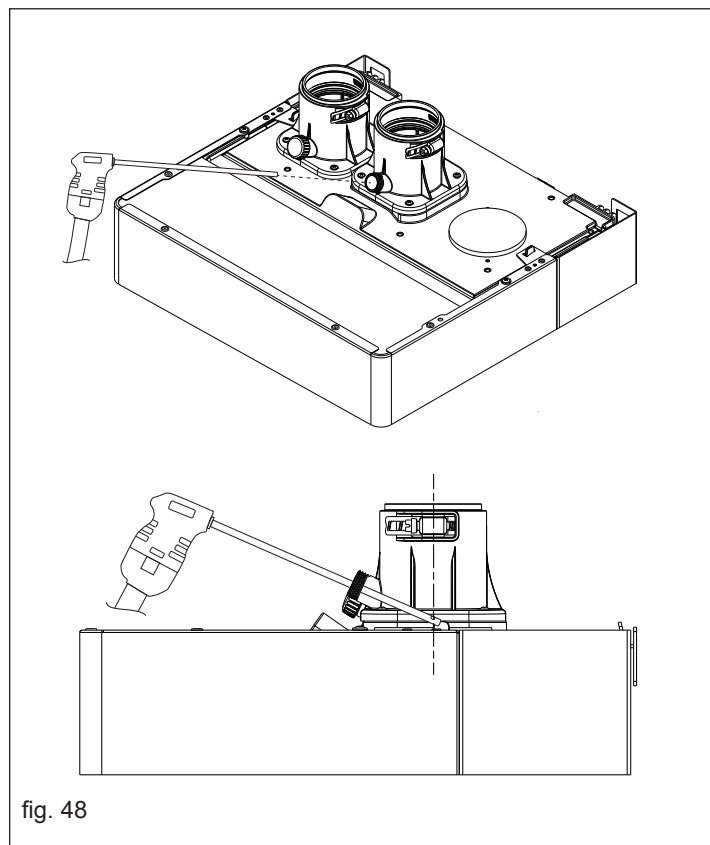
20. Close the hot water tap(s).

6.4.2 AUTOMATIC ADJUSTMENT:

This calibration is already carried out in the factory during production. It must be performed again in the aforementioned cases.

If a combustion component has been replaced, e.g. circuit board, gas valve, fan, ignitor/ flame sensor; the automatic and then the manual combustion adjustment must be performed.

1. With the appliance in stand-by, fully insert the combustion analyzer probe into the combustion test port and then extract it approximately 1-1/4" (3cm) so the tip of the probe is in the center of the flue.



4. Within 5 seconds, after all the LED symbols display in succession, press the  button.

Au to appears on the display.

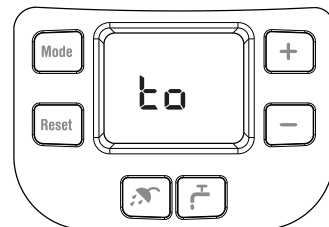
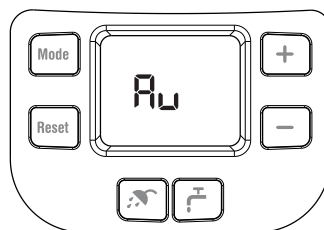


fig. 50

5. Fully open a hot water tap. The water heater should turn on and is now operating at maximum power.



NOTE: If the water heater keeps turning off due to reaching temperature, open multiple hot water taps or a large volume tap such as a bathtub to ensure enough flow to keep the water heater firing in high fire.

A calibration cycle at maximum power (high-fire), ignition power and minimum power (low-fire) will be performed for the next 5 minutes.

At the end of the cycle the display shows P0

6. To exit the procedure, press the  button.

7. Close the hot water tap.

8. Perform a manual combustion adjustment (**Ma nu**), refer to Section 6.4.1 Combustion Adjustment.

2. Set parameter P17=5. Refer to Section: 9 Parameters for instructions on accessing parameters.

3. Press and hold the  and  buttons simultaneously, until the display shows all the LED symbols in succession.

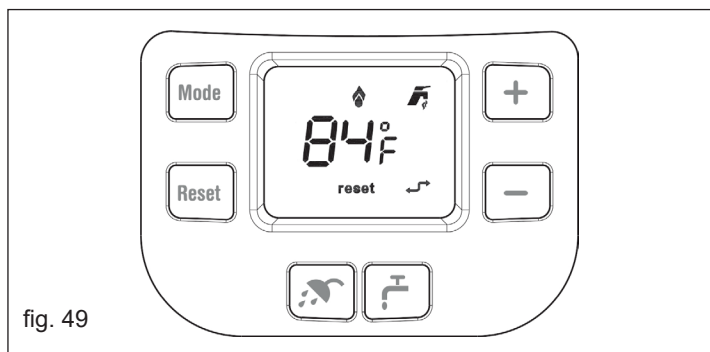


fig. 49

7. Operation

7.1 Sequence of Operation DHW Mode

1. A hot water tap is open creating a demand for domestic hot water.
2. The flow meter detects the demand for domestic hot water when the flow is greater than 0.8 gpm (3.0 l/min).
3. The  symbol begins to flash indicating a call for domestic hot water.
4. The control board internally checks the water heaters safety limits and sensors are working within the proper ranges.
5. Simultaneously, the control board turns on the internal mixing pump and fan. The fan ramps up to an ignition RPM.
6. Simultaneously, the spark ignitor is powered creating a spark, the gas valve opens and the appliance is ignited.



NOTE: The water heater should light on the first trial for ignition; however, it goes through five trials for ignition.

7. The electrode senses the flame and sends a signal back to the control board and the  symbol comes on.
8. The water heaters PID logic takes into account both the input temperature sensors, the set point temperature and water flow rate modulates the water heater by ramping the gas valve and fan up or down accordingly to maintain the domestic hot water set point.
9. Once the water heater achieves the proper modulation the combustion is verified using the flame signal and the gas valve is adjusted to achieve the proper CO₂.
10. When the hot water tap is closed the demand is satisfied and the unit goes back to standby. The fan and pump runs in a post purge mode.

7.2 Recirculation Mode

The water heater has the ability to utilize an external recirculation pump. The pump should be connected to the 120V CE connection on the M3 terminal block. Refer to Section 12.5.2 Recirculation Application for a piping example using a recirculation pump.

7.3 Using a 3-way valve

The water heater also has the ability to utilize an external 3-way valve. The 3-way valve must be a 120V and connects to the 3W connection on the M3. Refer to Section 12.5.5 Solar Storage Tank w/ 3-Way Valve Application for an example of using a 3-way valve.

7.4 Freeze Protection

The water heater can operate at a minimum ambient temperature of 32°F (0°C) and maximum of +104°F (+40°C).

Freeze protection is built into the water heater and activates the pump and the burner when the temperature of the water inside the appliance drops below 41°F (5°C).

This protection is active when the appliance is functioning normally without error.

In the case of low temperature, to prevent freezing, insulate the condensate drain pipes and domestic water circuit.



WARNING: In the event of an error the freeze protection does not work and the appliance may freeze.



WARNING: In the case of a long absence, if there is a risk of freezing, draining the domestic hot water circuit and the condensate drain pipes.



CAUTION: The freeze protection logic is for protection of the appliance only and does not protect the connected piping system from freezing.

7.5 Seize Protection

The water heater has a built-in seize protection that exercises the internal pump as well as energizes the recirculation pump contact and 3-way valve contact if the unit does not run for over 24 hrs.



WARNING: In the event of an error the seize protection does not work and the appliance components may seize.

7.6 Legionella Cycle

If the appliance is connected to a storage tank, an automatic disinfection cycle against the Legionella bacterium is built-in to the logic of the water heater by selecting a proper parameter (refer to Section 9 Parameters for instructions on accessing parameters).

Once a week basis, if the temperature detected by the storage tank sensor has not exceeded 140°F (60°C), the water heater performs a legionella cycle bringing the temperature of the water in the storage tank to 149°F (65°C) for a pre-determined time to remove any bacteria that may be present.

8. Info menu – Metering menu- Alarms log menu

To access the Info menu – Metering menu – Alarms log menu:
Simultaneously press the  and  buttons, wait until all LED symbols have been shown in succession.

The display alternately shows “In” and “n00”, which indicates the first code of the Info menu, and then displays the value associated to the code.

By briefly pressing the + button, the list of codes can be scrolled through; when reaching the last code the Metering menu is displayed and then the Alarms log menu.

By pressing the - button, the list will be displayed in reverse order.

To exit the menus press the  and  buttons for approx. 5 seconds.

The Alarms log menu can be canceled by pressing the  button for 5 seconds.

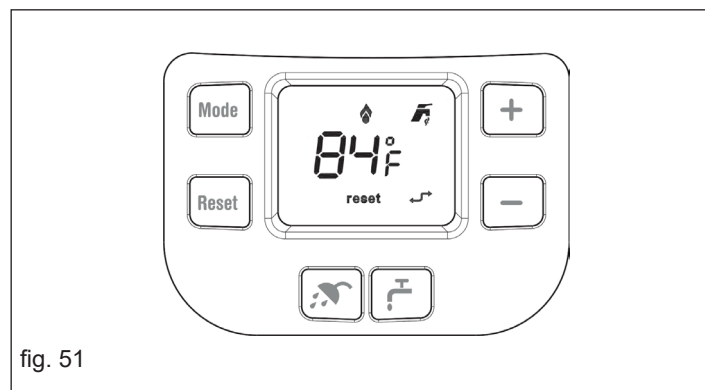


fig. 51

Info menu

Code	Description	Range	Unit of measurement
In00	Software version		
In01	DHW inlet temperature sensor	-13 - 210 (-25 - 99)	°F (°C)
In02	Recirculation temperature sensor	-16 - 210 (-9 - 99)	°F (°C)
In03	Exhaust temperature sensor	-16 - 210 (-9 - 99)	°F (°C)
In04	DHW outlet temperature sensor	-16 - 210 (-9 - 99)	°F (°C)
In05	Storage tank temperature sensor	-16 - 210 (-9 - 99)	°F (°C)
In06	Setpoint DHW temperature	setpoint temperature*	°F (°C)
In07	Modulation percentage	0 - 100	%
In08	DHW flow rate	0 - 26 (0 - 99)	gpm (l/min)
In09	Not Applicable	--	--
In10	Fan speed	0..255	Rpm x100

*In06 set point will be set between P16, maximum set point and P20, minimum set point.

Metering menu

Code	Description	Range	Unit of measurement
Co0	Hours of power supply	0 - 99	h x 100 from 0.0 to 9.9: values flash from 10 to 99: values are solid
Co1	Hours of burner operation	0 - 99	h x 100 from 0.0 to 9.9: values flash from 10 to 99: values are solid
Co2	Number of burner ignitions	0 - 99	x 1000 from 0.0 to 9.9: values flash from 10 to 99: values are solid
Co3	Number of faults	0 - 99	x 1 1
Co4	Number of active parameters	0 - 99	x 1 1
Co5	Number of parameters for Eco-King Service	0 - 99	x 1 1

Alarms log menu

AL0	Displays the last error code
AL1	Displays 2nd last error code
AL2	Displays 3rd last error code
AL3	Displays 4th last error code
AL4	Displays 5th last error code
AL5	Displays 6th last error code
AL6	Displays 7th last error code
AL7	Displays 8th last error code
AL8	Displays 9th last error code
AL9	Displays 10th last error code

9. Parameters



WARNING: Parameters shall only be accessed by a qualified installer, service agency or the gas supplier. Failure to adhere to these instructions as well as reading the installation manual in it's entirety may result in a fire or explosion causing property damage, personal injury or loss of life.

To access the parameters section:

1. Press the  and  buttons simultaneously until the display has shown all the LED symbols in succession.

The display will show:

- "ts" (1 second)
- The parameter number (1 second)
- The parameter value (3 seconds)

Select P49 and press the  button.

Enter password 49, press the  button to confirm.

2. Use the + and - buttons to scroll the list of parameters.
3. By pressing the  button it's possible to access the parameter value.
4. The parameters can be modified by pressing the + and - buttons.
5. To confirm the value modification press the  button.
6. To exit the parameters function, press the  and  buttons simultaneously until the display has shown all the LED symbols in succession.

