GTS®

Gas-to-Steam Humidifier

Installation, Operation, and Maintenance Manual

DRISTEEM®
The humidification experts

WARNING!

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from 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 technical support call:
1-800-328-4447

C US

ATTENTION INSTALLER

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

DRI-STEEM technical support

800-328-4447

Where to find more information

On our Web site:

The following related documents can be viewed, printed or ordered from our web site, **www.dristeem.com**

- Catalogs (include dispersion nonwetting distance graphs):
  - GTS®
  - Ultra-sorb®
- Installation, Operation, and Maintenance manuals:
  - Ultra-sorb
  - Vapor-logic3® (includes sensor placement recommendations and troubleshooting information)
- *DRI-STEEM Design Guide* (includes steam loss tables and general humidification information)

In Dri-calc:

Dri-calc® is our humidification system sizing and selection software, which can be ordered at www.dristeem.com.

Included in Dri-calc:

- A comprehensive library of installation guide documents, including:
  - Rapid-sorb installation instructions for vertical airflows
  - Recommended dispersion placement within a duct or air handler
  - Recommended sensor placement

Or call us at 800-328-4447

While obtaining documents from our web site or from Dri-calc is the quickest way to review our literature, we will also mail to you any literature you need.

Table of contents

WARNING!

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.

WARNING!

If you do not follow the instructions in this manual exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

For your safety, read this entire manual before installing or operating the GTS humidifier.

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.

FOR YOUR SAFETY: WHAT TO DO IF YOU SMELL GAS

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

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.

More safety precautions are on the next page ►

Safe operating instructions

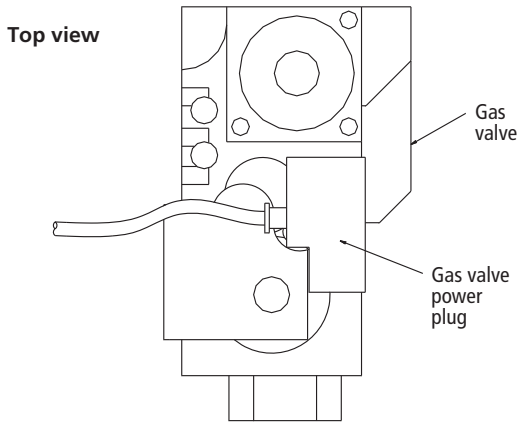
1. **STOP! Read the safety information on the previous page.**
2. Set the humidistat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device that automatically lights the burner. Do not try to light the burner by hand.
5. Remove control access panel.
6. Unplug the black power plug on the gas valve (see Figure 3-1).
7. Wait five minutes to clear out any gas.
   If you then smell gas, STOP! Follow "B" in the safety information on the previous page.
   If you don't smell gas, go to the next step.
8. Plug the black power plug back into the gas valve.
9. Replace control access panel.
10. Turn on all electric power to the appliance.
11. Set humidistat to desired setting.
12. If the appliance will not operate, follow the instructions on this page titled, "To turn off gas to appliance," and call your service technician or gas supplier.

More safety precautions are on the next page ►

To turn off gas to appliance

1. Set the humidistat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove control access panel.
4. Unplug the black power plug on the gas valve.
5. Replace control access panel.

Figure 3-1:
Detail of gas valve



WARNING!

Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. 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. A failure to follow this warning can cause electrical shock, fire, personal injury, or death.

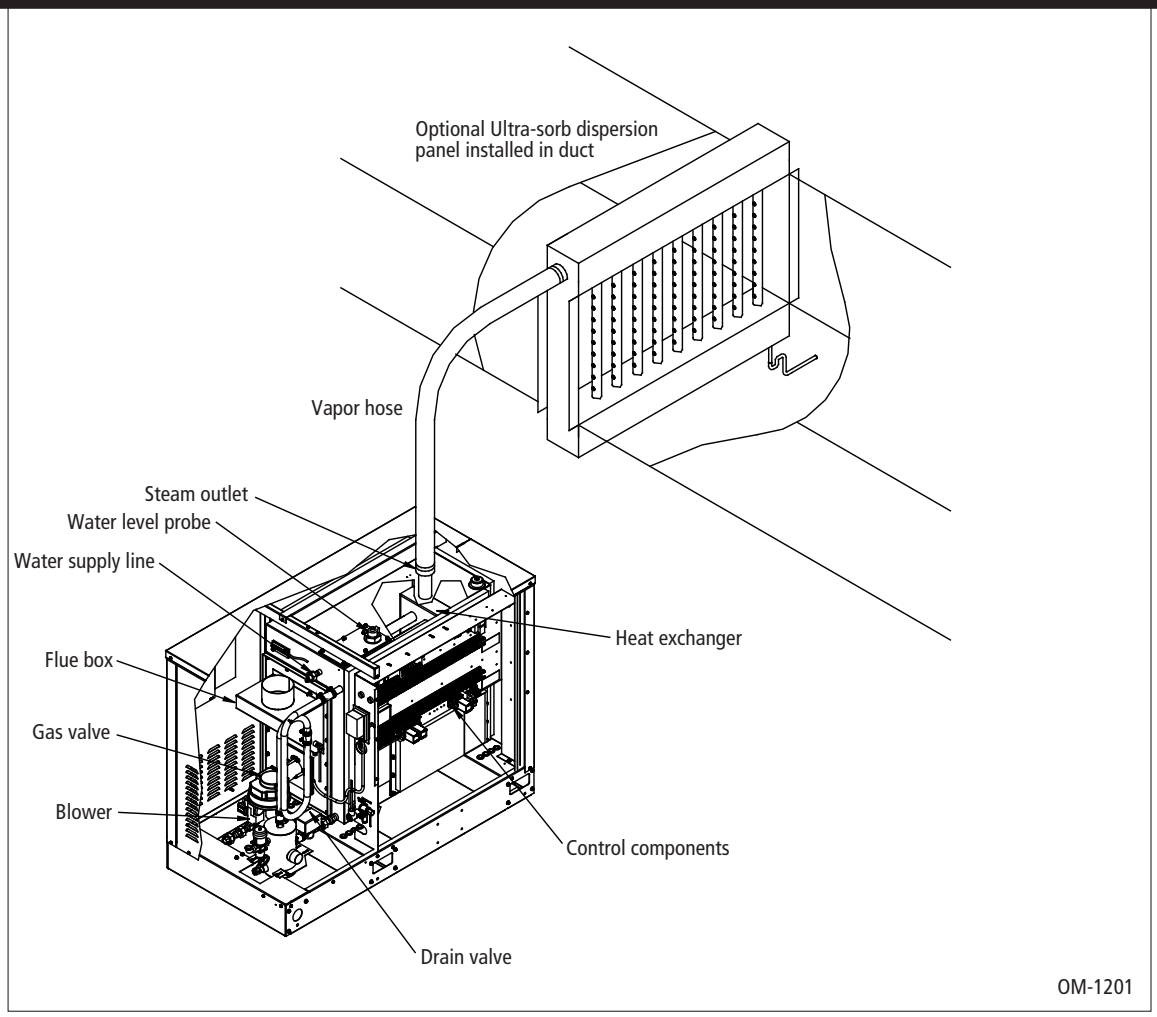
- Inspect humidifier and accessories upon arrival for damaged, missing, or improper parts. If there is a problem, call DRI-STEEM.
- Application of this humidifier should have special attention given to vent sizing and material, gas input rate, and unit sizing. Improper installation or misapplication 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 use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control that has been under water.
- 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.

More safety precautions are on the next page ►

WARNING!

- Installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code, ANSI Z223.1 (latest edition). In Canada, the installation of this unit must comply with 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."
- 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.
- 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. The openings should provide one square inch of free area per 1000 Btuh (1055 kJ/h) input rating of the unit, with a minimum of 100 square inches (645 cm^2) for each opening. See the table and information on Page 30 for additional information.
- 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.
- Humidifier flue gases must be vented to the outside atmosphere.
- 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 diagram 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).

Figure 6-1:
GTS standard water model



Notes:

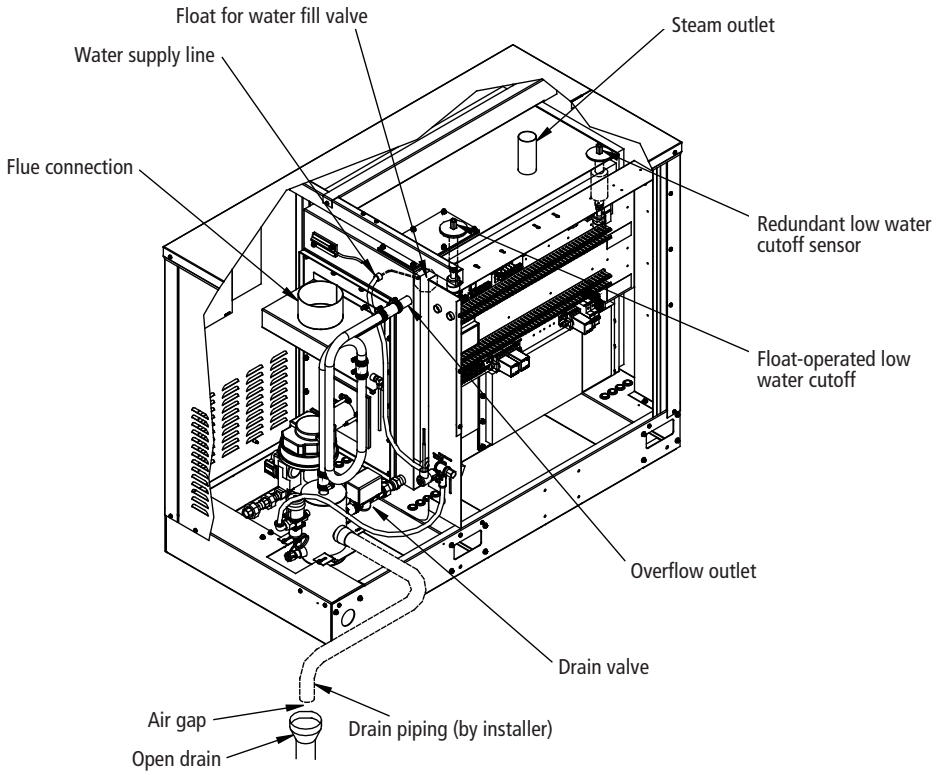
- GTS standard water models can be converted in the field for use with deionized/reverse osmosis (DI/RO) water. GTS-DI models can be converted in the field for use with potable or softened water.
- Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.

GTS standard water models

GTS standard water gas-fired humidifiers burn either natural or propane gas to heat potable or softened fill water into steam for humidification. The unit has from one to four 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. A probe monitors water level, requiring water conductivity to be at least 100 μS/cm to operate properly. Therefore, GTS standard water models do not operate with demineralized water (deionized or reverse osmosis treated water). For demineralized water operation, use the GTS-DI model (described on next page).

All GTS models are compatible with DRI-STEEM's dispersion panels Rapid-sorb and Ultra-sorb.

Figure 7-1:
GTS-DI (DI/RO water model)



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GTS-DI models

GTS-DI humidifiers burn either natural or propane gas to heat deionized (DI) or reverse osmosis (RO) fill water into steam for humidification. GTS-DI models control water level using a float valve.

GTS-DI models are virtually maintenance-free and require very little or no downtime.

All GTS models are compatible with DRI-STEEM's dispersion panels Rapid-sorb and Ultra-sorb.

The GTS-DI model is available for use with deionized or reverse osmosis water. This unit produces chemical-free steam and reliable, accurate humidification control.

Notes:

- GTS standard water models can be converted in the field for use with deionized/reverse osmosis (DI/RO) water. GTS-DI models can be converted in the field for use with potable or softened water.
- Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.

Specifications, capacities, and weights (North American models only)

Table 8-1:
GTS specifications, capacities, and weights for North American models only

GTS model	Maximum steam capacity		Input		Water usage at maximum capacity**		Tank volume		GTS				GTS with outdoor enclosure				120 V 60 Hz full load amps*
									Operating weight		Shipping weight		Operating weight		Shipping weight		
	lbs/hr	kg/h	MBh	kW	gals/hr	litres/hr	gals	litres	lbs	kg	lbs	kg	lbs	kg	lbs	kg	
GTS-100	75	34	100	29	9	34.1	33	124.9	700	320	375	170	800	365	500	230	1.8
GTS-200	150	68	200	59	18	68.1	33	124.9	700	320	375	170	800	365	500	230	1.8
GTS-300	225	102	300	88	27	102.2	41	155.2	850	385	450	205	1000	455	600	270	3.0
GTS-400	300	136	400	117	36	136.3	41	155.2	850	385	450	205	1000	455	600	270	3.0
GTS-600	450	204	600	176	54	204.4	64	242.3	1100	500	600	270	1450	660	950	430	4.5
GTS-800	600	272	800	234	72	272.5	73	276.3	1400	635	700	320	1750	795	1050	475	6.0

Note:
* Add 15 full load amps for outdoor enclosure heater load on all GTS models
** Add 10% to account for skim and automatic drain/flush features if utilized (std water units only).

Important: See Pages 76-77 for European model specifications and capacity notes.

Table 8-2:
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

Capacity notes

- At sea level, approximately 137 Btu are required to raise the temperature of one pound of water from 75 °F to 212 °F. (At sea level, approximately 318 kJ are required to raise the temperature of one kilogram of water from 24 °C to 100 °C.)
- An additional 970 Btu are required to change the state of one pound of 212 °F water to vapor. (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. Use the following general steam loss guidelines:
  – Vapor hose: 0.15 lbs/hr/ft (0.22 kg/h/m)
  – Insulated pipe: 0.05 lbs/hr/ft (0.07 kg/h/m)
  – Hard pipe and dispersion tubes: 0.50 lbs/hr/ft (0.7 kg/h/m)

For more detailed information about condensation steam loss, see the DRI-STEEM Design Guide or our software program, Dri-calc.

LP gas

All models operate at rated MBh/kW input.

High altitude

A derate in MBh/kW input exists when operating units at a high altitude. See Table 8-2 for high altitude derate information.

Figure 9-1:
Dimensions

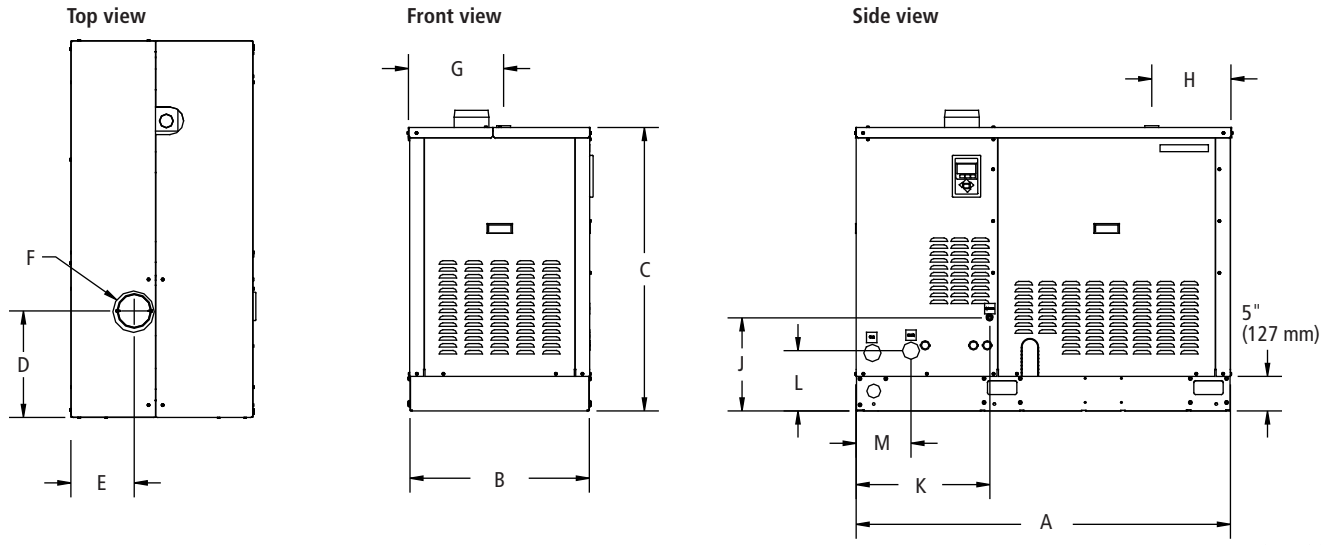


Table 9-1:
Dimensions

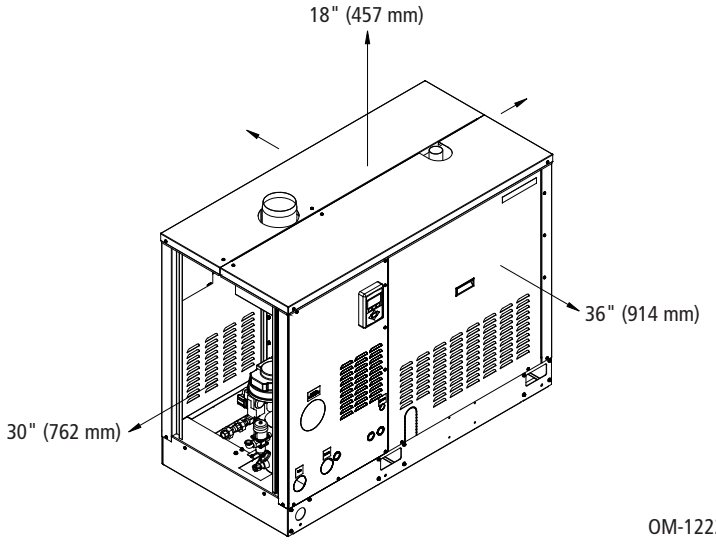
	Description	GTS-100 GTS-200		GTS-300 GTS-400		GTS-600		GTS-800	
		inches	mm	inches	mm	inches	mm	inches	mm
A	Overall length	54.35	1380	54.35	1380	54.35	1380	54.35	1380
B	Overall width	26.38	670	32.38	822	42.38	1076	48.38	1229
C	Shroud height	41.00	1040	41.00	1040	41.00	1040	41.00	1040
D	Flue position	18.00	457	17.00	432	17.00	432	16.25	413
E		13.00	330	15.63	397	18.63	475	21.00	533
F	Flue diameter	5.00	127	7.00	178	8.00	203	10.00	254
G	Steam outlet position	14.00	356	20.50	521	29.25	743	35.25	895
H		11.63	295	11.63	295	11.63	295	11.63	295
J	Fill valve connection position	13.00	330	13.00	330	13.00	330	13.00	330
K		13.00	330	13.00	330	13.00	330	13.00	330
L	Drain position	8.75	222	8.75	222	8.75	222	8.75	222
M		8.00	203	8.00	203	8.00	203	8.00	203

Locating the humidifier and clearance recommendations

Locating the humidifier

- Provide a level, solid foundation for the humidifier.
- Locate the humidifier as near as possible to a chimney or outside wall so that the flue pipe from the humidifier is short and direct.
- 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. If installed in a separate room, 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. The pan must not restrict combustion airflow.
- Do not install the humidifier on carpeting, tile or other combustible material other than wood flooring (indoor application only).
- 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.

