

**IMPORTANT:** Read and save these instructions.

**DRISTEEM**<sup>®</sup>  
The humidification experts

**STS**<sup>®</sup>

Steam-to-Steam Humidifier

**Installation, Operation,  
and Maintenance Manual**



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#### **ATTENTION INSTALLER**

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

**DRI-STEEM® technical support**  
800-328-4447

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#### **WARNING!**

Disconnect electrical power before installing supply wiring. Contact with energized circuits can cause severe personal injury or death as a result of electrical shock.

This product must be installed by qualified HVAC and electrical contractors and in compliance with local, state, federal, and governing codes. Improper installation can cause property damage, severe personal injury, or death as a result of electric shock, burns, and/or fire.

The humidifier tank, dispersion assembly, and all connected hose or piping can contain or discharge hot steam and/or hot water at 100 °C. Discharged steam is not visible. Contact with hot surfaces, discharged hot water, or air into which steam has been discharged can cause severe personal injury.

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

Supply water pressure greater than 550 kPa can cause the humidifier to overflow.

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### Warranty

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## STS models

### Note:

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

### Standard water models (STS)

State-of-the-art technology in a simple, low-maintenance humidifier.

This humidifier is designed to be used with either softened or unsoftened tap water.

The standard water STS humidifier requires water conductivity of at least 100  $\mu\text{S}/\text{cm}$  (2 grains/gallon) to operate. It will not operate with water treated by reverse osmosis or deionization processes. However, STS humidifiers are available for use with these water types. See below.

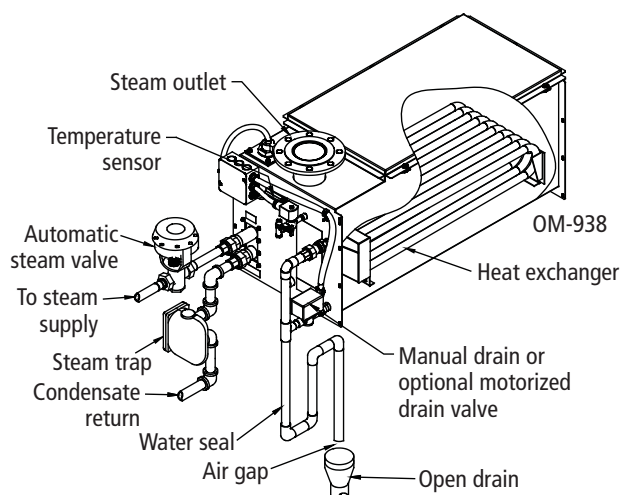
### Deionized water models (STS-DI)

The STS-DI, shown below, is designed specifically for use with deionized or reverse osmosis water.

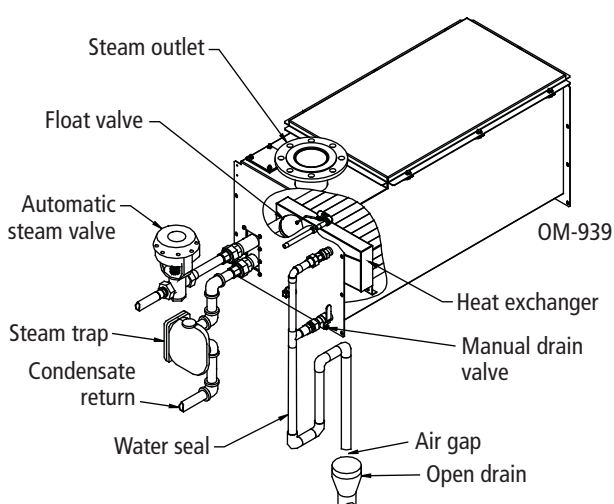
Both models can be converted in the field for use with softened/unsoftened tap water or deionized/reverse osmosis water.

**Figure 4-1:  
STS models**

**STS standard water model**



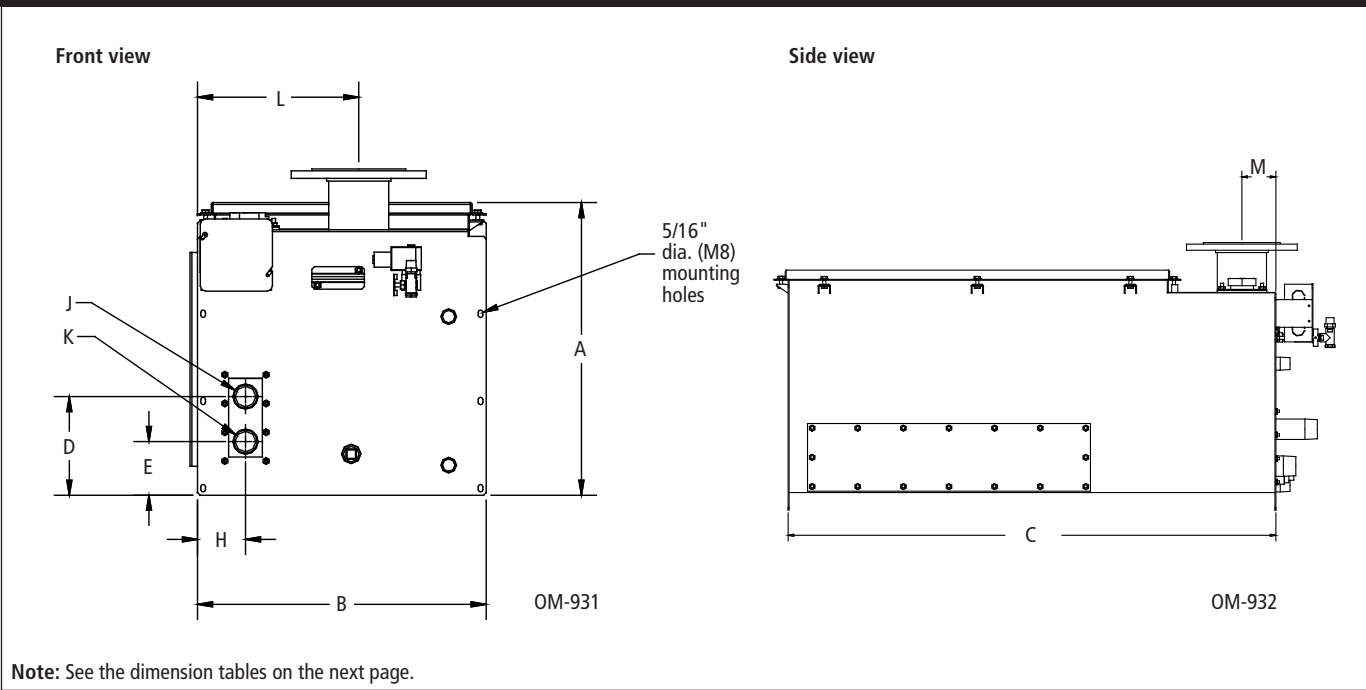
**STS-DI water model**



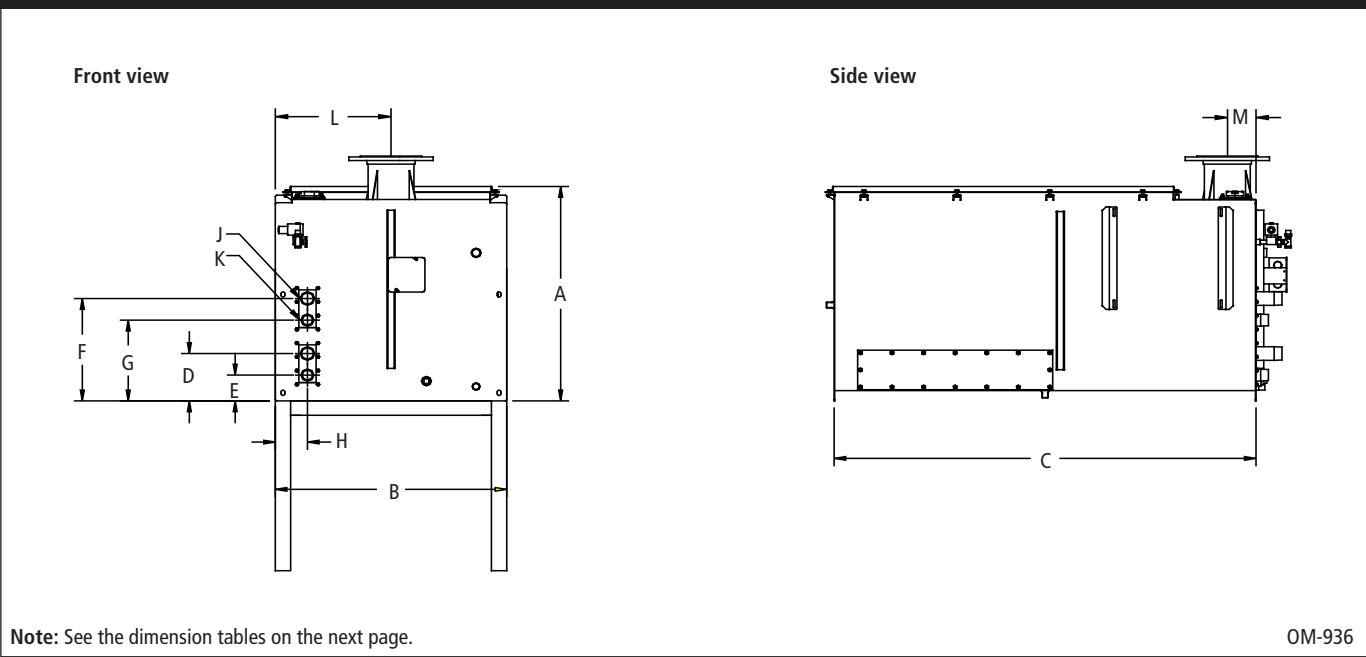
**Note:** Drain piping material must be suitable for 100 °C water.

# Dimensions

**Figure 5-1:**  
**Dimensions, STS models 25, 50, 100, 200 and 400 (with copper or stainless steel heat exchangers)**



**Figure 5-2:**  
**Dimensions, STS model 800 (with copper or stainless steel heat exchangers)**



## Dimensions

**Table 6-1:**  
**STS dimensions with copper heat exchangers**

	Description	STS model numbers				
		25C	50C	100C	400C	800C
		mm	mm	mm	mm	mm
A	Height*	495	495	495	495	756
B	Width	375	375	489	768	768
C	Length	600	1007	1007	1401	1401
D	Distance from bottom to supply inlet of first heat exchanger	168	168	168	168	168
E	Distance from bottom to return outlet of first heat exchanger	92	92	92	92	92
F	Distance from bottom to supply inlet of second heat exchanger	—	—	—	—	363
G	Distance from bottom to return outlet of second heat exchanger	—	—	—	—	285
H	Distance from side to heat exchanger	83	83	83	83	83
J	Pressurized steam supply inlet	¾" pipe thread (DN20)	1¼" pipe thread (DN32)	1¼" pipe thread (DN32)	1½" pipe thread (DN40)	1½" pipe thread (DN40)
K	Pressurized steam return outlet	¾" pipe thread (DN20)	¾" pipe thread (DN20)	1¼" pipe thread (DN32)	1¼" pipe thread (DN32)	1¼" pipe thread (DN32)
L	Distance from side to steam vapor outlet	159	219	245	330	330
M	Distance from front to steam vapor outlet	64	57	70	95	95

**Notes:**

\* Add 597 mm to overall height when STS is mounted on four support legs. Add 572 mm to overall height when STS is mounted on two H-legs.

**Table 6-2:**  
**STS dimensions with stainless steel heat exchangers**

	Description	STS model numbers					
		25S	50S	100S	200S	400SNC**	800SNC**
		mm	mm	mm	mm	mm	mm
A	Height*	495	495	495	495	495	756
B	Width	375	375	489	768	768	768
C	Length	600	1007	1007	1401	1401	1401
D	Distance from bottom to supply inlet of first heat exchanger	174	174	174	174	174	174
E	Distance from bottom to return outlet of first heat exchanger	85	85	85	85	85	85
F	Distance from bottom to supply inlet of second heat exchanger	—	—	—	—	—	368
G	Distance from bottom to return outlet of second heat exchanger	—	—	—	—	—	279
H	Distance from side to heat exchanger	83	83	83	83	83	83
J	Pressurized steam supply inlet	¾" pipe thread (DN20)	1" pipe thread (DN25)	1" pipe thread (DN25)	1½" pipe thread (DN40)	1½" pipe thread (DN40)	1½" pipe thread (DN40)
K	Pressurized steam return outlet	¾" pipe thread (DN20)	¾" pipe thread (DN20)	¾" pipe thread (DN20)	¾" pipe thread (DN20)	¾" pipe thread (DN20)	¾" pipe thread (DN20)
L	Distance from side to steam vapor outlet	159	219	245	330	330	330
M	Distance from front to steam vapor outlet	64	57	70	95	95	95

**Notes:**

\* Add 597 mm to overall height when STS is mounted on four support legs. Add 572 mm to overall height when STS is mounted on two H-legs.

\*\* SNC = Stainless steel heat exchanger with no coating. For use with DI/RO water only.

## Capacities and weights

**Table 7-1:  
Output capacities for STS models with copper heat exchangers**

STS model number	Steam pressure*			
	34 kPa	69 kPa	90 kPa	103 kPa
	kg/h	kg/h	kg/h	kg/h
25C	9	32	45	54
50C	23	68	91	109
100C	45	136	181	218
400C	136	263	327	358
800C	295	578	680	726

**Notes:**  
\* Steam pressure at connection to the STS steam valve (valve provided by DRI-STEEM)

### Heat exchangers and water type

#### Use with standard water:

- STS models ending in "C" (copper heat exchangers with a nickel coating)
- STS models ending in "S" (stainless steel heat exchangers with a Teflon coating)

#### Use with DI/RO water:

- STS models ending in "C" (copper heat exchangers with a nickel coating)
- STS models ending in "S" (stainless steel heat exchangers with a Teflon coating)
- STS models ending in "SNC" (stainless steel heat exchangers with no coating)

**Table 7-2:  
Output capacities for STS models with stainless steel heat exchangers**

STS model number	Steam pressure*			
	34 kPa	69 kPa	90 kPa	103 kPa
	kg/h	kg/h	kg/h	kg/h
25S	5	11	14	16
50S	14	25	34	36
100S	27	50	64	68
200S	68	132	163	177
400SNC**	77	178	250	289
800SNC**	96	374	497	555

**Notes:**  
\* Steam pressure at connection to the STS steam valve (valve provided by DRI-STEEM)  
\*\* SNC = Stainless steel heat exchanger with no coating. For use with DI/RO water only.

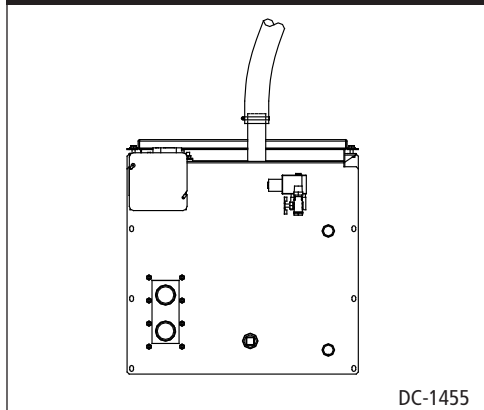
**Table 7-3:  
STS weights**

STS model number	Shipping weight	Operating weight*
	kg	kg
25	43	79
50	57	152
100	63	159
200	111	386
400	145	431
800	186	658

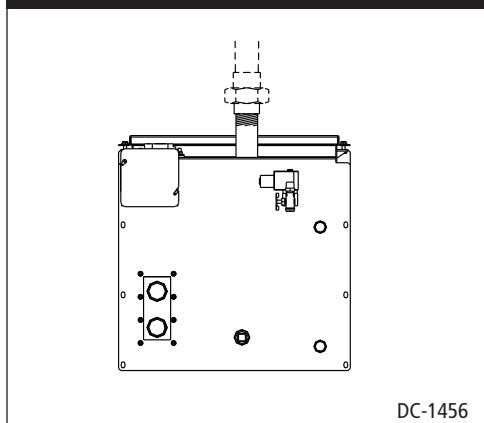
**Note:**  
\* Operating weight does not include weight of interconnecting piping provided by installer.

## Selecting a location

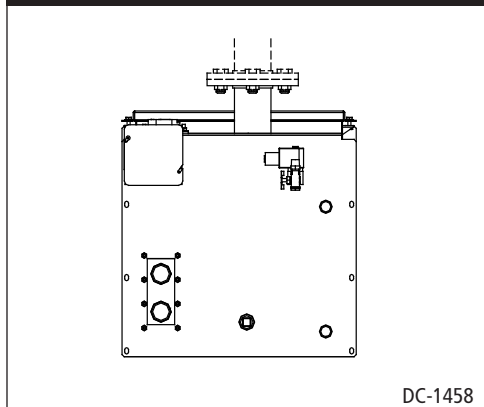
**Figure 8-1:**  
**Hose connection**



**Figure 8-2:**  
**Threaded pipe connection**



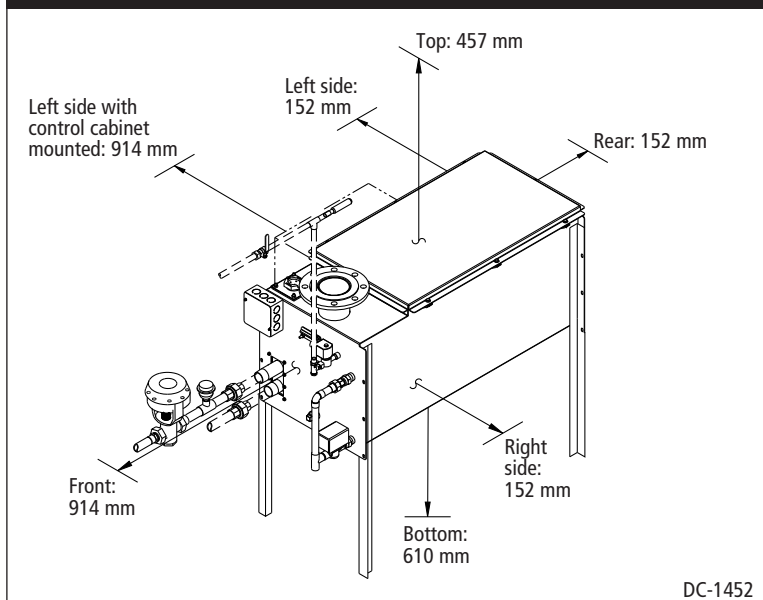
**Figure 8-3:**  
**Flange connection**



When selecting the location of the humidifier, consider the following:

- Maximum ambient temperature for control cabinet is 40 °C.
- Noises inherent to operation such as STS water fill cycles
- Easy access for maintenance
- Critical service and maintenance clearances around humidifier — primarily top, left side, and front (see clearance recommendations below)
- Convenient location to dispersion system for routing of vapor hose, tubing, or piping
- Electrical connections — power, control, and safety circuits
- Steam supply piping connections — inlet steam piping, condensate piping, and optional equipment (see Page 30 of this manual)
- Plumbing connections — supply water, drain piping, and condensate return piping
- Water seal requirements
- Avoid locations above critical equipment or processes.
- Avoid locations close to sources of electromagnetic emissions such as power distribution transformers and high horsepower motors controlled by variable frequency drives.

