READ AND SAVE THESE INSTRUCTIONS

GTS®

Gas-to-Steam Humidifier
LX Series

Installation, Operation, and Maintenance Manual

⚠ WARNING

Fire or explosion hazard
If the information in this manual is not followed exactly, a fire or explosion could 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.

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 an off-site 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.

For toll-free support call DriSteem Technical Support: 1-800-328-4447

driSteem™

Warnings and cautions

⚠ WARNING	**CAUTION**
Indicates a hazardous situation that could result in death or serious personal injury if instructions are not followed.	Indicates a hazardous situation that could result in damage to or destruction of property if instructions are not followed.

⚠ WARNING

Fire or explosion hazard

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 gas can be heavier than air and settle on the floor.

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 an off-site phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

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

Attention installer

Read this manual before installing, and leave this manual with product owner. This product must be installed by qualified HVAC and electrical contractors. Installation must be code approved. Improper installation can cause property damage, severe personal injury, or death as a result of electric shock, burns, or fire.

DriSteem® Technical Support:
North America: 800-328-4447
Europe: +3211823595

Read all warnings and instructions

Read this manual before performing service or maintenance procedures on any part of the system. Failure to follow all warnings and instructions could produce the hazardous situations described, resulting in property damage, personal injury, or death.

Failure to follow the instructions in this manual can cause moisture to accumulate, which can cause bacteria and mold growth or dripping water into building spaces. Dripping water can cause property damage; bacteria and mold growth can cause illness.

Continued

Warnings and cautions

WARNING




Carbon monoxide, fire, explosion, and electrical shock hazards

Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, fire, explosion, electrical shock, and other hazardous conditions. These hazardous conditions could cause personal injury, property damage, or death. To prevent hazardous conditions, read all warnings; lock all power disconnect switches in the OFF position before removing any access panels; and consult a qualified installer, service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified installer or agency must use only factory authorized and listed kits or accessories when modifying this product.

- Inspect humidifier and accessories upon arrival for damaged, missing, or improper parts. If there is a problem, call your local DriSteem Representative/Distributor.
- Application of this humidifier should have special attention given to vent sizing and material, gas input rate, and unit sizing. Improper installation or misapplication of the humidifier can cause excessive servicing or permanent component failure.
- When working on equipment, observe precautions in literature, tags, and labels attached to or shipped with the unit and observe other safety precautions that may apply. Wear safety glasses and work gloves. Have a fire extinguisher available during start-up, adjustment procedures, and service calls.
- Do not lift humidifier by gas controls, gas manifold, fire box, or shroud.
- Should overheating occur, or the gas supply fail to shut off, shut off the manual gas valve to the appliance before shutting off the electrical supply.
- The evaporating chamber is designed as a nonpressurized vessel. **DO NOT restrict piping where steam exits the humidifier**. Install drain piping and piping that connects the evaporating chamber to the dispersion assembly only as described in this manual. DO NOT install a shut-off valve on the piping connecting the evaporating chamber to the steam outlet.
- Check the humidifier name plate for the gas type indicated (natural gas or propane gas). Supply the humidifier only with the gas type indicated, or burner failure will result. To convert the humidifier to a different gas type, contact DriSteem Technical Support or your local DriSteem Representative/Distributor.
- Installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, must conform to:
  - **In the United States:** The National Fuel Gas Code, ANSI Z223.1 (latest edition).
  - **In Canada:** Local plumbing or waste water codes and other applicable codes and with the current code CAN/CGA-B149.1, "Installation Code for Natural Gas Burning Appliances and Equipment," or CAN/CGA-B149.2, "Installation Code for Propane Burning Appliances and Equipment."
  - **In Europe:** The National Gas Safety (Installation & Use) Regulations.
- Do not install in potentially explosive or flammable atmospheres laden with grain dust, sawdust, or similar airborne materials.
- Installation of humidifier in high humidity or salt water atmospheres causes accelerated corrosion, reducing the normal life-span of the unit.
- To prevent premature heat exchanger failure, do not locate any gas-fired unit in areas where chlorinated, halogenated, or acid vapors are present in the atmosphere.
- Locate the humidifier in an area clear of combustible materials, gasoline, and other flammable vapors and liquids.

Continued

Warnings and cautions

WARNING




Carbon monoxide, fire, explosion, and electrical shock hazards (continued)

- With the exception of sealed combustion units, do not locate units in tightly sealed rooms or small compartments without provision for adequate combustion air and venting. Room air combustion must be supplied through a minimum of two permanent openings in the wall, with at least one near the bottom. See "Combustion and ventilation air" for additional information.
- Do not install the humidifier indoor directly on carpeting, tile, or other combustible material other than wood flooring. Outdoor units may be installed directly on combustible flooring or, in the U.S., on wood flooring or Class A, Class B or Class C roof covering materials.
- Remove all shipping brackets and materials before operating the humidifier.
- Do not locate humidifier in a negative pressure space. Combustion products could be suctioned from the venting. See page 53.
- Humidifier flue gases must be vented to the outside atmosphere.
- Do not interfere, disable, or tamper with the devices monitoring the combustion gas discharge, including the flue temperature and flue pressure sensors. Only authorized and trained technicians should perform any service on these items.
- Do not interfere or tamper with any sealed components. Only authorized and trained technicians should perform any service on these items.
- This humidifier is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the humidifier.
- The GTS humidifier LX series must be vented and supplied with combustion and ventilation air as described in this IOM. Ensure the vent and air piping and the combustion air supply comply with these instructions regarding vent, system, air system, and combustion air quality. Inspect finished vent and air piping thoroughly to ensure all are airtight and comply with the instructions provided and with all requirements of applicable codes. Failure to provide a properly installed vent and air system will cause severe personal injury or death.
- This humidifier requires a special venting system. Use only approved stainless steel, PVC, CPVC, or polypropylene pipe and fittings listed in this IOM. Failure to comply could result in severe personal injury, death, or substantial property damage.
- Do not connect any other appliance to the vent pipe or multiple humidifiers to a common vent pipe. Failure to comply could result in sever personal injury, death, or substantial property damage.
- The flue gas vent shall not pass through any air duct or plenum. Do not insulate plastic flue gas vent pipe.
- Do NOT mix components from different systems. The vent system could fail, causing leakage of flue products. Mixing of venting materials will void the warranty.
- Power supply disconnect switch must be in the off position while making wiring connections to prevent electrical shock and equipment damage. All units must be wired in strict accordance with the wiring diagrams furnished with this unit.
- Turn off all gas while installing the gas piping and manual shutoff valve for the humidifier.
- The appliance and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures exceeding 0.5 psig (3.5 kPa).

Continued

Warnings and cautions

WARNING	
	**Hot surfaces and hot water** This steam humidification system has extremely hot surfaces. Water in tank, steam tubing, and dispersion assemblies can be as hot as 212 °F (100 °C). Discharged steam is not visible. Contact with hot surfaces, discharged hot water, or air into which steam has been discharged can cause severe personal injury. To avoid severe burns, follow the cool-down procedure in this manual before performing service or maintenance procedures on any part of the system.
	**Disconnect electrical power** Disconnect electrical power before installing supply wiring or performing service or maintenance procedures on any part of the humidification system. Failure to disconnect electrical power could result in fire, electrical shock, and other hazardous conditions. These hazardous conditions could cause property damage, personal injury, or death. Follow the shutdown procedure on Page 62 before performing service or maintenance procedures on any part of the system.

Continued

Warnings and cautions

CAUTION

Hot discharge water
Discharge water can be as hot as 212 °F (100 °C) and can damage some drain plumbing.

The humidifier is equipped with integrated water drain tempering that needs make-up water no greater than 90°F (32 °C) in order to function properly. Make sure the water supply to the humidifier remains open during draining.

Excessive supply water pressure
Supply water pressure greater than 80 psi (550 kPa) can cause the humidifier to overflow.

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Table of contents

ATTENTION INSTALLER

Original Instructions
Read this manual before installing. Leave manual with product owner.

DriSteem Technical Support
800-328-4447

Website:

Documents can be viewed, printed or ordered from our website, www.dristeem.com.

DriCalc sizing and selection software:

DriCalc® is our humidification system sizing and selection software, which can be accessed from dristeem.com.

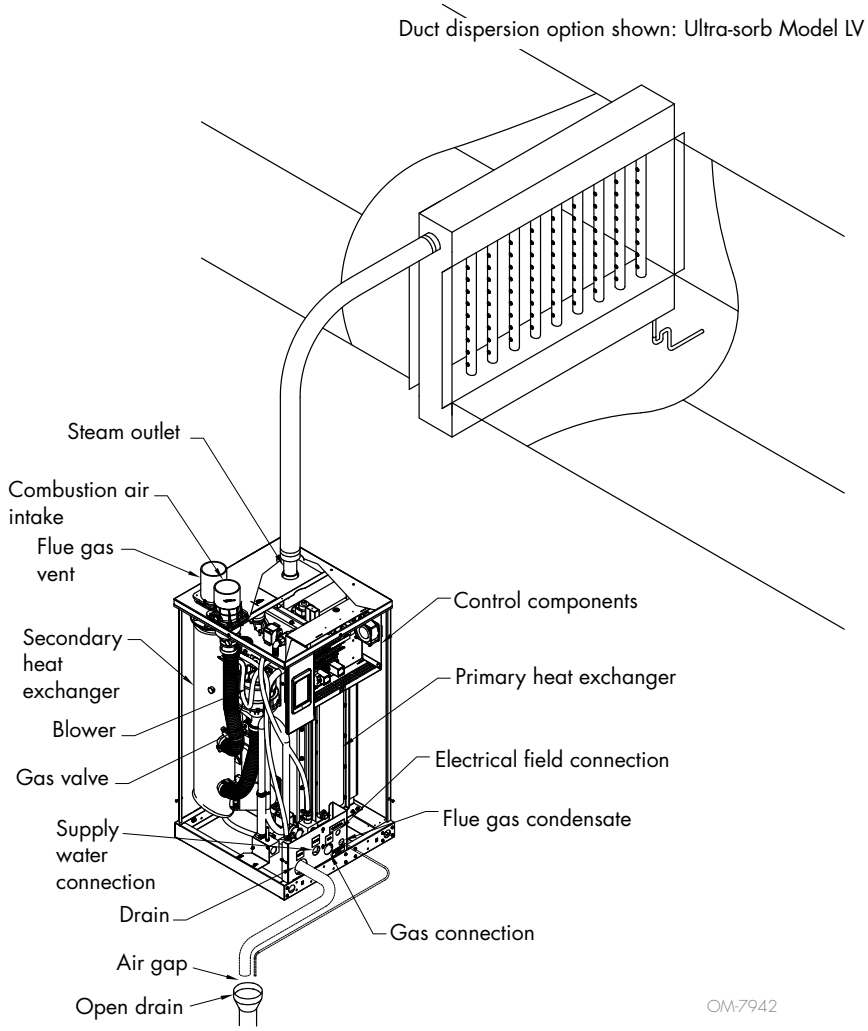
Product overview

The GTS humidifier LX series burns either natural or propane gas to heat and boil fill water into steam for humidification. The unit has either one or two burners that fire into a heat exchanger submerged in a tank of water. When there is a call for humidity, the burners fire and generate steam until the call for humidity ends.

UNIVERSAL WATER

DriSteem's GTS humidifier LX series incorporates universal water control for use with any water type (well, tap, softened, DI or RO water). There is no need to change control configurations based on water type when ordering equipment or retrofitting to fit new water sources in the field. The water level control algorithm monitors water quality and any changes over time to assure the user of accurate control no matter the type of water that is used.

FIGURE 8-1: GTS HUMIDIFIER LX SERIES



Supply water guidelines

Supply water quality is an important component of humidifier reliability and maintenance.

Examples:

- Corrosive water can decrease the service life of the humidifier.
- Excessive water hardness can increase the humidifier maintenance requirements.

To maximize humidifier service life and minimize humidifier maintenance, DriSteem has established guidelines for supply water. See Table 8-1.

Table 8-1:
DriSteem supply water guidelines

Chlorides*	
Tap water	< 50 ppm
RO/DI water	< 5 ppm
Softened water	< 25 ppm
* Damage caused by chloride corrosion is not covered by your DriSteem warranty.	
Total hardness	
Tap water	< 500 ppm (29 gpg)
pH	
Tap water	6.5 to 8.5
RO/DI, softened water	7.0 to 8.0
Silica	< 15 ppm
Supply water outside of the guidelines may void your DriSteem warranty. Please contact your DriSteem Representative or DriSteem Technical Support if you need advice.	

WATER LEVEL CONTROL

The LX series of GTS humidifiers control water level using a three-rod probe (see Figure 9-1). All water types and conductivities work with the universal water system. The user does not need to select a new water type or change hardware to change water types. Additional valves and Vapor-logic algorithms measure and control the water level for optimum efficiency and low water safety conditions. Vapor-logic automatically provides a steady output while maintaining the water level between the bottom and middle probes.

FIGURE 9-1: WATER LEVEL CONTROL

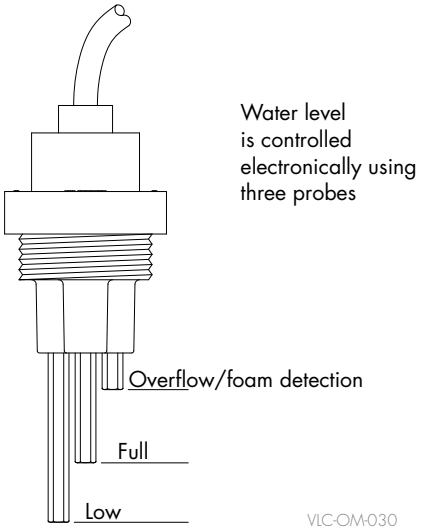
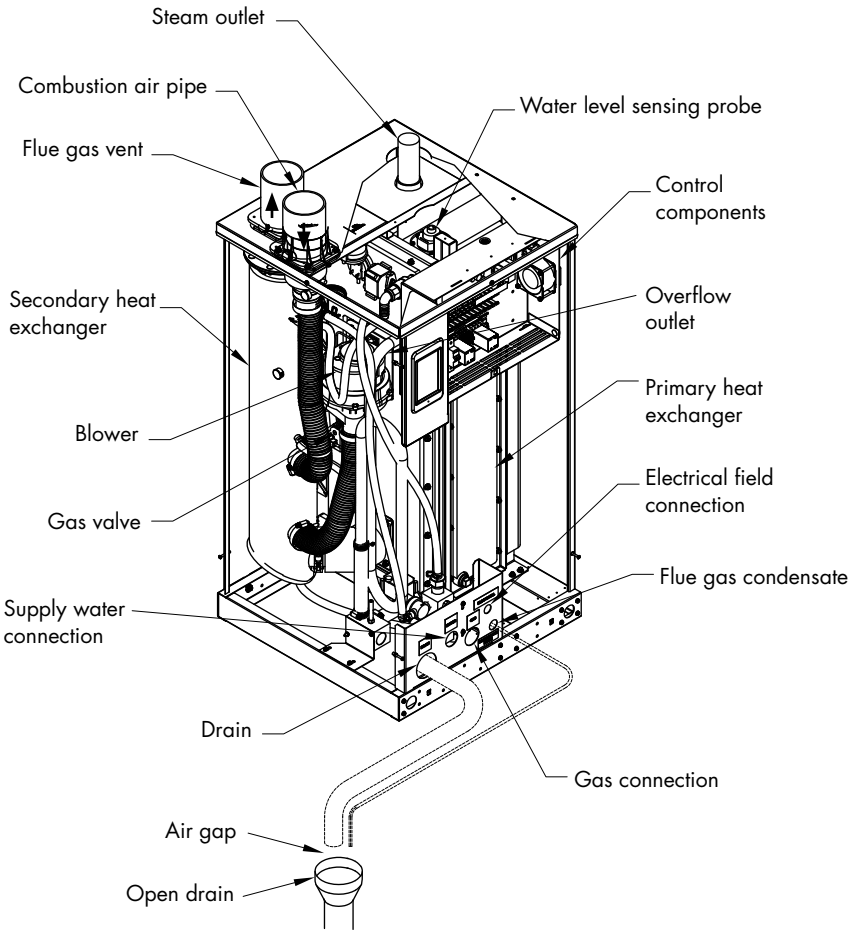
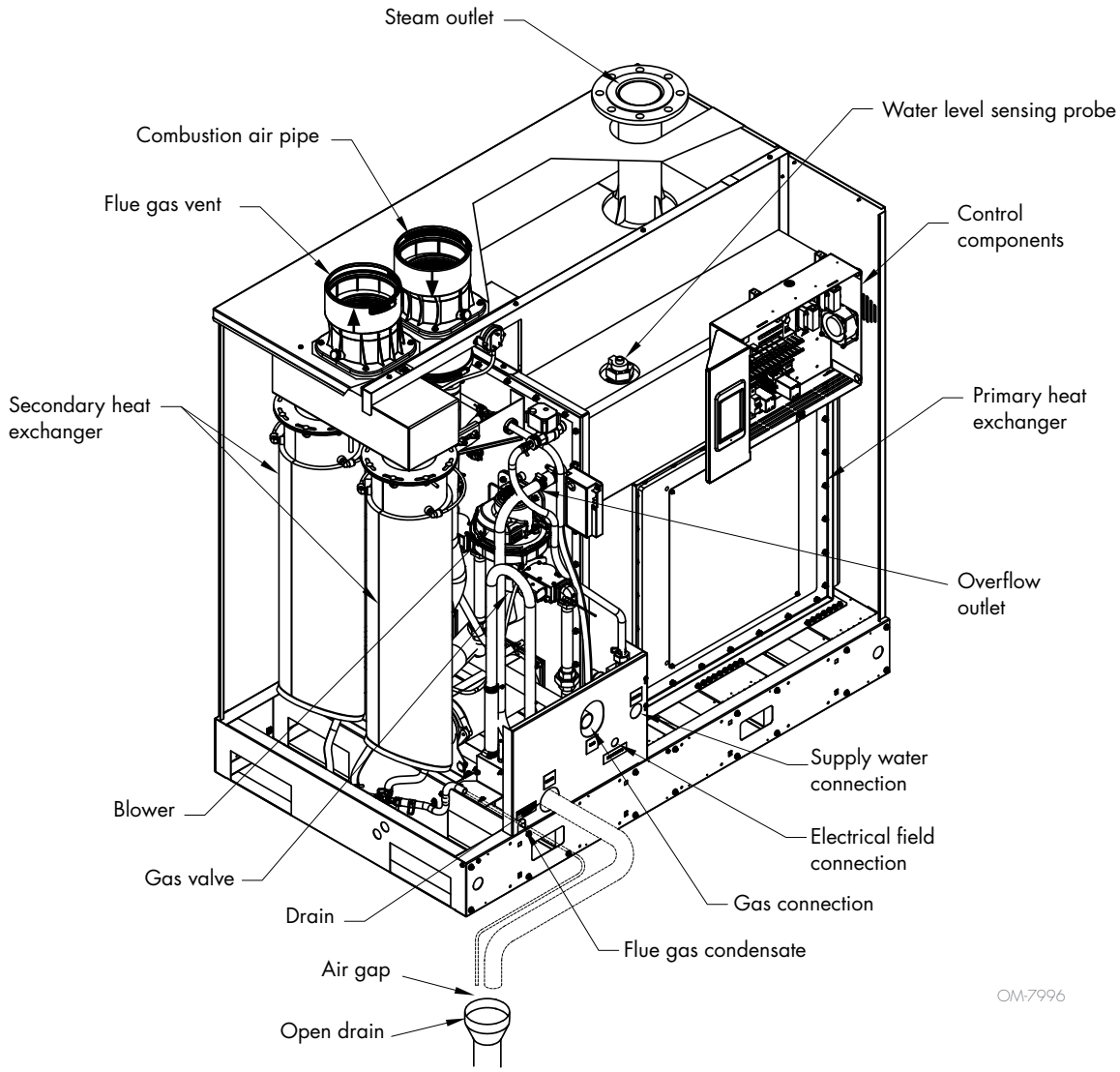


FIGURE 9-2: GTS HUMIDIFIER LX SERIES (MODELS LX-50 THROUGH LX-150)



Note: Dashed lines indicate supplied by installer

FIGURE 10-1: GTS HUMIDIFIER LX SERIES (MODELS LX-400 THROUGH LX-600)



Note: Dashed lines indicate supplied by installer

Principle of operation

Upon a call for humidity, the blower(s) will power up, the ignition module will turn the gas valve(s) on and the enhanced spark ignition system ignites the burner(s). The burner(s) fire into the primary heat exchanger in the tank causing the water to heat and eventually boil. When the water is heating, the blower(s) are fully on to reduce heat up time. Once the unit starts humidifying, the blower(s) and gas valve(s) modulate in accordance with the humidification demand. There are many features built in to the GTS LX to keep it operating efficiently and safely.

OPERATIONAL FEATURES

- **Fill Valves:** As the humidifier boils water away, the precision fill valve(s) on the secondary heat exchanger will pulse on and off to maintain the water level in the tank. This water is pre-heated in the secondary heat exchanger before entering the tank. The precision fill algorithm in Vapor-logic controller keeps the tank from losing its boil on a re-fill, allowing for consistent steam output. The fast fill valve on the tank is used for quickly filling the tank after a drain and for drain water tempering.
- **Probe Check:** The probe check ensures that the conductivity probes are accurately sensing water level for all water types. The humidifier will fill with water to just above the middle probe, and then it will skim off the surface of the water to remove any surfactants that might be floating on the surface of the water. The drain will turn on and stay open until the water level has fallen below all three probes. Then the water will return to its normal operating level. The frequency of probe checks is based on water type. The humidifier will do this every time after a drain.
- **Condensing Operation:** The primary heat exchanger and secondary heat exchanger are designed to cool the flue temperatures to below 140 degrees. The secondary heat exchanger is actually two heat exchangers. One is pre-heating the combustion air and the other one is pre-heating the inlet water. Flue gas is the source of heat for both heat exchangers.
- **Smart Drain:** The humidifier drain rate is adjusted automatically based on the quality of water detected by the conductivity probes. A GTS LX Series humidifier using RO/DI water will drain and skim less frequently than a unit using potable water.
- **Drain Water Tempering:** This unit is equipped with drain water tempering. When the drain valve opens, the temperature sensor in the drain manifold senses that the water is too hot and opens the fill valves to cool the water down. The sensor controls the flow rate of the fill and drain valves to keep the temperature just under 140 degrees. See Page 35.

Principle of operation

SAFETY FEATURES

- **Enhanced Spark Ignition:** Direct spark ignition is enhanced by targeting the spark in a fuel enriched zone for reliable ignition events.
- **Flue Temperature Sensor and Switch:** The flue temperature sensor and switch is located at the top of the secondary heat exchanger. It reads the temperature of the flue gasses exiting the unit and sends that information to the Vapor-logic controller. If the temperature does reaches unsafe operating temperatures for PVC venting, the humidifier will modulate down to try to reduce the flue temperature. Once the temperature has dropped to a safe operating temperature, the unit will continue normal operation.
- **Flue Pressure Switch:** The flue pressure switch is mounted on the humidifier. If the flue becomes blocked or the blower fails to run, the blocked flue switch will shut down the humidifier until the problem has been resolved.
- **Blower Speed:** When there is a call for humidity, all of the combustion blowers must start. Each combustion blower sends a signal to the microprocessor relaying its current speed. If this speed is outside of an acceptable range, the GTS will not operate.
- **Tank Temperature Sensor and Switch:** The tank temperature sensor and switch is mounted in the tank above the burner tube. When the tank temperature exceeds safe operating temperatures, Vapor-logic will shut the unit down. As a redundant safety, the switch is also tied directly to the power source of the gas valves.
- **Drain Temperature Sensor:** The drain temperature sensor is in the drain manifold. When tempering is enabled, the sensor ensures that the drain water is below 140 degrees Fahrenheit. This protects drain pipes that are not rated for higher temperatures.
- **Foam Detection:** The top probe of the three-probe system detects foam that may form in the tank. In the case of a foam event, the tank will drain and then continue operation.
- **End-of-Season Drain:** The humidifier will automatically drain after 72-hours of non-use. This is a user-adjustable setting. See the Vapor-logic controller operation manual for instructions on how to adjust this feature.
- **Freeze Protection:** If, for any reason, the tank temperature falls below 40 degrees, the humidifier will drain.

Models, capacities, electrical specifications, and weights

Table 13-1:
GTS models, capacities, electrical specifications, turndown, and weights

GTS model	Maximum steam capacity		Input			Water usage at maximum capacity		Tank volume		GTS humidifier LX series*				Burner quantity	Turndown		Full load amps*	
										Operating weight		Shipping (empty) weight**						
	lbs/hr	kg/h	MBh	kW	m^3/h	gals/ hr	litres/ hr	gals	litres	lbs	kg	lbs	kg		ratio	lbs/hr	120V 60 Hz	230V 50 Hz
LX-50	50	23	61	17.8	1.7	6	23	14	53	304	138	187	85	1	5:1	10	2.0	1.5
LX-75	75	34	91.5	26.8	2.5	9	34	14	53	304	138	187	85	1	6:1	12.5	2.0	1.5
LX-100	100	45	122	35.8	3.4	12	45	13	49	300	136	192	87	1	8:1	12.5	2.0	1.5
LX-150	150	68	183	53.6	5.1	18	68	25	95	450	204	242	110	1	6:1	25	2.5	2.0
LX-200	200	91	244	71.5	6.8	24	91	42	159	706	320	356	161	1	6.7:1	30	4.0	2.5
LX-250	250	113	305	89.4	8.5	30	114	42	159	706	320	356	161	1	8.3:1	30	4.0	2.5
LX-300	300	136	360	105.5	10	36	136	41	155	709	321	367	166	1	10:1	30	4.0	2.5
LX-400	400	181	488	143	13.5	48	182	80	303	1259	571	593	269	2	13.3:1	30	6.5	3.5
LX-500	500	227	610	178.8	16.9	60	227	80	303	1259	571	593	269	2	16.7:1	30	6.5	3.5
LX-600	600	272	720	211	20	72	273	78	295	1265	574	615	279	2	20:1	30	6.5	3.5

* For outdoor enclosures, see Table 28-1.
** Add approximately 60-90 lbs (27-41 kg) for packaging material.

LP GAS

All models operate at rated input

HIGH ALTITUDE

The input shown in Table 13-2 is derate when operating units at a high altitude. See the "Start-up procedure" on page 59 for adjusting oxygen levels on the LX series gas valve.

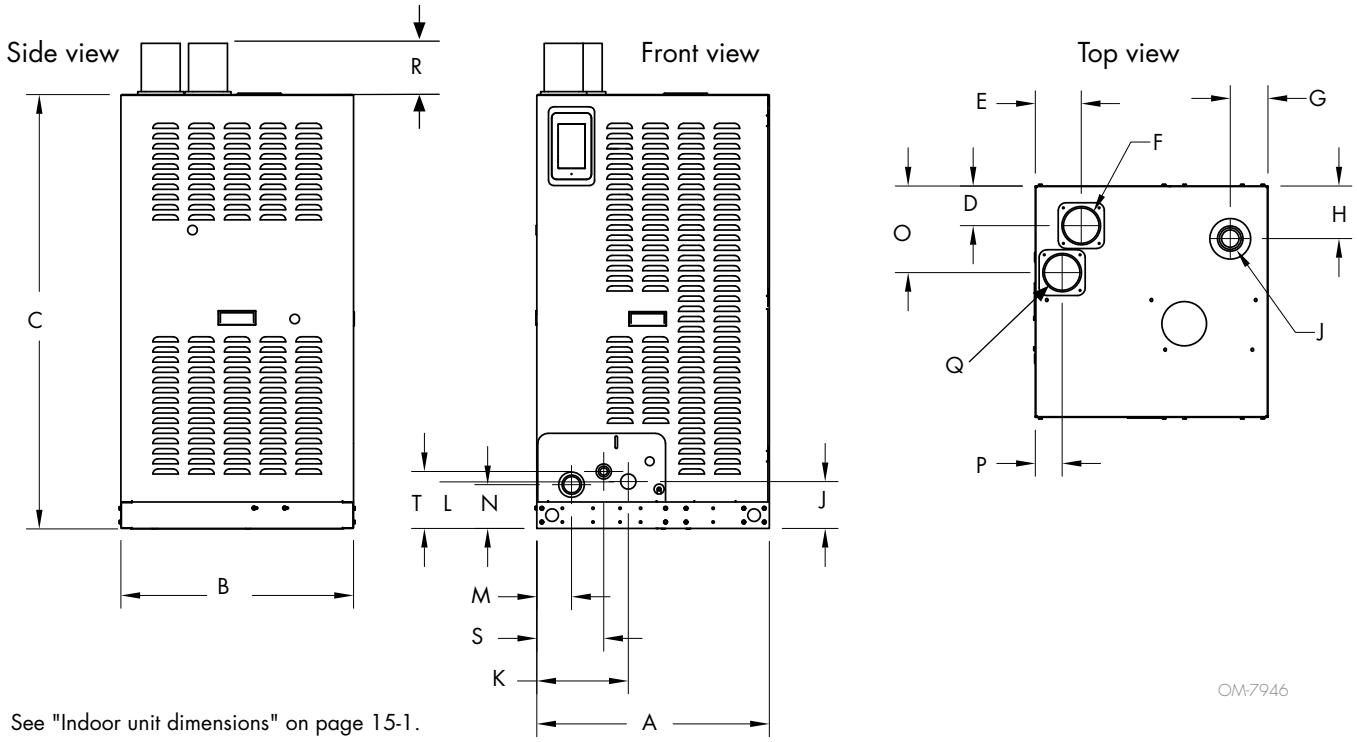
Important: See Pages 80 and 81 for additional European model specifications and capacity notes.

