



Your guide to selecting and specifying Nortec Steam Exchange Humidifiers!



SE Series

Engineering Manual

Includes technical specifications,
guidelines, and options for selection
and application of SETC B+ / SEP
Steam Exchange humidifiers

Thank you for choosing Nortec.

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The SETC/P Steam Exchange Humidifier

The SETC/P is an atmospheric steam generator designed for air humidification via steam distributor, blower pack, or steam manifold (SAM-e). The SETC/P uses pressurized steam from a boiler fed into a heat exchanger submerged in potable, RO, or DI water to generate heat and steam.

The main applications of SE series humidifiers is humidification of buildings which have a high pressure boiler which can also be used for heating or other industrial processes. SE humidifiers take the steam produced by the boiler which contains anti-scaling chemicals and converts it into clean and pure steam for humidification.

How the Humidifier Works

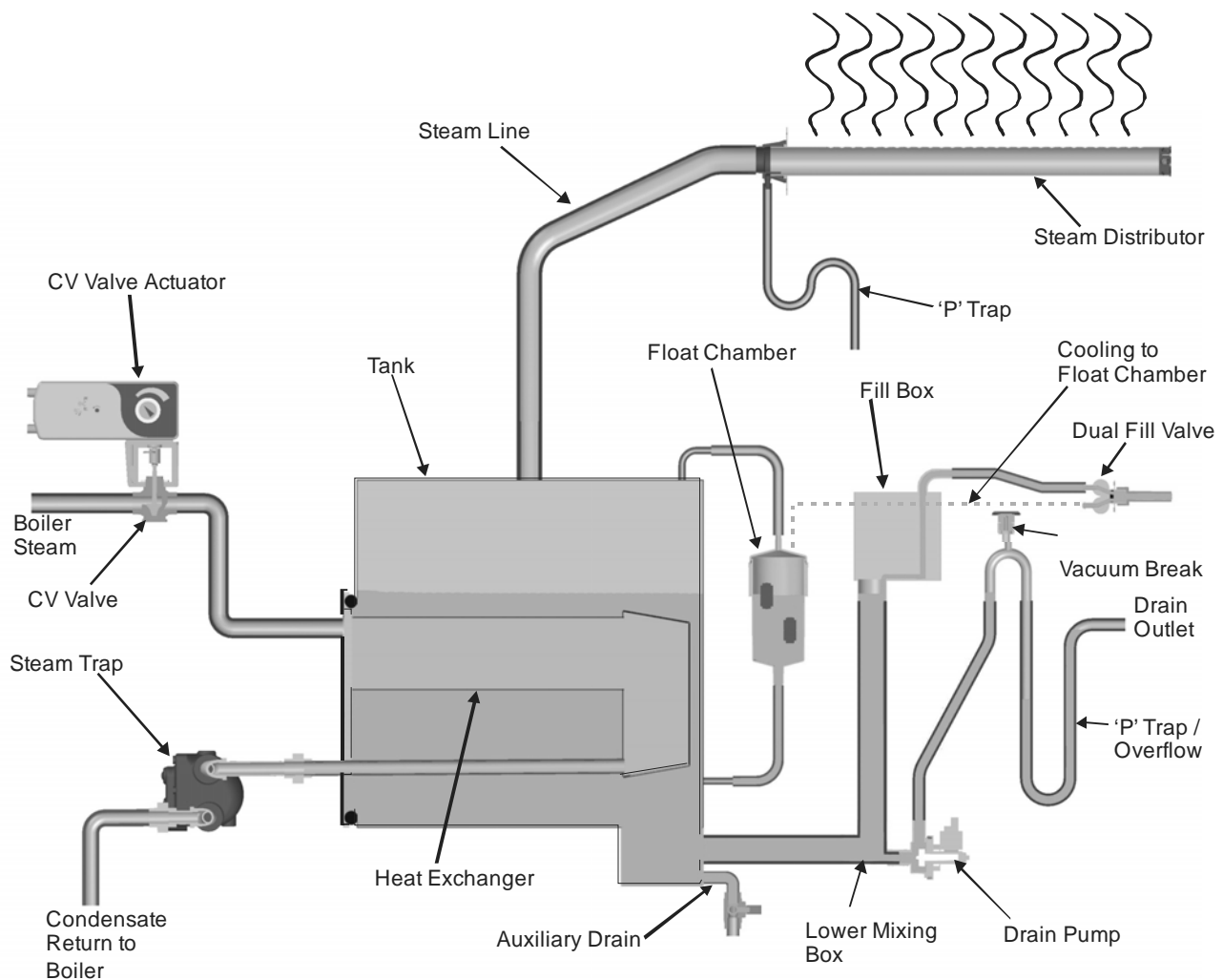


Figure 1: Humidifier Schematic

Steam Generation

- After initial start-up and tank filling the humidifier will sit in standby mode, awaiting a call for humidity.

- When a call is received, the humidifier will send a signal to the CV Valve actuator. The actuator will open as required and the flow of boiler steam will begin.
- Energy from the boiler steam is transferred to the fresh water tank through a heat exchanger inside of the unit. This causes the water to boil. Full boil from a cold tank can take up to 15 minutes. On SETC models, the Keepwarm feature can be activated to reduce boil time.
- Once the humidifier has reached full boil, the humidifier will modulate the actuator, controlling the flow of steam into the unit. This will allow the unit to reduce its output level as the humidity levels in the space being humidified are reached.
- During the boiling process minerals are left behind from the water. The unit will occasionally activate the drain pump to flush out some of the minerals in the water and reduce the concentration in the tank. The fill valve will also be activated periodically to replace water that is boiled off during normal operation.
- When the demand to the unit stops, the unit will close the steam valve and steam production will stop. The unit will enter standby mode and await a call for humidity. If Keepwarm is activated (SETC only), the CV valve will be opened periodically to heat the tank.

Drains

- As steam is produced minerals are left behind in the SE's tank. The SE performs periodic drains to reduce the amount of minerals that will precipitate as scale.
- In general more frequent drains result in less maintenance. The amount of water drained to control mineral concentration in the tank can be configured in the SETC's software.
- To cool drain water the SE activates the fill valve whenever the drain pump is activated. Cool fill water flows down from the fill box and blends with hot tank water in the lower mixing box before being drawn into the drain pump. The drain cooling feature can be deactivated via software.

Steam Distribution

Steam generated by the humidifier may be introduced into the air in several different ways. The most common method for adding the steam into the air is to mount a steam distributor tube in a supply air duct as shown in Figure 1: Humidifier Schematic. For larger ducts or larger loads it is also common to use a steam manifold with a single steam line connection and multiple tubes for distributing the steam. For introducing steam directly into a room, remote mounted blower packs are used. (see Steam Distribution on page 41)

Steam Line

The steam line between the tank steam outlet and the distributor may be Nortec steam hose, copper pipe, or stainless steel pipe or tube. The SETC/P is an atmospheric steam generator so it is very important no restrictions are present in the steam line and that the steam line is sized properly to carry the full output capacity of the humidifier. It is also important to minimize the length of steam lines. See Table 11: Maximum Recommended Length of Steam Line on page 44 for information on selecting steam lines and maximum recommended lengths.

Whenever steam is distributed condensate is formed in the distribution system and steam distributor, manifold, or blower pack. Insulating steam lines is one important way to reduce the amount of condensate formed. Steam lines must be sloped so that condensate does not collect in the lines and create a restriction to steam flow.

Condensate Return

The condensate must be collected and removed from the system so that it does not build up and leak into the duct (or room if blower pack is used). Condensate must be collected and fed to drain. (see Figure 25: Condensate Traps on page 43)

SE Humidifier Models

Indoor Models

The SETC with its Total Controller and state-of-the-art features and options is the most advanced steam exchange humidifier available. The base model SEP provides steady and reliable humidification using the same proven heat exchanger technology as the SETC. The SETC/P is available in capacities ranging from 50 lb/hr (23 kg/hr) to 1050 lb/hr (475 kg/hr). SETC/P humidifiers are packaged in five different cabinets depending on their capacity. See Figure 7: SE Indoor Dimensions for dimensional information.

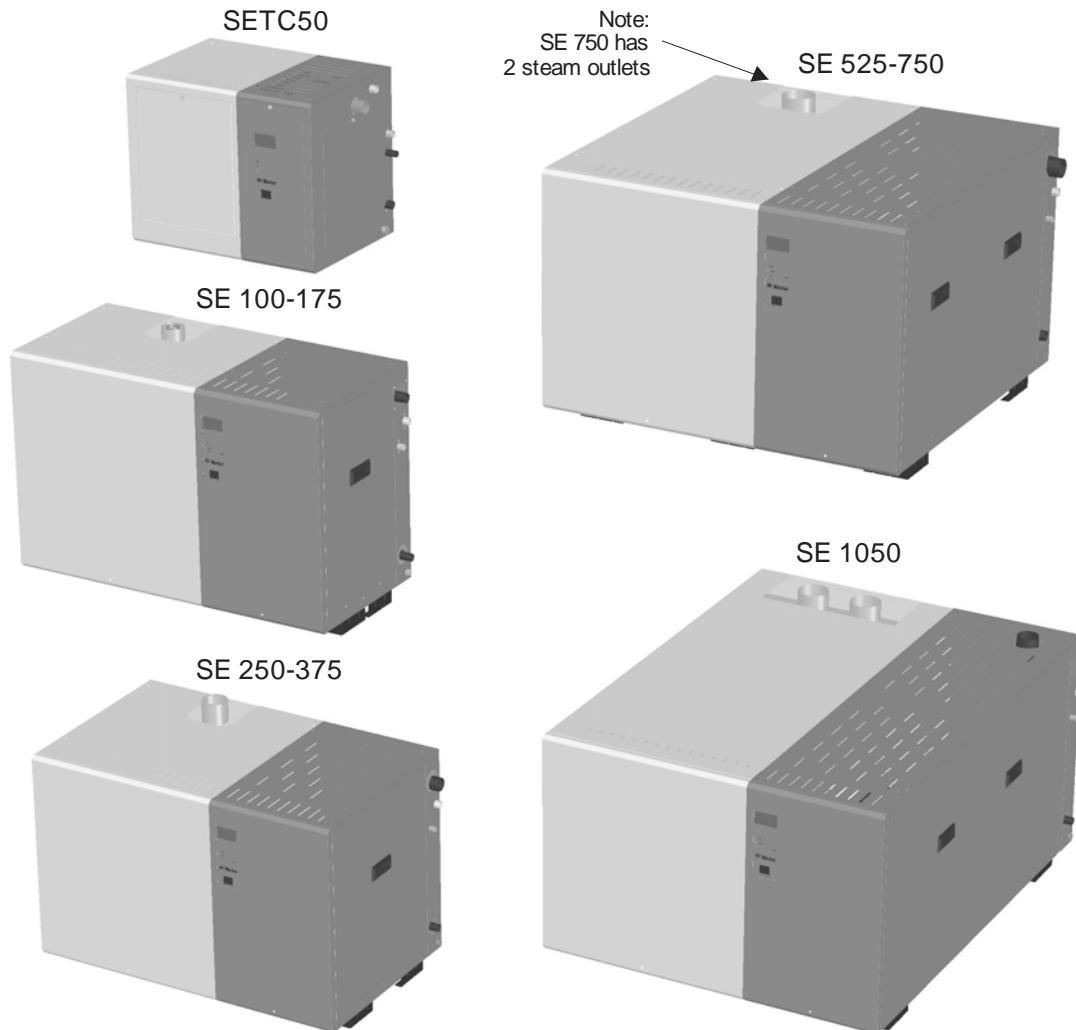


Figure 2: SE Series Indoor Models

SETC Outdoor Models

The SETC Series Outdoor Models are designed to be rooftop mounted on a roof curb (by others). When properly installed the outdoor enclosure will provide protection from rain, wind, and snow in areas with ambient temperature -40 to 104 °F (-40 to 40 °C) and relative humidity 0 - 100% (non condensing). All outdoor models include a ventilation package to prevent overheating in warm months, and a freeze protection package to prevent freezing in cold months.

The SETC Outdoor is available in capacities ranging from 100 lb/hr (45 kg/hr) to 1050 lb/hr (475 kg/hr). The SETC Outdoor humidifiers are packaged in four different cabinets depending on their capacity. See Figure 8: SETC Outdoor Dimensions for dimensional information..

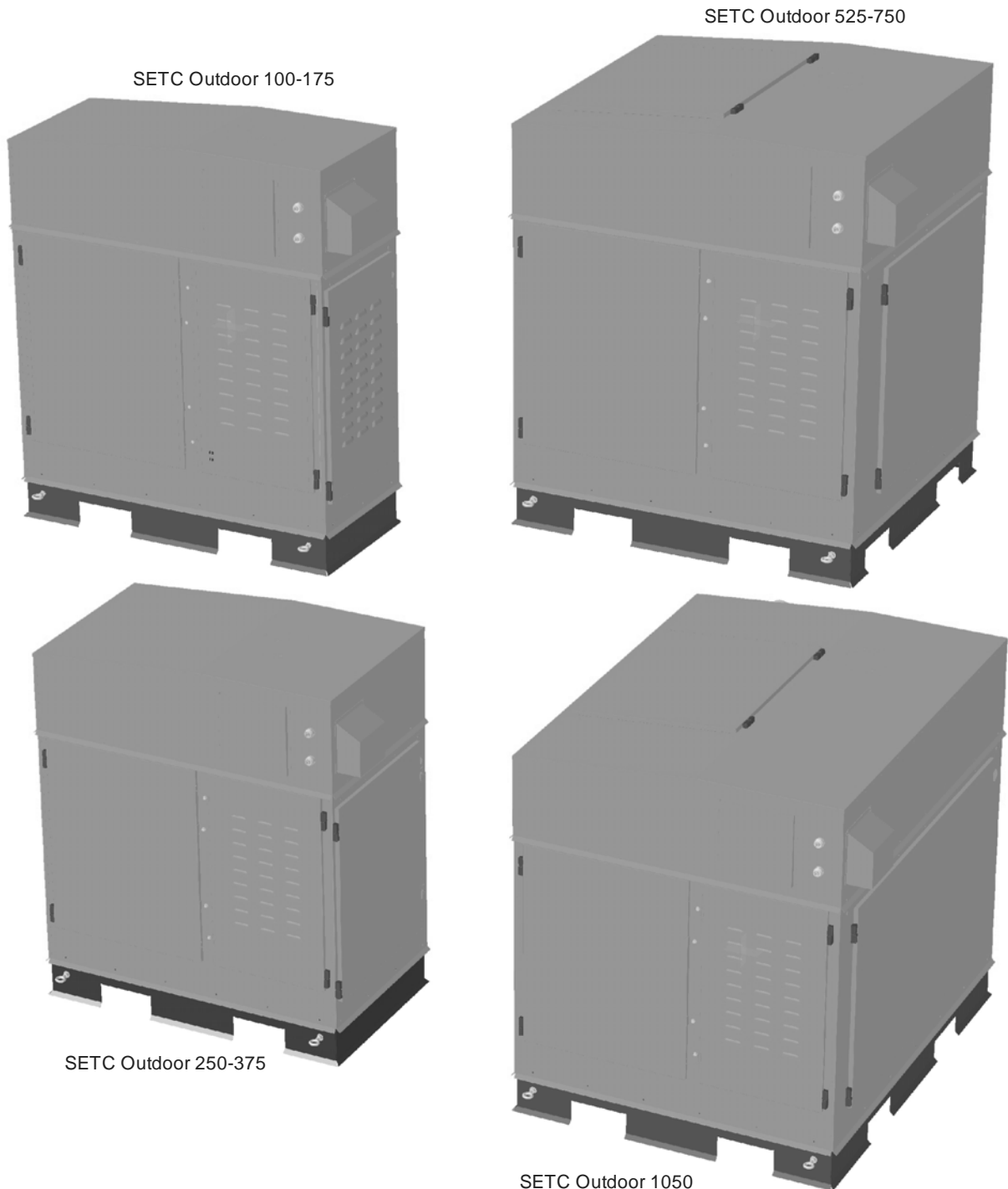


Figure 3: SE Series Outdoor Models

SETC and the SEP

The main difference between the SETC and the SEP humidifier is in their controls and user interface. The SETC model's Total Controller provides a graphic LCD screen and keypad, accepts additional control signals, optional building management system connectivity (BACnet, Lonworks, Johnson N2, and Modbus), and optional Internet monitoring via Nortec Online. The SEP controls provide the basic functionality required for humidifier operation. See Table 1: SETC/P Features for a listing of the two control systems features. Figure 4 shows the differences in the SETC's and SEP's user interface.

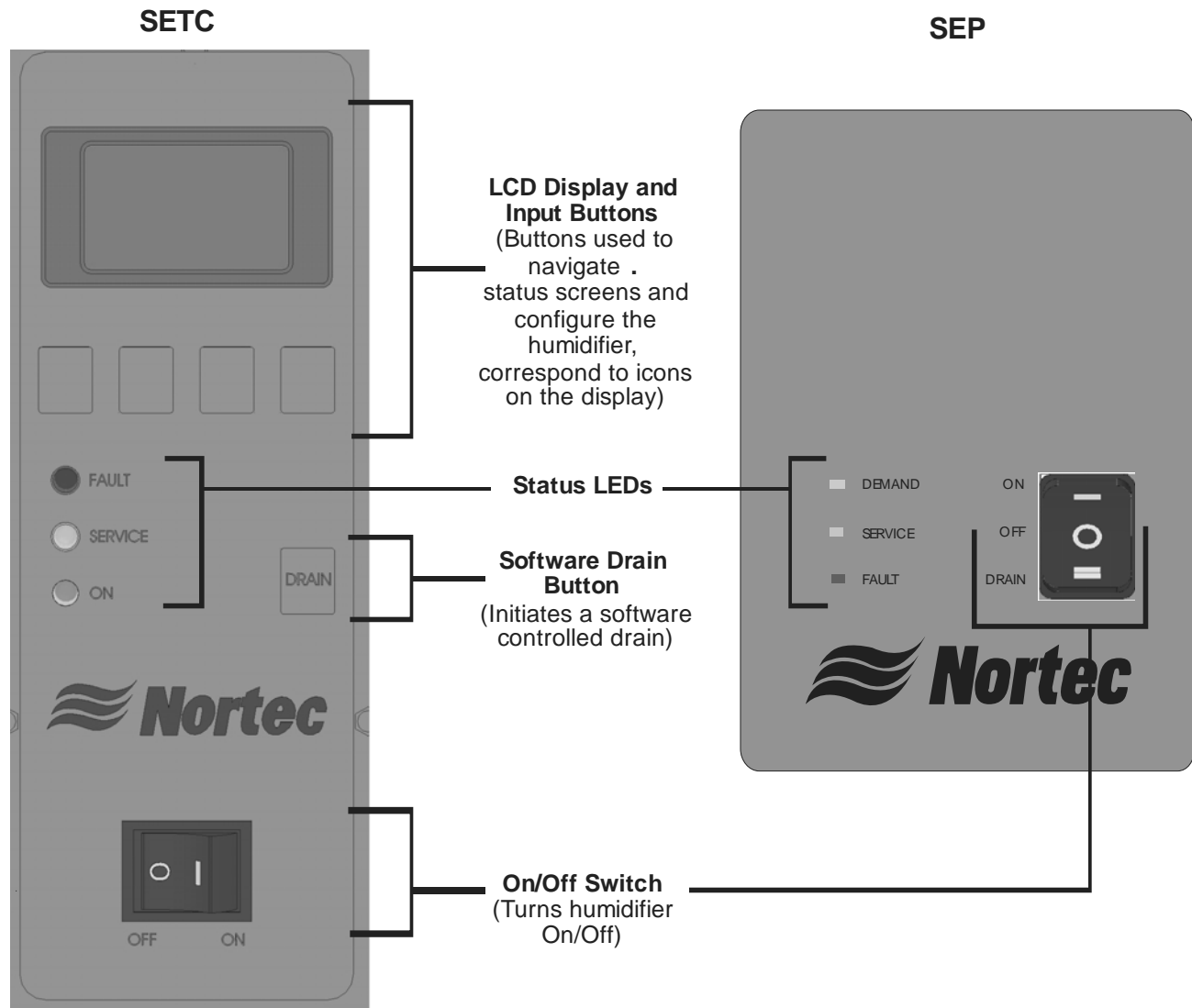


Figure 4: SETC and SEP User Interfaces

The SETC LCD screen and keypad - allow easy configuration of all features of the SETC humidifier such as blowdown rate, full tank blowdown, control signals, 3 day drain and others. The LCD screen also provides status information indicating current status and configuration, a graph of recent operation, service and fault messages, and troubleshooting information. One of the key features of the SETC controller is tracking operation and providing information about service requirements to make it easy to service and maintain the SETC.

SE Humidifier Features

From their integrated steam traps and enclosure's to the SETC's internet based monitoring capability both the SETC and SEP include many advanced features that set them apart from other humidifiers. The following list outlines some of the SE series key features.