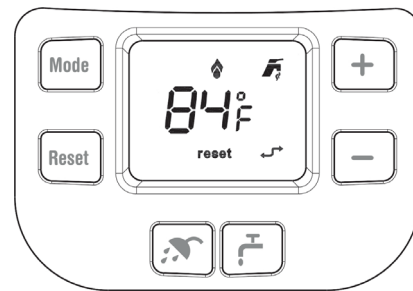


fig. 52

Parameter nr.	Description	Range	Default
P01	Hydraulic system 0 = instantaneous 1 = Storage tank with temperature probe (WH)	0 - 8	0
P02	Gas Type 0 = Natural Gas 1 = LPG	0 - 1	Natural gas 0 LPG 1
P03	DHW inlet configuration 0 = flow switch 1 = flow-meter 2 = flow-meter K 3 = flow-meter G	0 - 3	3
P07	Room sealed boiler type (if selected) 0 = with combustion control	0	0
P08	DHW OFF selection 0 = fixed; 1 = connected to DHW set point	0 - 1	0
P09	Ignition speed (P09*25) rpm	80 - 160	Natural gas 123 LPG 160
P11	Maximum DHW power	P12 = 100 %	100
P12	Minimum power	0 = [min(P10, P11)]	0
P16	DHW maximum set point value	95 - 140°F / 35 - 60°C	60
P17	Calibration 0 / default = manu; 5 = auto	0 - 20	0
P18	DHW modulation with flowmeter	0 - 1	If P03 = 1 default 1 If P03 = 0 fixed to 0
P19	Exhaust thermostat (0) / Flue NTC (1) selection	0 - 1	1
P20	Minimum value for DHW set point	95 - 122°F / 35 - 50°C	37
P21	Low temperature zone selection NORMAL range CH temperature LOW range CH temperature	0 - 1	0

Parameter nr.	Description	Range	Default
P22	Minimum fan-speed increasing	0 - 50	0
P23	Cycling time pump activation (min): cold zone	0 - 10	0
P26	Selection of power Water heater: 5 = 8.7 US gal./ 33 liters	5	5
P28	Delay of DHW activation with solar configuration	0 - 180 sec	0
P29	Ignition heating ramp (value 1= 10 s)	0 - 80	12
P32	Maximum speed ((P32*25)+4000) rpm (per 18 + 2000 rpm)	60 - 255	Natural gas 128 LPG 118
P33	Minimum speed (P33*25) rpm	30 - 80	Natural gas 48 LPG 46
P37	Configuration Aux probe 3 = return temperature probe	3	3
P38	Anti-freeze temperature activation	32 - 50°F / 0 - 10°C	5
P41	Configuration 0 = Boiler 1 = Water heater	0 - 1	1
P42	DHW pre-heat enable / disable 0 = disabled 1 = enabled	0 - 1	0
P43	Measurement Unit 0 = metric 1 = imperial	0 - 1	1
P44	Pressure switch selection 0 = water pressure switch 1 = water pressure sensor	0 - 1	0
P49	OEM Enable (=49 enable read/write of followig parameters)	0 - 99	0
P50	Relay configuration 1 LC27 1 = remote alarm NO 2 = remote alarm NC 3 = zone valve 4 = automatic water refill 5 = NU 6 = recirculation pump 7 = zone valve with OT 8 = NU	0 - 8	0
P54	Flowmeter value for DHW request activation	20 - 40 (lx10)/min	30
P55	DHW post ventilation time	1 - 30 sec x 10	3
P56	DHW post circulation time	0 - 100 sec	30
P57	Increasing fan rpm (exhaust pressure drop)	0 - 10 %	0
P61	Exhaust temperature alarm	68 - 302°F / 20 - 150°C	95
P62	Manufacturer's Information		
P63	Manufacturer's Information		
P65	Anti-legionella duration (only for storage tank with thermostat)	5 - 30 min	15
P66	Anti-legionella function 44 = disabled	44= off 113 ÷ 176°F 44= off 45 - 80°C	44
P68	Manufacturer's Information		
P69	Manufacturer's Information		
P70	Recirculation SetPoint 36 = disabled	36= off 99 ÷ 131°F 36= off 37 ÷ 55°C	36
P71	Recirculation re-ignition ΔT	41 - 59°F / 5 - 15°C	5
P72	Presence of Solar sensor 0 = absent 1 = present	0 - 1	0
P73	ΔT ON load boiler version	32 - 50°F / 0 - 10°C	10
P74	"Comfort" function range	95 - 140°F / 35 - 60°C	43
P76	Exhaust limit temperature (PVC pipe) 0 = disabled (default value as set by P61) 1 = 65°C / 149°F	0 - 1	1

Parameter nr.	Description	Range	Default
P77	Backlight activation 0 = disabled = ON by pressing a button 1 = always ON	0 - 1	1
P78	Backlight ON - time	1 - 6 sec x 10	3
P79	Deactivation Exhaust temperature alarm (30 s) 0 = disabled 1 = enabled	0 - 1	1
P80	Delta TCH (slope on CH for check pump blockage) 0 = disabled	32 - 68°F / 0 - 20°C	5
P81	Maximum CH temperature for burner switch off function 0 = disabled	32 - 302°F / 0 - 150°C	90
P82	Delta temp. CH / return 0 = disabled	32 - 122°F / 0 - 50°C	50
P83	Service function activation (months) 0 = disabled	0 - 255	0
P98	Reset TSP to default value	0 - 1	0
P99	Reset OEM to default value	0 - 1	0



WARNING: The parameters relating to temperature values are always expressed in °C.
Refer to the following tab for conversion to °F.

CONVERSION TABLE	
°C	°F
0	32
1	34
2	36
3	37
4	39
5	41
6	43
7	45
8	46
9	48
10	50
11	52
12	54
13	55
14	57
15	59
16	61
17	63
18	64
19	66
20	68
21	70
22	72
23	73
24	75
25	77
26	79
27	81
28	82
29	84
30	86

CONVERSION TABLE	
°C	°F
31	88
32	90
33	91
34	93
35	95
36	97
37	99
38	100
39	102
40	104
41	106
42	108
43	109
44	111
45	113
46	115
47	117
48	118
49	120
50	122
51	124
52	126
53	127
54	129
55	131
56	133
57	135
58	136
59	138
60	140
61	142

CONVERSION TABLE	
°C	°F
62	144
63	145
64	147
65	149
66	151
67	153
68	154
69	156
70	158
71	160
72	162
73	163
74	165
75	167
76	169
77	171
78	172
79	174
80	176
81	178
82	180
83	181
84	183
85	185
86	187
87	189
88	190
89	192
90	194
91	196
92	198

CONVERSION TABLE	
°C	°F
93	199
94	201
95	203
96	205
97	207
98	208
99	210
100	212
101	214
102	216
103	217
104	219
105	221
106	223
107	225
108	226
109	228
110	230
111	232
112	234
113	235
114	237
115	239
116	241
117	243
118	244
119	246
120	248
121	250
122	252
123	253

CONVERSION TABLE	
°C	°F
124	255
125	257
126	259
127	261
128	262
129	264
130	266
131	268
132	270
133	271
134	273
135	275
136	277
137	279
138	280
139	282
140	284
141	286
142	288
143	289
144	291
145	293
146	295
147	297
148	298
149	300
150	302
151	304

10. Troubleshooting

Two types of errors can occur:

- Errors that can be restored by the user, using the  button
- Errors which require a qualified service technician to service the water heater. In this case, the appliance attempts a self-reset but, if the fault persists, a qualified service technician must be called.



WARNING: Troubleshooting beyond resetting the water heater shall only be performed by a qualified installer, service agency or the gas supplier. Failure to adhere to these instructions as well as reading the installation manual in its entirety may result in a fire or explosion causing property damage, personal injury or loss of life.

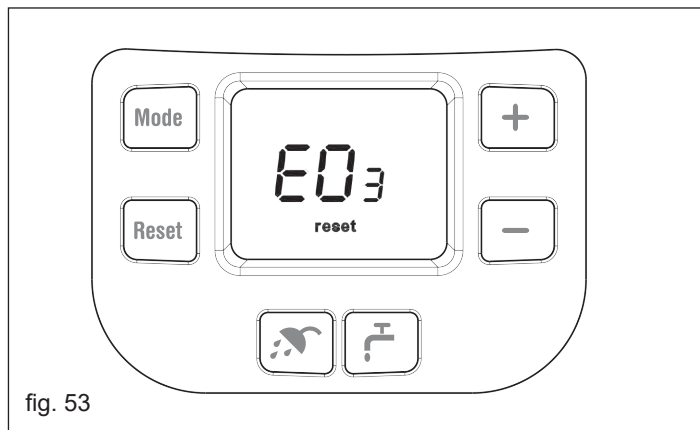


fig. 53

Code	Description	Causes	Solutions
E 01	Ignition Fault	On a request for DHW, the appliance does not switch on after 5 ignition attempts	End User: Press Reset, if the anomaly persists, contact a qualified service technician Service Technician: - Check ignitor electrode for spark, proper gap and for cracks in ceramic - Check the wire connection to ignitor and control board is tight - Ensure ignitor/ flame sensor electrode is not dirty, clean or replace if necessary - Make sure polarity is correct to the unit - Check the incoming gas pressure - Check gas is flowing across the gas valve during trial for ignition - After performing the previous checks perform a automatic and manual combustion adjustment - Check for recirculation of combustion products
E 02	Water High Limit Open	Water high limit open due to over-heating of the appliance or high limit disconnected	End User: Press Reset, if the error repeats, wait for the appliance to cool down (approx. 30 minutes) and attempt another reset. If the anomaly persists, contact a qualified service technician. Service Technician: - Check for proper water flow through the unit - Check for scale build-up and flush if necessary - Ensure wiring to the high limit and control board is connected properly and not loose or damaged. - Check the high limit is closed and reads 0 ohms when closed. - Ensure air is purged from the system and no shut-off are open - Check water is flowing in the correct direction through the unit - Check the internal circulator
E 03	Exhaust High Limit Open	Exhaust high limit faulty or disconnected	End User: Contact a qualified service technician. Service Technician: - Check wiring from control board to exhaust high limit is not damaged, shorted or broken. - Ensure the exhaust high limit is connected. - Check the resistance reading at the high limit, referencing the 10k Sensor Temperature vs. Resistance Chart in the appendix; replace if necessary.
E 06	Domestic hot water NTC temperature sensor fault	The appliance detects an error of the DHW NTC temperature sensor; the water heater appliance is in lock out	End User: Contact a qualified service technician. Service Technician: - Check the resistance reading at of the outlet temperature sensors, referencing the 10k Sensor Temperature vs. Resistance Chart in the appendix; replace if necessary.

Code	Description	Causes	Solutions
E 11	Flame circuit fault	Flame presence has been detected in the burner at a time when it should not be.	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Check if a flame is present in the burner assembly, if not change the control board. - Shut the power off to the unit, if the flame disappears change the control board. If it persists change the gas valve.
E 11	Condensate drain circuit blocked	Water detected in the combustion chamber	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Check and clean the condensate drain circuit from any obstructions. - Check the ignition/ flame sensor electrode is connected properly and is not dirty. - Make sure the unit is properly grounded. - Let the heat exchanger refractory air dry before firing the unit.
E 12	Gas valve modulator disconnected	Gas valve electric circuit open	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Check the wiring harness is connected properly to the gas valve and control board and is not damaged. - Check the gas valve; replace if faulty - Replace control board if the wiring harness is connected correct and is not damaged and gas valve is in working condition.
E 13 flashing	Temporary exhaust high limit temperature error	Excessive exhaust temperature, self-resetting, the appliance operates, but not in the best way possible	End User: Contact a qualified service technician. Service Technician: - Inspect the heat exchanger to see if it's dirty; clean if necessary, ensure the condensate trap is cleaned afterwards. - Check the incoming gas pressure is correct; reference the Appendix: Recommended Gas Pressures. - Check the combustion with a combustion analyzer; referencing Section 6.4 Combustion Adjustment.
E 13	Exhaust high limit temperature error	Exhaust temperature has gone over the limit of the safety sensor	End User: Contact a qualified service technician. Service Technician: - Inspect the heat exchanger to see if it's dirty; clean if necessary, ensure the condensate trap is cleaned afterwards. - Check the incoming gas pressure is correct; reference the Appendix: Recommended Gas Pressures. - Check the combustion with a combustion analyzer; referencing Section 6.4 Combustion Adjustment. - Check the exhaust sensor and replace it if faulty
E 16	Recirculation NTC temperature sensor error	The appliance detects an anomaly of the recirculation NTC temperature sensor, the production of hot water is however guaranteed, but not in the best way possible	End User: Contact a qualified service technician. Service Technician: - Check the resistance reading at the return temperature sensor, referencing the 10k Sensor Temperature vs. Resistance Chart in the appendix; replace if necessary.

Code	Description	Causes	Solutions
E 19	Incorrect water flow rate measuring device selection	Parameter P03 set incorrectly	End User: Contact a qualified service technician. Service Technician: - Check the flow meter filter - Open the flow meter and control the rotor - Ensure wiring is not damaged - Replace the flow meter control board - Replace the control board.
E 28	Maximum number of shut-downs reached	Number of resets available, already performed	End User: Contact a qualified service technician. Service Technician: - An error can be reset 5 consecutive times. To have another 5 attempts available, disconnect the power supply to the appliance for approx. 30 seconds. If the anomaly persists, contact the Eco-King Technical Support.
E 30	Domestic cold water NTC temperature sensor fault	The appliance detects an error of the DCW NTC temperature sensor; the production of hot water is however guaranteed, but not in the best way possible	End User: Contact a qualified service technician. Service Technician: - Check the resistance reading at of the outlet temperature sensors, referencing the 10k Sensor Temperature vs. Resistance Chart in the appendix; replace if necessary.
E 37	Low voltage error	Power supply voltage lower than 84V.	End User: The error should automatically reset; contact a qualified service technician. Service Technician: - Check incoming voltage to the appliance; correct power issues if necessary.
E 40	Incorrect frequency detected	The incoming frequency is not compliant	End User: The error should automatically reset; contact a qualified service technician. Service Technician: - Contact Eco-King Technical Support
E 41	Loss of flame more than 6 times consecutively (frequent flame loss)	It occurs if the flame loss error occurs more than 6 times	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Check ignition electrode for spark, proper gap and for cracks in ceramic - Check the wire connection to ignitor and control board is tight - Ensure ignition/ flame sensor electrode is not dirty, clean or replace if necessary - Make sure polarity is correct to the unit - Check the incoming gas pressure - Check gas is flowing across the gas valve during trial for ignition - After performing the previous checks perform a automatic and manual combustion adjustment. - Check for recirculation of combustion products
E 42	Buttons error	The appliance detects an error on the push button panel	End User: Disconnect power supply for 30 seconds and re-connect, if error code persists contact a qualified service technician. Service Technician: - Check if buttons are sticking. - Replace control board if buttons are fine and unit does not reset after power cycle.

Code	Description	Causes	Solutions
E 43	Communication error between appliance and remote control (RC)	Communication error between appliance and RC (if connected). It occurs in the case of connection to a RC that is not compatible or if there is no communication between appliance and RC	End User: Disconnect power supply for 30 seconds and re-connect, if error code persists contact a qualified service technician. Service Technician: - Check wiring connection between RC and the terminal block (M1) - Check the wiring connection between the terminal block (M1) and the control board - Ensure wiring is not damaged
E 44	Exceeded maximum time for gas valve to stay open.	The gas valve remains open for a period of time longer than what is considered normal operation without the water heater firing.	End User: Press Reset, if the anomaly persists, contact a qualified service technician Service Technician: - Check ignition electrode for spark, proper gap and for cracks in ceramic - Check the wire connection to ignitor and control board is tight - Ensure ignition/ flame sensor electrode is not dirty, clean or replace if necessary - Make sure polarity is correct to the unit - Check the incoming gas pressure - Check gas is flowing across the gas valve during trial for ignition - After performing the previous checks perform a automatic and manual combustion adjustment. - Check the gas valve.
E 62	Calibration request	The appliance does not function, the appliance must be recalibrated	End User: Contact a qualified service technician. Service Technician: - Inspect the heat exchanger to see if it's dirty; clean if necessary, ensure the condensate trap is cleaned afterwards. - Check the incoming gas pressure is correct; reference the Appendix: Recommended Gas Pressures. - Check the combustion with a combustion analyzer; reference Section 6.4 Combustion Adjustment.
E 80	Gas valve opening problem	Gas valve not opening	End User: Press Reset, if the anomaly persists, contact a qualified service technician Service Technician: - Check the wiring harness is connected to the gas valve and control board and is not damaged; replace if necessary. - Check there is voltage going to the gas valve, replace gas valve if there is/ replace control board if there is not.
E 83	Combustion air/ Exhaust vent obstructed	Combustion air/Exhaust vent obstructed	End User: Remove snow accumulated in front of venting terminations. If snow accumulation is not the issue contact a qualified service technician.  WARNING: RISK OF CARBON MONOXIDE POISONING OR FIRE DUE TO JOINT SEPARATION OR PIPE BREAKAGE. Do not repair or take apart venting unless you are a qualified service technician. Failure to comply may result in substantial property damage, personal injury or death. Service Technician: - Check for obstruction in the vent - Check vent screens for dirt and debris clean or repair if necessary.