**Figure 8-4:**  
**Recommended clearances**



## Location

**Table 9-1:  
Available steam outlet size and type by model**

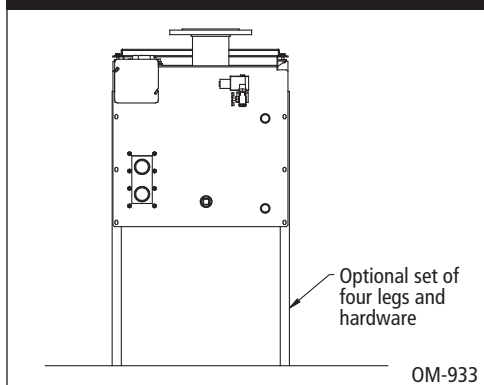
STS model number	Pipe thread size		Hose size		Flange size				Area-type® fan
	1½"	2"	1½"	2"	3"	4"	5"	6"	
25	X	X	X	X					X
50	X	X	X	X	X				X
100	X	X	X	X	X	X			X
200		X		X	X	X	X	X	
400		X		X	X	X	X	X	
800						X	X	X	

**Table 9-2:  
STS connection sizes**

Description	Connection size
Water makeup (fill)	¼" pipe thread (DN8)
Drain	¾" (DN20) for standard water models 25 through 100 (and all DI water models) 1" (DN25) for standard water models 200 through 800
Steam dispersion outlet	Varies with capacity and dispersion type. To determine outlet size, see Dri-calc® or the "Maximum steam carrying capacity and length of interconnecting hose, tubing, and pipe" table in the DRI-STEEM Design Guide.
Condensate return	¾" pipe thread (DN20)
Pressurized steam supply inlet and return outlet	See dimensions tables on Page 6.

## Mounting

**Figure 10-1:  
Support legs**



**Important:**

Installation must comply with local governing codes.

### Mounting methods

To ensure that the water level control system works properly, the tank must be mounted level side to side and front to back. For overhead installations, install a drip pan to prevent possible water damage. Support legs, trapeze hanger, and wall brackets are not available for STS/STS-DI models 200, 400, and 800.

The following mounting methods are the only options available to maintain compliance to the UL 998 standard; alternate mounting methods will compromise the humidifier's CE, ETL, and C-ETL approval.

### Support legs

**(STS/STS-DI models 25, 50, 100 only)**

Use enclosed bolts, nuts, and washers to fasten legs to tank. Shim or adjust so the tank sets level side to side and front to back. Verify level after the tank is filled and is at operating weight.

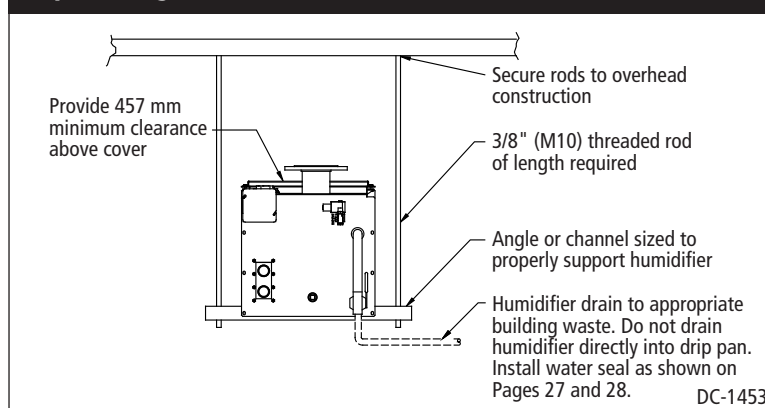
### Trapeze hanger

**(STS/STS-DI models 25, 50, 100 only)**

Secure threaded rod to an overhead structure that is strong enough to support the operating weight of the STS/STS-DI humidifier and field installed piping, plus the weight of the control cabinet if it is mounted on the humidifier. Adjust the mounting so that the tank sets level side to side and front to back. Verify level after the tank is filled and is at operating weight.

**More on the next page ►**

**Figure 10-2:  
Trapeze hanger**



## Mounting

### H-legs

(STS and STS-DI models 200, 400, 800 only)

While the STS and STS-DI tank is securely held in the air, attach front and rear supports using the supplied  $\frac{3}{8}$ " (M10) bolts, nuts, and washers. **MAKE SURE THE BOTTOM OF THE TANK IS SUPPORTED BY THE H-LEG SUPPORTS.** This can be accomplished by having the bolts slightly loose as the tank is lowered to the floor. Then tighten them after the unit is place. Adjust the mounting so the tank sets level side to side and front to back. Verify the tank is level after it is filled and at operating weight.

### Wall brackets

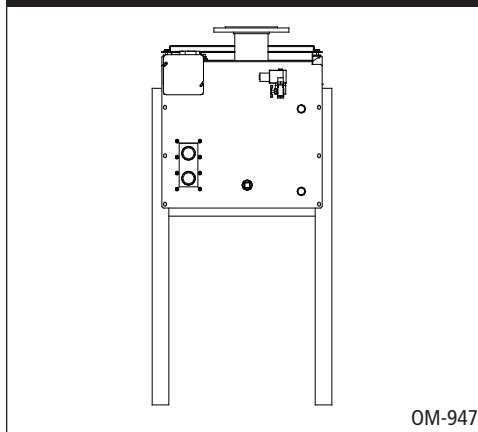
(STS/STS-DI models 25, 50, 100 only)

DRI-STEEM recommends using  $\frac{3}{8}$ " (M10) fasteners.

- Concrete or block walls — use concrete anchors (expansion bolts) rated for the operating weight of the STS/STS-DI humidifier. Locate the wall brackets so they are flush to the front and back flanges of the tank.

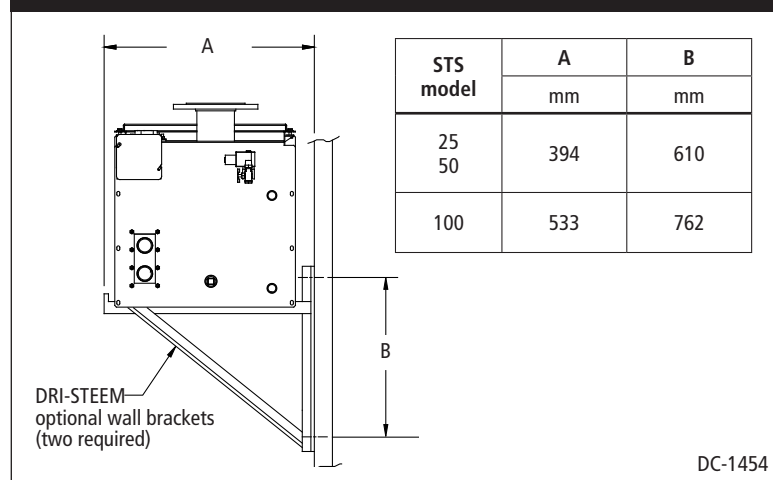
More on the next page ►

**Figure 11-2:**  
H-legs



OM-947

**Figure 11-1:**  
Wall brackets



## Mounting

**Table 12-1:**  
**Mounting options by model**

Mounting method	STS/STS-DI models			
	25, 50, 100		200, 400, 800	
	Standard	Optional	Standard	Optional
Trapeze	x			
H-legs			x	
Support legs		x		
Wall brackets		x		

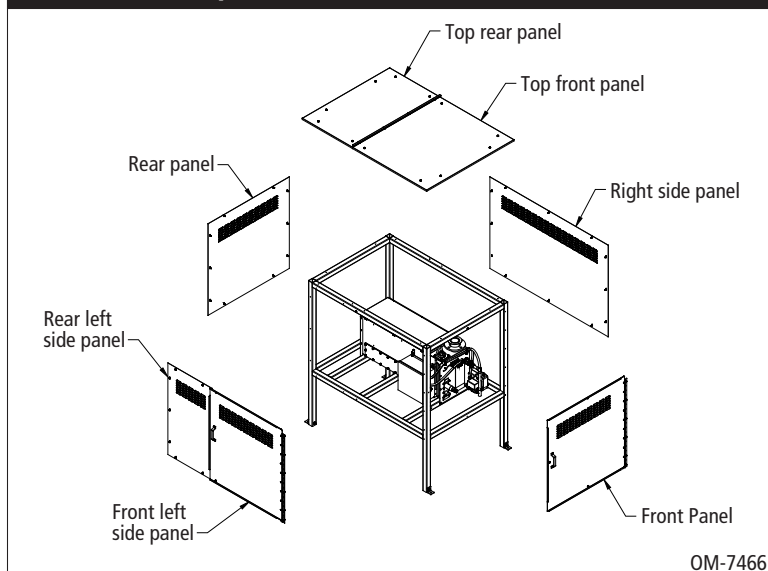
- Metal stud wall — follow the 100 mm × 50 mm timber wood stud wall guidelines below, but provide a second set of 100 mm × 50 mm timbers on the backside of the wall. Run a bolt with a washer through the face 100 mm × 50 mm timber, the metal stud, and the backside 100 mm × 50 mm timber with washer and nut to connect the 100 mm × 50 mm timbers. DRI-STEEM does not recommend mounting the 200, 400, and 800 models on a metal stud wall.
- Wood stud wall, recommended mounting — two horizontal 100 mm × 50 mm timbers with center line spaced at dimension shown in the table below.
  - STS 25: lag bolt (coach screw) both horizontal 100 mm × 50 mm timbers to two vertical studs (404 mm on center)
  - STS 50: lag bolt (coach screw) to three studs
  - STS 100: lag bolt (coach screw) to four studs

Lag bolt (coach screw) wall brackets to the horizontal 100 mm × 50 mm timbers. Locate the wall brackets so they are flush to the front and back flanges of the tank.

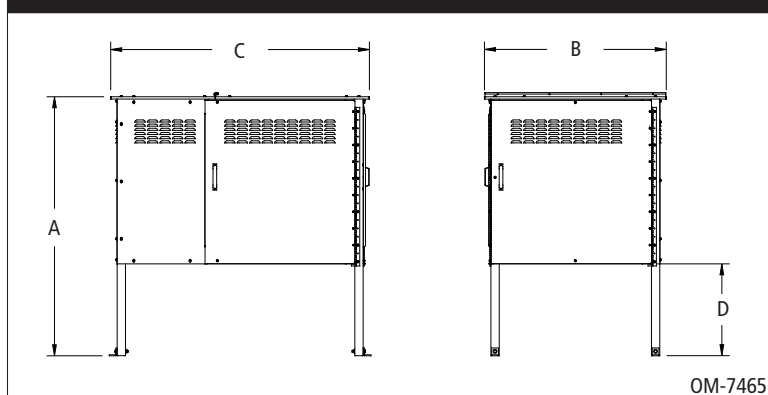
Shim or adjust mounting so the tank sets level side to side and front to back. Verify level after the tank is filled and is at operating weight.

## Weather cover

**Figure 13-1:**  
Weather cover exploded view



**Figure 13-2:**  
Weather cover dimensions



**Table 13-1:**  
Weather cover dimensions

Letter	Description	STS 25 to 100	STS 200 to 800
		mm	mm
A	Height	1575	1676
B	Length	1105	1346
C	Width	1575	1988
D	Distance from bottom	559	559

### Optional STS weather cover

The optional weather cover is water-resistant and designed to protect an STS unit from rain and sun. The STS weather cover has been tested and approved by ETL Testing Laboratories, Inc., and is listed to UL Standard 1995 and certified to CAN/CSA Standard C22.2 No. 236.

**Table 13-2:**  
Weather cover weights

Weather cover size	kg
STS 25 to 100	193
STS 200 to 800	250

### Note:

Weather Covers are only available in the United States and Canada.

# Weather cover

### Note:

For information about the STS outdoor enclosure (a weather-tight enclosure with access doors, supplemental heating and cooling fan[s]), see the following pages.

The weather cover encloses the STS humidifier to protect it from wind, sun, and rain. The weather cover is fully assembled at the DRI-STEEM factory. It has been tested and evaluated by ETL Testing Laboratories, Inc., and is listed to UL Standard 1995 and CAN/CSA Standard C22.2 No. 236.

### Installation notes

Open panels C and D to make necessary connections to the humidifier. Refer to the installation section of this manual for all electrical, supply water, and drain connection requirements.

### Installation issues specific to weather cover applications

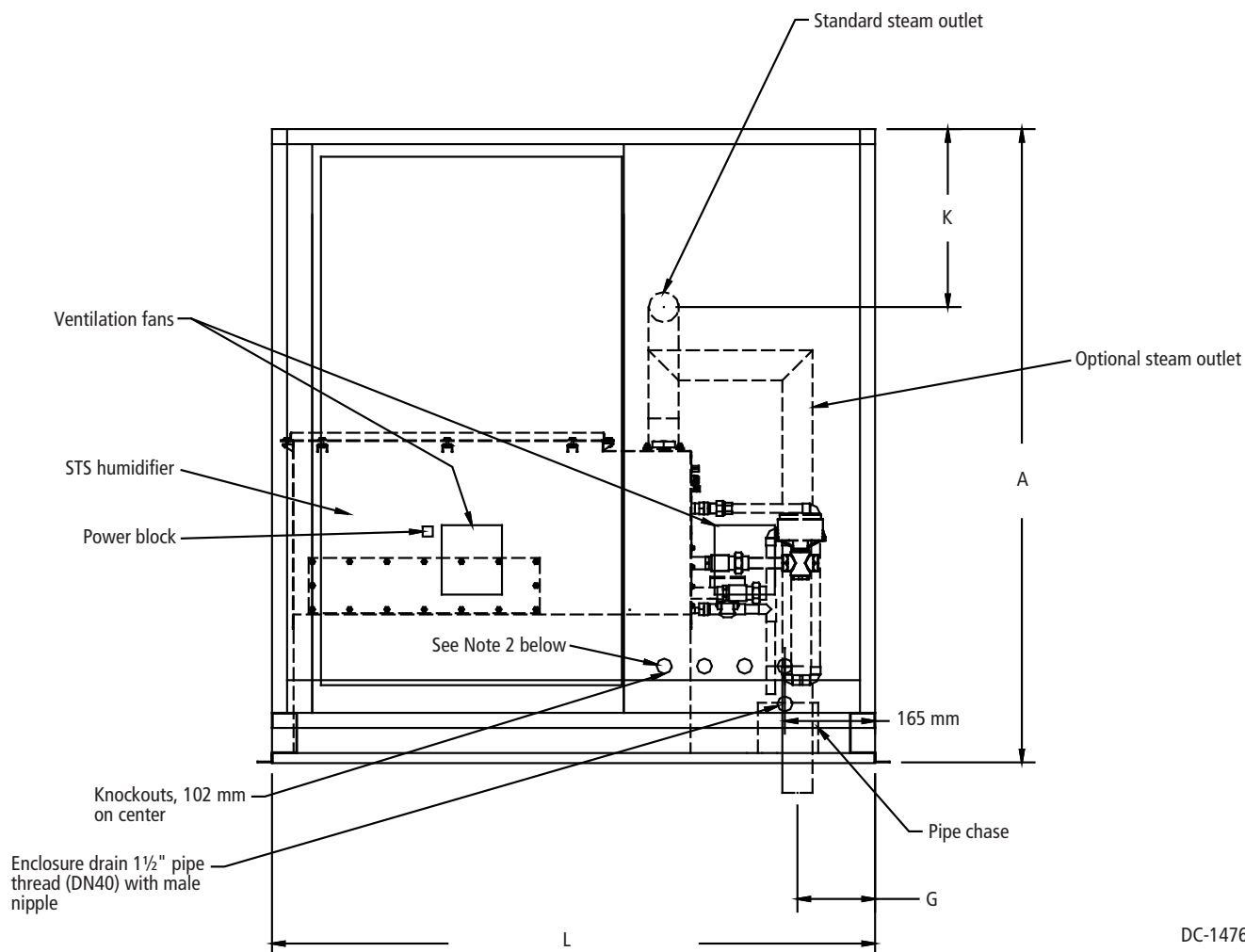
- Installation must comply with all governing codes.
- The bottom of the weather cover is open to accommodate piping and electrical connections.
- Electrical connections must be made with approved, outdoor-rated, watertight conduit.
- Freeze protection must be provided on all water piping.
- Steam supply must be insulated.
- Avoid using vapor hose in outdoor applications — the effects of ultraviolet rays will prematurely age the vapor hose.
- Installer required to drill a hole in weather cover for steam piping. Seal after making steam connection to maintain weather protection.
- The steam outlet must be isolated with a union so the steam supply can be disconnected easily for removal of the weather cover to gain access to the STS for service and maintenance.

### Annual weather cover maintenance requirements

- Check all fasteners and verify they are secure.
- Check for any sign of leakage — trace back to origin and repair.

## Outdoor enclosure

**Figure 15-1:**  
STS outdoor enclosure with standard or optional steam outlet, elevation view

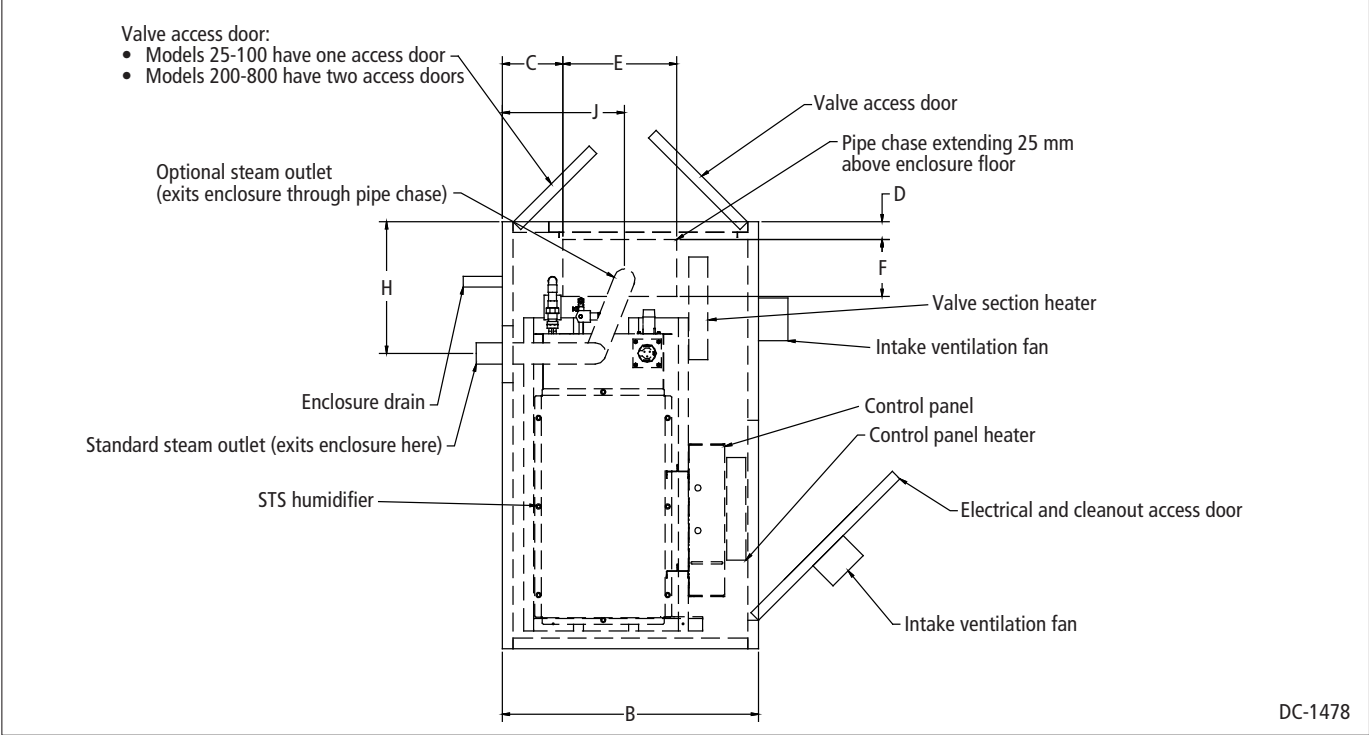


### Notes:

1. The outdoor enclosure has two available steam distribution configurations. The standard configuration has a steam outlet on the right side 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 four knockouts located on the right and left side of the enclosure. Knockout sizes are hole dia. 50 mm for STS models 25-100, and hole dia. 63.5 mm for STS models 200-800. Run the electrical power into the enclosure at these knockouts.
3. All piping from the STS unit to the steam outlet is stainless steel pipe. Depending on the application, interconnecting piping from the steam outlet to the dispersion assembly can be tubing, pipe or DRI-STEEM vapor hose. See Page 36 for more information about connecting to the dispersion assembly.
4. For STS applications, install a riser trap in the branch line leading to the humidifier.
5. The preferred location for the STS steam control valve is inside the outdoor enclosure. If one of these valves must be located inside the building, it must be located within 1.8 m of the humidifier to reduce pressure drop.
6. See the dimensions table on the next page.