Table 1: SETC/P Features

General	SETC	SEP	SETC Outdoor
High efficiency stainless steel heat exchangers	X	X	X
Internal steam trap on each heat exchanger	X	X	X
CV Valve, actuator, and wye strainer included	X	X	X
Modulating output for excellent humidity control	X	X	X
Range of capacities to match load requirements	X	X	X
50 to 10,500 lb/hr output with staged modulation.	X		X
Standard 120 VAC power requirement	X	X	X
C-UL-US	X	X	X
30 month warranty	X	X	X
Warranty extendable to 3 yrs with Nortec Online	X		X
Clean and dry atmospheric steam	X	X	X
Installation / Maintenance			
Heat exchanger with flat sides for easy cleaning.	X	X	X
Wide range of water management options	X	(adjustable blowdown)	X
Floor or optional stand mounting	X	X	(Curb Mount)
Choice of steam distribution (BP, Distributor, SAM-e)	X	X	X
Electronics			
Graphic Display Screen with Keypad input	X		X
LED status indicators	X	X	X
Remote status via dry points	X		X
Proportional and Integral Control	X	(Proportional)	X
Internal control from humidity sensor inputs.	X		X
Manual Capacity Adjustment	X	X	X
On/Off operation	X	X	X
Compatible with all standard Industrial controls	X	(0/2-10 VDC)	X
Single and dual channel control	X	(Single)	X
BMS integration via Links 2 to Lonworks, BACnet, Johnson, Modbus	Option		Option
Nortec Online	Option		Option
Other			
Weatherproof Enclosure			X
Curb mount			X
Freeze protection valve and keep warm			X
Electrical cabinet heater and exhaust fan			X
Selectable 3 day drain after no period with no demand	X		X
Potable, deionized, and reverse osmosis water	X	X	X

SE Humidifier Components

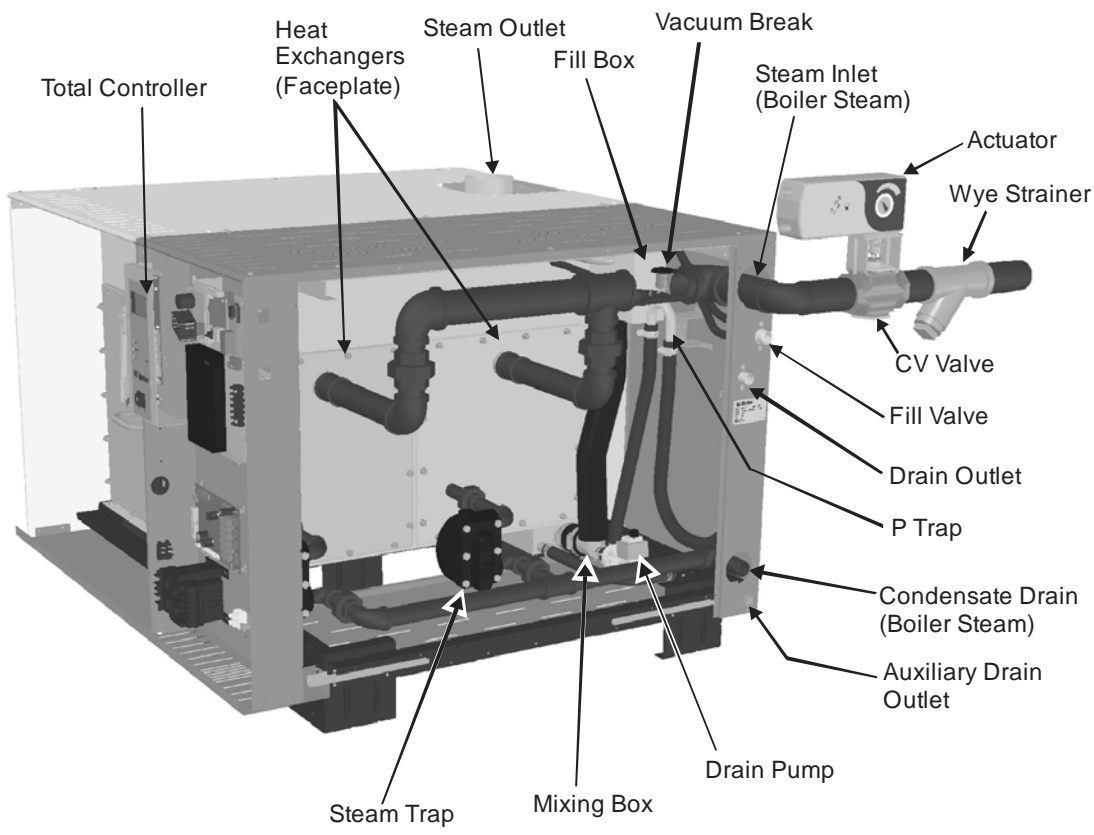
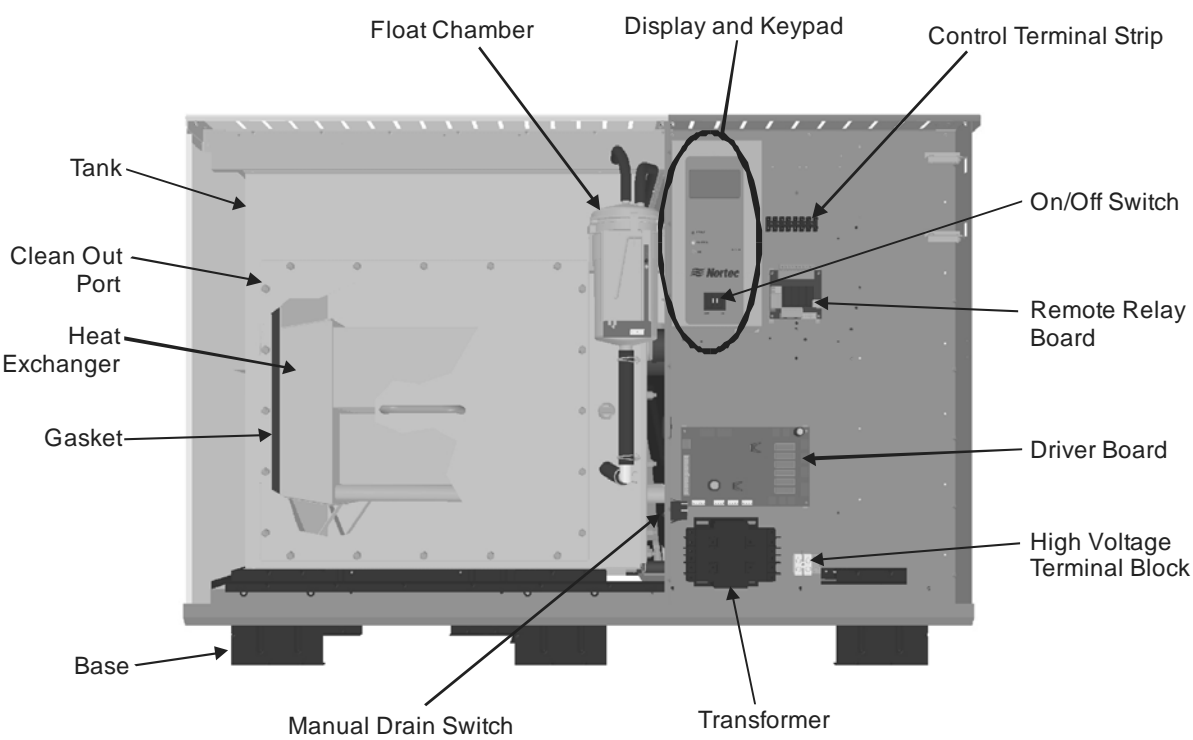


Figure 5: SETC Humidifier Components

Description of Components

Table 2: Humidifier Components

Component	Function of Component
Actuator	Opens and closes the CV valve in proportion to demand for steam.
Auxiliary Drain Outlet	Drains water from tank in case of pump failure.
Base	Provides an integrated floor support for the humidifier.
Clean Out Port	Provides access to clean scale from the tank and heat exchanger.
Condensate Drain	Drains condensate formed from boiler steam in the heat exchanger(s)
Control Terminal Strip	Terminal strip for connecting external controls and blower pack to humidifier.
CV Valve	Controls the amount of steam allowed into the heat exchanger which in turn controls the output of the humidifier.
Display and Keypad	User interface for configuring the humidifier.
Drain Outlet	Drain port used for draining water from the humidifier tank.
Drain Pump	Drains water from humidifier.
Driver Board	Provides input and output connections to humidifier components.
Fill Box	Provides an air gap for backflow prevention.
Fill Valve	Controls flow of water into humidifier.
Float Chamber	Measures water level in the humidifier tank.
Gasket	Seals heat exchanger face plate and clean out port cover to tank.
Heat Exchanger(s)	Exchanges energy from boiler steam to the tank water to produce steam for humidification. The faceplate mounts the heat exchanger to the tank.
High Voltage Terminal Block	Primary power connection from remote disconnect to humidifier.
Manual Drain Switch	Manually activates pump to drain water from the tank.
Mixing Box	Blends hot tank water with cool fill water to provide drain water cooling.
On/Off Switch	Turns power On/Off to humidifier controller. Note: Turn off humidifier disconnect to shut off primary power to the humidifier.
P Trap	Prevents steam from flowing out the drain outlet.
Remote Relay Board	Provides a terminal strip to dry contacts which open/close to indicate the humidifier is on, humidifying, needs service, or is in a fault condition.
Steam Inlet	Connection for boiler steam, it is connected to the heat exchangers.
Steam Outlet	Connect to steam line with steam hose.
Steam Trap	Drains condensate from the heat exchanger without letting boiler steam escape to drain.
Tank	Holds the water used to generate clean steam for humidification.
Total Controller	Controls all functions of the humidifier's operation and provides user interface for configuration of the humidifier.
Transformer	Steps primary voltage down to 24 VAC for the controller and internal components such as the fill valve and drain valve.
Vacum Break	Prevents a siphon from occurring when the drain pump is stopped.
Wye Strainer	Protects CV valve and other system components from dirt and rust in the piping system.

SE Outdoor Components

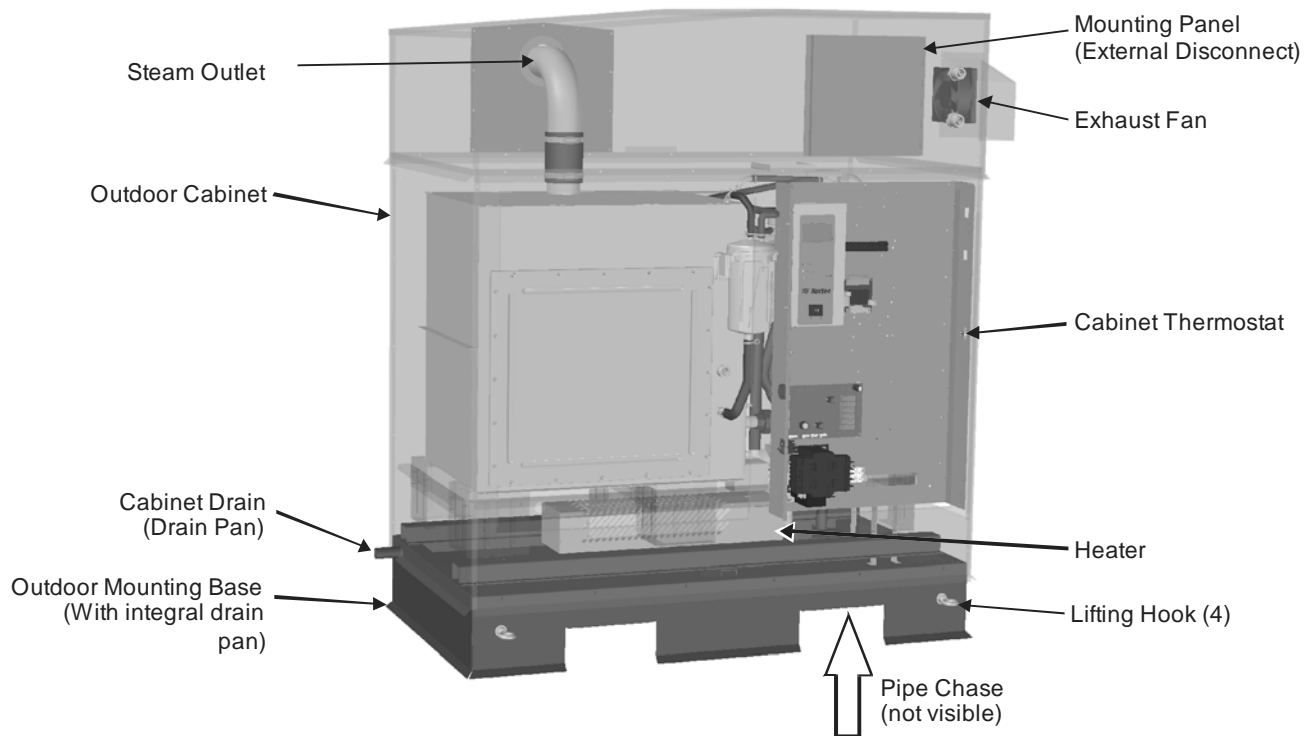


Figure 6: SETC Outdoor Components

Table 3: SETC Outdoor Components

Component	Function of Component
Cabinet Drain	Drain outlet for integrated cabinet drain pan (outdoor unit only). Drain to rooftop.
Cabinet Thermostat	Sensor that activates the heaters if the cabinet temperature is too cold for the electronics (will not prevent the tank and water components from freezing).
Exhaust Fan	Cooling fan which is activated if the electrical cabinet gets too hot.
Heater	Electrical cabinet heater used to keep electronics warm enough for operation and cold weather start up only.
Lifting Hooks	Hooks provided for lifting the humidifier.
Mounting Panel	A panel provided on the outside of the humidifier for mounting a dedicated external disconnect.
Outdoor Cabinet	An enclosure that provides protection from precipitation and allows the SETC to be installed outdoors.
Outdoor Mounting Base	An integrated support for the humidifier which includes a drain pan (outdoor unit only), a pipe chase, and a means for curb mounting the humidifier.
Pipe Chase	An opening in the outdoor cabinet's drain pan which is used for routing electrical power, controls, boiler steam, boiler condensate, fill water, and drain water through the base of the humidifier.
Steam Outlet	Outlet for steam produced by the humidifier. Connect to steam line with steam hose.

SE Humidifier Specifications and Dimensions

Table 4: SETC/P Specifications

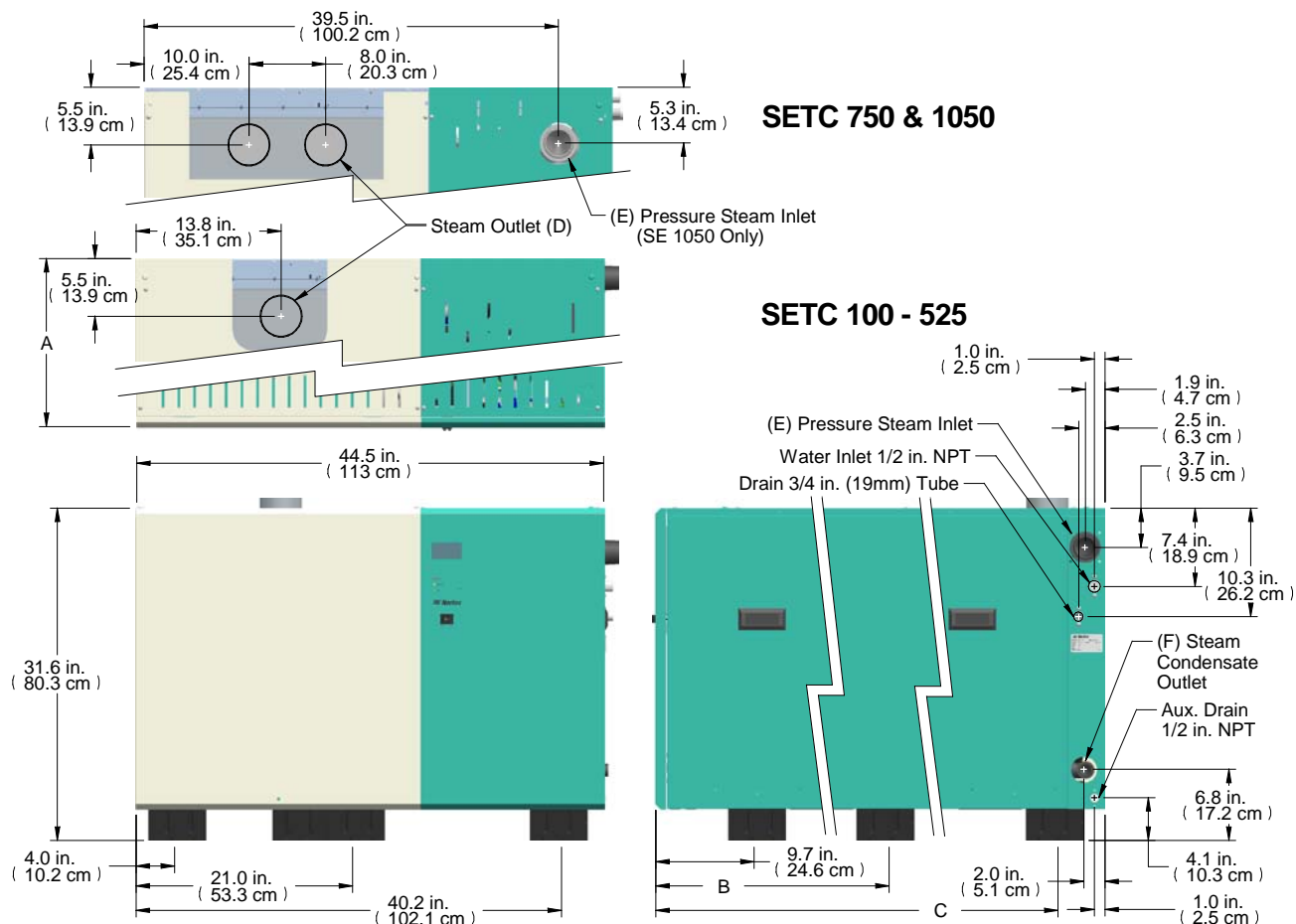
Model	SETC Indoor Part No	SEP Part No.	CV Valve	CV Valve, Steam Inlet, Wye Port (NPT)	Condensate Port (NPT)	Net/Full Weight Indoor lb (kg)	Required fill line flow gal (l) /min	Required Drain capacity gal (l) /min	Electrical (Indoor only, see Table 6 for outdoor)
50	2552765	2520383	2.8	1/2	3/4	125/180 (57/82)	2.6 (10)	5.2 (20)	Voltage 110-120 Phase 1 Amps 1.25 A Power 0.15 KW Max Disconnect 15 A
100	2550073	2525132	5.5	3/4	3/4	267/423			
175	2550074	2525133	10	1	3/4	(121/192)			
250	2550075	2525134	12	1	3/4	355/599			
375	2550076	2525135	20	1 1/4	3/4	(161/272)			
525	2550077	2553312	28	1 1/2	1	529/992			
750	2550078	2553313	40	2	1	(240/450)	4.5 (17)	8 (29)	
1050	2550080	2525139	65	2 1/2	1 1/4	703/1384 (318/628)			

Table 5: SETC/P Capacities and Water Consumption

Model	*Supply Steam Pressure (psig)	*Max Output lb/hr (kg/hr)	Approximate Boiler Steam Consumption lb/hr (kg/hr)	**Water Consumption gal (l) /hr	**Drain Volume gal (l) /hr
50	5	13 (6)	15 (7)	2.3 (9)	0.8 (3)
	10	32 (14)	36 (16)	5.7 (21)	1.9 (7)
	15	50 (23)	58 (26)	9.0 (34)	3.0 (11)
100	5	26 (12)	30 (14)	4.7 (18)	1.6 (6)
	10	63 (29)	72 (33)	11.3 (43)	3.8 (14)
	15	100 (45)	115 (52)	18.0 (68)	6.0 (23)
175	5	46 (21)	52 (24)	8.2 (31)	2.7 (10)
	10	110 (50)	127 (58)	19.8 (75)	6.6 (25)
	15	175 (80)	201 (91)	31.5 (119)	10.5 (40)
250	5	65 (30)	75 (34)	11.7 (44)	3.9 (15)
	10	158 (72)	181 (82)	28.3 (107)	9.4 (36)
	15	250 (114)	288 (131)	44.9 (170)	15.0 (57)
375	5	98 (44)	112 (51)	17.5 (66)	5.8 (22)
	10	236 (107)	272 (123)	42.5 (161)	14.2 (54)
	15	375 (170)	431 (196)	67.4 (255)	22.5 (85)
525	5	137 (62)	157 (71)	24.5 (93)	8.2 (31)
	10	331 (150)	380 (173)	59.5 (225)	19.8 (75)
	15	525 (239)	604 (274)	94.4 (357)	31.5 (119)
750	5	195 (89)	224 (102)	35.1 (133)	11.7 (44)
	10	473 (215)	543 (247)	84.9 (321)	28.3 (107)
	15	750 (341)	863 (392)	134.8 (510)	44.9 (170)
1050	5	273 (124)	314 (143)	49.1 (186)	16.4 (62)
	10	662 (301)	761 (346)	118.9 (450)	39.6 (150)
	15	1050 (477)	1208 (549)	188.7 (714)	62.9 (238)

* Supply steam pressure must be present at the CV valve to achieve rated output

** At maximum output , 25% blow down, and with drain water cooling activated.



Model	A in. (cm)	B in. (cm)	C in. (cm)	D in. (mm)	E NPT	F NPT
100	20.8 (53)	N/A	16.1 (40.8)	1 3/4 (44)	3/4	3/4
175				3 (76)	1	3/4
250	27.2 (69)	N/A	22.4 (56.8)	3 (76)	1	3/4
375				4 (102)	1 1/4	3/4
525	42.7 (108.6)	21.9 (55.5)	38.0 (96.4)	4 (102)	1 1/2	1
750				2 X 4 (102)	2	1
1050	58.3 (148.2)	29.7 (75.3)	53.6 (136.1)	2 X 4 (102)	2 1/2	1 1/4

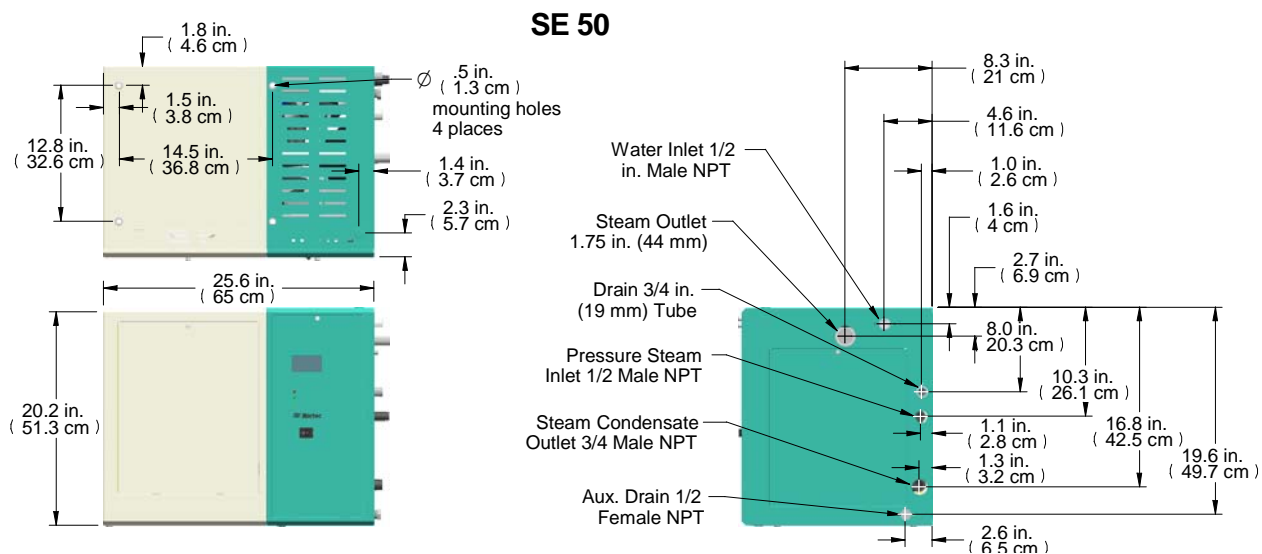
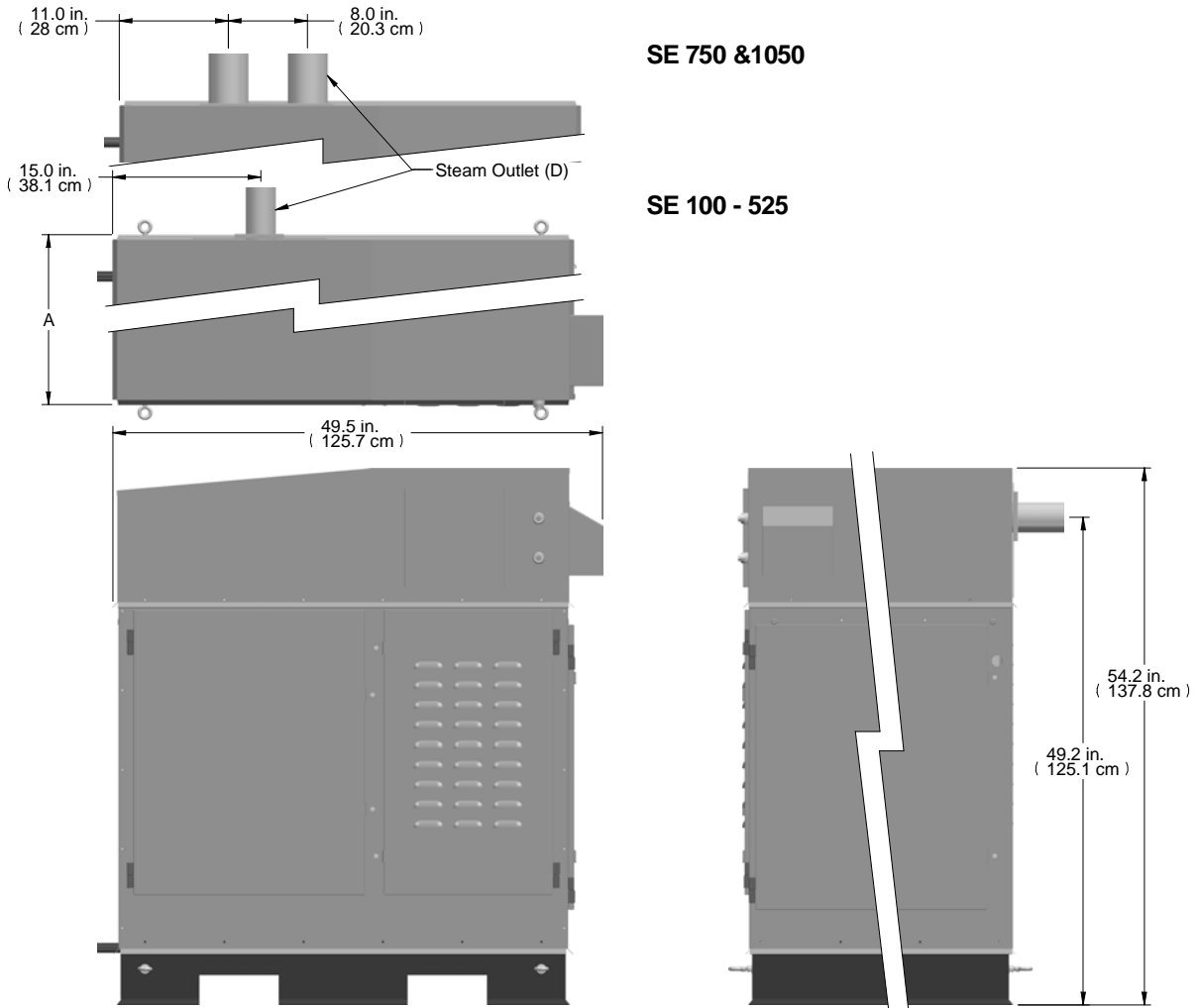