Table 13-2:
High altitude derate

Altitude		Input derate %
feet	meters	
0–2000	0–610	0
2001–2500	610–765	2
2501–3000	765–915	4
3001–3500	915–1065	6
3501–4000	1065–1220	8
4001–4500	1220–1370	10
4501–5000	1370–1525	12
5001–5500	1525–1675	14
5501–6000	1675–1830	16
6001–6500	1830–1980	18
6501–7000	1980–2135	20
7001–7500	2135–2285	22
7501–8000	2285–2440	24

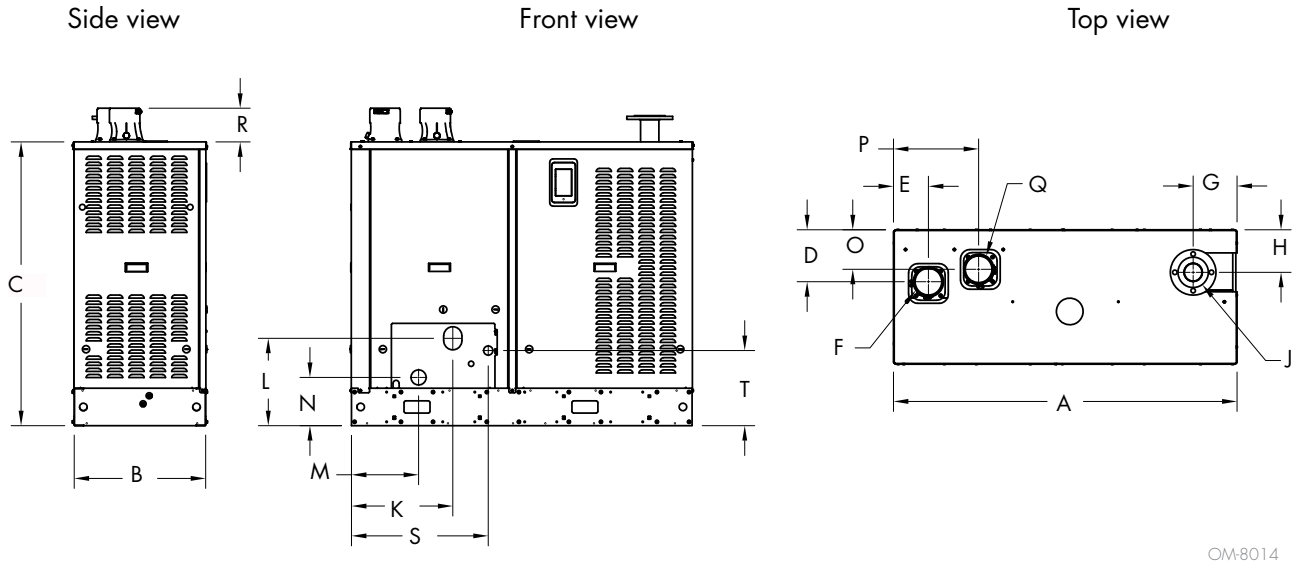
Indoor dimensions

FIGURE 14-1: LX MODELS 50 - 150 INDOOR UNIT DIMENSIONS



See "Indoor unit dimensions" on page 15-1.

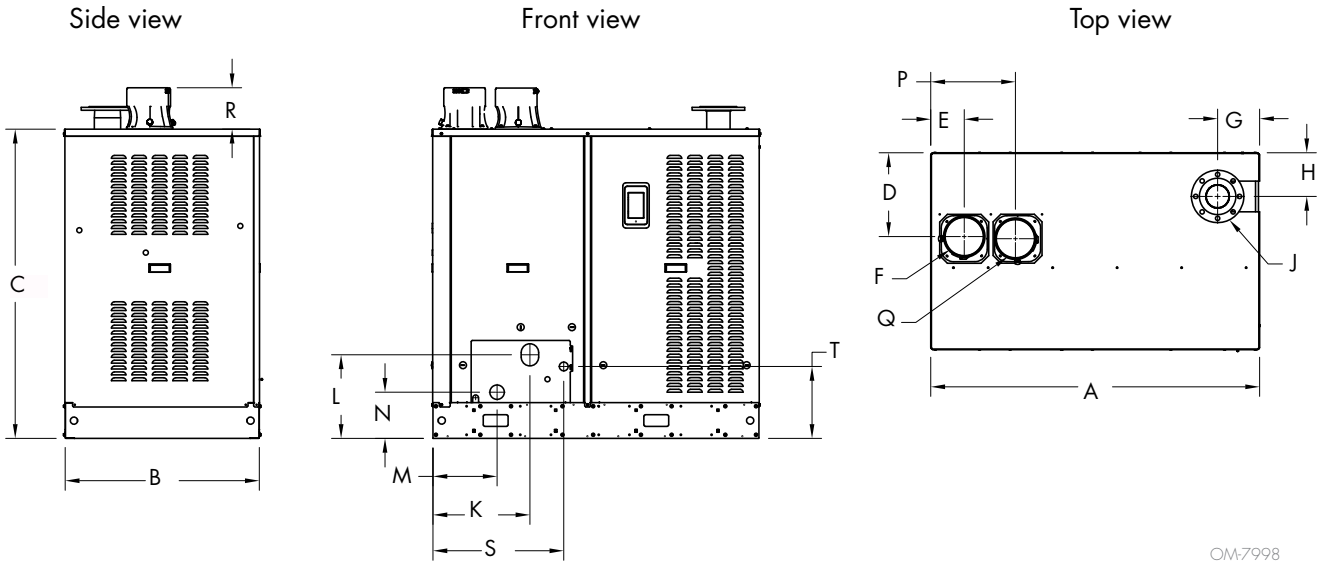
FIGURE 14-2: LX MODELS 200 - 300 INDOOR UNIT DIMENSIONS



See "Indoor unit dimensions" on page 15-1.

Indoor dimensions

FIGURE 15-1: LX MODELS 400 - 600 INDOOR UNIT DIMENSIONS



For outdoor dimensions see page 23.

Table 15-1:
Indoor unit dimensions

	Description	LX-50, LX-75, LX-100		LX-150		LX-200, LX-250, LX-300		LX-400, LX-500, LX-600	
		inches	mm	inches	mm	inches	mm	inches	mm
A	Overall length	23.25	590	32.25	819	56	1422	56	1422
B	Overall width	23.25	590	23.25	590	22	559	34	864
C	Overall height	42.75	1085	42.75	1085	47	1194	53	1346
D	Flue position	4.3	109	4.3	109	8.7	221	14.5	368
E		4.4	112	4.4	112	5.61	143	5.6	142
F	Flue diameter	3	76	3	76	4	102	6	152
G	Steam outlet position	3.8	97	3.8	97	7.1	180	7	178
H		5.3	135	5.3	135	6.9	175	7.4	188
J	Steam outlet diameter	2	51	2	51	3	76	4	102
K	Gas inlet position	9.2	234	9.2	234	16.6	4022	16.6	422
L		4.6	119	4.6	119	14.3	363	14.3	363
M	Drain position	3.5	89	3.5	89	11	279	11	279
N		4.5	114	4.5	114	8	203	8	203
O	Combustion air	8.92	227	8.92	227	6.5	165	14.5	368
P		2.7	69	2.7	69	14	363	14.5	368
Q	Combustion air diameter	3	76	3	76	4	102	6	152
R	Flue and combustion air height	5.5	140	5.5	140	5.6	142	7.1	180
S	Fill valve connection position	6.59	167	6.59	167	22.4	569	22.4	569
T		5.60	142	5.60	142	12.4	315	12.4	315

Location and clearance recommendations

FINDING A LOCATION

- Provide a level, solid foundation for the humidifier.
- The GTS humidifier LX series vent and air piping can be installed through the roof or through a sidewall. Use only vent/air piping methods described in this IOM. Locate the humidifier as near as possible to an outside wall or accessible roof space so that the flue pipe from the humidifier is short, direct, and limited to wind exposure.
- Locate the unit so it and its electrical components are protected from water during humidifier operation and service.
- Install the humidifier in a location away (and protected) from drafts. Follow the instructions concerning combustion and ventilation air.
- Locate the humidifier in an area where leakage from the tank or its connections will not result in damage to the adjacent structure or to lower floors of the structure. When such locations cannot be avoided, install a suitable drain pan (adequately drained) under the humidifier (field supplied). The pan must not restrict combustion airflow.
- If located in an insulated space, keep the humidifier free and clear of insulating materials. Insulating material can be combustible. Inspect the humidifier area when the humidifier is installed or when insulation is added.
- See the combustion air and flue gas venting section on page 53 for pipe termination locations and instructions.

⚠ WARNING

Installation requirements
The humidifier must be installed by a qualified technician and meet the requirements of all governing codes. Failure to follow these instructions could cause severe bodily injury or death.

Location and clearance recommendations

FIGURE 17-1: LX SERIES CLEARANCE RECOMMENDATIONS (INDOOR UNITS)

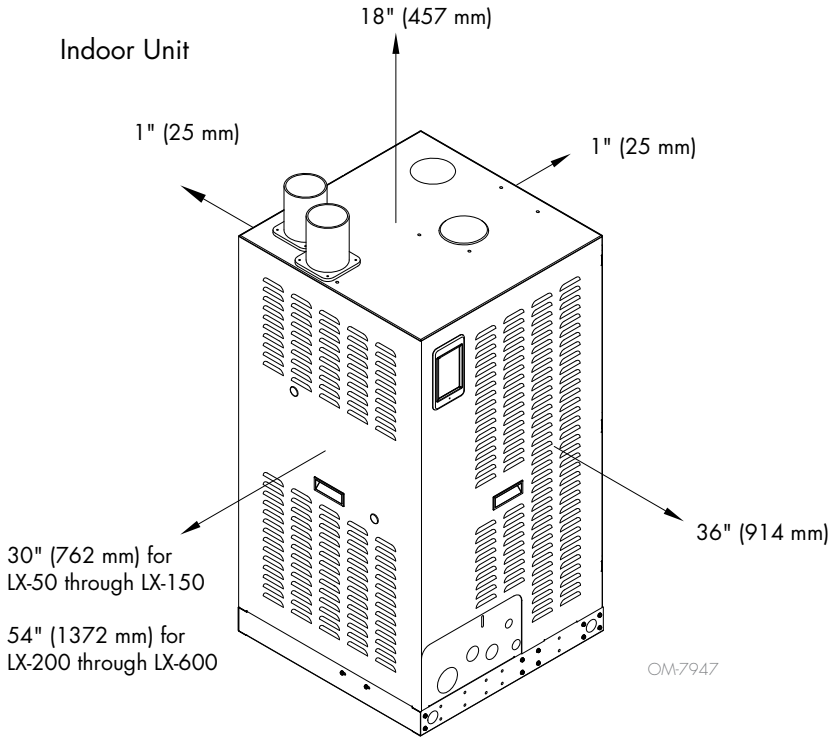
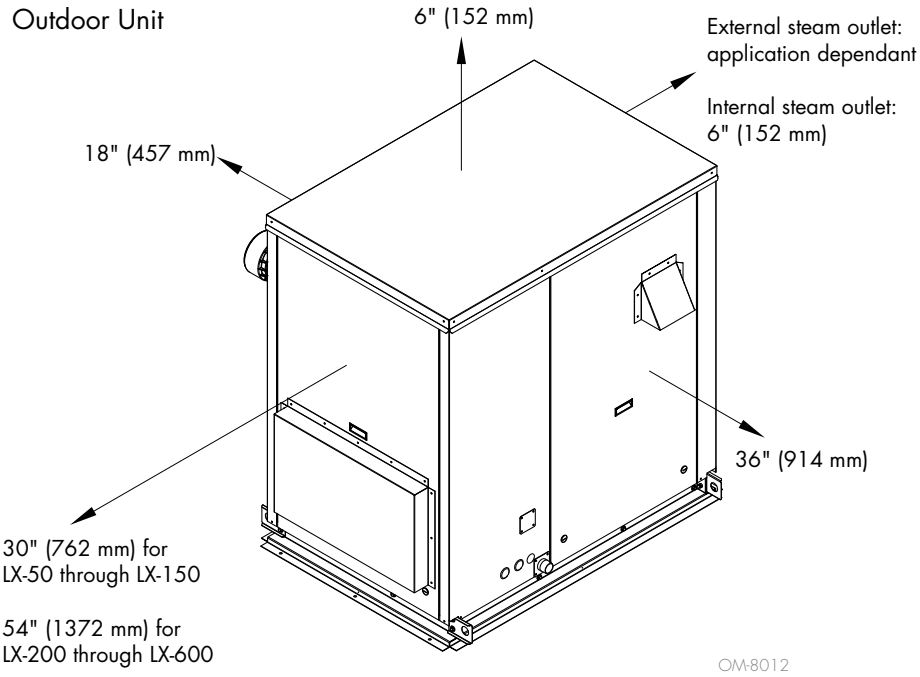
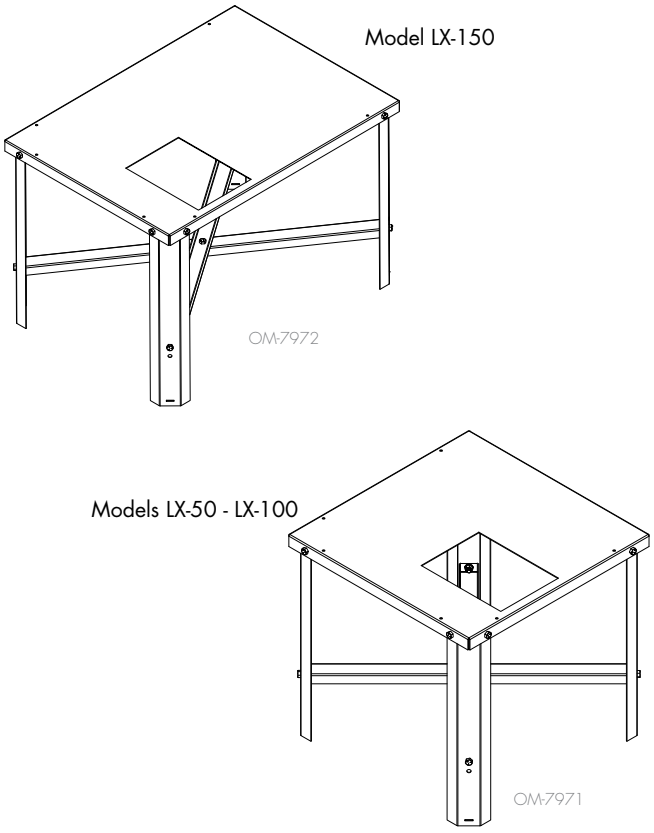


FIGURE 17-2: LX SERIES CLEARANCE RECOMMENDATIONS (OUTDOOR UNITS)



Optional floor stand mount (Models 50, 75,100, and 150 only)

FIGURE 18-1: LX SERIES FLOOR STAND MOUNT ASSEMBLY



FLOOR STAND MOUNTING INSTRUCTIONS

1. Refer to Figure 19-1 for assembly of the floor stand.
2. Use the hardware provided by DriSteem to assemble.
3. Arrange appropriate lifting mechanism and personnel to mount the GTS humidifier LX series on the floor stand. See Warning below.
4. Use the lifting hole on the base of humidifier to carefully lift it off the ground. See Warning below.
5. Slowly lower the humidifier on the floor stand.
6. Secure the base of the humidifier to the floor stand using sheet metal screws.

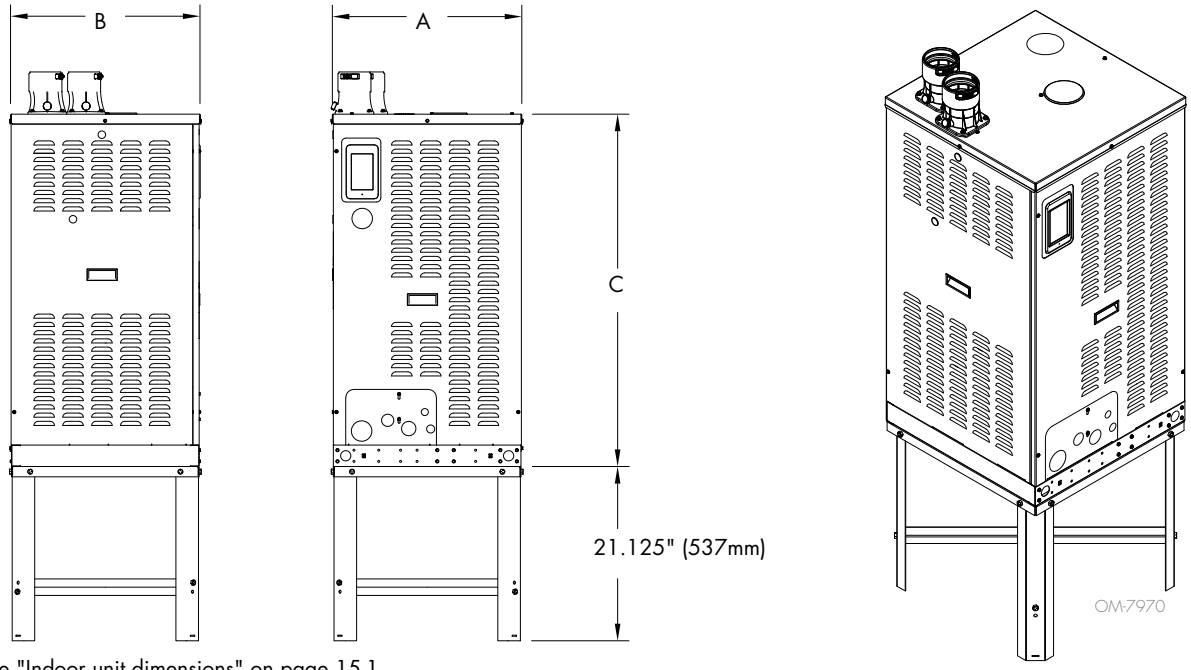
⚠ WARNING

HEAVY OBJECT
To avoid muscle strain or back injury, use lifting aids and proper lifting techniques when removing or replacing.

Notes:
- Weight of floor stand:
  Models LX-50 - LX-100: 24 lbs (11 kg),
  Model LX-150: 30 lbs (14 kg)
- Allows for condensate piping/pump
- Bottom supply water connection is located underneath the side water connection. See fill valve connection position on page 15.

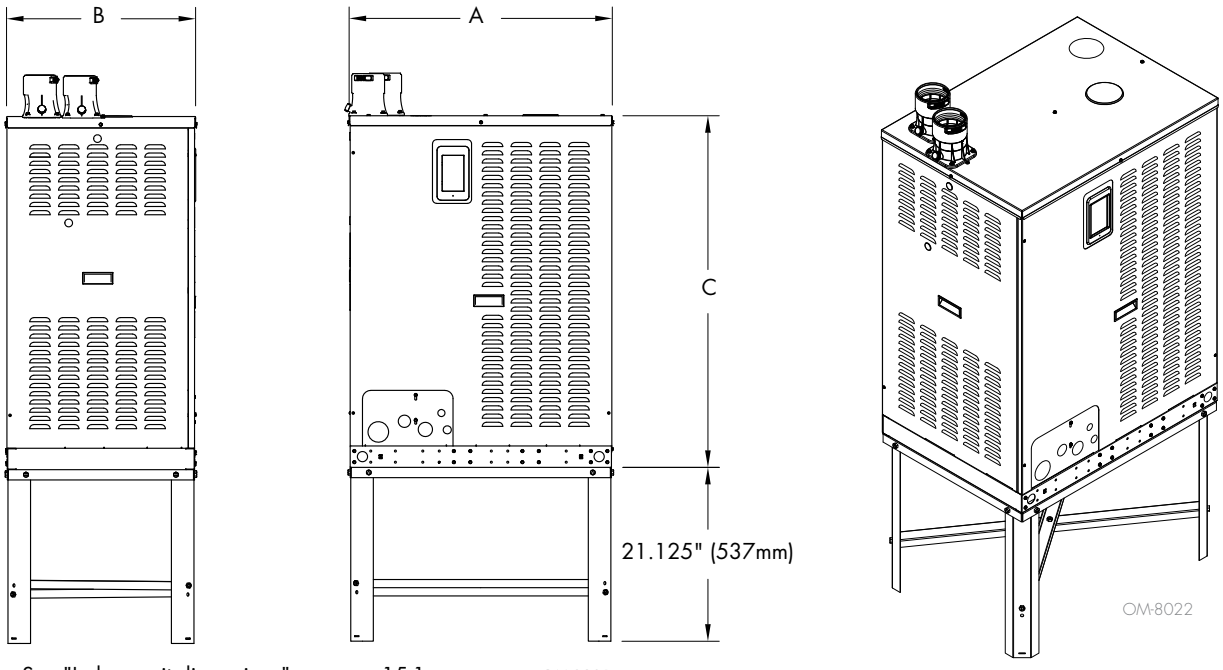
Optional floor stand mount (Models 50, 75,100, and 150 only)

FIGURE 19-1: LX SERIES WITH FLOOR STAND MOUNT (MODELS 50, 75, AND 100)



See "Indoor unit dimensions" on page 15-1.

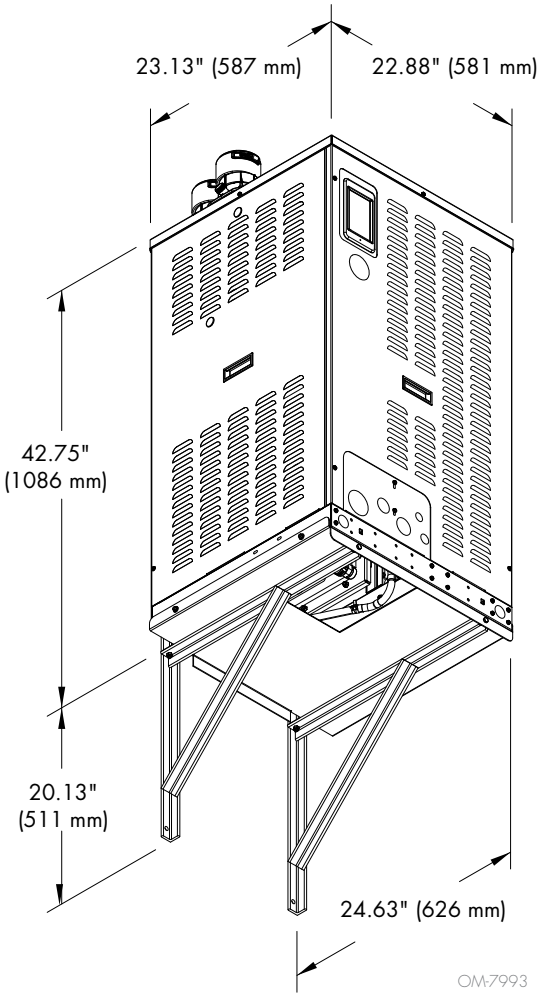
FIGURE 19-2: LX SERIES WITH FLOOR STAND MOUNT (MODEL 150)



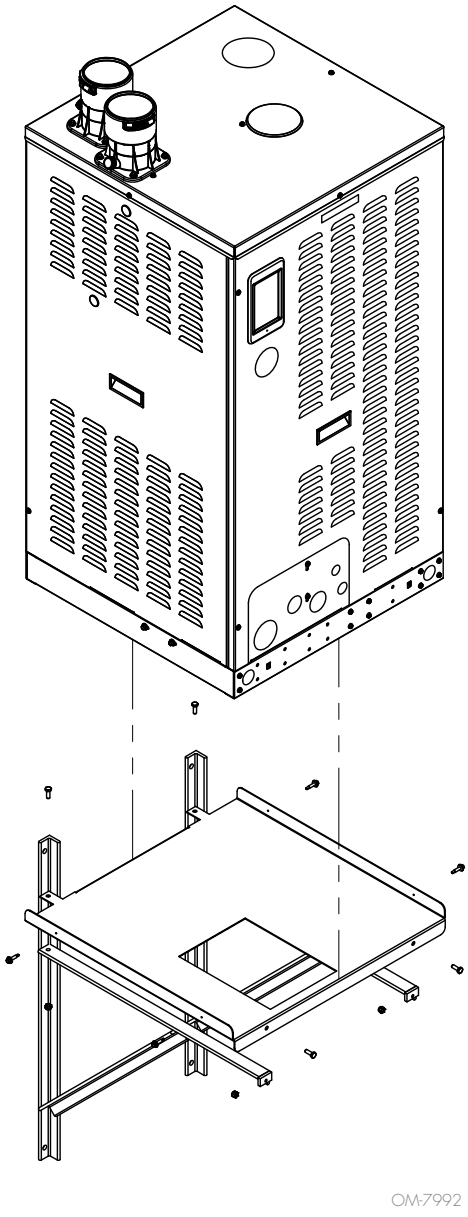
See "Indoor unit dimensions" on page 15-1.

Optional wall mount (Models 50, 75 and 100 only)

FIGURE 20-1: LX SERIES WITH WALL MOUNT



See "Indoor unit dimensions" on page 15-1.

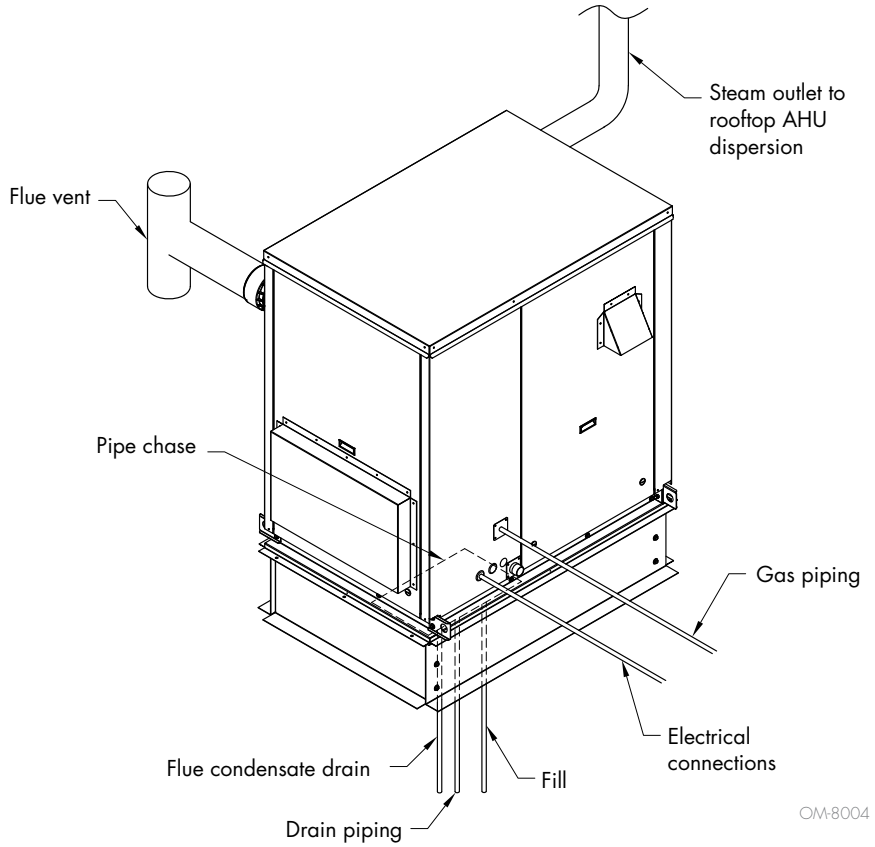


Outdoor enclosure Overview

GENERAL DESCRIPTION

- The outdoor GTS is CSA/ETL approved for installation outdoors. It uses an optional heater and fans to properly operate in operating temperatures of -40 °F to 122 °F (-40 °C to 50 °C). The unit is intended to be mounted on a concrete pad or rooftop curb. Properly sized curbs are available from DriSteem.
- The knockouts located on the front of the unit are used to run electrical power and gas to the unit. There is a pipe chase located inside the enclosure that is used for both the supply water and drain piping. Supply water and drain piping will need to come through the knockouts at the front of the unit if the chase cannot be used. Combustion air is drawn from within the enclosure, and flue gas is vented out the back of the enclosure.
- An emergency drain is provided on the front of the unit. In case of a water leak, water drains onto the roof through this emergency drain. The drain is intended to have a field installed water seal.
- If constant monitoring of the unit is desired, or if the unit is located in a severe climate, install a remote mount display. Additional cable lengths up to 500' (152 m) are available as an option.
- In cold climates, Freeze Protection Piping (see page 27), is an important component to the proper operation of the outdoor humidifier.

FIGURE 21-1: OUTDOOR ENCLOSURE TYPICAL INSTALLATION OVERVIEW



Outdoor enclosure: Operation

If the ambient temperature in the enclosure is below 50 °F (10 °C), the heater is powered up. The heater remains powered up until the enclosure reaches 60 °F (15.5 °C). When there is no call for humidity, an aquastat maintains tank temperature at the factory default of 50 °F (10 °C). This temperature can be reset in the field to be from 50-180 °F (10-82 °C). If for any reason the tank temperature falls below 40 °F (4 °C), the tank will drain to keep the unit from freezing.

When the temperature of the enclosure reaches 85 °F (29 °C), the ventilation fans turn on to cool the electronic components. If the enclosure temperature reaches 150 °F (66 °C), the Vapor-logic controller will extinguish any operating burners and allow the ventilation fans to cool the enclosure. When the enclosure temperature falls below 150 °F (66 °C), the GTS humidifier automatically resumes normal operation.