Outdoor enclosure

Figure 16-1:  
STS outdoor enclosure, top view



**Note:**  
The Outdoor Enclosure is only available in the United States and Canada.

Table 16-1: STS outdoor enclosure dimensions*			
Item	Description	STS or STS-DI model number	
		25-100	200-800
		mm	mm
A	Enclosure height	1422	1676
B	Enclosure width	914	1168
C	Pipe chase position	114	114
D		57	89
E	Pipe chase size	508	312
F		203	254
G	Steam pipe position	152	216
H		473	559
J		368	521
K		311	279
L	Enclosure length	1524	1981
<b>Note:</b> * See drawings on this and the previous page.			

## Outdoor enclosure

**Table 17-1:**  
**STS outdoor enclosure weights**

STS or STS-DI model number	Outdoor enclosure shipping weight*	Outdoor enclosure operating weight*
	kg	kg
STS-25	272	308
STS-50	284	381
STS-100	290	390
STS-200	476	748
STS-400	510	794
STS-800	556	1021
<b>Note:</b> * Includes humidifier		

### Specifications

- See Page 7 for capacities and input requirements.
- Add 15 full load amps (120 VAC) when using an outdoor enclosure with a heater package.
- Add 2 full load amps (120 VAC) when using an outdoor enclosure without a heater package.

**Table 17-2:**  
**STS outdoor enclosure connection sizes**

Description	STS or STS-DI model number	
	25-100	200-800
Water makeup (fill)	1/4" pipe thread (DN8)	1/4" pipe thread (DN8)
Drain	3/4" (DN20)	1" (DN25)
Condensate return	3/4" pipe thread (DN20)	3/4" pipe thread (DN20)
Steam outlet	See STS catalog	

## Outdoor enclosure

The outdoor enclosure option is used when DRI-STEEM humidifiers are installed outdoors. The following information is not intended to supersede any requirements of federal, state or local codes having jurisdiction; prior to installing the unit, consult authorities having jurisdiction.

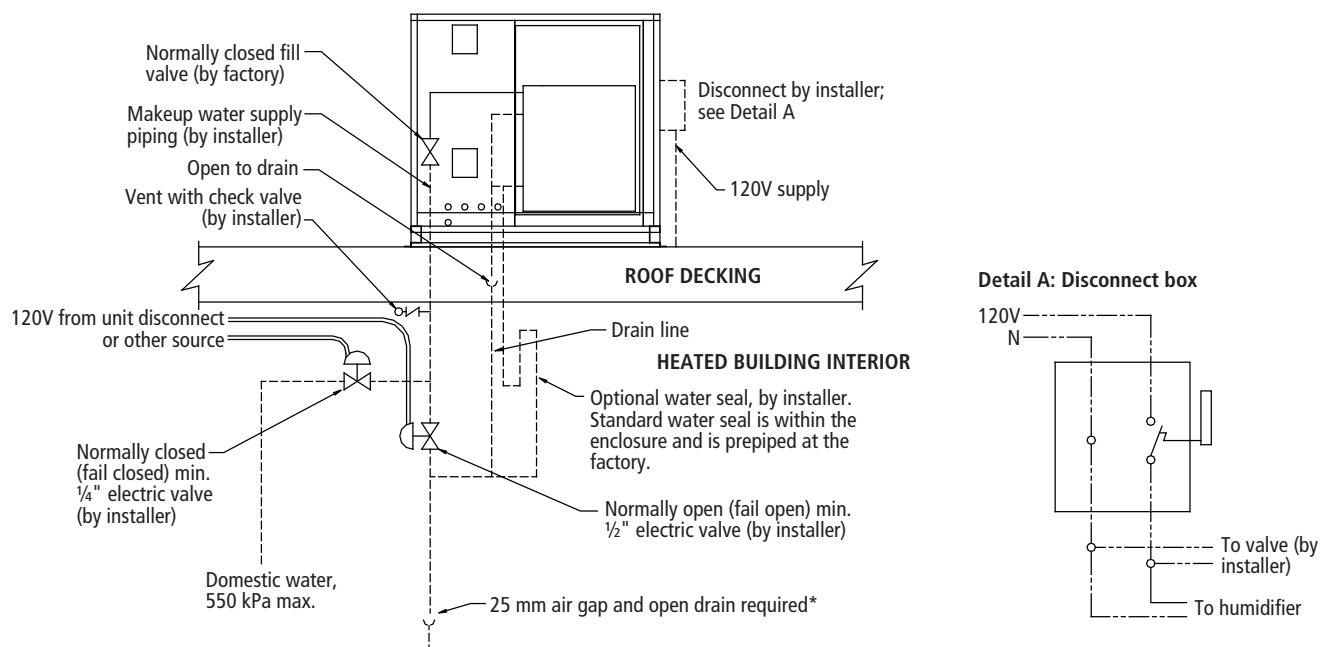
### Operating temperatures

DRI-STEEM humidifiers housed in an outdoor enclosure operate properly from  $-40^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ .

Insulate supply water piping to avoid dripping from condensation. To ensure that water will not remain in the fill line and freeze if there is a loss of power, field-install additional valves in a conditioned space upstream of the fill valve. These valves should be powered on the same circuit as the humidifier such that if the power goes off, water will drain out of the fill line to prevent freezing. See Figure 18-1.

More on the next page ►

**Figure 18-1:**  
**Optional installation method for water supply piping**



**Note:**

\* 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.

OM-954

## Outdoor enclosure

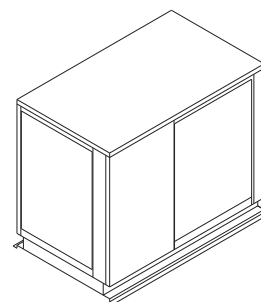
### Outdoor enclosure mounting

- The outdoor enclosure must be level and located so that there is enough clearance for opening the access doors.
- Verify that the position of support legs, pad, or curb properly support the unit and that support structure dimensions coincide with unit dimensions.
- Locate unit so that air intakes are not too close to any exhaust fan outlets, gasoline storage, or other contaminants that could potentially cause dangerous situations. The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.
- When located on the roof, the outdoor enclosure air intakes must be a minimum of 356 mm above the roof to prevent intake of snow or splashed rain. Locate the outdoor enclosure so that prevailing winds do not blow into the air intakes.
- Be sure to remove all shipping brackets and other packaging prior to installing the unit.
- During transit, unloading, and setting of the unit, bolts and nuts may have become loosened. Check that all nuts are tightened.
- There are four knockouts located on the right and left side of the enclosure. It is recommended that the electrical power is run into the enclosure at these knockouts.
- The outdoor enclosure is designed for handling by two methods. In both cases it must be lifted from the bottom base using a method that holds it level, and keeps it from tipping, falling, or twisting. If the unit is severely twisted during handling, permanent damage may 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.

More on the next page ►

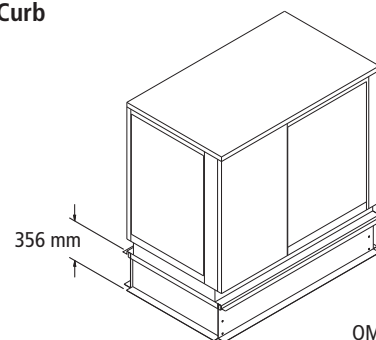
**Figure 19-1:**  
Outdoor enclosure mounting options

#### Flush



DC-1110

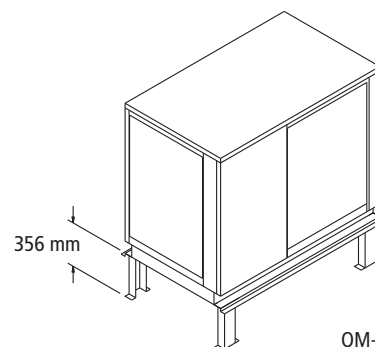
#### Curb



OM-1095

#### Legs

(STS 25-100 only)



OM-1096

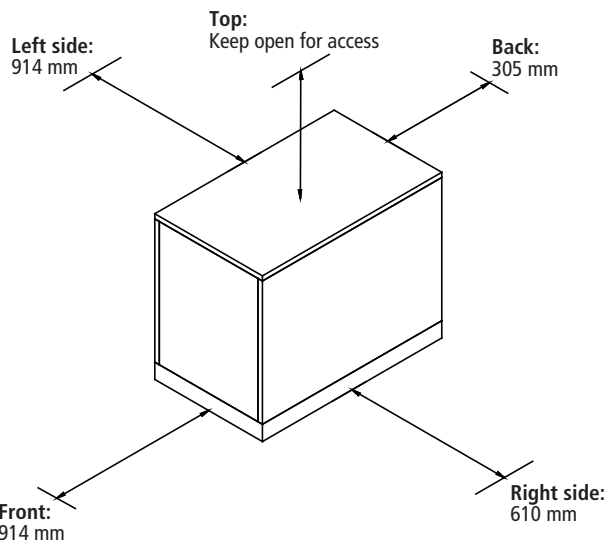
## Outdoor enclosure

### Important note about STS outdoor enclosure installation

- Install a riser trap in the branch line leading to the humidifier.
- The preferred location for the STS steam control valve is inside the outdoor enclosure. If one of these valves must be located inside the building, it must be located within 1.8 m of the humidifier to reduce pressure drop.
- The alternative method of handling is through the unit's channel base frame and/or 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, wood strips should be inserted between the cables and unit where necessary. All four lifting points must be used and will be marked "lift here" on the unit.
- The outdoor enclosure has two available steam distribution configurations. The standard configuration has a steam outlet on one side 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 the drawings on Pages 15 and 16.

More on the next page ►

**Figure 20-1:**  
**Outdoor enclosure clearances**



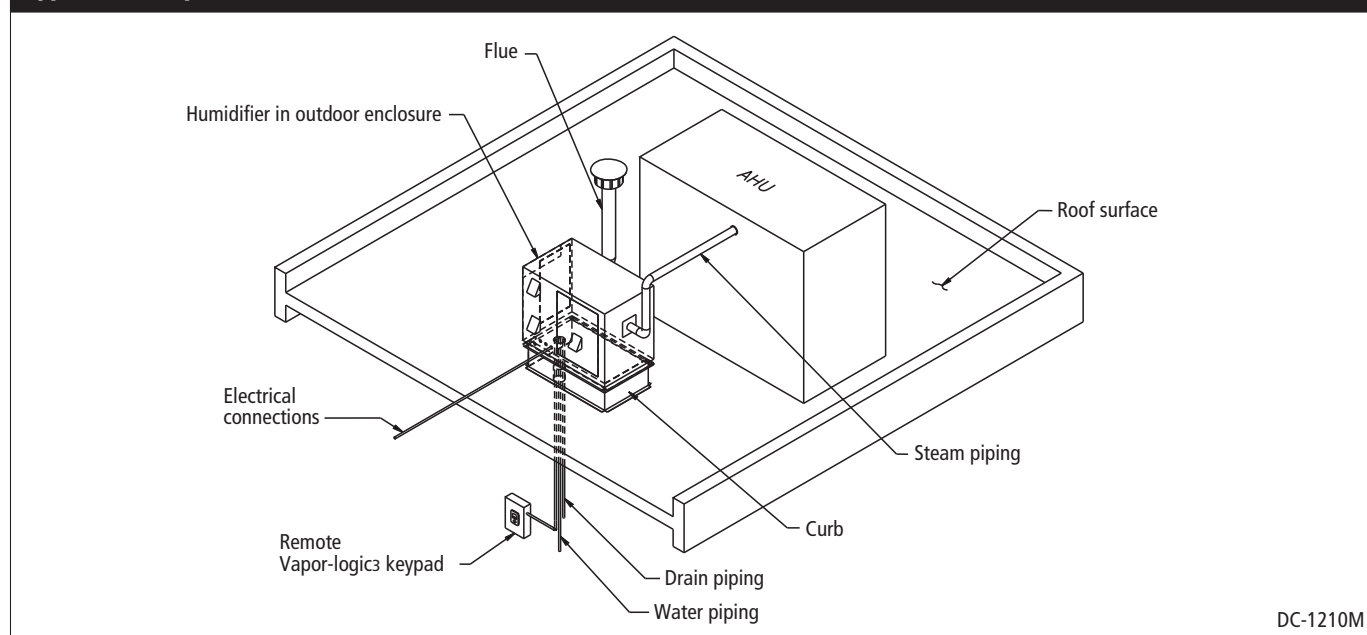
OM-955

## Outdoor enclosure

- A pipe chase is located inside the enclosure. A cover for the pipe chase is provided to maintain proper pressure within the enclosure in the event that this opening is not utilized. However, it is recommended that this pipe chase be used for both the supply water piping and drain piping, in which case the pipe chase cover should be removed. Install insulation rated for 100 °C to completely fill the area around the pipes to maintain proper enclosure pressure.
- When the enclosure is 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 utility connections.
- When ordered with the heater package, two thermostat-controlled heaters are provided: one strip heater is located in the control cabinet section, and one strip heater is located in the front section to keep the enclosure at a constant minimum temperature.

More on the next page ►

**Figure 21-1:**  
Typical rooftop installation overview



## Outdoor enclosure

**Note:**

If your STS humidifier uses a LW417 controller, the aquastat option must be purchased to provide freeze protection.

- An enclosure drain is provided. In case of a water leak, water will drain from the enclosure through this drain.
- For humidifiers with Vapor-logic<sup>3</sup> control, a keypad with standard 1.5 m cable ships mounted to the subpanel in the 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, a remote mount keypad should be installed. Additional cable lengths up to 152 m are available as an option for this mounting configuration (Vapor-logic<sup>3</sup> control required).
- Curbs (optional) will be shipped knocked down for ease of transporting to the roof. Curbs are manufactured of 16-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 356 mm high. A 50 mm × 12 mm closed-cell curb gasket with adhesive on one side is supplied with hardware. The gasket must be installed between the top of the curb and the base surface of the outdoor enclosure to prevent moisture from leaking into the building from either driving rain or melting snow. An installation drawing is also included.
- Stand legs (optional): Four symmetrically-shaped stand legs are provided with all the necessary hardware for elevating the outdoor enclosure 356 mm from the ground. The stand legs should be securely mounted to the grade by the installing contractor. To prevent the outdoor environment from penetrating the enclosure, close-off provisions must be made between the stand legs.
- All piping from the humidifier to the steam outlet is stainless steel pipe. Depending on the application, interconnecting piping from the steam outlet to the dispersion assembly can be tubing, pipe or DRI-STEEM vapor hose.

**More on the next page ►**

## Outdoor enclosure

### Operation

When power is applied to the outdoor enclosure:

- If the ambient temperature in the enclosure is below 10 °C, the enclosure strip heaters are powered up. The humidifier is not allowed to operate unless the temperature inside the enclosure is equal to or greater than 2 °C. The strip heaters will power down when the temperature inside the enclosure reaches 10 °C. The aquastat feature of the humidifier will allow the humidifier to continue operating until it reaches a factory default tank temperature of 21 °C. This temperature can be reset in the field to be up to 82 °C.
- If the ambient temperature in the enclosure is at or above 30 °C but less than 66 °C, two ventilation fans turn on to cool the electronic components.
- If the ambient temperature in the enclosure is 66 °C or greater, a high limit switch powers down the humidifier. The ventilation fans will continue to run and, once the enclosure temperature falls below 54 °C, the humidifier will automatically resume normal operation.
- If there is a power loss to the enclosure, the normally-open (fail-open) drain valve will drain the humidifier.

## Piping: Drain

### Drain piping

The drain line piped from the humidifier must be run to an approved sanitary waste or suitable drain. If nonmetallic pipe or vapor hose is used, it must be rated for 100 °C minimum continuous operating temperature.

Minimum drain pipe size is ¾" (DN20) inside diameter. If the length of the drain piping exceeds 3 m, increase the pipe size to 1¼" (DN32) pipe.

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

Governing codes may require that the 100 °C drain and skim water from the humidifier be tempered before it is discharged into the building drain piping. The Drane-kooler® option will temper 22.7 L/m of 100 °C water to 60 °C. **To allow normal operation and prevent steam from escaping through the drain line, the installer must provide a water seal of a sufficient height to contain the pressure developed in the humidifier system.** See Table 27-1 for water seal heights.

Drain piping after the water seal must be pitched a minimum of 10 mm/m (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 by a pump, DRI-STEEM offers a condensate pump option. A check valve is required on the discharge of the pump. Electrical power for the pump is independent of the humidifier. Plug the pump into a wall outlet; an integral float switch turns the pump on and off.

**More on the next page ►**

## Piping: Drain

**STS humidifier** — the drain connection to an STS humidifier is a pipe thread sweat (soldered) fitting. The installer should place a union directly after the factory drain fitting, provide a water seal of height H1 (see Table 27-1), and pipe. To mount the humidifier closer to the floor, use the “Alternate water seal and drain valve piping” diagram shown on the right. The installer needs to rework the factory piping that connects the drain valve to the skim/overflow fitting, cut out the elbow, and repipe per the diagram.

The **STS-DI humidifier** has a pipe thread fitting on the drain valve and on the skim/overflow fitting. Prior to dumping into a drain, the installer needs to connect the drain and skim/overflow, provide a water seal of height H1 (see Table 27-1), and pipe. To mount the humidifier closer to the floor, use the “Alternate water seal and drain valve piping,” see diagram on the right.