Figure 7: SE Indoor Dimensions

Table 6: SETC Outdoor Specifications

Model	SETC Outdoor Part No	Net/Full Weight lb (kg)	Amps A	Power KW	Max. Disconnect A	Voltage and Phase
100	2550081	267/423	5.4	0.65	15	Voltage 110-120 Phase 1
175	2550082	(121/192)	5.4	0.65	15	
250	2550083	355/599	5.4	0.65	15	
375	2550084	(161/272)	5.4	0.65	15	
525	2550085	529/992	9.6	1.15	15	
750	2550086	(240/450)	9.6	1.15	15	
1050	2550088	703/1384 (318/628)	13.8	1.65	20	

Note: See Table 4: SETC/P Specifications and Table 5: SETC/P Capacities and Water Consumption on page 10 of SE Series Installation manual for remaining specifications



Model	A in. (cm)	Steam Outlet in. (mm)	Steam Inlet NPT	Condensate Drain NPT	Fill Connection	Drain Connection
100	21.5 (55)	1 3/4 (44)	3/4	3/4	1/2 in. NPT	3/4 in (19 mm) tube Connect with hose cuff.
175		3 (76)	1	3/4		
250	27.9 (71)	3 (76)	1	3/4		
375		4 (102)	1 1/4	3/4		
525	43.5 (111)	4 (102)	1 1/2	1		
750		2 X 4 (102)	2	1		
1050	59.1 (150)	2 X 4 (102)	2 1/2	1 1/4		

Figure 8: SETC Outdoor Dimensions

Specifying the SE Humidifier

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Humidifier Specification Checklist

The following checklist can be used to specify the SE Series Humidifier. A description of each selection is provided later on in this section.

Humidifier Tag: _____ Zone _____

Humidifier Model _____ Part No _____

Humidifier Load _____ lb/hr =

Humidification Load _____ + Supply Line Losses _____ + Distribution Losses _____

Supply Steam Pressure _____ psi Capacity at Supply Pressure _____

Humidity Control

☐ Demand ☐ Transducer ☐ On/Off Signal Type _____

☐ By Others ☐ By Nortec, Part No _____

High Limit

☐ Demand (SETC Only) ☐ Transducer (SETC Only) ☐ On/Off Signal Type _____

☐ By Others ☐ By Nortec, Part No _____

Location

☐ Indoor ☐ Stand, ☐ Ceiling kit, Part No _____

☐ Outdoor

Steam Distribution

☐ Duct Width _____ Height _____

☐ SAM-e

Header Length _____ Tube spacing _____ Part No _____

Distribution Tube Length _____ Qty _____ Part No _____

Steam Inlet type _____ Part No _____

☐ Tube Insulation, Qty _____ Part No _____

☐ Header Insulation, Part No _____

☐ Mounting Frame, Part No _____

☐ Distributor, Length _____ Qty _____ Part No _____

☐ Blower Pack, Qty _____ Part No _____

Additional Options (Nortec Links 2, Nortec Online, Air proving... See Table 8: Options and Accessories)

Humidifier Load

The SE Series humidifiers are available with capacities ranging from 50 to 1050 lb/hr (22.5 to 477 Kg/hr). In addition to the available models, up to 10 humidifiers can be combined together to operate from one control signal for capacities of over 10,500 lb/hr (4,770 Kg/hr). The humidifier(s) selected must have a capacity equal to or greater than the load.

The humidifier load is made up of three components;

- 1) **Humidification Load** - Water that must be added to the air to achieve the desired humidity level.
- 2) **Supply Line Losses** - Water that condenses in the steam lines between the humidifier and the location where the steam is being introduced into the air.
- 3) **Distributor Losses** - Water that condenses in the steam distributor itself.

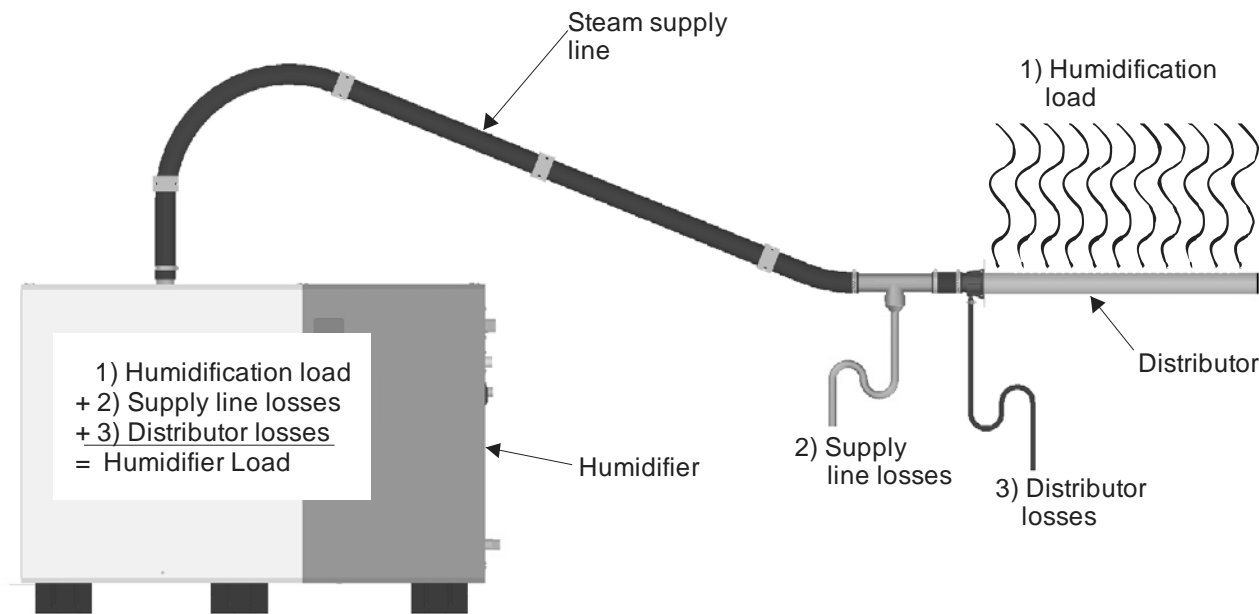


Figure 9: Humidifier Load

Humidification Load

The easiest way to calculate the humidification load for any application is to use Nortec's Humidifier Engineering and Load-sizing Program (HELP). The software can be downloaded from www.humidity.com. Nortec Publication 2553856 - Humidification Load Calculation also provides information on selecting a humidity setpoint, the effects of relative humidity, and methods for manually calculating the humidification load.

Supply Line Losses

Table 11: Maximum Recommended Length of Steam Line on page 44 provides maximum recommended lengths for various steam line sizes as well as possible losses due to condensation in steam lines. Table 12: Equivalent Length of Some Common Fittings on page gives equivalent lengths of some common fittings used in making steam lines. The information in the tables along with information about the layout and length of the steam line should be used to estimate the supply line losses.

Example 1: Supply Line Losses - SE 250 with 30 ft x 3 in. steam line with one 90° elbow.

- 1 Obtain possible losses for 3 in line from Table 11.

$$A = 0.16 \text{ lb/hr/ft}$$

- 2 Calculate the equivalent length of steam line using 3 in. 90° Elbow in Table 12.

$$B = 30 \text{ ft} + 5 \text{ ft} = 35 \text{ ft.}$$

- 3 Multiply the equivalent length by the possible losses to get supply line losses.

$$C = B \times A = 35 \times 0.16 = 5.6 \text{ lb/hr}$$

Distributor Losses

Convection heat transfer between a steam distributor in a duct and the air in the duct is the primary mechanism responsible for distributor losses. The amount of losses is proportional to the length of distributor and the temperature of the air in the duct. Figure 10 can be used to estimate distributor losses.

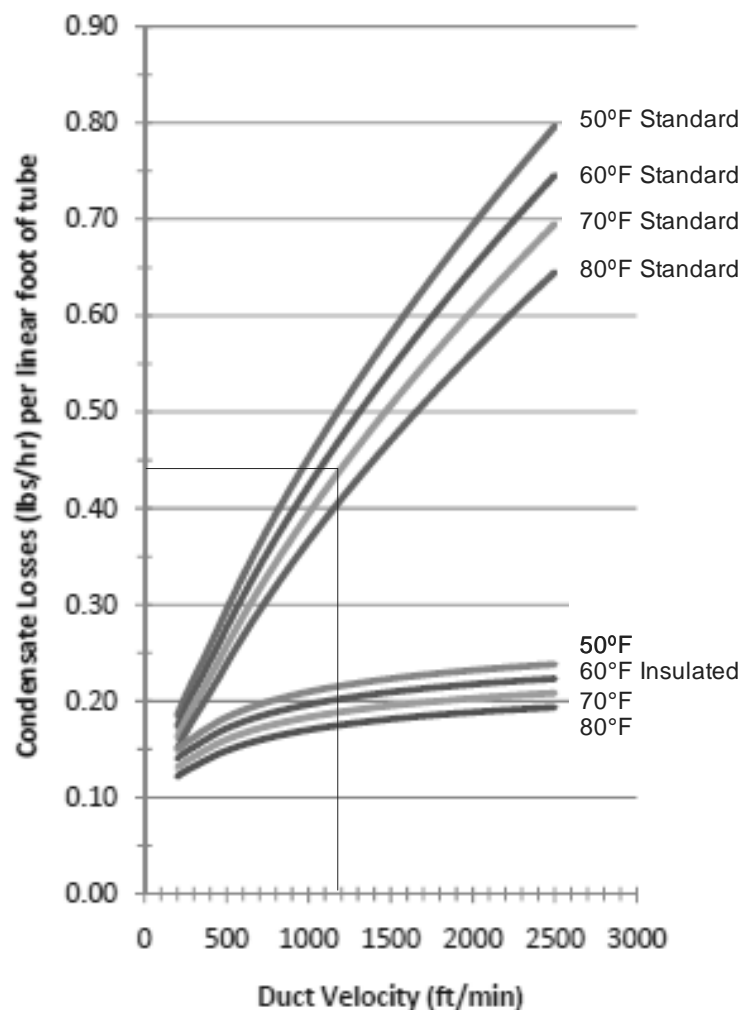


Figure 10: Distributor Losses

Note:

Nortec's patent pending stainless steel Air-gap Insulation provides one method for reducing a distributor losses and conserving energy. See Nortec publication 1503529 – SAM-e Engineering Manual for more information on specifying SAM-e insulation.



Example 2: Distributor Losses – What are approximate condensate losses in a 48 “ tall standard SAM-e with 12 distribution tubes in a 70°F duct with 1200 fpm velocity.

- 1 Obtain losses per linear foot of distributor from Figure 10.

$$A = 0.45 \text{ lb/hr/ft}$$

- 2 Calculate approximate length of all distributor tubes.

$$B = 12 \text{ tubes} \times 4 \text{ ft/tube} = 48 \text{ ft}$$

- 3 Multiply approximate length of all tubes by losses per linear foot to get distributor losses.

$$C = 48 \times 0.45 = 21.6 \text{ lb/hr}$$

Supply Steam Pressure

One of the unique features of the steam exchange humidifier is that its maximum output is affected by the steam supply pressure. Models are designated by the capacities at maximum supply pressure of 15 psi. An SETC 1050 will produce 1050 lb/hr (477 Kg/hr) of steam when supplied with 15 psi steam. If the available steam supply pressure is lower than 15 psi then the output will be reduced as shown in Figure 11. Table 5: SETC/P Capacities and Water Consumption also provides steam output at 10 and 5 psi supply pressures.

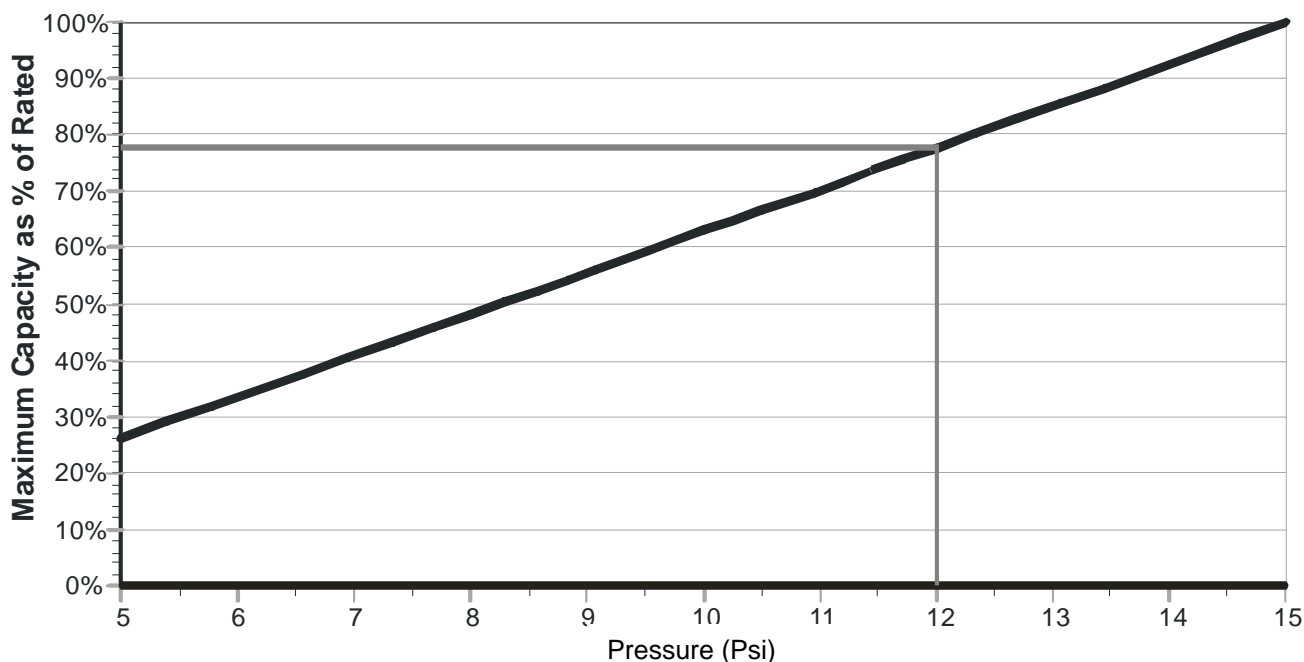


Figure 11: Output as a Function of Supply Steam Pressure

To select the model(s) of SE humidifier that is required to fulfill a given humidifier load requirement, the output must be de-rated if the supply steam pressure is lower than 15 psi.



Note:.

The steam supply line must be designed to provide design pressure at the CV valve when there is 100 % demand (CV valve completely open). Pressure losses in the steam supply line will reduce SE output.

Example 3: SE 250 Output – What is the maximum capacity of an SE 250 supplied with 12 psi steam pressure?

- 1 From Figure 11 the output will be reduced to 78% at 12 psi supply pressure.
- 2 Multiply capacity at 15 psi by 78% to get max capacity at 12 psi.

$$\text{Max Capacity (12 psi)} = 0.78 \times 250 = 195 \text{ lb/hr}$$

Humidifier Controls

See SETC/P Controls on page 46 for a listing of controls offered by Nortec and installation requirements. The SETC humidifier can be operated with one or two modulating inputs. The SEP has one modulating input which can be used for a duct high limit or humidity control. Both the SETC and SEP can be operated as On/Off. Controls can be supplied by Nortec or by others. SE humidifiers are compatible with the following control inputs.

Table 7: SE Series Control Signals

Control Signal	SETC	SEP
0-10 V	Demand and Transducer	Demand
2-10 V	Demand and Transducer	
0-5 V	Demand and Transducer	
1-5 V	Demand and Transducer	
0-20 mA	Demand and Transducer	
4-20 mA	Demand and Transducer	Demand
On/Off	Dry Contact 24 VAC	Dry Contact 24 VAC

The control signal type can be configured by Nortec at the factory or can be user configured. For the SETC the configuration is done with the LCD and keypad. On the SEP it is done with jumpers on the control board.

Installation Location

Refer to the section on Location on page 30 for details about clearance requirements and information about optional stands and ceiling kits.

SE Series Indoor The SE Series indoor humidifiers are designed to be either floor mounted or stand mounted (stand optional). SE 50 models can also be ceiling mounted with the optional ceiling installation kit. Install only in areas with ambient temperature 41-104 °F (5 – 40 °C) relative humidity 5 - 95% (non condensing).

SE Series Outdoor The SETC Series Outdoor Models are designed to be rooftop mounted on a roof curb (by others). When properly installed the outdoor enclosure will provide protection from rain, wind, and snow in areas with ambient temperature –40 to 104 °F (-40 to 40 °C) and relative humidity 0 - 100% (non condensing). All models include a ventilation package to prevent overheating in warm months, and a freeze protection package to prevent freezing in cold months.

Note:

Internal heaters will not keep the SETC from freezing in cold climates. They are intended to maintain electronics at a minimum operating temperature for cold weather startup. Heat from an operating humidifier's tank provides the heat to keep the unit from freezing.



Steam Distribution Method

Steam may be added to air in a supply air duct or air handler using Nortec’s Steam Distributors or SAM-e manifolds. Steam can also be added directly into a space by using Nortec’s remote mounted blower packs. Refer to the section Steam Distribution starting on page 41 for information about steam distribution methods and steam lines used to connect the SE humidifier to steam distributors.

See also Nortec publications 1503529 – SAM-e Engineering Manual and 2556592 - Steam Distributor Installation Manual for detailed information about Nortec Steam Distribution Options

SE Series Options and Accessories

Nortec provides a complete line of options and accessories for every humidification application. Table 8: Options and Accessories lists available options available for the SE Series with a brief description of their function. A complete list of the options which can be used with the SE Series along with their corresponding part numbers is given in the Chapter titled Submittals.