Code	Description	Causes	Solutions
E 86	Fan error	The fan is at a stand-still or rotates at an incorrect number of revs	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Check the wiring connections from the control board to the fan is not damaged and is secure; replace if necessary. - Check the control board for damage; replace the fan if the control board is fine. If error persists replace the control board.
E 87	Problem in the gas valve circuit	An anomaly is detected of one of the components that manage the gas valve	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Contact Eco-King Technical Support
E 89	Gas valve error	Combustion control problem detected	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Ensure ignitor/ flame sensor electrode is not dirty, clean or replace if necessary - Check the incoming gas pressure - Check gas is flowing across the gas valve during trial for ignition - After performing the previous checks perform a automatic and manual combustion adjustment. - Check for recirculation of combustion products
E 91	Combustion adjustment software anomaly	Circuit board malfunctioning	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Check ignition electrode for spark, proper gap and for cracks in ceramic - Check the wire connection to ignitor and control board is tight - Ensure ignition/ flame sensor electrode is not dirty, clean or replace if necessary - Make sure polarity is correct to the unit - Check the incoming gas pressure - Check gas is flowing across the gas valve during trial for ignition - After performing the previous checks perform a automatic and manual combustion adjustment. - Check for recirculation of combustion products - If error persists replace the control board
E 98	Software board error	Circuit board malfunctioning	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Check incoming power and polarity to ensure it's correct; repair if necessary - Replace control board
E 99	Generic error	Anomaly detected	End User: Press Reset , if the anomaly persists, contact a qualified service technician Service Technician: - Contact Eco-King Technical Support

11. Maintenance



WARNING: Any type of ordinary and extraordinary maintenance must be performed by qualified service technician in compliance with the local codes and the authorities having jurisdiction. In the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Code, using only original spare parts.

The water heater must be inspected at regular intervals to ensure the integrity and longevity of the water heater. Eco-King recommends a minimum annual maintenance. In cases with poor air quality such as:

- Laundry facilities
- Dry cleaning facilities
- Farms / areas with livestock or manure
- Woodworking or furniture refinishing shops
- Swimming pools/ hot tubs
- Auto-body/ metal shops
- Refrigeration repair shops
- Beauty/ hair salons
- Photo labs, chemical/ plastic processing plants
- Concrete plant/ construction sites

Eco-King recommends maintenance be performed on more frequent intervals as determined by the service technician. Before carrying out any cleaning or maintenance, shut-off the power supply to the appliance and close the supply gas shut-off valve.

11.1 General Care

The water heater panels must only be cleaned with damp cloths and soapy water.



WARNING: Do not clean the panels, painted parts and plastic parts with paint thinners or easily flammable substances (alcohol, petrol, etc.).

The vent termination should be inspected frequently and kept clear from obstructions (snow, bird nests, debris, dirt, etc.). Keep the area around the combustion air and exhaust vent clear and free from snow and ice. Combustible materials, gasoline and flammable liquids and vapors should be kept away from the water heater.

11.2 Maintenance Instructions

Venting

- Check the vent screens are not damaged and ensure they are clean, replace if necessary.
- Ensure the terminations have the proper clearances per local code and the installation operation manual, correct if necessary.
- Check the intake and exhaust terminations are properly sealed at their penetration through the building envelope, repair if necessary.
- Ensure venting is supported and sloped correctly per the venting manufacturer's instructions, local codes and the authorities having jurisdiction, correct if necessary
- Make sure the venting is connected properly and secure to the water heater, correct if necessary.
- Ensure there are no holes or cracks in the venting, repair if necessary.

Gas

- Check the gas piping for damage (cracks, holes, leaks, etc.), repair if necessary.
- Check the incoming dynamic gas pressure is correct.

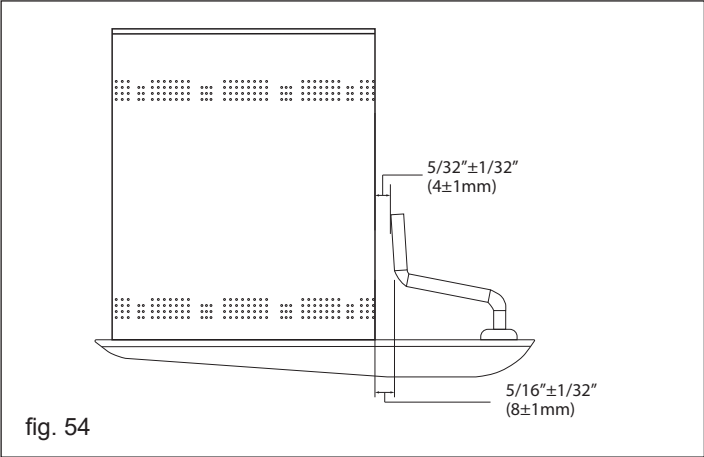
	Nominal inlet gas pressure (in. w.c.)	Permitted inlet gas pressure range (in. w.c.)
Natural Gas	7.0	3.5 - 10.5
Propane (LPG)	11.0	8.0 -13.0

Heat Exchanger

- Open the heat exchanger and check for leaks, check the condensate drain to see if a steady stream of water is continually coming out.
- Clean the heat exchanger using a stiff plastic brush. If necessary, use a cleaning agent approved to be used on stainless steel heat exchangers.
- After cleaning the heat exchanger flush the heat exchanger with water.
- Clean the condensate trap afterwards.

Burner & Electrode

- Inspect the burner for holes and debris, replace if damaged.
- To clean the burner use compressed air, if necessary use soapy water with a stiff plastic brush.
- The electrode gap should be per the specifications in fig. 62.



Condensate Trap

- Clean the condensate trap by disconnecting it and flushing it out.
- After connecting the condensate trap ensure it has been primed before starting the water heater.



WARNING: The condensate drain pipe must not be modified, check that there are no residue obstructing the condensate drain pipe. If a condensate neutralizer is installed, consult the instructions for use and provide periodic cleaning and maintenance per the installation and operation manual.

Pressure Relief Valve

- The pressure relief valve should be manually exercised the by pulling the lever on the relief valve for 5 seconds. Ensure precautions have been taken to prevent contact with hot water coming out of the relief valve and to prevent water damage.
- Consult the pressure relief valve manufacturer's instructions as they may require a more frequent maintenance schedule.



WARNING: If the 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.

- If a condensate neutralizer is used, the pH level should be checked on a periodic maintenance schedule per the neutralizer manufacturer's instructions. The neutralizer medium should be collected and disposed of in accordance with the neutralizer manufacturer's instructions as well as local codes and the local authorities having jurisdiction.

Electrical Connections

- Check the electrical wires are not cracked or brittle, replace if necessary.
- Inspect the component connections and connections at the control board to ensure all the connections are tight and secure, repair if necessary.

Water Quality

Water quality should be maintained throughout the lifetime of the water heater. Refer to Section 4.1.3 Water Quality for proper tolerances of the water heater.

Operation

At the end of performing a maintenance service, the unit should be turned on and put through a cycle and the sequence of operation observed to ensure the unit is operating properly.

The info mode can be used during this time to check that the temperature sensors are operating within range.

After checking the sequence of operation a combustion analysis should be performed per Section 6.3 Combustion Analysis.

Cleaning of combustion chamber

The inspection and the cleaning of the combustion chamber should be done yearly, during the standard maintenance of the appliance.

If sediments of combustion products are stuck on the coil of the heat exchanger, they must be removed following the instructions listed below:

1. The chamber must be first be cleaned with a vacuum.
2. The coils must be cleaned thoroughly with a not metallic bristle brush.

3. If the dirt is difficult to remove, it is possible to use a specialized cleaner made for cleaning the flue gas side of the stainless steel heat exchanger.

To ensure the cleaning of the space between the coils, at the end of steps 2 and 3, it is suggested to clean the heatexchanger with compressed air vacuum any dust deposits left behind to ensure the cleaning of combustion chamber.

The divider plate insulation must be inspected and replaced if it is damaged.

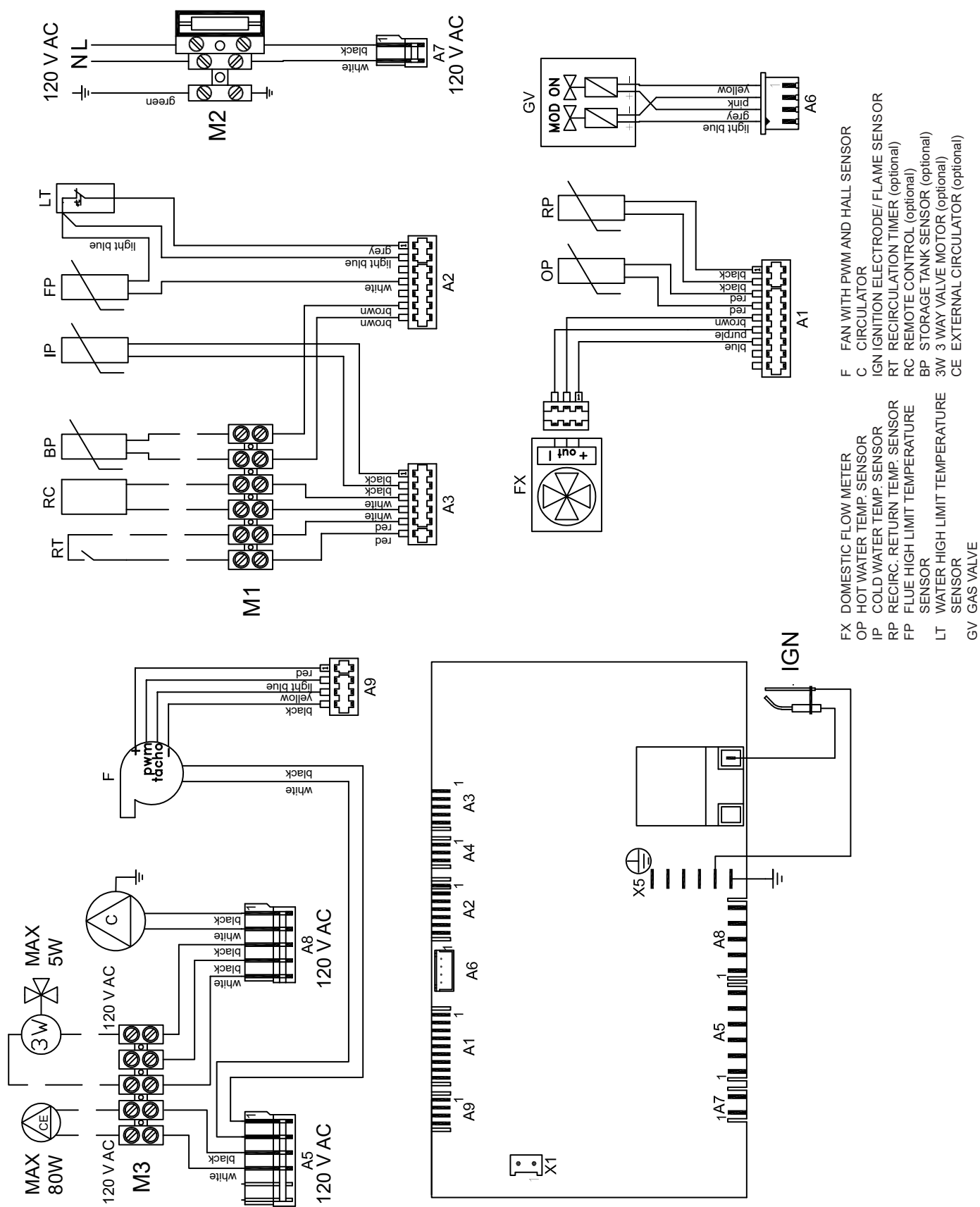
If the siphon located on the condensate exhaust circuit has caused a rise of the condensates in the combustion chamber, the heat exchanger's insulation must be replaced.

To ensure the correct tightening between the burner door and the heat exchanger, it is necessary to inspect the burner door gasket and change it (if it is not in proper condition).