Figure 10-1:
GTS clearance recommendations

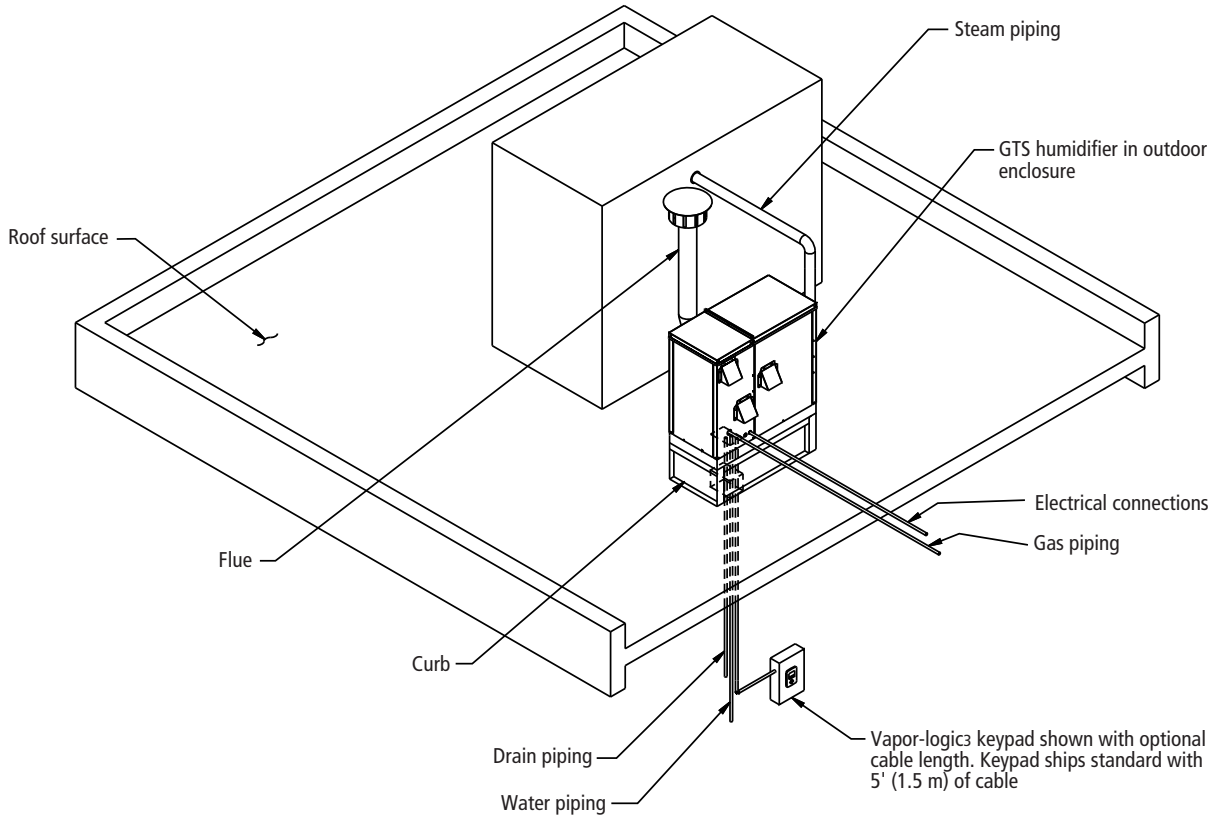


Note:
DRI-STEEM recommends a minimum of 1" (25 mm) clearance between hot surfaces and combustible walls.

Outdoor enclosure mounting option

The outdoor enclosure option is used when the GTS is installed outdoors. 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.

Figure 11-1:
Outdoor enclosure typical installation overview



Outdoor enclosure mounting (continued)

Handling

- The GTS outdoor enclosure is designed for handling by two methods. In both cases it must be lifted from the bottom base 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.
- The preferred method of lifting is by forklift. This is only possible if forks extend across the entire unit. Forks that do not extend across the entire unit could cause tipping resulting in unsafe conditions or damage to the unit.
- The alternative method of handling is from under the unit and/or by using special lifting lug hooks installed on 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. If this type of spreader is not available, insert wood strips between the cables and unit where necessary.

Outdoor enclosure mounting (continued)

Location

- The GTS outdoor enclosure must be level and located so there is enough clearance for opening the access panels.
- Verify that the position of pad or curb properly supports the unit and that support structure dimensions coincide with unit dimensions.
- Locate unit so air intakes are not too close to exhaust fan outlets, gasoline storage, or other contaminants that potentially could cause dangerous situations. Using and storing gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.
- When located on the roof, the air intakes must be a minimum of 14" (360 mm) off the roof to prevent intake of snow or splashed rain. The unit should be located so prevailing winds do not blow into the air intakes.
- An emergency drain is provided. In case of any water leak, water drains onto the roof through this emergency drain.
- A keypad with standard 5' (1.5 m) cable ships mounted to the subpanel in the GTS outdoor enclosure. The keypad must not come in contact with the strip heaters or block the intake ventilation hood.
- If constant monitoring of the unit is desired, or if the unit is located in a severe climate, install a remote mount keypad. Additional cable lengths up to 500' (152 m) are available as an option for this mounting configuration.
- Curbs (optional) are shipped knocked down for ease of transporting to the roof. Curbs are manufactured of 14-gauge galvanized steel and shipped with all hardware for bolt-together assembly. All holes are matched before leaving the factory. Curb is to be a minimum of 14" (360 mm) high. A closed-cell curb gasket with adhesive on one side is supplied with hardware. An installation drawing also is included. To prevent moisture from leaking into the building from either driving rain or melting snow, install the gasket between the top of the curb and the base surface of the unit.

Outdoor enclosure mounting (continued)

Before you begin

- Prior to installing the unit, remove all packaging.
- During the transit, unloading, and setting of the unit, bolts and nuts may become loose. Check that all nuts are tightened as required.
- There are three knockouts located on the right and left side of the enclosure. DRI-STEEM recommends running electrical power into the enclosure at these knockouts.
- When unit is mounted on an outdoor curb, 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.
- The outdoor enclosure has two available steam distribution configurations. The standard configuration has a steam outlet at the back of the outdoor enclosure for connecting to steam dispersion unit piping. The optional internal steam distribution configuration routes steam within the outdoor enclosure and down through the pipe chase into a building. See drawings on Pages 15 and 16.

  Important: A pipe chase is located inside the burner section of the enclosure. DRI-STEEM recommends using this pipe chase for both the supply water piping and drain piping. Use insulation to completely fill the area around the pipes to maintain proper enclosure pressure and protect unit components from elevated moisture levels within building; insulation must serve as an effective vapor barrier.
- The heater package has two thermostat-controlled heaters: one strip heater is located in the control section, and one strip heater is located in the burner section to keep the enclosure at a constant minimum temperature.
- Refer to the installation section of this manual for directions on installing electrical, gas, flue, drain, and water connections. A separate electrical service connection for the outdoor GTS is recommended. Insulation and/or heat taping of water piping is recommended.

Piping

- Insulate supply water piping to avoid dripping from condensation. To ensure that water does not remain in the fill line and freeze if there is a loss of power, DRI-STEEM recommends field installing 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 Figure 15-1).
- When pad-mounted or when the pipe chase cannot be used, the supply water and drain piping can be run through the knockouts, although preferably on the opposite side from the gas and electric.
- Sealed combustion air is piped directly from the outside of the enclosure to the burner, so no conditioned air is removed from the space below. This is factory piped and no assembly is required. Check tightness of pipe clamps.
- External flue piping shall be provided by installers and field installed. The flue of the outdoor enclosure exits out the left side of the unit and a vertical stack must be constructed. The stack must be a minimum of 5–10 feet (1.5–3.0 m) above the top of the roof. However, the exact height varies depending on unit size, climate, etc. Governing codes prevail. A UL/C-UL (or equivalent) listed cap must be used and a drip tee included.

Figure 15-1:
Outdoor enclosure installation detail

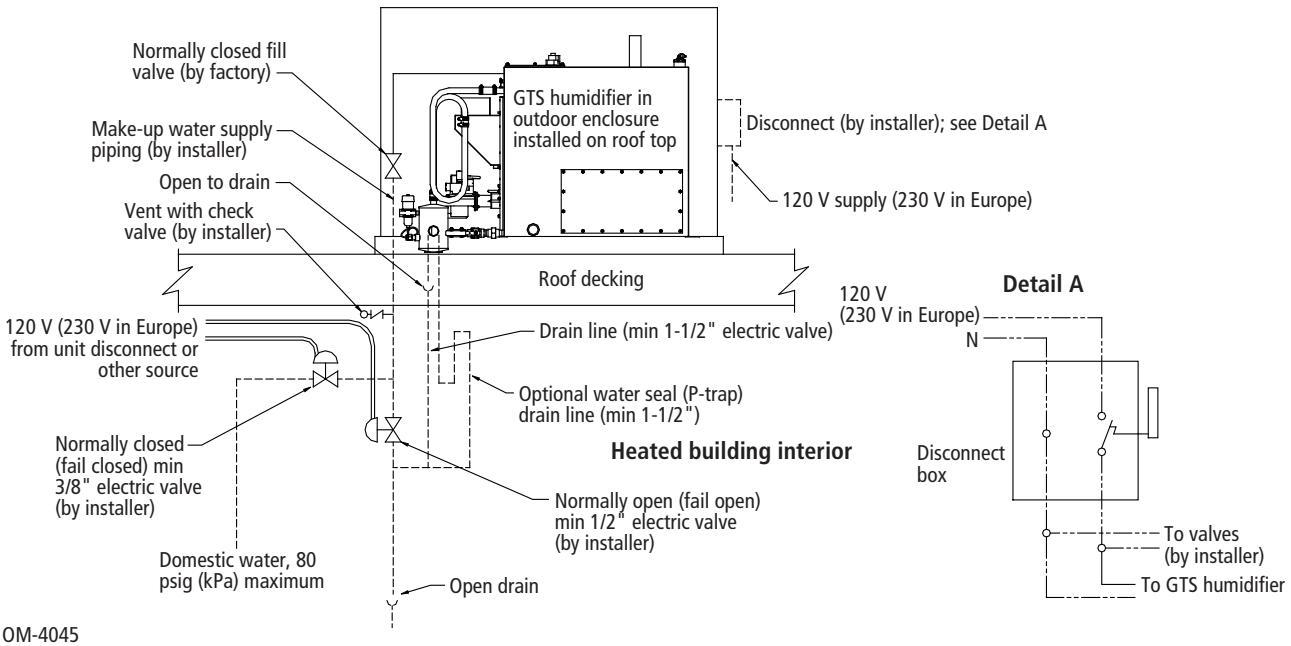
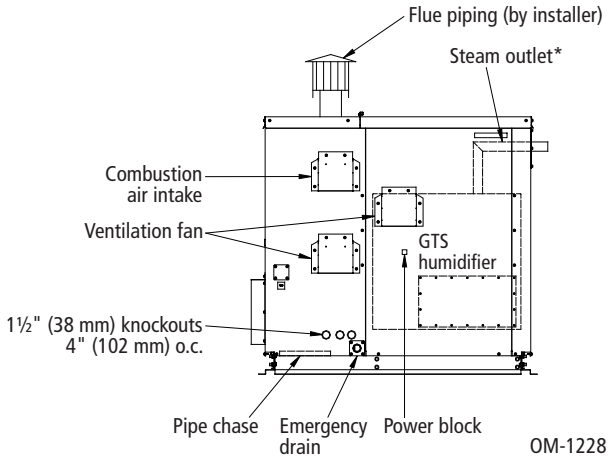
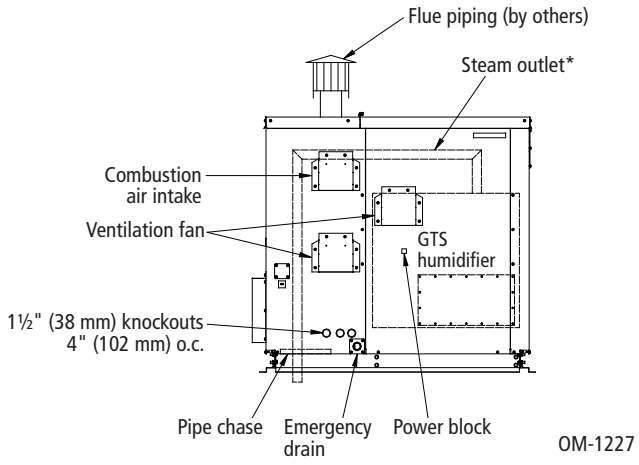


Figure 16-1:
GTS outdoor enclosure with standard or optional steam outlet, elevation view

Standard steam outlet



Optional steam outlet

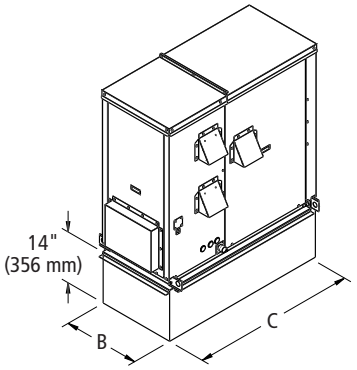


Notes:
1. The outdoor enclosure has two available steam distribution configurations. The standard configuration has a steam outlet at the back of the outdoor enclosure for connecting to steam dispersion unit piping. The optional internal steam distribution configuration routes steam within the outdoor enclosure and down through the enclosure pipe chase into a building.
2. There are three knockouts located on the right and left side of the enclosure. Run the electrical power and gas piping into the enclosure at these knockouts.
3. Piping from the GTS unit to the steam outlet is stainless steel pipe. Piping from the steam outlet to the dispersion assembly is provided by the installer. Choose interconnecting steam piping material that is appropriate for the application (e.g., for high-purity steam applications, consider using stainless steel interconnecting steam piping). See Page 22 for steam outlet sizes.
4. The GTS housed in an outdoor enclosure will operate properly in operating temperature of –40 °F to 122 °F (–40 °C to 50 °C).

Table 17-1: Outdoor enclosure dimensions

	Description	GTS-100 GTS-200		GTS-300 GTS-400		GTS-600		GTS-800	
		inches	mm	inches	mm	inches	mm	inches	mm
A	Enclosure height	54.63	1388	54.63	1388	54.63	1388	54.63	1388
B	Enclosure width	26.00	660	32.00	813	42.00	1067	48.00	1219
C	Enclosure length	57.25	1454	57.25	1454	57.25	1454	57.25	1454

Figure 17-1: Outdoor enclosure mounted on a curb



Note:
To enable moving the GTS with a fork lift or pallet jack, the outdoor enclosure ships with the protective base cover unattached. The base cover is shown attached in this drawing.

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Figure 17-2: Outdoor enclosure mounted flush

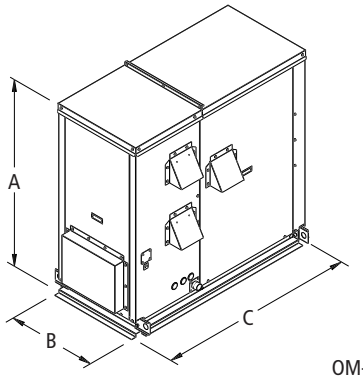

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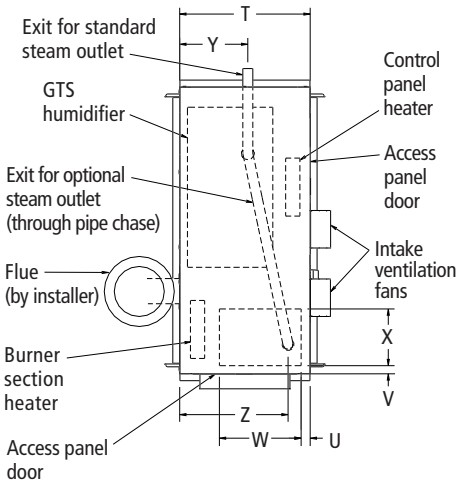
Table 17-2: Outdoor enclosure top view dimensions

	Description	GTS-100 GTS-200		GTS-300 GTS-400		GTS-600		GTS-800	
		inches	mm	inches	mm	inches	mm	inches	mm
T	Enclosure width	26.00	660	32.00	813	42.00	1067	48.00	1219
U	Pipe chase position	3.00	76	3.00	76	3.00	76	3.00	76
V		3.00	76	3.00	76	3.00	76	3.00	76
W	Pipe chase size	16.00	406	16.00	406	16.00	406	16.00	406
X		11.00	279	11.00	279	11.00	279	11.00	279
Y	Steam pipe position	14.12	359	20.12	511	30.12	765	36.12	917
Z		21.00	533	27.00	686	37.00	940	43.00	109

Figure 17-3: Outdoor enclosure top view



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GTS outdoor enclosure sequence of operation

- Power is applied to the outdoor enclosure.
- If the ambient temperature in the enclosure is below 50 °F (10 °C), the strip heaters are powered up. If the enclosure temperature reaches 35 °F (2 °C), power is allowed to the GTS subpanel and the GTS unit is enabled. The strip heaters remain on until the enclosure reaches 50 °F (10 °C) to ensure that the temperature inside the enclosure does not drop below the freezing point.
- When the enclosure temperature is at or above 50 °F (10 °C), the GTS tank heats the enclosure. When there is no call for humidity, an aquastat maintains tank temperature at the factory default of 70 °F (21 °C). This temperature can be reset in the field to be from 40-180 °F (4-82 °C).
- When the ambient temperature in the enclosure reaches 85 °F (29 °C), two ventilation fans turn on to cool the electronic components. A high limit is also provided to power down the GTS if the enclosure temperature reaches 150 °F (66 °C). In a high limit situation, the ventilation fans continue to run and once the enclosure temperature falls below 130 °F (54 °C), the GTS automatically resumes normal operation.
- A normally open drain valve is provided on the GTS outdoor enclosure to drain the tank in the event of a power loss.

WARNING!