### Alternate water seal and drain valve piping

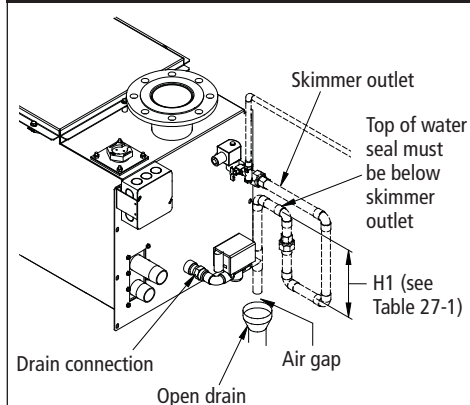
Typically, the water seal height dictates the minimum dimension the bottom of the humidifier can be above the floor. The alternate water seal reduces the water seal piping below the humidifier up to 203 mm, allowing the tank to sit closer to the floor.

### Water supply piping

The STS and STS-DI humidifier has a 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.

**More on the next page ►**

**Figure 25-1:  
Alternative water seal and drain valve  
piping**



Dashed lines indicate provided by installer. Use when water seal must be elevated above flow line of drain connection, such as when the humidifier is mounted near the floor.

OM-945

## Piping: Drain

The supply water pressure range must be 172 kPa to 552 kPa for all STS and STS-DI models except the STS-DI 800.

The STS-DI 800 supply water pressure range must be 414 kPa to 552 kPa. An optional fill assembly is available to allow a minimum water pressure of 172 kPa at an additional cost.

### STS model

Water supply assembly includes a strainer, needle valve, and fill solenoid — ¼" pipe thread (DN8) connection. European models are provided with a ⅜" 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, adjust the needle valve to decrease the water fill rate and/or use hot supply water.

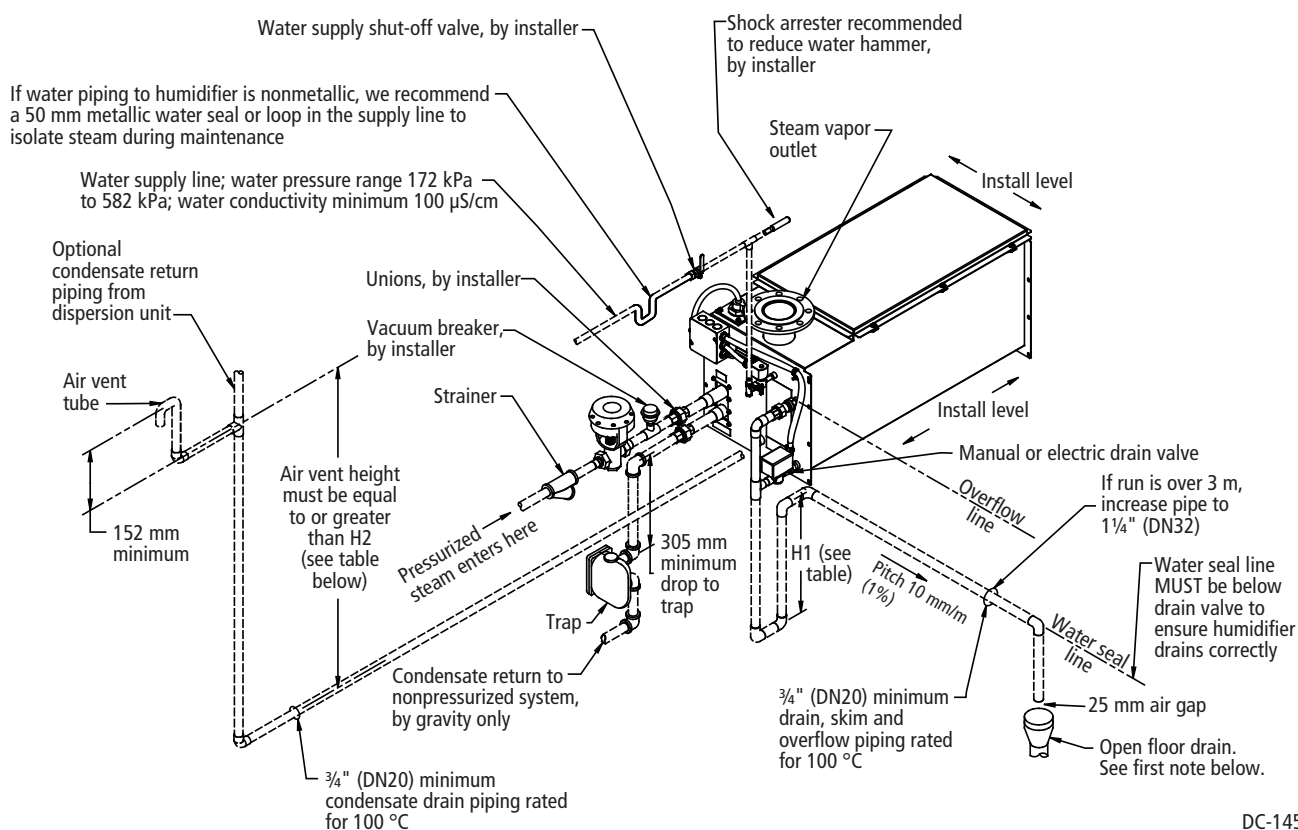
In cases where water hammer occurs when the fill solenoid closes, a shock arrester is recommended. Reducing the supply water pressure (minimum 172 kPa) or using flexible tubing (rated 100 °C, minimum continuous operating temperature) may diminish the noise, but installing a shock arrester is the best solution.

The minimum water conductivity for the probe-type water level control system to work is 100 µS/cm (2 grains/gallon).

**More on the next page ►**

## Piping: Standard water, one heat exchanger

**Figure 27-1:**  
**Field piping overview for STS models 25, 50, 100, 200, 400 (models with one heat exchanger)**



DC-1451

### Figure 27-1 notes:

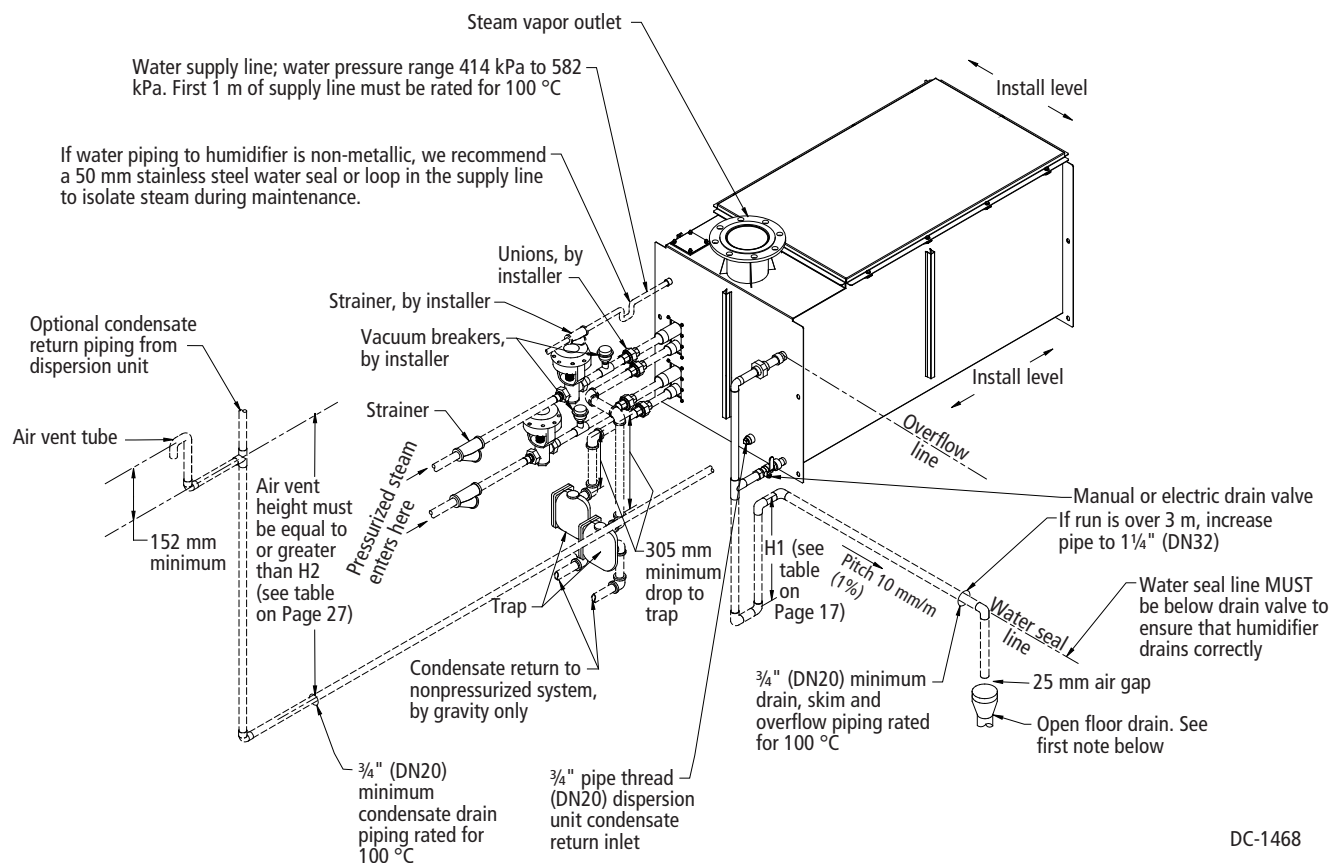
- Locate air gap only in spaces with adequate temperature and air movement to absorb flash steam; otherwise, condensation may form on nearby surfaces. Refer to governing codes for drain pipe size and maximum discharge water temperature.
- Offset humidifier from floor drain to prevent flash steam from rising into the humidifier.
- Dashed lines indicate provided by installer.
- The water supply inlet is more than 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 a DI/RO system or for piping a system with two heat exchangers.

**Table 27-1:**  
**Heights required to overcome humidifier internal pressure (H1, H2)**

Unit output	Water seal height (H1)	Air vent height (H2)	
	STS models	STS models	
	All	25, 50, 100, 200, 400	800
kg/h	mm	mm	mm
≤ 62	305	686	—
63–83	381	762	—
> 83	457	838	1073

## Piping: DI water, two heat exchangers

**Figure 28-1:**  
**Field piping overview for STS-DI 800 (DI water model with two heat exchangers)**



DC-1468

### 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.
- Offset humidifier from floor drain to prevent flash steam from rising into the humidifier.
- Dashed lines indicate provided by installer.
- The water supply inlet is more than 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.
- STS-DI model 800 requires supply line water pressure to be between 414 kPa and 552 kPa. An optional fill assembly for these models is available for water pressures between 172 kPa and 552 kPa. All other STS models operate with water pressure between 172 kPa and 552 kPa.
- Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.
- See the previous page for recommended water supply piping for a standard water system or for piping a system with one heat exchanger.

## Piping:

### DI water, two heat exchangers

#### STS-DI model

A float valve controls the water supply — ¼" pipe thread (DN8) connection. European models are provided with a ⅜" pipe thread (DN10) connection. For the DI end-of-season drain option, a solenoid valve is added on the inlet of the float valve. This option shuts off the fill water supply and drains the tank when there is no demand for humidity for 72 hours. (This is a default setting, which is adjustable. To modify this value, see the *Vapor-logic3 Installation and Operation Manual*.)

When using nonmetallic tubing for supply water, it must be rated for 100 °C minimum continuous operating temperature. DRI-STEEM recommends installing a 914 mm 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 50 mm water seal/loop in the supply line to isolate steam during DI/RO water system maintenance.

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

If the STS-DI humidifier is supplied with tap water, the float valve assembly will become clogged and run without water.

**More on the next page ►**

## Piping: Steam supply

### Note:

- For STS 800 models, to guarantee steam output capacities, a dedicated steam valve and steam trap is required for each heat exchanger.

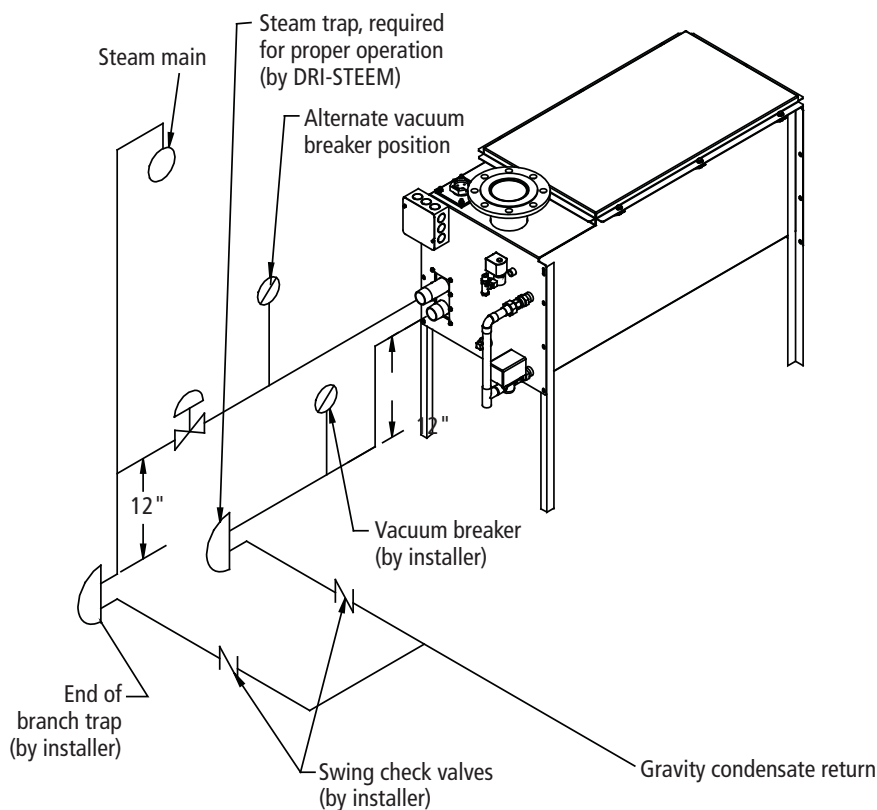
The heat exchanger in the STS humidifier is designed for a maximum steam pressure of 105 kPa. The steam valve, trap, and strainer are shipped loose for field installation.

The figure below shows piping of an STS unit from an overhead steam supply main with condensate returned to a vented gravity flow return system. Note the steam trap installed at the bottom of the branch feeding the steam valve of the STS. Failure to install this trap will cause water hammer, which could damage the STS heat exchanger.

Vacuum breakers are necessary to ensure condensate can drain from the heat exchanger when the steam valve closes.

Lifting condensate with pressurized steam is not recommended. Premature heat exchanger failure and erratic control can occur when using pressurized steam to lift condensate. A steam condensate pump is recommended when lifting condensate in a pressurized system.

**Figure 30-1:**  
Steam supply piping



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## Wiring

### Electrical wiring diagrams provided with humidifier and control cabinet

- Ladder style wiring diagrams (located inside control cabinet door) show power, control, and humidifier to control cabinet interconnection requirements.
- External connections diagrams (located inside control cabinet door) show connection points to the microprocessor-based controller and wire terminals for external safety and control devices: airflow proving switches, high limits, transmitters, or humidistats.

All wiring must be in accordance with all governing codes and with STS wiring diagrams.

### Electrical installation

Wiring and branch circuit protection is provided by the installer per the National Electrical Code (NEC) or in Europe, IEC 60364. For power supply and machine ground connections, size the wire using the 75 °C wiring table, per the NEC (or IEC 60364). Then use copper conductors rated for a 105 °C environment. The wiring from the control cabinet to the humidifier must be rated for 105 °C.

All STS humidifiers have a 230-volt, single phase electrical supply. Verify current characteristics and capacity requirements against those listed on the name plate.

### Wiring requirements

The length of wire from the control cabinet to the humidifier must not exceed 15 m for the Vapor-logic3 or 9 m for the LW417.

The right side of the control cabinet is the control circuit side; the left side is the power circuit side. Place conduit connection holes in the control cabinet so that the control and power wire routing is limited to their respective sides of the control cabinet.

### Note:

- Maximum current draw for STS humidifiers is 3 amps. Add 1.6 amps if Area-type dispersion is used.
- Damage caused by chloride corrosion is not covered by your DRI-STEEM warranty.

### **CAUTION!**

Only qualified electrical personnel should perform installation procedures.

### **CAUTION!**

When drilling holes in the control cabinet, protect all internal components from debris and VACUUM OUT THE CONTROL CABINET when finished. Failure to comply with this directive can damage sensitive electronic components and void your DRI-STEEM warranty.

More on the next page ►

## Wiring

### **CAUTION!**

When drilling holes in the control cabinet, protect all internal components from debris and **VACUUM OUT THE CONTROL CABINET** when finished. Failure to comply with this directive can damage sensitive electronic components and void your DRI-STEEM warranty.

Control wiring and power wiring must be run in dedicated or separated earthed metal conduit, cable trays, or trunking.

The control cabinet should be mounted in a location convenient for service with a minimum of 914 mm clearance in front of the door.

The installer is responsible for making electrical connections at the power terminals.

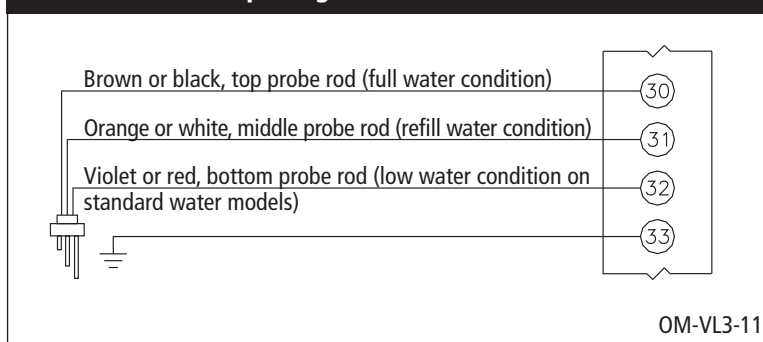
### **Control wiring**

The following wiring methods for external low voltage control wiring should minimize electrical noise problems:

- Humidistat, RH transmitter, and temperature transmitter wiring must be minimum 1 mm<sup>2</sup> plenum rated, shielded (screened), twisted pair wire with a bare drain wire for grounding.
- Airflow proving switch wiring must be minimum 1 mm<sup>2</sup> stranded wire run in conduit. The airflow proving switch can be wired using minimum 1 mm<sup>2</sup> plenum rated, shielded (screened), twisted pair wire with a bare drain wire for grounding.
- The shield (screen) wire should be connected to the shield (screen) ground terminal/lug with a length less than 51 mm. Do not ground the shield (screen) wire on the humidistat or transmitter end.

**More on the next page ►**

**Figure 32-1:  
Humidifiers with Vapor-logics**



## Wiring

- Water level control device, fill valve, and drain valve wiring must be minimum 18-gauge stranded wire run in a separate conduit from power wires. **DO NOT USE SHIELDED (SCREENED) CABLE FOR WATER LEVEL CONTROL DEVICES.**
- The tank temperature sensor can be run with 1 mm<sup>2</sup> stranded wire if the control cabinet is located within 3 m of the humidifier. For wire lengths of 3 m to 15 m, use 1 mm<sup>2</sup> plenum rated, shielded (screened), twisted pair wire with a bare drain wire for grounding.