Table 8: Options and Accessories


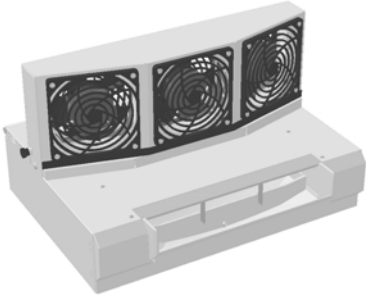
Option / Accessory	Used For
<div>Steam Distributors</div> <div></div>	<p>Steam Distributors are used for adding steam into air ducts. They are available in three different models . Each model is also available in different lengths. Distributor length should be chosen to fit the full width of the duct leaving installation clearance. Maximum capacity of each distributor is;</p> <p>ASD = 25 lb/hr (11.4 kg/hr) BSD = 35 lb/hr (15.9 kg/hr) CSD = 115 lb/hr (52 kg/hr)</p> <p>(See Nortec Publication 2556592 – Steam Distributor Installation Manual for a listing of Nortec Distributor models and part numbers)</p>
<div>Remote Blower Pack</div> <div></div>	<p>Remote blower packs are used for adding steam directly into a space remote from the humidifier. The remote blower pack is available in 2 different sizes for capacities ranging from 5-30 lb/hr (2.3 –13.6 kg/hr) and 50-100 lb/hr (22.7 – 45 kg/hr). For the SE the larger blower pack must be used.</p> <p>One blower pack can be used per humidifier for capacities up to 100 lb/hr (45 kg/hr) . For higher capacities a minimum of one blower pack per 100 lb/hr (45 kg/hr) of steam being dispersed is required.</p> <p>2530900 - Remote Blower Pack 50 - 100 lbs/hr 110-120V</p> <p>(See Nortec Publication 2525151 – Blower Pack Installation Manual for additional information about Nortec Blower Packs)</p>

Table 8: Options and Accessories (Continued)



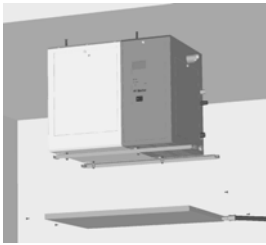


Option / Accessory	Used For
<p>SAM-e Steam Distribution Manifold</p> 	<p>The SAM-e Steam Distribution Manifold is used for adding steam into air ducts where either higher steam capacity or short absorption is required.</p> <p>The SAM-e consists of dispersion tubes with stainless steel nozzles that draw dry steam from the center of the tube, a header for supplying steam to each dispersion tube, steam inlet connection, an optional frame, and optional insulation.</p> <p>The SAM-e is available in a range of sizes and dispersion tubes to match duct dimensions and steam capacity as closely as possible.</p> <p>(See Nortec Publication 1503529 – SAM-e Engineering Manual for a listing of SAM-e models and part numbers)</p>
<p>SE Stand</p> 	<p>The optional SE floor stand positions the SE humidifier at a convenient working height and provides additional clearances for sloping drains. The stand must be assembled at site.</p> <p>2525140 - Floor Stand Kit, GS 100, SE 100/175 2525141 - Floor Stand Kit, GS 200, SE 250/300 2525142 - Floor Stand Kit, GS 300/400, SE 525/750 2525143 - Floor Stand Kit, GS 500/600, SE 1050</p> <p>(See also Mounting on Optional Stand on page 31)</p>
<p>SE 50 Ceiling kit</p> 	<p>Nortec offers an optional ceiling mounting kit (part number 2520345) which allows the SE50 to be ceiling mounted with zero clearance to the ceiling.</p> <p>2520345- Ceiling Mount Kit c/w Drip Pan, SE 050</p> <p>(See also Ceiling Mounting (SE50 Only) on page 32)</p>
<p>On/ Off Humidistats</p> 	<p>On/Off Humidistats are used to turn the humidifier on and off based on sensed RH. They can be mounted in the space being humidified or in the return air duct. The digital humidistat provides an LCD screen and keypad for setting the RH setpoint and displaying sensed RH.</p> <p>(See On/Off Controls on page 47)</p>
<p>Modulating Humidistats</p> 	<p>Modulating Humidistats are used to control the output of the humidifier based on sensed RH. They can be mounted in the space being humidified or in the return air duct. The digital humidistat provides an LCD screen and keypad for setting the RH setpoint and displaying sensed RH. They can be used for either controlling humidity or for high limit control.</p> <p>(See Modulating Humidistats on page 47)</p>

Table 8: Options and Accessories (Continued)




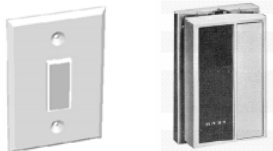

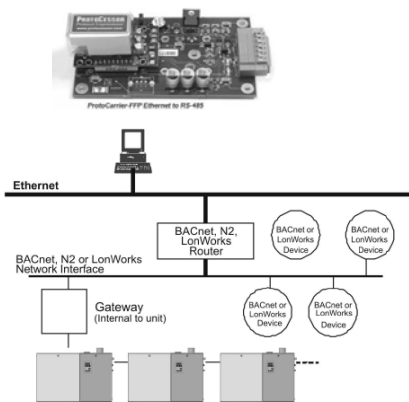
<p>Humidity Transducers</p> 	<p>Digital Humidity Transducers communicate RH in a space or duct to the humidifier. When used with an SETC (not SEP) the humidifier displays the sensed RH on its LCD display screen, setpoints are entered using the humidifier keypad and the humidifier's software calculates required output based on setpoint and sensed RH. Transducers are available for room or duct installation.</p> <p>(See Humidity Transducers on page 48)</p>
<p>Outdoor Temperature Sensor</p> 	<p>The outdoor temperature sensor is used in conjunction with Nortec's Digital humidistats to provide a humidity setpoint reset when outdoor temperature is very low. The setpoint is reduced to prevent condensation on windows and other parts of a buildings structure.</p> <p>2520263 - Duct Mount Outdoor Temperature Sensor</p> <p>(See Outdoor Temperature Reset on page 49)</p>
<p>Air Proving Switches</p> 	<p>Air proving switches are used to ensure humidification only occurs when air is moving in a duct. The air proving switch is installed in series with all other On/Off devices on the humidifier's On/Off/security loop.</p> <p>1329203 - Air Proving On/Off Duct Mounted</p> <p>(See On/Off Controls on page 47)</p>
<p>High / Low Humidity Alarm Packages</p> 	<p>Various alarm packages are available for indicating when humidity is outside of required limits. The packages include a mechanical humidistat and display panel with a light.</p> <p>2533363 – High Duct Humidity Alarm Package 2533365 – Low Duct Humidity Alarm Package 2533364 – High Room Humidity Alarm Package 2533366 – Low Room Humidity Alarm Package</p>
<p>Control Setting at Factory</p> 	<p>The SETC /P can be factory ordered configured for the type of controls that will be used. Factory configuration eliminates the need to configure the SETC/P in the field and makes it plug and play with respect to software configuration. Part numbers are available for each available control configuration.</p> <p>(See Control Acceptance Configured at Factory on page 49)</p>
<p>Nortec Links 2</p> 	<p>Nortec Links II provides connectivity to BACnet, Lonworks, Johnson N2, or Modbus building management systems. A separate part number must be selected to specify the type of building management system. (SETC only)</p> <p>2527110 - Nortec Links 2 For GS/SE, BACNET/IP 2527111 - Nortec Links 2 For GS/SE, BACNET/MSTP 2527112 - Nortec Links 2 For GS/SE, LONWORKS 2527113 - Nortec Links 2 For GS/SE, N2 2525535 - Nortec Links 2 FOR SE-50, BACNET/IP 2532740 - Nortec Links 2 For SE-50, BACNET/MSTP 2532741 - Nortec Links 2 For SE-50, LONWORKS 2532742 - Nortec Links 2 For SE-50, N2</p> <p>(See Nortec Links 2 (Optional SETC Only) on page 53)</p>

Table 8: Options and Accessories (Continued)

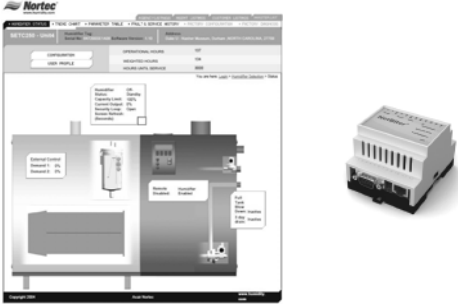
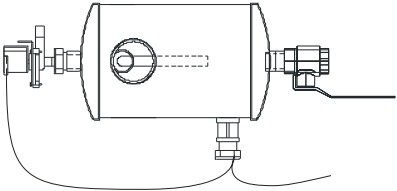

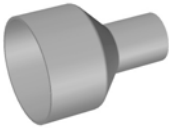
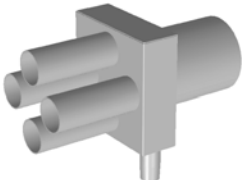
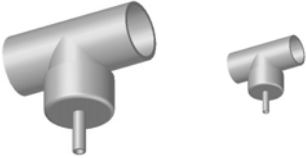



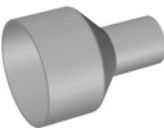

<p>Nortec Online</p> 	<p>Nortec Online provides remote monitoring of humidifiers over the internet using standard web browsers. The system can be configured to send emails to service personnel, Nortec agents, and the factory when the humidifier requires service. It also provides a trend history of humidifier performance and allows factory staff to remotely diagnose service issues and configure software. (SETC Only)</p> <p>1509600 - Nortec OnLine, Static IP for GSTC/SETC 1509601 - Nortec OnLine, DHCP for GSTC/SETC 1509681 - Nortec OnLine, Slave for GSTC/SETC 1509682 - Nortec OnLine, Add 1YR Monitoring</p> <p>(See Nortec Online (Optional SETC Only) on page 53)</p>
<p>External Drain water Cooler</p> 	<p>The external drain water cooler can be used for cooling hot water such as condensate before feeding it to drain. The cooler includes a tank, water valve (electric or pneumatic) and thermostat.</p> <p>1710010 – Drain Water Cooler Self Actuated 1710020 – Drain Water Cooler Electric</p>
<p>Steam and Condensate Hose</p> 	<p>Steam hoses are used as steam distribution lines or for making connections to copper or stainless steel steam distribution lines. When used for steam distribution the maximum recommended hose length is 10 ft (3 m). Steam hose is available in two sizes.</p> <p>Condensate hose can be used for draining condensate or for connecting to copper or stainless steel condensate lines.</p> <p>1328810 – Steam Supply Hose 7/8 in. ID. 1 ft (30 cm) 1328820 - Steam Supply Hose 1 3/4 in. D 1 ft (30 cm) 1328840 – Condensate Hose 3/8 in. ID 1 ft (30 cm)</p> <p>(See also Steam Lines and Condensate Returns on page 42)</p>
<p>Steam Line reducers</p> 	<p>Nortec recommends increasing the diameter of long steam distribution lines to prevent back pressure. Steam line reducers can be used for transitions to/from the increased diameter steam lines.</p> <p>1507846 – Steam Line Reducer 1 3/4 to 7/8 in. Copper 1508165 - Steam Line Reducer 1 3/4"o 7/8 in. Stainless Steel</p>
<p>Steam Line Adapters</p> 	<p>Steam line adapters are used for connecting multiple steam lines into a single larger steam line. All adapters include a condensate drain to prevent build up of condensate. Nortec offers a range of adapters suitable for combining up to 8 x 1 3/4 in. steam lines.</p> <p>1502569 – Adapter 3 in to 2 x 1 3/4 in 150270 – Adapter 3 in to 3 x 1 3/4 in 150271 – Adapter 4 in to 3 x 1 3/4 in 150272 – Adapter 4 in to 4 x 1 3/4 in.</p> <p>(See Nortec Publication 1503529 SAM-e Engineering Manual)</p>

Table 8: Options and Accessories (Continued)

<p>Large / Small Condensate Trap</p> 	<p>Condensate traps must be used to remove condensate that forms in steam distribution lines. Nortec offers copper condensate traps to match its large and small steam hose.</p> <p>1329634 – Steam Line Reducer 7/8 x 7/8 x 3/8 1329635 - Steam Line Reducer 1 3/4 x 1 3/4 x 3/8</p> <p>(See also Figure 25: Condensate Traps on page 43)</p>
<p>Double Check Valve</p> 	<p>The SETC/P includes an air gap in its fill cup to prevent back flow to the supply water system. The double check valve can be used as additional protection or when local plumbing codes require it.</p> <p>1458807 - Double Check Valve For Water Inlet Line</p>
<p>In Line Water Filter and replacement Filters</p> 	<p>The inline water filter can be used for supply water which contains a large amount of sediment that could block the SETC/P cylinder strainer or drain valve.</p> <p>1329505 - In-Line Water Filter 5 Micron Filter 1329561 - Replacement Water Filters 1 Micron 1329506 - Replacement Water Filters 5 Micron</p>
<p>Condensate Pump</p> 	<p>The condensate pump can be used for pumping either drain water from the SETC / P or condensate where gravity feed to a drain is not possible.</p> <p>1429527 - Drain Water Sump Pump (High Temperature)</p>
<p>Air Gap Reducer</p> 	<p>All SETC/P humidifiers require an air gap on the drain line as close as possible to the humidifier. The air gap reducer is a copper fitting that can be used to provide the air gap.</p> <p>2522172 - Factory Provided External Drain Air-Gap Reducer</p>
<p>Pocket Hygro Thermometer</p> 	<p>The pocket hygro thermometer provides a means for easily checking the humidity and temperature in a space and is a useful tool for troubleshooting humidity problems.</p> <p>1469595 - Pocket Hygro-Thermometer Digital Display</p>

Note: All illustrations of options / accessories are provided strictly for the purpose of describing them. Actual appearance of each option accessory may differ from that shown.

Sample Specification

PART 1 - GENERAL

1.1 Work Included:

- A. Nortec SETC Series Steam Exchange Humidifier(s) as indicated on drawing(s) and as indicated on schedule(s).
- B. Complete and operable humidification system (which meets applicable building codes).
- C. Equipment start-up and project inspection by qualified factory trained representative.

1.2 Quality Assurance:

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authority having jurisdiction, and marked for intended use.
- C. Comply with ARI 640, "Standard for Commercial and Industrial Humidifiers."
- D. Products shall be supported with a warranty that ensures the product will be free from defects in materials and workmanship for a period of two years after shipment.
- E. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Commissioning Authority. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure. Refer to Project Closeout, Section 01700, for substantial completion details. Refer to Section 01810, Commissioning, for detailed commissioning requirements.
- F. Products specified below are to be manufactured in an ISO 9001-2000 certified facility.

1.3 Submittals:

- A. Submit product data under provisions of Section 15010. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes. Include rated capacities, operating weights, furnished specialties, and accessories.
- B. Submit manufacturer's installation instructions.
- C. Submit operation and maintenance data.
- D. Submit coordination drawings. Detail fabrication and installation of humidifiers. Include piping details, plans, elevations, sections, details of components, and dispersion tubes. Detail humidifiers and adjacent equipment. Show support locations, type of support, weight on each support, and required clearances.
- E. Submit wiring diagrams including power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- F. Submit minimum water quality requirements and water pressure requirements.

1.4 Extra Materials:

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.5 References:

- A. ANSI/NFPA 70 – National Electrical Code.

1.6 Coordination:

A. Coordinate location and installation of humidifiers in ducts and air-handling units. Revise locations and elevations to suit field conditions and to ensure proper humidifier operation.

XXXXX OR XXXXX

A. Coordinate location and installation of humidifier in the space it serves with the electrical, mechanical, and plumbing contractors.

PART 2 - PRODUCTS

STEAM EXCHANGE HUMIDIFIER SETC

A. Packaged unit, Steam Exchange humidifier operating with boiler steam pressures between 5 psi to 15 psi, with output capacities up to 1050 lbs/hr (477 kg/hr), suitable for immediate, or future, use of all water types including, De-Ionized (DI), Reverse Osmosis (RO), potable and softened water, without modification required. Certified by UL.

B. Methods of distribution require a steam distributor[s] or Short Absorption Manifold [s] (SAM-e) for mounting into AHU/duct[s] or Remote Mounted Blower Pack[s] (RMBP) for direct space applications (refer to options schedule).

C. Stainless steel heat exchanger[s] shall have flat surfaces to retard scale build-up. Tubular heat exchangers are not acceptable.

1. Removable heat exchanger[s] with modular, horizontal design for easy handling during maintenance.
2. Large surface area promoting equal distribution across surface area and good heat transfer. Pre-formed welded frame construction to minimize weld area and leakage potential.
3. Heat exchanger[s] are constructed from 316L stainless steel. Copper exchanger[s], Teflon coating, and nickel plating not acceptable.
4. Access through front panel for easy removal of heat exchanger(s) for maintenance.
5. Stainless steel tank lid with gasket, easily removed for maintenance.
6. Float and thermostatic (F & T) trap[s], must be included internal to the unit by the manufacturer.
7. Inlet steam pressure must not exceed 15 psig. Need not meet pressure vessels act.

D. Enclosed cabinet, powder coated steel construction and air gap between cabinet and insulated humidifier tank ensures safe surface temperature.

1. Evaporation tank and all internal tank components to be constructed of 304 stainless steel.
2. All tank surfaces shall be insulated with minimum 1" (25 mm) thick insulation and enclosed within unit cabinetry to ensure safe surface temperature, high overall efficiency, and fast unit response time. Units with exposed insulation shall not be acceptable.
3. Maintenance shall not require the removal of the steam distribution lines.
4. Standard internal drain water cooler to ensure drain water tempering to 140° F (60° C). If external drain water cooler required, provide factory cross-braced unit stand and factory supplied stainless steel p-trap.
5. Blow-down p-trap, factory installed, enclosed in cabinet, prevents steam leakage to drain. Field installation not acceptable.

6. Provide easily accessible, primary voltage terminal block, internal to cabinetry, for single point field connection of electrical supply.

7. Single point connection for pressure steam inlet must be provided. Internal piping from steam valve to heat exchanger[s] must be factory installed and tested. Field piping from the inlet to the exchanger[s] is not allowed.

8. Humidifier to prevent “back-siphoning” using an internal air gap for supply water, to meet local plumbing codes.

9. Drain line to include a vacuum breaker to prevent siphon drainage of the tank.

E. Automatic water level control within a separate float chamber, isolated from the boiling action, to prevent false water level indication.

1. Fill rate must modulate to match capacity demand to ensure consistent output. Fill cycles based on low water only is not acceptable.

2. System shall fill through the bottom of the tank to reduce steam-quenching effect and noise level. Filling at top of the tank is not acceptable.

3. Unit water level is to be continuously monitored with a dual magnetic electronic float system, located outside of the boiling water to ensure accurate water level control and reduced maintenance. Cool fill water is to be supplied into the sensing chamber to keep the device cool. Systems using conductivity probes or floats located within hot reservoir water are not acceptable.

4. Float chamber must be located outside of the tank to keep the floats away from the boiling action. Units with floats in the tank as well as conductivity probes are susceptible to inaccurate water level sensing and failure, will not be considered.

5. Humidifier shall have a dual fill valve to feed water to the tank and float chamber, to reduce scaling and mineral build up on the magnetic floats.

6. Float chamber to include LED indication of five possible water level indications.

7. Ongoing self-diagnostics including periodic float operation and fill/drain rate verification.

8. Positive drainage/blow-down using a drain pump, drawing water from the bottom of the tank, maximizing mineral evacuation (when applicable). Skimmer not acceptable.

9. Blow down interval shall be based on actual steam production, and must be adjustable to compensate for all water conditions, to ensure maximum energy and maintenance efficiency.

10. Pre-cleaning flushing feature shall be provided to reduce maintenance time.

11. Must include end of season blow-down feature to evacuate contained water and minerals after 72 hours with no demand for humidification.

F. Factory mounted, full size, backlit, Liquid Crystal Display provides full operational status. Display to include a keypad for user interface and adjustment of operational parameters including:

1. Unit output (%).

2. Water level in the tank.

3. Modulating control demand status.

4. On/off control and safety (High limit, air proving) circuit status.

5. Actual room and/or duct rh, and humidity set point, when using transducer input[s].

6. Controller configuration (Proportional band and integral) when using transducer input[s].
 7. Troubleshooting guide with scroll down menu.
 8. Fault indication including date and time history.
 9. Maintenance intervals.
 10. Fill and drain status.
 11. Drain/flush intervals and duration.
 12. Date and time.
 13. Capacity limitation.
 14. 72 hours drain enable/disable.
 15. Control type configuration on/off or full modulation when demand signal(s), or transducer input[s] are provided.
 16. Up to 10 humidifiers, supplying one AHU or area, can be controlled in series from one modulating humidity control system.
 17. Capability of interface to building management system using BACnet or LonTalk protocols.
- (Nortec Links) Note: All operational parameters factory set to reduce field set-up time.
- G. Standard of acceptance:
- Nortec SETC.
- H. Optional accessories:
1. Refer to options schedule.

PART 3 - EXECUTION

3.1 Examination:

- A. Examine ducts, air-handling units, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before humidifier installation.
- C. Proceed with installation only after any unsatisfactory conditions have been corrected.

3.2 Installation:

- A. Install humidifiers and steam dispersion panels per manufacturers' instructions
- B. Seal humidifier dispersion-tube duct penetrations with flange.
- C. Install with required clearance for service and maintenance.

3.3 Testing:

- A. System verification testing is part of the commissioning process. Verification testing shall be performed by the Contractor and witnessed and documented by the Commissioning Authority. Refer to section 01810, Commissioning, for system verification tests and commissioning requirements.

XXXXX OR XXXXX

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 Training:

A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Commissioning Authority. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Commissioning Authority after submission and approval of formal training plans. Refer to System Demonstrations, section 01670, for contractor training requirements. Refer to section 01810, Commissioning, for further contractor training requirements.

XXXXX OR XXXXX

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain humidifiers.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
4. Schedule training with Owner, through project manager or project engineer, with at least seven days advance notice.

Humidifier Installation Requirements

30 Location

- 30 General Location Requirements

30 Indoor Location

- 31 Mounting on Optional Stand
- 32 Ceiling Mounting (SE50 Only)

33 Outdoor Location

- 34 SETC Outdoor Curb

35 Plumbing

- 37 Freeze Protecting Water Supply

38 Boiler Steam and Boiler Condensate Return

40 Electrical

41 Steam Distribution

- 42 Steam Lines and Condensate Returns

46 SETC/P Controls

- 47 Nortec Controls
- 50 Control Location
- 51 Control wiring
- 52 Staged Modulation

53 Nortec Online and Nortec Links 2

NOTE:

The following sections provide an outline of the installation requirements. For detailed installation instructions refer to Document No. 2552940 SE Series Installation and Operation Manual and to Document No. 2552939 SE Outdoor Supplemental Installation and Spare Parts Manual .

Location

General Location Requirements

- Ensure mounting surface is strong enough to support the full weight of the humidifier and accessories (see Table 4: SETC/P Specifications and Table 6: SETC Outdoor Specifications)
- Install in location where electrical power, boiler steam, and drain (with proper slope) can be connected to the humidifier.
- Install in a location where regular maintenance can be performed.
- When possible install below the steam distributor. If mounted above the steam distributor take care to provide proper steam line routing and proper condensate traps.
- DO NOT locate the humidifier any further then absolutely necessary from the steam distributor location as net output will be reduced as a result of heat loss through the steam line.
- The humidifier cannot be used as a structural member. All piping connected to the unit must be supported independently.
- Avoid mounting humidifier on combustible surfaces including (but not limited to) carpet, tile, or certain insulating materials.
- Clearance dimensions shown are for reference only and are the minimum required for maintenance of the humidifier. Consult local and national codes before final location and installation. Nortec does not accept responsibility for installation code violations.

Indoor Location

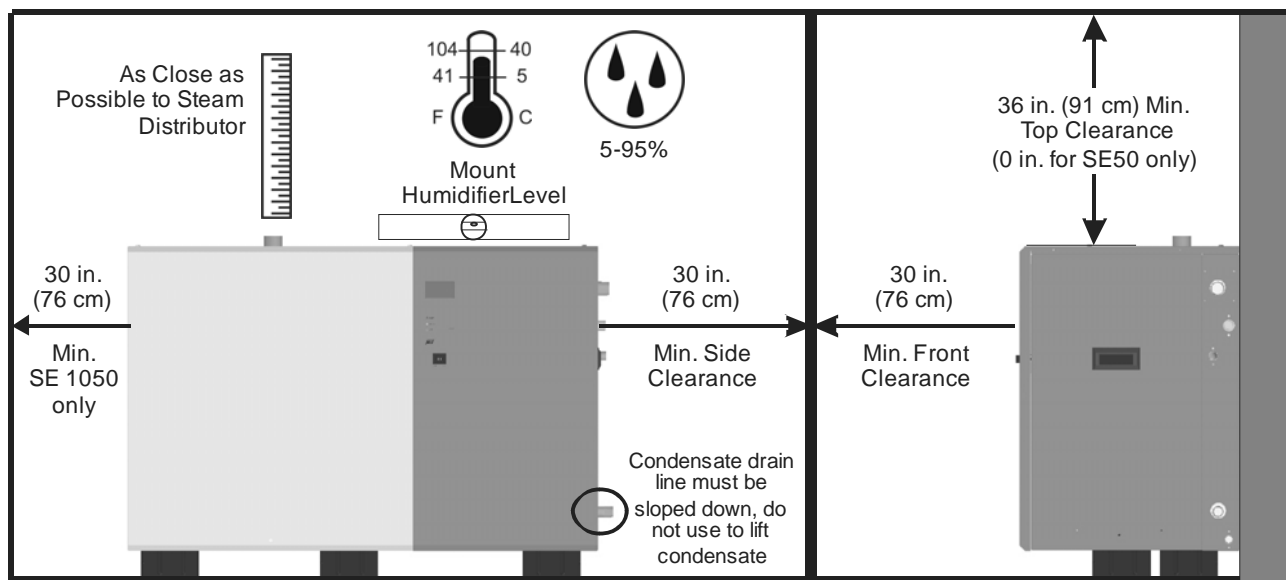


Figure 12: SE Indoor Installation Location / Clearance

The SE series humidifiers are designed to be either floor mounted or stand mounted (stand optional). SE 50 models can also be ceiling mounted with the optional ceiling installation kit.