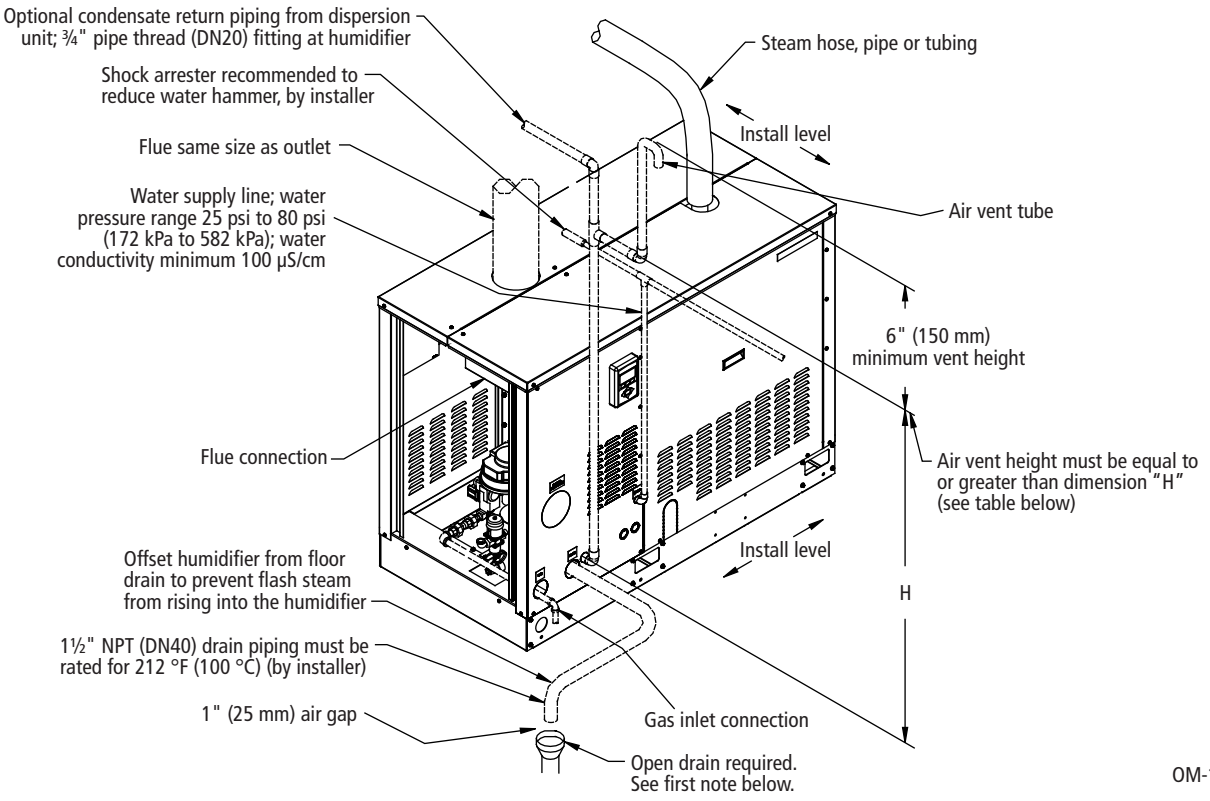
The electrical subpanel must have an uninterrupted or unbroken ground according to National Electrical Code, ANSI/NFPA 70 and Canadian Electrical Code, CSA C22.1, or according to governing codes, to minimize personal injury if an electrical fault should occur. This ground can consist of electrical wire or conduit approved for electrical ground when installed in accordance with existing electrical codes. Do not use gas piping as an electrical ground.

- GTS humidifiers must be supplied with 120-volt AC, 60 Hz (North American models) or 230-volt AC, 50 Hz (European models) separately fused electrical service. The GTS humidifier is equipped with a transformer 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 No. 70-1987. The electrical conductors shall be Type MTW (105 °C) AWG #14 wire for line voltage (120V), with BLACK WIRE for HOT, WHITE WIRE for NEUTRAL, GREEN AND YELLOW WIRE for GROUND, and #18 gauge 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. 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 diagram located inside the control cabinet. See table on Page 8 for information on the various models.
- Refer to the *Vapor-logic3 Installation and Operation Manual* for additional information on the controller furnished with this GTS humidifier.

WARNING!

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.

Figure 20-1:
Field piping overview for GTS standard water models



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.
- The water supply inlet is more than 1" (25 mm) above the skim/overflow port, eliminating the possibility of backflow or siphoning from the tank. No additional backflow prevention is required; however, governing codes prevail.
- Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.
- See the next page for recommended water supply piping for DI/RO water models.

Table 20-1:
Height required to overcome GTS internal pressure (H)

GTS model number	H = Height required to overcome humidifier internal pressure	
	inches	mm
100	35	889
200	35	889
300	41	1041
400	41	1041
600	41	1041
800	41	1041

Figure 21-1:
Field piping overview for GTS DI/RO water models

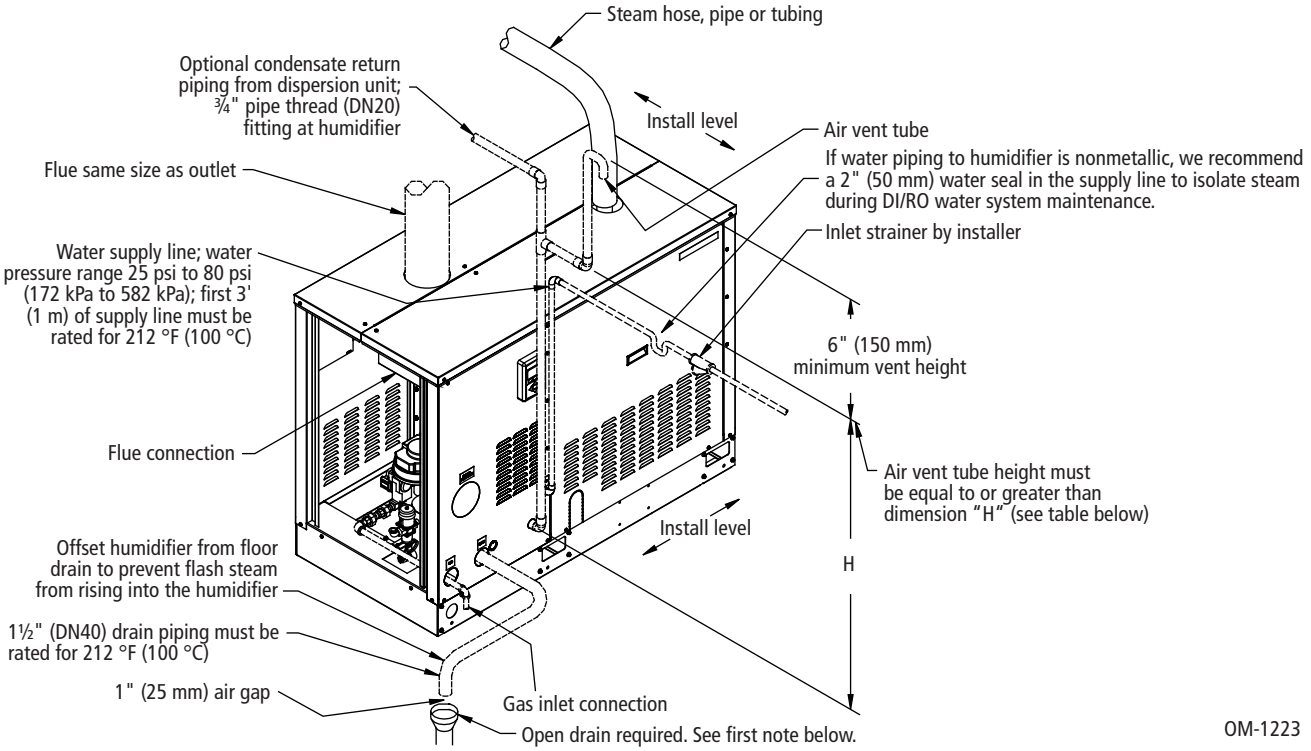


Table 21-1:
Height required to overcome GTS-DI internal pressure (H)

GTS-DI model number	H = Height required to overcome humidifier internal pressure	
	inches	mm
100	35	889
200	35	889
300	41	1041
400	41	1041
600	41	1041
800	41	1041

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.
- The water supply inlet is more than 1" (25 mm) above the overflow port, eliminating the possibility of backflow or siphoning from the tank. No additional backflow prevention is required; however, governing codes prevail.
- Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.
- In order to minimize DI/RO water use, disconnect factory piping to the water tempering device and pipe directly to tap water.
- See the previous page for recommended water supply piping for standard water models.

Supply water and drain overflow connections

Supply water and drain overflow connections

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

- Make union connections at the humidifier on the make-up water supply and drain/overflow lines.
- Provide a shutoff valve in the supply water line to isolate the humidifier from the water system while servicing.
- Shock arrester, provided by installer, is recommended to reduce water hammer.
- A 1" (25 mm) opening is provided in the humidifier tank to accommodate skim and/or overflow protection. (Note: Follow governing code requirements regarding size of drain pipe.)
- 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.
- If planning to use heated supply water, disconnect the water supply line to the water tempering device at the fill manifold and reconnect it to a cold water supply. This will ensure that the water tempering device operates properly.

Table 22-1: Connection sizes

Description	GTS-100 GTS-200		GTS-300 GTS-400		GTS-600		GTS-800	
	inches	DN	inches	DN	inches	DN	inches	DN
Gas supply	½ (pipe thread)	15	1 (pipe thread)	25	1 (pipe thread)	25	1¼ (pipe thread)	32
Sealed combustion piping (optional)	4	100	4	100	4	100	4	100
Flue vent	5	125	7	180	8	200	10	250
Water supply to fill valve and tempering device*	3/8 (pipe thread)	10	3/8 (pipe thread)	10	3/8 (pipe thread)	10	3/8 (pipe thread)	10
Drain	1½ (pipe thread)	40	1½ (pipe thread)	40	1½ (pipe thread)	40	1½ (pipe thread)	40
Steam outlet	2 (pipe thread or hose)	50	3 (flange)	80	4 (flange)	100	4 (flange)	100
Condensate return (recommended)	¾ (pipe thread)	20	¾ (pipe thread)	20	¾ (pipe thread)	20	¾ (pipe thread)	20

Note:
* In order to minimize DI/RO water use, disconnect factory piping to the water tempering device and pipe directly to tap water.
If planning to use heated supply water, disconnect the water line to the water tempering device at the fill manifold, and reconnect it to a cold water supply.
This will ensure that the water tempering device operates properly.

Water supply piping general instructions

The GTS humidifier has a 1" (25 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). When nonmetallic water piping is used, it must be rated to withstand 212 °F (100 °C) or greater temperature. If not, the final three feet of piping connected to the humidifier should be metallic and should not be insulated.

DRI-STEEM recommends installing a shock arrester to reduce water hammer (see Figure 20-1).

GTS (standard water) water supply piping

The water supply assembly has a 3/8" pipe thread (DN10) connection. Since the primary component of the water supply assembly is a solenoid valve, there may be noise issues that surface during a fill cycle.

During a fill cycle, the supply water drops the water temperature in the tank and may collapse the steam, which can cause a low rolling sound. To diminish this, install a needle valve between the fill valve and tank to decrease the water fill rate and/or use hot supply water.

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.

The minimum water conductivity for the GTS standard water model is 100 µS/cm.

Important: Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.

GTS-DI water supply piping

GTS-DI models control water level with a float valve, and have a 3/8" pipe thread (DN10) connection. For DI models with the end-of-season drain option, a solenoid valve is added on the inlet of the float valve. The end-of-season feature shuts off the fill water supply and drains the tank when there is no demand for humidity for 72 hours. (This length of time is a default setting and is user-adjustable. See the *Vapor-logic3 Installation and Operation Manual* for more information.)

When using nonmetallic tubing for supply water, it must be rated for 212 °F (100 °C) minimum continuous operating temperature. DRI-STEEM recommends installing a 3' (1 m) piece of noninsulated stainless steel pipe directly off the humidifier prior to connecting to the nonmetallic tubing. When using nonmetallic tubing, DRI-STEEM recommends the installer place a 2" (50 mm) water seal/loop in the supply line to isolate steam during DI/RO water system maintenance. (See Figure 21-1 on page 21.)

DRI-STEEM recommends installing a strainer in the water supply line to prevent clogging of the solenoid valve or float valve orifice. A strainer is highly recommended when the humidifier has the end-of-season drain option. The strainer prevents particulate from collecting at the solenoid valve seat.

In order to minimize DI/RO water use, disconnect factory piping to the water tempering device and pipe directly to tap water.

WARNING!

If the GTS-DI humidifier is supplied with tap water, the float valve assembly will become clogged and particulate will accumulate on the low water cutoff switch (float switch). This will cause failure of a critical safety circuit and the potential for a dry tank fire. A dry tank fire can cause heat exchanger, vapor hose, and wire insulation failure, severe property damage, severe personal injury, or death.

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, DRI-STEEM recommends it be rated for 212 °F (100 °C) minimum continuous operating temperature.

Minimum drain pipe size is 1½" (DN40) inside diameter. If the length of the drain piping exceeds 10' (3 m), increase the pipe size.

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.

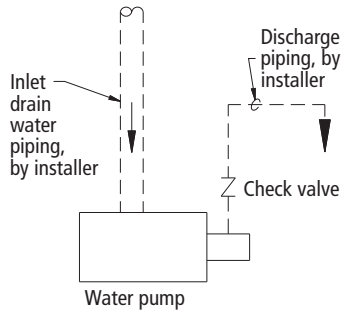
An open drain with a 1" (25 mm) air gap between the drain piping and the drain is required. Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensing on nearby surfaces may occur.

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 25-1). Electrical power for the pump is independent of the humidifier.

The GTS humidifier has an auxiliary 1½" (DN40) drain outlet located below the subpanel. 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.

Figure 25-1:
Lifting drain water



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

DC-1117

Integral water tempering chamber

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 has an integral water tempering chamber that tempers 6 gpm (22.7 L/m) of 212 °F (100 °C) water to 140 °F (60 °C). The water tempering sequence of operation is:

1. Hot water discharged from the humidifier enters the water tempering chamber from either the skim/overflow port or the tank drain.
2. Cold water enters the water tempering chamber through a temperature-actuated valve to mix with the hot discharged water.
3. Tempered water at 140 °F (60 °C) maximum exits through the water tempering chamber side outlet for safe discharge into a municipal sewer system or PVC pipe.
4. In order to minimize DI/RO water use, disconnect factory piping to the water tempering device and pipe directly to tap water.
5. If planning to use heated supply water, disconnect the water line to the water tempering device at the fill manifold, and reconnect it to a cold water supply. This will ensure that the water tempering device operates properly.

Table 25-1:
Integral water tempering specifications

Water type	Maximum low rate		Maximum temperature	
	U.S. gpm	L/m	°F	°C
Hot water inflow	6	22.7	212	100
Cold water inflow*	6	22.7	70	21
Tempered water outflow	12	45.4	140	60

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

Caution! Supply the humidifier only with the gas type (natural gas or LP gas) listed on the humidifier name plate or burner failure will result. To convert the humidifier to natural gas or LP gas, contact DRI-STEEM technical support or your DRI-STEEM representative/distributor.

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

Important: 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.

For European models, the required supply pressure is 20 or 25 mbar for natural gas and 30, 37, or 50 mbar for propane 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 connecting 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 ¼" (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!

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 an explosion or fire 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. Pressure tappings for test gauges are located on all gas valves.
- Allow at least 5' (1.5 m) of piping between any high pressure regulator and unit pipe connection.
- Piping installation must be in accordance with governing codes, and ANSI Z233.1, "National Fuel Gas Code," or CAN/CGA-B149 in Canada. Do not use flexible connectors.

More gas piping instructions on the next page ►

- 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 ½" (DN15). Table 27-2 below 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 27-1.

Table 27-1:
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: 27-2 when the specific gravity of gas is other than 0.60 (natural gas) or 1.53 (propane).

Table 27-2:
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)									
		½" (DN15)		¾" (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 28.

More gas piping instructions on the next page ►

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 all burners running, 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.

Example

For this example, refer to the tables on the previous page.

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

$$\frac{\text{Btuh (kW) input}}{\text{Calorific value of gas}}$$

Calorific values are:
- Natural gas: 1025 Btu/ft^3 (10.6 $kW\text{-}hr/m^3$)
- Propane: 2500 Btu/ft^3 (25.9 $kW\text{-}hr/m^3$)

For example, if you have a GTS-400 operating on natural gas, calculate the ft^3/hr or m^3/hr as follows:

$$\frac{400{,}000 \text{ Btuh}}{1025 \text{ Btu/ft}^3} = 390 \text{ ft}^3/\text{hr}$$

$$\frac{117.2 \text{ kW}}{10.6 \text{ kW-hr/m}^3} = 11.1 \text{ m}^3/\text{hr}$$

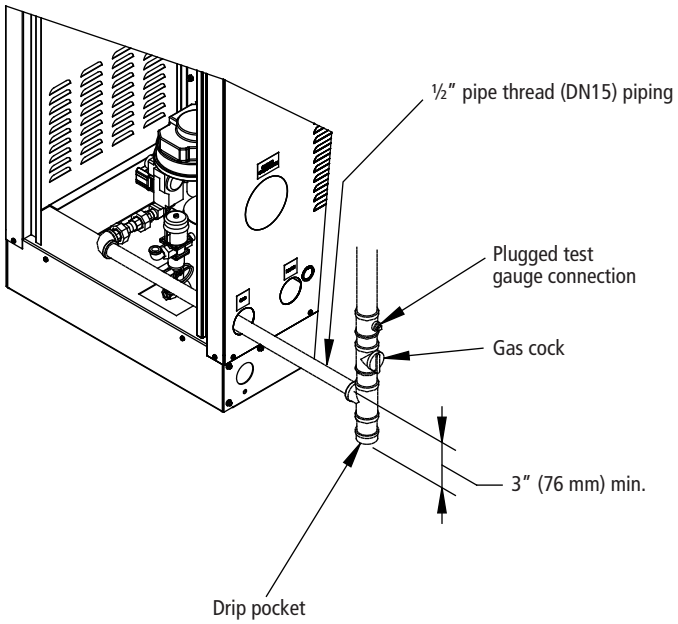
If you need to run your gas piping 60 feet (18 m), see Table 27-2 on the previous page and look horizontally across the 60 ft (18 m) row until you locate the next highest value above your calculated ft^3/hr or m^3/hr. In this example, you are looking for the next highest value above 390 ft^3/hr (11.05 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 27-2 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 the gas pipe capacities table (Table 27-2), 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.