### Grounding requirements

The approved earth ground must be made with solid metal-to-metal connections and must be a good conductor of radio frequency interference (RFI) to earth (multistranded conductors).

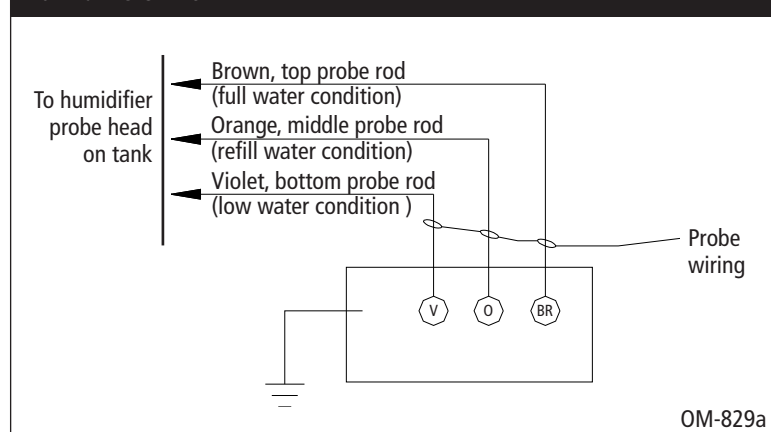
Ground wire should be the same size as the power wiring or sized per European IEC 60364 requirements.

When the control cabinet is mounted remotely from the humidifier, a ground wire is necessary from the machine ground lug on the humidifier to the machine ground lug in the control cabinet. The bonding machine ground wire should be no less than 14-gauge AWG (mm<sup>2</sup>) or sized per IEC 60364 requirements.

**Important:** Failure to follow these wiring procedures can result in erratic operation or failure.

This product has been tested at the factory for proper operation. Product failures resulting from faulty handling, incorrect wiring, or shorting of wires together on external components are not covered under your DRI-STEEM warranty. Review information and diagrams before proceeding.

**Figure 33-1:**  
**Humidifiers with LW417**



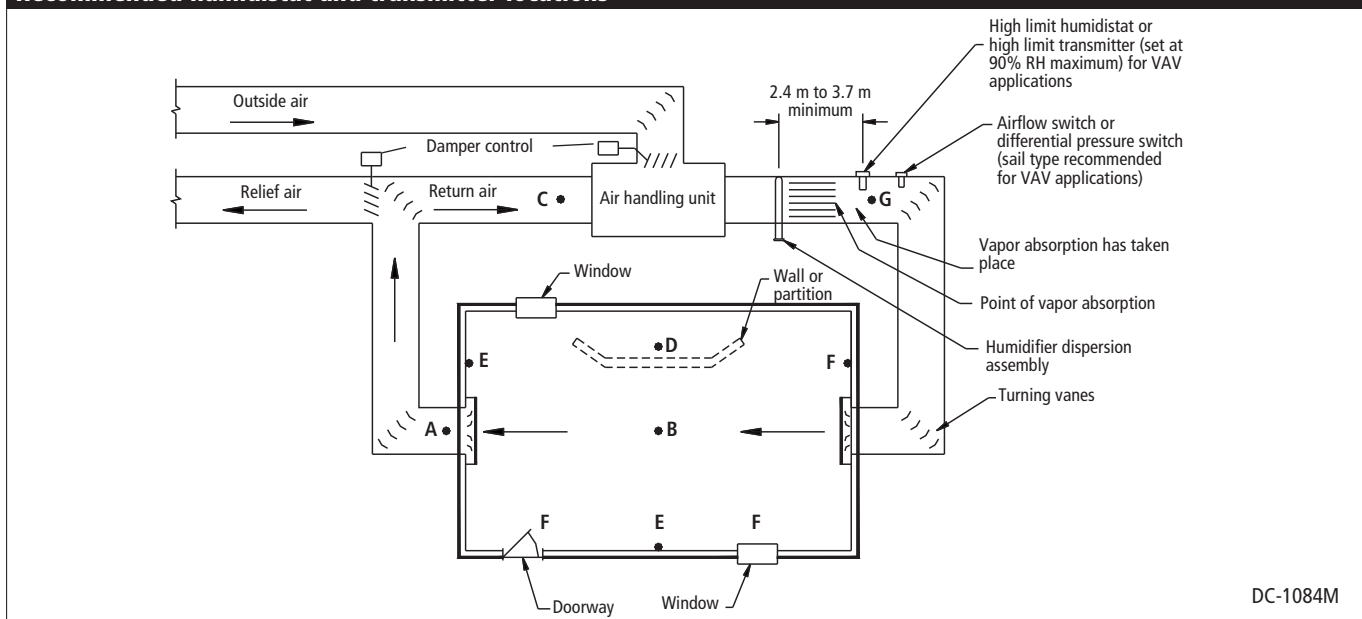
## Humidistat and transmitter placement

### Humidistat and transmitter locations are critical

Humidistat or transmitter location has a significant impact on humidifier performance. In most cases, it is recommended that you do not interchange duct and room humidity devices. Room humidity devices are calibrated with zero or little airflow; whereas duct humidity devices require air passing across them. Recommended humidistat and transmitter locations (see Figure 34-1):

- A This is the ideal sensing location because this placement ensures the best uniform mix of dry and moist air with stable temperature control.
- B This location is acceptable, but the room environment can affect controllability such as when the humidistat or transmitter is too close to air grilles, registers, or heat radiation from room lighting.
- C This location is acceptable because it provides a good uniform mixture of dry and moist air, but if an extended time lag exists between moisture generation and sensing, make sure the control contractor extends the sampling time.
- D This location behind a wall or partition is acceptable for sampling the entire room if the sensor is near an air exhaust return outlet. This location is also typical of humidistat or transmitter placement for sampling a critical area.
- E These locations are not acceptable because they may not represent actual overall conditions in the space.
- F These locations are not acceptable. Do not place humidistats or transmitters near windows, door passageways, or areas of stagnant airflow.
- G This is the best location for a duct high limit humidistat or humidity transmitter.

**Figure 34-1:**  
**Recommended humidistat and transmitter locations**



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## Dispersion: General instructions

### Selecting the dispersion assembly location

- For each dispersion device, DRI-STEEM documents distances required for non-wetting to occur. If you have questions about absorption non-wetting distances, see the non-wetting tables in the STS catalog, available for viewing, printing or ordering at [www.dristeem.com](http://www.dristeem.com)
- It is important that the dispersion assembly be 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 will be after the heating coil or where the air temperature is highest.
- Place the dispersion assembly such that absorption will occur before the intake of a high efficiency filter. The filter can remove the visible moisture and become waterlogged.
- Place the dispersion assembly such that absorption will occur before coming in contact with any metal surface.
- Place the dispersion assembly such that absorption will occur before fire or smoke detection devices.
- Place the dispersion assembly such that absorption will occur 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 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, condensation may form on nearby surfaces.

### Where to find more information

#### In this document:

- Interconnecting piping and drip tee installation, Pages 36-38
- Single tube and multiple tube installation instructions, Pages 40-44
- Rapid-sorb® installation instructions, Pages 45-52
- Area-type fan information, Pages 53-54

#### On our web site:

The following documents can be viewed, printed or ordered from our web site, [www.dristeem.com](http://www.dristeem.com)

- Catalogs (include dispersion nonwetting distance graphs):
  - STS
  - 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)

#### On Dri-calc:

Dri-calc® is our humidification system sizing and selection software, and may be ordered at our web site, [www.dristeem.com](http://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'd also be happy to mail to you any literature you need.

## Dispersion: Interconnecting piping requirements

### WARNING!

Dispersion tube, vapor hose, tubing, or hard pipe can contain steam, and surfaces can be hot. Discharged steam is not visible. Contact with hot surfaces or air into which steam has been discharged can cause severe personal injury.

**Figure 36-1:**  
**Ultra-sorb with the High-efficiency**  
**Tube option**



#### High-efficiency Tube option

Dispersion assemblies with the High-efficiency Tube option are designed to produce significantly less dispersion-generated condensate and airstream heat gain, which reduces wasted energy by up to 85%. These improvements are accomplished by reducing the thermal conductivity of the tubes with 1/8" of polyvinylidene fluoride (PVDF) insulating material on the outside of the tubes. These assemblies require careful unpacking, installation, and handling. If your dispersion assembly has the High-efficiency Tube option, be sure to read this section carefully.

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#### 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 167 mm/m (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 recommend installation as shown on Page 38.
- For single tube applications, see the hose kit sizing chart on Page 40.

#### Connecting humidifier to dispersion assembly with tubing or pipe

- See the table on Page 41 for interconnecting tubing and pipe pitch requirements for single tube and multiple tube applications. See the table on Page 46 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. 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, 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

### 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 will minimize 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.

### Important:

Failure to follow the recommendations in this section can result in excessive back pressure 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 37-1:**  
**Maximum steam carrying capacity and length of interconnecting vapor hose, tubing, and pipe\***

Vapor hose <sup>†††</sup>			Copper or stainless steel tubing and Schedule 40 steel pipe		
Hose I.D.	Maximum capacity	Maximum length <sup>**</sup>	Tube or pipe size <sup>***</sup>	Maximum capacity	Maximum developed length <sup>†</sup>
DN	kg/h	m	DN	kg/h	m
40 (1½")	68	3	40 (1½")	68	6
50 (2")	113	3	50 (2")	100	9
			80 <sup>††</sup> (3 <sup>††</sup> )"	204	24
			100 <sup>††</sup> (4 <sup>††</sup> )"	340	30
			125 <sup>††</sup> (5 <sup>††</sup> )"	635	30
			150 <sup>††</sup> (6 <sup>††</sup> )"	1043	30

\* Based on total maximum pressure drop in hose, tubing, or piping of 1244 Pa

\*\* Maximum recommended length for vapor hose is 3 m. Longer distances can cause kinking or low spots.

\*\*\* To minimize loss of capacity and efficiency, insulate tubing and piping.

† Developed length equals measured length plus 50% of measured length to account for pipe fittings.

†† Requires flange connection

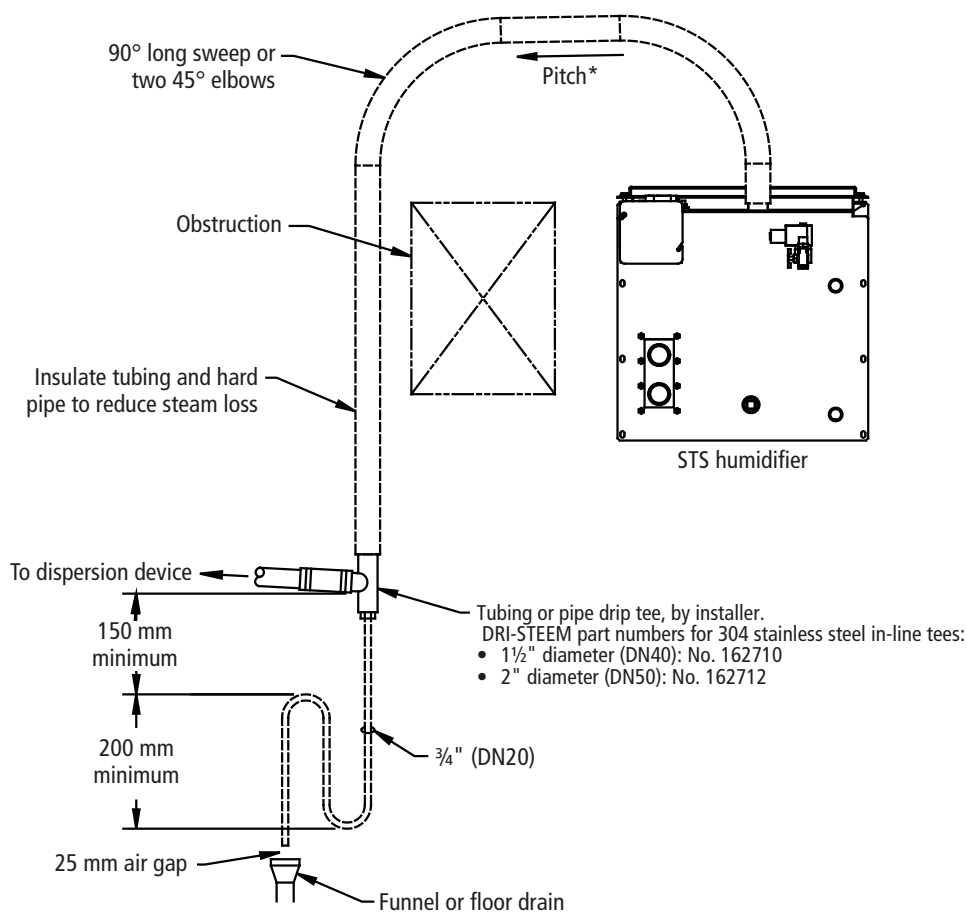
††† When using vapor hose, use DRI-STEEM vapor hose for best results. Field-supplied hose may have shorter life and may cause foaming in the evaporating chamber resulting in condensate discharge at the dispersion assembly. Do not use vapor hose for outdoor applications.

## Dispersion: Drip tee installation

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, or 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; otherwise, condensation may form on nearby surfaces. 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.

DC-1470

## Dispersion: Overhead installation

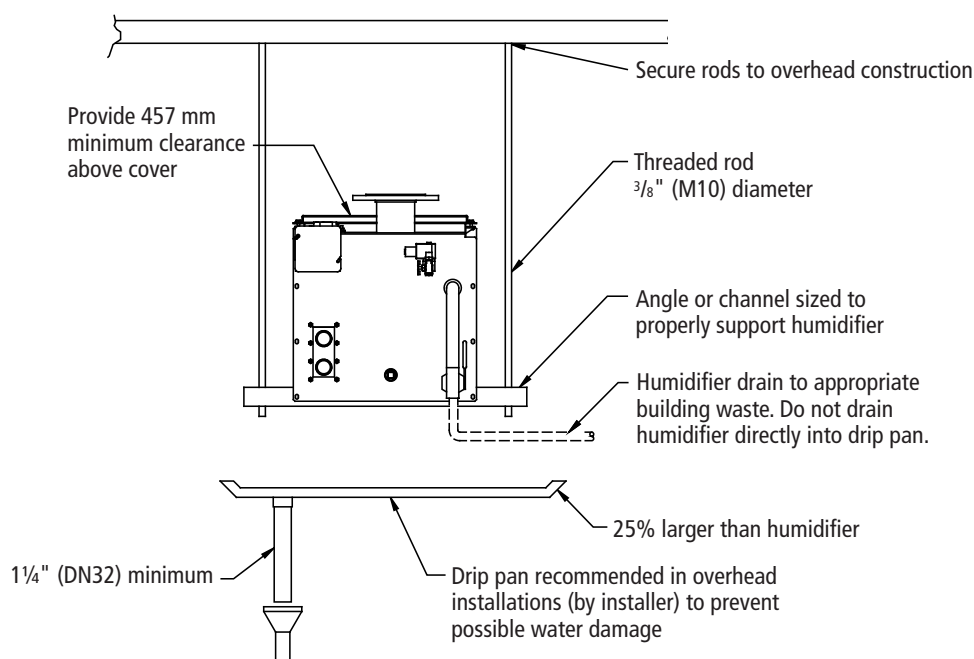
### Overhead installation

Water piping and humidifiers should not be installed above expensive equipment. A condensing or leaking water pipe or other accidental water spillage could cause serious damage to the equipment below.

When such an installation cannot be avoided, install a galvanized drip pan under the humidifier piping, valve, etc. to catch and drain away unintended water (see figure below).

It is advisable to terminate the drain above an open floor drain. The overflow from the STS should be piped separately to a floor drain. Do not drain the STS directly into the drip pan.

**Figure 39-1:  
Overhead installation**



DC-1453

## Dispersion: Single tube and multiple tube

### Important:

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 40-1:  
Hose kit sizing by capacity**

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

### 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

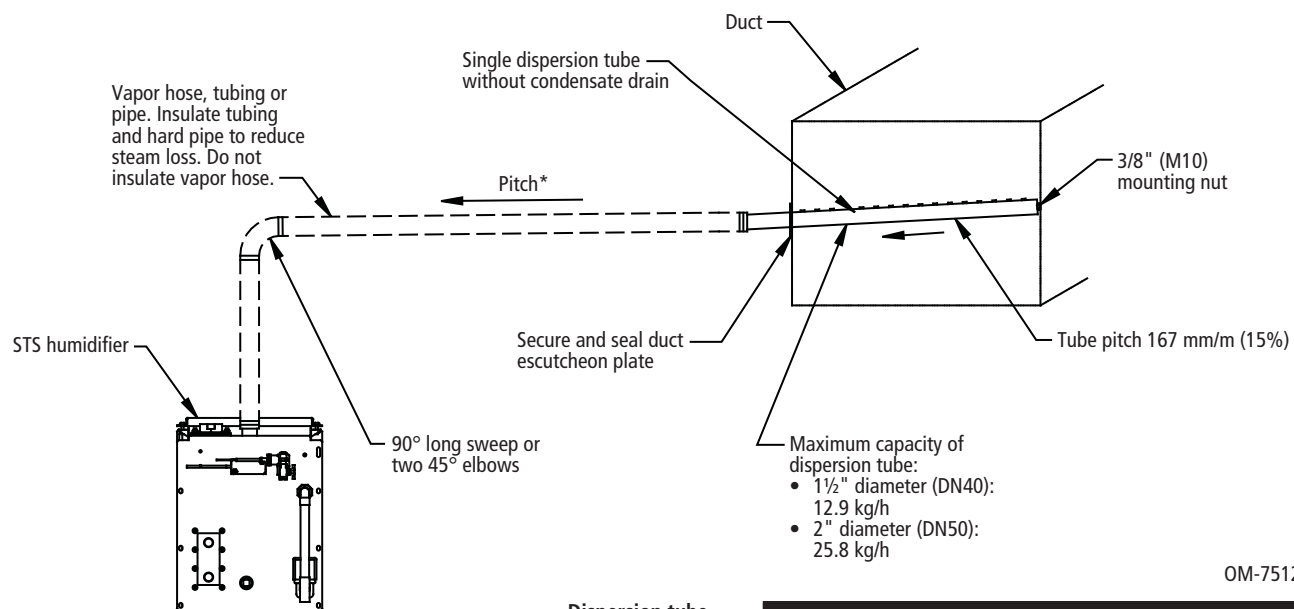
- Orient dispersion tube(s) so that tubelets (steam orifices) point up.
- See the table on the next page for dispersion tube pitch requirements.
- When mounting the humidifier above the level of the dispersion tube(s), see the drip tee installation drawing on Page 38.

### 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 100 °C continuous operating temperature.
- Condensate drain line must be piped as shown in the figures on the following pages. Provide a 152 mm drop prior to a 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 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 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.