In the event of a power loss, the drain valve will open and drain the tank to prevent the water from freezing. The water will not be cooled by the integral drain water tempering. In the case of an unexpected power outage, if tempering is required, a Drane-kooler needs to be installed inside the building (see Figure 27-1). Prior to maintenance personnel cutting power to the humidifier, the tank should either be drained using the Vapor-logic controller, or the normally open drain valve should be disabled (see instructions on right).

Manually disabling the drain valve

When the normally open valve is in the closed (powered) position, lift up on the knob located on the drain valve. Be sure to push the knob back down when power has been restored to the humidifier.

FIGURE 22-1: OUTDOOR ENCLOSURE MOUNTED ON A CURB

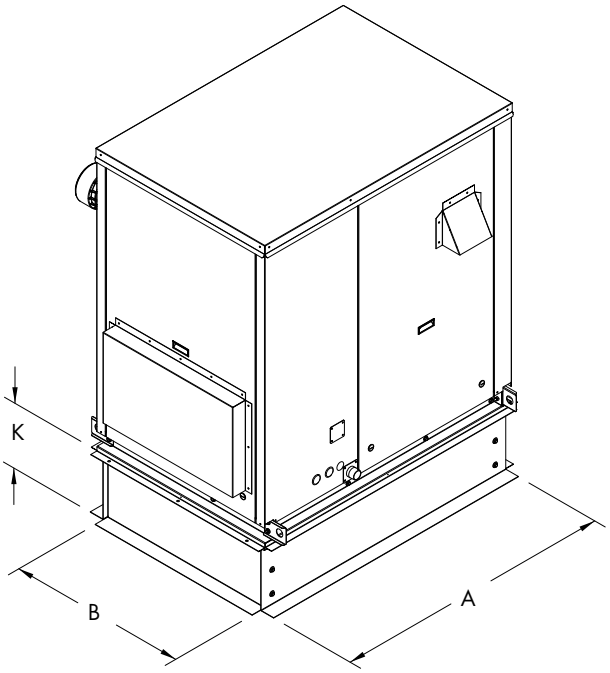


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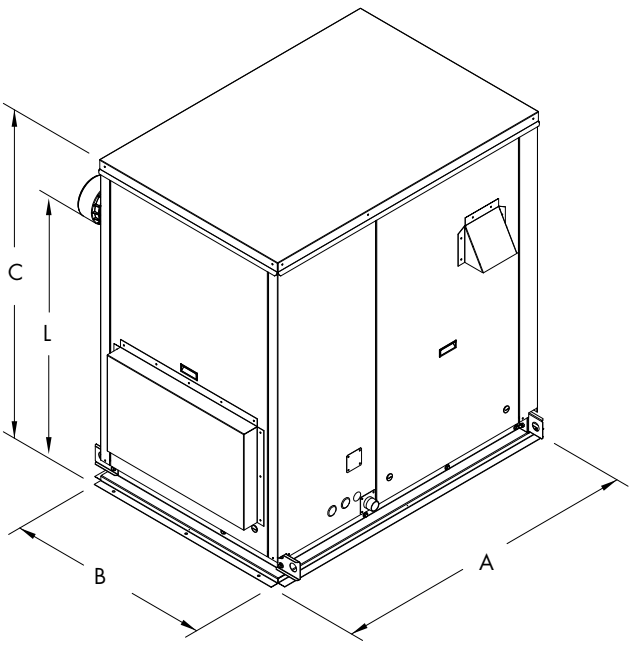
FIGURE 22-2: OUTDOOR ENCLOSURE MOUNTED FLUSH



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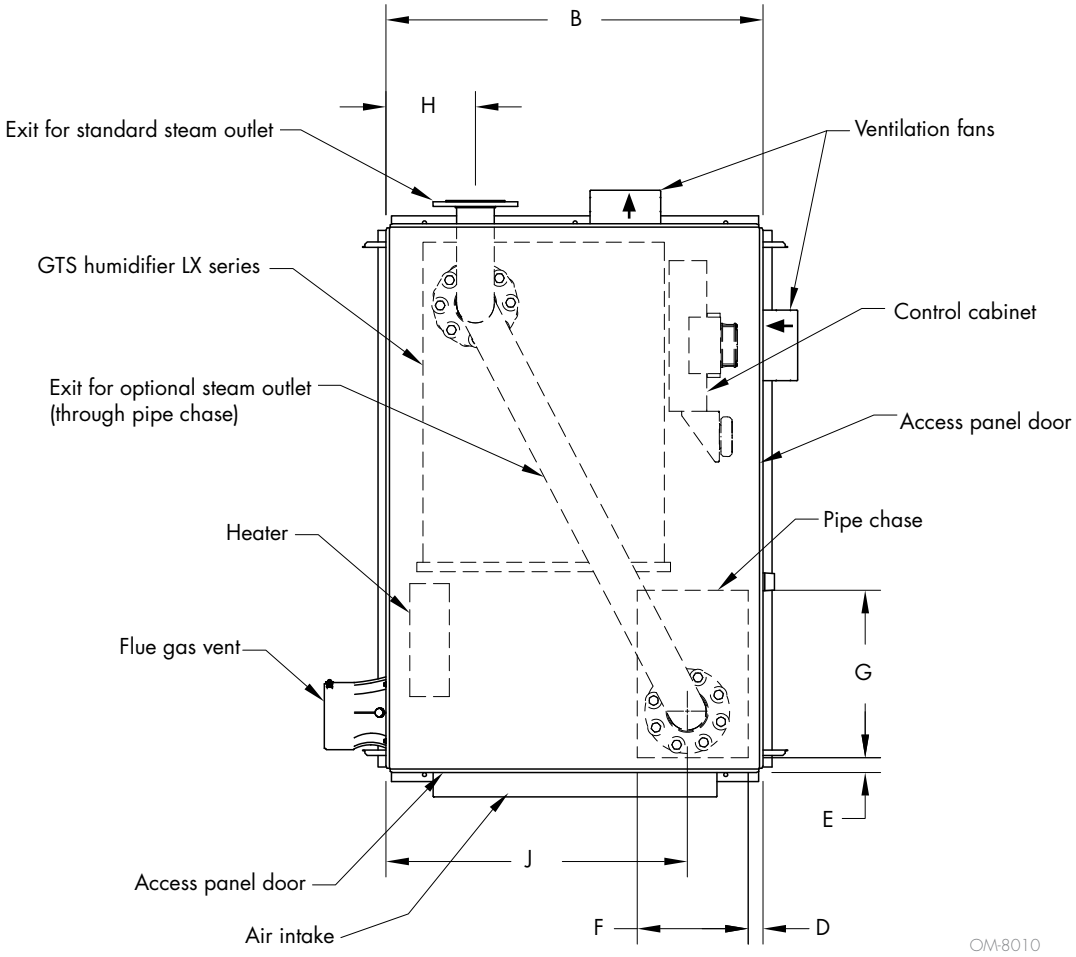
Outdoor enclosure: Dimensions

FIGURE 23-1: OUTDOOR ENCLOSURE TOP VIEW



DIMENSIONS

- For outdoor unit weights, see Table 28-1.
- For clearances, see Figure 17-1.

Table 23-1:
Outdoor unit dimensions

	Description	LX-50, LX-75, LX-100		LX-150		LX-200, LX-250, LX-300		LX-400, LX-500, LX-600	
		inches	mm	inches	mm	inches	mm	inches	mm
A	Enclosure length	36	914.4	45	1143	57.35	1456.59	57.35	1456.59
B	Enclosure width	27.35	694.7	27.35	694.7	27.35	694.69	39.10	993.04
C	Enclosure height	57	1447.8	57	1447.8	62	1574.8	62	1574.8
D	Pipe chase position	2.05	52.02	2.05	52.02	2.05	52.0	2.05	52.02
E		6.51	165.28	6.51	165.3	3.05	77.4	2.05	52.04
F	Pipe chase size	7	177.8	7	177.8	7	177.8	10	254
G		11	279.4	11	279.4	14	355.6	16	406.4
H	Steam pipe position	6.46	164.1	6.46	164.1	9.17	233	8.965	227.61
J		22.77	578.3	20.83	529.1	22.16	562.84	31.48	799.36
K	Curb height	14.0 - 36.0	356 - 914	14.0 - 36.0	356 - 914	14.0 - 36.0	356 - 914	14.0 - 36.0	356 - 914
L	Height to bottom of flue outlet	48.35	1228.1	48.35	1228.1	49.49	1257	46.65	1184.9

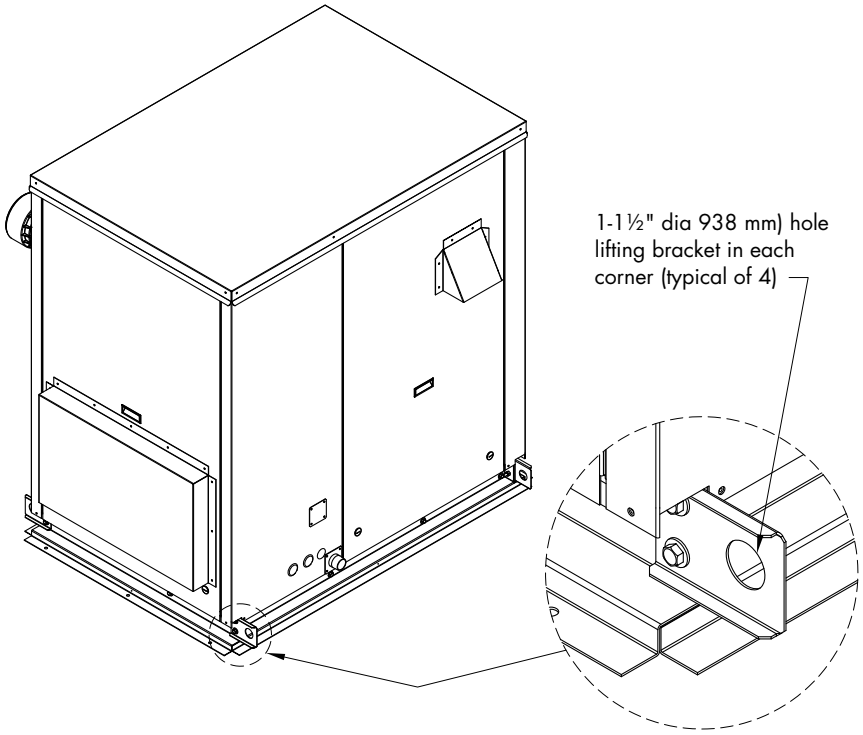
Outdoor enclosure: Location

- The following information is not intended to supersede any requirements of federal, state, or governing codes having jurisdiction; prior to locating the unit, authorities having jurisdiction should be consulted.
- The GTS must be level and located so there is enough clearance for opening the access panels (see recommended clearances on Page 17).
- Do not locate unit in areas where the surrounding air has high levels of particulates, such as some industrial parks or areas near highways. In situations such as these, you will need to filter the air inlets.
- The unit should be located so prevailing winds do not blow into the air intakes.
- When located on the roof, the air intakes must be a minimum of 14" (360mm) off the roof to prevent intake of snow or splashed rain.
- Locate unit so air intakes are not too close to other exhaust fan outlets, gasoline storage, or other contaminants that could potentially cause dangerous situations. Using and storing gasoline or other flammable vapors and liquids in open containers near this appliance is hazardous.

Outdoor enclosure: Mounting

- Verify that the position of the pad or curb properly supports the unit and that support structure dimensions coincide with unit dimensions.
- DriSteem rooftop curbs are shipped knocked down for ease of transporting to the roof. The curb is manufactured out of 14-gauge galvanized steel and is shipped with all hardware for bolt-together assembly, a curb gasket for sealing between the curb and the unit, and an installation drawing. All holes are matched before leaving the factory.
- Roof curbs supplied by others must be at least 14" high, and there must be a gasket between the top of the curb and the base surface of the unit to prevent moisture from leaking into the building from either driving rain or melting snow.
- Prior to installation, remove all of the unit packaging.
- The GTS outdoor enclosure must be lifted by the lift plates (See Figure 25-1) on the base of the unit. It must be lifted in a fashion that holds it level and keeps it from tipping, falling, or twisting.
    - If the unit is severely twisted during handling, permanent damage can occur.
    - It is the installer's responsibility to verify the handling equipment's capability to safely handle the unit.
    - All lifting operations must be accomplished with a load spreader of sufficient width to ensure that the lifting cables clear the side of the unit.

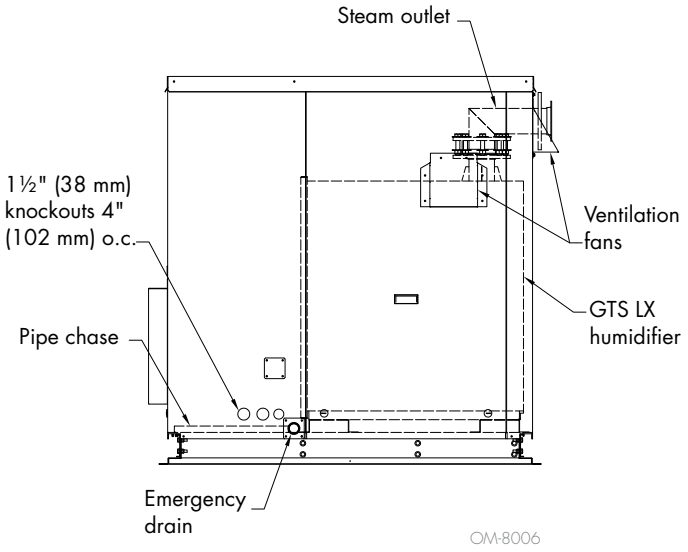
FIGURE 25-1: OUTDOOR ENCLOSURE MOUNTING WITH LIFT BRACKET



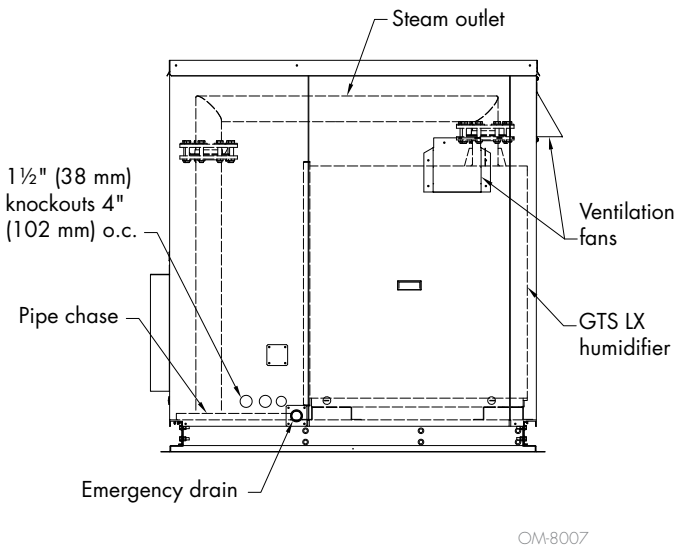
Outdoor enclosure: Piping

FIGURE 26-1: GTS OUTDOOR ENCLOSURE STEAM OUTLET OPTIONS

External steam outlet



Internal steam outlet



See Piping beginning on Page 30 for directions on installing water, drain, flue gas condensate, and gas on the GTS humidifier LX series. For Outdoor Enclosure specific items, see below.

SUPPLY WATER AND DRAIN

- **Using the pipe chase**
  Use insulation to completely fill the area around the pipes in the chase to maintain proper enclosure pressure and protect unit components from elevated moisture levels within the building; insulation must serve as an effective vapor barrier.

  Use the provided pipe chase cover to seal off the pipe chase. Cut necessary holes, and seal after installation.
- **Using the knockouts on the front of the unit**
  Heat trace and insulate piping if freezing temperatures is a concern.
- **Insulate supply water piping** inside the unit to avoid dripping from condensation.
- For **cold climates**, see Freeze Protection Piping on Page 27.

FLUE GAS CONDENSATE

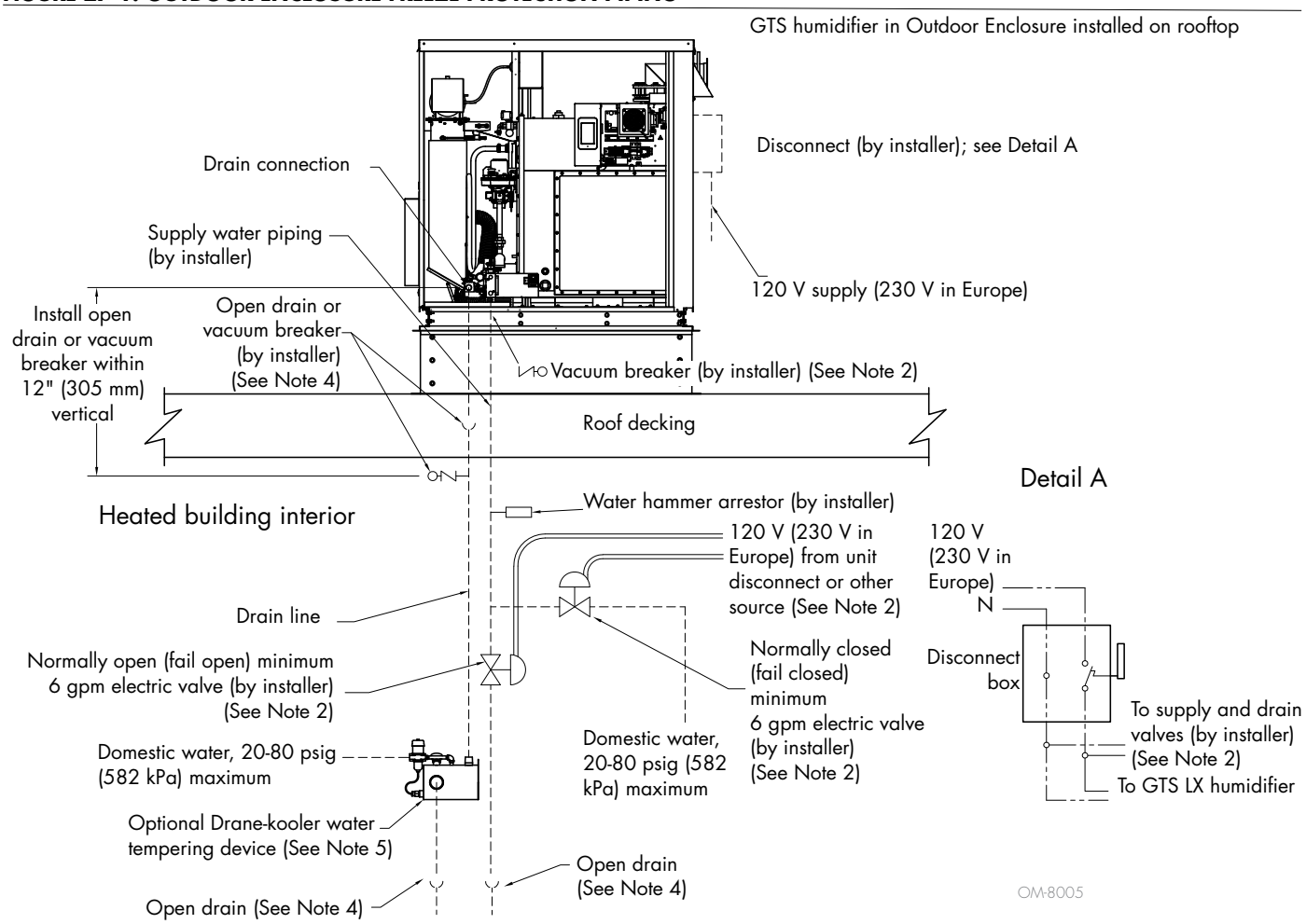
For cold climates, do not drain condensate on roof. This will cause the condensate to freeze and back up. Follow local code requirements.

STEAM

The humidifier has two available steam distribution configurations. The standard configuration has a steam outlet on the right side of the enclosure. The optional internal steam distribution configuration routes steam within the enclosure and down through the pipe chase into a building.

Outdoor enclosure: Freeze Protection Piping

FIGURE 27-1: OUTDOOR ENCLOSURE FREEZE PROTECTION PIPING



Piping notes:

1. Insulate supply water piping to avoid dripping from condensation.
2. To ensure that water does not remain in the fill line and freeze if there is a loss of power, use field installed additional valves upstream of the fill valve in a conditioned space. Power these valves on the same circuit as the GTS; if the power goes off, water drains out of the fill line to prevent freezing (see above). If these valves are used, a vacuum breaker needs to be installed on the fill line near the unit.
3. In extreme or critical applications in which the unlikely event of a water leak could cause severe damage, use a thermostat with a remote sensor on the fill line to cut power to the Model LX and safety valves to stop fill water to the Model LX and drain the fill piping when the temperature is below freezing.
4. Locate 1" air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces. Refer to governing codes for drain pipe size and maximum discharge water temperature.
5. If drain water tempering is required in the case of a power outage, install a Drane-kooler water tempering device. Pipe the cold water supplying the Drane-kooler ahead of the field-installed additional valves mentioned in Note 2.
6. DriSteem is not responsible for any freeze related damage to the humidifier or lines leading to the humidifier.

Outdoor enclosure: Venting

See General Venting beginning on Page 44 for directions on venting. For Outdoor Enclosure specific items, see below.

- Flue gas venting should end with a tee to the back of the unit to minimize effects of wind and prevent condensate from dripping on to the unit. Governing codes prevail.
- Combustion air is drawn from within the DriSteem outdoor enclosure which is sufficiently vented.

Table 28-1:
Outdoor unit amps and weights

Model	Full Load Amps** (Heater Package)		Full Load Amps** (No Heater Package)		Operating weight		Shipping (empty) weight*	
	120V 60 Hz	230V 50Hz	120V 60Hz	230V 50Hz	lbs	kg	lbs	kg
LX-50	7.0	4.5	3.0	2.5	479	217	362	164
LX-75	7.0	4.5	3.0	2.5	479	217	362	164
LX-100	7.0	4.5	3.0	2.5	475	216	367	166
LX-150	7.5	5.0	3.5	3.0	629	285	421	191
LX-200	9.0	5.5	5.0	3.5	914	415	564	256
LX-250	9.0	5.5	5.0	3.5	914	415	564	256
LX-300	9.0	5.5	5.0	3.5	916	415	574	260
LX-400	16.5	8.5	7.5	4.5	1606	729	940	426
LX-500	16.5	8.5	7.5	4.5	1606	729	940	426
LX-600	16.5	8.5	7.5	4.5	1612	731	962	436

* Add approximately 60-90 lbs (27-41 kg) for packaging material.
** Full load amps listed are for the humidifier and the enclosure.

Wiring

⚠ WARNING

Grounding
Installation must meet the requirements of governing codes or, in the absence of governing codes, in accordance with the National Electrical Code, ANSI/NFPA 70, or Canadian Electrical Code, CSA C22.1, or IEE wiring regulations (BS7671). The electrical subpanel must have an uninterrupted or unbroken ground to minimize personal injury if an electrical fault should occur. This ground can consist of electrical wire or conduit approved for electrical ground when installed in accordance with existing electrical codes. Do not use gas piping as an electrical ground.

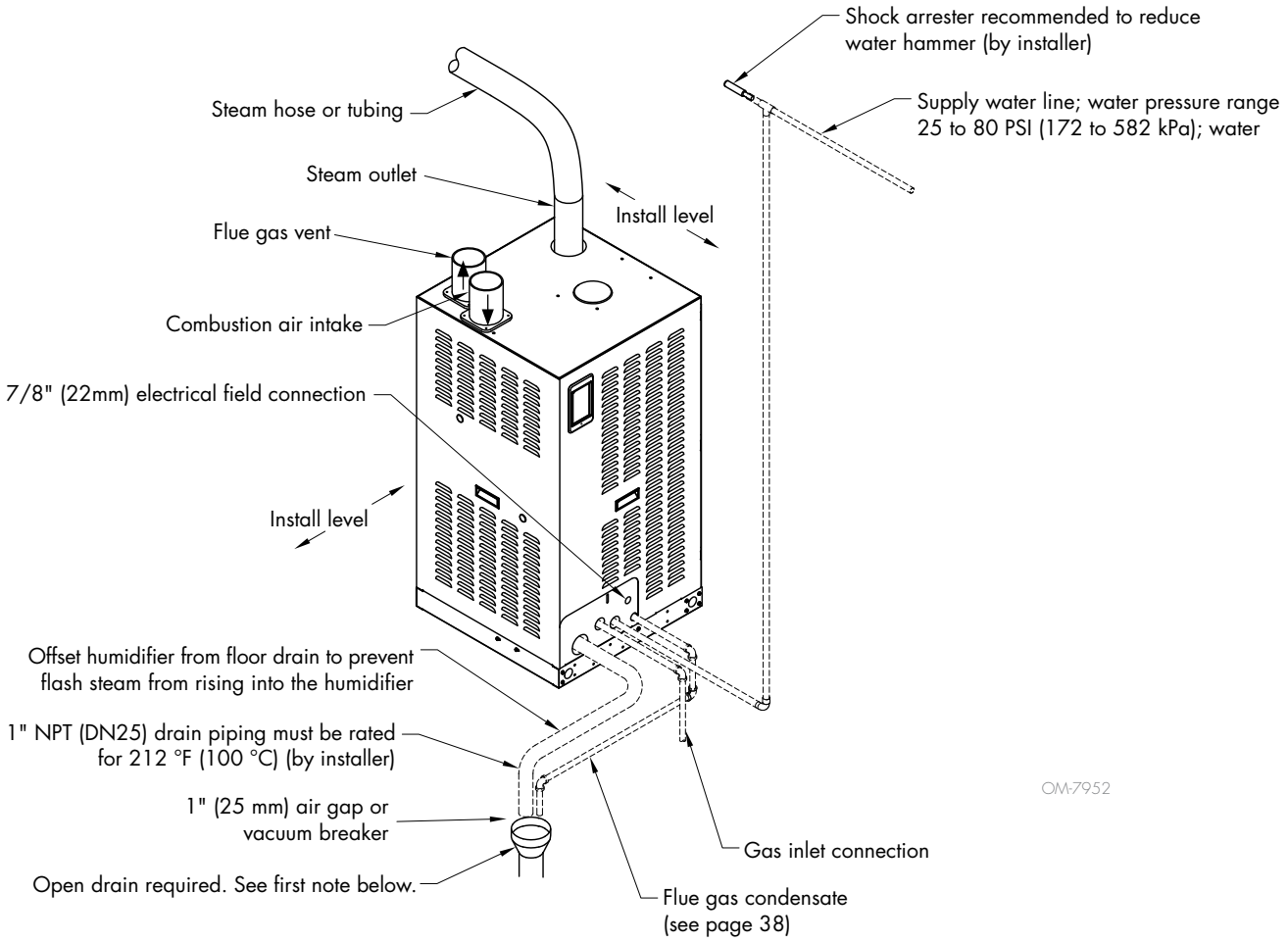
⚠ WARNING

Fire hazard
Do not connect aluminum wire between disconnect switch and humidifier. Use only copper wire. Failure to follow these instructions could cause a fire, resulting in severe bodily injury, death, or significant property damage.

- GTS humidifiers must be supplied with 120 Vac, 60 Hz (North American models) or 230 Vac, 50 Hz (European models) separately fused electrical service. The GTS humidifier is equipped with transformers to step down the voltage to 24 Vac control voltage.
- When installed, the GTS humidifier must be electrically grounded in accordance with governing codes or, in the absence of governing codes, in accordance with the National Electrical Code, ANSI/NFPA 70; or Canadian Electrical Code, CSA C22.1; or IEE wiring regulations (BS7671).
- In North America, the electrical conductors shall be Type MTW (105 °C) AWG #14 (2.5 mm^2) wire for 120 V line voltage , with BLACK WIRE for HOT, WHITE WIRE for NEUTRAL, GREEN AND YELLOW WIRE for GROUND. Units with Outdoor Enclosure must use AWG #12 (4 mm^2) for 120 V line voltage. Use #18 gauge (1 mm^2) for control wiring.
- In Europe, the electrical conductors shall be Type MTW (105 °C) 2.5 mm^2 wire for line voltage (230V), with BLACK WIRE for LINE, BLUE WIRE for NEUTRAL, GREEN AND YELLOW WIRE for GROUND, and 2.5 mm^2 wire for control wiring.
- All electrical components and wiring must be protected from mechanical damage and water. The control system requires an earth ground for proper operation.
- The GTS humidifier is adjusted for correct performance at the factory. Only a qualified gas appliance technician may alter throttle setting.
- Check the electric current characteristics and capacity requirements against the nameplate. All wiring must be in accordance with all governing codes and with the GTS wiring diagrams located inside the control cabinet. See the electrical specifications in Table 13-1 (North America) and Table 81-1 (Europe).
- Refer to the *Vapor-logic Installation and Operation Manual* for additional information on the controller furnished with this GTS humidifier.