More gas piping instructions on the next page ►

Figure 29-1:
GTS gas piping

GTS or GTS-DI models 100, 200



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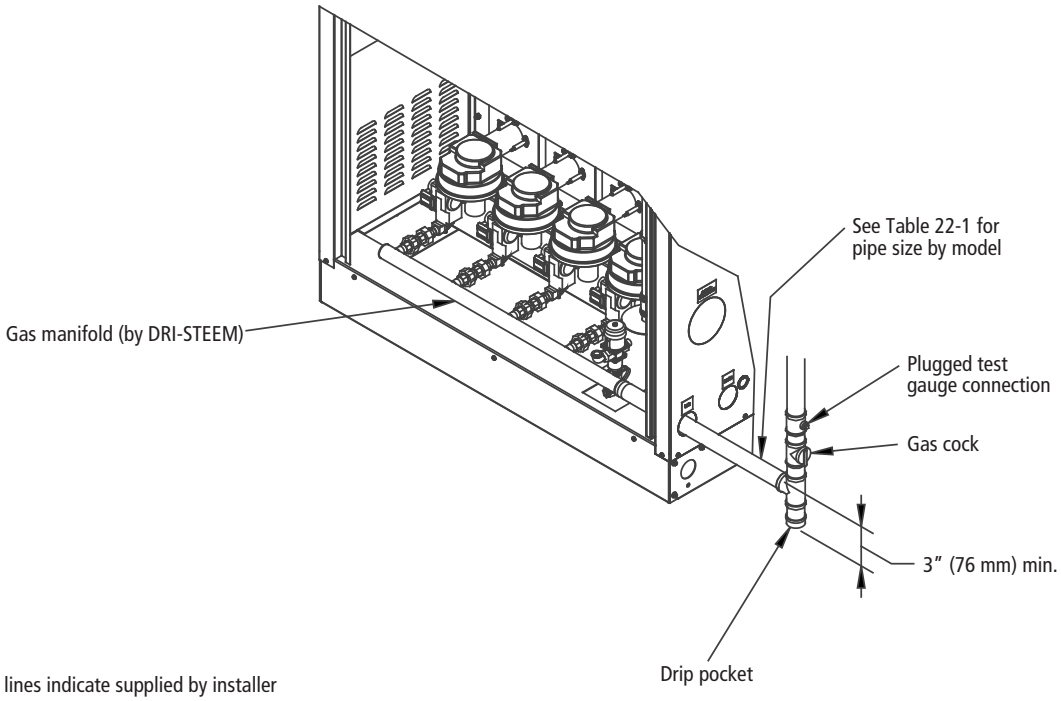
GTS or GTS-DI models 300-800



OM-1235

Note:
Dashed lines indicate supplied by installer

WARNING!

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, and other household products.

When the GTS is located in an environment with negative pressure or toxic air, it must have sealed combustion.

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

Note:

GTS outdoor enclosures are always provided with a sealed combustion connection.

Combustion and ventilation air

The GTS supports both room air and sealed combustion. 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 Z223.1-1988 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 appliance 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 appliance 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 30-1 outlines four types of locations, and the requirements of each.

More instructions on the next page ►

Table 30-1:
Location of humidifier and required air openings

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

Note:
* The minimum dimension of any opening is 3" × 3" (76 mm × 76 mm).

Sealed combustion

The GTS supports sealed combustion using 4" (DN100) PVC or CPVC piping (see Figure 31-1). All GTS models have a single point connection to the blower below the humidifier shroud.

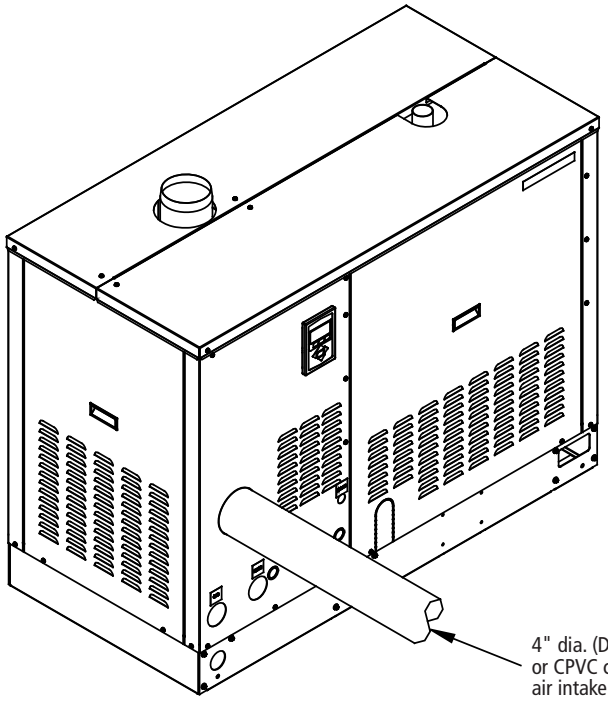
When running PVC or CPVC piping for sealed combustion, the maximum allowable distance to the outdoor air source is 70' (21.3 m) including 7' (2.1 m) equivalent length for each elbow. The outside air source can be either a final connection outside the building or a connection to an outdoor air plenum 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.

If sealed combustion piping is less than 20 ft (6 m), we recommend insulating piping to prevent condensation.

WARNING!

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 31-1:
GTS optional sealed combustion connection



WARNING!

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.

Vertical and horizontal venting guidelines (stack connection)

- The GTS is a Fan Assisted Category I (natural draft) Appliance. Installations where the vent terminates in a side wall of the building, or where the overall horizontal run exceeds the overall vertical run require a power venter. See Page 34.
- Maximum flue temperature is 400 °F (205 °C) + ambient.
- Flue draft negative pressure greater than 0.2" wc (50 Pa) may cause unacceptable post ignition.
- Vent piping must be UL or UL/CSA listed type B, B-W, or any other vent type approved for a Category I appliance.
  - Type B: Double wall construction, inner wall aluminum, outer wall galvanized steel
  - Type B-W: Same as type B except fabrication in oval shapes only

  Do not use more than one type of venting per application Required clearance for Type B and B-W vent piping is 1" (25 mm).
- Do not use vent equipment from more than one manufacturer.
- When connecting the humidifier to a gas vent or chimney, 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, governing codes, and the vent manufacturer's instructions.
- 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.

CAUTION! Install a drip tee or flue box condensate port for start-up flue condensate removal. Failure to follow these instructions could cause water to accumulate in the flue box.

- The purpose of venting the gas humidifier is to completely remove all products of combustion and ventilation gases to the outside air.
- For vertical vent pipe terminations only: Do not reduce the vent diameter and avoid short turns in the vent piping. Use the same size stack as the vent furnished with the humidifier. Maintain a minimum upward slope of ¼" per linear foot (2%) on all horizontal runs. Maintain proper support of vent connections and joints. Observe clearances (in accordance with applicable codes) from all combustible materials and install an approved cap for the stack outlet. The bottom of the cap must be one stack diameter above the top of the stack.
- Inspect for proper and tight construction. Remove any restrictions or obstructions. An existing chimney may require cleaning.
- For vertical vent pipe terminations only: Extend chimney or vent at least 3' (1 m) above its passage through a roof and at

More instructions on the next page ►

least 2' (0.6 m) above any ridge within 10' (3 m) of the chimney (governing codes apply).

- Do not connect this humidifier to a chimney flue servicing a separate appliance designed to burn solid fuel.
- Never connect this humidifier to a chimney serving a fireplace, unless the fireplace opening is permanently sealed off.
- Code prohibits venting into an unlined masonry or concrete chimney.
- If this humidifier is connected to a lined, masonry chimney, the chimney must be sized and installed according to the provisions of the National Fuel Gas Code or Canadian CAN/CGA.B149 requirements, or governing codes.
- Vent connector serving this appliance shall not be connected into any portion of mechanical draft systems operating under positive pressure.
- Add insulation to any roof or wall penetration vent connector that is exposed to ambient temperatures of 30 °F (0 °C) or less, especially any application using single-wall vent pipe as a connector.
- Do not insulate vent pipe exposed to outdoor weather conditions (e.g., above roof lines).
- Install vent piping as direct as possible, with a minimum number of turns or elbows.
- Rigidly support the vent pipe every 5' (1.5 m) or less with hangers or straps to ensure there is no movement after installation. The humidifier vent box 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.
- The vent system must terminate above the roof surface per the National Fuel Gas Code or CAN/CGA.B149 requirements or governing codes, and must include a UL or C-UL listed vent cap or roof assembly, unless prohibited by governing codes.
- For vertical vent pipe terminations only: This humidifier may be commonly vented with other listed Category I gas-fired appliances. Total input rates of all appliances determines the vent size.
- 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 requirements and Canadian Standards CAN/CGA.B149 or governing codes.
- 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, or Section 7, Venting Systems and Air Supply Appliances, of the CAN/CGA B149 Installation Codes, governing building codes, and the vent manufacturer's instructions.

WARNING!

For applications where the vent pipe terminates in a vertical position, the horizontal length of the vent and vent connector must not exceed the height of the vent system unless a power venter is used. Failure to follow these instructions could cause flue gases to exit the vent piping causing severe personal injury or death.

Table 34-1: Equipment required for horizontal venting

Item	Field controls model number for GTS or GTS-DI models 100, 200, 300, 400	Field controls model number for GTS or GTS-DI models 600 and 800
Power venter	PVO-600 (5")	PVE-1200 (8")
Barometric damper	MG-1 (5")	MG-1 (8")
Vent hood	SWH-1-5 (5")	SWH-8
Electrical ratings	120 VAC 60 Hz 2.1 A	120 VAC 60 Hz 2.5 A

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

Table 34-2: Recommended minimum vent sizes

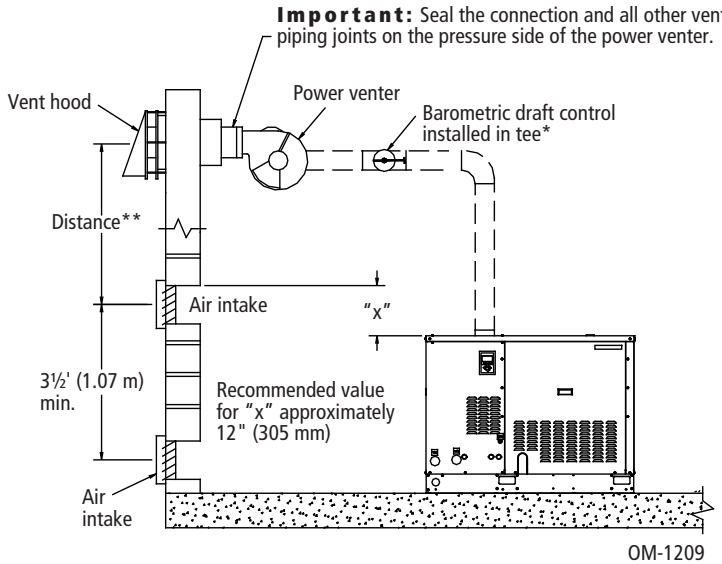
Model	Minimum vent size			
	Vertical vent		Horizontal vent	
	inches	mm	inches	mm
GTS-100	5	130	5	130
GTS-200	5	130	5	130
GTS-300	7	180	5*	130
GTS-400	7	180	5*	130
GTS-600	8	205	8	205
GTS-800	10	255	8*	205

Note:
* For best results, make transition to smaller vent diameter as close to the power venter as possible.

Special horizontal venting requirements

- Ensure that distances from the vent terminal to adjacent public walkways, buildings, and openable windows and building openings are consistent with the National Fuel Gas Code, ANSI Z223.1, CAN/CGA B149 Installation Codes, or governing codes.
- In areas accessible to the public, the vent terminal must be at least 7' (2.1 m) above ground level to prevent burns from the 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.
- A minimum horizontal clearance of 4' (1.22 m) from electric meters, gas meters, regulators, and relief equipment must be maintained.
- Maximum equivalent length of vent pipe is 100' (30 m). Minimum equivalent length of vent pipe is 10' (3 m). See power venter installation manual for equivalent lengths of fittings.
- Vent box pressure must be –0.01" wc (–2.5 Pa). Set by adjusting power venter and barometric damper, with all burners running (see manufacturer's instructions included with power venter and damper).

Figure 34-1: GTS venting



Notes:
* Install a tee after the first elbow from the humidifier as shown. Use the open end of this tee for the location of the barometric damper.
** Required distance between air intake and vent hood is defined by the National Fuel Gas Code, ANSI Z223.1, and/or CAN/CGA B149 Installation Codes.
Refer to power venter manual for clearance requirements relative to combustion air openings.

Selecting the dispersion assembly location

- For each dispersion device, DRI-STEEM documents distances required for absorption to occur. If you have questions about absorption distances, see the absorption tables in the U.S. English version of the GTS catalog, available for viewing, printing, or ordering at www.dristeem.com
- It is important that the dispersion assembly is positioned where the water vapor being discharged is carried off with the airstream and is absorbed before it can cause condensation or dripping in the duct.
- In general, the dispersion assembly is best placed where the air can most readily absorb the moisture being added without causing condensation at or after the unit. This normally is after the heating coil or where the air temperature is highest.
- Place the dispersion assembly so that absorption occurs before the intake of a high efficiency filter. The filter can remove the visible moisture and become waterlogged.
- Place the dispersion assembly so absorption occurs before coming in contact with any metal surface.
- Place the dispersion assembly so absorption occurs before fire or smoke detection devices.
- Place the dispersion assembly so absorption occurs before a split in the duct. Otherwise, the dispersion assembly may direct more moisture into one duct than the other.
- When draining dispersion condensate to an open drain, provide a 1" (25 mm) gap between the condensate drain piping and the drain. Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensing on nearby surfaces may occur.

Where to find more information

On our Web site:

The following documents can be viewed, printed or ordered from our web site, **www.dristeem.com**

- Catalogs (include dispersion nonwetting distance graphs):
  - GTS
  - Ultra-sorb
- Installation, Operation and Maintenance manuals:
  - Ultra-sorb
  - Vapor-logic3 (includes sensor placement recommendations and troubleshooting information)
- *DRI-STEEM Design Guide* (includes steam loss tables and general humidification information)

In Dri-calc:

Dri-calc is our humidification system sizing and selection software, which can be ordered at www.dristeem.com.

Included in Dri-calc:

- A comprehensive library of installation guide documents, including:
  - Rapid-sorb installation instructions for vertical airflows
  - Recommended dispersion placement within a duct or air handler
  - Recommended sensor placement

Or call us at 800-328-4447

While obtaining documents from our Web site or from Dri-calc is the quickest way to review our literature, we will also mail to you any literature you need.

Dispersion: Interconnecting piping requirements

CAUTION!

Failure to follow the recommendations in this section can result in excessive back pressures on the humidifier. This will result in unacceptable humidification system performance such as leaking gaskets, blown water seals, erratic water level control, and spitting condensate from the dispersion tube(s).

Connecting humidifier to dispersion assembly with vapor hose

- Always support vapor hose to prevent sags or low spots and to maintain a minimum pitch of 2"/ft (15%) back to the humidifier.
- See the maximum steam carrying capacity table on the next page.
- Use DRI-STEEM vapor hose. Other manufacturers of vapor hose may use unacceptable release agents or material mixes that can affect humidifier system performance adversely. Using hose from alternative manufacturers increases the possibility of tank foaming and accelerated aging. Foaming causes condensate discharge at the dispersion assembly.
- Do not use vapor hose in outdoor applications.
- Do not insulate vapor hose. Insulation causes accelerated heat aging, causing the vapor hose to become hard and susceptible to failure due to cracks.
- The steam outlet on the humidifier is sized to the output of the humidifier. DO NOT use hose with an inside diameter (ID) smaller than the humidifier steam outlet.
- If the humidifier must be located above the dispersion assembly, use the recommended installation as shown on Page 38.
- For single tube applications, see the hose kit sizing table on Page 39.

Connecting humidifier to dispersion assembly with tubing or pipe

- See the table on Page 40 for interconnecting tubing and pipe pitch requirements for single tube and multiple tube applications. See the table on Page 45 for interconnecting tubing and pipe pitch requirements for Rapid-sorb applications.
- The steam outlet on the humidifier is sized to the output of the humidifier. DO NOT use interconnecting tubing or pipe with an inside diameter (ID) smaller than the humidifier steam outlet.

  CAUTION! Reducing the inside diameter of the interconnecting piping will result in the internal humidifier system pressure exceeding the parameters for acceptable performance.
- Steam supply adapters are available from DRI-STEEM. These adapters convert a tubing outlet on the humidifier to threaded pipe, allowing a pipe connection.
- 90° elbows are not recommended; use two 45° elbows, 1' (0.3 m) apart.
- Thin wall tubing heats up faster and causes less start-up loss than heavy wall pipe.

More on the next page ►

Dispersion: Interconnecting piping requirements (continued)

Connecting humidifier to dispersion assembly with tubing or pipe (continued)

- Insulating hard pipe reduces the loss in output caused by condensation.
- When using hard pipe, take care to remove ALL traces of lubricants used to thread the pipe. This minimizes the possibility of tank foaming. Denatured alcohol or mineral spirits work best for removing lubricant.
- If the humidifier must be located above the dispersion assembly, use the recommend installation as shown on Page 38.
- See the maximum steam carrying capacity table below.

Table 37-1:
Maximum steam carrying capacity and length of interconnecting vapor hose, tubing, and pipe*

Vapor hose†††						Copper or stainless steel tubing and Schedule 40 steel pipe					
Hose I.D.		Maximum capacity		Maximum length**		Tube or pipe size***		Maximum capacity		Maximum developed length†	
inches	DN	lbs/hr	kg/h	ft	m	inches	DN	lbs/hr	kg/h	ft	m
1½	40	150	68	10	3	1½	40	150	68	20	6
2	50	250	113	10	3	2	50	220	100	30	9
						3††	80††	450	204	80	24
						4††	100††	750	340	100	30
						5††	125††	1400	635	100	30
						6††	150††	2300	1043	100	30

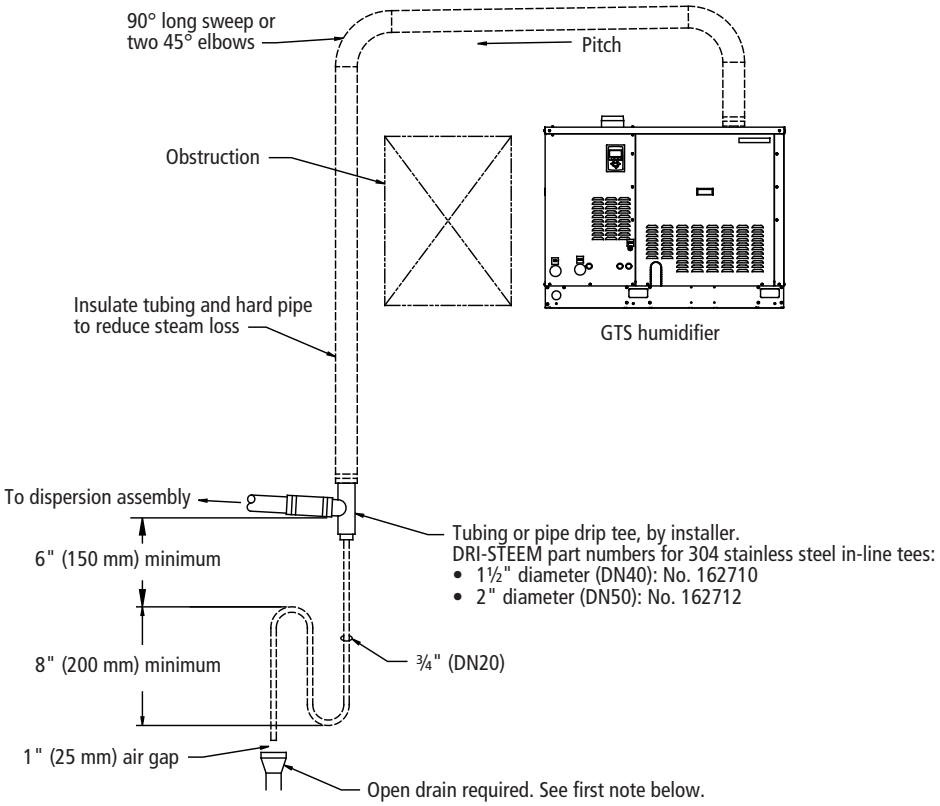
* Based on total maximum pressure drop in hose, tubing, or pipe of 5" wc (1244 Pa)
** Maximum recommended length for vapor hose is 10' (3 m). Longer distances can cause kinking or low spots.
*** To minimize loss of capacity and efficiency, insulate tubing and pipe.
† Developed length equals measured length plus 50% of measured length to account for pipe fittings.
†† Requires flange connection
††† When using vapor hose, use DRI-STEEM vapor hose for best results. Field-supplied hose may have shorter life and may cause foaming in the evaporating chamber resulting in condensate discharge at the dispersion assembly. Do not use vapor hose for outdoor applications.