12. Appendixes

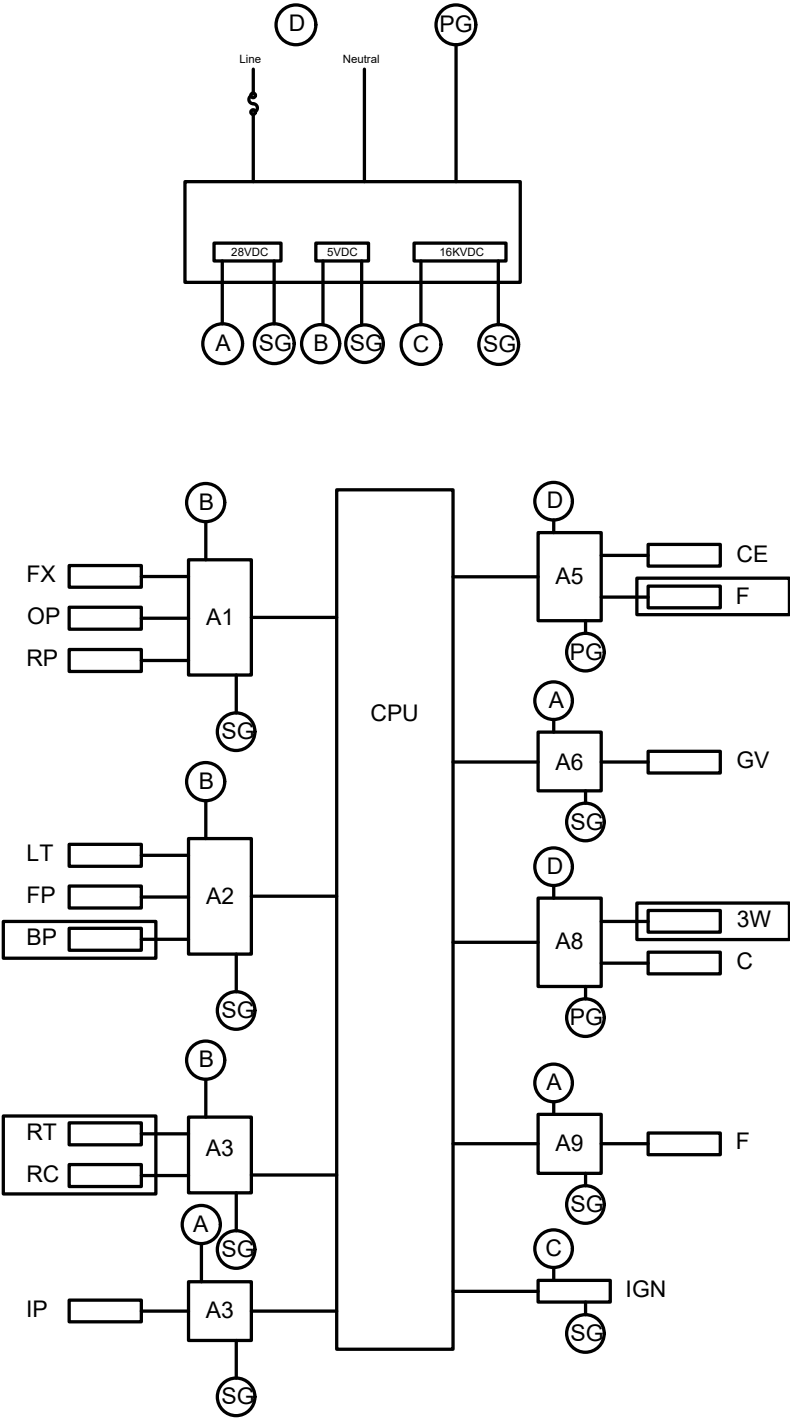
12.1 Wiring Diagram

fig. 55



12.2 Ladder Diagram

fig. 56



- | | | |
|---------------------|--|--------------------------------------|
| A 28VDC | FX DOMESTIC FLOW METER | F FAN WITH PWM AND HALL SENSOR |
| B 5VDC | OP HOT WATER TEMP. SENSOR | C CIRCULATOR |
| C 16 KVDC | IP COLD WATER TEMP. SENSOR | IGN IGNITION ELECTRODE/ FLAME SENSOR |
| D 120V | RP RECIRC. RETURN TEMP. SENSOR | RT RECIRCULATION TIMER (optional) |
| PG Primary Ground | FP FLUE HIGH LIMIT TEMPERATURE SENSOR | RC REMOTE CONTROL (optional) |
| SG Secondary Ground | LT WATER HIGH LIMIT TEMPERATURE SENSOR | BP STORAGE TANK SENSOR (optional) |
| | GV GAS VALVE | 3W 3 WAY VALVE MOTOR (optional) |
| | | CE EXTERNAL CIRCULATOR (optional) |

12.3 Parts Breakdown



WARNING: if during disassembly of components wear of the sealing components is detected (o-rings and gaskets), replace them.

Remove the front cover (fig. 57)

- Loosen the case screws (top and bottom) and remove them
- Pull the front cover from the bottom and remove it.
The front cover is clamped to the water heater at the top by two hooks.

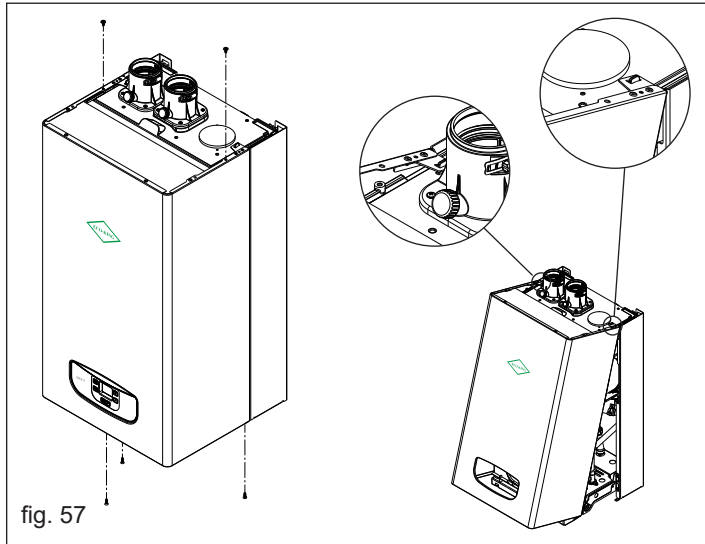


fig. 57

Remove the burner door and gas orifice

- Remove the front cover (see specific paragraph)
- Move the control board down (fig. 21)
- Disconnect the ignition electrode and the ignitor grounding wire (1-fig. 58)
- Disconnect the fan electrical connectors (2-fig. 59)
- Remove the clip (3-fig. 59), loosen the nut and remove the gas pipe (4-fig. 59)



CAUTION: Pay attention to the position of the gas orifice (5-fig. 59).

- Loosen the gear clamp of the intake air pipe on the mixer (6-fig. 59) and remove the intake air pipe from the mixer
- Remove the nuts securing the door to the exchanger and remove the door (fig. 60)
- Reassemble the components in reverse order making sure that the radiused part of the nozzle is positioned towards the valve (fig. 60).



WARNING: A soap and bubble leak test should be performed per local code and the authorities having jurisdiction when the unit is running to ensure the gas valve is open and gas is flowing through the connection.

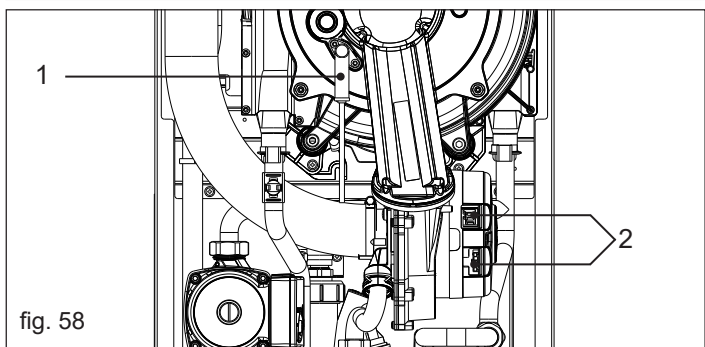


fig. 58

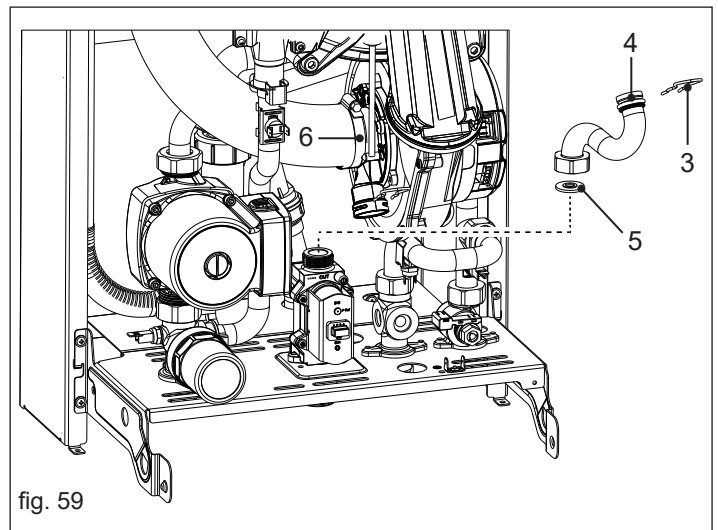


fig. 59

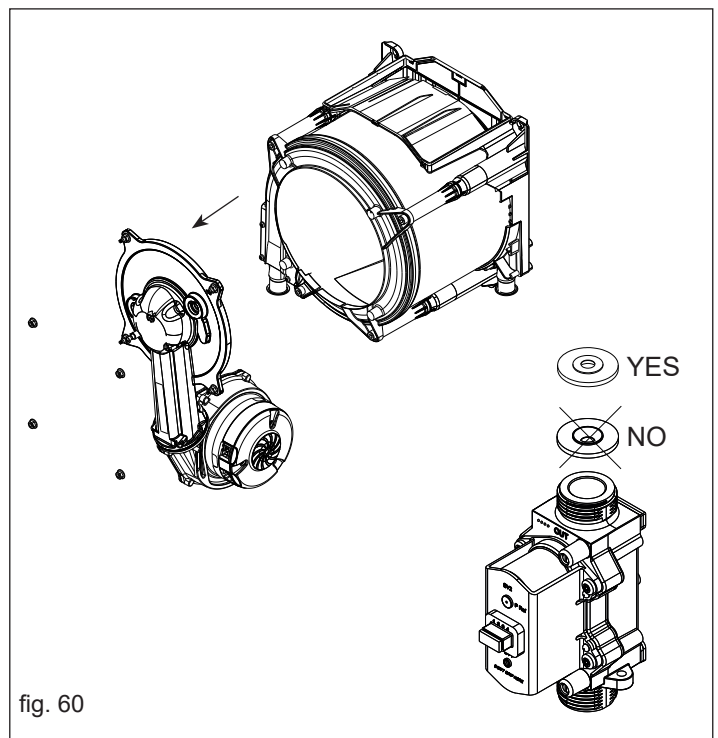


fig. 60

Remove the ignition electrode

- Remove the front cover (see specific paragraph)
- Move the control board down (fig. 21)
- Disconnect the ignition electrode and the ignitor grounding wire (7-fig. 61)
- Unscrew the screws of the electrode (8-fig. 61)
- Remove the electrode
- Reassemble the components in reverse order paying attention to the positioning of the electrode (fig. 62).

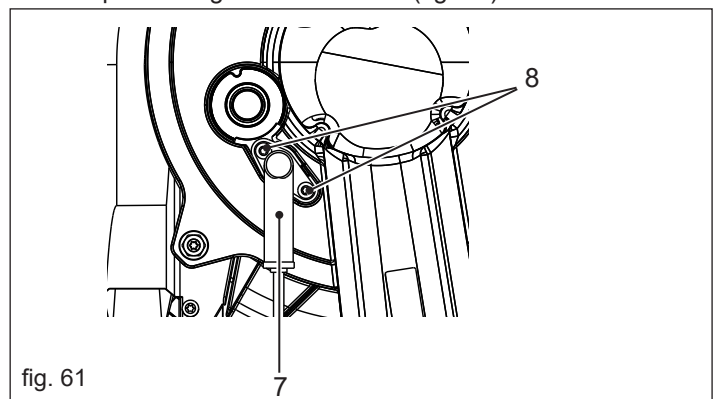
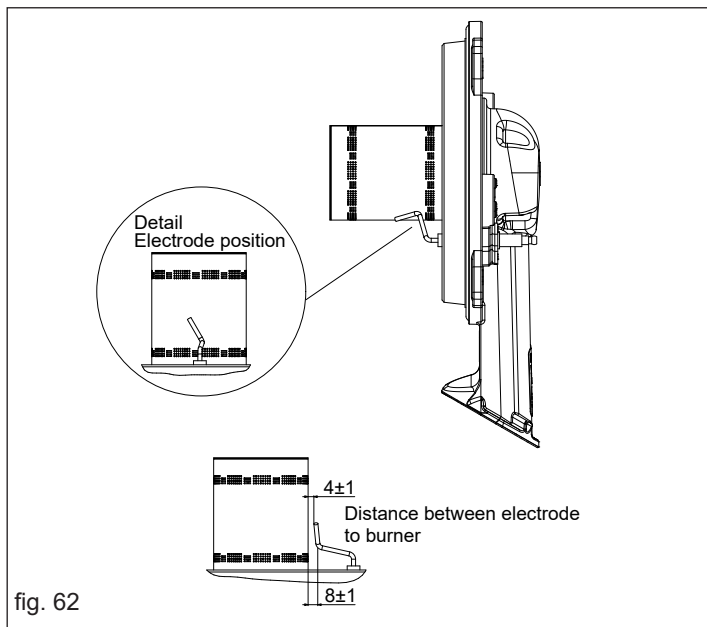


fig. 61



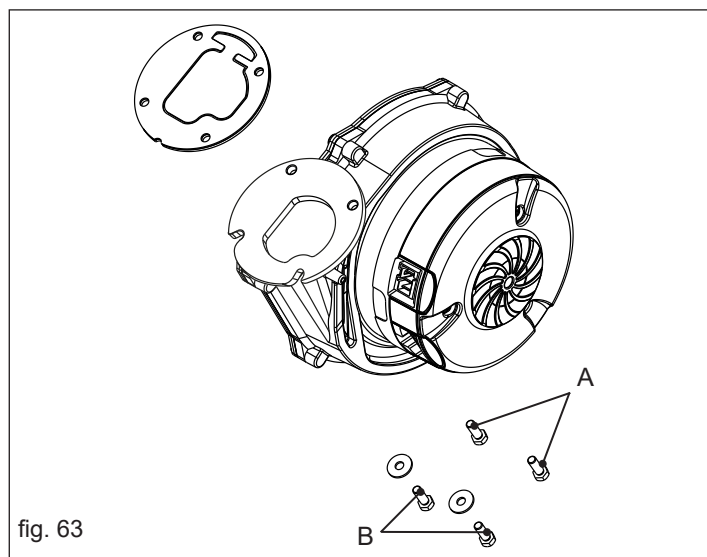
Remove the fan

- Remove the front cover (see specific paragraph)
- Move the control board down (fig. 21)
- Disconnect the fan electrical connectors (2-fig. 59)
- Remove the clip (3-fig. 59), loosen the nut and remove the gas pipe (4-fig. 59)



CAUTION: Pay attention to the position of the gas orifice (5-fig. 64).