Piping overview

FIGURE 30-1: LX SERIES FIELD PIPING OVERVIEW - MODELS LX-50 THROUGH LX-150

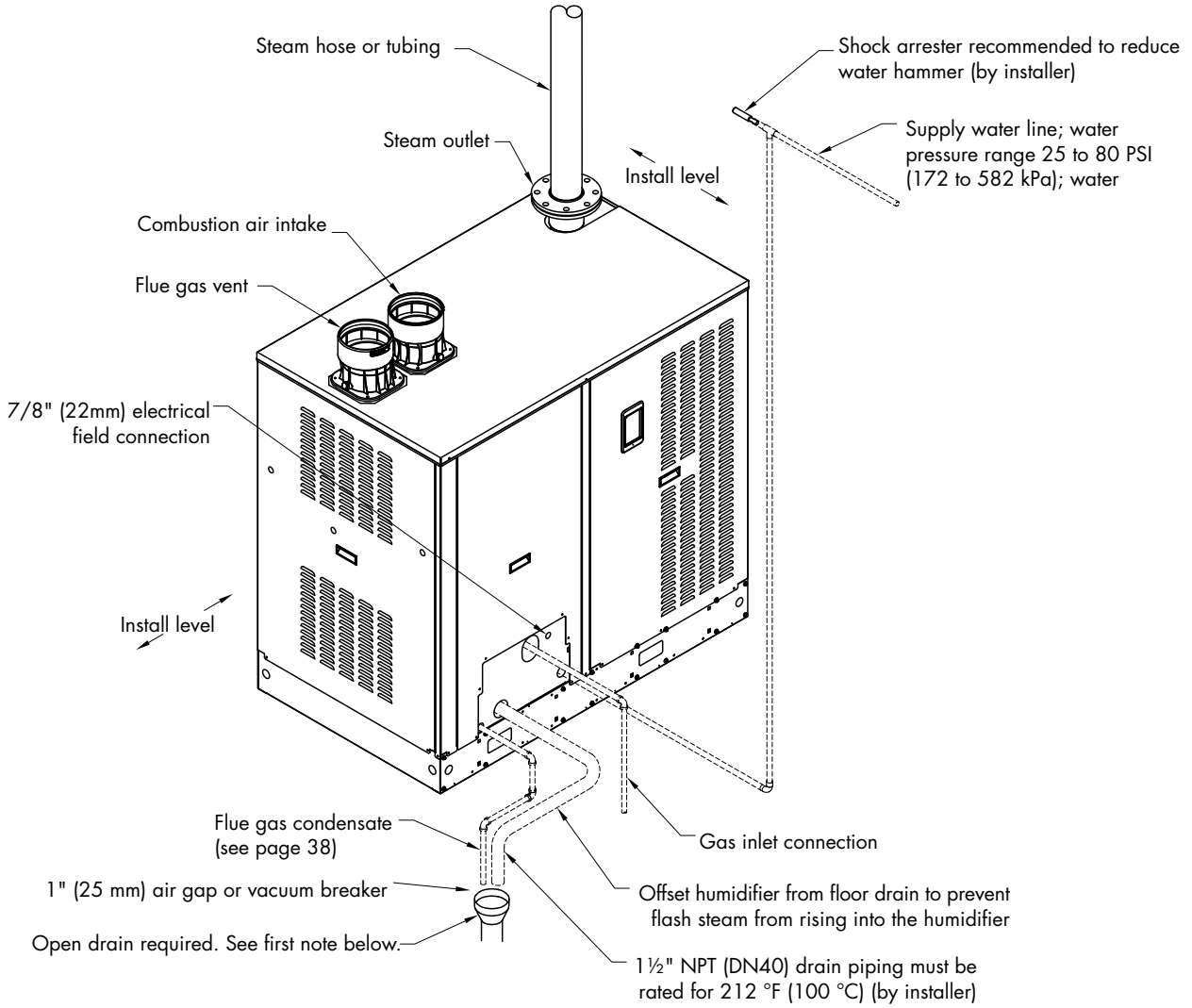


Notes:

- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces. Refer to governing codes for drain pipe size and maximum discharge water temperature.
- Dashed lines indicate provided by installer.
- Humidifier flue gases must be vented to the outside atmosphere.
- Supply water inlet is more than 2" (51 mm) above skim/overflow port, eliminating the possibility of backflow or siphoning from tank. No additional backflow prevention is required; however, governing codes prevail.
- For additional backflow prevention installation, install at a minimum of 40' (12 m) from the humidifier.
- Damage caused by chloride corrosion is not covered by your DriSteem warranty.

Piping overview

FIGURE 31-1: LX SERIES FIELD PIPING OVERVIEW - MODELS LX-200 THROUGH LX-600



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Notes:

- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces. Refer to governing codes for drain pipe size and maximum discharge water temperature.
- Dashed lines indicate provided by installer.
- Humidifier flue gases must be vented to the outside atmosphere.
- Supply water inlet is more than 2" (51 mm) above skim/overflow port, eliminating the possibility of backflow or siphoning from tank. No additional backflow prevention is required; however, governing codes prevail.
- For additional backflow prevention installation, install at a minimum of 40' (12 m) from the humidifier.
- Damage caused by chloride corrosion is not covered by your DriSteem warranty.

Piping: Connection sizes

Table 32-1:
Connection sizes

Description	LX-50, LX-75, LX-100		LX-150		LX-200, LX-250, LX-300		LX-400, LX-600	
	inches	DN	inches	DN	inches	DN	inches	DN
Gas supply	1/2 (pipe thread)	15	1/2 (pipe thread)	15	3/4 (pipe thread)	20	1 ¼ (pipe thread)	32
Sealed combustion piping	3	80	3	80	4	100	6	150
Flue vent	3	80	3	80	4	100	6	150
Supply water	3/8 (pipe thread - side) 1/2 (pipe thread - bottom)	10 15	3/8 (pipe thread - side) 1/2 (pipe thread - bottom)	10 15	3/8 (pipe thread - side) 1/2 (pipe thread - bottom)	10 15	3/8 (pipe thread - side) 1/2 (pipe thread - bottom)	10 15
Drain	1 (drain block)	25	1 (drain block)	25	1 (drain block)	25	1 (drain block)	25
Steam outlet*	2 (all steam: hose/pipe thread)	50	2 (all steam: hose/pipe thread)	50	3 (all steam: flange/pipe thread)	80	4 (all steam: flange/pipe thread)	100
Flue gas condensate	5/8 (OD)	18	5/8 (OD)	18	5/8 (OD)	18	5/8 (OD)	18
Condensate return (recommended)	3/4 (pipe thread)	20	3/4 (pipe thread)	20	3/4 (pipe thread)	20	3/4 (pipe thread)	20

Notes:
* For pipe thread steam outlet options, see DriCalc, DriSteem's free sizing and selection software, available at www.dristeem.com.

STEAM PIPING SUPPORT

Support interconnecting piping between the humidifier steam outlet and the dispersion system with pipe hangers. Failure to properly support the entire steam piping weight can cause damage to the humidifier tank and void the warranty.

Piping: Supply water and drain

SUPPLY WATER CONNECTIONS

Regardless of the type of water used, the following general instructions MUST be followed:

- There is one water connection to the humidifier. Water is connected in the field to the fill water manifold. The fill water manifold provides water to the humidifier tank and to the secondary heat exchanger. The water provided to the tank is also used for tempering drain water.
- Make union connections at the humidifier on the make-up water supply and drain/overflow lines.
- Use insulating unions or bushings to make connections between copper and other dissimilar metal fittings, such as galvanized steel. These insulating fittings are required to minimize electrolytic corrosion, which results from the direct connection of dissimilar metals in a water system.
- Before beginning ignition sequence of the humidifier at a new installation, make sure the humidifier tank is full of water and the water is free to flow into the tank.
- Do not use heated supply water. Using supply water over 90°F (32 °C) will adversely effect the performance of the GTS humidifier LX series.
- Water inlet and outlet must be permanent pipe connections shown in Table 32-1. Do not connect with hose-sets or other non-permanent methods.

SUPPLY WATER PIPING

- The GTS humidifier has a 2" (51 mm) internal air gap to prevent back siphoning into a potable water system. However, some governing codes may require additional protection such as a vacuum breaker or backflow preventer.
- The supply water pressure range must be 25 psi to 80 psi (172 kPa to 552 kPa).
- The supply water assembly has both a 3/8" (DN10) pipe thread (side) and 1/2" (DN 15) pipe thread (bottom) connection.
- During an integral drain tempering event, cold water in the internal drop tube may cause a low rolling sound.
- In cases where water hammer occurs when the fill solenoid closes, a shock arrester is recommended. Reducing the supply water pressure (minimum 25 psi [172 kPa]) or using flexible tubing (rated for 212 °F [100 °C] minimum continuous operating temperature) may diminish the noise, but installing a shock arrester is the best solution.
- Supply water tubing must be rated for at least 80 psi (552 kPa) at 140°F (60 °C) continuous service.
- Provide a shutoff valve in the supply water line to isolate the humidifier from the water system while servicing.

Important: Damage caused by chloride corrosion is not covered by your DriSteem warranty. See “Supply water guidelines” on Page 8.

Table 33-1:
Supply water guidelines

Supply water pressure	25-80 psi at 6.0 gpm flow rate	172-552 kPa
Supply water flow rate	6.0 gpm	21 l/min
Supply water temperature	34°F to 90°F	1°C to 32°C

Piping: Supply water and drain

DRAIN

Note: Follow governing code requirements regarding size of drain pipe.

The drain line piped from the humidifier must be run to an approved sanitary waste or suitable drain. Although the GTS humidifier is equipped with integral water tempering, if nonmetallic drain pipe or hose is used, it should be rated for 212 °F (100 °C) minimum continuous operating temperature.

If vertical drop of drain exceeds 12" (305 mm) a vacuum breaker or open drain with air gap must be installed within 12 vertical inches (305 mm) of unit. Failure to do so will create a siphon during drain events, disrupting normal drain operation and allowing steam to enter the drain through the overflow p-trap outlet (see Figure 34-1).

Ensure the drain piping configuration (diameter, length, slopes, elbows, hangers, etc.) supports a 12 gpm flow rate for proper drain operation and to prevent overflow and spillage from an open drain with air gap. If combining multiple drain lines together, ensure proper common pipe sizing practices are used.

Do not locate the humidifier directly above a floor drain — skim and drain water dumped into the drain will cause flash steam. This steam will rise and saturate electrical components, adversely affecting component life and performance.

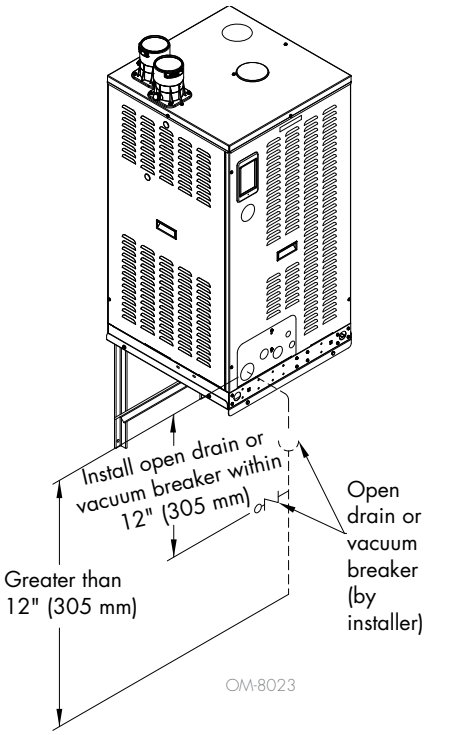
An open drain or vacuum breaker with a 1" (25 mm) air gap between the drain piping and the drain is required. Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensing on nearby surfaces may occur.

Drain piping after the water seal must be pitched a minimum of 1/8"/ft (1%) toward the drain. Governing codes may require more pitch.

If the proximity of a drain requires the humidifier drain and skim water to be lifted, use a water pump with capacity of at least 12 gallons per minute (gpm) or 45.4 litres per minute (L/m). A check valve is required on the discharge of the pump (see Figure 35-1). Electrical power for the pump is independent of the humidifier.

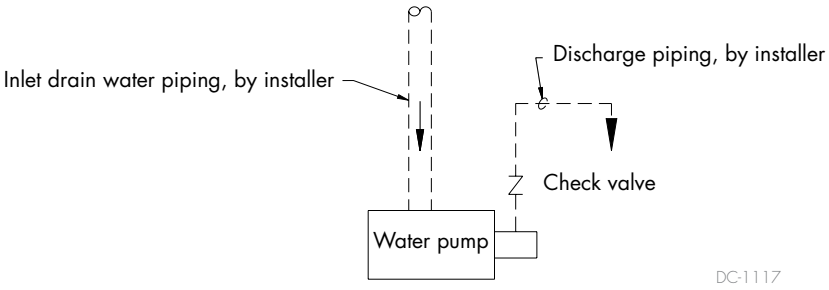
The GTS humidifier has an auxiliary 3/4" (20 DN) drain outlet located on or near the cleanout plate. This drain outlet can be hard-piped during installation to enable rapid tank draining before maintenance. This outlet can also provide access for removing scale from the tank bottom. If this connection is used, install a union to facilitate removal of the cleanout plate.

FIGURE 34-1: VERTICAL DRAIN



Piping: Supply water and drain

FIGURE 35-1: LIFTING DRAIN WATER



Note: Size water pump to handle a minimum of 12 gpm (45.4 L/m).

AUTOMATIC DRAIN WATER TEMPERING

Governing codes may require that the 212 °F (100 °C) drain and skim/overflow water from the humidifier be tempered before it is discharged into the building drain piping. The GTS humidifier LX series is shipped with drain water tempering enabled. This feature can be disabled in the Vapor-logic controller. When drain water tempering is enabled, the following steps will take place to ensure drain water is less than 140°F (60 °C):

1. Water greater than 140°F (60 °C) is detected in the drain assembly with a temperature sensor.
2. Fill valves open, directing cool water to the drain port within the tank.
3. Hot and cold water mix in the tank near the drain port.
4. Drain port valve opens and sends tempered water to the drain manifold.
5. The Vapor-logic controller controls the drain and fill valves using input from the drain temperature sensor to enable closed-loop control of drain water temperature, thus ensuring it does not exceed 140°F (60°C) while minimizing water usage.

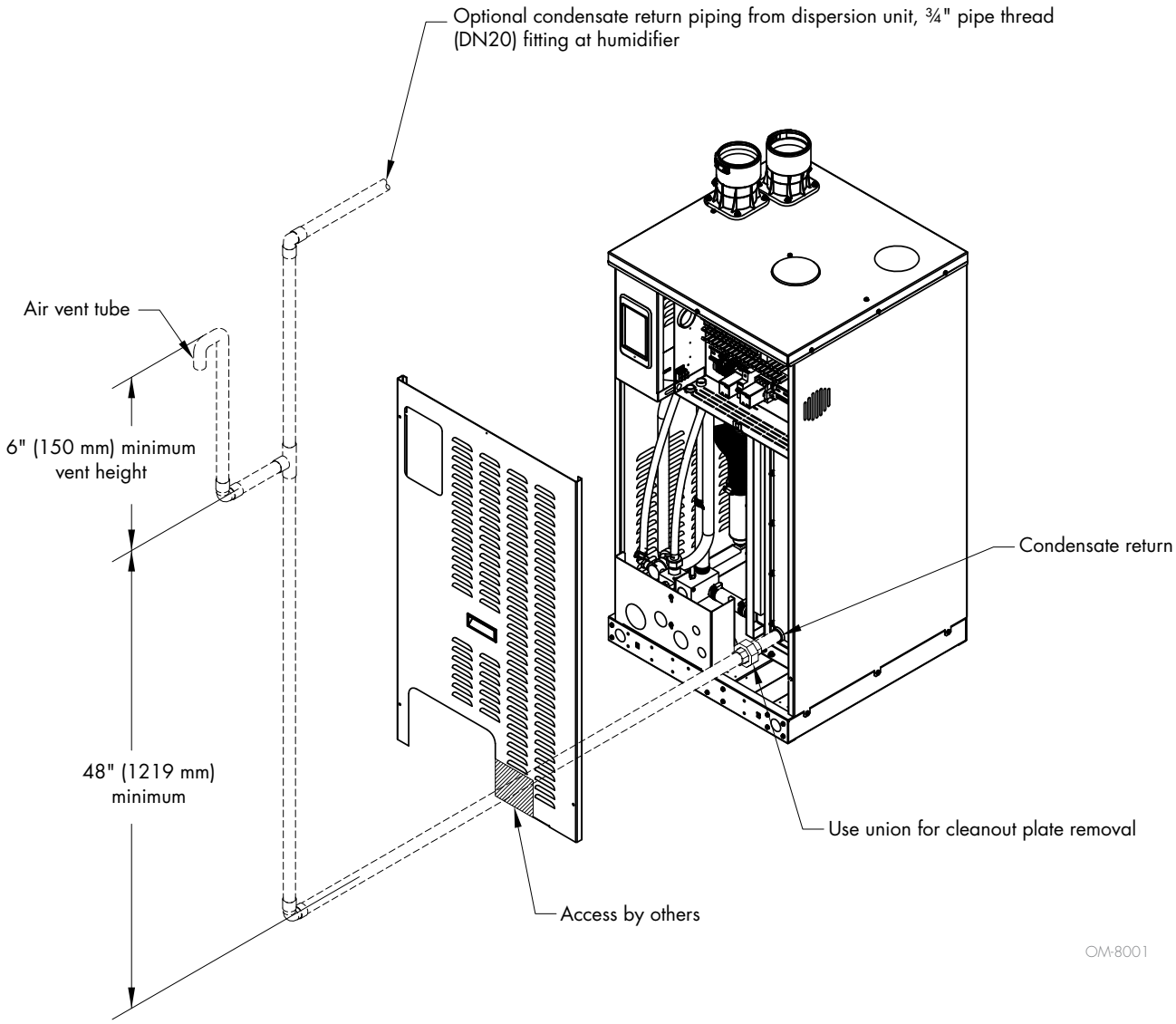
Table 35-1:
Water tempering specifications for optional Drain-kooler water tempering device

Water type	Maximum Flow rate		Maximum temperature	
	U.S. gpm	L/m	°F	°C
Hot water inflow	6	22.7	212	100
Cold water inflow*	6	22.7	90	32
Tempered water outflow	12	45.4	140	60

* Cold water inflow pressure must be between 25 psi and 80 psi (172 kPa and 552 kPa).

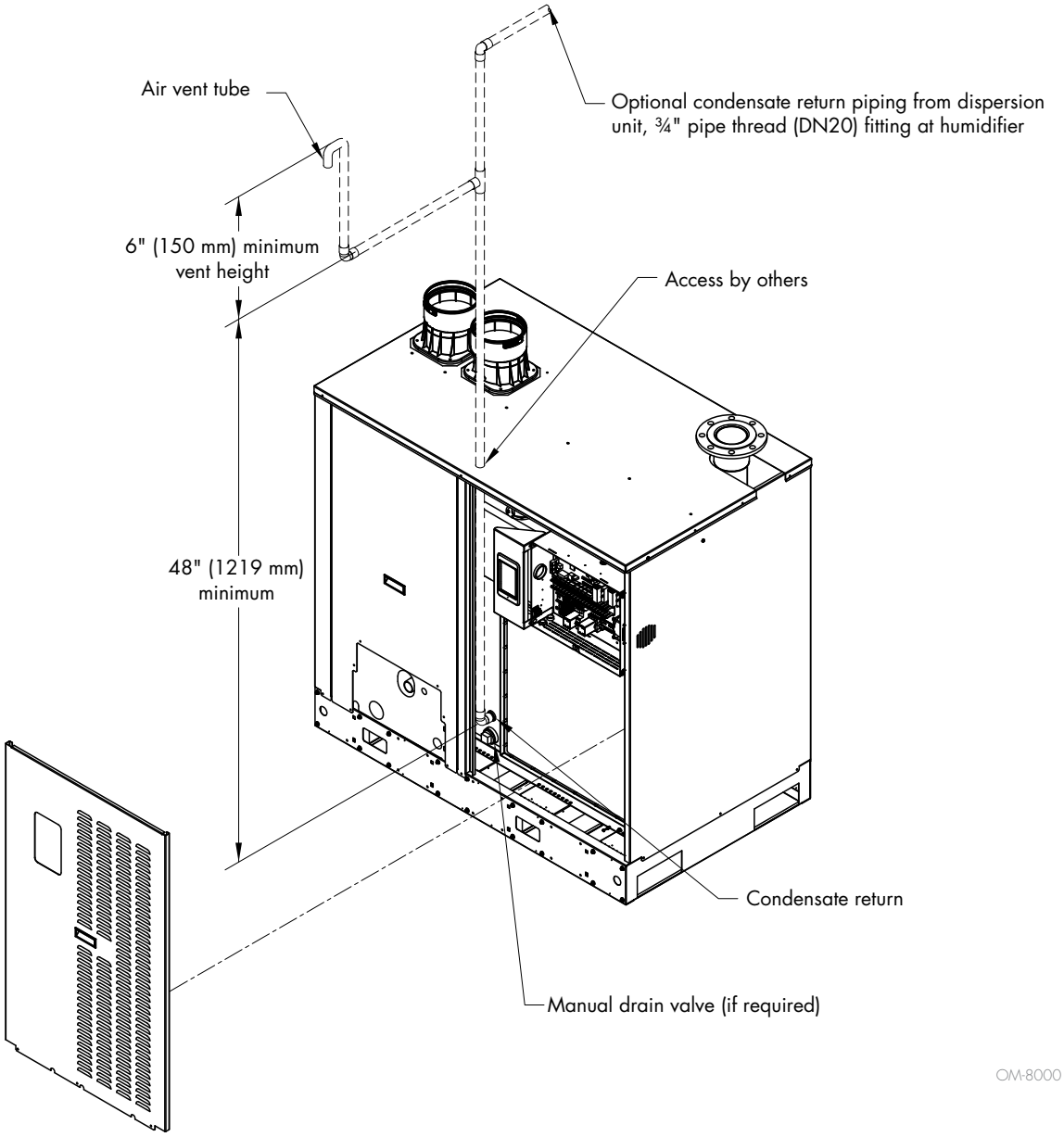
Piping: Condensate return

FIGURE 36-1: LX SERIES CONDENSATE RETURN FIELD PIPING - MODELS LX-50 THROUGH LX-150



Piping: Condensate return

FIGURE 37-1: LX SERIES CONDENSATE RETURN FIELD PIPING - MODELS LX-200 THROUGH LX-600



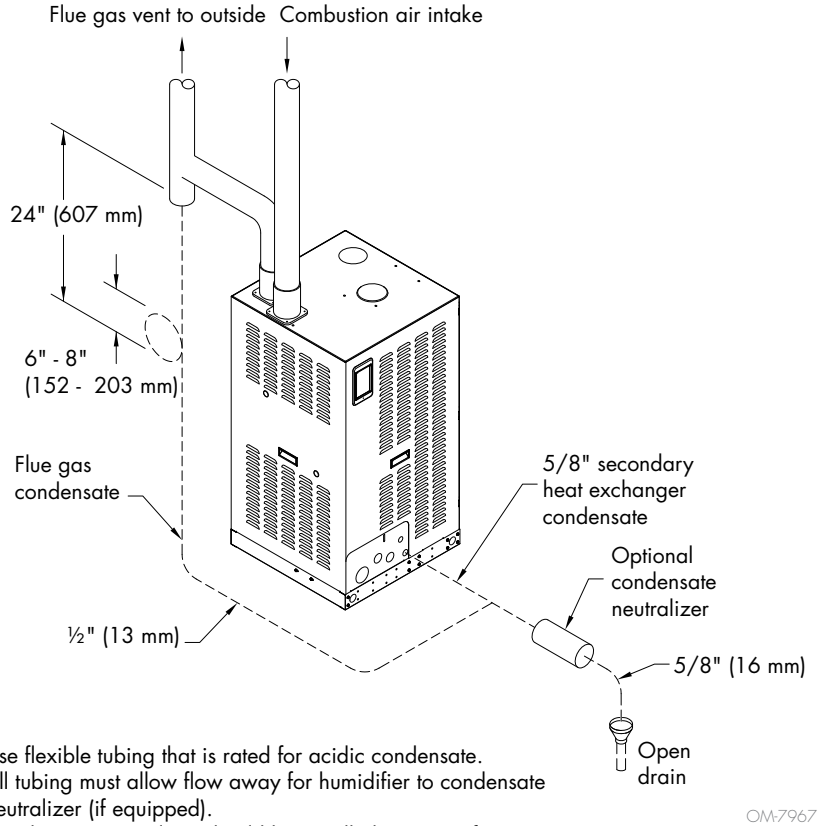
Piping: Flue gas condensate

The GTS LX Series is a condensing gas-fired appliance. Condensate drains from the secondary heat exchanger and needs to be managed.

FLUE CONDENSATE PIPING GUIDELINES

- Follow local code requirements for discharge of condensate. The flue gas condensate will have a 2-4 pH range and may need to be treated prior to discharge.
- Minimum drain pipe size is 5/8" inside diameter.
- If treatment is needed, DriSteem offers a condensate neutralizer kit. The neutralizer should be installed per manufacturer instructions below condensate p-trap level. Avoid obstructions as condensate could be damaging to surrounding surfaces and articles.
- Prime the condensate p-trap at the base of the secondary heat exchanger.

FIGURE 38-1: FLUE GAS CONDENSATE PIPING - MODELS LX-50 THROUGH LX-150



Notes:
1. Use flexible tubing that is rated for acidic condensate.
2. All tubing must allow flow away for humidifier to condensate neutralizer (if equipped).
3. Condensate neutralizer should be installed per manufacturer instructions below the condensate p-trap level.
4. If floor drain is greater than 5' (1.5 m) from humidifier, use a 5/8" PVC pipe instead of a hose.

CAUTION

Flue condensate removal
(For Models LX-50 - LX-300 only).

Install a drip tee within the first 3' (1 m) of flue venting for flue condensate removal. Failure to follow these instructions could reduce the service and efficiency of the secondary heat exchanger.

If flue vent is less than 10' (3 m) long and a sidewall exit, then no drip tee needed.

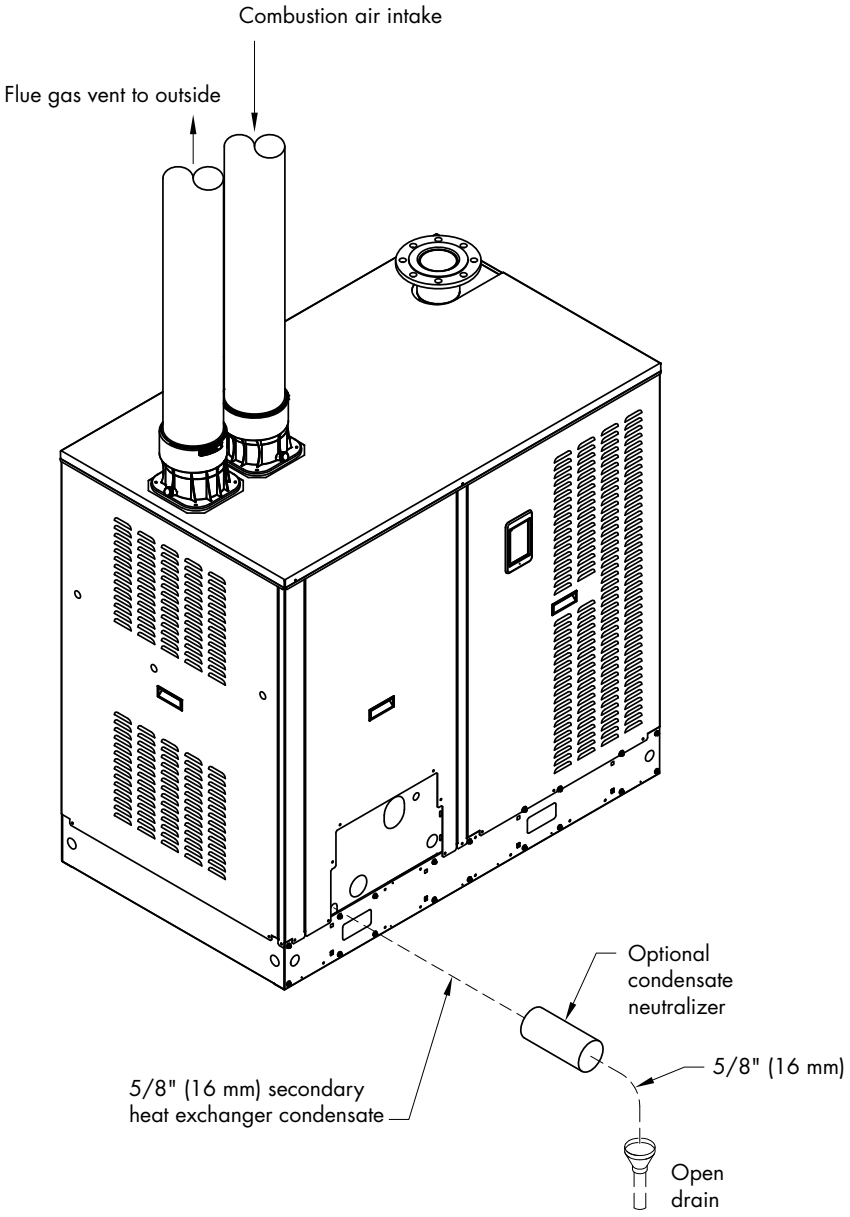
WARNING

Failure to prime all flue gas condensate traps (tees and secondary heat exchanger P-trap) with water will result in combustion gas entering the living space (which may contain carbon monoxide).

To avoid the risk asphyxiation from carbon monoxide, never operate the humidifier unless the condensate drip tees and secondary heat exchanger P-trap are sealed with water.

Piping: Flue gas condensate

FIGURE 39-1: FLUE GAS CONDENSATE PIPING - MODELS LX-200 THROUGH LX-600



Notes:
1. Use flexible tubing that is rated for acidic condensate.
2. All tubing must allow flow away for humidifier to condensate neutralizer (if equipped).
3. Condensate neutralizer should be installed per manufacturer instructions below the condensate p-trap level.
4. If floor drain is greater than 5' (1.5 m) from humidifier, use a ½" PVC pipe instead of a hose.