Install a drip tee as shown below

- When the humidifier is mounted higher than the dispersion assembly
- When interconnecting hose or piping needs to go over an obstruction
- When interconnecting piping runs are long

Important: Vapor hose must be supported to prevent sagging or low spots.

Figure 38-1:
Drip tee installation (piping over an obstruction)



Notes:
- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam, or condensing on nearby surfaces may occur. Refer to governing codes for drain pipe size and maximum discharge water temperature.
- Support vapor hose so there are no sags or low spots
- Dashed lines indicate provided by installer

Dispersion: Single tube and multiple tube

Installation

- See the following pages for detailed drawings and notes for installing single tube and multiple tube dispersion assemblies.
- See the hose kit sizing table on this page for single tube applications.

Dispersion tube mounting

- Orient dispersion tube(s) so that tubelets (steam orifices) point up.
- See the table on the next page for dispersion tube pitch requirements.
- When mounting the humidifier above the level of the dispersion tube(s), see the drip tee installation drawing on Page 38.

Condensate drain piping

- Minimum diameter (ID) for draining from one or two dispersion tubes: ¾" (DN20)
- Minimum diameter (ID) for draining from three or more dispersion tubes: 1" (DN25)
- Condensate drain piping must be rated for 212 °F (100 °C) continuous operating temperature.
- Condensate drain line must be piped as shown in the figures on the following pages. Provide a 6" (152 mm) drop prior to a 5" (127 mm) water seal to:
  – Ensure drainage of condensate from the header
  – Keep steam from blowing out of the drain line
- After the water seal, run the drain line to an open drain with a 1" (25 mm) vertical air gap. Cut the drain line at a 45° angle on the end above the drain to permit a direct stream of water into the drain pipe while maintaining a 1" (25 mm) air gap. Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam, or condensing on nearby surfaces may occur.
- All drain lines must be installed and sized according to governing codes.

CAUTION!

Failure to follow the recommendations in this section can result in excessive back pressures on the humidifier. This will result in unacceptable humidification system performance such as leaking gaskets, blown water seals, erratic water level control, and spitting condensate from the dispersion tube(s).

Table 39-1: Hose kit sizing by capacity

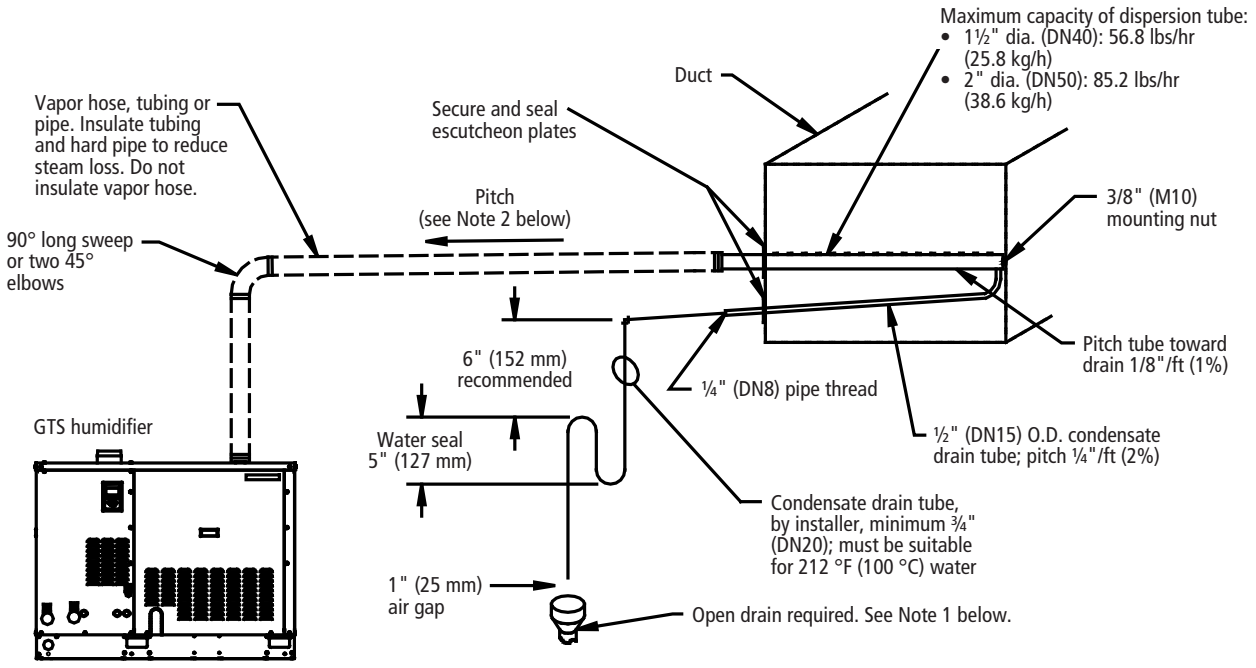
Maximum tube capacity		Hose kit (vapor hose, dispersion tube, and hardware)
lbs/hr	kg/h	
28.4	13	1½" (DN40) without drain
56.8	25.8	1½" (DN40) with drain
		2" (DN50) without drain
85.2	38.6	2" (DN50) with drain
> 85.2	>38.6	These models require multiple tube assemblies and cannot use a single hose kit.

Table 40-1:
Pitch of dispersion tube(s) and interconnecting piping for single tube or multiple tube evaporative dispersion units*

Condensate drain	Type of interconnecting piping	Diameter of dispersion tube and interconnecting piping	Pitch of interconnecting piping	Pitch of dispersion tube(s)	Pitch of condensate drain
Without drain	Vapor hose	1½" (DN40)	2"/ft (15%) toward humidifier	2"/ft (15%) toward humidifier	No drain
		2" (DN50)			
	Tubing or pipe	1½" (DN40)	1/8"/ft (1%) toward humidifier		
		2" (DN50)			
With drain	Vapor hose	1½" (DN40)	2"/ft (15%) toward humidifier	1/8"/ft (1%) toward condensate drain	¼"/ft (2%) toward floor drain or toward humidifier if humidifier is below dispersion unit
		2" (DN50)			
	Tubing or pipe	1½" (DN40)	½"/ft (5%) toward humidifier		
		2" (DN50)	¼"/ft (2%) toward humidifier		

Note:
* When piping over an obstruction, see the drip tee installation illustration on Page 38.

Figure 41-1:
Single tube dispersion with condensate wasted to floor drain



Notes:
1 Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam, or condensing on nearby surfaces my occur. Refer to governing codes for drain pipe size and maximum discharge water temperature.
2 Pitch vapor hose, tubing or pipe toward humidifier:
– 2"/ft (15%) when using vapor hose
– ½"/ft (5%) when using 1½" tubing or pipe
– ¼"/ft (2%) when using 2" tubing or pipe
3 Dashed lines indicate provided by installer

OM-1212a

Table 41-1:
Dispersion tube and condensate drain escutcheon plate dimensions

	for 1½" tube		for 2" tube	
	inches	mm	inches	mm
A	1.51	38	2.03	52
B	3.25	83	5.00	127
C	0.75	19	0.75	19
D	3.25	83	3.25	83

Figure 41-2:
Dispersion tube and condensate drain escutcheon plates

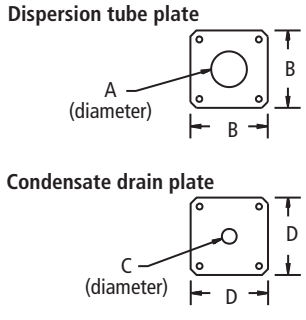


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Figure 42-1:
Single tube with condensate returned to humidifier

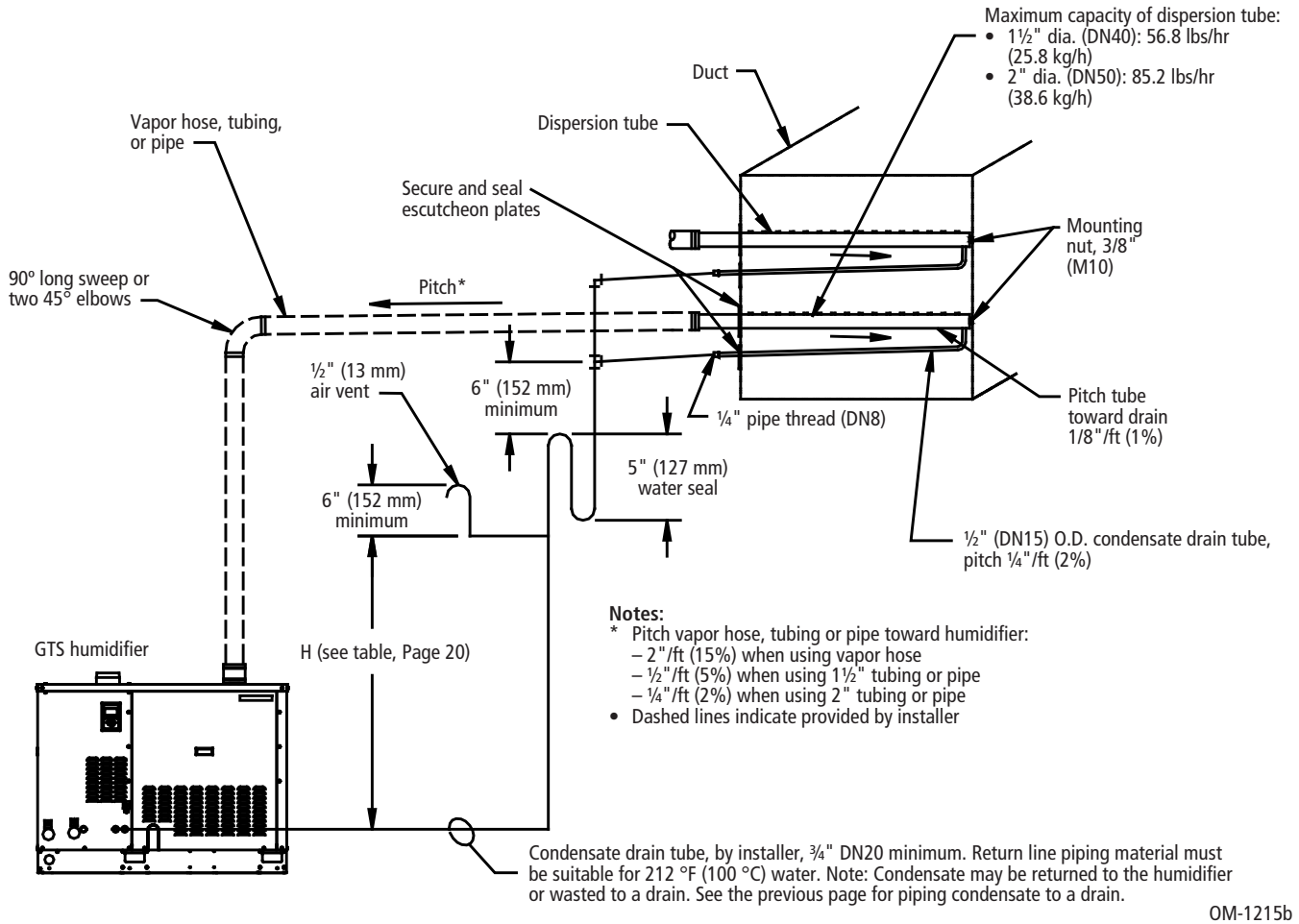


Figure 42-2:
Single tube dispersion with condensate drain

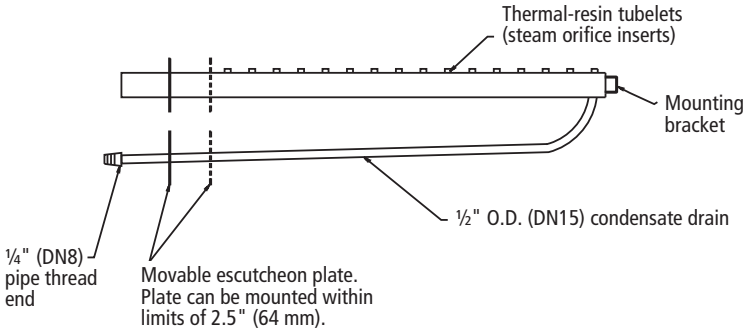
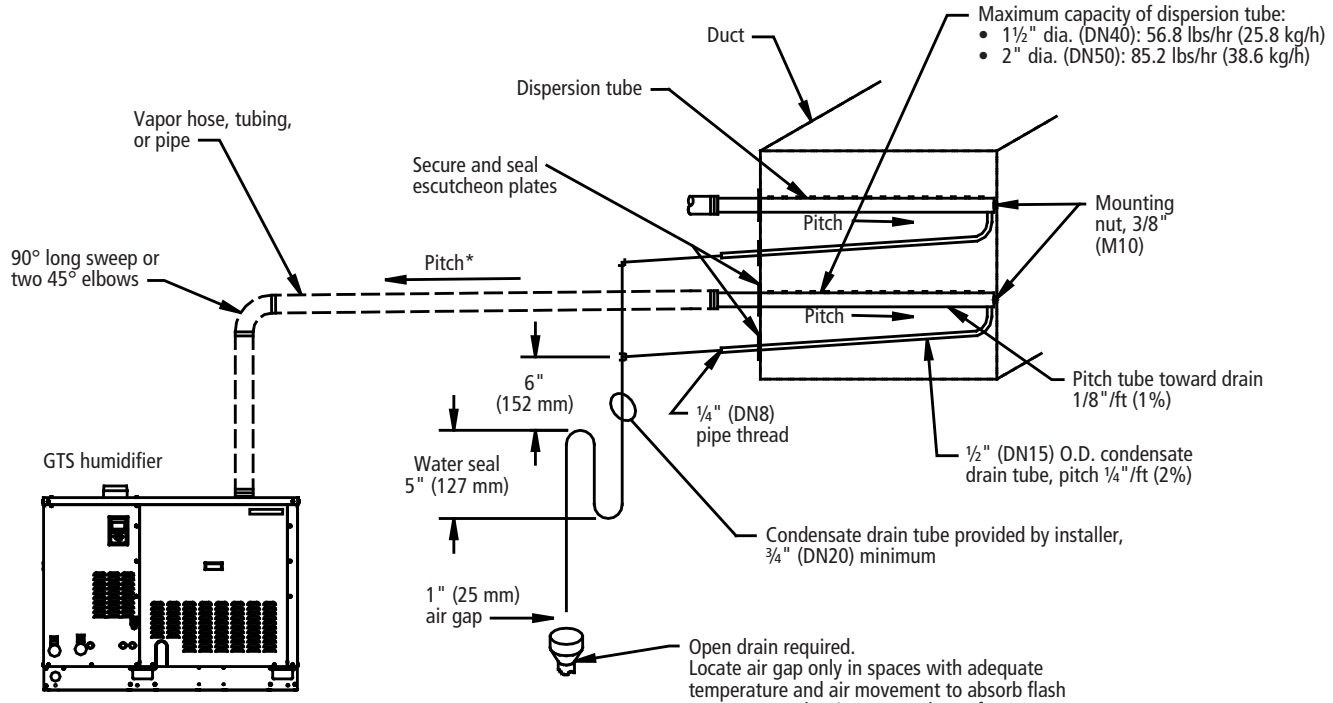


Figure 43-1:
Multiple tubes with condensate wasted to floor drain



Notes:
* Pitch vapor hose, tubing or pipe toward humidifier:
– 2"/ft (15%) when using vapor hose
– ½"/ft (5%) when using 1½" tubing or pipe
– ¼"/ft (2%) when using 2" tubing or pipe
• Dashed lines indicate provided by installer

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CAUTION!

Failure to follow the recommendations in this section can result in excessive back pressures on the humidifier. This will result in unacceptable humidification system performance such as leaking gaskets, blown water seals, erratic water level control, and spitting condensate from the dispersion tube(s).

Table 44-1: Rapid-sorb dispersion tube capacities

Tube capacity		Tube diameter	
lbs/hr	kg/h	inches	DN
≤ 35	≤ 16	1½	40
36-70	17-32	2	50

Table 44-2: Rapid-sorb header capacities

Header capacity		Header diameter	
lbs/hr	kg/h	inches	DN
≤ 250	≤ 113	2	50
251-500	114-227	3	80
501-800	228-363	4	100

General Rapid-sorb installation instructions

- Before you begin installation, read all dispersion instructions in this manual.
- Before you begin installation, unpack shipment and verify receipt of all Rapid-sorb components with packing list. Report any shortages to DRI-STEEM factory immediately. The components typically include the following:
  - Multiple dispersion tubes
  - Header
  - ¾" × 2" (19 mm × 51 mm) L-bracket
  - A single duct escutcheon plate the size of the header
  - Slip couplings or hose cuffs and clamps.
  - Accessories such as duct plates, slip couplings, or hose cuffs are in a plastic bag.
  - The bolts and washers for mounting the dispersion tubes to the bracket will be in the end of the tubes or packaged in a bag with the other accessories.
  - The tubes, header, and L-bracket are tagged with the customer requested identification number written on each component.
- When choosing a location for installation, select a location that provides necessary access in and around the ductwork or air handler.
- The Rapid-sorb typically is installed centered side to side in a duct, or is installed across the face of a coil in an air handler.
- The center line of the outer dispersion tubes should never be closer than 4.5" (114 mm) from the side of the ductwork or air handler wall.
- Rapid-sorbs are provided with an L-bracket for installation:
  - L-brackets that are 50" (1270 mm) or less in length have a hole 4" (102 mm) in from each end to mount the L-bracket to the duct or air handler wall.
  - L-brackets that are greater than 50" (1270 mm) in length have an additional hole in the center of the L-bracket.
  - **Important:** Before marking and drilling holes in the duct or air handler, refer to ALL pitch requirements for the Rapid-sorb assembly you received (see the table on Page 45). The size, quantity, and location of penetrations are determined by the specific dimensions and configuration of the Rapid-sorb assembly you received.
  - **Note:** The hardware for mounting the L-bracket to the duct or air handler wall and the hardware for the header support bracket is not provided.
- The Rapid-sorb instructions that follow are for the most typical Rapid-sorb installations — installed in a duct horizontal airflow with Rapid-sorb header either inside or outside the duct. See the Dri-calc Installation Guides library or contact your representative/distributor or DRI-STEEM for installation instructions for air handler or vertical airflow applications.