Mounting on Optional Stand



Note: Condensate drain line must be sloped downward to boiler condensate return. Use pump (by others) or stand (optional) if necessary.

The optional SE floor stand positions the SE humidifier at a convenient working height and provides additional clearances for sloping drains. The stand must be assembled at site on a level surface and permanently secured the floor via the holes in the leg support plates following any local codes or regulations. See Table 8: Options and Accessories on page 19 for a listing of Stand part numbers.

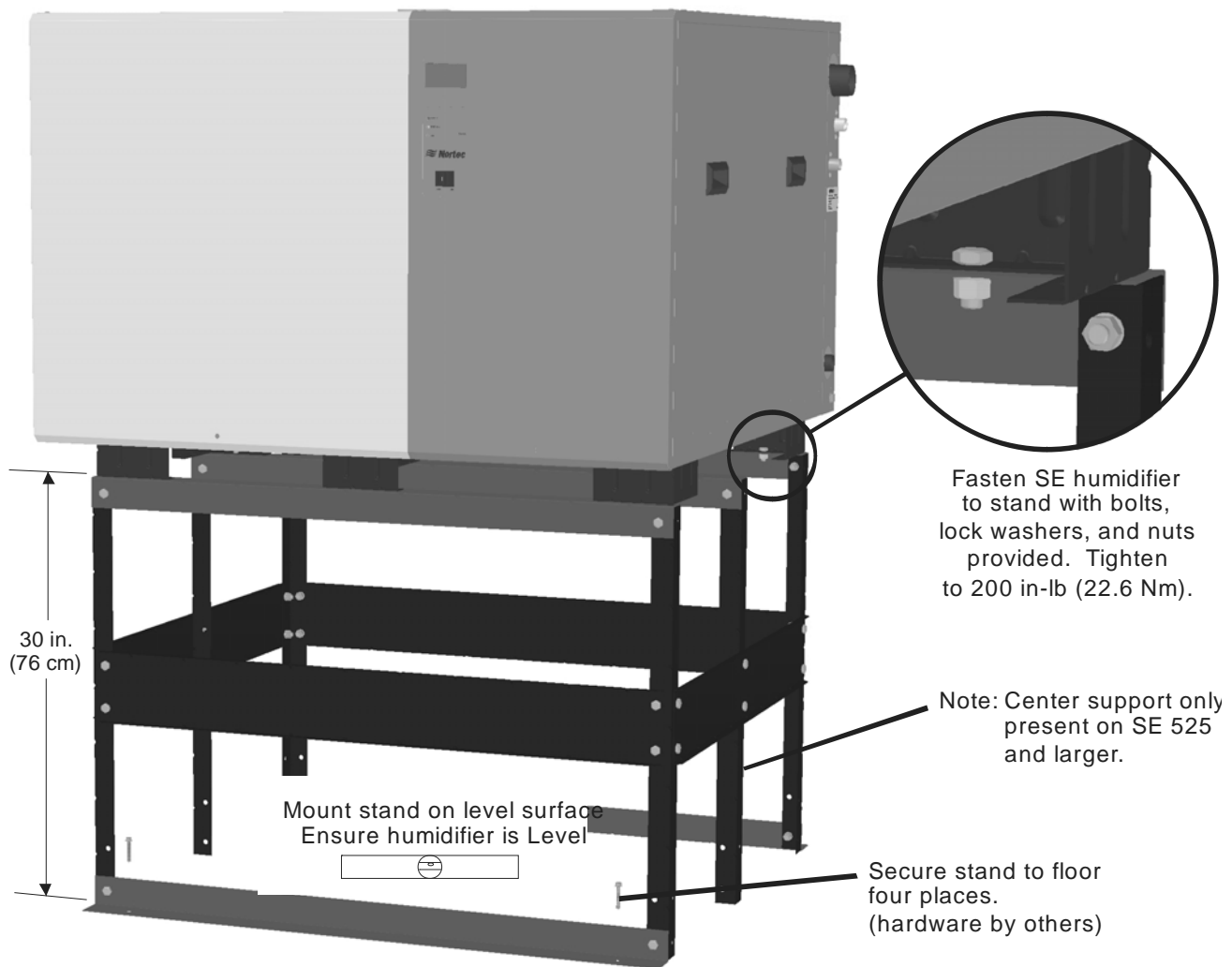


Figure 13: Optional SE Indoor Stand

Ceiling Mounting (SE50 Only)

Nortec offers an optional ceiling mounting kit (part number 2520345) which allows the SE50 to be ceiling mounted with zero clearance to the ceiling. Follow the following guidelines for installation.

- The SE50 weighs 180 lb (82 kg) when filled with water and without any accessories or piping. It is the installer's responsibility to calculate the total weight which must be supported, to ensure the ceiling structure is adequate, and to install support rods and to connect drain pan per local codes and regulations.
- A drain line emptying into an open drain must be connected to the ceiling kit drain pan. Nortec recommends a 1/2 in. pipe with sufficient slope to ensure any water collected in the pan will drain from it.

Note: The SE50 requires regular maintenance including removal of scale from the heat exchanger and tank. Make sure it is installed in a location where the maintenance can be performed.

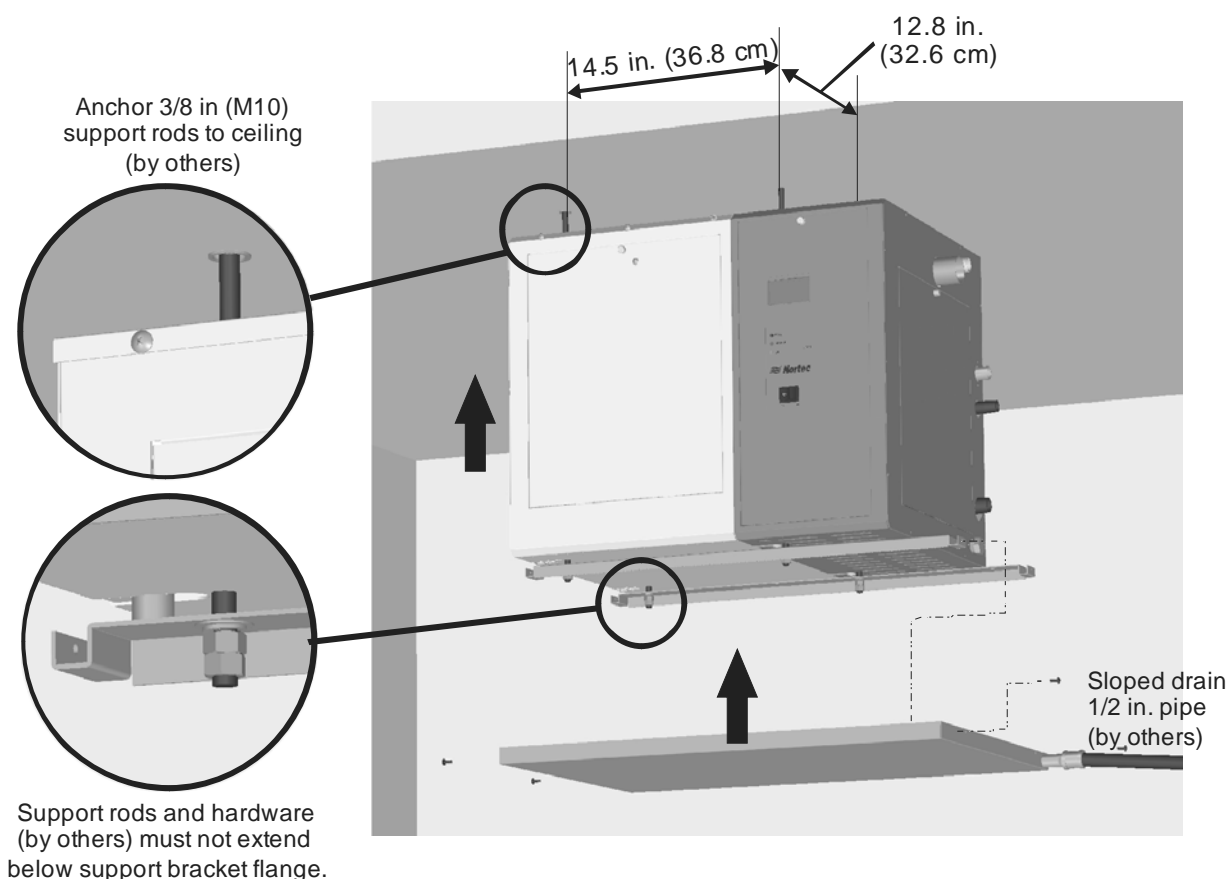


Figure 14: Ceiling Mounting the SE50

Outdoor Location

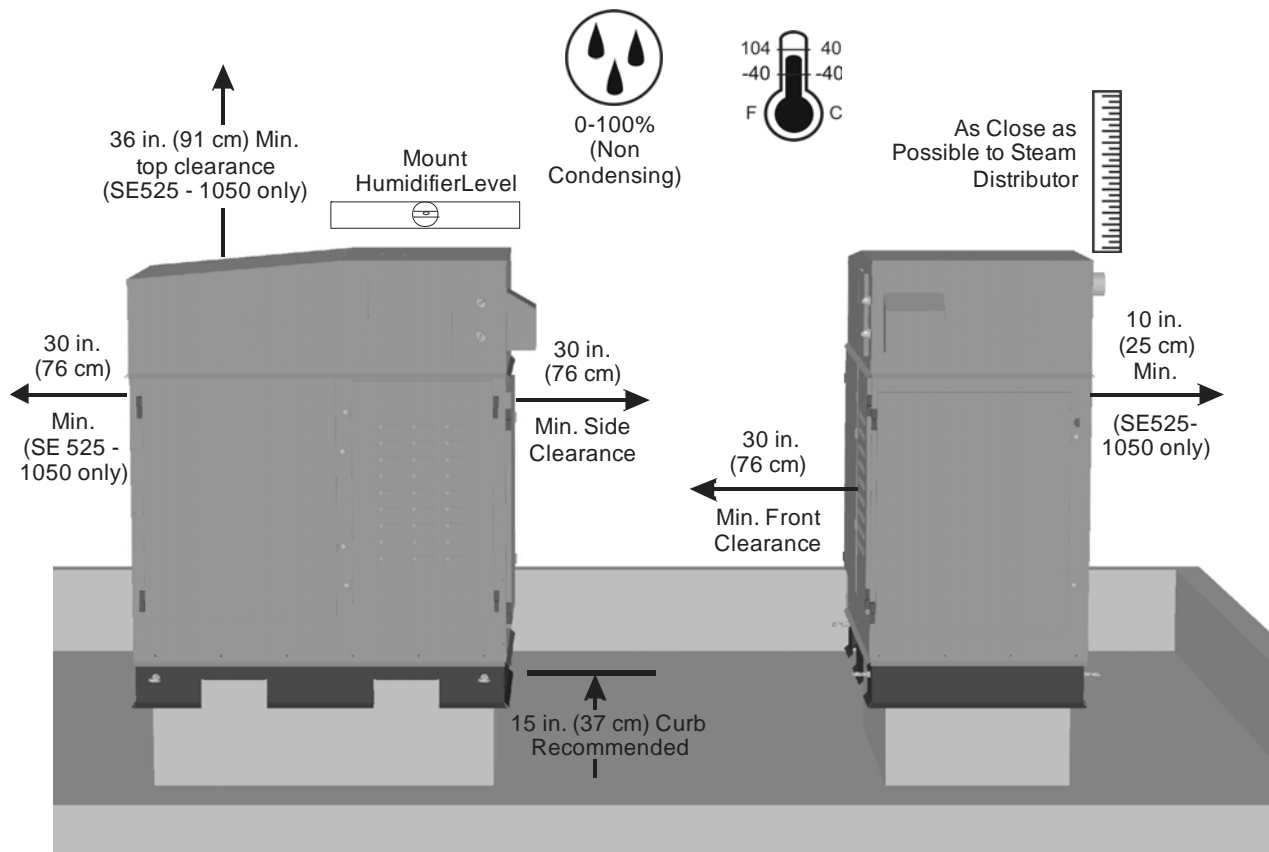


Figure 15: SETC Outdoor Installation Location / Clearance



Caution: When installing the SETC Outdoor in conditions where freezing temperatures may occur ensure that freeze protection guidelines are followed. See Freeze Protecting Water Supply on page 37.

The SETC Series Outdoor Models are designed to be rooftop mounted on a roof curb (by others). When properly installed the outdoor enclosure will provide protection from rain, wind, and snow in areas with ambient temperature -40 to 104 °F (-40 to 40 °C) and relative humidity 0 - 100% (non condensing). All models include a ventilation package to prevent overheating in warm months, and a freeze protection package to prevent freezing in cold months.

- The SETC Outdoor is designed to be mounted on a roof curb. Use pipe chase in enclosure base for routing of services to the humidifier from below. See Figure 16: SETC Outdoor Roof Curb and Table 9: SETC Roof Curb Depth (Dimension A) for roof curb dimensions and pipe chase location..
- Seal building after plumbing to ensure that building pressure remains as intended.
- Avoid installing the humidifier in an area where building exhaust may enter the cabinet through ventilation louvers. A minimum clearance of 10ft (3m) from mechanical exhaust outlets is recommended.
- Install so that ventilation louvers are not obstructed and cannot be blocked by accumulation of ice and snow.

SETC Outdoor Curb

The base of the SETC includes a drain pan with a pipe chase to route water, drain, boiler steam, boiler steam condensate, control wiring, and primary power wiring. The roof curb should be designed to support the base and allow services to be routed to the humidifier through the pipe chase.

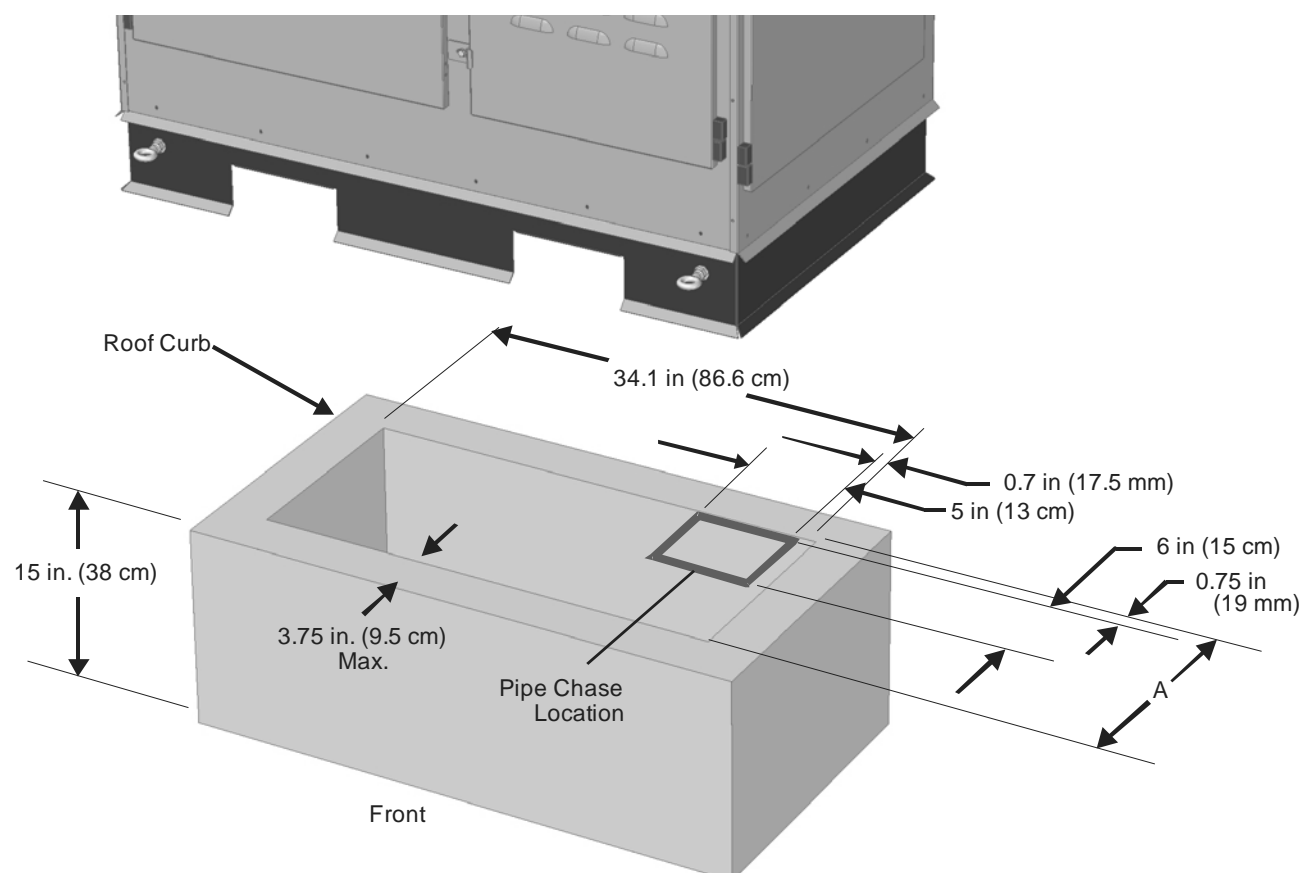
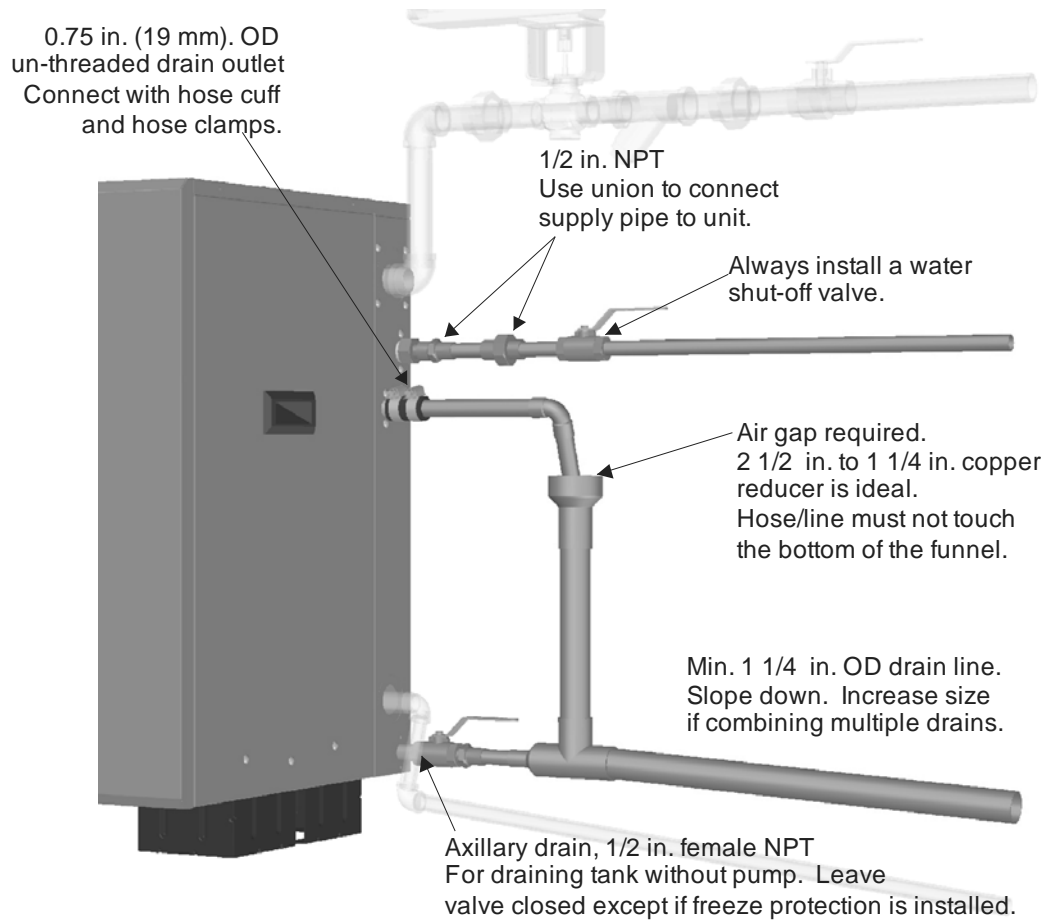


Figure 16: SETC Outdoor Roof Curb

Table 9: SETC Roof Curb Depth (Dimension A)

Model	A (Inside Curb Depth) In (cm)
100	8.6 (28 cm)
175	8.6 (28 cm)
250	15 (38 cm)
375	15 (38 cm)
525	30.6 (78 cm)
750	30.6 (78 cm)
1050	46.3 (118 cm)

Plumbing



*Pipe, unions, and water shut-off valve supplied by others.

Figure 17: SE Indoor Water Supply and Drain Connection



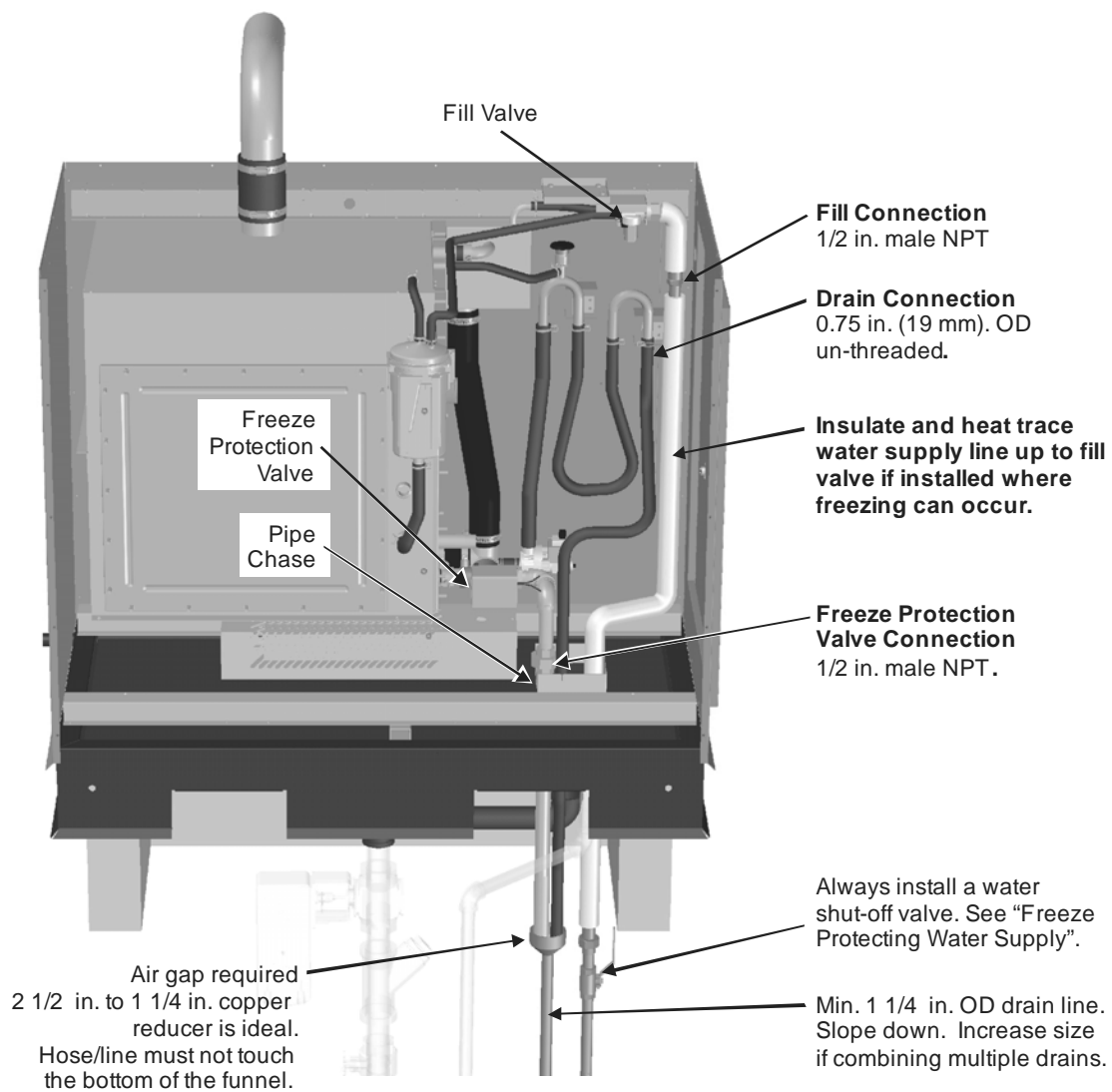
Note: Supply cold potable water, deionized water or reverse osmosis water at 30 - 80 PSIG.