- Loosen the gear clamp of the intake air pipe on the mixer (6-fig. 59) and remove the intake air pipe from the mixer
- Remove the screws (A) and loose the other two (B) that secure the fan to the door
- Reassemble the components in reverse order making sure that the radiused part of the nozzle is positioned towards the valve (fig. 60)
- Pay attention to the positioning of the clapet valve (fig. 63).



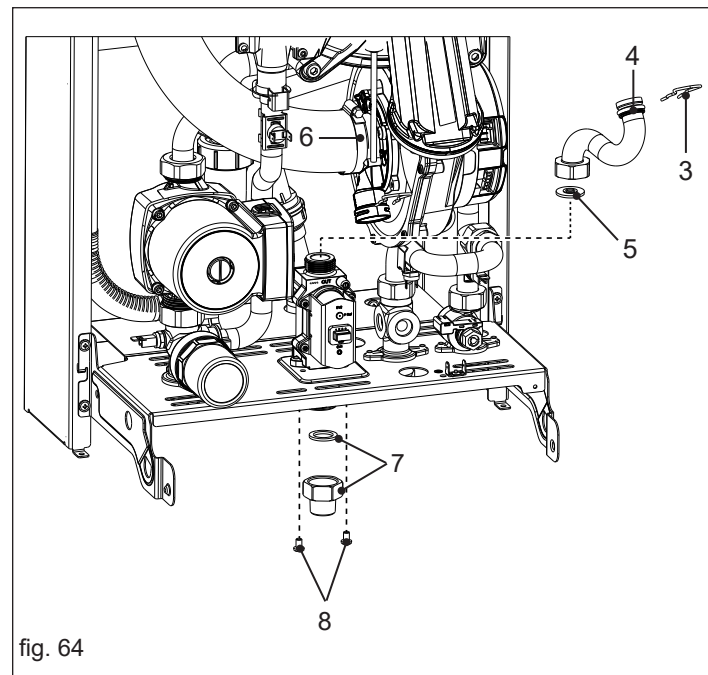
Remove the gas valve

- Remove the front cover (see specific paragraph)
- Move the control board down (fig. 21)
- Disconnect the gas valve electrical connector
- Remove the clip (3-fig. 64), loosen the nut and remove the gas pipe (4-fig. 64)



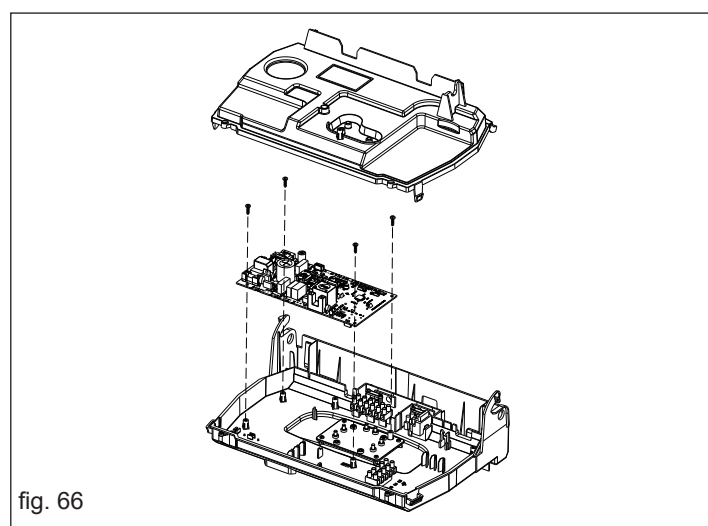
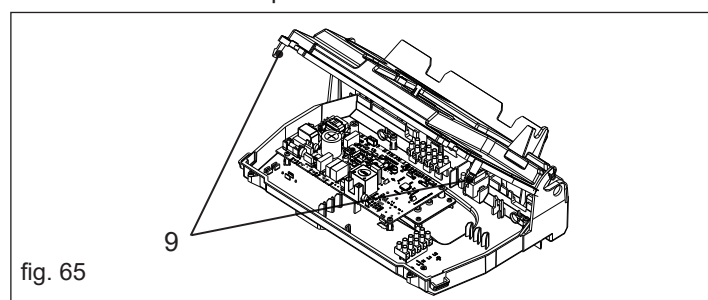
CAUTION: Pay attention to the position of the gas orifice (5-fig. 64).

- Loosen the gear clamp of the intake air pipe on the mixer (6-fig. 64) and remove the intake air pipe from the mixer
- Remove the reduction and gas valve gasket (7-fig. 64)
- Remove the gas valve screws (8-fig. 64)
- Remove the gas valve
- Reassemble the components in reverse order making sure that orifice is in the correct position (see fig. 60).



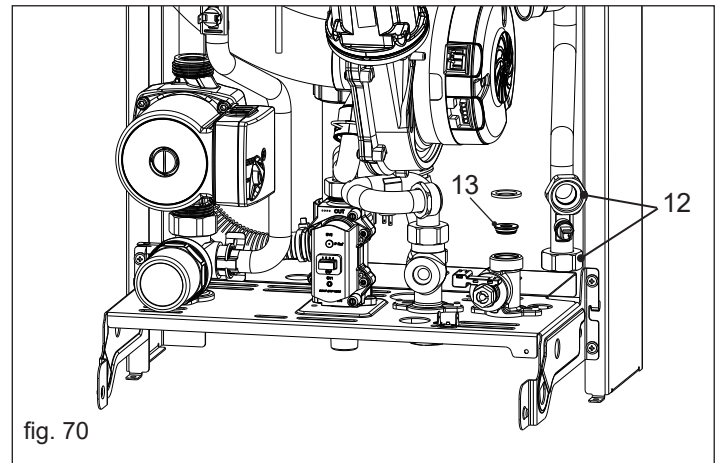
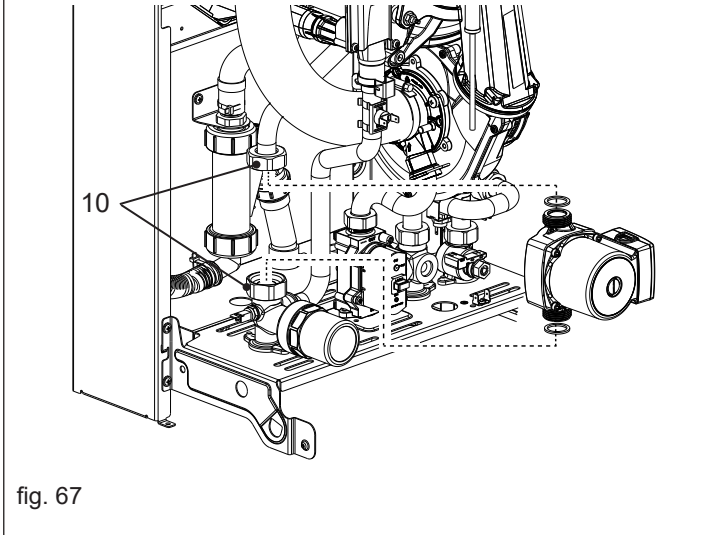
Remove the electronic control board

- Remove the front cover (see specific paragraph)
- Move the control board down (fig. 21)
- Open the control panel by depressing the fixing clips (9-fig. 65)
- Disconnect the control board wiring connections and the screws (fig. 66)
- Remove the electronic control board
- Reassemble the components in reverse order.



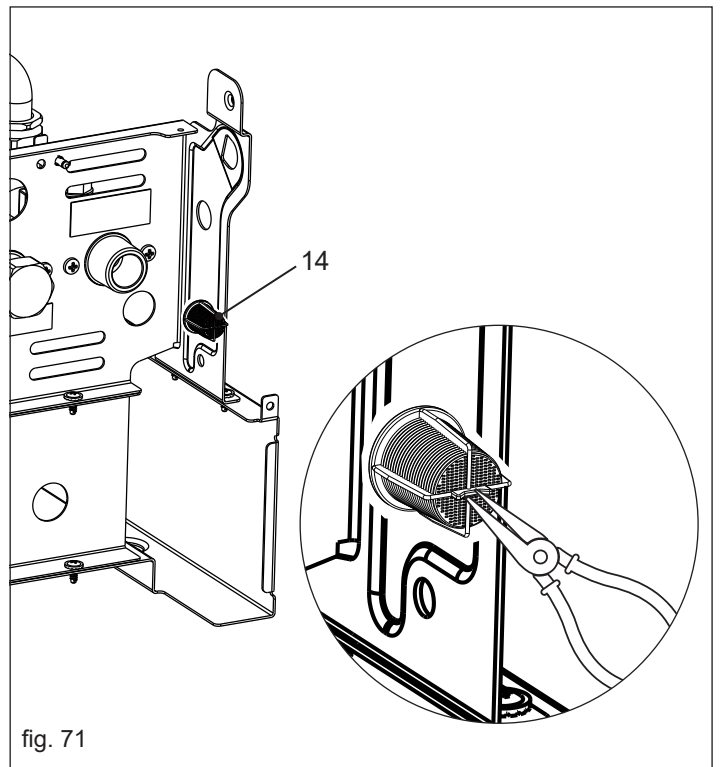
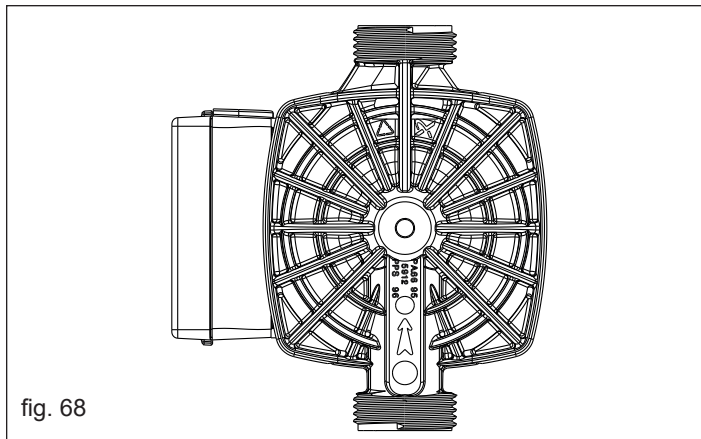
Remove the circulator

- Remove the front cover (see specific paragraph)
- Move the control board down (fig. 21)
- Disconnect the electrical connector from the circulator
- Loosen the circulator swivel nuts (10-fig. 67)
- Remove the circulator paying attention to the seals (fig. 67)
- Reassemble the components in reverse order paying attention to the direction of the circulator's water flow which must be from bottom to top as indicated by the arrow imprinted on the circulator (fig. 68).



Remove the water filter

- Remove the cold water inlet pipe from the system to the water heater
- Using needle nose pliers, remove the water filter from the flow meter pulling from the appropriate tabs (14-fig. 71).



Remove the flow meter

- Remove the front cover (see specific paragraph)
- Move the control board down (fig. 21)
- Remove the clip (11-fig. 69), loosen the nut and remove the circulator pipe
- Loosen the inlet pipe nut from the flow meter and the recirculation pipe nuts (12-fig. 70)
- Turn the inlet pipe to access the flow meter
- Remove the flow meter using a pointed tool (13-fig. 70)
- Reassemble the components in reverse order.

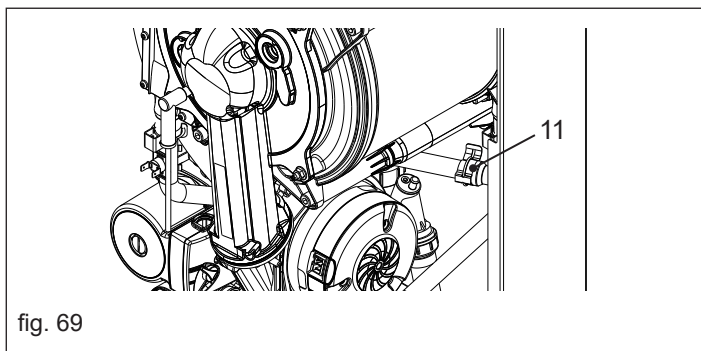
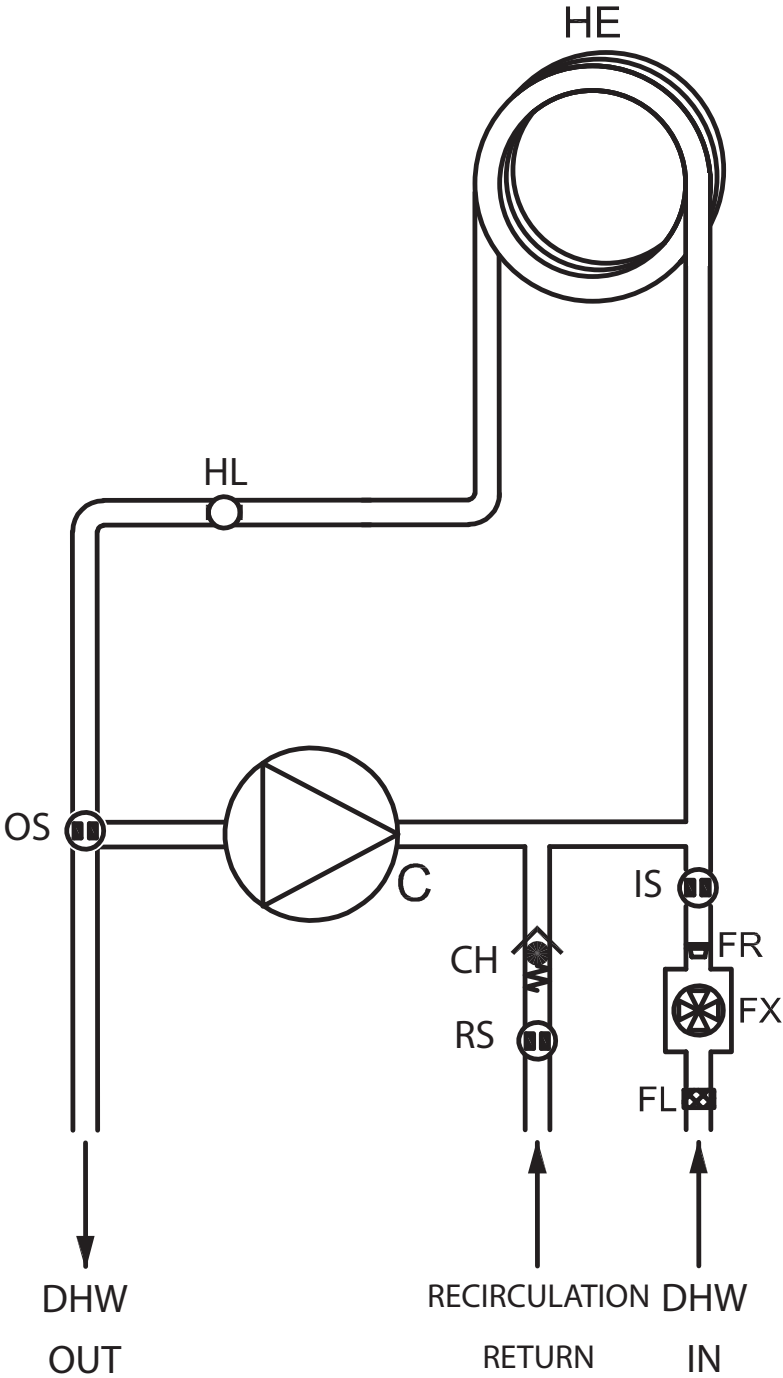