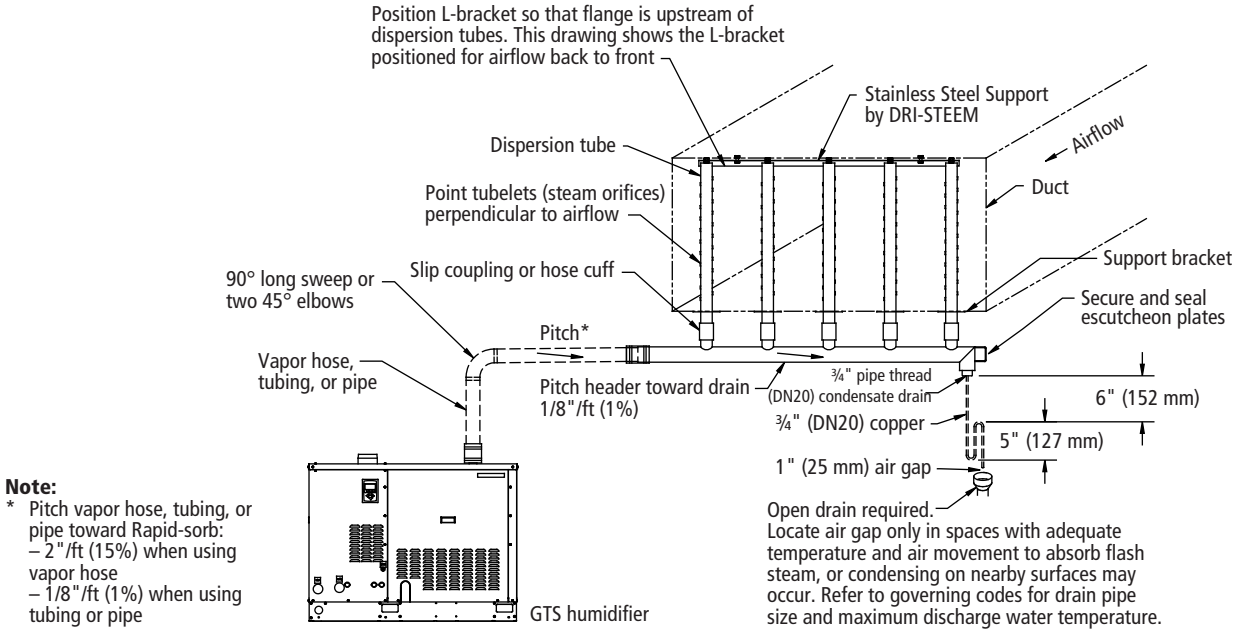
Rapid-sorb pitch requirements

- When installing Rapid-sorb with the header outside a horizontal airflow duct, consider the following pitch issues:
  - For 1½" (DN40) dispersion tubes, use a fastener of sufficient length to accommodate the 1/8"/ft (1%) pitch requirements toward the ¾" pipe thread (DN20) header drain fitting.
  - For 2" (DN50) dispersion tubes, the bracket can be mounted flush to the ductwork. The 1/8"/ft (1%) pitch typically can be accomplished in the length of the hose cuffs used to connect the tubes to the header.
- See the table below and the drawings on the following pages for pitch requirements.

Table 45-1:
Pitch of interconnecting piping, dispersion tubes, and headers for Rapid-sorb evaporative dispersion units

Airflow	Type of interconnecting piping	Diameter of interconnecting piping	Pitch of interconnecting piping	Pitch of dispersion tubes	Pitch of header
Horizontal	Vapor hose	1½" (DN40), 2" (DN50)	2"/ft (15%) toward Rapid-sorb	Vertically plumb	1/8"/ft (1%) toward condensate drain
	Tubing or pipe	1½" (DN40), 2" (DN50), 3" (DN80), 4" (DN100), 5" (DN125), 6" (DN150)	1/8"/ft (1%) toward Rapid-sorb		
Vertical	Vapor hose	1½" (DN40), 2" (DN50)	2"/ft (15%) toward Rapid-sorb	2"/ft toward header	1/8"/ft (1%) toward condensate drain
	Tubing or pipe	1½" (DN40), 2" (DN50), 3" (DN80), 4" (DN100), 5" (DN125), 6" (DN150)	1/8"/ft (1%) toward Rapid-sorb		

Figure 46-1:
Rapid-sorb installed in a horizontal airflow with header outside the duct



Assembly and installation instructions for a Rapid-sorb installed with header outside the duct (horizontal airflow)

1. Locate and cut the holes in the ductwork for the dispersion tubes. Use the L-bracket as a template to locate the holes on the duct floor.

2. Temporarily, loosely suspend or support the header below the final location — the vertical balance point of the dispersion tube length dictates where the header should be suspended or supported temporarily.

3. Mount the dispersion tubes to the header with the provided connector, either a slip coupling or a hose cuff.
   - When installing slip couplings for 1½" (DN40) dispersion tubes, take care not to shear the O-rings.
   - Set the slip coupling on the header stub or dispersion tube so the O-ring is resting on the face of the tubing.
   - Rotate the slip coupling as you push it on to the tubing.
   - The O-rings are lubricated at the factory. If additional lubrication is necessary, DO NOT use a petroleum-based lubricant.

4. Position the flange of the L-bracket so it is upstream of the tubes when the assembly is raised and fastened into position. Fasten the L-bracket to the end of the dispersion tubes with the provided bolt, lock washer, and flat washer.

More on next page ►

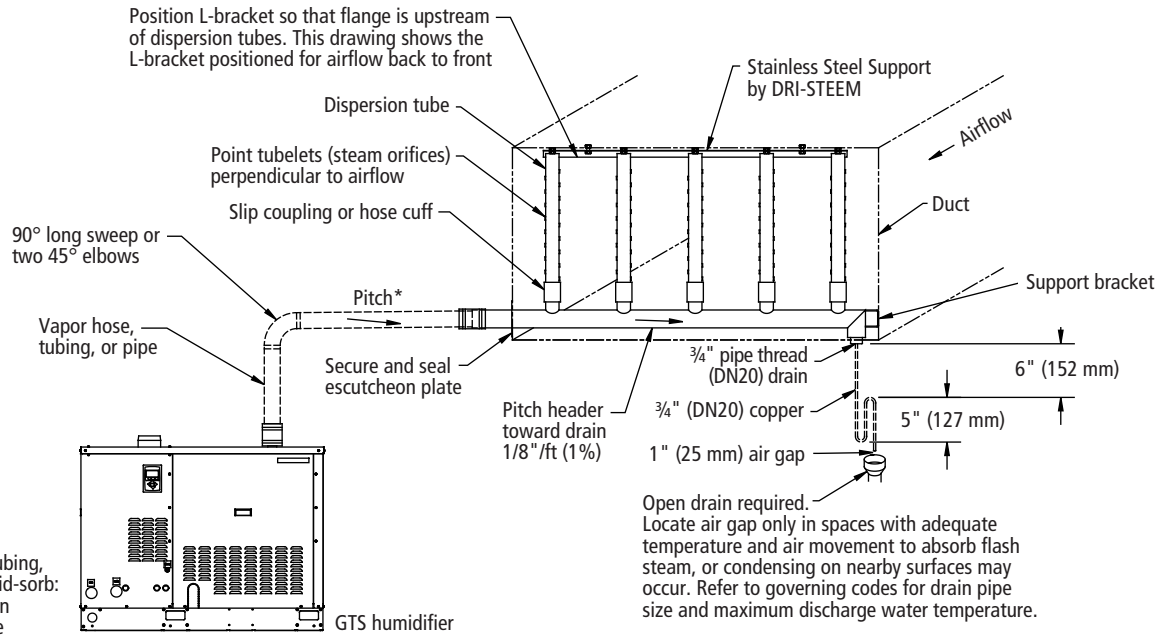
Assembly and installation instructions for a Rapid-sorb installed with header outside the duct (continued)

5. Before tightening the L-bracket bolts to the dispersion tubes follow these instructions:
   - For 1½" (DN40) dispersion tubes:
     - The dispersion tube will rotate in the slip coupling. Verify that the dispersion tube orifices are directed perpendicular to the airflow.
     - The dispersion tube and slip coupling must be fully engaged on to the header stub for the O-rings to provide a seal.
   - For 2" (DN50) dispersion tubes:
     - Before securing the hose cuff in place with the hose clamps on the dispersion tube and the header stub, verify that the dispersion tube orifices are directed perpendicular to the airflow.
6. Slide the assembly up until the L-bracket aligns with the mounting holes in the duct.
   - For 1½" (DN40) dispersion tubes:
     - The header pitch is duplicated in the L-bracket.
     - The dispersion tube and slip coupling must be fully engaged on to the header stub for the O-rings to provide a seal.
     - The high end of the L-bracket can be fastened tight to the duct or air handler.
     - On the low end of the L-bracket, the fastener must be long enough to compensate for the pitch, and a nut should be provided and secured on both sides of the L-bracket and the duct or air handler for stability.
   - For 2" (DN50) dispersion tubes:
     - Fasten the bracket to the top of the duct and use the hose cuffs to compensate for the pitch of the header.
     - Before securing the hose cuff in place with the hose clamps on the dispersion tube and the header stub, verify that the header pitch, 1/8"/ft (1%) toward drain, is maintained.
7. Permanently secure both ends of the header and verify that the header pitch, 1/8"/ft (1%) toward drain, is maintained.
8. Verify that all fasteners are secure:
   - L-bracket to duct
   - Dispersion tubes to L-bracket
   - Hose clamps on 2" (DN50) tubes
9. Secure and seal the dispersion tube escutcheon plate and condensate drain tube escutcheon plate around the respective tubes, if applicable.

Note:

See Page 46 for steam supply and condensate drain line connection instructions.

Figure 48-1:
Rapid-sorb installed in a horizontal airflow with header inside the duct



Note:
* Pitch vapor hose, tubing, or pipe toward Rapid-sorb:
- 2"/ft (15%) when using vapor hose
- 1/8"/ft (1%) when using tubing or pipe

OM-1213

Assembly and installation instructions for a Rapid-sorb installed with header inside the duct (horizontal airflow)

1. Locate and cut the holes in ductwork or air handler for steam header penetration, condensate drain piping, and header support bracket fastener. Allow 1/8"/ft (1%) header pitch toward the support bracket when you drill the hole for the header support bracket fastener.

2. Loosely fasten the header in place.

3. Rotate the header 90° so the header stubs point horizontally in the duct.
   - When installing in an air handler, the rotation of the header is often less than 90°. Typically, due to the condensate drain piping requirements, the header can be set on the floor of the air handler, assembled in the vertical position, and then raised and mounted in place.

4. Mount the dispersion tubes on the header with the slip couplings or hose cuffs.
   - When installing slip couplings for 1½" (DN40) dispersion tubes, take care not to shear the O-rings.
   - Set the slip coupling on the header stub or dispersion tube so the O-ring is resting on the face of the tubing.

More on next page ►

Assembly and installation instructions for a Rapid-sorb installed with header inside the duct (continued)

- Rotate the slip coupling as you push it on to the tubing.
- The O-rings are lubricated at the factory. If additional lubrication is necessary, DO NOT use a petroleum-based lubricant.

5. Allow the dispersion tubes to rest against the bottom of the duct.
6. Position the flange of the L-bracket so it is upstream of the tubes when the assembly is rotated into position. Fasten the L-bracket to the end of the dispersion tubes with the provided bolt, lock washer, and flat washer.
7. Rotate the assembly up until the L-bracket aligns with the mounting holes in the duct or air handler.
   - 1½" (DN40) dispersion tubes
     - The header pitch is duplicated in the L-bracket.
     - The dispersion tube and slip coupling must be fully engaged on to the header stub for the O-rings to provide a seal.
     - The high end of the L-bracket can be fastened tight to the duct or air handler.
     - On the low end of the L-bracket, the fastener must be long enough to compensate for the pitch, and a nut should be provided and secured on both sides of the L-bracket and the duct or air handler for stability.
   - 2" (DN50) dispersion tubes
     - Fasten the bracket to the top of the duct or air handler and use the hose cuffs to compensate for the pitch of the header.
     - Before securing the hose cuff in place, with the hose clamps on the dispersion tube and the header stub, verify that the dispersion tube orifices are directed perpendicular to the airflow.
8. Verify that all fasteners are secure:
   - L-bracket to duct
   - Dispersion tubes to L-bracket
   - Hose clamps on 2" (DN50) tubes
   - Header support bracket fastener
9. Secure and seal the header escutcheon plate around the header.
10. See page 48 for steam supply and condensate drain line connection instructions.

Steam supply connections to the Rapid-sorb header

1. Connect the steam supply interconnecting piping from the humidifier to the Rapid-sorb. The steam supply piping requires a minimum of 1/8"/ft (1%) pitch toward the header.
2. If multiple humidifiers are supplying one Rapid-sorb, a multiple steam supply connector is provided.
   - Typically, the multiple steam supply connector attaches to the Rapid-sorb header supply end with hose cuff and clamps.
   - Route the necessary number of steam supplies from the humidifier tanks to the steam supply connector.
   - Position the steam supply connector to accept the steam supplies while maintaining the necessary pitch.
   - Make sure the hose clamps on the steam supply connector and header are tight.

Condensate drain connections to the Rapid-sorb header

1. Piping must be minimum ¾" I.D. (DN20) and rated for 212 °F (100 °C) minimum continuous operating temperature.
2. Condensate drain line must be piped as shown in the figures on the previous pages. Provide a 6" (152 mm) drop prior to a 5" (127 mm) water seal to:
   - Ensure drainage of condensate from the header
   - Keep steam from blowing out of the drain line
3. After the water seal, run the drain line to an open drain with a 1" (25 mm) vertical air gap. Cut the drain line at a 45° angle on the end above the drain to permit a direct stream of water into the drain pipe while maintaining a 1" (25 mm) air gap. Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam, or condensing on nearby surfaces may occur.
4. All drain lines must be installed and sized according to governing codes.

Area-type™ fan dispersion

The table on the following page lists the Area-type steam minimum rise, spread, and throw nonwetting dimensions. Surfaces or objects located within this minimum dimension can cause condensation and dripping.

- Rise: The minimum nonwetting height above the steam chute
- Spread: The minimum nonwetting width from the steam chute
- Throw: The minimum nonwetting horizontal distance from the steam chute

The greater the space relative humidity, the higher and farther the discharged steam will carry and rise in the space until becoming absorbed.

The Area-type fan, brackets, and wiring are factory installed on the humidifier.

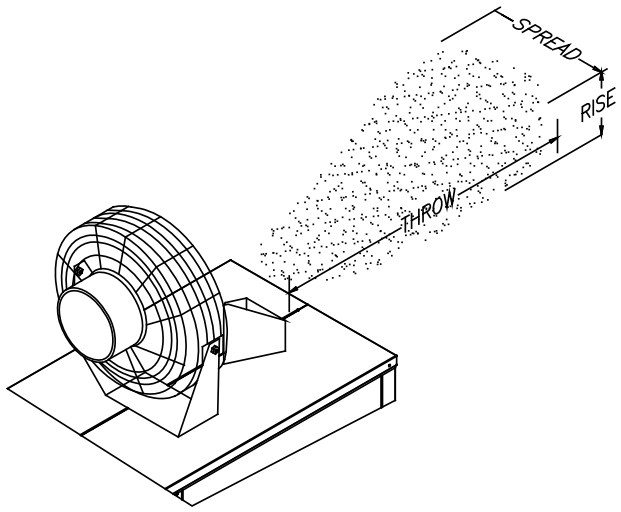
Table 51-1:
Area-type electric fan specifications

Motor	120 V, 50/60 Hz
Blade diameter	18" (457 mm)
Speeds	3
Control	Rotary switch
cfm (high speed)	5350
m^3/s (high speed)	2.52
rpm (high speed)	1500
Amps (high speed)	1.52

Note:

For European models, contact your distributor for Area-type parts.

Figure 51-1:
Area-type rise, spread, throw



OM-1230

Table 52-1:
Area-type (evaporative steam) minimum non-wetting distances*

Maximum steam capacity		60 °F (16 °C)																	
		30% RH						40% RH						50% RH					
		Rise		Spread		Throw		Rise		Spread		Throw		Rise		Spread		Throw	
lbs/hr	kg/h	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m
50	20	1.0	0.3	2.0	0.6	6.0	1.8	1.0	0.3	2.0	0.6	6.0	1.8	1.0	0.3	2.5	0.8	6.0	1.8
75	34	3.0	0.9	3.0	0.9	8.0	2.4	3.0	0.9	3.0	0.9	8.0	2.4	3.0	0.9	4.0	1.2	8.0	2.4
100	45	4.0	1.2	4.0	1.2	10.0	3.1	4.0	1.2	4.0	1.2	10.0	3.1	4.0	1.2	5.0	1.5	10.0	3.1
150	68	6.0	1.8	5.0	1.5	12.0	3.7	6.0	1.8	5.0	1.5	12.0	3.7	6.0	1.8	5.0	1.5	12.0	3.7
200	90	7.0	2.1	7.0	2.1	13.0	4.0	8.0	2.4	7.0	2.1	14.0	4.3	8.0	2.4	7.0	2.1	14.0	4.3
225	102	7.0	2.1	7.0	2.1	13.0	4.0	8.0	2.4	7.0	2.1	14.0	4.3	8.0	2.4	7.0	2.1	14.0	4.3
250	110	8.0	2.4	8.0	2.4	15.0	4.6	9.0	2.7	9.0	2.7	16.0	4.9	9.0	2.7	9.0	2.7	16.0	4.9
285	130	9.0	2.7	9.0	2.7	17.0	5.2	10.0	3.1	10.0	3.1	18.0	5.5	10.0	3.1	10.0	3.1	18.0	5.5
300	136	9.0	2.7	9.0	2.7	17.0	5.2	10.0	3.1	10.0	3.1	18.0	5.5	10.0	3.1	10.0	3.1	18.0	5.5
Maximum steam capacity		70 °F (21 °C)																	
		30% RH						40% RH						50% RH					
		Rise		Spread		Throw		Rise		Spread		Throw		Rise		Spread		Throw	
lbs/hr	kg/h	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m
50	20	1.0	0.3	1.5	0.5	4.0	1.2	1.0	0.3	2.0	0.6	4.0	1.2	1.0	0.3	2.0	0.6	4.0	1.2
75	34	2.0	0.6	2.0	0.6	6.0	1.8	2.0	0.6	2.5	0.8	6.0	1.8	2.0	0.6	2.5	0.8	6.0	1.8
100	45	3.0	0.9	3.0	0.9	8.0	2.4	3.0	0.9	3.0	0.9	8.0	2.4	3.0	0.9	3.0	0.9	8.0	2.4
150	68	4.0	1.2	4.0	1.2	10.0	3.1	4.0	1.2	4.0	1.2	11.0	3.4	4.0	1.2	4.0	1.2	11.0	3.4
200	90	5.0	1.5	5.0	1.5	11.0	3.4	5.0	1.5	5.0	1.5	12.0	3.7	5.0	1.5	5.0	1.5	12.0	3.7
225	102	5.0	1.5	5.0	1.5	11.0	3.4	5.0	1.5	5.0	1.5	12.0	3.7	5.0	1.5	5.0	1.5	12.0	3.7
250	110	6.0	1.8	6.0	1.8	12.0	3.7	6.0	1.8	6.0	1.8	13.0	4.0	6.0	1.8	6.0	1.8	14.0	4.3
285	130	7.0	2.1	7.0	2.1	14.0	4.3	7.0	2.1	7.0	2.1	15.0	4.6	7.0	2.1	7.0	2.1	16.0	4.9
300	136	7.0	2.1	7.0	2.1	14.0	4.3	7.0	2.1	7.0	2.1	15.0	4.6	7.0	2.1	7.0	2.1	16.0	4.9

Notes:
* With fan on high speed
Rise: Minimum non-wetting height above the steam chute
Spread: Minimum non-wetting width from the steam chute
Throw: Minimum non-wetting horizontal distance from the steam chute

After the system is installed and connected to gas, electrical, water supplies, and controls, you can begin start-up procedures.