Hardness 5-7 grain or 90 - 120 mg/l (as Ca^{+2} as CaCO_3)

Total Dissolved Solvents (TDS) 0.5-3 mg/l or **Conductivity** 1 to 70 mho/cm

Chlorides 0-25 ppm **PH** 7.2-8.5 **Alkalinity** 30-130 mg/l (as CaCO_3)

- All water supply and drain line connections must be installed in accordance with local plumbing codes.
- See Table 4 and Table 5 on page 10 for supply water flow requirements.
- Install water shut off valve and union before humidifier to facilitate servicing.
- Insure drain line is adequately sized to provide free and easy draining and that an air gap is installed as shown. See Table 4 and Table 5 on page 10 for flow requirements.
- Auxiliary drain connection with manual shut off valve is recommended for all units. Valve to be left closed on units without freeze protection option installed. Valve to be left open on units with freeze protection option installed except during servicing.
- High hardness or silica content supply water may require increased maintenance.
- Unit damage caused by water quality outside of the specified ranges is not covered under warranty.



*Pipe, unions, insulation, heat trace, and water shut-off valve supplied by others.

Figure 18: SETC Outdoor Water Supply and Drain Connection

Caution:

- When installing the SETC Outdoor in conditions where freezing temperatures may occur follow instructions in Freeze Protecting Water Supply on page 37 to prevent damage in case of power failure or humidifier fault.
- Internal heaters will not keep the SETC from freezing in cold climates. They are intended to maintain electronics at a minimum operating temperature for cold weather startup. Heat from an operating humidifier's tank provides the heat to keep the unit from freezing



Freeze Protecting Water Supply



Caution:

When installing the SETC Outdoor in condition where the temperature may drop below 32 °F (0 °C) always follow these guidelines to protect the water supply line from freezing. A frozen and burst water line can cause serious damage to property.

- Heat trace and insulate the water supply line all the way up to the fill valve.
- In case of power shut off or power failure the water supply line will not be protected from freezing by the heat trace. Water trapped in the supply line may freeze and cause damage. Install the valve system outlined below to shut off water inside the building and drain any water in the supply line. Valves, fittings, insulation and heat trace shown are supplied by others.

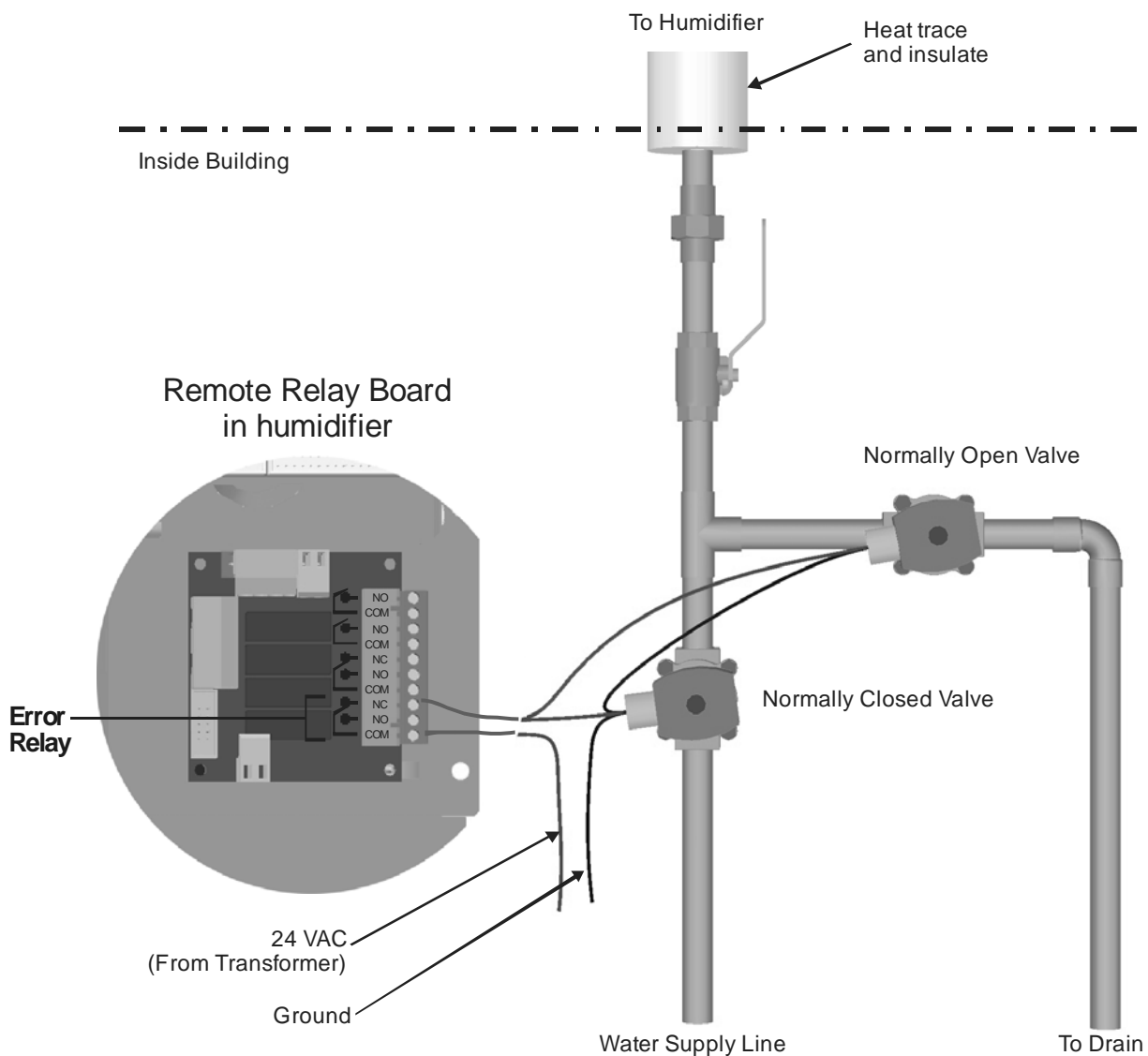


Figure 19: Freeze Protecting Water Supply

Boiler Steam and Boiler Condensate Return

Note:-

- Damage to SE heat exchanger will occur if it is exposed to pressure above 20 psi. A safety relief valve must be installed to prevent the SE from being exposed to pressure in excess of 15 psi when the SE is connected to a medium or high pressure boiler via a pressure reducing valve.
- The steam supply line must be designed to provide design pressure at the CV valve when there is 100 % demand (CV valve completely open). Pressure losses in the steam supply line will reduce SE output.
- Condensate must be drained to a non-pressurized boiler condensate return line.

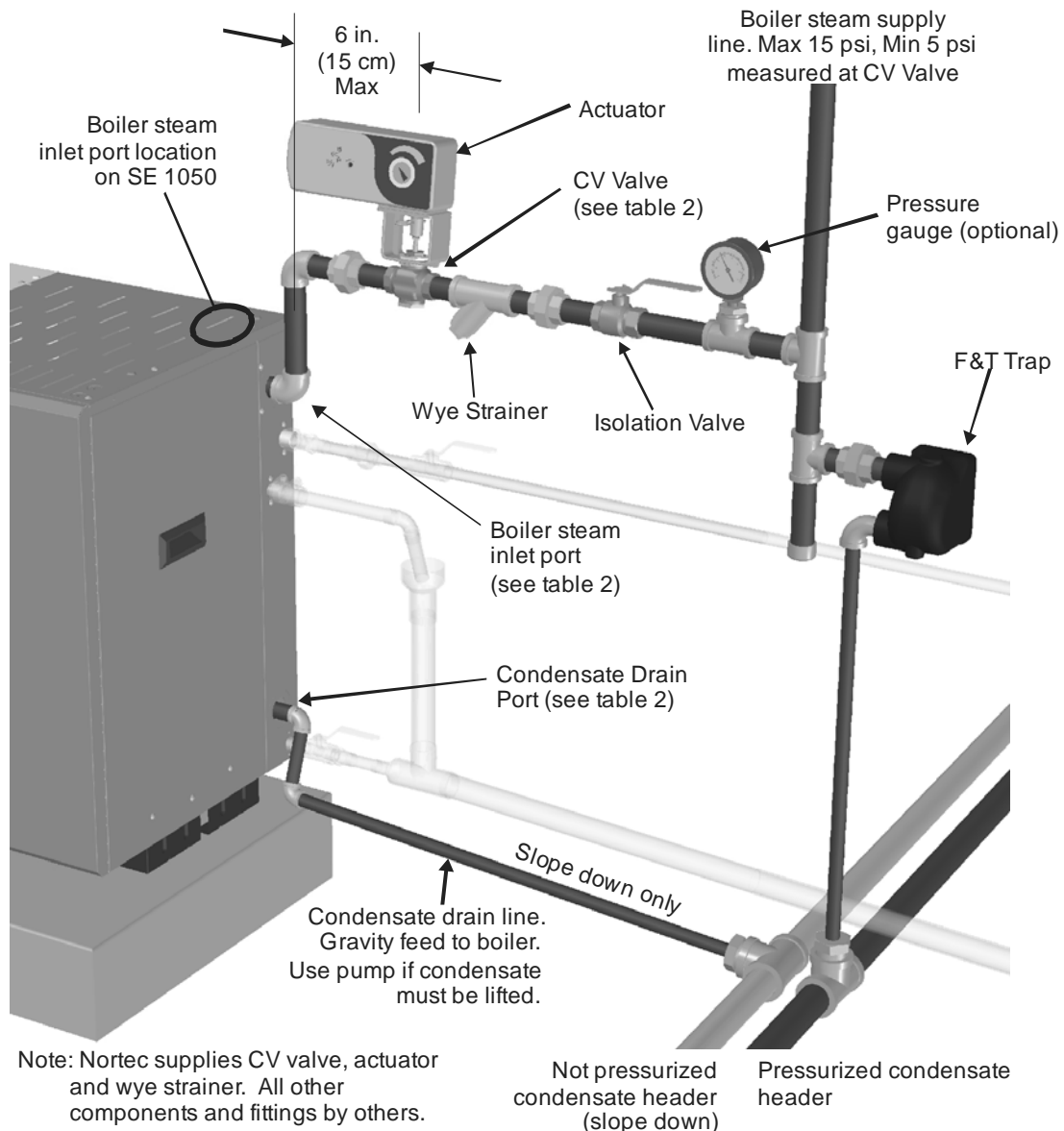


Figure 20: SE Indoor Boiler Steam and Condensate Connection

The port sizes of the CV valve, boiler steam inlet port, and condensate drain port are given in Table 4: SETC/P Specifications on page 10. Follow the following guidelines for installation.

- All steam line connections must be installed in accordance with local codes.

- Boiler steam supply line design is the responsibility of the installer. The boiler steam supply line must be designed so that that design pressure is present at the CV valve when the CV valve is completely open (100% demand). The diameter of the supply line up to the wye strainer may have to be oversized to insure proper steam pressure.
- The SE will operate on supply steam pressures between 5 and 15 psi measured at the CV valve. Lower steam supply pressures will result in lower output. See Table 5: SETC/P Capacities and Water Consumption on page 10 for capacities at different supply pressures.
- If condensate cannot be gravity fed to the boiler then a pump must be used to lift the condensate. See Spirax Sarco (www.spiraxsarco.com) and others for pumps and additional information on condensate management.

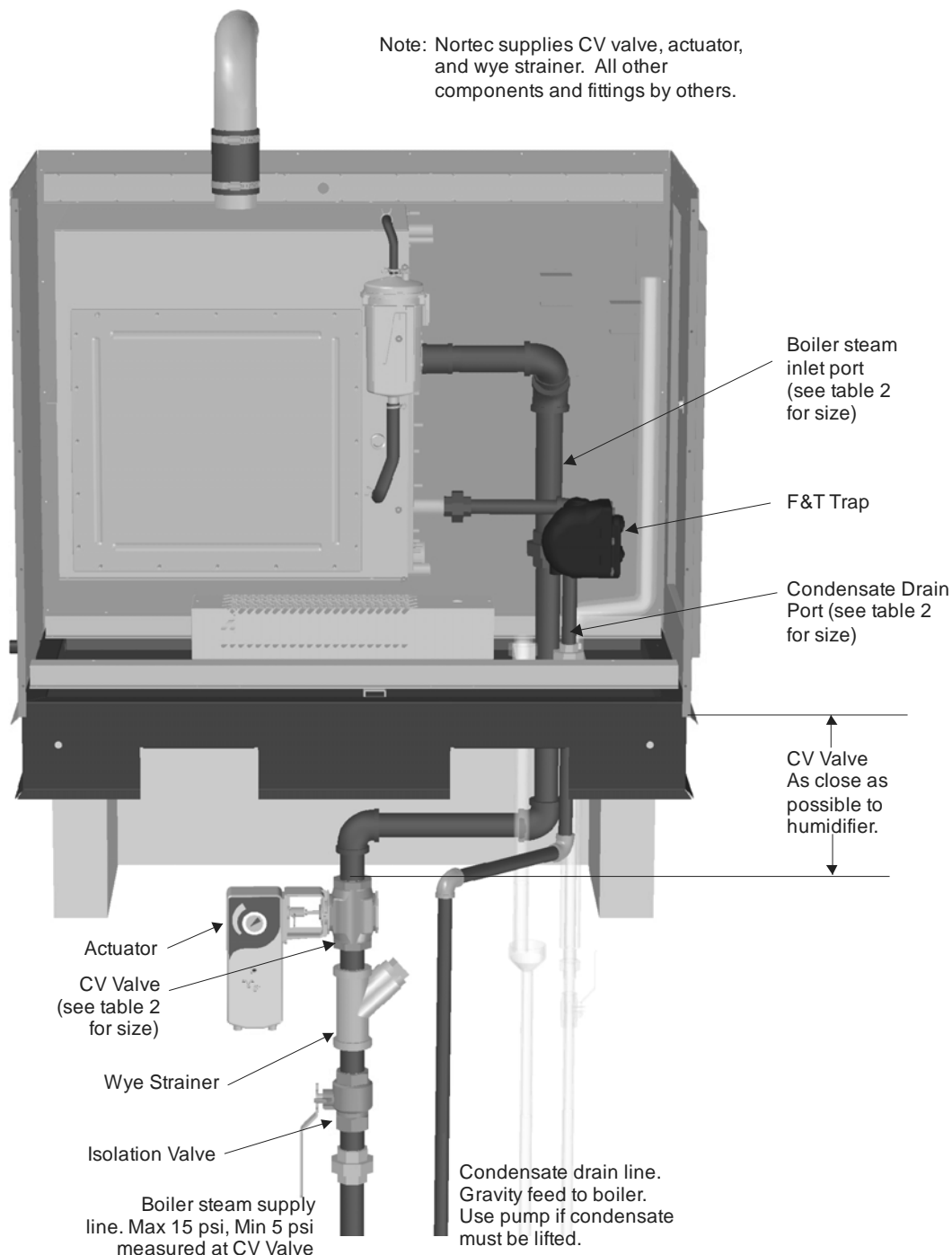
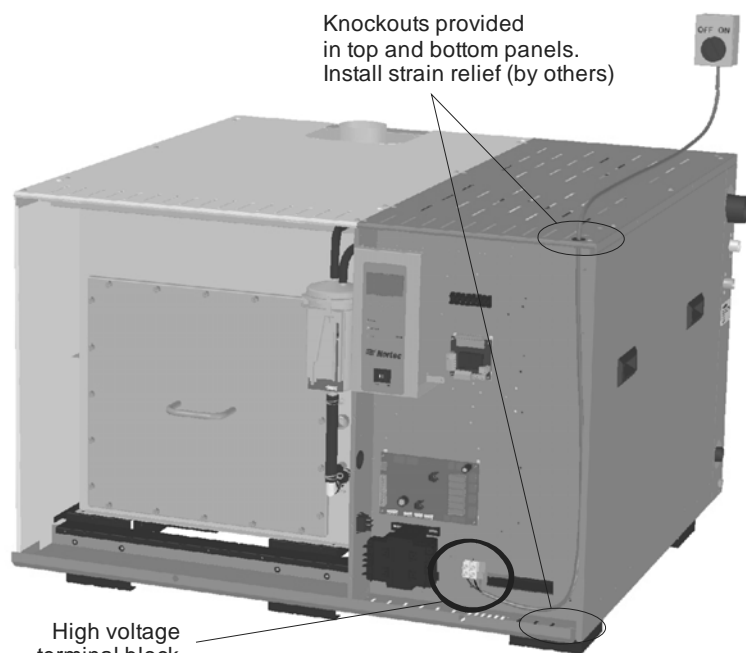


Figure 21: SE Outdoor Boiler Steam and Condensate Connection

Electrical

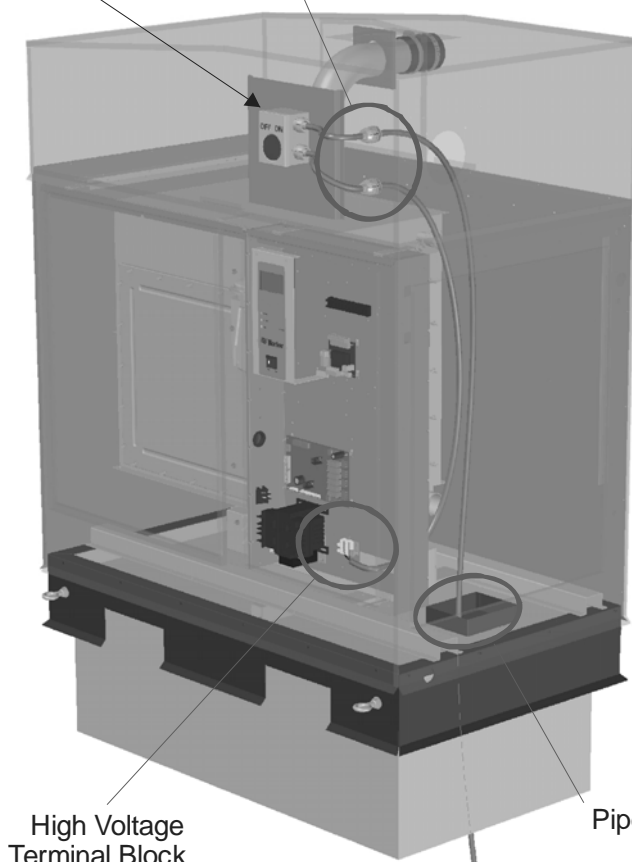
Caution:

All SE humidifiers operate on 120 VAC, single phase, 60 HZ power. Refer to specification label for power requirements.



Disconnect
(by others)

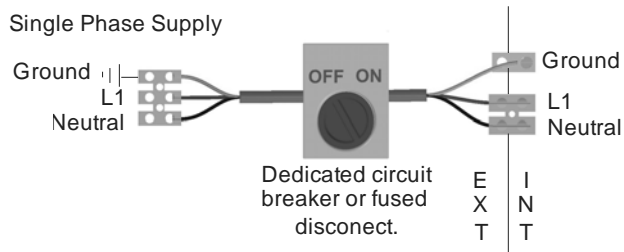
Conduit
Fittings



Note:

- 1 Dedicated external fused disconnect (by others) must be installed. Fusing must not exceed max circuit protection as indicated on the specification label.
- 2 Ensure that adequate power is available to carry full humidifier amp draw as indicated on the specification label.
- 3 Primary power on outdoor model may be routed up through pipe chase and conduit fittings or from roof top source.
- 4 All wiring to be in accordance with national and local electrical codes.

SE Primary Power Wiring



SE Power and Disconnect

Model	Power (kW)	Disconnect (A)
SE Indoor	0.15	15
SETC Outdoor 100	0.65	15
SETC Outdoor 175		
SETC Outdoor 250		
SETC Outdoor 375		
SETC Outdoor 525	1.15	20
SETC Outdoor 750		
SETC Outdoor 1050	1.65	20

Figure 22: Primary Power Connections

Steam Distribution

The best way to add steam into a space is to add it in a supply air duct or an air handler. Nortec offers both single steam distributors as well as SAM-e steam distribution manifolds for adding air to ducts and air handlers (see Figure 23).

If a duct or air handler is not present or if humidification is required for a specific area the steam can also be added using remote blower packs. Fans built into the blower packs help disperse the steam directly into the space being humidified.

See Nortec publications 1503529 – SAM-e Engineering Manual and 2556592 - Steam Distributor Installation for detailed information about Nortec Steam Distribution Options.

The following pages provide a brief outline of steam line requirements for connecting the SE humidifier to the selected steam distributor.