Piping: Gas

GAS PIPING GUIDELINES

- After threading and reaming the ends of the pipes, inspect piping and remove loose dirt and chips.
- Support piping so there are no strains imposed on unit or controls.
- Use two wrenches when tightening piping to unit or controls.
- Provide a drip pocket before each unit and in the line where low spots cannot be avoided.
- Takeoff to unit should come from top or side of main to avoid trapping condensate.
- Piping that is subject to wide temperature variations should be insulated.
- Pitch piping up toward unit at least 1/4" (6 mm) per 15' (4.5 m) of horizontal run.
- Compounds used on threaded joints of gas piping must be resistant to the harmful action of liquefied petroleum gases.

⚠ WARNING

Fire or explosion hazard
Purge air before lighting unit by disconnecting piping at gas control. In no case should line be purged into heat exchanger. Failure to follow these instructions could cause a fire or explosion, resulting in bodily injury, death, or significant property damage.

- After installation, check field piping and humidifier gas train for gas leaks.
- Do not use soap solution or open flame on humidifier gas train. A gas leak detector is recommended.
- Install a ground joint union and a manual shutoff valve immediately upstream of the unit. Install a plugged tapping upstream of the shut-off valve, accessible for test gauge connection (see Caution).
- Allow at least 5' (1.5 m) of piping between any high pressure regulator and unit pipe connection.
- Piping installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, must conform to:
  - In the United States: The National Fuel Gas Code, ANSI Z223.1 (latest edition).
  - In Canada: Local plumbing or waste water codes and other applicable codes and with the current code CAN/CGS-B149.1, "Installation Code for Natural Gas Burning Appliances and Equipment," or CAN/CGA-B149.2, "Installation Code for Propane Burning Appliances and Equipment."
  - In Europe: The National Gas Safety (Installation & Use) Regulations.

⚠ WARNING

Fire hazard
Supply the humidifier only with the gas type (natural gas or LP gas) listed on the humidifier name plate. Failure to supply the humidifier with the listed gas type could result in burner failure or a fire, causing property damage, personal injury, or death.

To convert the humidifier to natural gas or LP gas, contact DriSteem Technical Support or your DriSteem Representative/Distributor.

Table 40-1:
Gas Pressure

	Natural	LP
Minimum	6" wc	6" wc
Recommended	7" wc	11" wc
Maximum	24" wc	24" wc

CAUTION

Install connection for gas pressure test gauge
Gas pressure to the humidifier controls must never exceed 24" wc (6 kPa, 60 mbar), or the gas valve will become damaged and require replacement.

The gas pressure diagnostic port on the gas valve can be used to check pressure. Loosen the screw and push a 5/16" ID hose over the fitting connected to a gauge. Remove the hose and tighten the screw when finished.

Install a 1/8" pipe thread (DN6) plugged tapping, accessible for test gauge connection, immediately upstream of the gas supply connection to the appliance.

Piping: Gas (continued)

- Piping to units should conform with local and national requirements for type, volume, and gas handled and for pressure drop allowed in the line. Refer to the tables on this page to determine the gas flow in ft^3/hr or m^3/hr for the type of gas and size of unit to install. Using this value and the length of pipe necessary, determine the pipe diameter. Where several units are served by the same main, the total capacity, gas flow, and length of main must be considered. Avoid pipe sizes smaller than 1/2" (DN15). Table 41-2 allows for the usual number of fittings with a 0.3" wc (0.07 kPa) pressure drop.
- When the specific gravity of the gas is other than 0.60 for natural gas or 1.53 for propane, use Table 41-1.

Table 41-1:
Specific gravity conversion factors

Natural gas	
Specific gravity	**Factor**
0.55	1.04
0.60	1.00
0.65	0.962
Propane gas	
Specific gravity	**Factor**
1.50	0.633
1.53	0.626
1.60	0.612

Note:
Use the above multiplying factor with Table: 41-2 when the specific gravity of gas is other than 0.60 (natural gas) or 1.53 (propane).

Table 41-2:
Gas pipe capacities for gas pressures of 0.5 psig (3.45 kPa) or less

Length of pipe		**Gas flow in piping in ft^3/hr and m^3/hr at pressure drop of 0.3" wc (0.07 kPa) Specific gravity = 0.60**									
		Nominal iron pipe diameter in inches (DN)									
		1/2" (DN15)		**3/4" (DN20)**		**1" (DN25)**		**1¼" (DN32)**		**1½" (DN40)**	
ft	**m**	**ft^3/hr**	**m^3/hr**	**ft^3/hr**	**m^3/hr**	**ft^3/hr**	**m^3/hr**	**ft^3/hr**	**m^3/hr**	**ft^3/hr**	**m^3/hr**
10	3	132	3.7	278	7.9	520	14.7	1050	29.7	1600	45.3
20	6	92	2.6	190	5.4	350	9.9	730	20.7	1100	31.1
30	9	73	2.1	152	4.3	285	8.1	590	16.7	890	25.2
40	12	63	1.8	130	3.7	245	6.9	500	14.2	760	21.5
50	15	56	1.6	115	3.3	215	6.1	440	12.5	670	19.0
60	18	50	1.4	105	3.0	195	5.5	400	11.3	610	17.3
70	21	46	1.3	96	2.7	180	5.1	370	10.5	560	15.9
80	24	43	1.2	90	2.5	170	4.8	350	9.9	530	15.0
90	27	40	1.1	84	2.4	160	4.5	320	9.1	490	13.9
100	30	38	1.1	79	2.2	150	4.2	305	8.6	460	13.0

See example on page 42

Piping: Gas (continued)

EXAMPLE

For this example, refer to the tables on Page 41.

To determine gas piping size, begin by calculating the cubic feet/hour (ft^3/hr) or m^3/hr using the following formula:

- Btuh (kW) input / calorific value of gas

Calorific values are:

- Natural gas: 1025 Btu/ft^3 (10.6 kW-hr/m^3)
- Propane: 2500 Btu/ft^3 (25.9 kW-hr/m^3)

For example, if you have a LX-150 operating on natural gas, calculate the ft^3/hr or m^3/hr as follows:

- 183,000 Btuh / 1025 Btu/ft^3 = 390 ft^3 per hour
- 117.2 kW / 10.6 kW-hr/m^3 = 11.1 m^3 per hour above your calculated ft^3/hr or m^3/hr. In this example, you are looking for the next highest value above 390 ft^3/hr (11.05 m^3/hr), which is 400 ft^3/hr (11.3 m^3/hr) and indicates the use of a 1¼" (DN32) pipe for this application.

Using the same example, if the specific gravity of your natural gas was 0.55 (instead of the 0.60 standard), see Table 41-2 for an adjustment factor. In this case, the factor would be 1.04, which you multiply by the 390 ft^3/hr (11.05 m^3/hr) value. This gives you a new value of 406 ft^3/hr (11.49 m^3/hr). Referring again to Table 41-2, you see that for the same 60 ft (18 m) length, you now need to use 1½" (DN40) pipe due to the change in the specific gravity of the gas.

Gas leak testing

- When leak-testing the gas supply piping system, disconnect the humidifier and its gas shutoff valve during any pressure in excess of 24" wc (6 kPa). Isolate the humidifier from the gas supply piping system by closing its field-installed manual shutoff valve during any pressure not equal to 24" wc (6 kPa).

- With the burner running at full capacity, check gas supply pressure at the inlet pressure tap of the combination gas control valve.

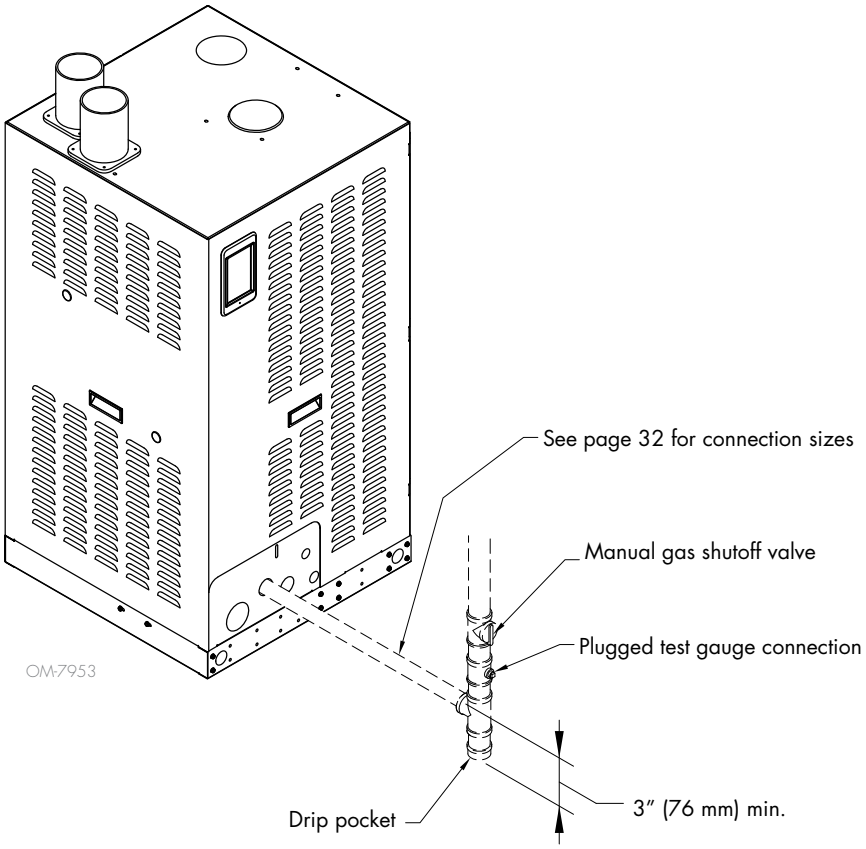
  For North American models, the recommended supply pressure is 7" wc (1.75 kPa) for natural gas or 11" wc (1.83 kPa) for LP gas. Perform gas piping purging as described in ANSI Z223.1 (latest edition) or in Canada, CAN/CGA-B149 codes. The minimum supply pressure is 6" wc (1 kPa) for natural gas or LP gas.

  For European models, the required supply pressure is 20 or 25 mbar for natural gas and 30, 37, or 50 mbar for propane gas.

Piping: Gas (continued)

FIGURE 43-1: GTS GAS PIPING

All Models



General venting

GUIDELINES

- The GTS humidifier LX series is a Fan Assisted Category IV (condensing, positive pressure) Appliance.
- Flue gas condensate is produced and drains from the secondary heat exchanger. Piping instructions for this connection can be found on Page 38.
- Maximum flue temperature is 140 °F (60 °C).
- Vent piping must be UL or UL/CSA listed PVC, CPVC, polypropylene or any other vent type approved for a Category IV appliance.
- Follow supplier fitting and cement/primer instructions to ensure proper fit, adhesion, and assembly.
- Clean and seal inlet piping per the pipe manufacturer's recommended solvents and cements. Follow manufacturer's recommended procedures for pipe and fitting preparation, cutting and attachment with appropriate solvents and cements for the material.
- Do not use vent equipment from more than one application/manufacturer.
- Do not insulate the flue vent piping.
- Installation must be in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1; or Section 7, Venting Systems and Air Supply Appliances, of the CAN/CGA B149 Installation Codes; or National Gas Safety Code (Installation & Use) Regulations (latest revision); governing codes, and the vent manufacturer's instructions.

Table 44-1:
Approved PVC/CPVC flue gas vent pipe and fittings

Item	Vent material	United States		Canada
Piping	PVC	ANSI/STM D2665	IPEX system 1738	ULC S636
	PVC, Sch. 40	ANSI/ASTM D1785		
	PVC, SDR series	ANSI/ASTM D2241		
	CPVC, Sch. 40	ANSI/ASTM F441		
	CPVC, SDR series	ANSI/ASTM F422		
Fittings	PVC, DWV, Sch. 40	ANSI/ASTM D2665		
	PVC, Sch. 40	ANSI/ASTM 2466		
	PVC, Sch. 80	ANSI/ASTM 2467		
	CPVC, Sch. 40	ANSI/ASTM F438		
	CPVC, Sch. 80	ANSI/ASTM F439		
Cement, primer	PVC	ANSI/ASTM D2564		
	CPVC	ANSI/ASTM F493		

Note: Do not use cellular (foam) core PVC, DWV pipe, ASTM F891, or cellular core CPVC or RADEL (Polyphenylsulfone).

⚠ WARNING

Installation requirements
The humidifier must be installed by a qualified technician and meet the requirements of all governing codes. Failure to follow these instructions could cause severe bodily injury or death.

Note:
For European models, contact your distributor for horizontal venting parts.

⚠ WARNING

Installation requirements
Failure to properly seal all joints and seams as required in the air inlet piping may result in flue gas recirculation, spillage of flue products and carbon monoxide emissions causing sever personal injury or death.

Table 44-2:
Approved vent manufacturers

Item	Manufacturer
Polypropylene	Centrotherm Eco Systems*
	DuraVent (M&G Group)
Stainless steel	DuraVent (M&G Group)
	Z-Flex
	Heat Fab
	Metal Fab
	Security Chimney

* For 2", 3", and 4" vent pipe only.

⚠ WARNING

Do not interfere, disable, or tamper with the devices monitoring the combustion gas discharge, including the flue temperature and flue pressure sensors. Only authorized and trained technicians should perform any service on these items. If the unit fails repeatedly due to a discharge (flue) fault, have the device serviced and tested by authorized and trained technicians.

General venting

- When applying the codes, reference also the venting manufacturer's instructions, the service gas supplier's regulations, and the specific instructions provided in this manual.
- Install vent piping as direct as possible, with a minimum number of turns or elbows.
- For Models LX-50 - LX-300 only: Install a drip tee within the first 3' (1 m) of flue venting for flue condensate removal. If flue vent is less than 10' (3 m) long and a sidewall exit, then no drip tee needed. See Figure 52-1. **Warning:** Failure to follow these instructions could reduce the service and efficiency of the secondary heat exchanger.
- The purpose of venting the gas humidifier is to completely remove all products of combustion and ventilation gases to the outside air.
- Maintain a minimum upward slope of 1/4" per linear foot (2%) and supported every 4' (1 m) on all horizontal runs of the flue gas. Maintain proper support of vent connections and joints. Observe clearances (in accordance with applicable codes) from all combustible materials.
- Inspect for proper and tight construction. Clean and remove any restrictions or obstructions. An existing chimney may be used as a chase.
- Do not connect this humidifier to a chimney flue servicing any other appliance.

Table 45-1:
Flue vent lengths

Model	Maximum equivalent pipe length ft (m)							
	Combustion air intake				Flue gas vent			
	2" (60 mm)	3" (80 mm)	4" (mm)	6" (mm)	2" (60 mm)	3" (80 mm)	4" (mm)	6" (mm)
LX-50	100 (30)	250 (76)			100 (30)	250 (76)		
LX-75	50 (15)	200 (61)			50 (15)	200 (61)		
LX-100	25 (8)	150 (46)			25 (8)	150 (46)		
LX-150		100 (30)				100 (30)		
LX-200		40 (12)	175 (53)			40 (12)	175 (53)	
LX-250		30 (9)	125 (38)			30 (9)	125 (38)	
LX-300		25 (8)	100 (30)			25 (8)	100 (30)	
LX-400			50 (15)	200 (61)			50 (15)	200 (61)
LX-500			35 (10)	150 (46)			35 (10)	150 (46)
LX-600				100 (30)				100 (30)

The minimum equivalent pipe length for flue gas vent and combustion air intake is 10 ft (3 m).

General venting

- The flue gas outlet and combustion air inlet pressures at the vent adapters on the LX series GTS humidifier must be within the ranges shown in Table 47-2 from full output to minimum output.
- Flue gas outlet and combustion air inlet adapters accept PVC, CPVC, Polypropylene and stainless steel piping.
- If the flue vent outlet or combustion air inlet is downsized or upsized per Table 45-1, the adapters must be installed vertically to the GTS LX humidifier.
- Never connect this humidifier to an existing chimney.
- Rigidly support the vent pipe every 3' (1 m) or less with hangers or straps to ensure there is no movement after installation. The humidifiers secondary heat exchanger should not support the weight of the vent piping.
- No portion of the vent system should extend into, or pass through, any circulation air duct or plenum.
- In replacement installation where an existing vent system may be used, inspect the vent system for condition, size, type of vent material, and height to meet the requirements in these instructions. When connecting the humidifier to a gas vent or chimney, the installation must be in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1; Section 7, Venting Systems and Air Supply Appliances, of the CAN/CGA B149 Installation Codes; The National Gas Safety Code (Installation & Use) Regulations (latest revision), governing building codes, and the vent manufacturer's instructions.
- Install and fire-stop all vent pipe passing through floors, ceilings, and walls with the proper clearances from combustible material according to the National Fuel Gas Code, Canadian Standards CAN/CGA.B149, the National Gas Safety Code (Installation & Use) Regulations (latest revision), or governing codes.

DETERMINE A LOCATION

Consider the surroundings when terminating the vent and air:

- Ensure that distances from vent terminal to adjacent public walkways, buildings, and openable windows and building openings are consistent with National Fuel Gas Code, ANSI Z223.1, CAN/CGA B149 Installation Codes, National Gas Safety Code (Installation & Use) Regulations (latest revision), or governing codes.
- In areas accessible to the public, vent terminal must be at least 7' (2.1 m) above ground level to prevent burns from hot terminal surface.
- The vent terminal and air intake locations must be at sufficient height above ground level to prevent blocking by expected snowfall.
- Building materials must be protected from degradation by flue gases.
- Maintain minimum horizontal clearance of 4' (1.22 m) from electric meters, gas meters, regulators, and relief equipment.
- Combustion air and flue gas terminations should be seated in the same atmospheric zones.

General venting

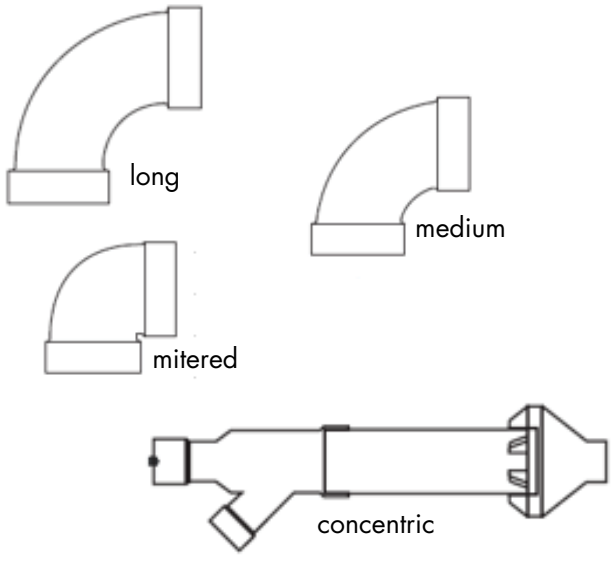
Table 47-1: Equivalent vent lengths

Description	2" - 3" diameter		4" diameter		6" diameter	
	feet	meter	feet	meter	feet	meter
Long radius 90° elbow	3	0.9	4	1.2	6	1.8
Medium radius 90° elbow	5	1.5	7	2.0	10	3.0
Mitered 90° elbow	8	2.4	11	3.3	16	4.9
Long radius 45° elbow	1.5	0.5	2	0.6	3	0.9
Medium radius 45° elbow	2.5	0.8	3	1.0	5	1.5
Mitered 45° elbow	4	1.2	5	1.6	8	2.4
Concentric vent termination	5	1.5	7	2.0		
Tee	16	4.9	21	6.5	32	9.8
3" to 2" (80 to 60 mm) step down adapter	5	1.5	7	2.0	10	3.0

Table 47-2: Venting pressure

Description	Minimum	Maximum
Flue gas outlet pressure	-0.05" WC (+12 Pa)	+0.45" WC (+112 Pa)
Combustion air inlet pressure	-0.45" WC (-112 Pa)	+0.05" WC (+12 Pa)

FIGURE 47-1: VENT ELBOWS AND TEES



Note: A maximum of eight elbows, including terminations, are allowed.

Room air combustion venting

The GTS humidifier is pre-plumbed to support both room air and sealed combustion. See Warning. Requirements and recommendations for each follow.

ROOM AIR COMBUSTION

- All fuel burning equipment must be supplied with air for combustion of the fuel. Sufficient air must be provided to ensure there is not a negative pressure in the equipment room or space.
- Provide adequate combustion and ventilation air in accordance with Section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1 or applicable provisions of governing codes. Canadian installations must be installed in accordance with sections 7.2, 7.3, and 7.4 of the CAN/CGA.B149 Installation Codes and all authorities having jurisdiction.
- For proper and safe operation this humidifier needs air for combustion and ventilation. **Do not** block or obstruct air openings on the appliance, spaces around the appliance, or air openings communicating with the humidifier area.
- Do not locate in a dusty environment.
- **Do not** block the flow of combustion and ventilation air. To provide for necessary oxygen for proper combustion, openings must be provided to allow outside air to enter the space where the humidifier is located. Enclosed spaces, such as equipment rooms, must be vented for combustion air. The size of air openings must be based on all gas-burning equipment installed in the space involved. Table 48-1 outlines four types of locations, and the requirements of each.

⚠ WARNING

Air for combustion
Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, chlorine and other household products.

When the GTS is located in an environment with negative pressure or toxic air, pipe the sealed combustion connection to fresh supply air at atmospheric pressure.

Failure to follow these instructions could cause severe bodily injury or death.

Table 48-1:
Location of humidifier and required air openings (non-ducted combustion air)

Location description	Required air opening
Confined space with all air from inside the building; conventional frame, brick or stone construction with normal infiltration (Note: this location rarely provides enough air for higher capacity units.)	Two openings, 1 sq. in. (6.5 cm^2) per opening per 1000 Btu/hr (293 W) input The minimum free area of all openings combined is 100 sq. in. (645 cm^2).
Confined space with all air from outside the building through air ducts	Two openings, 2 ducts, 1 sq. in. (6.5 cm^2) per opening per 2000 Btu/hr (586 W) input*
Confined space with all air from outside the building from through-wall openings only (no ducts)	Two openings, 1 sq. in. (6.5 cm^2) per opening per 4000 Btu/hr (1172 W) input*
Unconfined space with all air from outside the building	Same as confined space; all air from outside the building
* The minimum dimension of any opening is 3" × 3" (76 mm × 76 mm).	

Room air combustion venting

⚠ WARNING

Combustion air quality (list of contaminants)
Sample list of contaminants to be avoided:

The recommended source of combustion air is to use the outdoor air supply. However, the use of indoor air in most applications is acceptable except as follows:

1. If the furnace is installed in a confined space it is recommended that the necessary combustion air come from the outdoors by way of attic, crawl space, air duct, or direct opening.
2. If outdoor combustion air is used, there must be no exposure to the installations or substances listed in "3" below.
3. The following types of installation may require OUTDOOR AIR for combustion, due to chemical exposures:

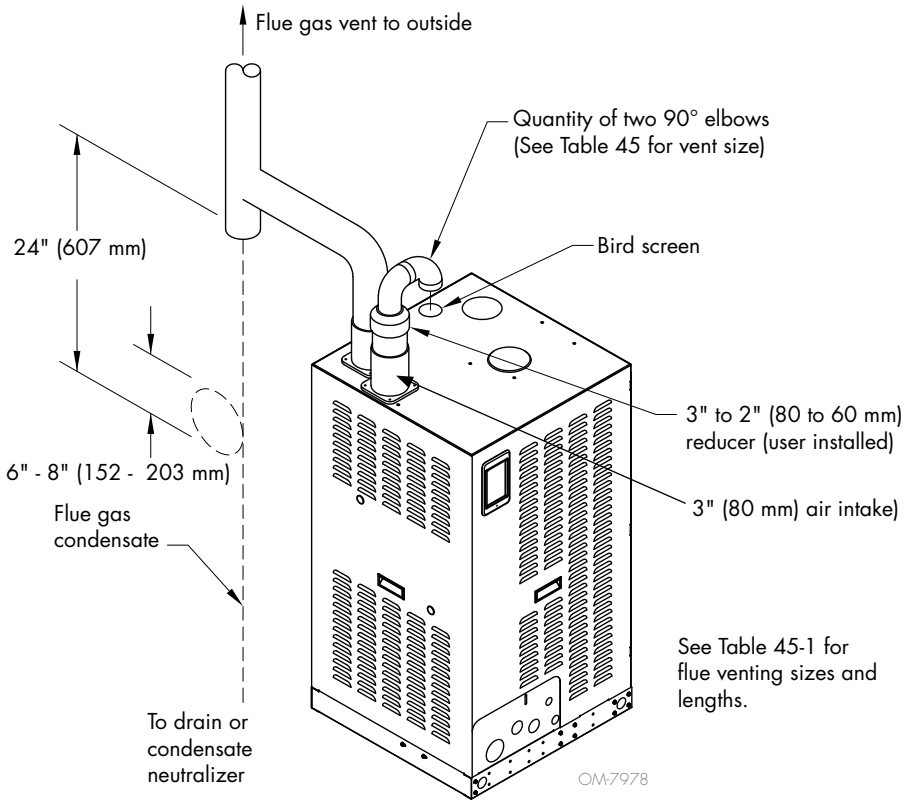
- Commercial buildings
- Buildings with indoor pools
- Furnaces installed in laundry rooms
- Furnaces installed in hobby or craft rooms
- Furnaces installed near chemical storage areas

Exposure to the following substances in the combustion air supply may also require OUTDOOR AIR for combustion:

- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine based swimming pool chemicals
- Water softening chemicals
- De-icing salts or chemicals
- Carbon tetrachloride
- Halogen type refrigerants
- Cleaning solvents (such as perchloroethylene)
- Printing inks, paint removers, varnishes, etc.
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners for clothes dryers
- Masonry acid washing materials

Room air combustion venting

FIGURE 50-1: ROOM AIR COMBUSTION FOR THE LX-50 THROUGH LX-300



Note: Field piping supplied by others.

CAUTION

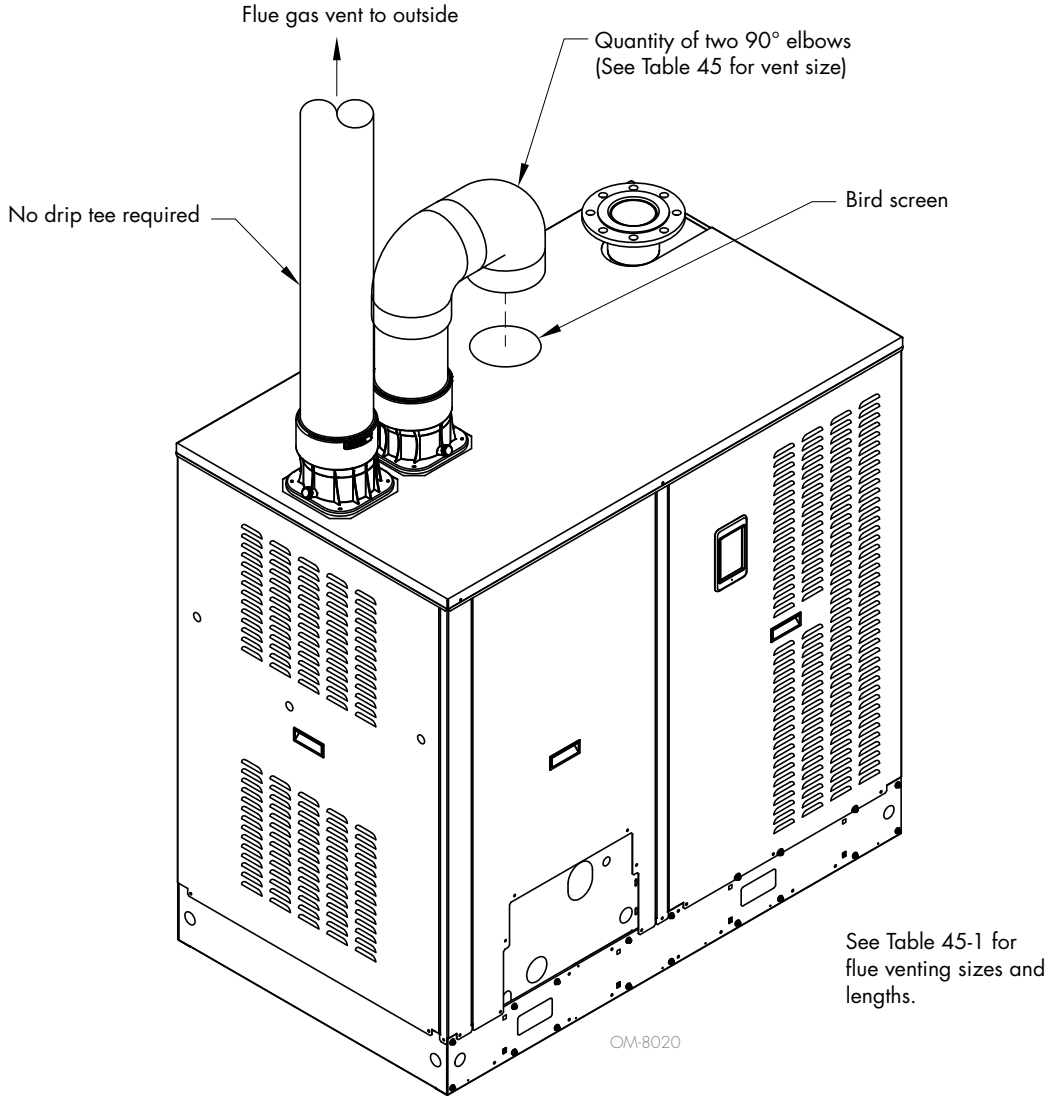
Flue condensate removal
(For Models LX-50 - LX-300 only).

Install a drip tee within the first 3' (1 m) of flue venting for flue condensate removal. Failure to follow these instructions could reduce the service and efficiency of the secondary heat exchanger.

If flue vent is less than 10' (3 m) long and a sidewall exit, then no drip tee needed.