1. 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-logic3 Installation and Operation Manual*
     - 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
2. **Piping (gas)**—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, water supply)—Verify that all piping connections have been completed as recommended and that water pressure is available.
3. **Electrical**—Verify that all wiring connections have been made in accordance with all governing codes and the GTS wiring diagrams.
4. **Controls**—Before proceeding with start-up and operation, 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-logic3 manual that was enclosed with the product shipment.

More on the next page ►

WARNING!

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

Note:

The *Vapor-logic3 Installation and Operation Manual* is a comprehensive operation manual. Refer to it for information regarding the following features:

- Keypad display setup and menu information
- Control input signals and functions
- Drain, flush, and skim features
- Safety features
- Alarm screens and fault messages

The Vapor-logic3 manual was shipped with your humidifier. Additional copies can be viewed, printed, or ordered at www.dristeem.com

5. Verify that the humidifier tank is securely installed and level before filling with water (see the operating weights table in this manual).
6. Verify that the humidifier tank is level front to back and side to side after it is full of water.
7. Refer to the following sections in the *Vapor-logic3 Installation and Operation Manual:*
   - Operation section
   - Start-up checklist (it is critical that the installer follow this checklist)
8. During start-up, do not leave the humidifier unattended.
9. Monitor humidifier operation through multiple fill cycles. The humidifier operating status appears on the keypad/display.
10. On standard water units, water skims from the humidifier after every fill cycle. Adjust the amount of skim by increasing or decreasing the skim time (see the *Vapor-logic3 Installation and Operation Manual)*. However, at start-up, DRI-STEEM recommends initially running the humidifier with the factory default setting for skim time. (See the operation information section in this manual.)

Safety systems

The GTS humidifier has a number of systems and safeguards to ensure proper operation.

- 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 actual speed is different from the demand speed, the GTS will not operate.
- The negative pressure gas valves used on the GTS are designed to keep a constant ratio of air and gas throughout the operating range of the blower. If the flue becomes blocked or the blower fails to run, the gas valve will not pass any gas to the burner and will shut down the humidifier.
- During operation, the water level in the tank is monitored by a probe system for standard water units and by a low water float for DI/RO units. These water monitors tie into the Vapor-logic3 controller. If the water level drops below a safe point, the humidifier shuts down.
- In standard water applications, the water level in the tank is also monitored by a redundant low-water system that runs independently of the Vapor-logic3. This system is tied directly into the power source for the gas valves. If this system detects a low water condition, the humidifier shuts down.
- In addition to monitoring the water level, there is a temperature sensor located near the top of the heat exchanger. If the water level drops too low and both the main and redundant low water sensors fail to detect it, the temperature sensor shuts down the humidifier before an unsafe condition occurs.
- For standard water systems, an additional low water safety system exists. The microprocessor keeps track of approximately how much water leaves the tank in the form of steam. If the total amount exceeds a preset limit without energizing the fill valve, a low water condition is assumed and the humidifier shuts down. Each time the fill valve energizes, the total steam produced amount resets to zero. (This system is not implemented on a DI/RO humidifier because the float valve is not an electric-solenoid type. On a DI/RO humidifier, a mechanical fill valve maintains the proper water level. This fill valve runs independently of the microprocessor. Therefore, there is no way to reset the steam total to zero as the tank fills.)

Operation: Start-up commissioning checklist

Visit date_____

Model #_____

Serial #_____

Tag #_____

Job site representation:

_____

_____

_____

Job name_____

Program code _____

DRI-STEEM rep_____

Supply water

- ❑ DI
- ❑ RO
- ❑ Soft
- ❑ Potable

Grains hardness_____

- ❑ Hot*
- ❑ Cold

Water pressure _____ psi
(must be between 25 and 90 psi [172 and 620 kPa])

- ❑ Water supply piping is ¼" pipe thread minimum

Float adjustments (DI system)

_____

Note: *If using heated supply water, disconnect the water supply line to the water tempering device at the fill manifold and reconnect it to a cold water supply. This will ensure that the water tempering device operates properly.

Gas supply

- ❑ Natural
- ❑ LP

Manifold pressure _____inches wc (_____kPa)

Supply shutoff valve distance_____

Supply line size_____

Flue piping

Class_____

Size_____

Rise_____

Run_____

- ❑ Slight pitch toward drip tee
- ❑ Termination point capped and covered

Power venter location_____

Barometric damper location_____

Required clearances

- ❑ Top cover removal 18" (457 mm)
- ❑ Distance vent box to combustible 30" (762 mm)
- ❑ Cleanout plate side 36" (914 mm)

Wiring

- ❑ Control transmitter
  Gauge _____
  - ❑ Shield
- ❑ High limit duct humidistat
  Gauge _____
  - ❑ Shield
- ❑ Airflow proving switch
- ❑ Power vent
- ❑ 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
- ❑ Vapor hose (do not insulate)

Rise_____

Run_____

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

More checklist on next page ...

Operation: Start-up commissioning checklist (continued)

Dispersion

- ❑ Ultra-sorb
- ❑ Rapid-sorb
- ❑ Single tube
- ❑ Single tube with drain

Condensate/drain piping

Water seal height of dispersion system

_____

- ❑ Air gap
- ❑ Condensate return to tank
- ❑ Drane-kooler

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

Burner 3 lights after:
- ❑ First try
- ❑ Second try
- ❑ Third try

Burner 3 color after 15 minutes:
- ❑ Blue
- ❑ Orange
- ❑ Red-orange

Burner 4 lights after:
- ❑ First try
- ❑ Second try
- ❑ Third try

Burner 4 color after 15 minutes:
- ❑ Blue
- ❑ Orange
- ❑ Red-orange

Safety testing to verify function

Low water test_____

High humidity limit test_____

Airflow test_____

Aquastat test_____

Additional comments

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Maintenance: For both GTS and GTS-DI models

Both GTS and GTS-DI models

Inspection recommendations:

- User inspection every 30 days.
- Appliance system inspected once a year by a qualified service person.

During inspection, verify the following:

- Proper field operation of burner. To verify, measure carbon monoxide (CO) level in the flue. If CO level is greater than 400 ppm, immediately shut down the GTS unit and consult the factory.
- Flue passageways external to the appliance, such as vent connector and chimney, are clear and free of obstructions.
- Vent connector is in place, sloping upward and is physically sound without holes or excessive corrosion.
- Physical support of the appliance is sound without sagging cracks or gaps between floor stand legs or tank flanges.
- There are no obvious signs of deterioration of the appliance.
- Burner flame is blue or orange in color — up to a ¼" (6 mm) from the surface of the burner.
- See “Clean the probes” and “Clean low water cutout probe” on Page 62 and 63.

Inspecting burner assemblies and heat exchanger tubes

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

- Turn off gas, electrical power, and water supply.
- Remove gas train shroud.
- Disconnect wiring to blowers, flame sensors, gas valves, and ignition controllers and remove burner assemblies (each assembly is mounted with four bolts).
- Remove vent box.
- Use a 6" (150 mm) flue brush with a 24" (600 mm) extension and reversible drill. Work brush in and out of all combustion chambers. **Note:** Disconnecting components from one burner assembly at a time and then cleaning the corresponding combustion chamber and burner will ease reassembly.

More on next page ►

- Remove loose deposits and residue that falls into rear header with a vacuum cleaner and hose extension.
- Inspect 1½" (DN40) return tubes and clean if necessary.
- Run thin brush between turbulator and tube wall on all four sides.
- Reinstall burner assemblies and gaskets; vent box and gasket; all electrical wiring; gas train shroud; and pressure switch connections.

Note:

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

Burner maintenance

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 may result in reduced unit capacity or unacceptable CO levels in the flue. Use sealed combustion in dirty environments. See burner maintenance instructions below.

Burner maintenance instructions

To service the burner system, clean both the blower and the burner. Remove the blower(s) from the system and clean dust from the wheel. Remove the burner(s) 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.

WARNING!

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

Replacement parts

When servicing or repairing this equipment, use only DRI-STEEM approved service replacement parts. Complete replacement part lists are on Pages 68–77. Refer to the rating plate on the unit for complete unit model number, serial number, and company address. Any substitution of parts or controls not approved by DRI-STEEM will be at owner's risk and will void the warranty.

Maintenance: GTS standard water models

GTS standard water quality recommendations

The best way to determine how often your particular system needs maintenance is to remove the probe plate and inspect it 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
  - Regular skimming
- 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
  - Regular skimming
  - Periodic drain and flush cycles
- Softened water dramatically reduces mineral accumulation inside standard water models.
  (Note: Solids, like silica, are not removed in the softening process.)

Adjusting skim duration

The skim time duration determines the quantity of water skimmed with each fill cycle. Skim time is field adjustable using the Vapor-logic3 keypad.

Each time the GTS refills, it fills to an elevation near the lip of the skim/overflow fitting. A portion of the refill water then flows to the drain carrying most of the minerals left by the previous evaporating cycle. This reduces the mineral concentration, thereby reducing the frequency of cleaning needed.

The heated water that flows to the drain is an operational cost. Cleaning the humidifier also is an operational cost. Therefore, DRI-STEEM recommends that the user observe and adjust the skimming quantity to achieve a balance between minimizing mineral buildup and conserving heated water.

Cool down humidifier before beginning maintenance

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 keypad/display Set Up screens) is less than room temperature (default setting is 40 °F [4 °C]) so that the heaters do not energize while cooling down the tank.
- For models with a standard drain valve:
  - Manually open the drain valve by moving the valve lever located on the back of the drain valve to the manual open position.
  - The fill valve eventually opens.
  - Let the fill water run until the tank is cooled; then shut off the field-installed manual supply water shut-off valve.
  - Let the tank drain; then manually close the drain valve.
- For models with optional drain valves:
  - For drain valves without the manual open lever, use the keypad to perform the cool down process.
  - Go to the control modes screen and select Manual Drain.
  - Allow approximately half the water to drain out of the tank.
  - In the Control Modes screen select Auto; the fill valve opens and the humidifier cools down.
  - When the fill valve closes, select Manual Drain in the Control Modes screen and let the tank drain dry. The humidifier should be cool enough to work on.
  - For more information about using the keypad, see the *Vapor-logic3 Installation and Operation Manual.*

WARNING!

When performing maintenance on the GTS humidifier, always switch the keypad control mode to Standby, place all power disconnects in OFF position and lock in OFF position, close the field installed manual water supply and gas shut-off valves. Failure to follow these instructions may cause severe bodily injury or death from electric shock.

Maintenance: GTS standard water models (continued)

Inspection and maintenance

1. Annually (also recommended when maintenance is performed)

- Inspect tank, piping, and gaskets for water and gas leaks.
- 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 plugs; valve should de-energize.

2. Seasonally (or as required, depending on water quality)

- Clean 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.
- Dismantle and clean drain valve and associated piping
- Clean the probes
  - Access the probe assembly either from the electrical panel or by removing the roof panel above the electrical area.
  - 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. Remove the housing from the tank by removing the cover plate from the tank.
  - 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 rod assembly for any signs of cracking, roughness, or deterioration. If found, replace probe assembly.

More on next page ►

Inspection and maintenance (continued)

  - Reassemble the probe assembly.
- Clean the skim/overflow port
  - Water should drain from the skimmer drain pipe after each fill cycle. 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 low water cutout probe — Remove the shroud cover and inspect the probe rod for mineral accumulation. The rod is located on the top of the tank near the back. Use stainless steel wool to clean the probe .
- 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

More on next page ►

WARNING!

When performing maintenance on the GTS humidifier, always switch the keypad control mode to Standby, place all power disconnects in OFF position and lock in OFF position, close the field installed manual water supply and gas shut-off valves. Failure to follow these instructions may cause severe bodily injury or death from electric shock.

Important:

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

the shrouded area.

- When the maintenance requirements are complete:
  - Replace cleanout plate and tighten the nuts on the plate.
  - Verify that the probe rod holder 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.
  - 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.

3. **Off-season maintenance**
   - Perform complete inspection and cleaning of the following:
     - Probe rods
     - Skimmer port and water seal
     - Humidifier tank
     - Heat exchanger
   - After cleaning, the humidifier should remain empty until humidification is required.

GTS-DI models 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 DRI-STEEM warranty does not cover damage caused by chloride corrosion.
- GTS-DI models do not require regular cleaning, although regular inspections are advised.
- GTS-DI models do not require skimming or draining and flushing to remove precipitated minerals. However, at the end of a humidification season, drain all DI humidifiers either by manually opening the drain valve or by programming the humidifier to automatically drain at end-of-season (electric fill and drain valve required).

Cool down humidifier before beginning maintenance

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

- Tanks will have hot surfaces.
- Verify that there is no call for humidity and that the aquastat set point (adjusted using the keypad/display Set Up screens) is less than room temperature (default setting is 40 °F [4 °C]) so the unit does not fire-up while cooling down the tank.
- For models with a standard drain valve:
  - Manually open the drain valve.
  - The float valve opens.
  - Let the fill water run until the tank is cooled; then shut off the field-installed manual supply water shut-off valve.
  - Let the tank drain; then manually close the drain valve.
- For models with end-of-season drain option:
  - Use the keypad to perform the cool down process.
  - Select Manual Drain in the control modes screen.
  - Allow approximately half the water to drain out of the tank.
  - Select Auto in the control modes screen; the fill valve opens and the humidifier cools down.
  - When the fill valve closes, select Manual Drain in the control modes screen and allow the tank to drain completely dry. The humidifier should be cool enough to work on.
  - For more information about using the keypad, see the *Vapor-logic3 Installation and Operation Manual.*

WARNING!

When performing maintenance on the GTS humidifier, always switch the keypad control mode to Standby, place all power disconnects in OFF position and lock in OFF position, close the field installed manual water supply and gas shut-off valves. Failure to follow these instructions may cause severe bodily injury or death from electric shock.

WARNING!

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

Inspection

1. **Annually** (also recommended when maintenance is performed)
   - Inspect tank and gaskets for leaks.
   - 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 cutoff switch
   - Verify that the float valve is closing off. If the float valve will not shut off, there may be particulate on the valve seat, or the stopper may be worn and need replacing.
   - As long as mineral-free water is used in the GTS, no cleaning or flushing of the humidifier should be necessary.

2. **Seasonally** (or as required, depending on water quality)
   - Inspect blower motor. Since a lubrication port is not provided, 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 shaded area.

3. **Off-season maintenance**
   - Perform a complete inspection of the following:
     - Float valve
     - Low water cutoff switch
     - Humidifier tank and gaskets
     - Heat exchanger
   - Drain humidifier tank and rinse.
   - After inspection, the humidifier should remain empty until humidification is required.

The *Vapor-logic3 Installation and Operation Manual* that shipped with your humidifier is a comprehensive operation manual. Refer to it for troubleshooting information.