## Dispersion: Single tube and multiple tube

**Figure 41-1:**  
**Single tube dispersion without condensate drain**



**Notes:**

- \* Pitch vapor hose, tubing or pipe toward humidifier:
- 167 mm/m (15%) when using vapor hose
  - 10 mm/m (1%) when using tubing or pipe
- Dashed lines indicate provided by installer

**Table 41-1:**  
**Dispersion tube escutcheon plate dimensions**

	for 1 1/2" tube (DN40)	for 2" tube (DN50)
	mm	mm
A	38	52
B	83	127

**Table 41-2:**  
**Pitch of dispersion tube(s) and interconnecting piping for Single tube or multiple tube evaporative dispersion units\***

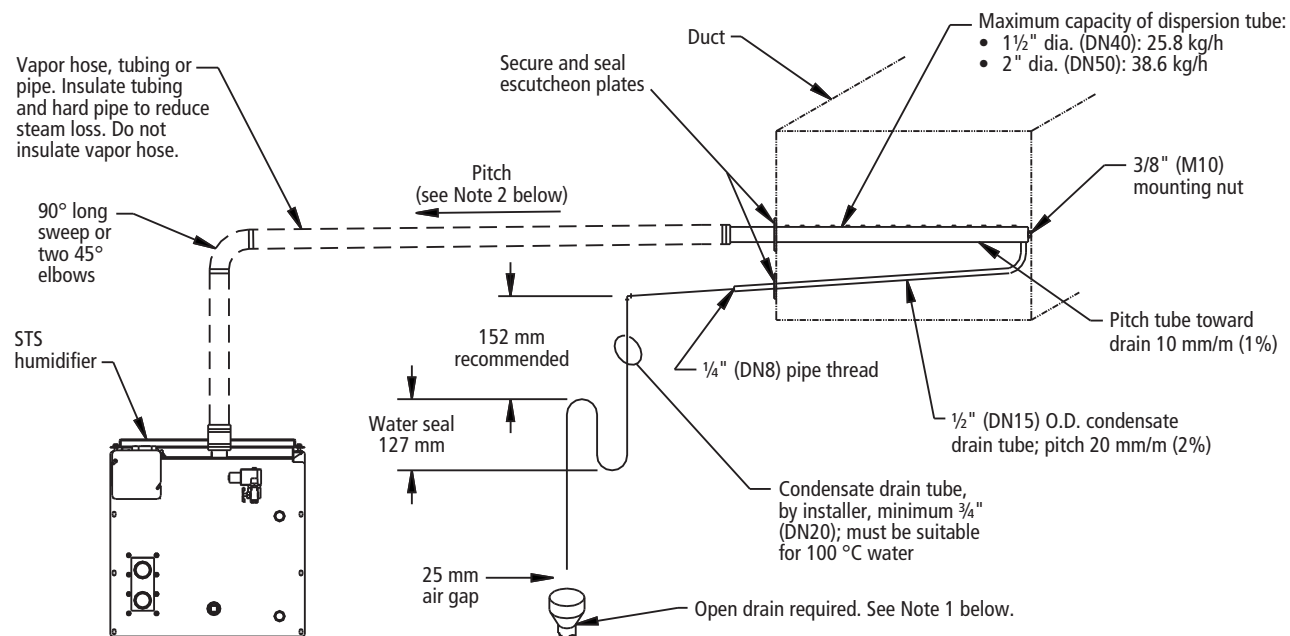
Condensate drain	Type of interconnecting piping	Diameter of dispersion tube and interconnecting piping	Pitch of interconnecting piping	Pitch of dispersion tube(s)	Pitch of condensate drain
Without drain	Vapor hose	1½" (DN40)	167 mm/m (15%) toward humidifier	167 mm/m (15%) toward humidifier	No drain
		2" (DN50)			
	Tubing or pipe	1½" (DN40)	10 mm/m (1%) toward humidifier		
		2" (DN50)			
With drain	Vapor hose	1½" (DN40)	167 mm/m (15%) toward humidifier	10 mm/m (1%) toward condensate drain	20 mm/m (2%) toward floor drain or toward humidifier if humidifier is below dispersion unit
		2" (DN50)			
	Tubing or pipe	1½" (DN40)	43 mm/m (5%) toward humidifier		
		2" (DN50)	20 mm/m (2%) toward humidifier		

**Note:**

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

## Dispersion: Single tube and multiple tube

**Figure 42-1:**  
Single tube dispersion with condensate wasted to floor drain



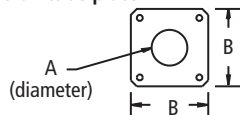
**Notes:**

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

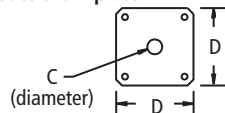
DC-1473a

**Figure 42-2:**  
Dispersion tube and condensate drain escutcheon plates

**Dispersion tube plate**



**Condensate drain plate**



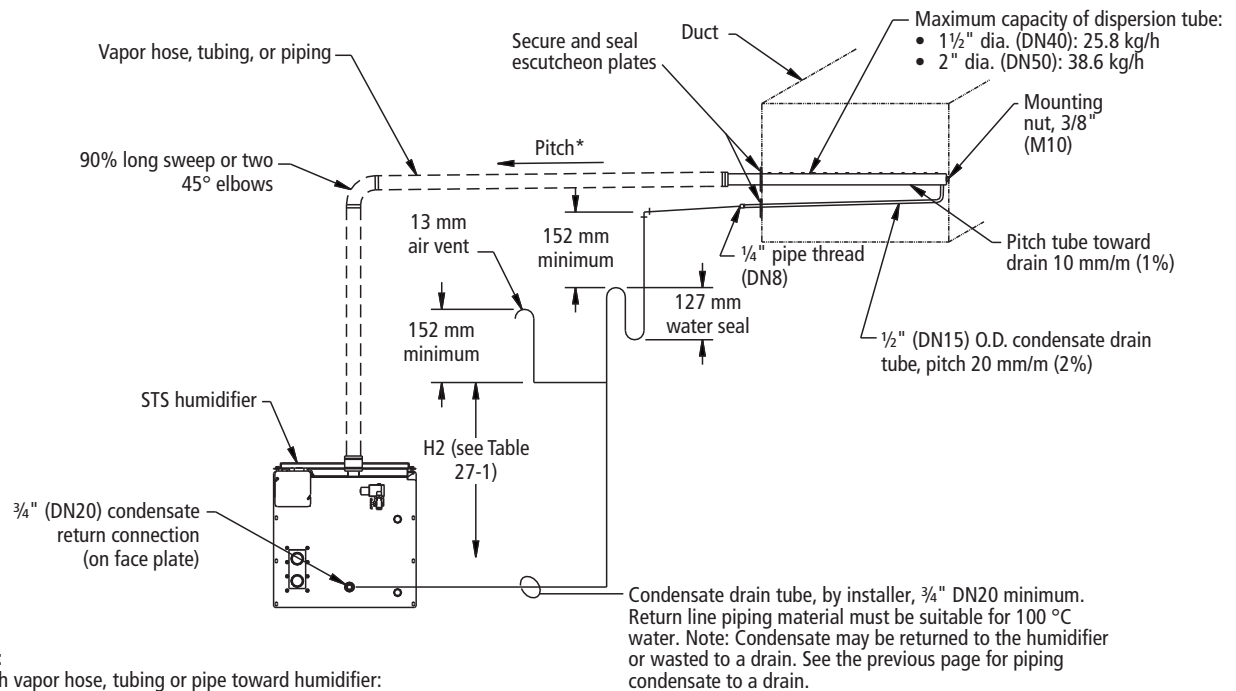
OM-351c

**Table 42-1:**  
Dispersion tube escutcheon plate dimensions

	for 1½" tube (DN40)	for 2" tube (DN50)
	mm	mm
A	38	52
B	83	127
C	19	19
D	83	83

## Dispersion: Single tube and multiple tube

**Figure 43-1:**  
**Single tube with condensate returned to humidifier**

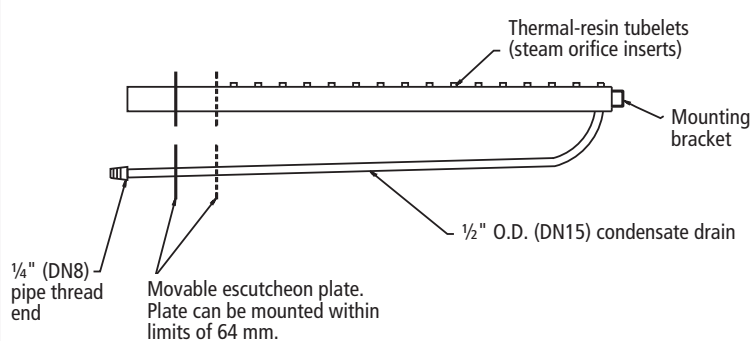


**Notes:**

- \* Pitch vapor hose, tubing or pipe toward humidifier:
  - 167 mm/m (15%) when using vapor hose
  - 43 mm/m (5%) when using 1 1/2" tubing or pipe
  - 20 mm/m (2%) when using 2" tubing or pipe
- Dashed lines indicate provided by installer

DC-1473b

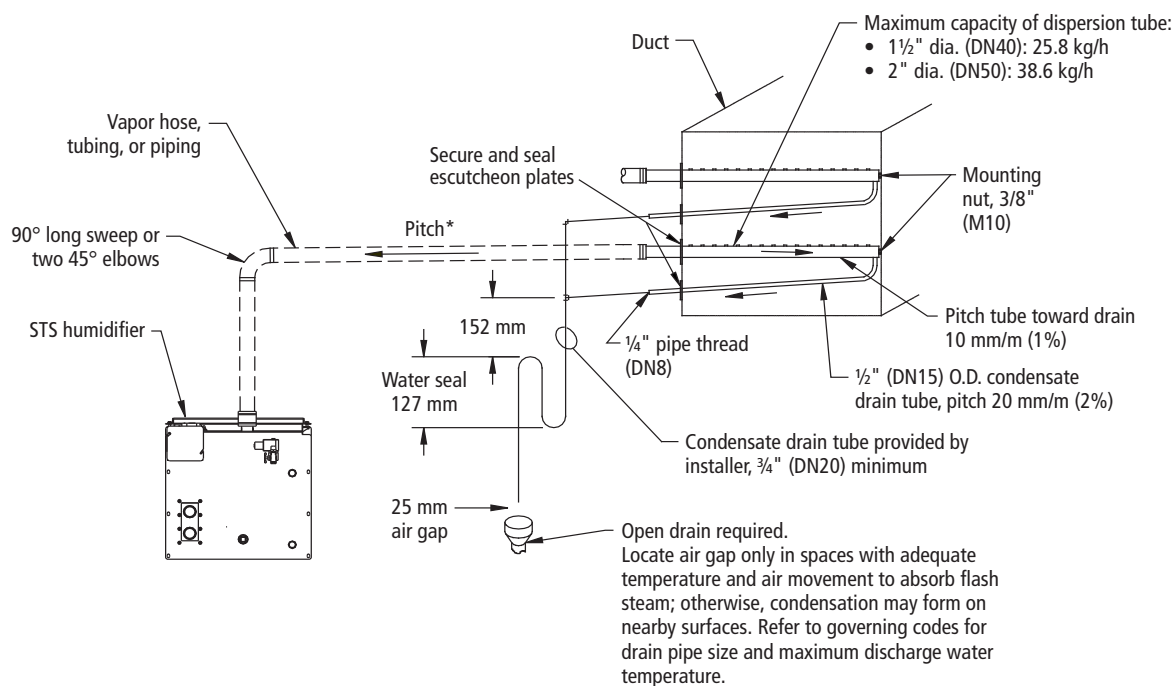
**Figure 43-2:**  
**Single tube dispersion with condensate drain**



OM-351b

## Dispersion: Single tube and multiple tube

**Figure 44-1:**  
**Multiple tube with condensate wasted to floor drain**



**Notes:**

- \* Pitch vapor hose, tubing or pipe toward humidifier:
  - 167 mm/m (15%) when using vapor hose
  - 43 mm/m (5%) when using 1 1/2" tubing or pipe
  - 20 mm/m (2%) when using 2" tubing or pipe
- Dashed lines indicate provided by installer

DC-1048a

# Dispersion: Rapid-sorb

## 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
  - 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 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 1270 mm or less in length have a hole 102 mm in from each end to mount the L-bracket to the duct or air handler wall.
  - L-brackets that are greater than 1270 mm in length have an additional hole in the center of the L-bracket.

More on next page ►

## Important:

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 45-1:  
Rapid-sorb dispersion tube capacities**

Tube capacity	Tube diameter
kg/h	DN
≤ 16	40
17-32	50

**Table 45-2:  
Rapid-sorb header capacities**

Header capacity	Header diameter
kg/h	DN
≤ 113	50
114-227	80
228-363	100

## Dispersion: Rapid-sorb

**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 46). 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 10 mm/m (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 10 mm/m (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.

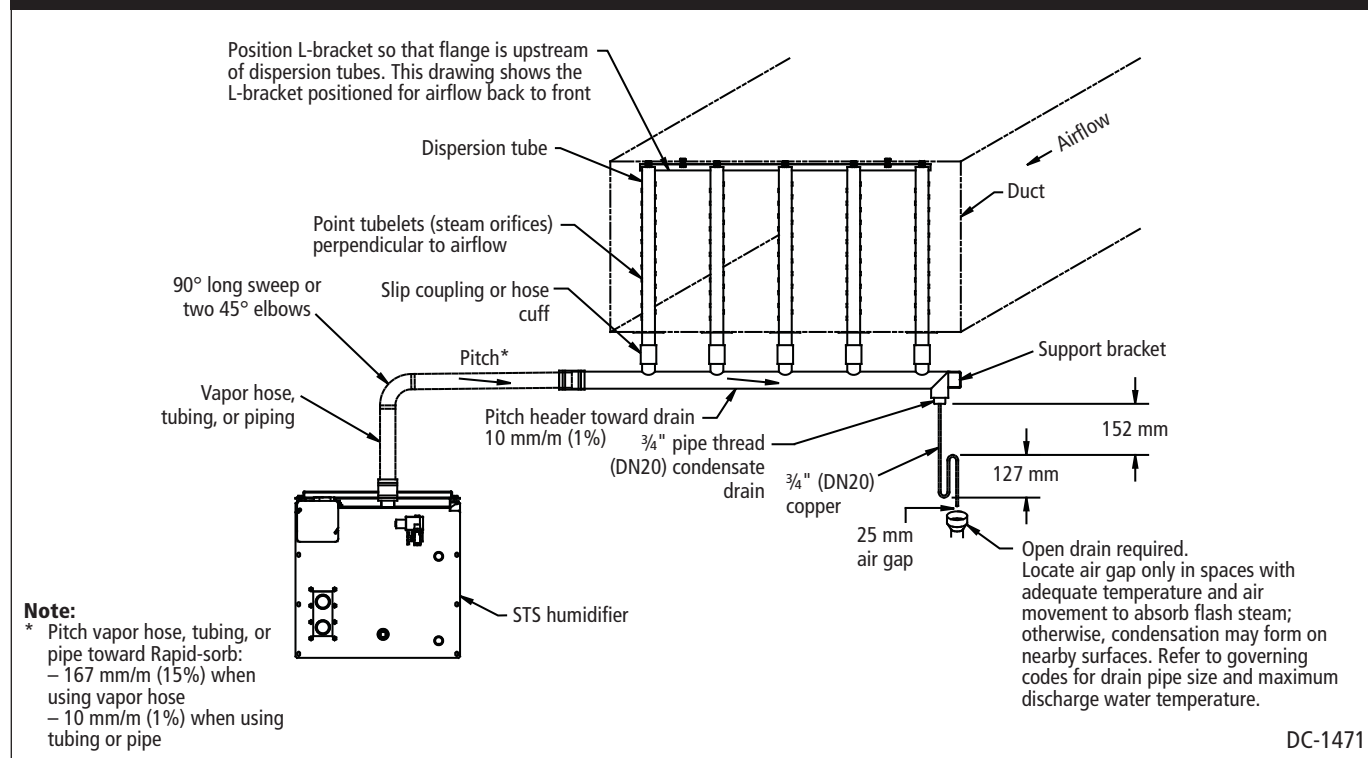
**More on the next page ►**

**Table 46-1:**  
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)	167 mm/m (15%) toward Rapid-sorb	Vertically plumb	10 mm/m (1%) toward condensate drain
	Tubing or pipe	1½" (DN40), 2" (DN50), 3" (DN80), 4" (DN100), 5" (DN125), 6" (DN150)	10 mm/m (1%) toward Rapid-sorb		
Vertical	Vapor hose	1½" (DN40), 2" (DN50)	167 mm/m (15%) toward Rapid-sorb	167 mm/m toward header	10 mm/m (1%) toward condensate drain
	Tubing or pipe	1½" (DN40), 2" (DN50), 3" (DN80), 4" (DN100), 5" (DN125), 6" (DN150)	10 mm/m (1%) toward Rapid-sorb		

## Dispersion: Rapid-sorb

**Figure 47-1:**  
**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.

More on next page ►

## Dispersion: Rapid-sorb

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

- 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.
  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.

**More on the next page ►**

## Dispersion: Rapid-sorb

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

- 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, 10 mm/m (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.

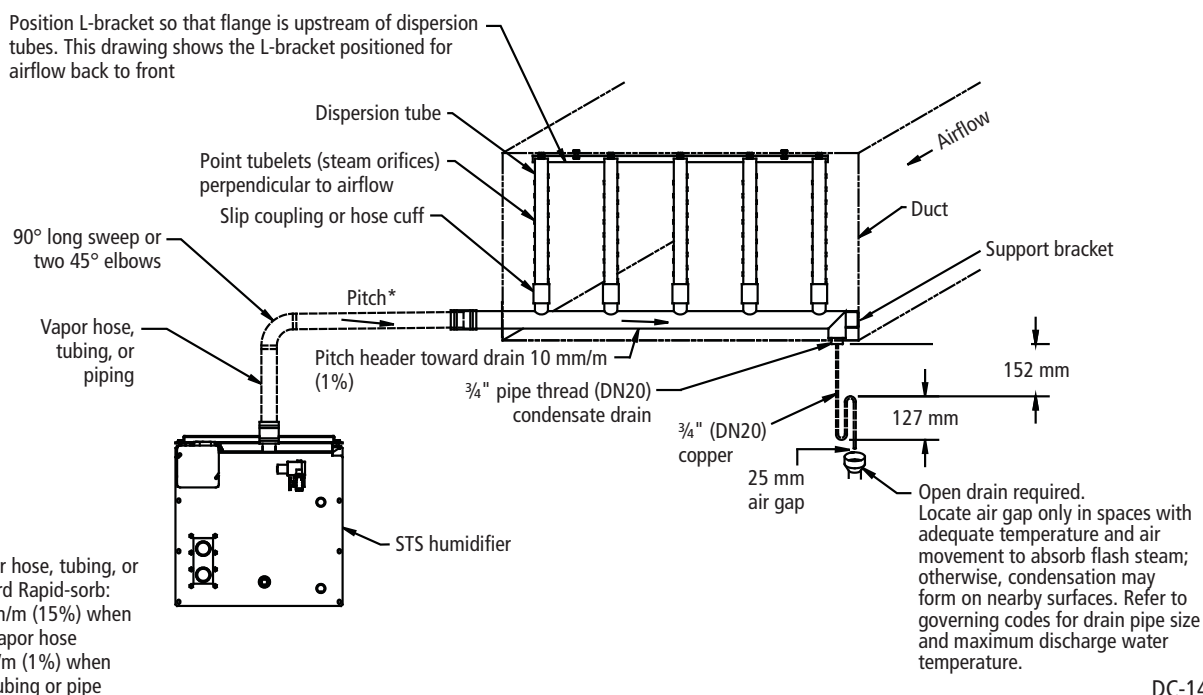
#### Note:

See Page 52 for steam supply and condensate drain line connection instructions.