Room air combustion venting

FIGURE 51-1: ROOM AIR COMBUSTION FOR THE LX-400 THROUGH LX-600



Sealed combustion venting

SEALED COMBUSTION (COMBUSTION AIR FROM OUTSIDE THE BUILDING)

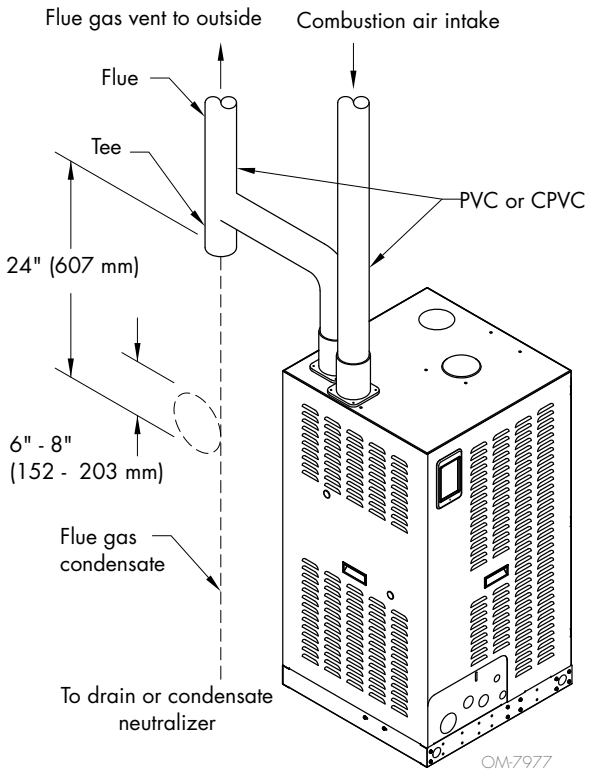
- The GTS is pre-plumbed to support sealed combustion using PVC, CPVC ABS, polypropylene, or stainless steel (see Figure 52-1). All GTS models have a single point connection on top of the humidifier shroud.
- When running piping for sealed combustion, see Tables 45-1 and 47-1 for maximum and minimum equivalent length of vent pipe and equivalent length of each elbow (maximum of eight elbows including terminations). The outside air source can be either a final connection outside the building or a connection to an outdoor air plenum within the building. When the combustion air origination point is outside the building, the opening must be covered with a large mesh screen to prevent the introduction of unwanted materials without restricting airflow.
- In cold climates, if sealed combustion piping passes through warm, conditioned space insulate piping to prevent condensation.

⚠ WARNING

Requirement for manifolding sealed combustion piping runs

When installing sealed combustion piping for more than one GTS humidifier, do not commonly manifold multiple sealed combustion piping runs without having the manifold sized for the specific installation by a licensed engineer. Failure to follow these instructions could starve the GTS humidifier of combustion air resulting in either the unit not being able to light or high carbon monoxide (CO) levels, which may cause severe personal injury or death.

FIGURE 52-1: LX SERIES SEALED COMBUSTION CONNECTION



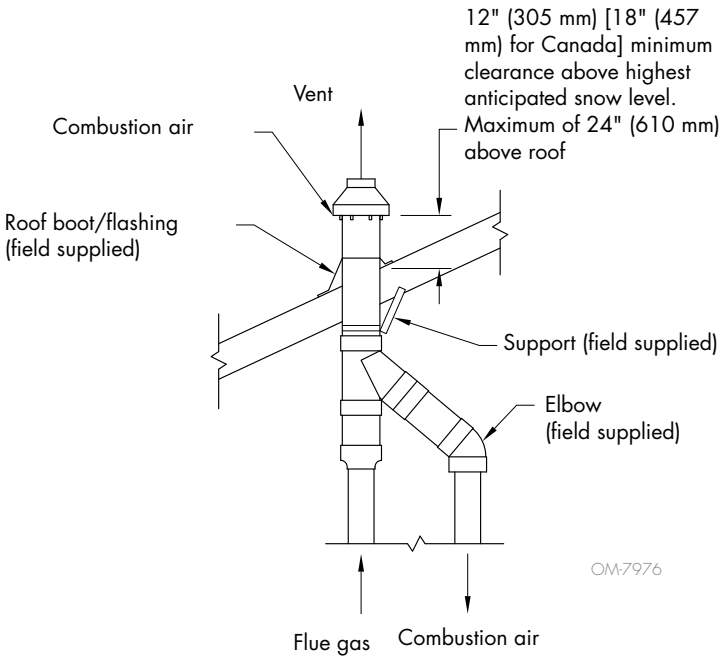
Note: Field piping supplied by others.

Vertical venting

In addition to this section, please see General venting on page 44.

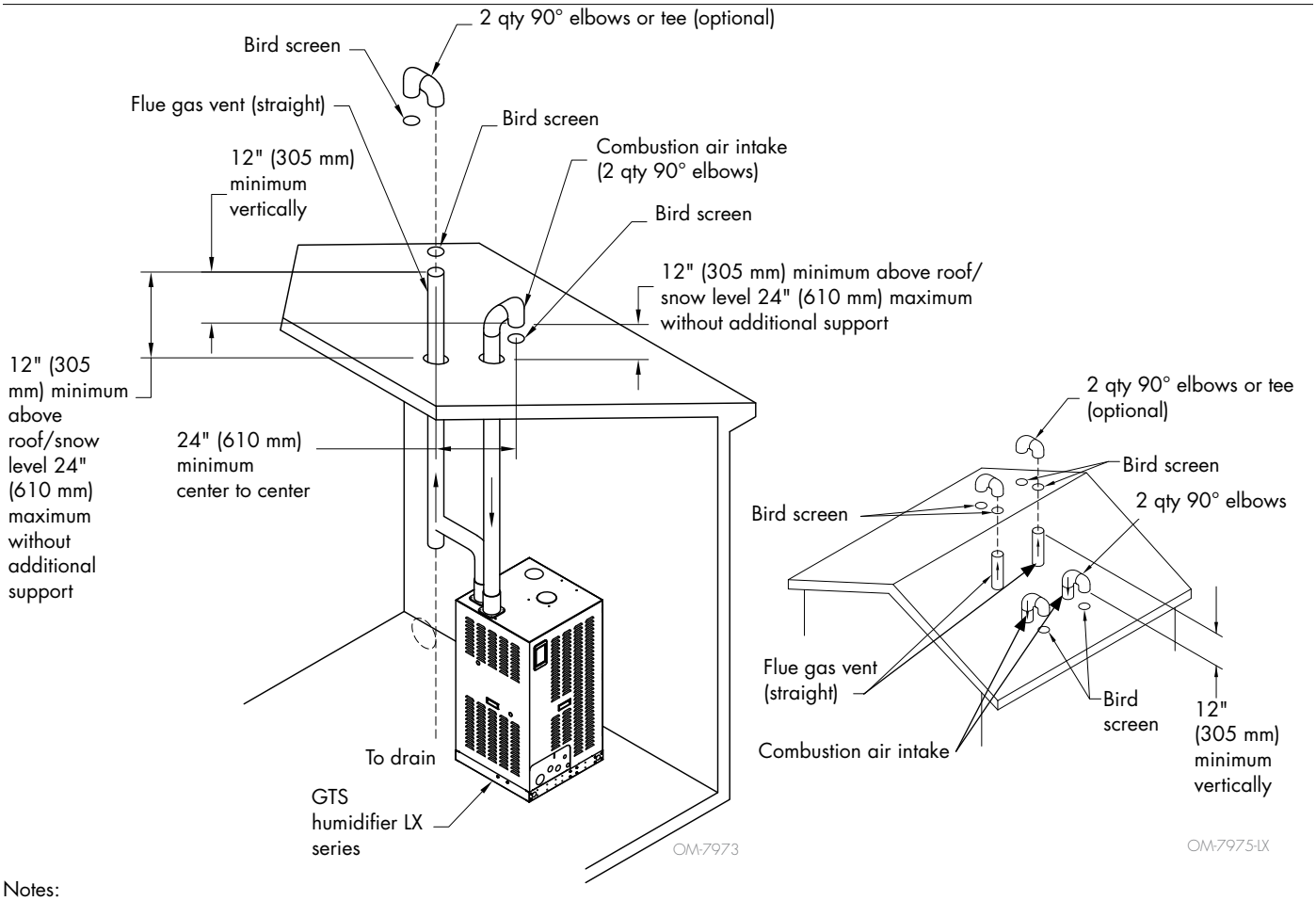
- The vent system must terminate above the roof surface per the National Fuel Gas Code, CAN/CGA.B149, or National Gas Safety Code (Installation & Use) Regulations (latest revision) requirements or governing codes, and must include a UL or UL/CSA listed vent cap or roof assembly, unless prohibited by governing codes. Install a high-wind vent cap on all GTS humidifiers.

FIGURE 53-1: CONCENTRIC VENT ROOF INSTALLATION



Vertical venting

FIGURE 54-1: GTS VERTICAL VENTING



Notes:

- For Models LX-50 - LX-300 only: Install a drip tee within the first 3' (1 m) of flue venting for flue condensate removal. If flue vent is less than 10' (3 m) long and a sidewall exit, then no drip tee needed. See Figure 52-1.
- Required distance between air intake and vent hood is defined by governing codes.
- Slope flue gas vent horizontal runs ¼"/ft (2°) back towards the tee at humidifier.
- 4' (1.2 m) minimum from any cable, dormer, or other roof structure with building interior access (e.g. vent or window).
- 10' (3 m) minimum from any forced air inlet to the building, including make up air inlets such as dryer or furnace areas.

Sidewall venting

In addition to this section, please see General venting on page 44.

See Figures 57-1 and Figures 57-2.

- The combustion **air** piping must end in a down-turned elbow. This arrangement avoids recirculation of flue products into the combustion air stream.
- The flue gas **vent** piping may terminate in an elbow pointed outward or away from the air inlet at least 12" (305 mm) above the combustion air inlet, or use a tee as a termination to minimize effects of wind.

DETERMINE A LOCATION

Additional placement considerations when the flue gas vent and combustion air intake are exiting a sidewall:

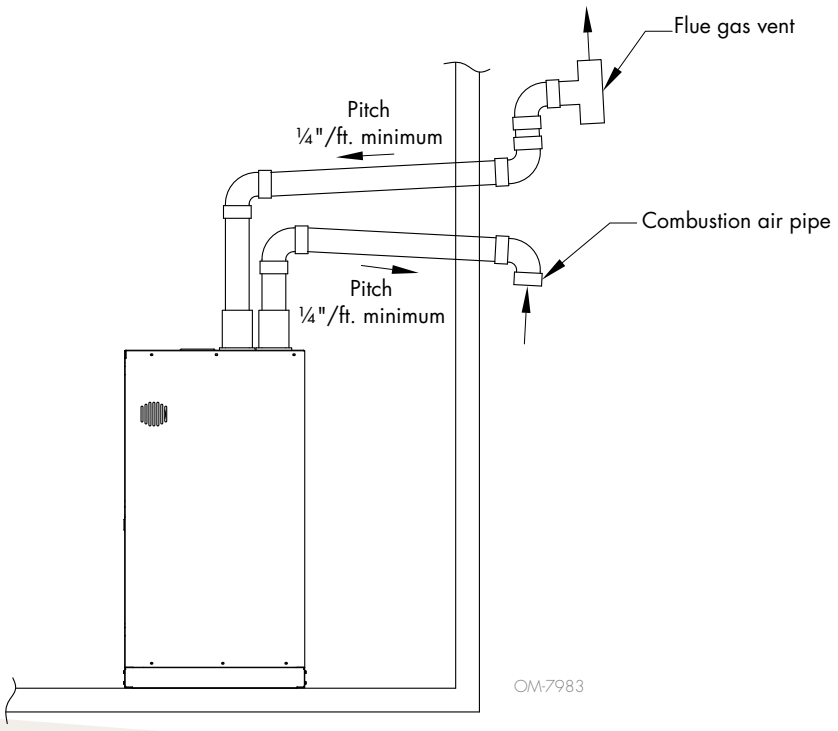
- Position the vent where vapors will not damage nearby shrubs, plants, or air conditioning equipment or be objectionable.
- The flue will form a noticeable plume as it condenses in cold air. Avoid areas where the plume could obstruct window views.
- Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
- Avoid possibility of accidental contact of flue gas with people or pets.

⚠ WARNING

A gas vent extending through an exterior wall shall not terminate adjacent to wall or below building extensions such as eaves, parapets, balconies, or decks. Failure to comply could result in severe personal injury, death, or substantial property damage.

Sidewall vent and air inlet terminations must terminate in the same pressure zone.

FIGURE 55-1: GTS HUMIDIFIER LX SERIES SIDEWALL VENTING

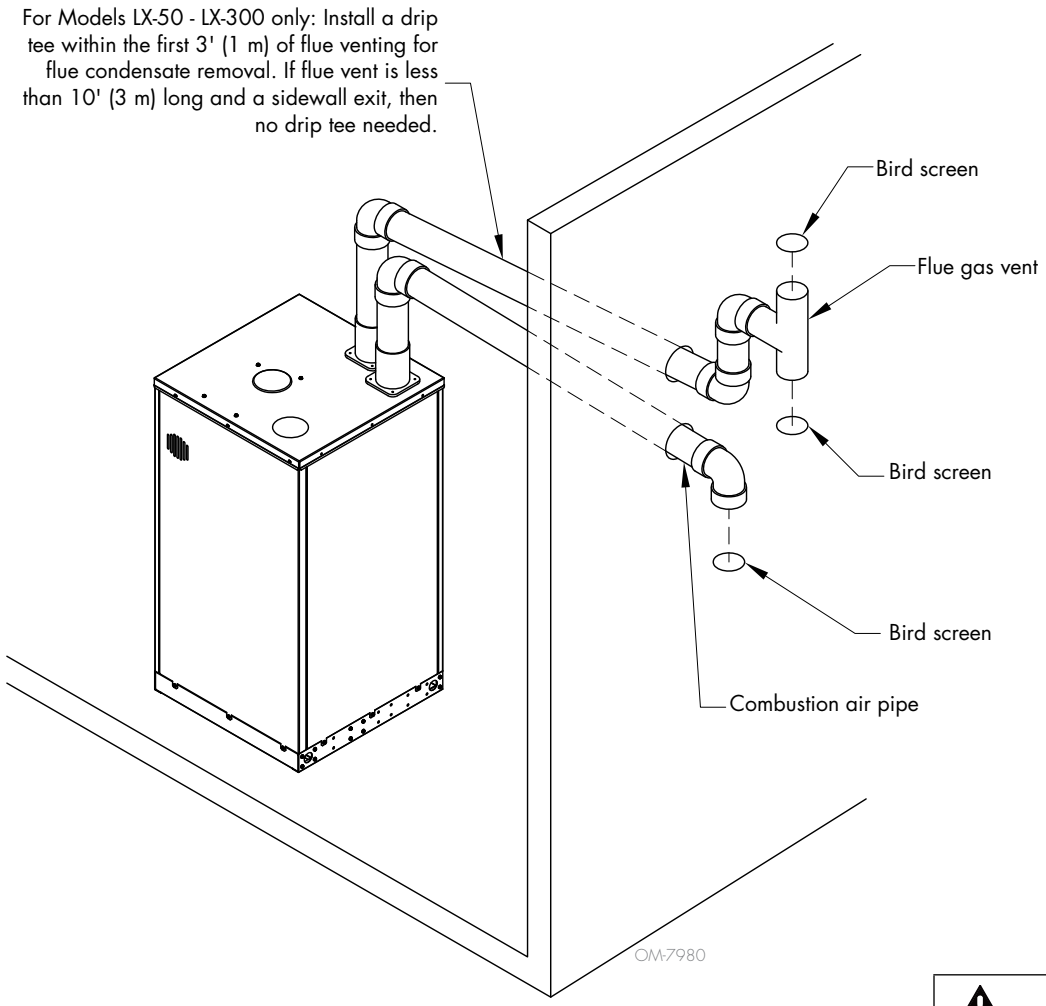


CAUTION

Sidewall venting commercial products will result in large exhaust plumes in cold climates. Consideration should be taken when locating in proximity to windows, doors, walkways, etc.

Sidewall venting

FIGURE 56-1: GTS HUMIDIFIER LX SERIES SIDEWALL VENTING



⚠ WARNING

Do not exceed the maximum lengths of the outside vent piping as shown in Figure 57-1. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential humidifier shutdown.

Sidewall venting

- Do not locate the vent where wind could affect performance or cause recirculation, such as inside building corners, near adjacent buildings or surfaces, window wells, stair wells, alcoves, courtyards, or other recessed areas.
- Do not locate the vent above any door or window. Condensate can freeze, causing ice formations.
- Locate or guard vent to prevent condensate damage to exterior finishes.
- The vent must end:
  - At least 6' (1.8 m) from adjacent walls.
  - No closer than 12" (305 mm) below roof overhang.
  - At least 3' (0.9 m) above any forced air intake within 10' (3 m).
  - No closer than 12" (305 mm) below or horizontally from any door or window or any other gravity air inlet.
- Air inlet must be at least 12" (305 mm) above grade or snow line; at least 12" (305 mm) below the vent end; and the vent pipe must not extend more than 24" (610 mm) vertically outside the building unless supports are added.

FIGURE 57-2: GTS HUMIDIFIER LX SERIES SIDEWALL VENTING WITH CONCENTRIC VENT

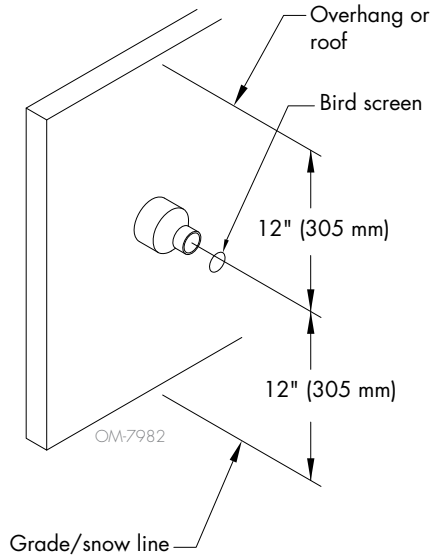
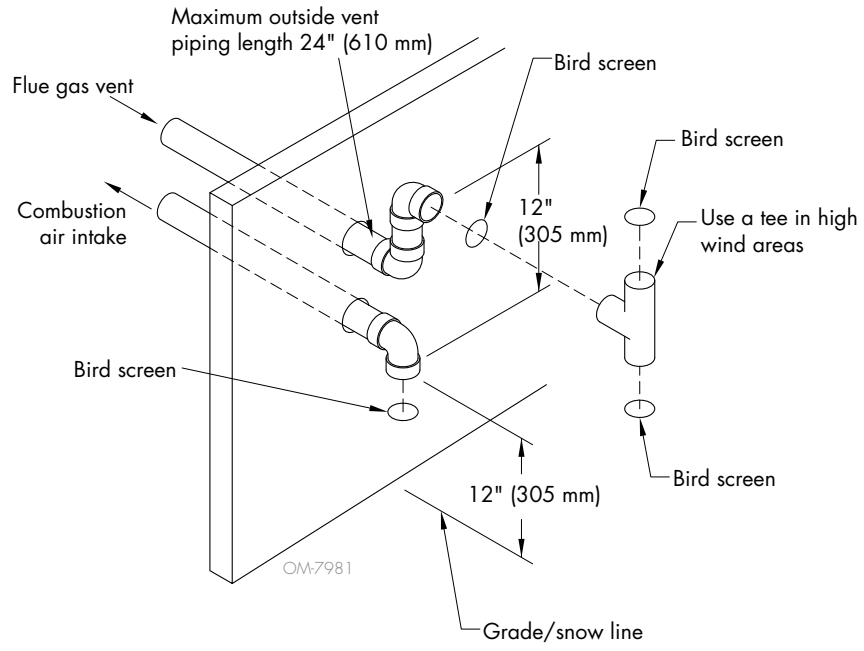


FIGURE 57-1: GTS HUMIDIFIER LX SERIES SIDEWALL VENTING



Start-up

START-UP CHECKLIST

After the system is installed and connected to gas, electrical, water supplies, controls, steam dispersion, and drain check the following items:

- ❑ Verify that the GTS humidifier, controls, piping, electrical connections, steam supply, and dispersion unit(s) are installed according to the following:
  - Installation instructions in this manual
  - *Vapor-logic Installation and Operation Manual* (shipped with the humidifier)
    - Installation section
    - Installation checklist
  - Ladder style wiring diagram (shipped inside unit)
  - External connections wiring diagram (shipped inside unit)
  - Gas connection instructions in this manual
  - Mounting instructions in this manual
  - All governing codes
- ❑ Piping (gas)
  - Verify that the gas type supplied to the humidifier matches the unit nameplate label.
  - Verify that all field and humidifier gas piping has been tested for leaks. (Soap and water are not recommended near gas valves.)
- ❑ **Piping (steam, drain, supply water)**—Verify that all piping connections have been completed as recommended and that water pressure is available.
- ❑ **Electrical**—Verify that all wiring connections have been made in accordance with all governing codes and the GTS wiring diagrams.
- ❑ **Controls**—Verify that all control wiring has been completed as specified and required for correct and safe operation of the GTS humidifier. Refer to the Vapor-logic Installation and Operation Manual.
- ❑ Verify that the humidifier tank is securely installed and level before filling with water (see the operating weights in Table 13-1.
- ❑ Verify that the humidifier tank is level front to back and side to side after it is full of water.

⚠ WARNING

Startup
Only qualified electrical and gas personnel should perform the start-up procedure.

The *Vapor-logic Installation and Operation Manual* is a comprehensive operation manual. Refer to it for information regarding the following features:

- Display setup and menu information
- Control input signals and functions
- Drain, flush, and skim features
- Safety features
- Alert screens and fault messages

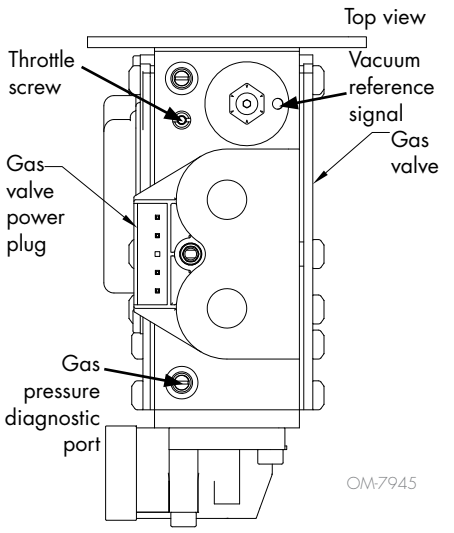
The manual was shipped with your humidifier. Additional copies can be viewed, printed, or ordered on our website: www.dristeem.com

Start-up

START-UP PROCEDURE

1. Verify the installer has followed the "Start-up Checklist" on Page 56 of this manual.
2. Prime the condensate p-trap at the base of the secondary heat exchanger and the p-trap off of the drip-tee (if required) on the flue.
3. Ensure the "Start-up commissioning checklist" on Pages 60 and 61 of this manual has been completed.
4. Power up the humidifier. When the humidifier is first powered up, the control cabinet fan will turn on. The blower fan(s) will also turn on and then shut off after a few seconds. At this point, the humidifier is considered disabled, because it is in Standby mode.
5. Follow the Vapor-logic on-screen set-up steps, ensuring that wiring is accurate and that start-up and installation checklists have been followed.
6. During start-up, do not leave the humidifier unattended.
7. Change mode from Standby to Auto in order for the humidifier to operate. The humidifier must also be showing a demand before it will start.
8. The humidifier will then perform several steps to prepare for humidification:
   - The LX will immediately begin a line flush with 5 gpm water running through the fill and drain lines. The purpose of this flush is to clean any debris out of the lines leftover from installation. The drain flush takes about one minute, and you may hear the humidifier draining.
   - Next, the humidifier will start to fill the tank with water and perform a probe check using the Vapor-logic controller. See page 11 for a description of a probe check. At this time, the water will be skimmed off the surface to prime the p-trap. A partial drain is part of the probe check; so again, you may hear the unit draining. This process will take anywhere from six to eighteen minutes depending on the size of your humidifier.
   - After the probe check is complete, the blower(s) will power up, the ignition module will turn the gas valve(s) on and the enhanced spark ignition system ignites the burner(s). The burner(s) fire into the primary heat exchanger in the tank causing the water to heat and eventually boil. When the water is heating, the blower(s) are fully on to reduce heat up time. Once the unit starts humidifying, the blower(s) and gas valve(s) modulate in accordance with the humidification demand. Time to boil ranges from small to large units but is around four minutes.
9. Monitor oxygen levels and adjust if out of range. Desired oxygen range is 5.5% +/- 1.0% at 100%. To adjust oxygen levels, turn the gas valve throttle screw clockwise to increase oxygen and turn counterclockwise to decrease oxygen levels.
10. See page 11 for continuous operation and safety features of the GTS LX.

FIGURE 59-1: DETAIL OF GAS VALVE



Start-up commissioning checklist

Visit date _____

Model # _____

Serial # _____

Tag # _____

Important: Troubleshooting information for this humidifier is located in the *Vapor-logic Installation and Operation Manual* shipped with your humidifier. If you do not have this manual, go to www.dristeem.com to download or order a copy.

Supply water

- ❑ RO
- ❑ DI
- ❑ Softened
- ❑ Potable

Grains hardness _____

Water pressure _____ psi
(must be between 25 and 80 psi
[172 and 582 kPa] at 6.0 gpm)

- ❑ Supply water piping is 3/8" (DN10) pipe thread (side) or ½" (DN 15) pipe thread (bottom) connection or up sized for longer runs to maintain 25-80 psi at 6.0 gpm.

_____

Gas supply

- ❑ Natural
- ❑ LP

Manifold pressure _____ inches wc
_____ kPa _____ mbar

Supply shutoff valve distance

Supply line size

Check for leaks

Flue piping

- ❑ Flue piping material
  - ❑ PVC
  - ❑ CPVC
  - ❑ Polypropylene
  - ❑ Stainless steel

Size _____

Rise _____

Run _____

- ❑ Dedicated flue gas and combustion air piping
- ❑ Slight pitch toward drip tee
- ❑ All pipe connections sealed and tight
- ❑ All flue gas condensate traps primed.
- ❑ Plastic flue gas vent pipe is **not** insulated.
- ❑ Total developed length is within requirements.
- ❑ Flue and combustion air pressures within spec at 100% output

Job site representation:

_____

_____

_____

Job name _____

Program code _____

DriSteem rep _____

Required clearances

- ❑ Top cover removal 18" (457 mm)
- ❑ Cleanout plate/electrical panel side 36" (914 mm)

Wiring

- ❑ Control transmitter
  - Gauge _____
  - ❑ Shield
- ❑ High limit duct humidistat
  - Gauge _____
  - ❑ Shield
- ❑ Airflow proving switch
- ❑ Combustion air damper
- ❑ Area-type fan
- ❑ External fault contact
- ❑ Twisted pair connection between boards (for multiple units only)

Steam pipe

Outlet size _____

- ❑ Flange
- ❑ Hard pipe
- ❑ Insulated
- ❑ Steam hose (do not insulate)

Rise _____

Run _____

- ❑ Pitched back to humidifier
- ❑ 45° angles used in piping

Continued

Start-up commissioning checklist

Dispersion

- ❑ Ultra-sorb
- ❑ Rapid-sorb
- ❑ Single tube
- ❑ Single tube with drain
- ❑ Space distribution unit
- ❑ Area type fan

Condensate/drain piping

Water seal height of dispersion system

_____

- ❑ Air gap, open drain, or vacuum breaker within 12" (305 mm) vertical of LX unit
- ❑ Condensate return to tank

Cold-start burner ignition

Burner 1 lights after:
- ❑ First try
- ❑ Second try
- ❑ Third try

Burner 1 color after 15 minutes:
- ❑ Blue
- ❑ Orange
- ❑ Red-orange

Burner 2 lights after:
- ❑ First try
- ❑ Second try
- ❑ Third try

Burner 2 color after 15 minutes:
- ❑ Blue
- ❑ Orange
- ❑ Red-orange

- ❑ Flue gas oxygen range 5.5% ±1.0 at 100%
- ❑ Flue gas CO ppm 0-60 ppm typical, 400 ppm max allowable

Safety testing to verify function

Low water test _____

High humidity limit test _____

Airflow test _____

Aquastat test _____

Blocked flue test_____

Additional comments

_____

Inspection recommendations

USER INSPECTION EVERY 30 DAYS

- Vent adapter and flue gas inspection port are in place with vent pipe seated and secured.
- Physical support of the appliance is sound without sagging, cracks, or gaps between floor stand or tank flanges.
- There are no obvious signs of deterioration of the appliance.
- Burner flame is primarily orange in color when operated under low demand, and primarily blue in color when operated under high demand.
- Check for alarms and messages through the alert log. See Vapor-logic controller instruction manual for description and troubleshooting.
- Check ignition sequence:
  1. Blower RPMs ramp up and then level off.
  2. Gas valve on (click) 4 seconds after blower starts
  3. Flame on the burner
  4. Flame rectification - flame is sensed
  5. Burner stays on - visual flame/glow

APPLIANCE SYSTEM INSPECTED AT A MINIMUM ONCE A YEAR BY A QUALIFIED SERVICE PERSON (ANNUAL PRE-SEASONAL INSPECTION)

- Proper field operation of burner. Measure CO, CO_2%, O_2%, flue temperature, and burner efficiency at 100% demand with the tank at a boil. Verify that measurements are within the guidelines described in Table 62-1; if not, consult DriSteem.
- Flue passageways external to the appliance, such as vent connector, sealed combustion piping, and chimney, are clear and free of obstructions.
- Upgrade Vapor-logic software to the latest version.
- At least annually, inspect the ventilation apparatus, ensuring the following:
  - Vent connector is in place, sloping upward, and physically sound without holes or excessive corrosion.
  - Physical support of the appliance is sound without sagging, cracks, or gaps between floor stand or tank flanges.
  - Adequate combustion and ventilation air in accordance with Section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1 or applicable provisions of governing codes. Canadian installations must be installed in accordance with sections 7.2, 7.3, and 7.4 of the CAN/CGA.B149 Installation Codes and all authorities having jurisdiction.