fig. 72

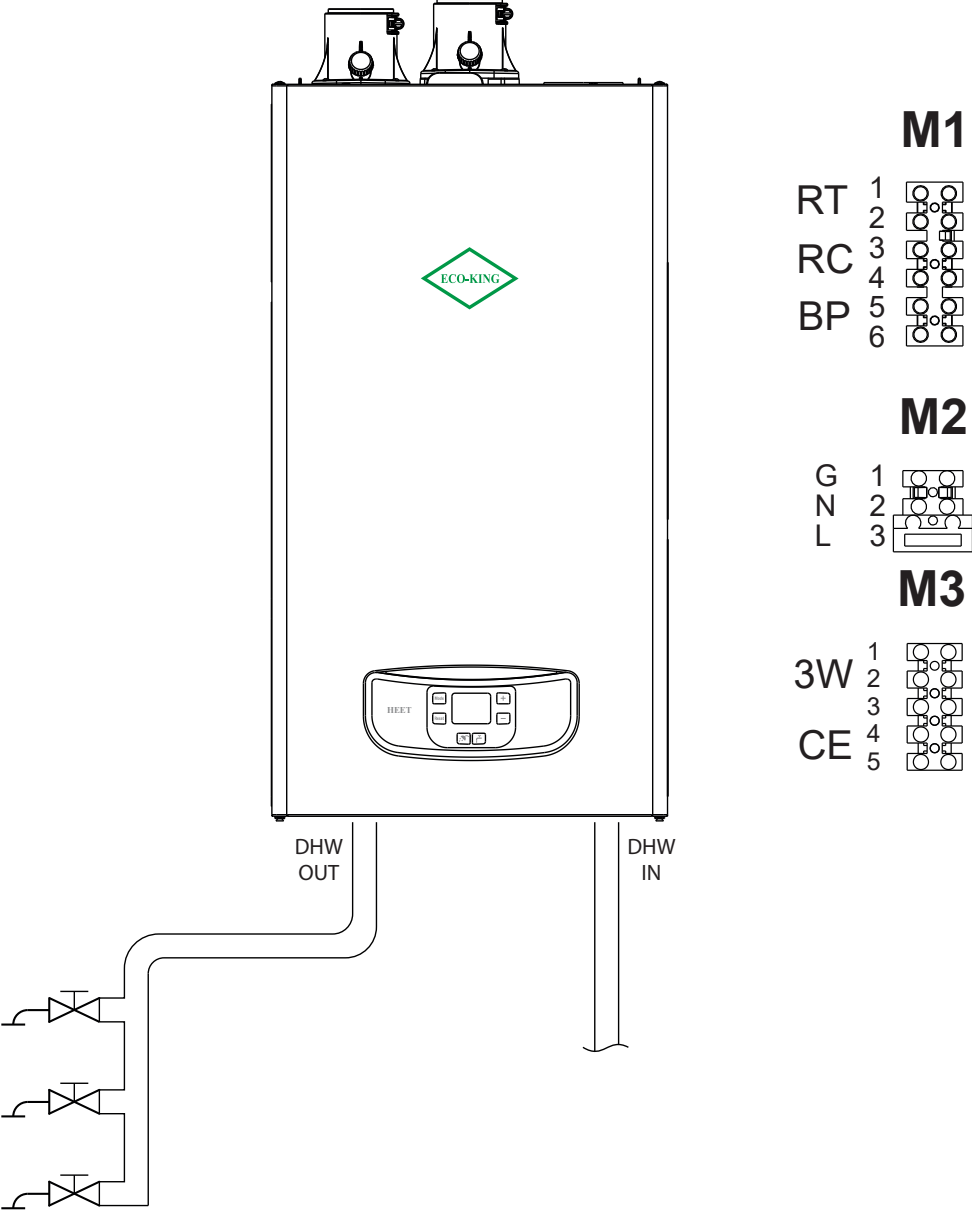


- | | |
|----------------------|---|
| HL | Water high-limit thermostat |
| HE | Heat exchanger |
| OS | Outlet temperature sensor |
| C | Mixing circulator |
| CH | Check valve |
| RS | Recirculation return temperature sensor |
| IS | Inlet temperature sensor |
| FL | Filter |
| FX | Flow meter |
| FR | Flow restrictor |
| DHW IN | DHW inlet |
| DHW OUT | DHW outlet |
| RECIRCULATION RETURN | Recirculation return system |

12.5 Piping & Wiring Examples

12.5.1 Standard Application

fig. 73

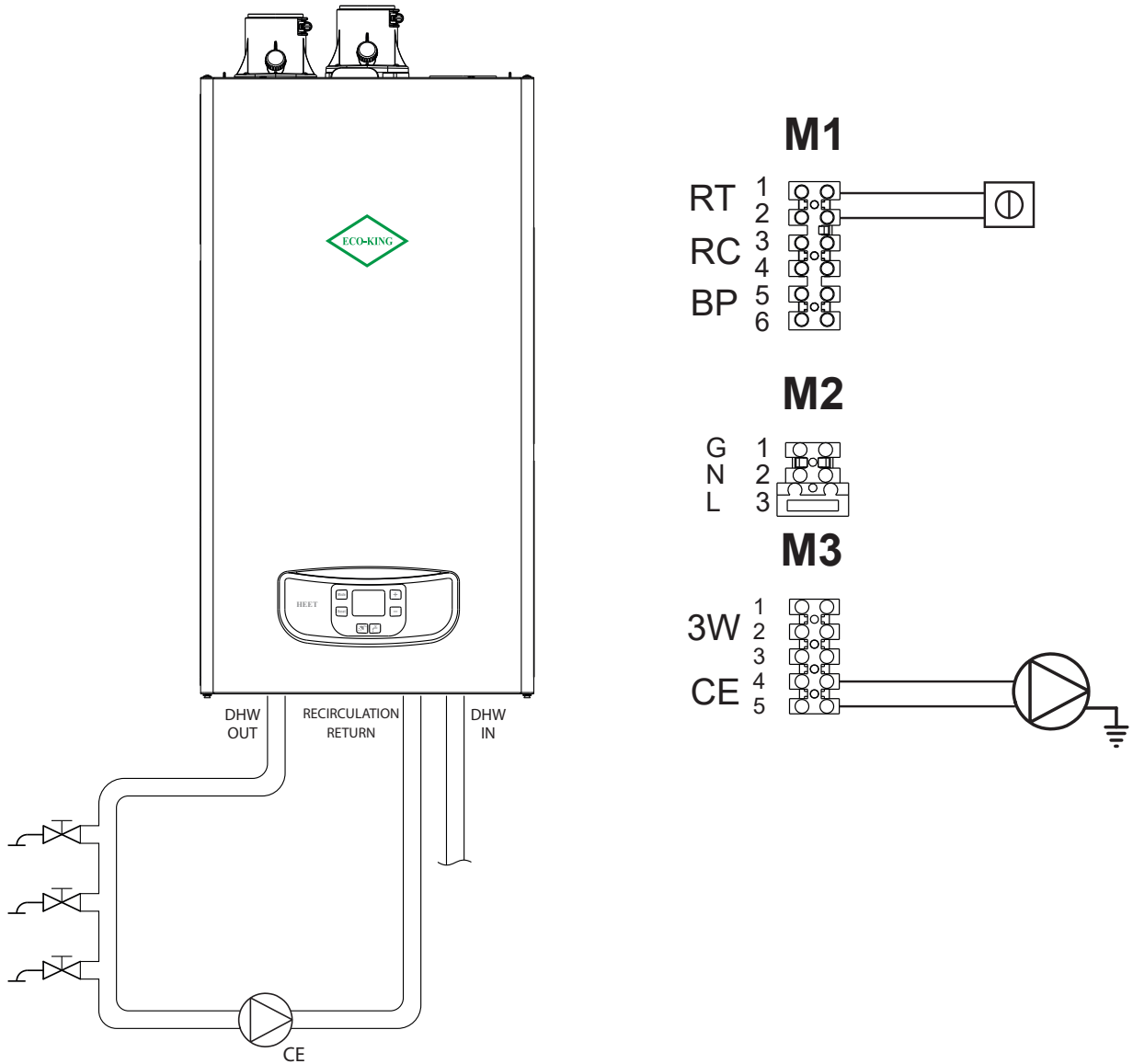


LEGEND

- CE external circulator (managed by water heater)
- 3W external three-way valve (managed by water heater)
- BP 10K storage tank temperature sensor (managed by water heater)
- RT recirculation timer
- RC remote control
- DHW IN DHW in
- DHW OUT DHW out

12.5.2 Recirculation Application

fig. 74



LEGEND

- CE external circulator (managed by water heater)
- 3W external three-way valve (managed by water heater)
- BP 10K storage tank temperature sensor (managed by water heater)
- RT recirculation timer
- RC remote control
- DHW IN DHW in
- DHW OUT DHW out
- RECIRCULATION RETURN recirculation return

Set the following parameters:

P01 = 0 (instantaneous)

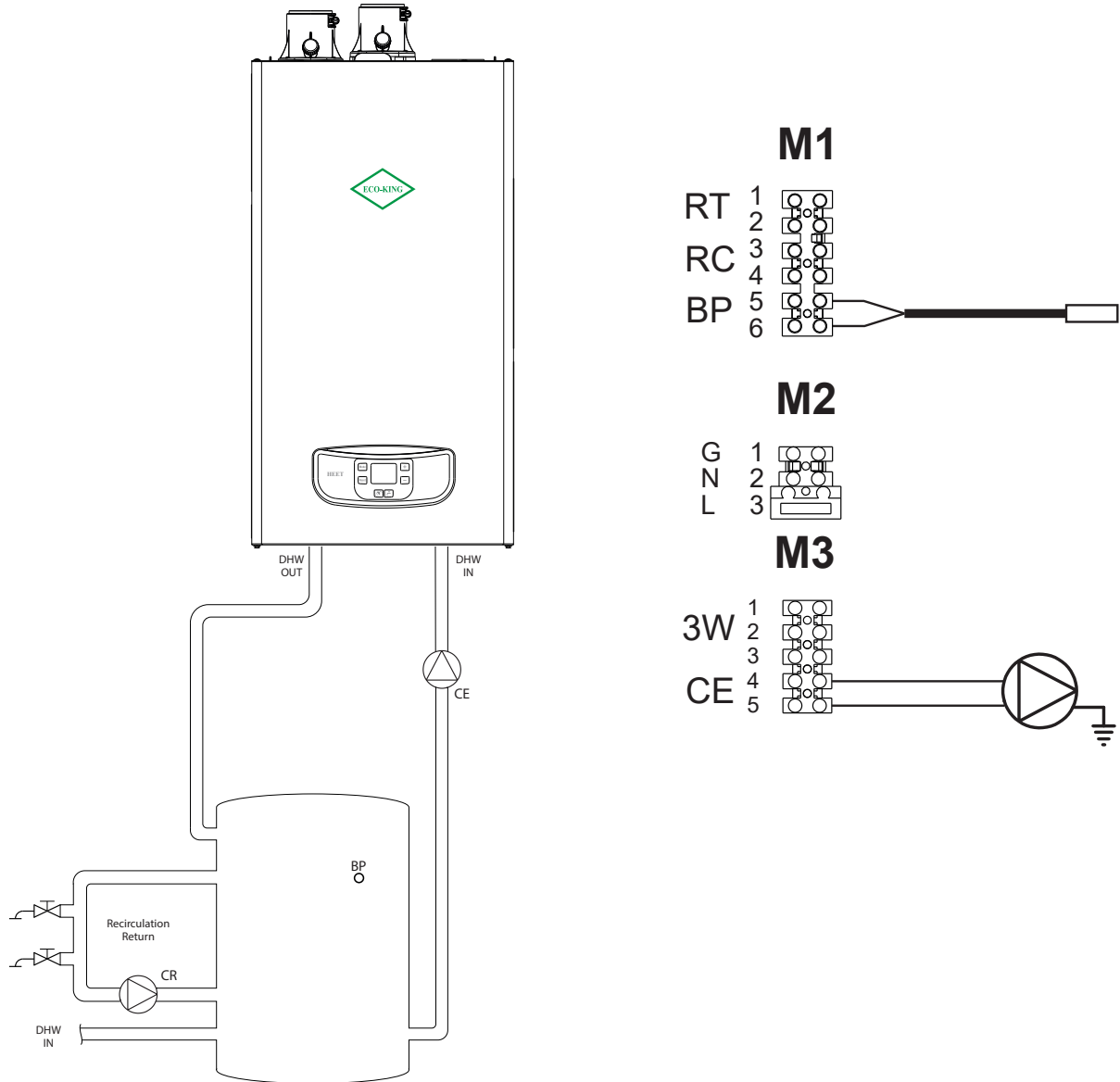
P70 ≠ 36 (37=99°F ÷ 55=131°F) recirculation temperature set-point (°F)

By connecting a timer to the RT contact, when the contact closes, the recirculation will be activated.

The external circulator (CE) will be energized, and return temperature sensor (RP) will determine when the system is satisfied and will de-energize the pump.