**More on next page ►**

## Dispersion: Rapid-sorb

**Figure 50-1:**  
Rapid-sorb installed in a horizontal airflow with header inside the duct



DC-1472

### 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 10 mm/m (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 ►

## Dispersion: Rapid-sorb

### 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 52 for steam supply and condensate drain line connection instructions.

**More on the next page ►**

## Dispersion: Rapid-sorb

### 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 10 mm/m (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  $\frac{3}{4}$ " I.D. (DN20) and rated for 100 °C minimum continuous operating temperature.
2. Condensate drain line must be piped as shown in the figures on the previous pages. Provide a 152 mm drop prior to a 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 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 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.

## Dispersion: Area-type fan

### 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.

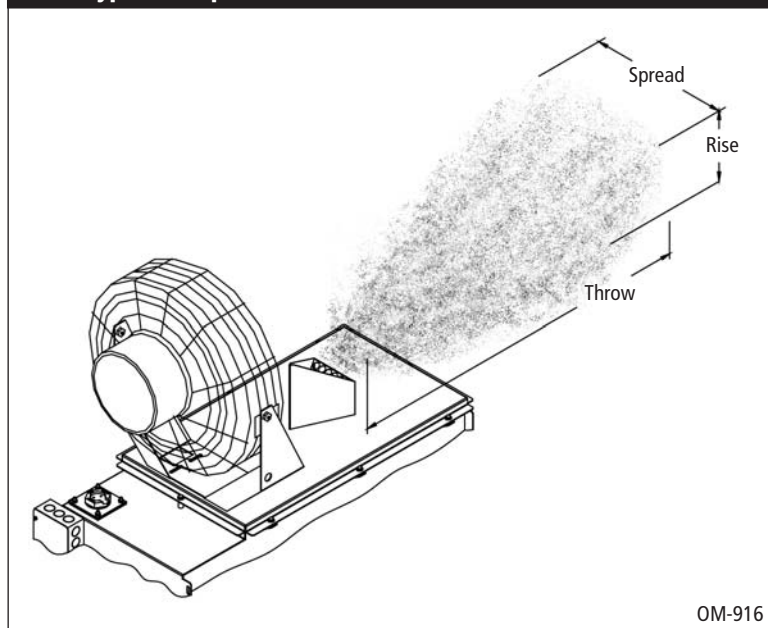
The Area-type fan and brackets are shipped separately and field-installed on the humidifier. After mounting the fan, terminate the wires as specified on the wiring diagram.

To provide power to the Area-type fan, run a neutral line with 208V/240V/single-phase and 208V/three-phase power supply lines to provide a 230V circuit for the fan. With all other power supply voltages (other than 230V), provide a separate 230V circuit for the fan, or order from DRI-STEEM a transformer installed in the control cabinet.

**Table 53-1:  
Area-type electric fan specifications**

Motor	230 V, 50/60 Hz
Blade diameter	457 mm
Speeds	3
Control	Rotary switch
cfm (high speed)	3190
m <sup>3</sup> /s (high speed)	1.51
rpm (high speed)	1500
Amps (high speed)	1.52

**Figure 53-1:  
Area-type rise, spread, throw**



## Dispersion: Area-type fan

**Table 54-1:**  
**Area-type (evaporative steam) minimum non-wetting distances\***

Maximum steam capacity	16 °C								
	30% RH			40% RH			50% RH		
	Rise	Spread	Throw	Rise	Spread	Throw	Rise	Spread	Throw
kg/h	m	m	m	m	m	m	m	m	m
20	0.3	0.6	1.8	0.3	0.6	1.8	0.3	0.8	1.8
34	0.9	0.9	2.4	0.9	0.9	2.4	0.9	1.2	2.4
45	1.2	1.2	3.1	1.2	1.2	3.1	1.2	1.5	3.1
68	1.8	1.5	3.7	1.8	1.5	3.7	1.8	1.5	3.7
90	2.1	2.1	4.0	2.4	2.1	4.3	2.4	2.1	4.3
102	2.1	2.1	4.0	2.4	2.1	4.3	2.4	2.1	4.3
110	2.4	2.4	4.6	2.7	2.7	4.9	2.7	2.7	4.9
130	2.7	2.7	5.2	3.1	3.1	5.5	3.1	3.1	5.5
136	2.7	2.7	5.2	3.1	3.1	5.5	3.1	3.1	5.5
Maximum steam capacity	21 °C								
	30% RH			40% RH			50% RH		
	Rise	Spread	Throw	Rise	Spread	Throw	Rise	Spread	Throw
kg/h	m	m	m	m	m	m	m	m	m
20	0.3	0.5	1.2	0.3	0.6	1.2	0.3	0.6	1.2
34	0.6	0.6	1.8	0.6	0.8	1.8	0.6	0.8	1.8
45	0.9	0.9	2.4	0.9	0.9	2.4	0.9	0.9	2.4
68	1.2	1.2	3.1	1.2	1.2	3.4	1.2	1.2	3.4
90	1.5	1.5	3.4	1.5	1.5	3.7	1.5	1.5	3.7
102	1.5	1.5	3.4	1.5	1.5	3.7	1.5	1.5	3.7
110	1.8	1.8	3.7	1.8	1.8	4.0	1.8	1.8	4.3
130	2.1	2.1	4.3	2.1	2.1	4.6	2.1	2.1	4.9
136	2.1	2.1	4.3	2.1	2.1	4.6	2.1	2.1	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

## Start-up procedure

### Introduction

After the system is installed and connected properly, you can begin start-up procedures.

### **CAUTION!**

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

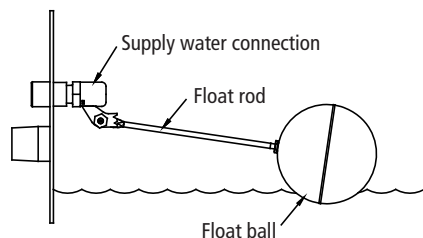
### Start-up and checkout procedures

1. Verify that the STS humidifier, controls, piping, electrical connections, steam supply, and dispersion unit(s) are installed according to the following:
  - Installation section on Pages 8-12 and 24-54
  - *Vapor-logics Installation and Operation Manual*
    - Installation section
    - Installation checklist
  - LW417 wiring instructions on Page 31-33 (if using the LW417 water level control option).
  - Ladder style wiring diagram (inside control cabinet)
  - External connections wiring diagram (inside control cabinet)
  - All governing codes
2. Verify that the humidifier is mounted level and securely supported before filling with water (see the operating weights in Table 7-3).
3. Verify that the humidifier is level front to back and side to side after it is full of water.
4. Refer to the *Vapor-logics Installation and Operation Manual*—the “Operation” section and the “Start-up checklist” (it is critical that the installer follow this checklist)—or the LW417 section of this start-up procedure.
5. During start-up, do not leave the humidifier unattended.
6. Monitor humidifier operation through multiple fill cycles.
7. At start-up, DRI-STEEM recommends initially running the humidifier with the factory default setting for skim time. (See *Adjusting skim duration* on Page 59.)

**More on the next page ►**

## Start-up procedure

**Figure 56-1:**  
Water level control for DI/RO  
water systems



Systems using deionized (DI) water or water that has been treated through reverse osmosis (RO) control water levels using a float valve and low water cutoff switch.

VLC-OM-026

### LW417 electronic water level control option (for standard water units only)

The LW417 is a custom microprocessor-based water level controller developed to operate with DRI-STEEM humidifiers. The features of this controller are:

- Water level control (for standard water units)
- Automatic drain and flush
- Variable skim times
- End-of-season drain
- Onboard diagnostics: “Ready water,” “Full,” and “Drain” LEDs to assist troubleshooting

When power is activated, the solenoid-operated water fill valve opens, filling the evaporating chamber. Filling continues until the water reaches level A (see Figure 57-1), at which time the fill valve closes. To ensure that a water seal is created in the field installed water seal, disconnect the probe plug and cable from the probe rod assembly (located on top of the tank), allowing the fill valve to re-energize and overfill the humidifier tank. This process takes a short time. Reconnect the probe plug and cable. Create a call for humidify to ensure the steam valve opens.

**IMPORTANT:** Timer logic input wire (see Figure 58-1) must be connected per wiring diagram for proper automatic drain and flush and end-of-season drain operation. The “Power” light blinks off twice at one-second intervals when these functions are disabled. Verify wiring with diagram supplied with unit.

#### Water refill

During operation, when the water line drops below level B, the fill valve opens and remains open until the water line returns to level A (see Figure 57-1).

#### Low water condition

Should the water line drop below level C, the steam value is de-energized and remains OFF until the water line is restored to level C.

More on the next page ►

## Start-up procedure

### Automatic drain and flush

This control module contains an integral electronic timer that tracks the humidifying time of the unit. When this accumulated time reaches what has been set in the timer, the drain/flush cycle is activated.

Upon activation, the following sequence occurs:

1. The drain valve opens, draining the mineral laden water from the evaporating chamber.
2. The default drain time is 10 minutes.
3. Flushing occurs during the last 10% of drain period.

The electronic timer is factory set for drainage after 40 hours of operation. Alternate settings of 20 hours and 80 hours are available. See the wiring diagram(s) attached to the unit for timer board location and instructions for changing the timer setting or refer to the table below.

### Test cycling the drain/flush system

The level control board incorporates a set of slide switches marked 1 through 8. To test:

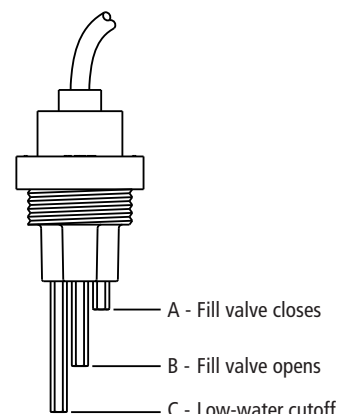
1. Place "SW1" slide switches 1, 2, and 3 to the off position.
2. Set the humidistat high enough so the unit remains "on call" for at least 15 minutes.
3. After about 2 minutes of operation, activation takes place, causing the drain valve to open. The water level then drops to level C (see Figure 57-1) and allows the fill valve to open. Both valves will remain open for the remainder of the autodrain and flush period.
4. The drain valve then closes, and the water level rises to level A (see Figure 57-1), causing the fill valve to close.
5. Once the test cycle is complete, return the slide switches back to the desired operating mode. **Failure to do so will result in a drain/flush cycle every 2 minutes.**

### Variable skim times

The skim time feature removes surface solids and foam from the water. This keeps the fill valve open for a certain amount of time after the water reaches level A (see Figure 57-1). The skim time is factory set for 3 seconds but can be changed in the field for locations with water that requires more skimming. See "Adjusting skim duration" on Page 59. See wiring diagram(s) attached to the unit for timer board location and instructions for changing the skim time setting.

More on the next page ►

**Figure 57-1:**  
Water level control for standard water systems



VLC-OM-030

**Table 57-1:**  
Autodrain settings

	Switch			Drain time	Interval time
	1	2	3		
<b>Self test</b>	Off	Off	Off	10 min.	2 min.
<b>Disabled</b>	On	Off	Off	-	-
<b>Option</b>	Off	On	Off	10 min.	20 hours
<b>Option</b>	On	On	Off	30 min.	20 hours
<b>Factory settings</b>	Off	Off	On	10 min.	40 hours
<b>Option</b>	On	Off	On	30 min.	40 hours
<b>Option</b>	Off	On	On	10 min.	80 hours
<b>Option</b>	On	On	On	30 min.	80 hours

## Start-up procedure

### End-of-season drain

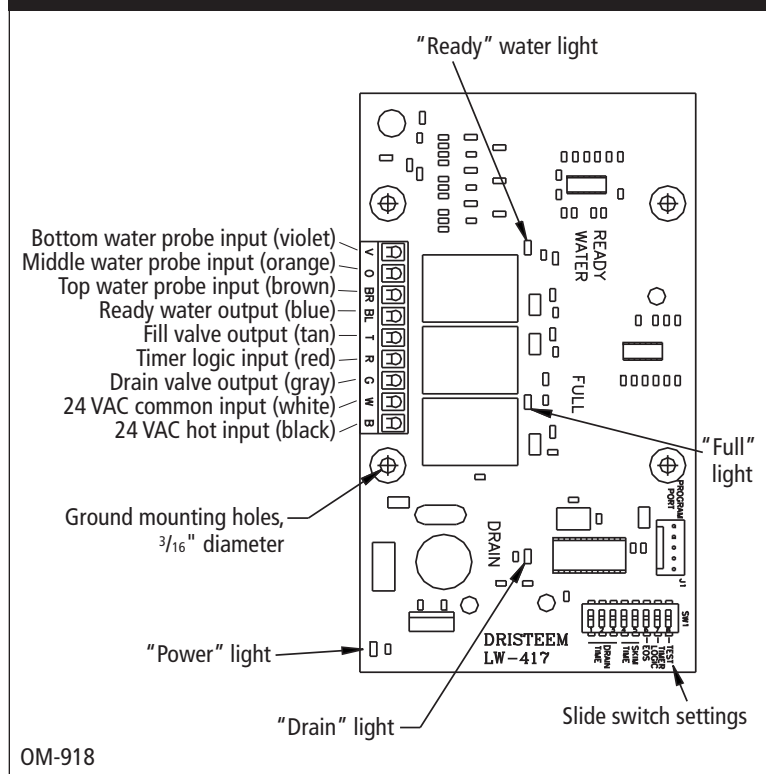
The end-of-season drain feature drains the tank after 72 hours of no system demand to minimize microbial growth inside the humidifier. When there is a demand for humidity, the tank fills and the unit runs when the operating level is reached.

### Onboard diagnostics

When the green "Power" light blinks on for one second and then is off for one second, enough scale has accumulated on the probes to begin to compromise the quality of the water level detection. Remove the probe assembly and brush off all scale and tarnish. See the troubleshooting guide on Pages 66-67 for any water level control module issues.

**IMPORTANT: Timer logic input wire (see figure below) must be connected per wiring diagram for proper automatic drain and flush and end-of-season drain operation. The "Power" light blinks off twice at one-second intervals when these functions have been disabled. Verify wiring with diagram supplied with unit.**

**Figure 58-1:  
LW417 circuit board**



## Water quality

The best way to determine how often your particular system needs maintenance is to remove the tank cover 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 (35 mg/L to 170 mg/L) requires:
  - Annual cleaning
  - Regular skimming
- High mineral content water (more than 170 mg/L) requires:
  - Cleaning frequency determined by use and water quality
  - Regular skimming
  - Periodic drain and flush cycles
- Softened water, which dramatically reduces mineral accumulation inside the standard water models, requires:
  - Increased skim time
  - No drain and flush cycles

(**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. The skim time is field adjustable using the Vapor-logic3 keypad or the dip switches on the LW417. See Table 59-1.

Each time the STS 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 is also an operational cost. Therefore,

**Table 59-1:**  
**Skim time settings**

	Switch		Skim time
	4	5	
<b>Option</b>	Off	Off	3 seconds
<b>Option</b>	On	Off	9 seconds
<b>Factory settings</b>	Off	On	32 seconds
<b>Option</b>	On	On	45 seconds

## Standard water models

### Humidifier De-scaling Solution

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

The De-scaling Solution cleans without risk of corroding humidifier tanks or welds; and there is no off-gassing, flammability, or added heat risks associated with other cleaning solutions. The De-scaling Solution also cleans surfaces unreachable by hand scraping.

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

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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 performing any maintenance, allow the tank to cool down.

**Note:** Fresh make-up water is used to speed up cooling. Do not close the manual water supply before cooling down the humidifier; otherwise the tank could stay hot for several hours.

- Insulated and uninsulated tanks will have hot surfaces.
- Close the manual shut-off valve on the inlet steam supply (STS humidifiers) or the inlet hot liquid supply (LTS humidifiers).
- Models with a standard drain valve and Vapor-logic3 controller::
  - For drain valves without the manual open lever, use the keypad to perform the cool down process. Refer to the Vapor-logic3 Installation and Operation Manual.
  - 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 dry. The humidifier should be cool enough to work on.
- Alternative method with the LW417 electronic water level control option
  - 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 opens when the water drops below the middle probe.
  - 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.

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**More on the next page ►**

## Standard water models

### Safety

**IMPORTANT:** When performing maintenance on the STS humidifier (after the tank has cooled down and drained),

- Always switch the keypad control mode to Standby (Vapor-logic3 only).
- Place all power disconnects in OFF position and lock in OFF position.
- Close the field installed manual supply water shut-off valve.
- Close the manual shut-off valve on the inlet steam supply.

### Inspection and maintenance

**Annually** (also recommended when maintenance is performed)

- All safety devices in the control circuit should be cycled on and off to verify they are functioning. These include:
  - High limit switch
  - Airflow proving switch
  - Low water level probe. Pull out probe plug; fill valve should energize.
- Inspect tank and gaskets for leaks.

**Seasonally** (or as required, depending on water quality)

#### Cleaning the tank

- Remove cleanout plate and dispose any loose scale that has collected in the bottom of the tank. This should be done 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.

#### Cleaning the probes

- Disconnect the probe plug and cable assembly (located on top of the tank) 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. To detach the housing from the tank, remove the four bolts that attach it to the tank. Then slide the housing vertically out of the tank.
- The scale should flake off easily from the probe assembly rods.
- The bottom 10 mm is the sensing portion of the probe rod; it should be brushed clean 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.
- Reassemble the probe assembly.

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**More on the next page ►**

## Standard water models

### Cleaning 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.
  - Install a union at the base of the water seal to ease removal if water quality causes the water seal to become clogged often with scale.

When the seasonal maintenance requirements are complete,

- Tighten down the nuts on the cleanout plate.
- Verify that the probe rod holder is secure and that the probe plug and cable assembly are plugged into the probe rod holder.
- Replace and secure all covers.
- Verify that the drain valve assembly is in the closed position.
- Turn on the water supply.
- Turn on the electrical power.
- 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.

### Off-season maintenance

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

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## DI water models

### STS-DI water requirements

- Regular verification that water processing equipment is operating correctly. The presence of chlorides in improperly processed DI water eventually causes pitting and failure of the heat exchanger tank and its components. Your DRI-STEEM warranty does not cover damage caused by chloride corrosion.
- No cleaning (regular inspections are advised)
- No skimming, drain, or flush cycles

### Cool down humidifier

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

**Note:** Fresh make-up water is used to speed up cooling. Do not close the manual water supply before cooling down the humidifier; otherwise the tank could stay hot for several hours.

- Insulated and uninsulated tanks will have hot surfaces.
- Close the manual shut-off valve on the inlet steam supply (STS humidifiers) or the inlet hot liquid supply (LTS humidifiers).
- 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.
- Models with end-of-season drain option (must have Vapor-logic3 controller)
  - Use the keypad to perform the cool down process. Refer to the *Vapor-logic3 Installation and Operation Manual*.
  - 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.

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### Safety

**IMPORTANT:** When performing maintenance on the steam-to-steam humidifier (after the tank has cooled down and drained),

- Always switch the keypad control mode to **Standby** (Vapor-logic3 only).
- Place all power disconnects in **OFF** position and lock in **OFF** position.
- Close the field installed manual supply water shut-off valve.