REPLACEMENT PARTS

When servicing or repairing this equipment, use only DriSteem-approved service replacement parts. Complete replacement part lists are on Pages 70 through 79. Refer to the rating plate on the GTS humidifier for complete unit model number, serial number, and company address. Any substitution of parts or controls not approved by DriSteem will be at owner's risk and will void the warranty.

⚠ WARNING

SHUTDOWN PROCEDURE

To prevent severe personal injury or death from electrical shock, fire, or explosion, follow this shutdown procedure before performing service or maintenance procedures on this humidifier.

1. Use Vapor-logic display, change the control mode to Standby.
2. Place all power disconnects in OFF position and lock in OFF position.
3. Close field-installed manual supply water shut-off valve.
4. Close gas shut-off valves.

Table 62-1:
GTS products of combustion guidelines (at 100% demand)

CO	Must be less than 400 ppm. 0-60 ppm typical.
CO_2%	8-9% is typical for natural gas, 9-10% is typical for LP gas
O_2%	5.5% ±1.0%
Flue temperature	Less than 140°F (Less than 60°C)
Thermal efficiency	Greater than 91%
NOx	20 ppm max, (domestic units)

Troubleshooting

The *Vapor-logic Installation and Operation Manual* that shipped with your humidifier is a comprehensive operation manual. Refer to it for troubleshooting information.

Water quality and maintenance

WATER QUALITY RECOMMENDATIONS

The best way to determine how often your particular system needs maintenance is to remove the water detection probe and inspect the interior of the unit for mineral deposits after three months of duty. Potable water carries a variety of minerals and other materials in a mix that varies from location to location. This variation in water quality, combined with the hours of operation and duty cycle, will determine your own unique maintenance schedule.

WATER QUALITY MAKES A DIFFERENCE

- Light to moderately hard water (2 to 10 grains hardness per gallon [35 mg/L to 170 mg/L]) requires:
  - Annual cleaning
  - Occasional skimming and draining
- High mineral content water (more than 10 grains hardness per gallon [more than 170 mg/L]) requires:
  - Cleaning frequency determined by use and water quality
  - More frequent skimming and draining
  - Periodic drain and flush cycles
- Softened water dramatically reduces mineral accumulation
  Note: Solids, like silica, are not removed in the softening process.
- RO/DI water virtually illuminates the build-up of minerals.

RO/DI WATER QUALITY RECOMMENDATIONS

- Verify regularly that water processing equipment is operating correctly. The presence of chlorides in improperly processed DI water can cause pitting and failure of the tank and heat exchanger. Your DriSteem warranty does not cover damage caused by chloride corrosion.
- GTS humidifiers that use RO/DI water do not require regular cleaning, although regular inspections are advised.
- GTS humidifiers that use RO/DI water do not require skimming or draining and flushing to remove precipitated minerals. However, at the end of a humidification season, drain all DI humidifiers by programming the humidifier to automatically drain at end-of-season.

Humidifier De-scaling solution

Scale buildup on humidifier heat exchangers acts as an insulator, reducing humidifier performance while increasing energy costs. To keep humidifiers operating as efficiently as possible, remove scale with DriSteem's Humidifier De-scaling Solution, available for purchase from your DriSteem representative or distributor.

The De-scaling Solution cleans without risk of corroding humidifier tanks or welds. The De-scaling Solution also cleans surfaces unreachable by hand scraping.

DriSteem's Humidifier De-scaling Solution is the only approved cleaner/de-scaler for use with DriSteem humidifiers. Use of other cleaners/ de-scalers may void your DriSteem warranty.

Water quality and maintenance

COOL DOWN PROCEDURE

Before performing any maintenance, allow the tank to cool down.

- Insulated and uninsulated tanks will have hot surfaces.
- Verify that there is no call for humidity and that the aquastat set point (adjusted using the display screens in Settings/Water Management) is less than room temperature (default setting is 50 °F [10 °C]) so the burners do not energize while cooling down the tank.
- Use the display to perform the cool down process.

1. Go to the Home screen.
2. Change mode to Drain, and allow approximately half the water to drain out of the tank. The fill valves may also be on to temper the water.
3. Change the mode back to Auto; the fill valve opens and the humidifier cools down with the additional cool water.
4. When the fill valve closes, go back into Drain mode, and allow the tank to drain completely. The humidifier should be cool enough to work on.

Note: For more information about using the display, see the *Vapor-logic Installation and Operation Manual*.

INSPECTION AND MAINTENANCE

1. **Annually** (also recommended when maintenance is performed)
   - Inspect tank, piping, and gaskets for water and gas leaks.
   - Inspect condensate lines for blockage and verify condensate neutralizer is in working condition (pH above 5).
   - Inspect venting bird screens for blockage. Clean or replace if damaged.
   - All safety devices in the control circuit should be cycled on and off to verify they are functioning. These include:
     - High limit switch
     - Airflow proving switch
     - Low water level probe. Pull out probe plug; fill valve should energize.
     - Flue temperature sensor. Observe the temperature read out on the Vapor-logic display during normal operation. The temperature will fluctuate slightly during refill events.
     - Tank temperature sensor. Observe the tank temperature read out on the Vapor-logic home screen during a cold start of the humidifier. The temperature will gradually increase to boiling temperature.

Inspection and maintenance

2. **Seasonally** (or as required, depending on water quality)
   - Clean tank
     - Drain tank.
     - Remove cleanout plate and dispose of any loose scale that has collected in the tank. Do this before the scale buildup reaches the bottom of the heat exchanger.
     - Inspect the area inside the tank in front of the drain valve fitting and thoroughly clean all scale and mineral buildup from that area.
     - Replace the cleanout plate using new gaskets.
   - Dismantle and clean drain valve and associated piping
   - Clean the probes
     - Access the probe assembly through the round pop cover on the roof panel.
     - Disconnect the probe plug and cable assembly and unscrew the probe rod assembly from the humidifier probe housing.
     - Inspect the probe housing and clean, ensuring that all the housing passageways are clear.
     - The scale should flake off easily from the probe assembly rods.
     - The bottom 3/8" (10 mm) of each rod is the sensing portion; clean these areas with a wire brush, abrasive pad, or steel wool.
     - Inspect the composite plastic probe head for any signs of cracking, roughness, or deterioration. If found, replace entire probe assembly.
     - Reassemble the probe assembly.
   - Clean the skim/overflow port
     - Water should drain from the skimmer drain pipe after each daily probe check. This should be verified visually by a weekly inspection.
     - Loosen deposits in and around the skimmer/overflow port with a long tool such as a screwdriver.
     - If flow through the water seal/P-trap is diminished due to mineral accumulation:
     - Remove the water seal piping from the humidifier and flush out.
     - Replace the water seal with new piping if the minerals have hardened in the water seal.
   - Clean the tank temperature probe — Inspect the probe for mineral accumulation. The probe is located on the heat exchanger plate just above the combustion assembly. Use stainless steel wool to clean the probe.

⚠ WARNING

Follow the shutdown procedure
Follow the shutdown procedure on Page 62 before performing service or maintenance procedures on this humidifier. Failure to follow the shutdown procedure could cause electrical shock, fire, or explosion and severe personal injury or death.

Inspection and maintenance (continued)

- Inspect blower motor — A lubrication port is not provided, therefore lubrication is not required.
- Remove dust — Using a vacuum, remove all dust from areas around the motor, vent fan(s), and louvers that allow air to the shrouded area.
- When the maintenance requirements are complete:
  - Replace cleanout plate and tighten the nuts on the plate. Torque the nuts to 60 in-lb (6.8 N-m).
    Note: Always install a new gasket when the clean out plate is reassembled.
  - Verify that the probe head is secure and that the probe plug and cable assembly are plugged into the probe rod holder.
  - Verify that the drain valve assembly is in the closed position.
- After confirming the plumbing connections are secure, perform a tank de-scaling procedure using the DriSteem GTS humidifier tank de-scaling kit.
- When the chemical de-scaling process is complete:
  - Replace and secure all covers and doors.
  - Turn on the water supply.
  - Turn on the electrical power.
  - Turn on gas.
  - Do not leave humidifier unattended. Allow the humidifier to cycle through multiple fill cycles and verify that the humidifier cover, cleanout plate, and probe holder gasket are not leaking.
- Verify proper operation of the humidifier after servicing is complete.

3. **Off-season** maintenance
   - Perform complete inspection and cleaning of the following:
     - Probe rods
     - Skimmer port and water seal
     - Humidifier tank
     - Primary heat exchanger (see page 67 for instructions)
   - Drain humidifier tank and rinse.
   - Perform a tank de-scaling using the DriSteem GTS humidifier tank de-scaling kit.
   - After cleaning, the humidifier should remain empty until humidification is required.

Important:
Minimum supply water pressure is 25 psi (172 kPa).

⚠ WARNING

Prevent wiring errors
When servicing controls, before disconnecting, label all connections. Wiring errors can cause explosion or fire, resulting in severe bodily injury, death, or significant property damage.

Inspection and maintenance: Heat exchangers

REMOVAL OF THE PRIMARY HEAT EXCHANGER

1. Disconnect:
   - Incoming gas line
   - Water lines (at the primary tank secondary tank and Drain-kooler water tempering device)
   - Main drain line
   - Component power connections (blower, ignition module and tank temp sensor)
2. Remove secondary heat exchanger. See instructions.
3. Remove the water tempering device.
4. Remove nuts around the perimeter of the heat exchanger face.
5. Pull heat exchanger out horizontally
   Note: Support the heat exchanger face once it is free of the studs.
6. Reverse this procedure to reassemble.
   Note: Always install a new gasket when the heat exchanger is reassembled.

REMOVAL OF THE SECONDARY HEAT EXCHANGER(S)

1. Drain the humidifier tank.
2. Follow the shut down procedure on page 62.
3. Disconnect from the secondary heat exchanger(s):
   - Combustion air hoses
   - Combustion air vacuum line
   - Incoming water
   - Discharge water
   - Pressure equalization hose
   - Pressure switch
   - Temperature switch
   - Condensate p-trap
4. Remove the tri-clover clamp connecting the primary and secondary heat exchanger(s).
5. Loosen the worm gear clamp on the stainless steel collar at the top of the heat exchanger(s).
6. Remove eight bolts and nuts from the flange at the secondary heat exchanger(s) flue gas outlet.
7. Remove the four nuts from the bracket securing the secondary heat exchanger(s) to the primary tank, and allow it to drop free from the plastic flue adapter.

Combustion assemblies

REMOVING THE COMBUSTION ASSEMBLY

This is not a regular maintenance item, but if the heat exchanger tubes contain carbon deposits, soot, or other residue, clean as follows:

1. Follow the shutdown procedure on Page 62.
2. Remove shroud.
3. Disconnect wiring to blowers, flame sensors, gas valves, and ignition controllers. Remove sealed combustion tube, pressure equalization tube, primary gas line and enhanced spark ignition gas supply line.
4. Remove the four burner assembly nuts from each assembly and pull the entire valve, blower, and burner assembly out.
5. Perform maintenance as required.
6. Reinstall the combustion assembly with the new gasket.
7. Reconnect all electrical wiring, intake venting, pressure switches, and gas supply lines.

   Note: To ease reassembly, disconnect components from one burner assembly at a time, and clean each individually.

⚠ WARNING

Respiratory hazard
When cleaning burners with compressed air, wear appropriate respiratory protection. Failure to do so may cause severe bodily injury.

Note:
Soot and carbon deposits may indicate a combustion problem that needs to be corrected. Consult the factory.

MAINTENANCE FREQUENCY

Under normal use conditions, the burner(s) should not need cleaning for a minimum of five years. However, depending on the operating environment, the burner(s) may require periodic cleaning to remove accumulated materials. Failure to clean burners can result in reduced unit capacity. Use sealed combustion in dirty environments. See burner maintenance instructions on page 69.

Combustion assemblies

BURNER MAINTENANCE INSTRUCTIONS

To service the burner system, clean both the blower and the burner. Remove the blower(s) from the system and allow you to clean dust from the wheel. Remove the four nuts from each burner assembly for cleaning. Removing and cleaning one burner at a time eases reassembly. To dislodge particulate matter from the burner surface matrix, use compressed air (100 psig [700 kPa] maximum). Keep the air nozzle about 2" (50 mm) from the burner's surface, blowing air perpendicular to the burner surface while moving the nozzle back and forth lengthwise. This dislodges particles trapped in the matrix, pushing them back inside the burner. Avoid blowing air across the surface, which tends to have a destructive effect on the burner surface. Allow particulate matter to fall from the burner through the air/gas inlet. To assist in removing the particulate matter, use a vacuum at the burner's air/gas inlet.

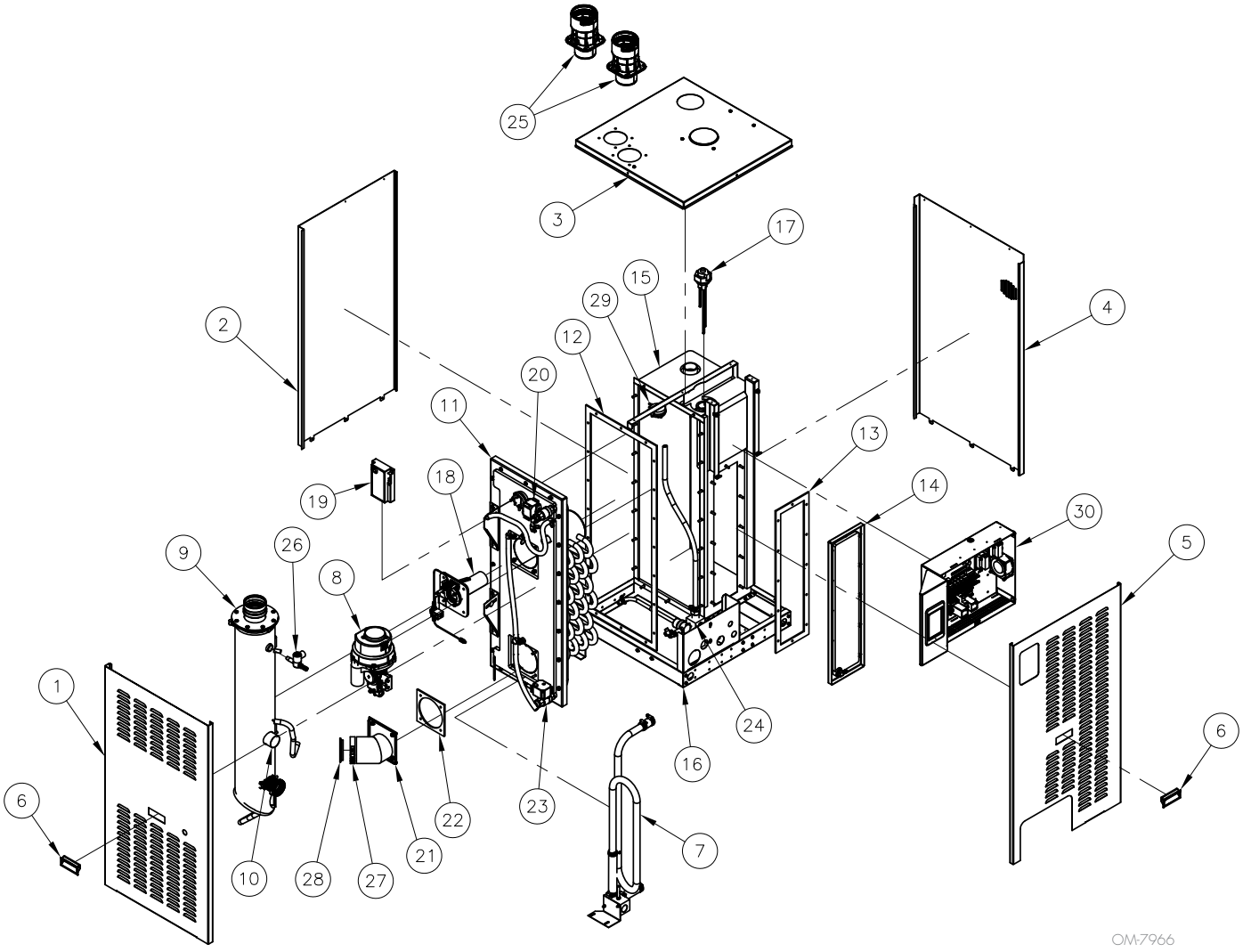
IGNITOR AND FLAME SENSE ROD

The enhanced spark ignition and flame sensor rod, as well as their supporting gaskets, should be replaced at the same time every 5 years. The entire combustion assembly does not need to be removed to replace these components.

1. Follow the shutdown procedure on Page 62.
2. Remove shroud.
3. Disconnect flame sensor wire, ignition wire and enhanced spark ignition from gas line.
4. Remove the mounting nuts and pull the components free from the assembly.
5. Replace with the new components.
6. Reconnect flame sensor wire, ignition wire and enhanced spark ignition to the gas line.
7. Replace shroud.

GTS humidifier (Models LX-50 through LX-150)

FIGURE 70-1: GTS HUMIDIFIER LX SERIES REPLACEMENT PARTS (MODELS LX-50 THROUGH LX-150)



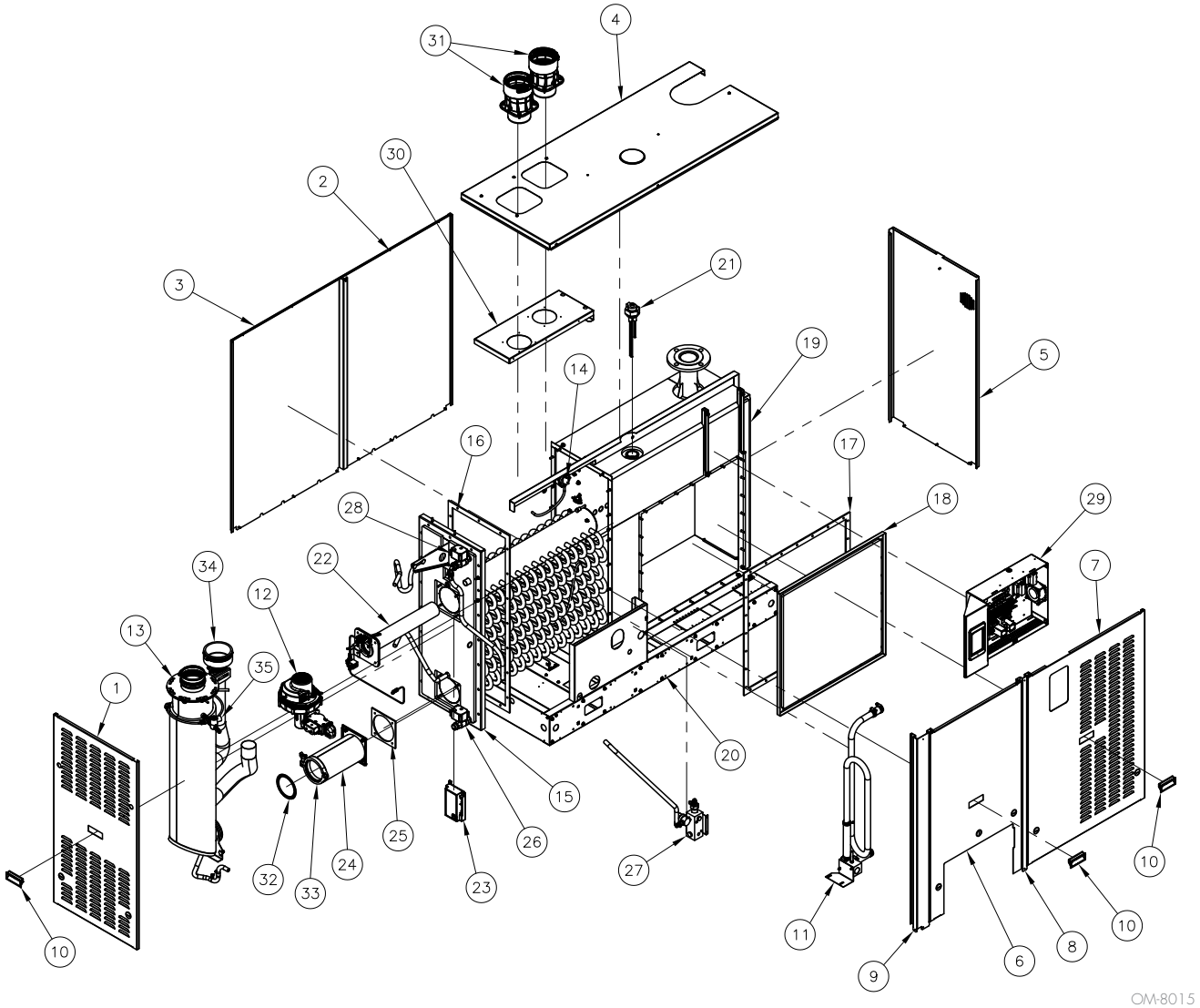
GTS humidifier LX series (Models LX-50 through LX-150)

Table 71-1:
GTS humidifier LX series replacement parts (Models LX-50 through LX-150)

No.	Description	Part no.	No.	Description	Part no.
1	LEFT BURNER SHROUD GTS LX 50-150	600273	14	CLEANOUT PLATE ASSY GTS LX 50/75/100 304	184405-050
2	BACK SHROUD GTS LX 50/75/100	600274		CLEANOUT PLATE ASSY GTS LX 50/75/100 316	184406-050
	BACK SHROUD GTS LX 150	600278		CLEANOUT PLATE ASSY GTS LX 150 304	184405-100
3	TOP SHROUD GTS LX 50/75/100	600271		CLEANOUT PLATE ASSY GTS LX 150 316	184406-100
	TOP SHROUD GTS LX 150	600276	15	TANK ASSY LX 50/75/100 304SST	184400-050
4	RIGHT SHROUD GTS LX 50-150	600275		TANK ASSY LX 50/75/100 316SST	184401-050
5	FRONT SHROUD GTS LX 50/75/100	600272		TANK ASSY LX 150 304SST	184400-100
	FRONT SHROUD GTS LX 150	600277		TANK ASSY LX 150 316SST	184401-100
6	HANDLE DOOR PLASTIC BLACK	405805-003	16	FRAME GTS LX 50/75/100 22.75 X 22.75	184310-001
7	DRAIN MANIFOLD ASSY GTS LX	600199-100		FRAME GTS LX 150 22.75 X 31.75	184310-002
	DRAIN MANIFOLD ASSY GTS LX EURO	600199-101	17	PROBE ASSY GTS LX	184315-003
	DRAIN MANIFOLD OUTDOOR ASSY GTS LX	600199-103	18	GTS LX BURNER ASSY 50/75/100	600445
	DRAIN MANIFOLD OUTDOOR ASSY GTS LX EURO	600199-104		GTS LX BURNER ASSY 150	600446
8	BLOWER ASSY GTS LX 50/75/100	400092-050	19	IGNITION CONTROL 24VAC SPARK	405811-001
	BLOWER ASSY GTS LX 150	400092-150	20	VALVE 3/4'' NPT SST (NC)	505077-001
9	FLUE FLANGE 5'' TO 3'' WELD	161145-001	21	INTERCONNECTING PIPING SEC HEAT EXCH 5''	161125-001
10	SEC HX ASSY GTS LX 50/75/100 INDOOR	600375-001	22	GASKET 5.75X5.75 CONN 3" PIPING SILICONE	308239-001
	SEC HX ASSY GTS LX 150 INDOOR	600376-001	23	DRAIN 3/4'' INDOOR ASSY LX	184325-001
11	PRIMARY HX ASSY LX 50 304	184410–051		DRAIN 3/4'' OUTDOOR ASSY LX	184325-002
	PRIMARY HX ASSY LX 75 304	184410–076	24	MANIFOLD BLOCK FILL 3/8'' INDOOR ASSY NPT	184330-001
	PRIMARY HX ASSY LX 100 304	184410–101		MANIFOLD BLOCK FILL 3/8'' OUTDOOR ASSY NPT	600432-001
	PRIMARY HX ASSY LX 150 304	184410–151		MANIFOLD BLOCK FILL 3/8'' INDOOR ASSY BSP	184330-011
	PRIMARY HX ASSY LX 50 316	184410–050		MANIFOLD BLOCK FILL 3/8'' OUTDOOR ASSY BSP	600432-002
	PRIMARY HX ASSY LX 75 316	184410–075	25	ADAPTER 3 TO 1 DURO VENT 3"	305394-003
	PRIMARY HX ASSY LX 100 316	184410–100	26	VALVE FILL SST ¼" 24V 0.125 ORF	184435-025
	PRIMARY HX ASSY LX 150 316	184410-150	27	TRICLOVER CLAMP 3" C	207001-300
12	GASKET HT EXCH PRIMARY EPDM LX 50-300	308239-013	28	TRICLOVER GASKET 3" O-RING EPDM	207002-300
13	GASKET CLEANOUT PLATE LX 50/75/100 EPDM	308238-051	29	PRESSURE SWITCH 1" WC	127601-001
	GASKET CLEANOUT PLATE LX 150 EPDM	308238-101	30	SUBPANEL ASSY GTS LX	Contact DriSteem

GTS humidifier (Models LX-200, LX-250, and LX-300)

FIGURE 72-1: GTS REPLACEMENT PARTS (MODELS LX-200 THROUGH LX-300)



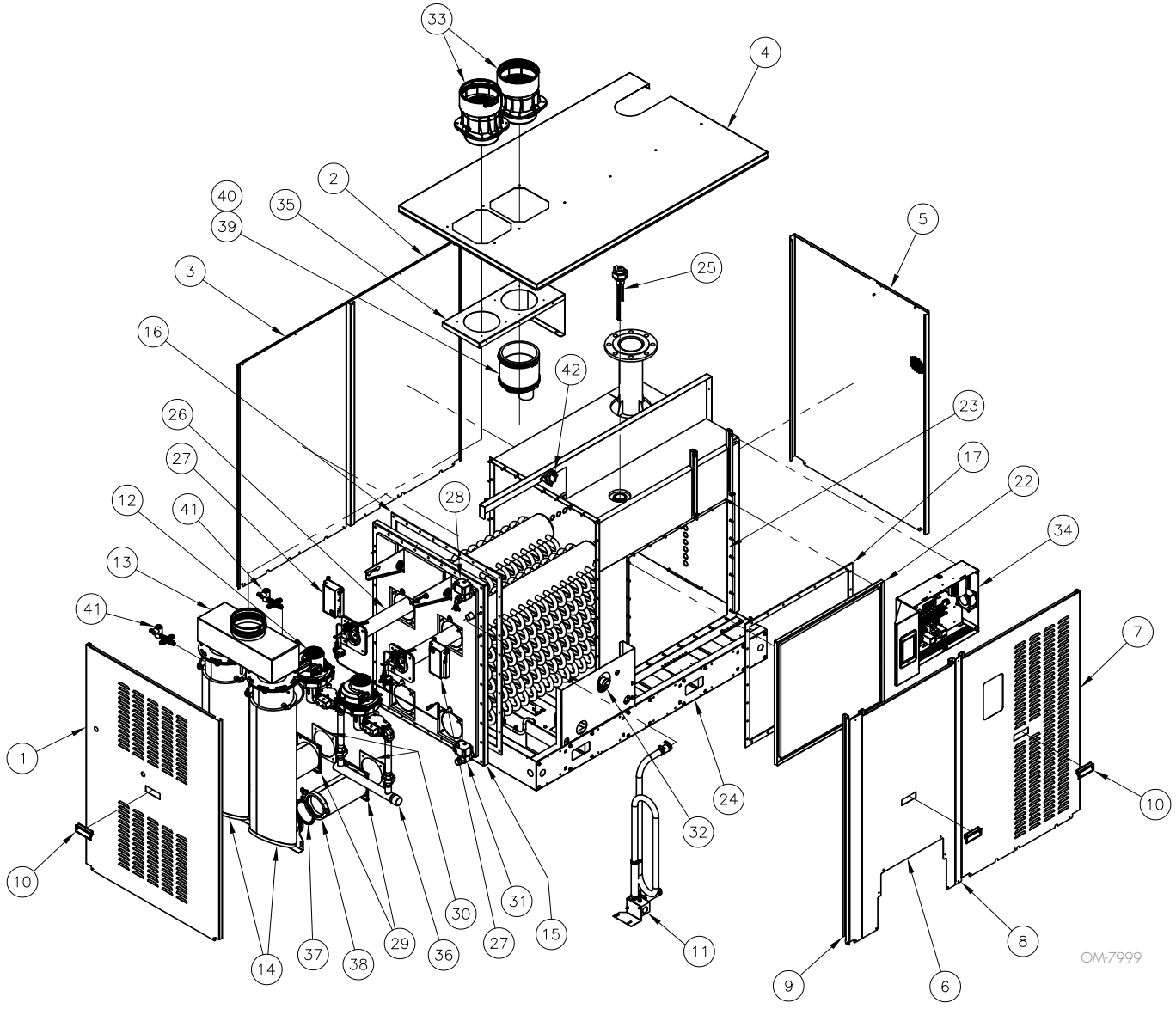
GTS humidifier LX series (Models LX-200, LX-250, and LX-300)