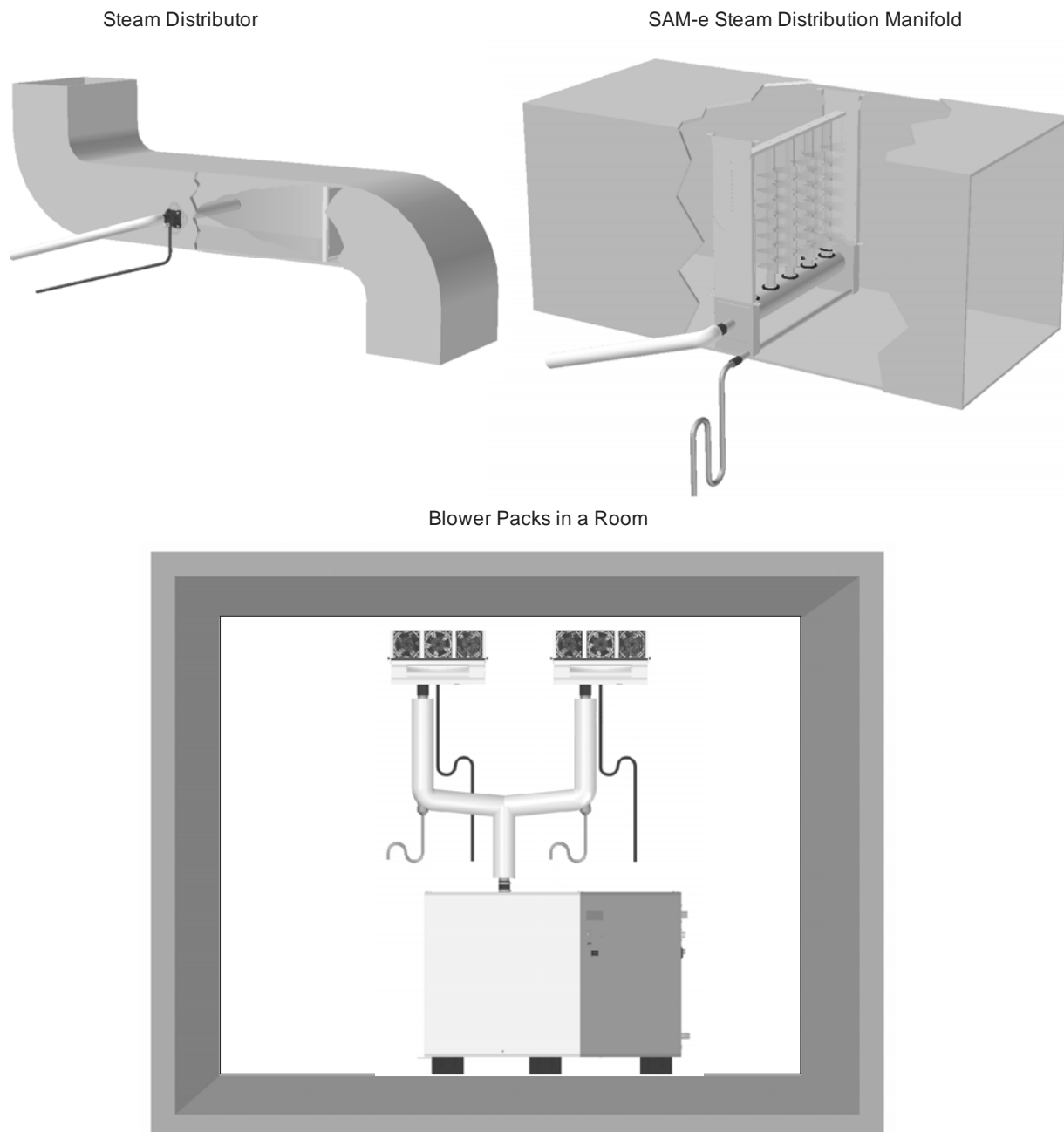


Figure 23: Methods of Steam Distribution

Steam Lines and Condensate Returns

Steam Line Length

The SETC/P humidifier should be mounted as close as possible to the duct steam distributor. Longer lines will result in energy losses from steam condensation in lines and may cause unwanted backpressure.



Material - The steam line between the cylinder steam outlet and the distributor may be Nortec steam hose, copper pipe, or stainless steel pipe or tube. Table 10 lists recommended materials and sizes for based on humidifier capacity.

Length - The SETC/P is an atmospheric steam generator so it is very important no restrictions are present in the steam line and that the steam line is sized properly to carry the full output capacity of the humidifier. It is also important to minimize the length of steam lines. Table 11: Maximum Recommended Length of Steam Line lists maximum recommended lengths for steam lines.

Insulation and Slope - Whenever steam is distributed, condensate is formed in the distribution system and steam distributor, manifold, or blower pack. Insulating steam lines is one important way to reduce the amount of condensate formed. Steam lines must be sloped so that condensate does not collect in the lines and create a restriction to steam flow.

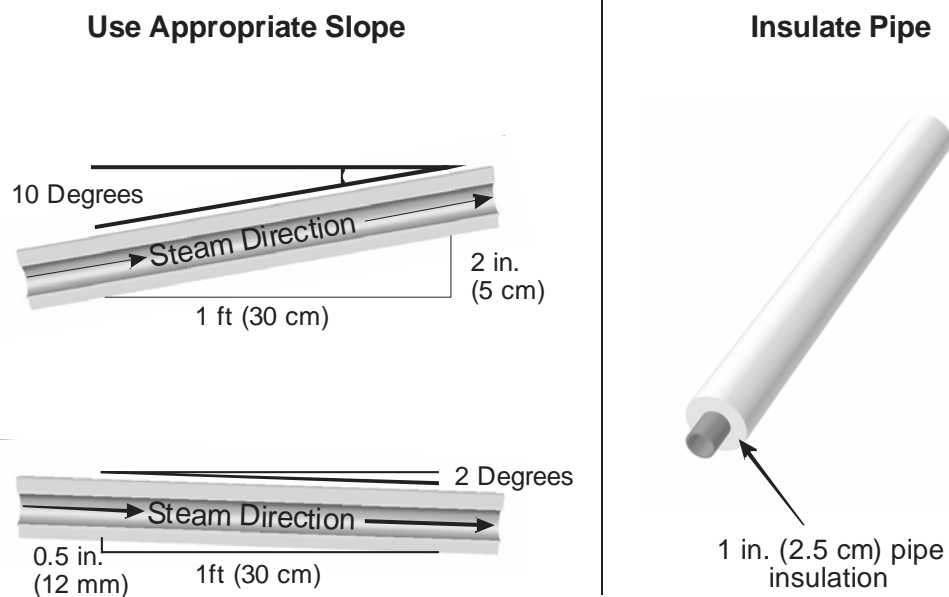


Figure 24: Main Steam Line Requirements

MAIN RULES FOR ATMOSPHERIC STEAM LINES

- Slope the steam lines.
- Trap condensate (Use full size 'T' for Traps).
- Steam lines must not have any restrictions which could cause back pressure.
- Insulate with 1.0 in. (2.5 cm) pipe insulation.
- Follow recommended materials, size and length see tables.



Table 10: Recommended Steam Line Materials

Steam Line Material	Lb/hr (kg/hr)	Steam Line Length		Steam Line Description
		ft	m	
Copper Tube	0-100 (0-45)	0-90	0-27	1 1/2 in. MED-L Tubing (1.625 in. OD)
	101-250 (46-113)	0-180	0-54	3 in. MED-L Tubing (3.125 in. OD)
	251-650 (114-295)	0-260	0-79	**4 in. MED-L Tubing (4.125 in. OD)
*Stainless Steel Tube	0-100 (0-45)	0-90	0-27	1.75 inch Tube x 0.065 inch thick wall
	101-250 (46-113)	0-180	0-54	3 inch Tube x 0.065 inch thick wall
	251-650 (114-295)	0-260	0-79	**4 inch Tube x 0.065 inch thick wall
Nortec Hose	31-100 (14-45)**	<15	<4.5	***Part Number 1328820 (1 3/4")

Note: * Nortec offers adapters and reducers which can be used to convert from one size of steam line to another.



Condensate Returns

- Route condensate back to humidifier fill cup if possible. Condensate will be returned to cylinder from fill cup.
- Condensate should not be routed to a sink used frequently by personnel. Route to a floor drain or equivalent. Condensate normally cools in traps but is still hot. A SAME or larger steam line generates more condensate and water may not cool in the trap. A drain water cooler option may be installed if required by code.

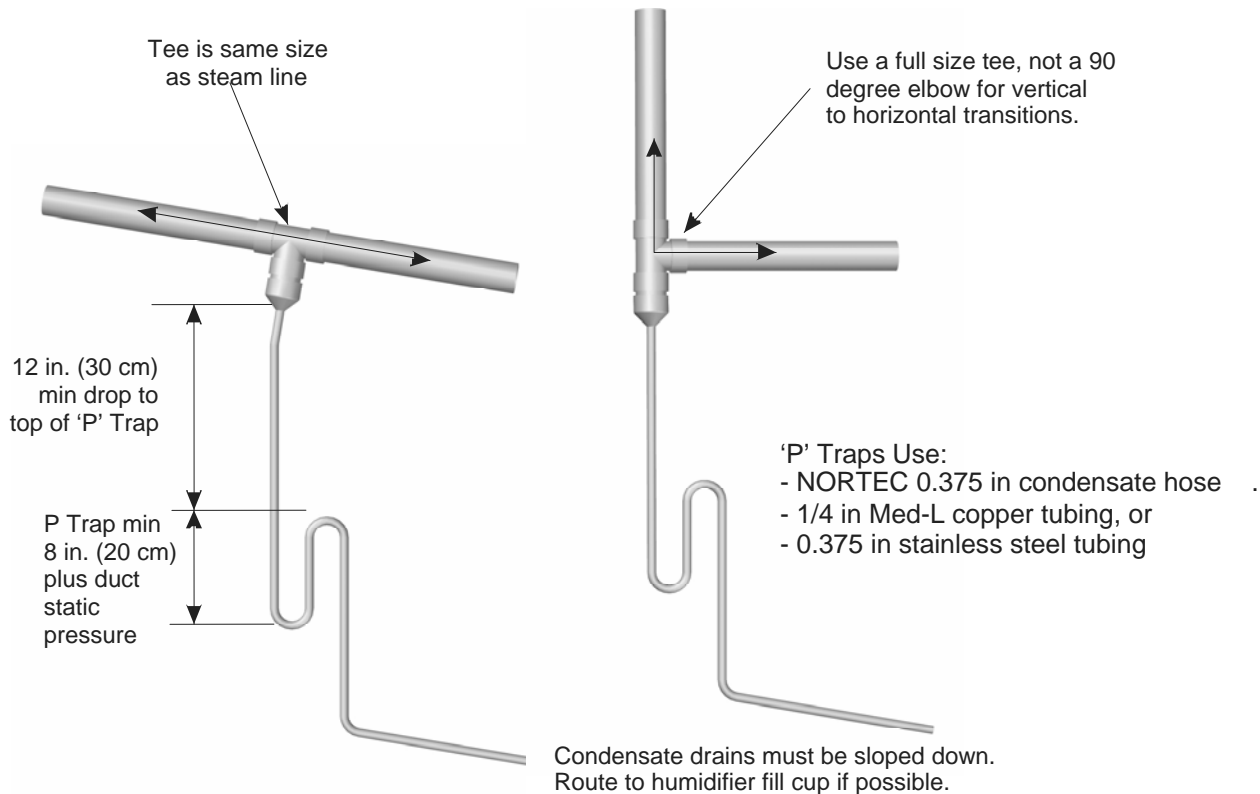


Table 11: Maximum Recommended Length of Steam Line

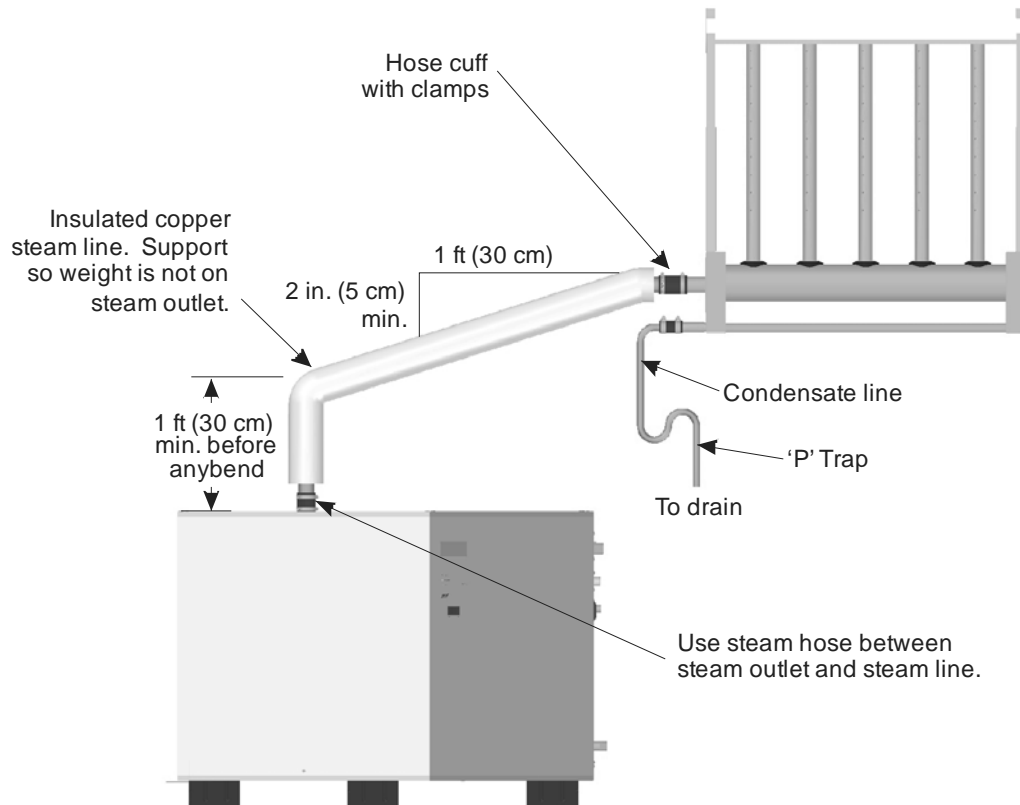
Unit Size	Steam Output		Steam Outlet and Line Size		Maximum Length		Possible Loss		Possible Loss at Max. length	
	lb/hr	(kg/hr)	Copper	(SST)	ft	(m)	lb/hr/ft	(kg/hr/m)	lb/hr	(kg/hr)
50	50	(23)	1 1/2	(1 3/4)	37	(11)	0.11	(0.16)	4	(2)
100	100	(45)	1 1/2	(1 3/4)	90	(27)	0.11	(0.16)	10	(4.5)
175	175	(80)	3	(3)	90	(27)	0.16	(0.24)	14	(6.5)
250	250	(114)	3	(3)	180	(55)	0.16	(0.24)	28	(13)
375	375	(170)	4	(4)	180	(55)	0.22	(0.33)	39	(18)
525	525	(239)	4	(4)	220	(67)	0.22	(0.33)	48	(22)
750	750	(341)	2X 4	(4)	260	(79)	0.44	(0.66)	114	(52)
1050	1050	(477)	2X 4	(4)	260	(79)	0.44	(0.66)	114	(52)

Table 12: Equivalent Length of Some Common Fittings

Tube Diameter in.	90 Degree Elbow ft (m)		45 Degree Elbow ft (m)		Side Outlet Tee ft (m)		Gate Valve ft (m)		Globe Valve ft (m)	
1 1/2 or 1 3/4	3.5	(1)	1.75	(0.5)	7	(2.1)	0.8	(2.4)	34	(10)
3	5	(1.5)	2.5	(0.75)	11	(3.3)	1.1	(3.1)	54	(16)
4	8	(2.4)	4	(1.2)	15	(4.5)	1.6	(0.5)	80	(24)

Steam Line Routing SE Indoor

Figure 26: Steam Distributor Above Humidifier (Copper Steam Line) shows a typical steam line routing between an SE humidifier and a SAM-e manifold. Additional specific examples are given in Nortec publication 2552940 - SE Series Installation and Operation Manual.

**Figure 26: Steam Distributor Above Humidifier (Copper Steam Line)**

Steam Line Routing SE Outdoor

- The Steam outlet(s) of the SETC Outdoor is from the back of the humidifier and unlike the indoor model does not require 12 in. (30 cm) of vertical steam run immediately after the humidifier. The steam line may be routed directly down or horizontally from the outlet. See Figure 27: SETC Outdoor Steam Outlet.
- The SETC Outdoor steam line must be insulated in all cases even for very short runs.

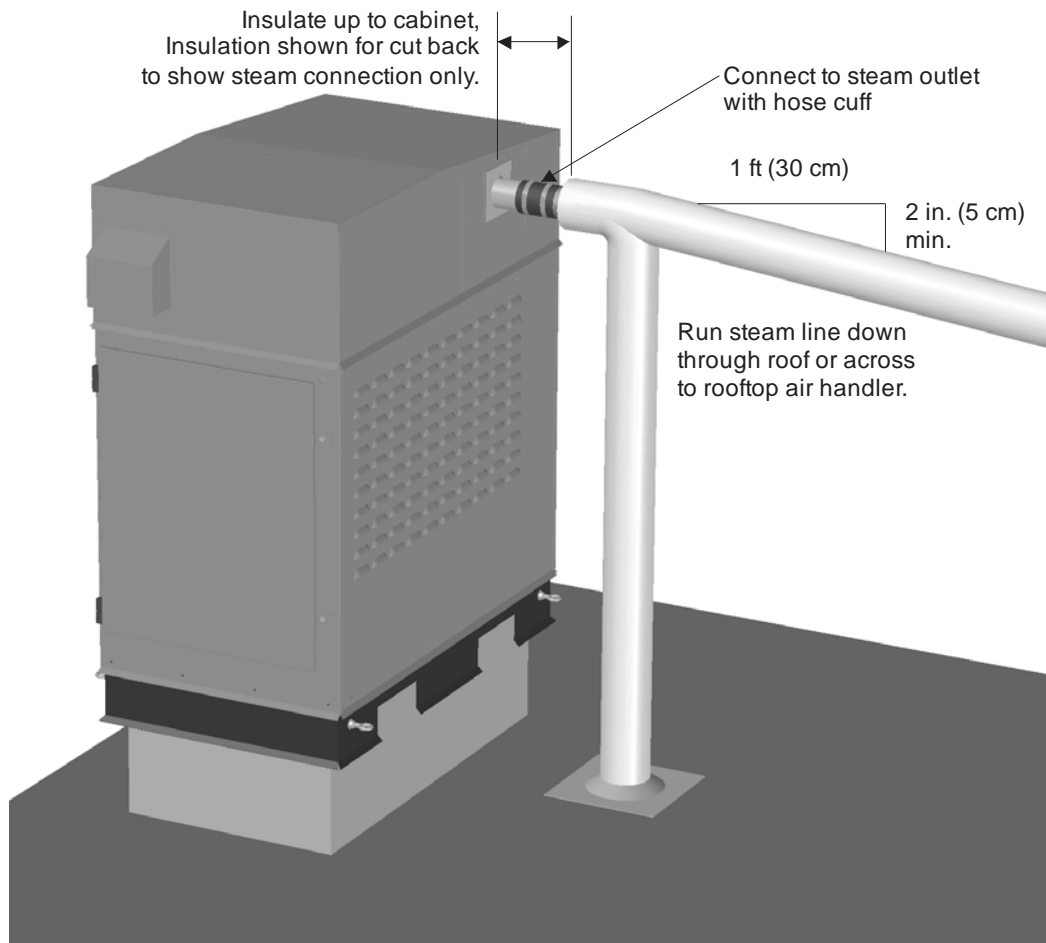


Figure 27: SETC Outdoor Steam Outlet

SETC/P Controls

Controls are available from Nortec as accessories or can be supplied by others. The following information is relevant to all controls, factory supplied or otherwise.

- The SETC humidifier can be operated with one or two modulating demand inputs or one or two transducer inputs.
- The SEP has one modulating demand input which can be used for a duct high limit or humidity control.
- Both the SETC and SEP can be operated as On/Off.
- The SETC humidifier control type can be configured via its LCD and keypad.
- The SEP humidifier control type can be configured via jumpers on its control board.
- Both the SETC and the SEP include a 24 VAC safety input which must be made in order for the humidifiers to operate.

The SE humidifier can be configured to operate with the following control configurations.

Table 13: Humidifier Control Configurations

	Configurations	SETC	SEP
Dual Channel	Modulating Demand Modulating High Limit On/Off Safety	0-5, 1-5, 0-10, 2-10, 0-16, 3.2-16 VDC 0-20, 4-20 mA	N/A
	Transducer Control Transducer high limit On/Off Safety	0-5*, 1-5, 0-10*, 2-10, 0*-16, 3.2-16 VDC 0-20*, 4-20 mA	N/A
Single Channel	Modulating Demand On/Off High Limit ** On/Off Safety**	0-5*, 1-5, 0-10*, 2-10, 0*-16, 3.2-16 VDC 0-20*, 4-20 mA	0-10, 2-10 VDC 0-20, 4-20 mA
	On/Off ** Modulating High Limit On/Off Safety**	0-5, 1-5, 0-10, 2-10, 0-16, 3.2-16 VDC 0-20, 4-20 mA	0-10, 2-10 VDC 0-20, 4-20 mA
	Transducer Control On/Off High Limit ** On/Off Safety**	0-5, 1-5, 0-10, 2-10, 0-16, 3.2-16 VDC 0-20, 4-20 mA	N/A
	On/Off ** Transducer High Limit On/Off Safety**	0-5, 1-5, 0-10, 2-10, 0-16, 3.2-16 VDC 0-20, 4-20 mA	N/A
On/Off	On/Off Control** On/Off High Limit** On/Off Safety**	24 VAC Dry Point	24 VAC Dry Point

* Transducer controls which have a possible 0 input are not recommended.

** All On/Off controls must be wired in series and connected to terminal 2 of the control terminal strip.

Note: Regardless of selecting on/off or modulating control method, Nortec humidifiers must have a closed circuit across their on/off security loop control terminal to operate. Nortec highly recommends the use of a high limit humidistat and an air proving switch in series for this function.



Nortec Controls

Nortec provides optional On/Off controls, modulating humidistats, or humidity transducers as shown in Figure 28, Figure 29, and Figure 30. Controls are available either wall mounted with integrated sensor, wall mounted with a remote sensor, or duct mounted with integral sensor.

On/Off Controls

On/Off controls are used in all Nortec humidifier security loops. The digital humidistat can also be used as a space humidity controller, duct humidity controller, or duct high limit. These controls include:

- **Air Proving Switch** – duct mounted, pressure differential switch, adjustable set point from 0.07 IWC to 12.0 IWC, good for positive, negative or differential pressure applications, stops humidifier if duct air pressure is not sensed. Turns humidifier off if air handler fails.
- **Duct Mounted Digital Humidistat** – control or high limit, adjustable set point from 15-90% rh with accuracy fixed at $\pm 3\%$ at 25 °C, operating range of 0-95% rh, closes on humidity drop for control and opens on rise for high limit duct application.
- **Wall Mounted Digital Humidistat** – control or high limit, adjustable set point from 15-90% rh with accuracy fixed at $\pm 3\%$ at 25 °C, operating range of 0-95% rh, closes on humidity drop for control and opens on rise for high limit application.
- **On/Off Controls Supplied by Others** – Can be used as long as they have a dry set of contacts capable of passing a 24-VAC, 2-A maximum signal.



2548731 - On/Off Wall Humidistat 2548732 - On/Off Duct Humidistat 1329203 - Air Proving Switch

Figure 28: Nortec On/Off Controls

Modulating Humidistats

Modulating Controls are used to send a modulating demand signal to the Nortec humidifier. Different models can accept different signals (see Table 13: Humidifier Control Configurations) Nortec supplied controllers send a 0-10 VDC demand signal. This signal can be used as a control and in some models can also be used as a modulating high limit. These controls include:

- **Wall Mounted Digital Humidistat with Integrated Sensor** – control or high limit, adjustable set point from 15-90% rh with accuracy fixed at $\pm 3\%$ at 25 °C, outputs a 0-10 VDC signal.
- **Wall Mounted Digital Humidistat Without Sensor** – control or high limit, adjustable set point from 15-90% rh with accuracy fixed at $\pm 3\%$ at 25 °C, outputs a 0-10 VDC signal. Requires a remote transducer sensor supplying a 2-10 VDC signal.