Download DRI-STEEM literature

Most DRI-STEEM product manuals can be downloaded, printed and ordered from our web site: www.dristeem.com

Figure 68-1:
GTS replacement parts

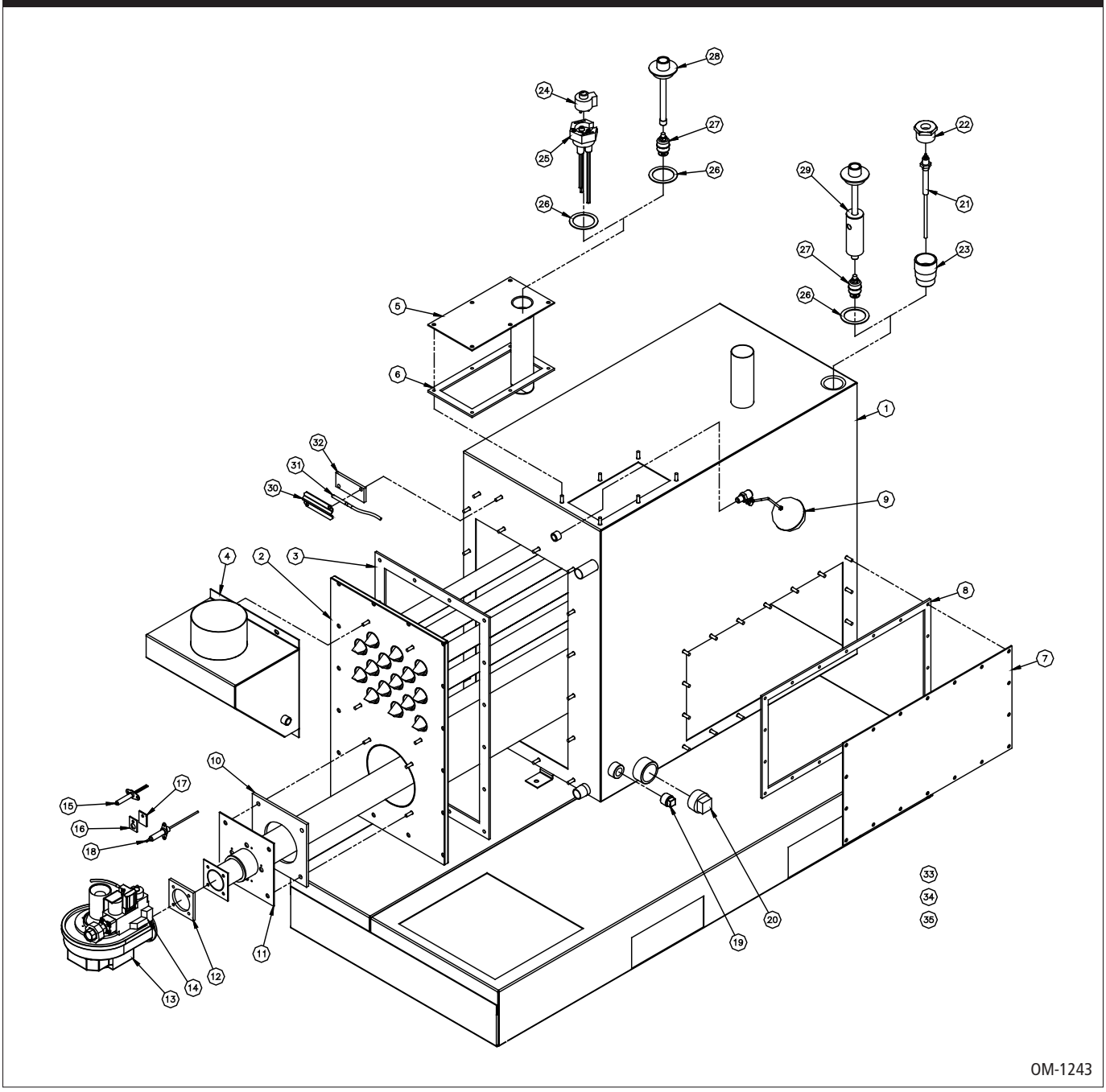
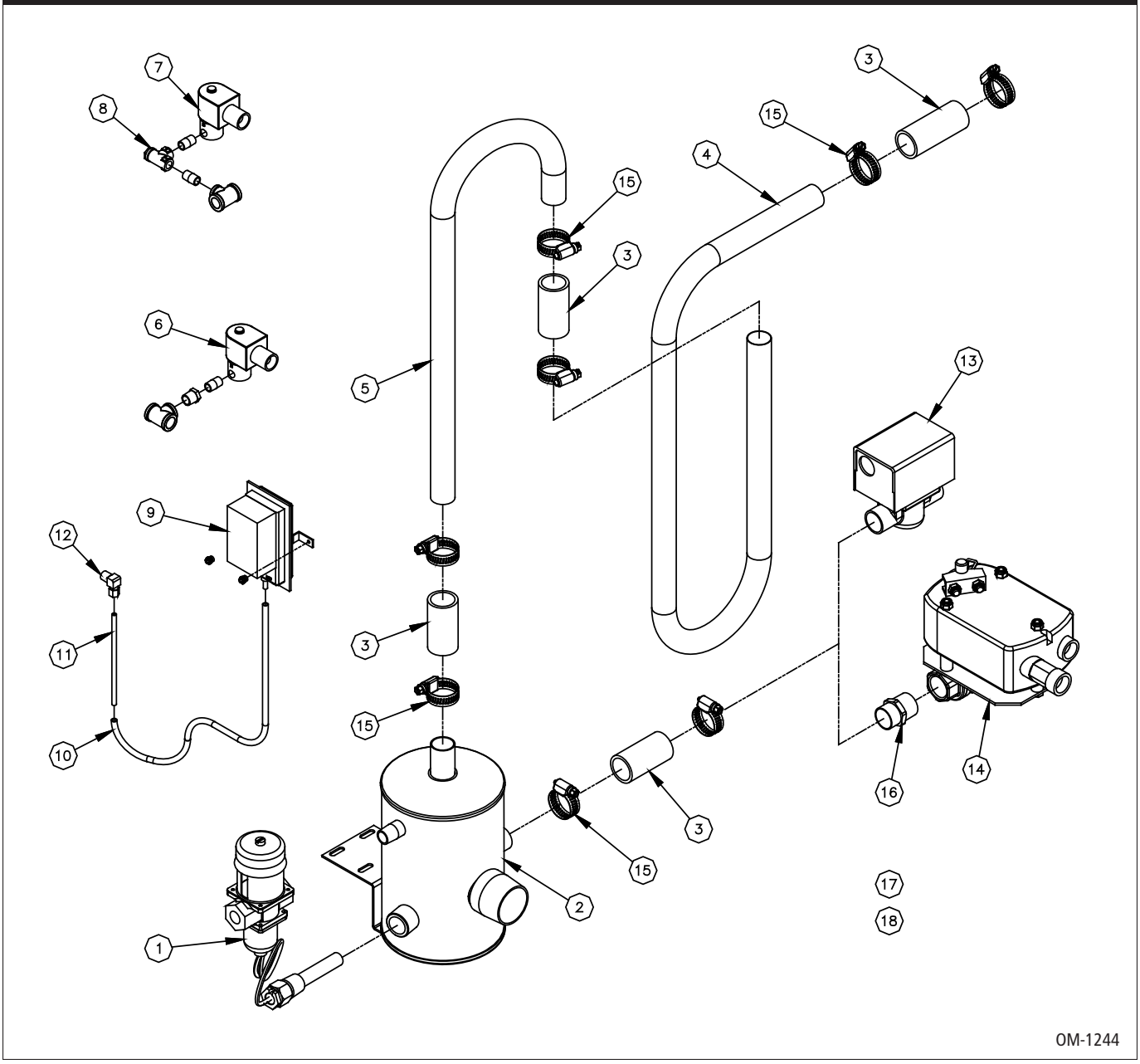


Table 69-1:
GTS replacement parts

No.	Description	Part no.	No.	Description	Part no.
1	Tank	Consult factory	19	Plug, ¾"	250192-002
2	Heat exchanger	Consult factory	20	Plug, 1½"	250681-002
3	Heat exchanger gasket	Consult factory	21	Redundant probe *	405726-001
4	Flue box	Consult factory	22	Bushing, 1¼" × ½" *	405800-015
5	Probe plate	165302-005	23	Adapter weld *	168010-005
6	Probe plate gasket	308235-006	24	Probe plug *	406050-100
7	Cleanout plate	165479-001	25	Probe assembly *	406303-010
8	Cleanout plate gasket	308235-005	26	Probe gasket	309750-004
9	DI float valve assembly **	Consult factory	27	DI float switch **	408420-002
10	Burner gasket	308230-006	28	DI float weld **	167789
11	Burner	Consult factory	29	Redundant DI float weld **	167789-002
12	Blower gasket	308230-007	30	Temperature sensor bracket	128666-001
13	Blower	405800-003	31	Temperature sensor	405760
14	Gas valve	405800-007	32	Temperature sensor gasket	308230-011
15	Ignitor	405719	33	Gas manifold weld ***	Consult factory
16	Sight glass bracket	128661	34	Sealed combustion assembly ***	Consult factory
17	Sight glass	405720	35	Pallet/shroud components ***	Consult factory
18	Flame sensor	405725			

Notes:
* Standard water models only
** DI models only
*** Not shown

Figure 70-1:
GTS fill, drain, and blocked flue replacement parts



GTS fill, drain, and blocked flue replacement parts

Table 71-1:
GTS fill, drain, and blocked flue replacement parts

No.	Description	Part no.
1	Water tempering valve	505090-001
2	Water tempering tank	167001-035
3	Drain hose cuff	Consult factory
4	Top water seal tube	204812-201
5	Bottom water seal tube	204812-202
6	Fill valve, DI EOS models **	505086
7	Fill valve, standard water models *	505084
8	Strainer *	300050
9	Blocked flue sensor	406190
10	Flexible tubing	405722
11	Copper tubing	100038-025
12	Compression elbow	405723
13	Drain valve, standard water models *	505075
14	Drain valve, DI-EOS models **	193458
15	Hose clamp	700560-100
16	Adapter, NPT × C	204700
17	Fill hose ***	Consult factory
18	Water tempering hose ***	307021-002
Notes: * Standard water models only ** DI models only *** Not shown		

Figure 72-1:
GTS electrical replacement parts

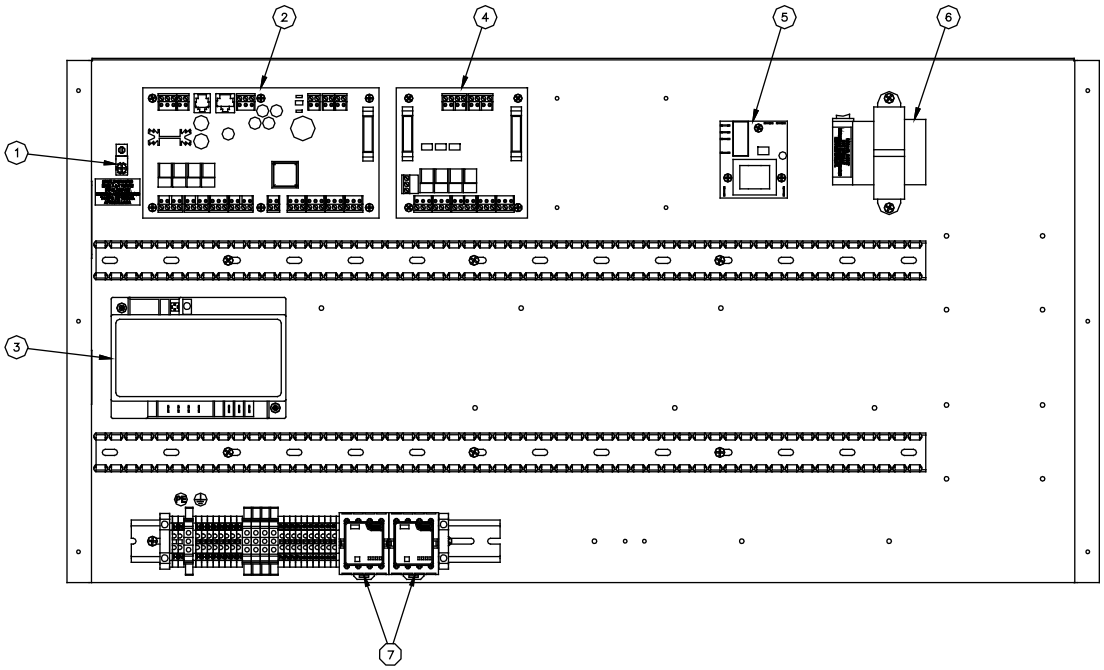
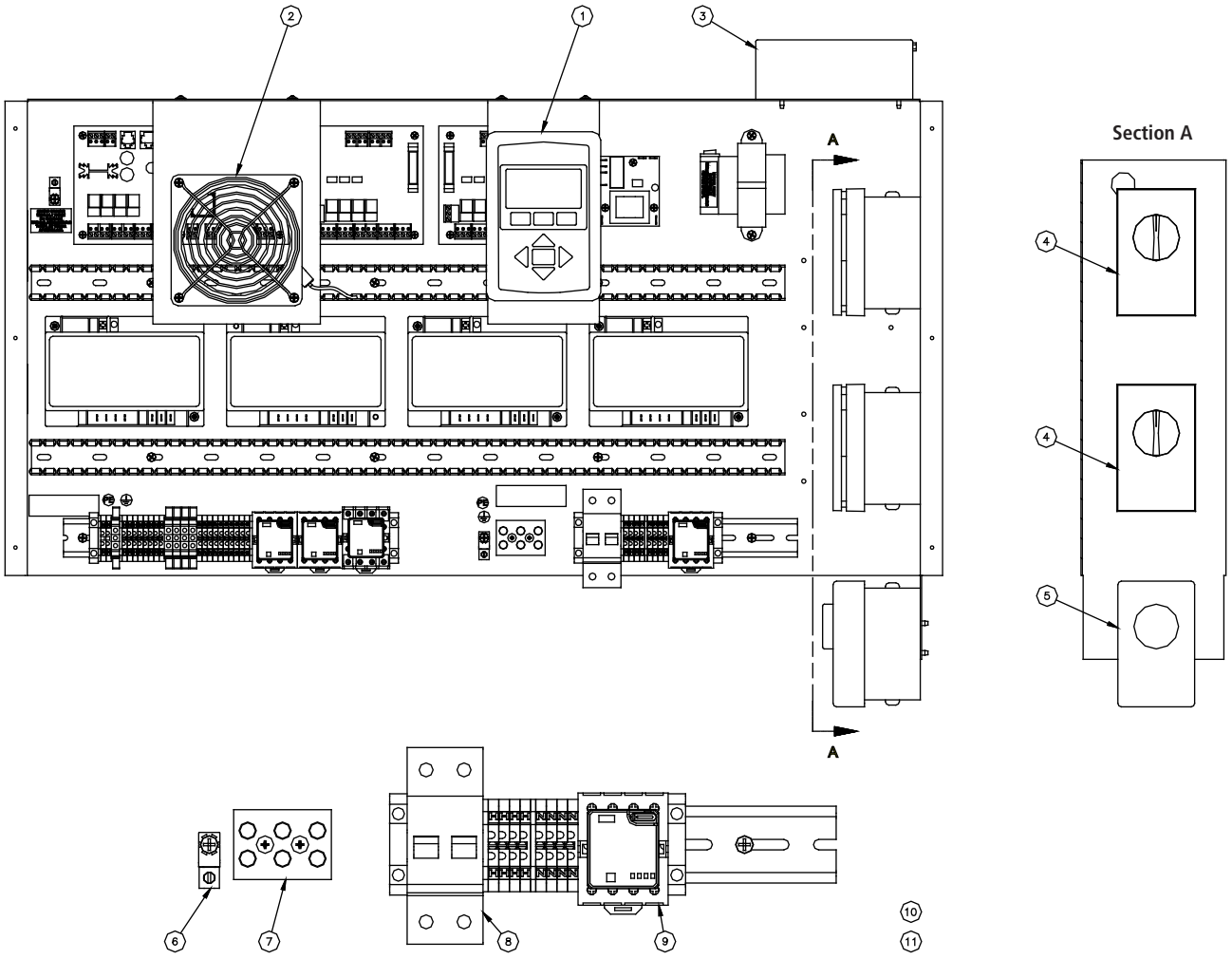


Table 73-1:
GTS electrical replacement parts

No.	Description	Part no.
1	Ground wire lug	409250-003
2	Vapor-logic3 main board	408491-001
3	Ignition module	405800-006
4	Vapor-logic3 GTS expansion board	408490-004
5	Low water board *	405726 *
6	Transformer	408965-001
7	Relays, Sockets, time delay	Consult factory

Note:
* Standard water models only

Figure 74-1:
Outdoor enclosure electrical replacement parts



Note:
For European models, refer to Fisair diagrams

OM-1242

Outdoor enclosure electrical replacement parts

Table 75-1:
Outdoor enclosure electrical replacement parts

No.	Description	Part no.
1	Vapor-logic3 display	408491-002
2	Fan assembly	185110-001
3	High limit stat	405800-065
4	Fan/low limit stat	405800-067
5	Heater stat	405800-066
6	Ground wire lug	409250-003
7	Power block	408300-002
8	Circuit breaker	406775-005
9	Relays, sockets, time delay	Consult factory
10	Heater assembly, 500W ***	Consult factory
11	Heater assembly, 1100W ***	Consult factory

Note:
*** Not shown

Information for European models only

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.

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.

Authorized countries of destination

The GTS and GTS-DI 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 76-1:
Gas specifications for European models

Humidifier model	Volumetric flow rate by gas category					Average flue temperature	Minimum draught requirement	Mass flow rate of combustion products
	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			
GTS-100	2.31 m^3/h	2.82 m^3/h	2.31-2.82 m^3/h	1.31 m^3/h	1.49 m^3/h	121 °C	-0.025 mbar	6.9 g/s
GTS-200	4.62 m^3/h	5.64 m^3/h	4.62-5.64 m^3/h	2.62 m^3/h	2.98 m^3/h	163 °C	-0.025 mbar	13.8 g/s
GTS-300	6.92 m^3/h	8.46 m^3/h	6.92-8.46 m^3/h	3.93 m^3/h	4.47 m^3/h	191 °C	-0.025 mbar	20.7 g/s
GTS-400	7.62 m^3/h	9.31 m^3/h	7.62-9.31 m^3/h	4.32 m^3/h	4.92 m^3/h	218 °C	-0.025 mbar	22.8 g/s
GTS-600	13.85 m^3/h	16.92 m^3/h	13.85-16.92 m^3/h	7.86 m^3/h	8.94 m^3/h	218 °C	-0.025 mbar	41.4 g/s
GTS-800	18.47 m^3/h	22.56 m^3/h	18.47-22.56 m^3/h	10.48 m^3/h	11.92 m^3/h	218 °C	-0.025 mbar	55.2 g/s

Information for European models only

Table 77-1:
GTS specifications, capacities, and weights for European models

Model number	Steam capacity per hour in kg*	P = (kW)	Q = (kW)	Steam outlet	Recommended flue size (Class B)	Operating weight in kg	Shipping weight in kg	Full load amps
GTS-100	34	0-24	0-29	DN50 (2") BSPT or DN50 hose	DN125 (5")	320	170	2.8
GTS-200	68	0-48	0-59	DN50 (2") BSPT or DN50 hose	DN125 (5")	320	170	2.8
GTS-300	102	0-72	0-88	DN80 (3") flange	DN180 (7")	385	205	4.0
GTS-400	136	0-80	0-117	DN80 (3") flange	DN180 (7")	385	205	4.0
GTS-600	204	0-144	0-176	DN100 (4") flange	DN200 (8")	500	270	5.5
GTS-800	272	0-192	0-234	DN100 (4") flange	DN250 (10")	635	320	7.0

Note:
* The 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.

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 hoses and tubes. Use the following steam loss guidelines:
  - Vapor hose: 0.22 kg/m/h
  - Insulated pipe: 0.07 kg/m/h
  - Dispersion tubes: 0.7 kg/m/h

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

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)

Max inlet water temperature

- 90 °C

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

Expect quality from the industry leader

For more than 40 years, DRI-STEEM has been leading the industry with creative and reliable humidification solutions. Our focus on quality is evident in the construction of the GTS, which features cleanable, stainless steel construction, and an industry-leading two year warranty that covers all parts.

For more information
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sales@dristeem.com

DRI-STEEM Corporation
An ISO 9001:2000 certified corporation and a subsidiary of Research Products Corporation

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

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Form No. GTS-IOM-0607
Part No. 890000-101 Rev C

Two-year limited warranty

DRI-STEEM Corporation ("DRI-STEEM") 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 DRI-STEEM ships such product, whichever date is the earlier.

If any DRI-STEEM product is found to be defective in material or workmanship during the applicable warranty period, DRI-STEEM'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 DRI-STEEM's election. DRI-STEEM shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or reinstallation of any defective product.

DRI-STEEM's limited warranty shall not be effective or actionable unless there is compliance with all installation and operating instructions furnished by DRI-STEEM, or if the products have been modified or altered without the written consent of DRI-STEEM, or if such products have been subject to accident, misuse, mishandling, tampering, negligence or improper maintenance. Any warranty claim must be submitted to DRI-STEEM in writing within the stated warranty period.

DRI-STEEM's limited warranty is made in lieu of, and DRI-STEEM 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.

DRI-STEEM 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 DRI-STEEM has notice of the possibility of such damages.

By purchasing DRI-STEEM's products, the purchaser agrees to the terms and conditions of this limited warranty.