12.5.3 Hybrid Recirculation w/ Storage Tank Application

fig. 75



LEGEND

CE external circulator (managed by water heater)
 3W external three-way valve (managed by water heater)
 BP 10K storage tank temperature sensor (managed by water heater)
 RT recirculation timer
 RC remote control
 CR system recirculation pump
 DHW IN DHW in
 DHW OUT DHW out
 RECIRCULATION RETURN recirculation return

Set the following parameters:

P01 = 1 (with storage tank)

P66 ≠ 44 (45=113°F ÷ 80=176°F) anti-legionella function set-point (recommended value 65=149°F).

P70 = 36 recirculation deactivated to be managed externally (if necessary 37=99°F ÷ 55=131°F)

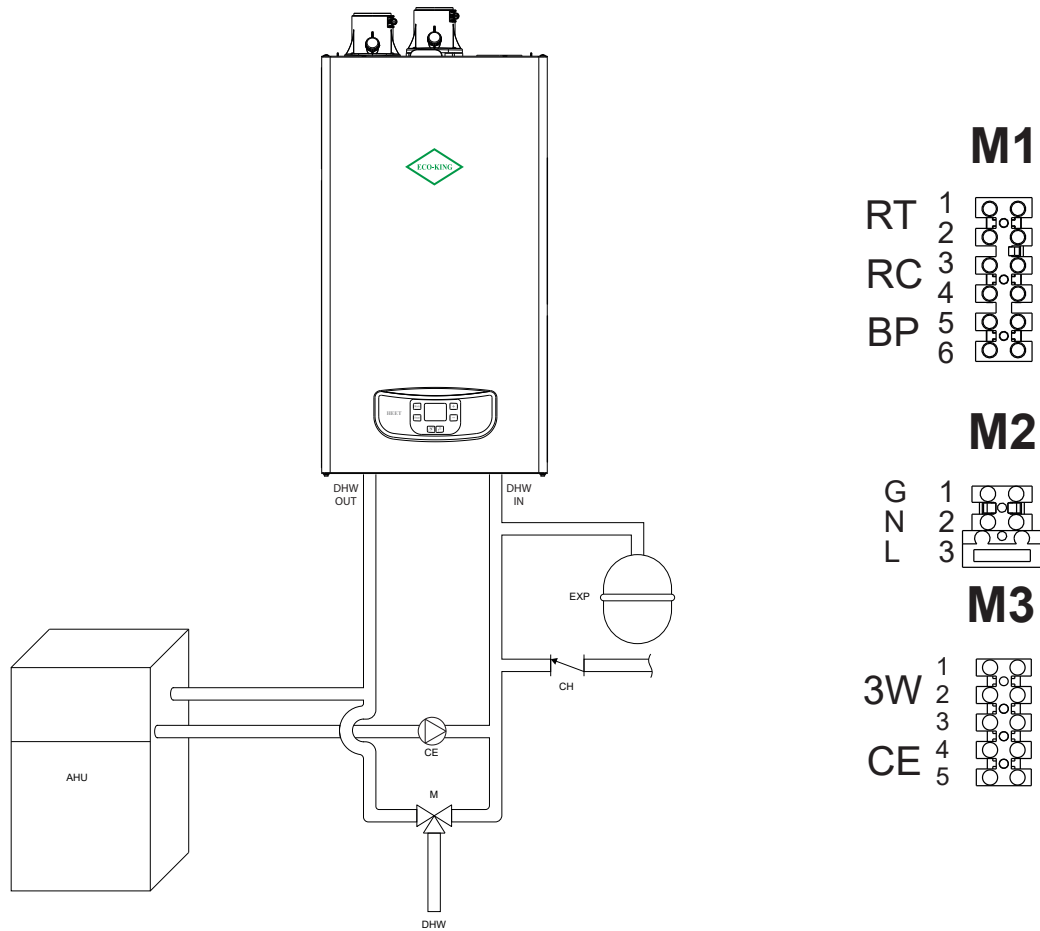
In this mode, the water heater maintains the temperature of an external storage tank by managing its load via an external circulator (CE) and a storage tank probe (BP).

The storage tank set-point can be adjusted as described in the chapter "Using the water heater" section ADJUST THE TEMPERATURE OF THE DOMESTIC HOT WATER.

CR to be controlled by a third party aquastat.

12.5.4 Space Heating w/ AHU Application

fig. 76



LEGEND

CE	external circulator (managed by water heater)
3W	external three-way valve (managed by water heater)
BP	10K storage tank temperature sensor (managed by water heater)
RT	recirculation timer
RC	remote control
CR	system recirculation pump
AHU	air handler
M	mixing Valve
CH	check Valve
EXP	potable expansion tank
DHW IN	DHW in
DHW OUT	DHW out
RECIRCULATION RETURN	recirculation return

CE is to be controlled by the AHU and should not be wired to the water heater.



WARNING: Toxic chemicals, such as those used for boiler treatment, shall not be introduced into the potable water used for space heating.

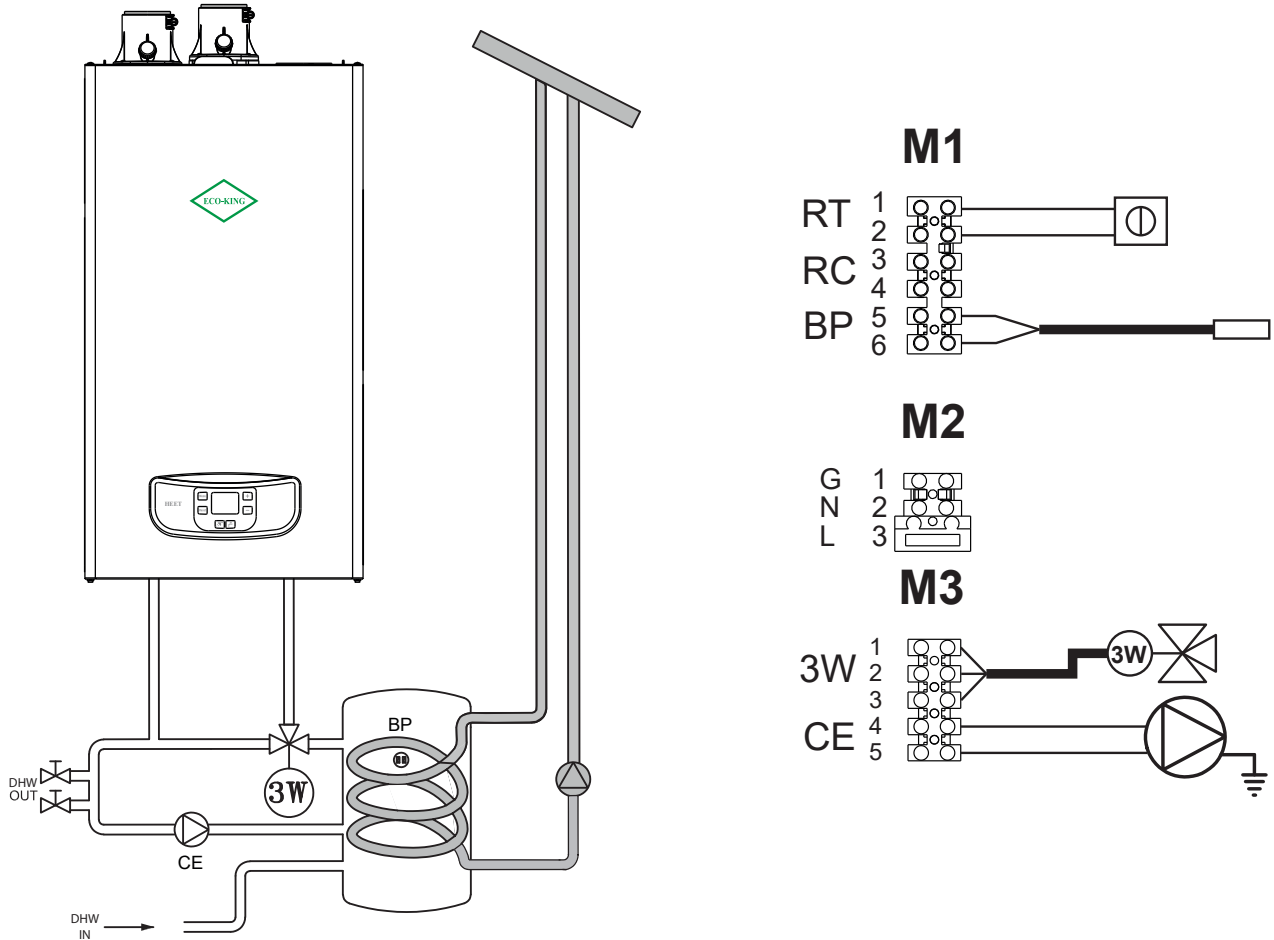
The appliance must not be connected to a system that was previously used with a non-potable water heating appliance. Piping and components connected to the water heater for the space heating application shall be suitable for use with potable water.

When the system requires water for space heating at temperatures higher than required for other uses, a means such as a mixing valve shall be installed to temper the water for those uses in order to reduce scald hazard potential.

The water heaters for combination water/space cannot be used in space heating applications only.

12.5.5 Solar Storage Tank w/ 3-Way Valve Application

fig. 77



LEGEND

CE	external circulator (managed by water heater)
3W	external three-way valve (managed by water heater)
BP	10K storage tank temperature sensor (managed by water heater)
RT	recirculation timer
RC	remote control
CR	system recirculation pump
DHW IN	DHW in
DHW OUT	DHW out
RECIRCULATION RETURN	recirculation return

Set the following parameters:

P01 = 0 (instantaneous)

P66 ≠ 44 (45= 113°F ÷ 80=176°F) anti-legionella function set-point (recommended value 65=149°F)

P70 ≠ 36 (37=99°F ÷ 55=131°F) recirculation set-point temperature (°F)

P72 = 1 solar probe (BP) active

The external circulator (CE) will be energized as long as the RT contact remains closed. The water heater turns on and off the burner in order to keep the temperature of the water in the recirculation system to P70 value (with proper tolerance).

In this mode:

- If the temperature detected by the BP is $\geq$ the domestic hot water set-point, the three-way valve will remain in the rest position excluding the water heater from the hydraulic circuit
- If the temperature detected by the BP is $<$ the domestic hot water set-point, the three-way valve will be powered and the water heater will work in instantaneous mode.

12.6 Requirements for the State of Massachusetts

NOTICE BEFORE INSTALLATION

This appliance must be installed by a licensed plumber or gas fitter in accordance with the Massachusetts Plumbing and Fuel Gas Code 248 CMR Sections 4.00 and 5.00.

IMPORTANT: In the State of Massachusetts (248 CMR 4.00 & 5.00)

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 above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS.

No installation or replacement of a vented gas appliance shall be permitted unless a battery powered or electrically hard wired carbon monoxide detector is present on the same floor as the appliance or on the next adjacent floor when the appliance is located in a crawl space unless the appliance is located in a detached, uninhabitable garage. For all residential dwellings, a carbon monoxide detector must also be present on each habitable level of the dwelling. These requirements shall not be deemed to waive any additional requirements imposed by M.G.L. c. 148 §26F1/2.

2. APPROVED CARBON MONOXIDE DETECTORS.

Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE.

Whenever any through-the-wall vent is installed less than seven feet above the finished grade, a metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight feet above grade directly in line with the exhaust vent terminal. The sign shall read, in print size no less than 0.5 inches in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".

4. INSPECTION.

The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.09 and 5.12.

12.7 10k Sensor Temperature vs. Resistance Chart

Temp (°F)	Temp (°C)	Resistance (Ω)
32	0	32,630
41	5	25,380
50	10	19,890
59	15	15,710
68	20	12,490
77	25	10,000
86	30	8,057
95	35	6,531
104	40	5,326
113	45	4,368
122	50	3,601
131	55	2,985
140	60	2,487
149	65	2,082
158	70	1,751
176	75	1,255
194	80	917
212	85	680