- **Duct Mounted Digital Humidistat With Sensor** – This package comes with both a remote sensor and a wall mounted controller without sensor. Control or high limit, adjustable set point from 15-90% rh with accuracy fixed at $\pm 3\%$ at 25 °C, outputs a 0-10 VDC signal.



1510142 - Digital Wall Humidistat
2520261 - Digital Wall W/O Sensor
1509858 - Wall Sensor

2520266 - Digital Duct Humidistat Package

Figure 29: Nortec Modulating Humidistats

Humidity Transducers

Transducer Sensors are signals sent back to either a controller or back to the humidifier. The SETC not the SEP can accept a direct transducer signal. The sensors include:

- **Wall Mounted Humidity Transducer** – Sensor, output of 2-10 VDC, range of 0 to 95% rh.
- **Duct Mounted Humidity Transducer** – Sensor, output of 2-10 VDC, range of 0 to 95% rh.
- **Transducer Sensor By Others** – Humidity sensors that rise linearly with the sensed rh in the room.



1509858 - 2-10V Wall Humidity Transducer

1509857 - 2-10V Duct Humidity Transducer

Figure 30: Nortec Humidity Transducers

Outdoor Temperature Reset

The outdoor temperature sensor is used to prevent condensation on windows or other surfaces that are adjacent to outdoor air. This sensor can be used in conjunction with the Nortec digital on/off and modulating controllers. The sensor allows the controller to override the set point to prevent the humidifier from humidifying when condensation could be possible (see Figure 31). Install the temperature sensor near the fresh air intake.

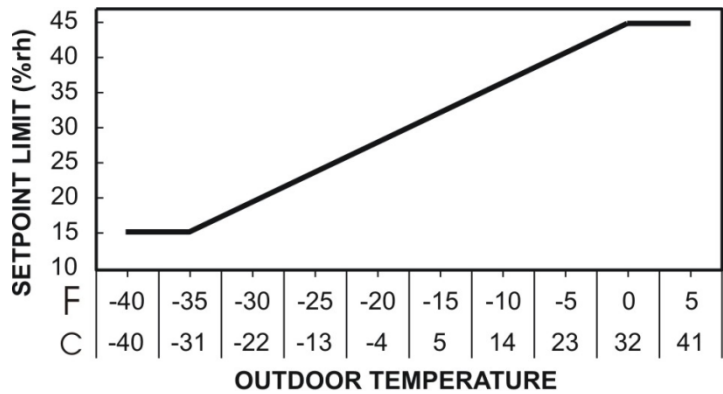


Figure 31: Outdoor Temperature Reset



2520263 - Outdoor Temperature Sensor

Figure 32: Outdoor Temperature Sensor

Control Acceptance Configured at Factory

Nortec offers factory configuration of controls to match those that will be used at site. Factory configuration eliminates the need to configure the SETC/P in the field and makes it plug and play with respect to software configuration

Table 14: Factory Configured Control Acceptance Part Numbers

Signal	Demand Acceptance		Transducer Acceptance	
	Single Channel	Dual Channel	Single Channel	Dual Channel
0-5 VDC	2523060	2523061	2523100	2523101
0-20mA	2523062	2523063	2523102	2523104
4-20 mA	2523064	2523065	2523105	2523107
0-10 VDC	2523066	2523089	2523110	2523111
0-16 VDC	2523090	2523091	2523112	2523113
1-5 VDC	2523092	2523093	2523114	2523115
2-10 VDC	2523094	2523095	2523116	2523117
0-20 VDC	2523096	2523097	2523118	2523119

Control Location

The humidity controls, whether controller or transducer, must be installed in a location which best represents the space that is being humidified. The preferred location for the humidity control is in the return air duct.

The high limit duct sensor must be installed downstream of the steam distributor but far enough downstream that steam is fully absorbed. Installing the sensor to close can result both in the humidifier short cycling and in damage to the sensor from saturation.

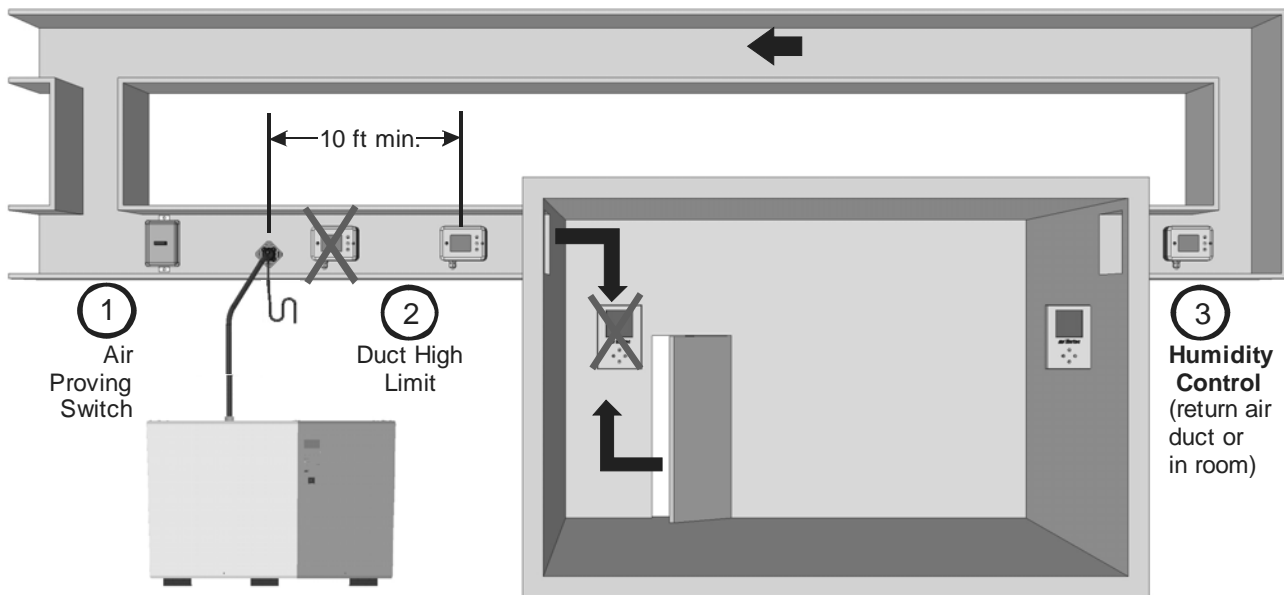


Figure 33: Control Location

- 1 Air Proving Switch**
 - Locate so that it can sense air flow or lack of it.
- 2 Duct High Limit**
 - SETC can be modulating, On/Off, or a humidity transducer.
 - SEP can be modulating or On/Off.
 - Locate at least 10 feet from steam distributor or far enough that under normal conditions steam is fully absorbed.
- 3 Humidity Control**
 - SETC can be modulating, On/Off, or a humidity transducer.
 - SEP can be modulating or On/Off.
 - Can be located either in return air duct (preferred) or in room being humidified.
 - Mount in area representative of room humidity (draft, doorways, sunlight, or overhang such as a shelf can affect reading).
 - Avoid placing near discharge diffuser of humidified air.

Control wiring

The SE humidifier control terminal strip is shown in Figure 34 along with a brief description of each of the inputs/outputs. The figure also shows the SETC remote relay board. For wiring use minimum of 18 AWG and keep as short as possible.

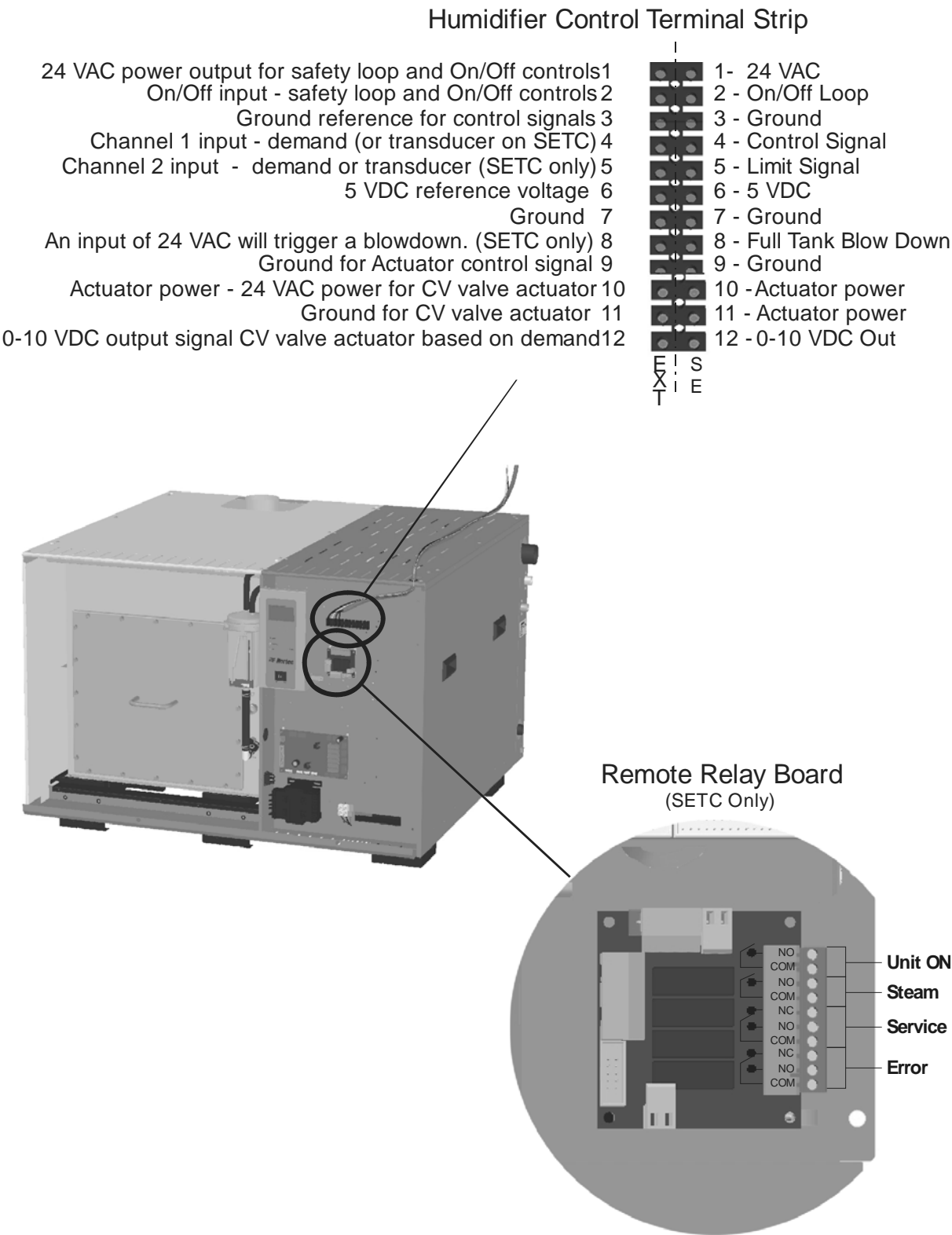


Figure 34: SE Humidifier Control Terminal Strip

Staged Modulation (SETC Only)

Staged Modulation allows connection of up to 10 humidifiers (equivalent of 10,000 lb/hr) to one control signal. Each unit connected in a staged system is configured to operate within a fixed range of the total system demand. Example, a slave unit configured to operate between 20 and 30% demand will output 0% when total system demand is less than 20% and 100% when demand is 30% or greater.

- Humidifier's must be wired together with 18-24 AWG multi-strand, twisted pair, shielded cable.
- Humidistats/transducers and On/Off safety loop are connected to master unit only.
- Configuration of Staged Modulation is carried out via the SETC's LCD and keypad.

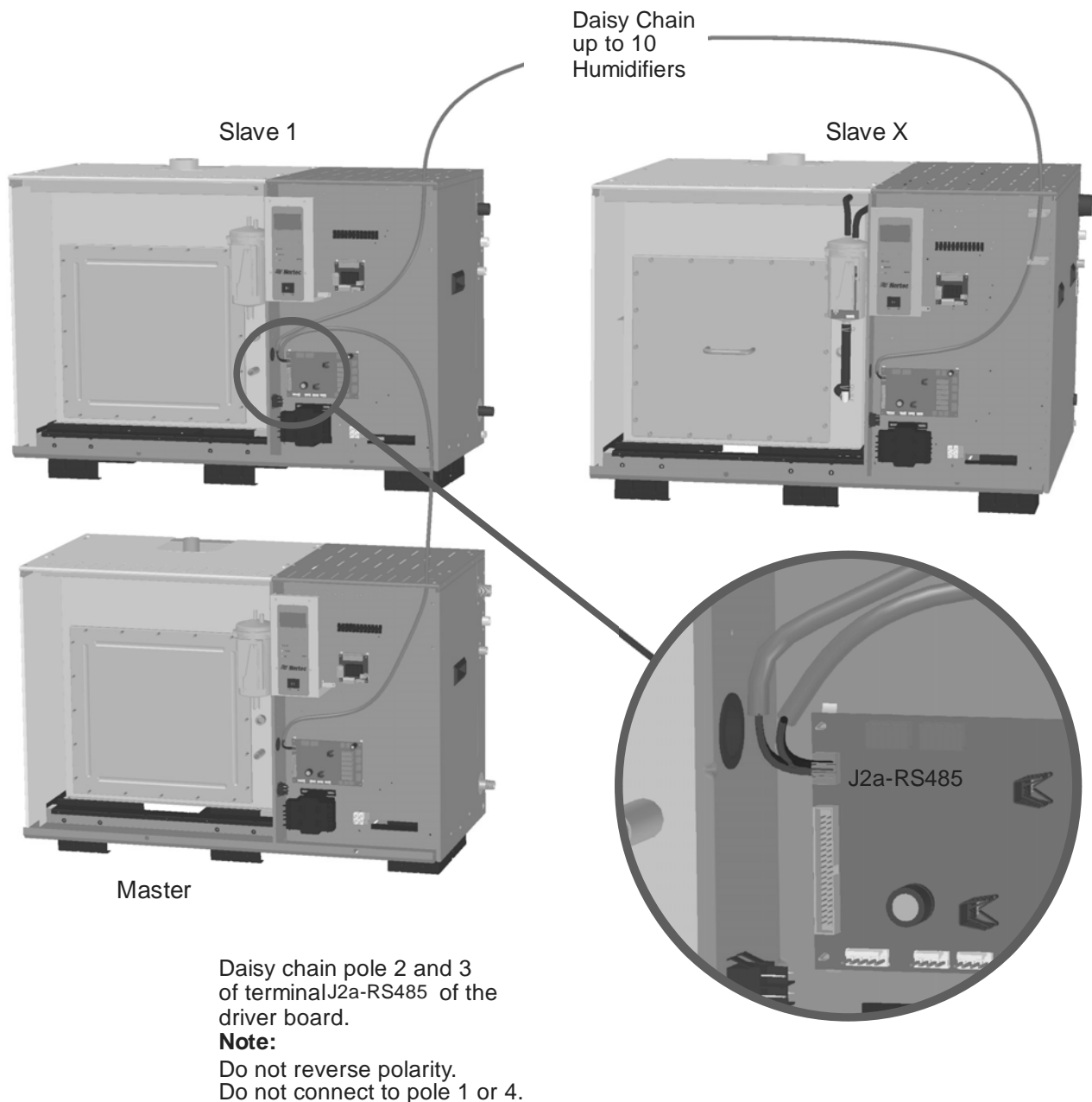


Figure 35: Staged Modulation Wiring

Nortec Online (Optional SETC Only)

Nortec ONLINE is an option that can be integrated with the SETC. It allows a user to monitor their unit from any computer with an Internet connection by logging in to www.norteconline.com. It can also be configured to send service reminders and fault warnings when they occur.

See Nortec publication 1509311 – Online GSTC/SETC Installation and Operation Manual for detailed information about Nortec Online.

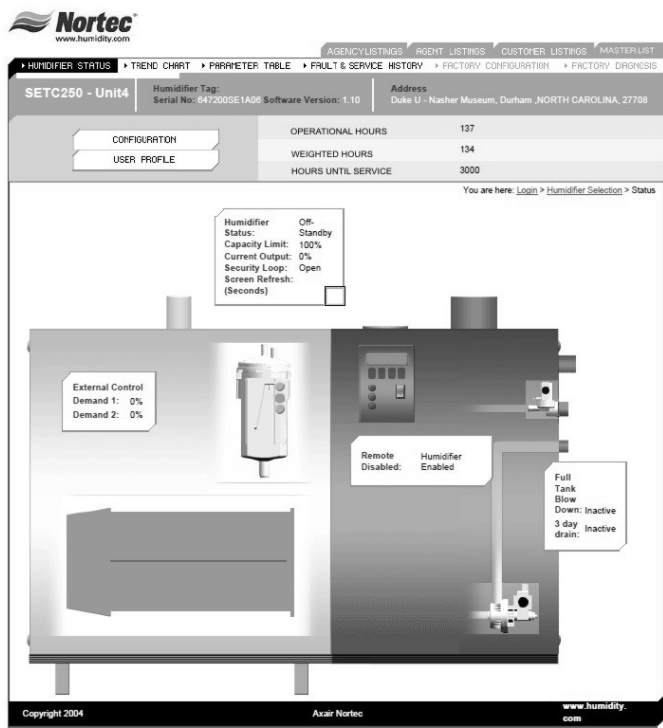


Figure 36: SE Humidifier Online Status Screen

Nortec Links 2 (Optional SETC Only)

Nortec LINKS 2 is an option that can be integrated with the SETC. It allows a Building Management System to monitor and / or control the humidifier.

See Nortec publication 2531037 – Links 2 GSTC/SETC Installaion and Operation Manual for detailed information about Nortec LINKS 2 and its operation and configuration.

Table 15: Nortec Links 2 Recommended Wire Types and Lengths

Protocol	Signal Type	Polarity		Recmended Cable	Max. Recommended Distance from Nortec Module
		A	B		
BACnet /MSTP	EIA-485, 2-wire	Net +	Net -	18-24 AWG Shielded, Twisted Pair	2000 ft at 9,600 bps 2000 ft at 38,400 kbps
Johnson N2					
BACnet /IP	LAN Standard	N/A	N/A	CAT. 5E cable with RJ-45 termination	Depends on cable manufacturer
Lonworks	EIA-232, 2-wire	Tx	Rx	18-24 AWG Twisted Pair	Should not exceed 50 ft

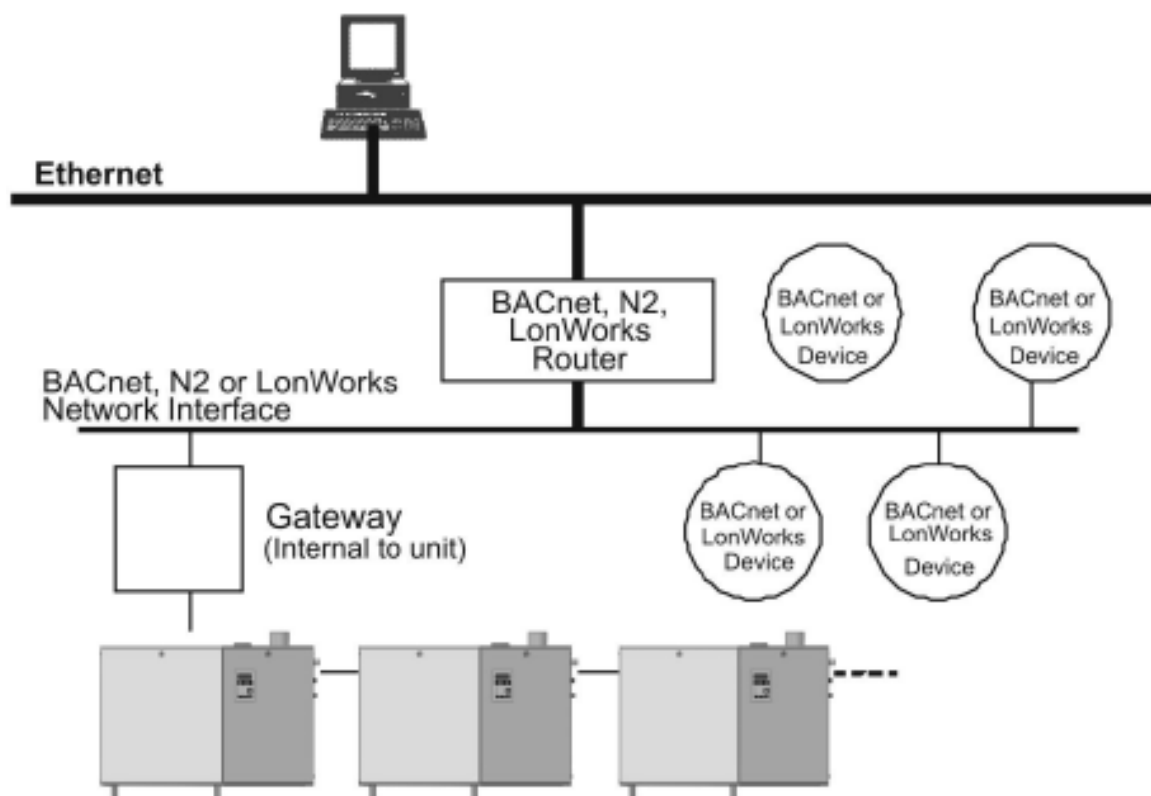


Figure 37: Sample Network with Nortec Links 2

Warranty

Walter Meier Inc. and/or Walter Meier Ltd. (hereinafter collectively referred to as THE COMPANY), warrant for a period of two years after installation or 30 months from manufacturer's ship date, whichever date is earlier, that THE COMPANY's manufactured and assembled products, not otherwise expressly warranted (with the exception of the cylinder), are free from defects in material and workmanship. No warranty is made against corrosion, deterioration, or suitability of substituted materials used as a result of compliance with government regulations.

THE COMPANY's obligations and liabilities under this warranty are limited to furnishing replacement parts to the customer, F.O.B. THE COMPANY's factory, providing the defective part(s) is returned freight prepaid by the customer. Parts used for repairs are warranted for the balance of the term of the warranty on the original humidifier or 90 days, whichever is longer.

The warranties set forth herein are in lieu of all other warranties expressed or implied by law. No liability whatsoever shall be attached to THE COMPANY until said products have been paid for in full and then said liability shall be limited to the original purchase price for the product. Any further warranty must be in writing, signed by an officer of THE COMPANY.

THE COMPANY's limited warranty on accessories, not of the companies manufacture, such as controls, humidistats, pumps, etc. is limited to the warranty of the original equipment manufacturer from date of original shipment of humidifier.

THE COMPANY makes no warranty and assumes no liability unless the equipment is installed in strict accordance with a copy of the catalog and installation manual in effect at the date of purchase and by a contractor approved by THE COMPANY to install such equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for consequential damage or damage resulting directly from misapplication, incorrect sizing or lack of proper maintenance of the equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for damage resulting from freezing of the humidifier, supply lines, drain lines, or steam distribution systems.

THE COMPANY makes no warranty and assumes no liability whatsoever for equipment that has failed due to ambient conditions when installed in locations having climates below 14 °F (-10 °C) during January or above 104 °F (40 °C) during July.

THE COMPANY retains the right to change the design, specification and performance criteria of its products without notice or obligation.

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