Table 73-1:
GTS replacement parts for Models LX-200 through LX-300)

No.	Description	Part no.	No.	Description	Part no.
1	LEFT BURNER SHROUD GTS LX 200-300	600172	18	CLEANOUT PLATE LX 200-600 304 SST	184405-600
2	SHROUD BACK LEFT GTS LX 200-300	600407		CLEANOUT PLATE LX 200-600 316 SST	184405-601
3	SHROUD BACK RIGHT GTS LX 200-300	600408	19	TANK ASSY GTS LX 200-300 304	184400-300
4	TOP SHROUD GTS LX 200-300	600169		TANK ASSY GTS LX 200-300 316	184400-301
5	RIGHT SHROUD GTS LX 200-300	600173	20	FRAME LX 200-300 21.52 X 55.75 X 6.13	600153
6	SHROUD FRONT LEFT GTS LX 200-300	600409	21	PROBE ASSY GTS LX	184315-003
7	SHROUD FRONT RIGHT GTS LX 200-300	600410	22	GTS LX BURNER ASSY 200 TO 600	600396
8	SUPPORT, CENTER GTS LX 200-300	600411	23	IGNITION CONTROL 24VAC SPARK	405811-001
9	SUPPORT, CORNER GTS LX 200-300	600412	24	INTER CONN. PIPING SECONDARY HX	600108
10	HANDLE DOOR PLASTIC BLACK	405805-003	25	GASKET 5.75X5.75 CONN 3" PIPING SILICONE	308239-001
11	DRAIN MANIFOLD ASSY GTS LX	600199-100	26	DRAIN 3/4'' INDOOR ASSY LX	184325-001
	DRAIN MANIFOLD ASSY GTS LX EURO	600199-101		DRAIN 3/4'' OUTDOOR ASSY LX	184325-002
	DRAIN MANIFOLD OUTDOOR ASSY GTS LX	600199-103	27	MANIFOLD BLOCK FILL 3/8'' INDOOR ASSY NPT	184330-001
	DRAIN MANIFOLD OUTDOOR ASSY GTS LX EURO	600199-104		MANIFOLD BLOCK FILL 3/8'' OUTDOOR ASSY NPT	600432-001
12	BLOWER ASSY GTS LX 200-600 120V	400092-200		MANIFOLD BLOCK FILL 3/8'' INDOOR ASSY BSP	184330-011
	BLOWER ASSY GTS LX 200-600 230V (PP)	400092-241		MANIFOLD BLOCK FILL 3/8'' OUTDOOR ASSY BSP	600432-002
13	SECONDARY HX ASSY LX 200/250 INDOOR	600236	28	VALVE 3/4'' NPT SST (NC)	505077-001
14	PRESSURE SWITCH 1" WC	127601-001	29	SUBPANEL ASSY GTS LX	Contact DriSteem
15	PRIMARY HX ASSY GTS LX 200-250 (304)	184410-250	30	MOUNT INTAKE/EXHAUST LX 200-300	600207
	PRIMARY HX ASSY GTS LX 200-250 (316)	184410-251	31	ADAPTER 3 TO 1 DURO VENT 4"	305394-004
	PRIMARY HX ASSY GTS LX 300 (304)	184410-300	32	TRICLOVER GASKET 4" O-RING EPDM	600248
	PRIMARY HX ASSY GTS LX 300 (316)	184410-301	33	TRICLOVER CLAMP 4"	600048
16	GASKET HT EXCH PRIMARY EPDM LX 50-300	308239-013	34	COMBUSTION AIR INTAKE HOSE ASSY -2.5 DIA	600196
17	GASKET CLEANOUT EPDM LX 200-600	308238-102	35	VALVE FILL SST ¼" 24V 0.125 ORF	184435-025

GTS humidifier (Models LX-400 through LX-600)

FIGURE 74-1: GTS REPLACEMENT PARTS (MODELS LX-400 THROUGH LX-600)



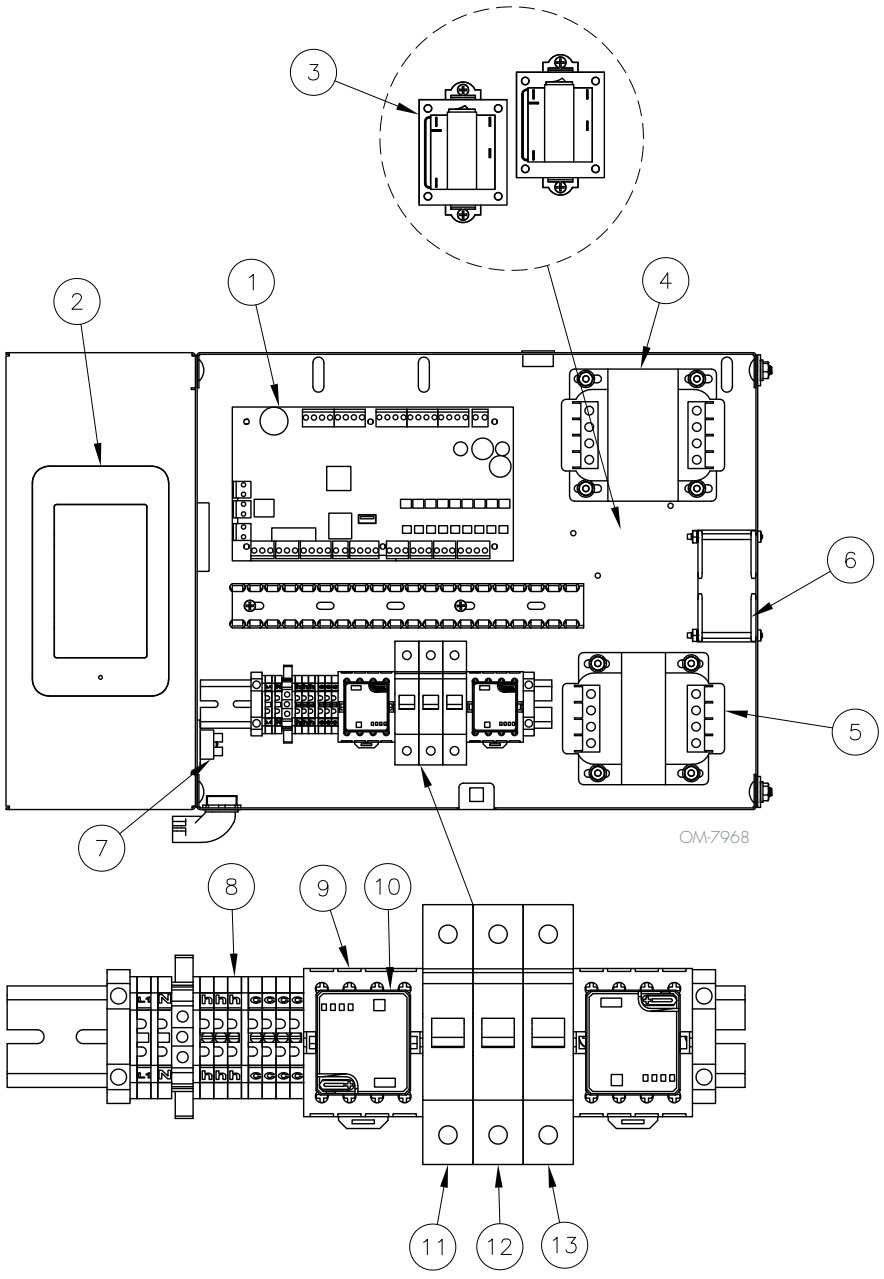
GTS humidifier LX series (Models LX-400 through LX-600)

Table 75-1:
GTS replacement parts for Models LX-400 through LX-600)

No.	Description	Part no.	No.	Description	Part no.
1	LEFT BURNER SHROUD GTS LX 400-600	600149	23	TANK ASSY GTS LX 400-600 304	184400-600
2	LEFT BACK SHROUD GTS LX	600401		TANK ASSY GTS LX 400-600 316	184400-601
3	RIGHT BACK SHROUD GTS LX	600402	24	FRAME GTS LX	600093
4	TOP SHROUD GTS LX 400-600	600146	25	PROBE ASSY GTS LX	184315-003
5	RIGHT SHROUD GTS LX	600150	26	GTS BURNER ASSY LX 200-600	600396
6	FRONT SHROUD GTS LX LEFT	600403	27	IGNITION CONTROL 24VAC SPARK	405811-001
7	FRONT SHROUD GTS LX RIGHT	600404	28	VALVE 3/4" NPT SST (NC)	505077-001
8	SUPPORT, CENTER GTS LX 400-600	600405	29	INTERCONNECTING PIPING SEC HEAT EXCHANGER 5"	600108
9	SUPPORT, CORNER GTS LX 400-600	600406	30	GASKET 5.75 X 5.75 CONN 3" PIPING EPDM	308239-001
10	HANDLE DOOR PLASTIC BLACK	405805-003	31	DRAIN 3/4" INDOOR ASSY LX	184325-001
11	DRAIN MANIFOLD ASSY GTS LX	600199-100		DRAIN 3/4'' OUTDOOR ASSY LX	184325-002
	DRAIN MANIFOLD ASSY GTS LX EURO	600199-101	32	MANIFOLD BLOCK FILL 3/8'' INDOOR ASSY NPT	184330-001
	DRAIN MANIFOLD OUTDOOR ASSY GTS LX	600199-103		MANIFOLD BLOCK FILL 3/8'' OUTDOOR ASSY NPT	600432-001
	DRAIN MANIFOLD OUTDOOR ASSY GTS LX EURO	600199-104		MANIFOLD BLOCK FILL 3/8'' INDOOR ASSY BSP	184330-011
12	BLOWER ASSY GTS LX 200-600 120V	400092-200		MANIFOLD BLOCK FILL 3/8'' OUTDOOR ASSY BSP	600432-002
	BLOWER ASSY GTS LX 200-600 230V	400092-241	33	ADAPTER 3 TO 1 DURO VENT 6"	305394-006
13	WELD FLUE ADAPTER 5" TO 6"	600534	34	SUB PANEL ASSY GTS LX	600562
14	INDOOR SECONDARY HEAT EXCHANGER ASS LX-400 TO LX-600 (2X)	600234	35	MOUNT INTAKE/EXHAUST LX 400-600	600113
15	PRIMARY HX ASSY GTS LX 400-500 (304)	184410-500	36	MAINFOLD WELD GAS 2 BURNER	600268
	PRIMARY HX ASSY GTS LX 400-500 (316)	184410-501	37	TRICLOVER GASKET 4" O-RING EPDM	600248
	PRIMARY HX ASSY GTS LX 600 (304)	184410-600	38	HIGH POLISH QUICK CLAMP	600048
	PRIMARY HX ASSY GTS LX 600 (316)	184410-601	39	COUPLING AND TUBE CLAMP	600066
16	GASKET HEAT EXCHANGER EPDM LX-400 TO LX-600	308239-014	40	ADAPTER 2 TO 1	600062
17	GASKET CLEANOUT PLATE LX 400-600 EPDM	308238-102	41	VALVE FILL SST ¼" 24V 0.125 ORF	183435-025
22	CLEANOUT PLATE ASSY GTS LX 200-600 304	184405-600	42	PRESSURE SWITCH 1" WC	127601-001
	CLEANOUT PLATE ASSY GTS LX 200-600 316	184405-601			

Electrical parts

FIGURE 76-1: GTS ELECTRICAL REPLACEMENT PARTS



Note: See Pages 78 and 79 for GTS Outdoor Enclosure replacement parts.

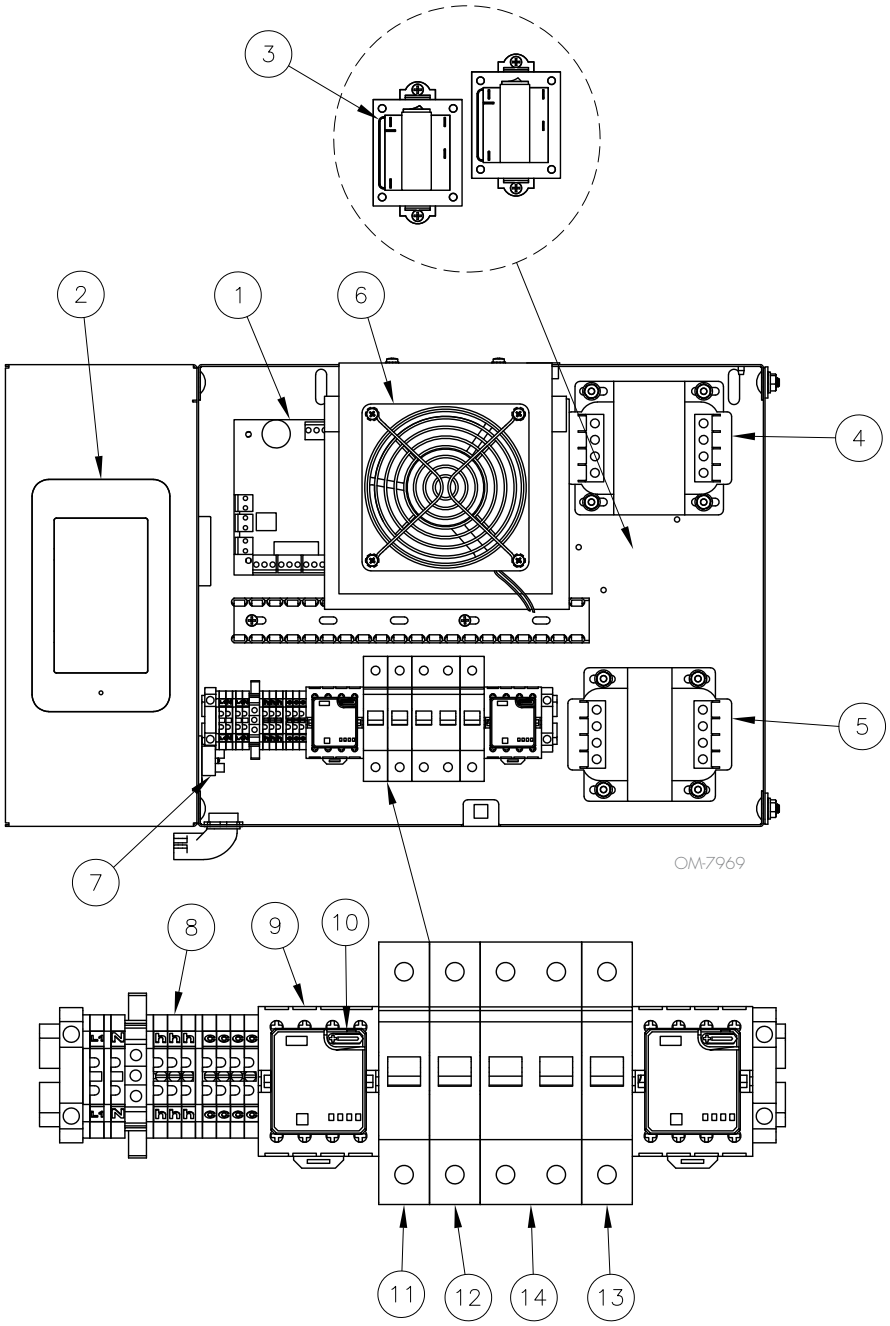
Electrical parts

Table 77-1:
GTS electrical replacement parts

No.	Description	Part no.
1	MAIN CONTROLLER VL6	408496-006
2	DISPLAY VAPOR-LOGIC TOUCHSCREEN	183508-001
3	TRANSFORMER, 120V, 24V SEC - QC	408965-101
4	TRANSFORMER, 230/400, 24V SEC - 100VA (EUROPEAN)	408985-201
	TRANSFORMER, 230/400, 24V SEC - 150VA (EUROPEAN)	408895-203
5	TRANSFORMER, 230/400, 115V SEC - 150VA (EUROPEAN)	408985-202
6	FAN SQ 24V 36CFM 3.13" X 1.5"	407115
7	TERMINAL 3 POSITION 10MM SPACING WECO (SDU OPTION)	530010-073
8	TERMINAL DIN RAIL 20A CENTER	408252-001
9	SOCKET RELAY DPDT W/OUT TIME DELAY	407900-019
10	RELAY 24V DPDT FINDER	407900-016
11	BREAKER CIRCUIT 2A 480V 1POLE GE D-CURVE (EUROPEAN)	406775-107
12	BREAKER CIRCUIT 5A 480V 1POLE GE D-CURVE (EUROPEAN)	406775-112
13	BREAKER CIRCUIT 4A 480V 1POLE GE D-CURVE (SDU OPTION)	406775-109

Outdoor enclosure

FIGURE 78-1: OUTDOOR ENCLOSURE ELECTRICAL REPLACEMENT PARTS



Outdoor enclosure

Table 79-1:
Outdoor Enclosure electrical replacement parts

No.	Description	Part no.
1	MAIN CONTROLLER VL6	408496-006
2	DISPLAY VAPOR-LOGIC TOUCHSCREEN	183508-001
3	TRANSFORMER, 120V, 24V SEC - QC	408965-101
4	TRANSFORMER, 230/400, 24V SEC - 100VA (EUROPEAN)	408985-201
	TRANSFORMER, 230/400, 24V SEC - 150VA (EUROPEAN)	408895-203
5	TRANSFORMER, 230/400, 115V SEC - 150VA (EUROPEAN)	408985-202
6	FAN ASSY CABINET 120V	185110-003
	FAN ASSY EURO CABINET 230V	185110-004
7	TERMINAL 3 POSITION 10MM SPACING WECO (SDU OPTION)	530010-073
8	TERMINAL DIN RAIL 20A CENTER	408252-001
9	SOCKET RELAY DPDT W/OUT TIME DELAY	407900-019
10	RELAY 24V DPDT FINDER	407900-016
11	BREAKER CIRCUIT 2A 480V 1POLE GE D-CURVE (EUROPEAN)	406775-107
12	BREAKER CIRCUIT 5A 480V 1POLE GE D-CURVE (EUROPEAN)	406775-112
13	BREAKER CIRCUIT 4A 480V 1POLE GE D-CURVE (SDU OPTION)	406775-109
14	BREAKER CIRCUIT 10A 480V 2POLE GE D-CURVE	406775-113
	BREAKER CIRCUIT 4A 480V 2POLE GE D-CURVE (EUROPEAN)	406775-104
	DUAL THERMOSTAT FOR OE	600293
	HEATER O.E. 120V 400W GTS LX*	600390
	HEATER O.E. 230V 400W GTS LX*	600390-001
*QTY 2 REQUIRED FOR LX-400 - LX-600		

European models only

This equipment has been tested by the Canadian Standards Association International to the Low Voltage, Gas Appliance, and EMC directives and has been certified by AFNOR for use in all EU countries.

Electrical warning label

Location: Control cover, shroud
Definition: Electrical shock hazard

Important:
This equipment is for use with second family (G20, G25) natural gases; and third family (G30, G31) propane gas. Contact your distributor before converting to another group or supply pressure.

AUTHORIZED COUNTRIES OF DESTINATION

GTS humidifiers bearing the CE mark are authorized for use in the European countries listed below.

Austria	AT	Greece	GR
Belgium	BE	Ireland	IE
Switzerland	CH	Iceland	IS
Germany	DE	Italy	IT
Denmark	DK	Luxembourg	LU
Spain	ES	Netherlands	NL
Finland	FI	Norway	NO
France	FR	Portugal	PT
United Kingdom	GB	Sweden	SE

APPLIANCE CATEGORY

In relation to the country of destination, this humidifier is classified under one of the following boiler categories: category I_{2H}, I_{2L}, I_{2E}, I_{2E+}, I_{2LL}, I_{2ES}, I_{2Fi}, I_{2ER}, $I_{3B/P}$, I_{3P}

See the unit data plate for the specific category of your appliance.

Table 80-1:
Gas specifications for European models

Model GTS LX Series	Volumetric flow rate by gas category				
	2H-G20-20 mbar 2E-G20-20 mbar 2Es-G20-20 mbar	2L-G25-25 mbar 2LL-G25-20 mbar 2Ei-G25-25 mbar	2E+G20/G25-20/25 mbar 2ER-G20/G25-20/25 mbar	3B-G30-30 mbar 3B-G30-50 mbar	3P-G31-30 mbar 3P-G31-37 mbar 3P-G31-50 mbar
LX-50	1.41 m³/h	1.72 m³/h	1.41-1.72 m³/h	0.80 m³/h	0.91 m³/h
LX-75	2.11 m³/h	2.58 m³/h	2.11-2.58 m³/h	1.20 m³/h	1.36 m³/h
LX-100	2.82 m³/h	3.44 m³/h	2.82-3.44 m³/h	1.60 m³/h	1.82 m³/h
LX-150	4.23 m³/h	5.16 m³/h	4.23-5.16 m³/h	2.40 m³/h	2.73 m³/h
LX-200	5.64 m³/h	6.88 m³/h	5.64-6.88 m³/h	3.20 m³/h	3.64 m³/h
LX-250	7.05 m³/h	8.60 m³/h	7.05-8.60 m³/h	4.00 m³/h	4.54 m³/h
LX-300	8.32 m³/h	10.15 m³/h	8.32-10.15 m³/h	4.72 m³/h	5.36 m³/h
LX-400	11.27 m³/h	13.76 m³/h	11.27-13.76 m³/h	6.39 m³/h	7.27 m³/h
LX-500	14.09 m³/h	17.20 m³/h	14.09-17.20 m³/h	7.99 m³/h	9.09 m³/h
LX-600	16.63 m³/h	20.30 m³/h	16.63-20.30 m³/h	9.43 m³/h	10.73 m³/h

European models only

Table 81-1:
Specifications for European models

Model GTS LX Series	Average flue temperature	Maximum flue back pressure	Mass flow rate of combustion products	Minimum mass flow rate of combustion products
LX-50	50 °C	1.2 mbar	5.9 g/s	1.2 g/s
LX-75	50 °C	1.2 mbar	8.9 g/s	1.8 g/s
LX-100	50 °C	1.2 mbar	11.8 g/s	2.4 g/s
LX-150	50 °C	1.2 mbar	17.8 g/s	3.6 g/s
LX-200	50 °C	1.2 mbar	23.7 g/s	3.6 g/s
LX-250	50 °C	1.2 mbar	29.6 g/s	3.6 g/s
LX-300	50 °C	1.2 mbar	35.0 g/s	3.6 g/s
LX-400	50 °C	1.2 mbar	47.4 g/s	3.6 g/s
LX-500	50 °C	1.2 mbar	59.2 g/s	3.6 g/s
LX-600	50 °C	1.2 mbar	69.9 g/s	3.6 g/s

Table 81-2:
GTS models, capacities, electrical specifications, and weights, European models

GTS model	Steam capacity per hour in kg*	P = (kW)	Q = (kW)	Steam outlet	Recommended flue size	Operating weight in kg	Shipping weight in kg	Full load amps
LX-50	23	0-17	0-18	DN50 (2") hose/BSP	DN50 or 80 (2" or 3")	217	164	1.5
LX-75	34	0-25	0-27	DN50 (2") hose/BSP	DN80 (3")	217	164	1.5
LX-100	45	0-33	0-36	DN50 (2") hose/BSP	DN80 (3")	216	166	1.5
LX-150	68	0-50	0-54	DN50 (2") hose/BSP	DN80 (3")	285	191	2.0
LX-200	91	0-67	0-72	DN80 (3") hose/BSP/flange	DN100 (4")	415	256	2.5
LX-250	113	0-82	0-89	DN80 (3") hose/BSP/flange	DN100 (4")	415	256	2.5
LX-300	136	0-98	0-106	DN80 (3") hose/BSP/flange	DN100 (4")	415	260	2.5
LX-400	181	0-132	0-143	DN100 (4") BSP/flange	DN150 (6")	729	426	3.5
LX-500	227	0-166	0-179	DN100 (4") BSP/flange	DN150 (6")	729	426	3.5
LX-600	272	0-195	0-211	DN100 (4") BSP/flange	DN150 (6")	731	436	3.5

* Maximum steam capacities listed may be as much as 10% lower than the given values due to local variations in the Wobbe index of G20 and G25 gases.

European models only

CAPACITY NOTES

- At sea level, 402 kJ are required to raise the temperature of one kilogram of water from 4 °C to 100 °C.
- An additional 2257 kJ are required to change the state of one kilogram of 100 °C water to vapor.
- Another factor to consider is condensation steam loss from piping.

LP GAS

All models operate at rated kW input.

OPERATING CHARACTERISTICS

- Unit is capable of operating in ambient conditions of 5 °C to 40 °C.
- Unit is capable of operating in ambient conditions between 30% RH and 95% RH (noncondensing).
- NOx class 5
- Maximum flue temperature under normal operating conditions: 68.3 °C
- Maximum flue temperature safety lockout 82.2°C

GAS SUPPLY PRESSURE

20 or 25 mbar for natural gas (depending on gas group),
and 30, 37 or 50 mbar for propane gas (depending on gas group)

PMS (ALL UNITS)

7.0 bar

ELECTRIC SUPPLY

230V, 667W to 2415W (see data plate)

INLET WATER TEMPERATURE

See Table 33-1.

European models only

TYPE C3 BOILERS

The terminal outlets from separate combustion and air supply circuits shall fit inside a square of 100 cm and that the distance between the planes of the two orifices shall be less than 100 cm.

TYPE C5 AND C6 BOILERS

The terminals for the supply of combustion air and for the evacuation of combustion products shall not be installed on opposite walls of the building.

TYPE C6 BOILERS

- With all non-certified control devices defeated during a worst case boil down condition, overheat combustion product temperature rating will not exceed 82.2°C.
- Minimum combustion product temperature output is 30°C.
- CO_2 content at normal operating conditions is 8.5%.
- Maximum allowable pressure difference is 125 Pa
  Flue gas outlet maximum =112 Pa at maximum
  Flue gas outlet minimum = -12.5 Pa

  Inlet air maximum =12.5 Pa
  Inlet air minimum = -112 Pa
- 25 m/s maximum allowable draught
- Condensate return into the humidifier is allowed but should be minimized.
- Maximum allowable recirculation rate of 10% under worst case wind conditions.

CAUTION

Install connection for gas pressure test gauge

Gas pressure to the humidifier controls must never exceed 6 kPa (60 mbar), or the gas valve will become damaged and require replacement. Install a 1/8" pipe thread (DN6) plugged tapping, accessible for test gauge connection, immediately upstream of the gas supply connection to the appliance.

Notes

Notes

Expect quality from the industry leader

Since 1965, DriSteem has led the industry with innovative methods for humidifying and cooling air with precise control. Our focus on ease of ownership is evident in the design of the GTS humidifier, which features cleanable, stainless steel construction. DriSteem also leads the industry with a Two-year Limited Warranty and optional extended warranty.

For more information

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For the most recent product information visit our website: www.dristeem.com

DRI-STEEM Corporation
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Continuous product improvement is a policy of DriSteem; therefore, product features and specifications are subject to change without notice.

Form No. GTS-LX-IOM-EN-0320
Part No. 890000-261 REV D

TWO-YEAR LIMITED WARRANTY

DRI-STEEM Corporation ("DriSteem") warrants to the original user that its products will be free from defects in materials and workmanship for a period of two (2) years after installation or twenty-seven (27) months from the date DriSteem ships such product, whichever date is the earlier. If any DriSteem product is found to be defective in material or workmanship during the applicable warranty period, DriSteem's entire liability, and the purchaser's sole and exclusive remedy, shall be the repair or replacement of the defective product, or the refund of the purchase price, at DriSteem's election. DriSteem shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or reinstallation of any defective product. The Limited Warranty does not include cylinder replacement for electrode steam humidifiers or media replacement for Wetted Media Systems.

DriSteem's Limited Warranty shall not be effective or actionable unless there is compliance with all installation and operating instructions furnished by DriSteem, or if the products have been modified or altered without the written consent of DriSteem, or if such products have been subject to accident, misuse, mishandling, tampering, negligence or improper maintenance. Any warranty claim must be submitted to DriSteem in writing within the stated warranty period. Defective parts may be required to be returned to DriSteem. Excluded from the Limited Warranty are all consumable and wear and tear items such as cylinders, membranes, filters, or media replacements. These items are subject to usual wear and tear during usage.

DriSteem's Limited Warranty is made in lieu of, and DriSteem disclaims all other warranties, whether express or implied, including but not limited to any IMPLIED WARRANTY OF MERCHANTABILITY, ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, any implied warranty arising out of a course of dealing or of performance, custom or usage of trade. DriSteem SHALL NOT, UNDER ANY CIRCUMSTANCES BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, REVENUE OR BUSINESS) OR DAMAGE OR INJURY TO PERSONS OR PROPERTY IN ANY WAY RELATED TO THE MANUFACTURE OR THE USE OF ITS PRODUCTS. The exclusion applies regardless of whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory, even if DriSteem has notice of the possibility of such damages.

By purchasing DriSteem's products, the purchaser agrees to the terms and conditions of this Limited Warranty.

EXTENDED WARRANTY

The original user may extend the term of the DriSteem Limited Warranty for a limited number of months past the initial applicable warranty period and term provided in the first paragraph of this Limited Warranty. All the terms and conditions of the Limited Warranty during the initial applicable warranty period and term shall apply during any extended term. An extended warranty term of an additional twelve (12) months or twenty four (24) months of coverage may be purchased. The extended warranty term may be purchased until eighteen (18) months after the product is shipped, after which time no extended warranties are available. When a DriSteem humidifier is purchased with a DriSteem RO system, an extended twenty-four (24) month coverage is included.

Any extension of the Limited Warranty under this program must be in writing, signed by DriSteem, and paid for in full by the purchaser.