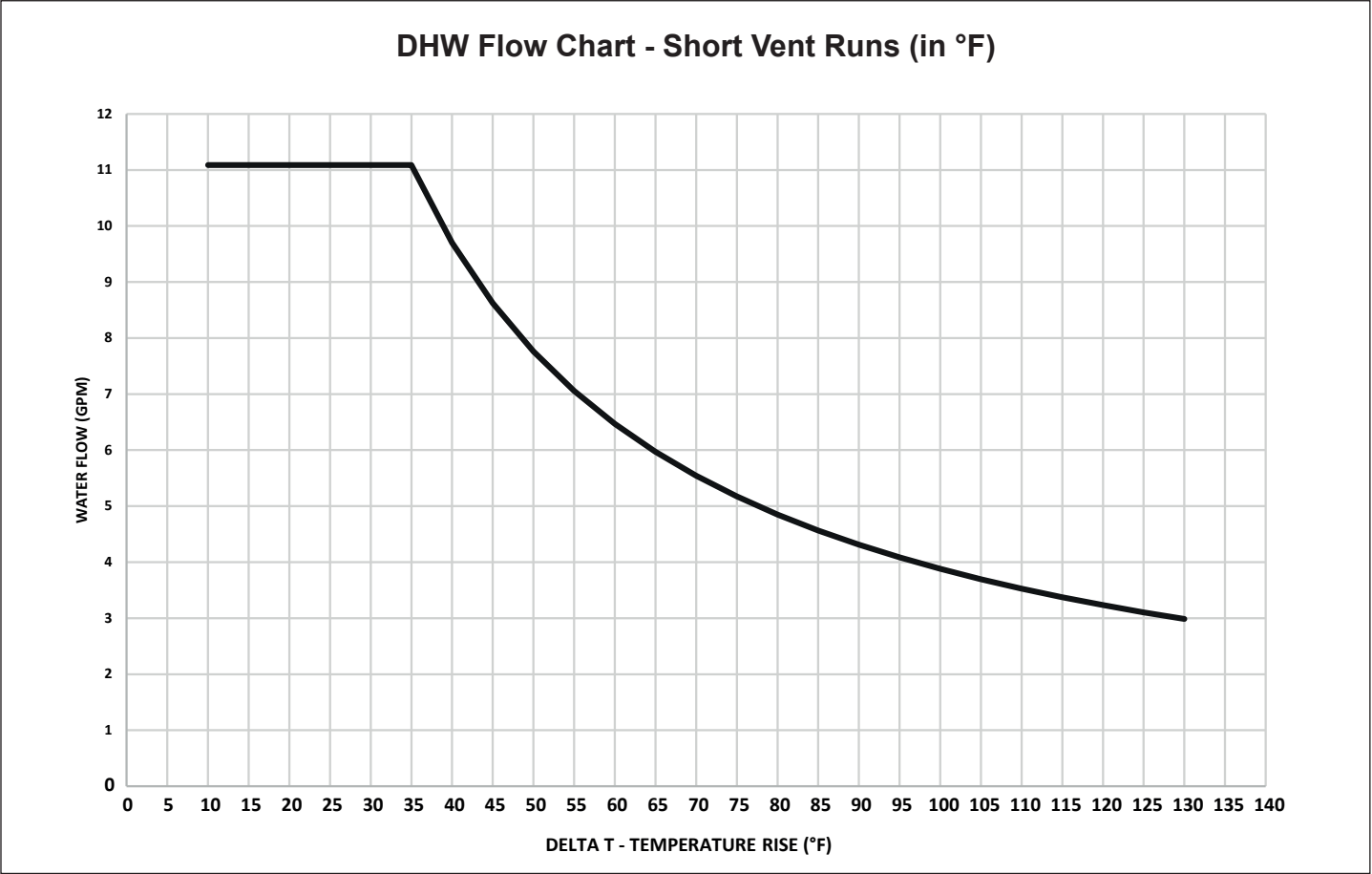
12.8 Recommended Combustion Readings

	Natural Gas	LPG (Propane)
CO ₂ max-min	9.0% ±0.5	10.5% ±0.5

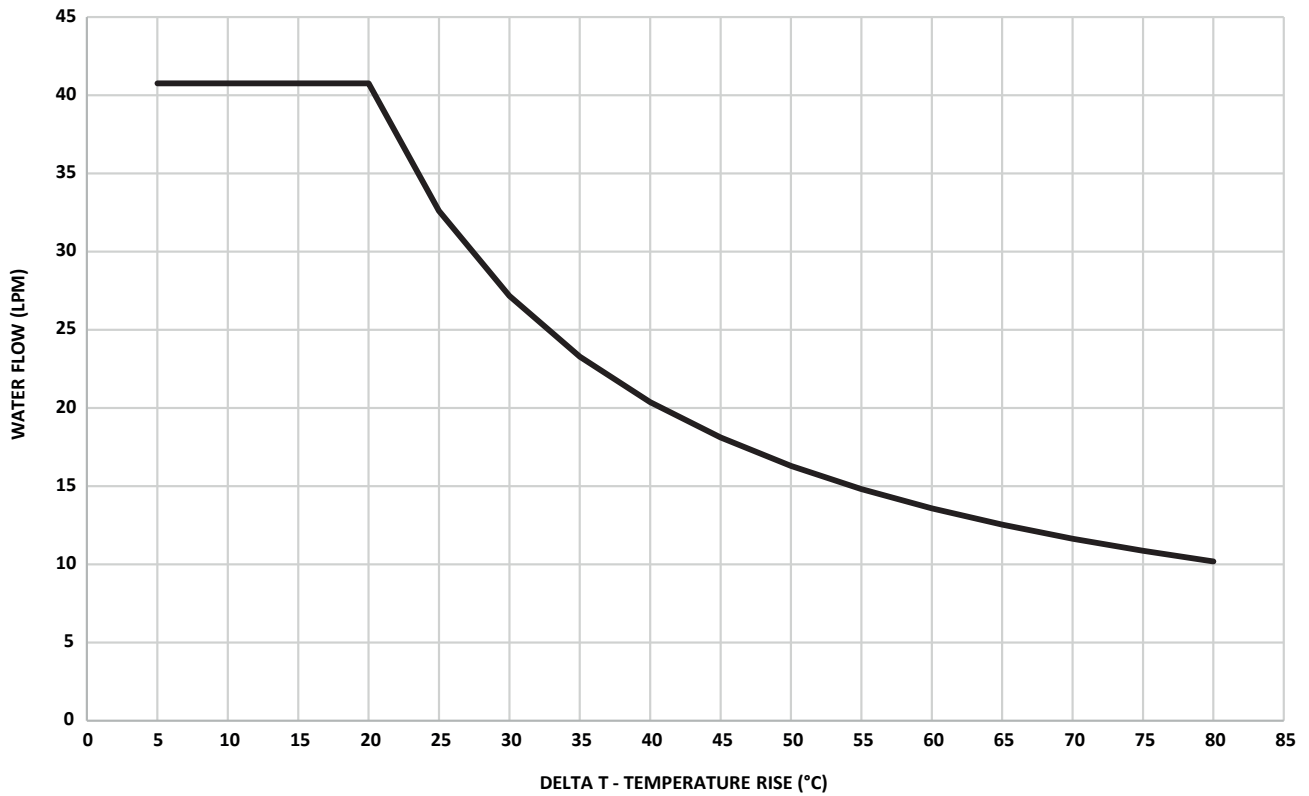
12.9 Recommended Gas Pressures

	Nominal inlet gas pressure (in. w.c.)	Permitted inlet gas pressure range (in. w.c.)
Natural Gas	7.0	3.5 - 10.5
Propane (LPG)	11.0	8.0 - 13.0

12.10 DHW Flow Chart (Temperature Rise vs. Flow rate) Short Vent Runs

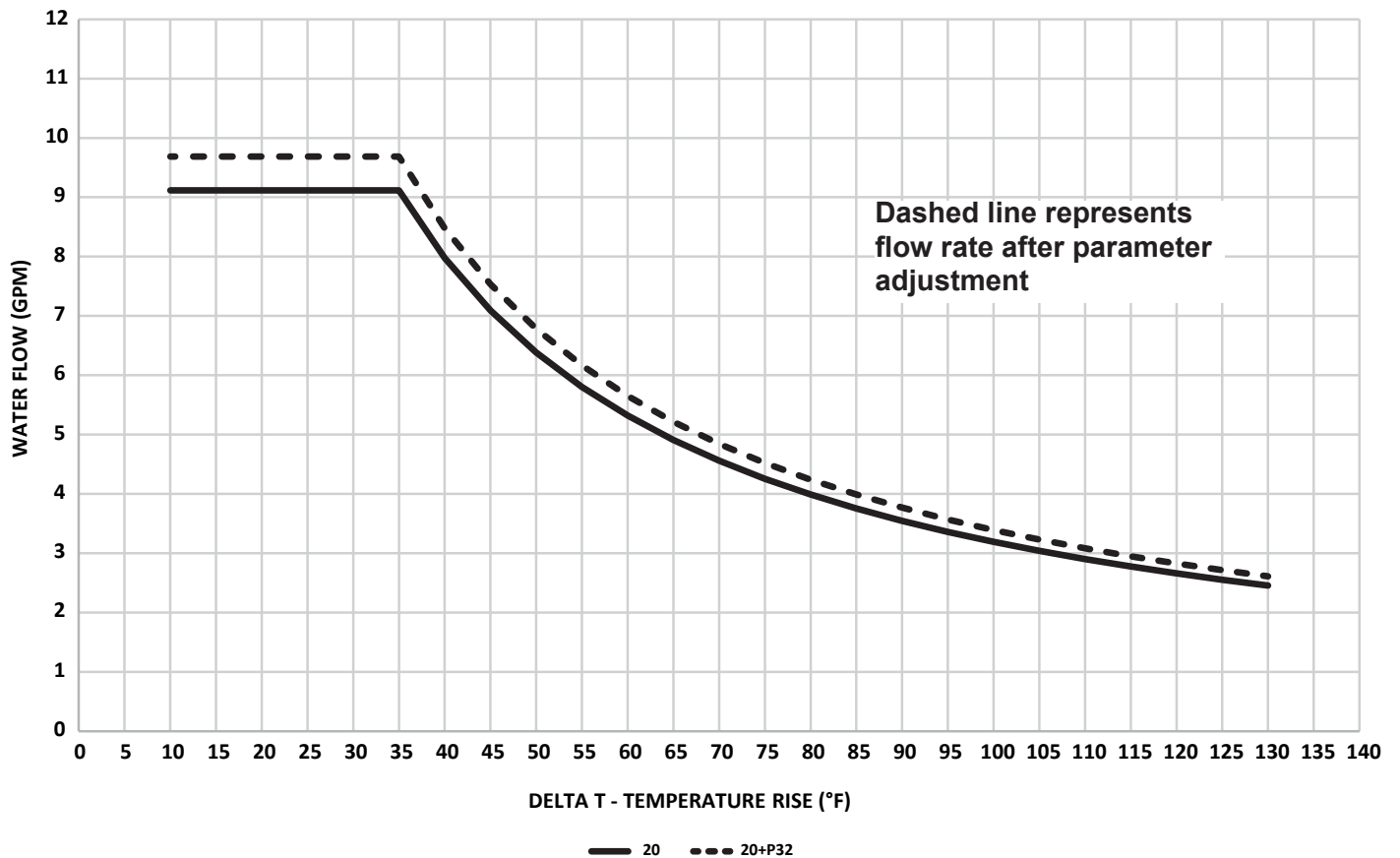


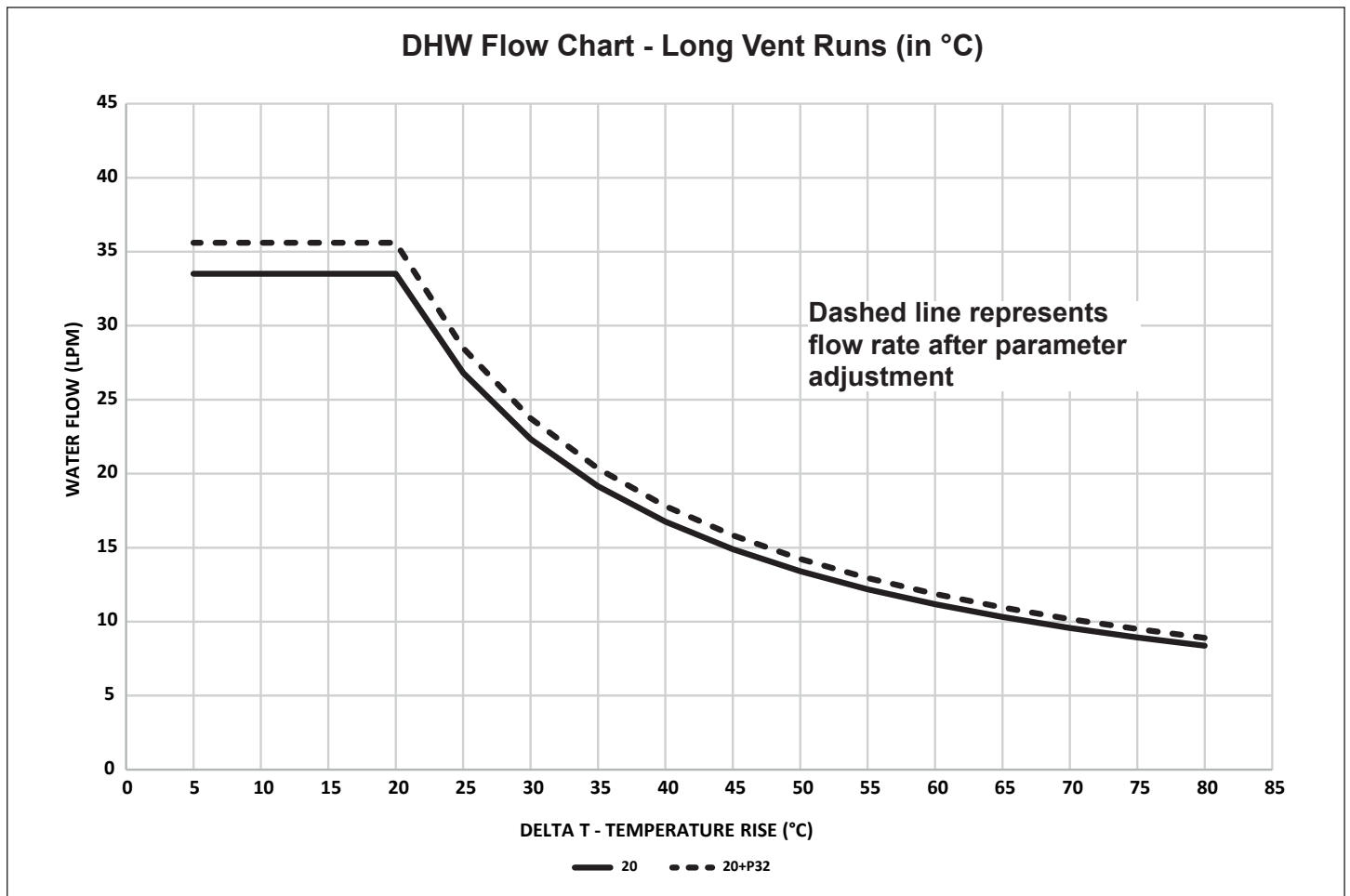
DHW Flow Chart - Short Vent Runs (in °C)



12.11 DHW Flow Chart (Temperature Rise vs. Flow rate) Long Vent Runs

DHW Flow Chart - Long Vent Runs (in °F)





DHW Flow Calculation For Long Vent Runs

When using long vent runs the btuh output of the unit can be found in Section 4.8.8 Power Output Reduction (Long Vent Runs). Using the formula below the flow rate can be calculated:

$$\text{GPM} = \text{btuh output} / (500 \times \Delta t)$$

where,

GPM = US gallons per minute

btuh output = obtained in section 4.8.9 Power Output Reduction (Long Vent Runs)

Δt = temperature difference between incoming water and outlet water (°F)

Example

If vent length is 130ft long the power input rating would be **174,000 btuh** per section 4.8.9 Power Output Reduction (Long Vent Runs) and our incoming water temperature at the coldest time of the year is 40°F (4.4°C) and the desired setpoint is 120°F (49°C).

$$\begin{aligned} \text{GPM} &= (\text{btuh input} \times \text{eff.}) / (500 \times \Delta t) \\ &= (174,000 \times 0.98) / (500 \times (120-40)) = 4.3 \text{ US gpm} \end{aligned}$$

Therefore, the maximum flow rate the water heater can achieve in this scenario is **4.3** US gpm.



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