**More on the next page ►**

## DI water models

### Inspection and maintenance

#### Annually (also recommended when maintenance is performed)

- 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
- Inspect tank and gaskets for leaks.
- 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 humidifier, no cleaning or flushing should be necessary.

#### Off-season maintenance

- Perform a complete inspection of the following:
  - Heat exchanger
  - Float valve
  - Humidifier tank and gaskets
- After inspection, the humidifier should remain empty until humidification is required.
- After the humidification season, DRI-STEEM recommends a complete inspection and cleaning of the heat exchanger, skimmer, and water chamber. After cleaning, the unit should remain empty until humidification is required.

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**On units with Teflon coated heat exchangers, do not use a sharp object when cleaning.** Cuts or scratches on the heat exchanger will impair its ability to shed scale during operation and could cause the Teflon to separate from the metal surface.

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## Outdoor enclosure

- Access to the humidifier side cleanout plate is through the outdoor enclosure electrical service door.
- Clean vent screens annually.
- Check for proper operation of strip heaters and ventilation fans annually.
- Refer to your humidifier's installation, operation and maintenance manual for complete maintenance of your humidifier.

### CAUTION:

Always shut off electrical service disconnect prior to working on the humidifier.

**Table 65-1:**  
**Outdoor enclosure troubleshooting guide**

Symptom	Possible cause	Recommended action
Fans not operating	No power	Check for power to outdoor enclosure.
	Loose connections	Reconnect wiring or tighten.
	Broken fan	Replace fan.
Heaters not operating	No power	Check for power to outdoor enclosure.
	Loose connections	Reconnect wiring or tighten.
	Broken heater	Replace heater.
Doors not sealing	Loose handles	Adjust handle.
	Bad gasket	Replace gasket.
<b>Note:</b> For humidifier troubleshooting, refer to your humidifier's installation, operation and maintenance manual.		

## STS humidifier

**Table 66-1:  
STS humidifier**

Issue	Possible causes	Actions
Humidifier will not heat	• No control transformer output	• Verify control voltage. Set humidifier to "call."
	• Humidistat is not calling	• Inspect for faulty humidistat.
	• Safety controls open (high limit, air proving, etc.)	• Check safety controls.
	• Faulty control board	• See Vapor-logic3 or LW417 troubleshooting guide.
	• Probe corrosion	• Replace probes.*
	• Steam stop valve closed	• Verify valve is open.
	• Steam trap plugged	• Clean trap body.
	• Low or no steam	• Verify steam is present.
	• Steam strainer plugged	• Clean strainer.
Humidifier will not fill	• No water pressure	• Verify manual water supply valve is open, minimum 172 kPa supply pressure.
	• Faulty water fill valve	• Verify action of fill solenoid valve; verify control voltage present at coil. Audible click should be heard as solenoid operates.
	• Plugged water strainer	• Clean strainer.
	• Plugged valve	• Clean valve.
	• Faulty control board	• Verify control voltage.
Humidifier does not stop filling	• Lack of tank-to-probes continuity	• Jumper wires violet, orange, and then brown to ground. If water stops, verify tank ground.
	• Water conductivity less than 100 micromhos/cm minimum (2 grains per gallon)	• Check water supply conductivity, then consult factory.
	• Manual drain not fully closed	• Close manual ball valve.
	• Fill valve stuck open	• Check valve for foreign matter.
	• Fill valve installed backward	• Check for correct water flow through valve; note arrow.
Low output	• Automatic drain valve not seating	• Clean ball and seat of valve.
	• Manual drain not fully closed	• Close manual ball valve.
	• Excessive skimming amount	• Reduce skim time.
	• Fill valve stuck open	• Check valve for foreign matter. Check if valve installed backward.
	• Low supply steam pressure	• Check steam supply pressure. Provide steam pressure as specified on unit.
	• Steam valve inoperable	• Valve not opening fully. Check signal to valve.
	• Steam trap blocked	• Trap not passing condensate.
	• Scale coated heat exchanger	• Clean heat exchanger.
* Although the three stainless steel electrode probes eventually will erode due to corrosion, they usually are functional up to approximately 5,000 hours of operation.		
More on the next page >		

## LW417 controller

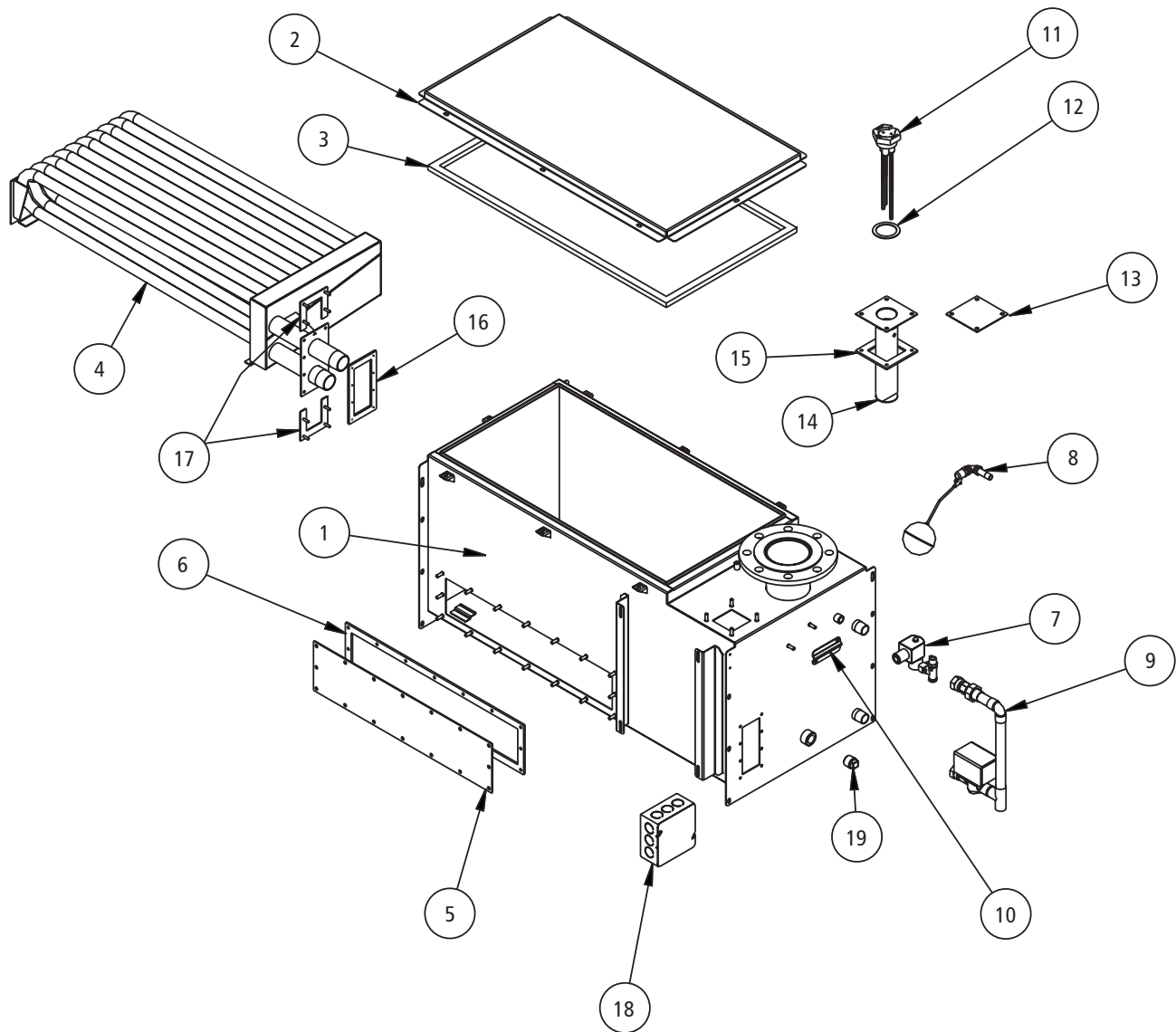
Table 67-1: LW417 controller					
Issue	Module indicating lights			Possible causes	Actions
	Full	Ready water	Drain		
Humidifier will not heat	Off	Off	Off	• Control transformer	• Verify control voltage across secondary leads of transformer. Reset transformer circuit breaker.
	On	On	Off	• Humidistat is not calling	• Set humidistat to call. Inspect for faulty humidistat or wiring.
				• Safety controls open	• Check safety controls, airflow switch, high limit humidistat, etc.
				• Faulty control board	• Verify control voltage between input terminals "B & W."
Humidifier will not heat – "ready water" indicator "off" but enough water in tank	Off	Off	Off	• Not enough water in tank; water supply closed	• Open water valve.
				• Low water conductivity	• If water in tank, add salt (100 µS/cm [2 grains/gallon] minimum).
				• Probe corrosion	• Clean water probe tips.**
				• Wiring or module	• Connect jumper wire from violet to white wire. If "Ready water" indicator remains "off," replace module.
				• Water detection wire	• Check that tank has common water detection wire to ground with 24 VAC common "white" wire.
Humidifier will not heat – blinking "green" LED power light (on 1 second, off 1 second)	Off	Off	Off	• System detected faulty probe rod assembly	• Clean or replace probe rod.
Humidifier will not fill	On	Off	Off	• Faulty "fill" relay on LW417 board	• Unplug probe plug from humidifier probe head. "Fill" LED light should be off. Check for 24 VAC across fill valve coil. If not present, FULL relay is defective. Replace module.
	Off	Off	Off	• Wiring	• Ensure that – Fill valve is wired to drain valve output. – Water detection probe wiring is correct. – Wiring distance between humidifier tank and water level control is not greater than 9 m.
	Off	On	Off	• System in end-of-season drain mode	• Create a call for humidity to reset the system and energize fill valve.
Humidifier does not stop filling	Off	Off	On	• Autodrain mode	• Ten minutes must complete first.
	On	Off	Off	• Faulty fill valve relay in LW417	• If "Full" LED light on control module is "on" and fill valve is energized, module is defective. Replace.
	Off	Off	Off	• Control module wiring	• Check wires for proper connections to module; see diagram. Ensure wiring distance between humidifier tank and water level control is not greater than 9 m.
				• Faulty control logic from LW417	• If "Full" LED light on control module is "off" and tank is full, module is defective. Replace.
Low output	On	On	Off	• Faulty "Ready water" detection	• Install jumper wire between "violet and white" wire leads, which should activate "Ready water" LED light and relay. If not activated, module is defective. Replace. Ensure wiring distance between humidifier tank and water level control is not greater than 9 m. Do not use shielded (screened) cable when wiring water detection probe system between humidifier and controller; use 1 mm <sup>2</sup> individual standard wire.
	On	Off	Off	• Controls and safeties. No call from humidistat or duct high limit humidistat. Airflow proving switch miswired or is defective	• Replace airflow proving switch.
Unit short cycles	On & Off	On	Off	• Probes incorrectly wired or need cleaning	• Confirm that unit is wired per diagram. Clean probe rod tips with steel wool.

\* For Vapor-logics troubleshooting, see the **Vapor-logics Installation and Operation Manual**, a comprehensive operation manual.

\*\* Probe rod corrosion or probe head material aging may cause level control system failure.

## Humidifier tank

**Figure 68-1:**  
Tank replacement parts



OM-946

## Humidifier tank

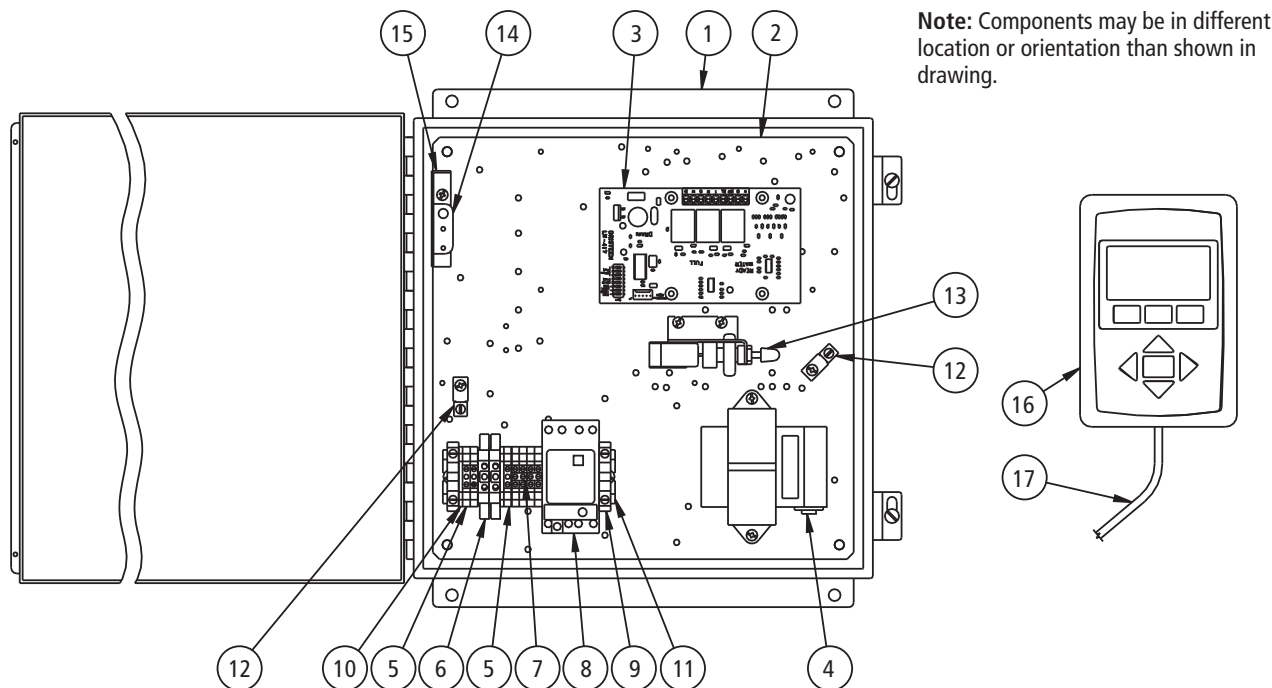
**Table 69-1:**  
**Tank replacement parts**

No.	Description	Part no.
1	Tank, STS	Consult factory
2	Cover, STS-25	165341-001
2	Cover, STS-50	165341-002
2	Cover, STS-100	165341-003
2	Cover, STS-200/400/800	165341-004
3	Cover gasket, STS-25	160692-001
3	Cover gasket, STS-50	160692-002
3	Cover gasket, STS-100	160692-003
3	Cover gasket, STS-200/400/800	160692-004
4	Heat exchanger, STS	Consult factory
5	Cleanout plate, STS-25	165481-001
5	Cleanout plate, STS-50/100	165481-002
5	Cleanout plate, STS-200/400/800	165481-003
6	Cleanout plate gasket, STS-25	308015-001
6	Cleanout plate gasket, STS-50/100	308015-002
6	Cleanout plate gasket, STS-200/400/800	308015-003
7	Fill assembly	Consult factory
8	Float fill assembly, STS-25/50/100	505315
8	Float fill assembly, STS-200/400/800	505305
9	Drain assembly	Consult factory
10	Temperature sensor assembly	405760
11	Probe assembly, STS-25/50/100/200/400	406195-001
11	Probe assembly, STS-800	406195-002
12	Probe gasket	309350-004
13	Probe plate, DI water	120370-020
14	Probe weld, standard water	165301
15	Probe plate/weld gasket	308416-001
16	Heat exchanger gasket, STS	308220
17	Heat exchanger mounting plate	164581-001
18	Junction box	407134-005/006
19	Condensate return plug	250192-075

**Note:** Components may be in different location or orientation than shown in drawing on previous page.

## Control cabinet

**Figure 70-1:**  
Control cabinet replacement parts



OM-949

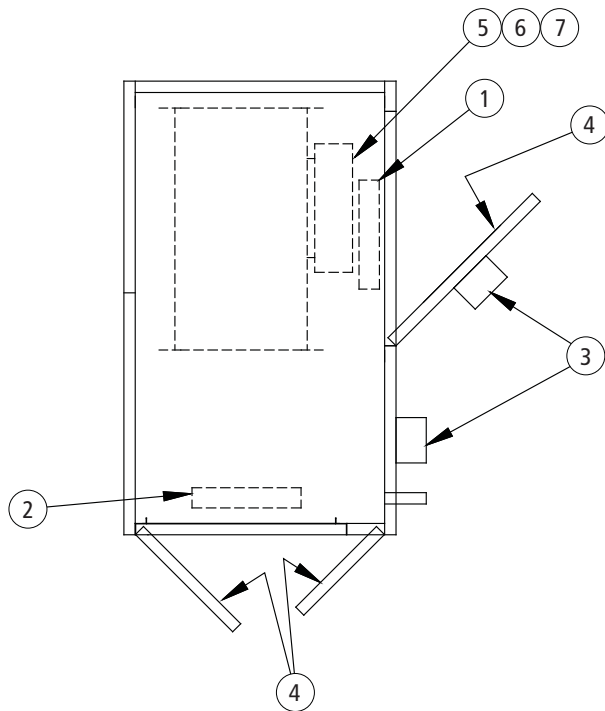
**Table 70-1:**  
Control cabinet replacement parts\*

No.	Description	Part no.
1	Control cabinet, 3660 mm x 3660 mm	407100-003
2	Subpanel, STS	165720-002
3	Control board, Vapor-logic3	408941-001
3	Control board, LW417	408632
4	Transformer, 230V to 24V	408965-001
5	Terminal block	408252-001
6	Ground terminal	408252-010
7	Terminal jumper	408252-009
8	Area-type time delay relay	407900-010/016/018
9	DIN-rail end cap	408252-006
10	Terminal spacer	408252-005
11	DIN-rail, 165 mm	167765-006
12	Ground lug	409250-003
13	P-E switch	408100
14	Interlock switch	408470
15	Interlock switch bracket	165614
16	Vapor-logic3 keypad	408490-002
17	Vapor-logic3 keypad cable, 1.5 m	408490-009

\* Specify humidifier model and serial numbers when ordering.

## Outdoor enclosure

**Figure 71-1:**  
**Outdoor enclosure replacement parts**



OM-953

**Table 71-1:**  
**Outdoor enclosure replacement parts**

Number in drawing	Description	Part number
1	500W strip heater	405800-052
2	1100W strip heater	405800-053
3	Cooling fan	405800-068
4	Gasket, door or roof	308005-010*
5	Stat, high limit	405800-065
6	Stat, low limit	405800-066
7	Stat, heater	405800-066
8	Stat, fan	405800-067

\* Specify quantity in feet

## 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 STS, which features cleanable, stainless steel construction, and an industry-leading Two-year Limited Warranty.

### For more information

[www.dristeem.com](http://www.dristeem.com)  
[sales@dristeem.com](mailto:sales@dristeem.com)

### DRI-STEEM Corporation

An ISO 9001:2000 certified 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. STS-IOM-M-1208  
Part No. 890000-502 Rev. B

## 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. The Limited Warranty does not include cylinder replacement for electrode steam humidifiers.

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. Defective parts may be required to be returned to DRI-STEEM.

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.

### Extended warranty

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

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

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