**Your guide to selecting and specifying Condair Steam Exchange Humidifiers!**

# SE Series

## Engineering Manual

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

condair

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*Thank you for choosing Condair.*

# Contents

# The SETC Steam Exchange Humidifier

The SETC/ is an atmospheric steam generator designed for air humidification via steam distributor, blower pack, or steam manifold. The SETC 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 utilizes it to produce clean and pure atmospheric steam for humidification.

# How the Humidifier Works

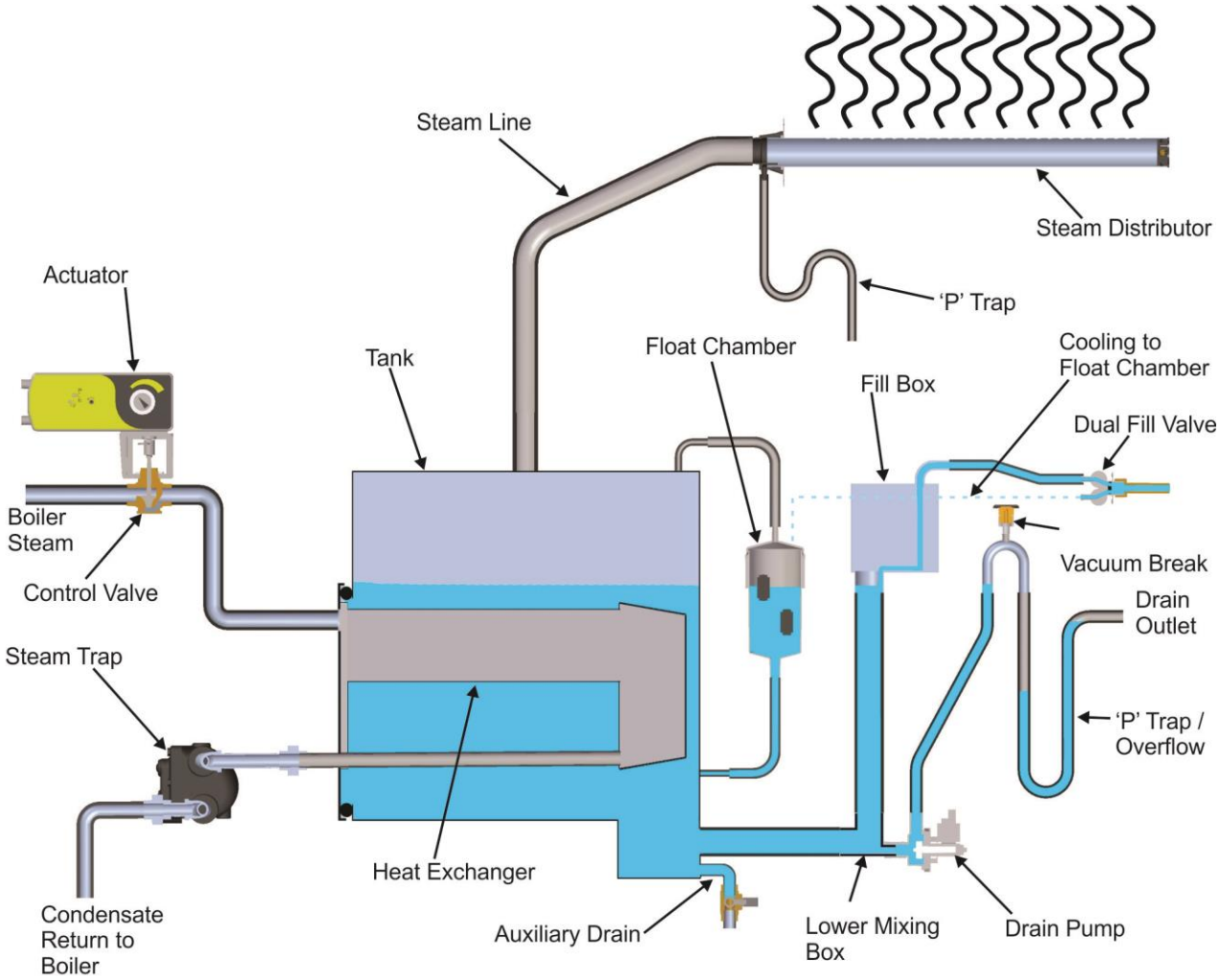



**Figure 1: Humidifier Schematic**

## 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 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 conditioned environment are satisfied.
- 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 control 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 control 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 conditioned environment in several different ways. The most common method for introducing steam into the conditioned environment 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 connects the atmospheric steam outlet of the humidifier to the atmospheric steam distributor. The SETC 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 to carry the full output capacity of the humidifier. Length of these lines must be minimized to reduce the efficiency loss of the humidification system.

Whenever steam is distributed, condensate is formed in the distribution system. 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 distribution 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 24: 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 SETC is available in capacities ranging from 50 lb/hr (23 kg/hr) to 1050 lb/hr (475 kg/hr). SETC humidifiers are packaged in five different cabinets depending upon capacity. See Figure 7: SE Indoor Dimensions on page 11 for dimensional information.

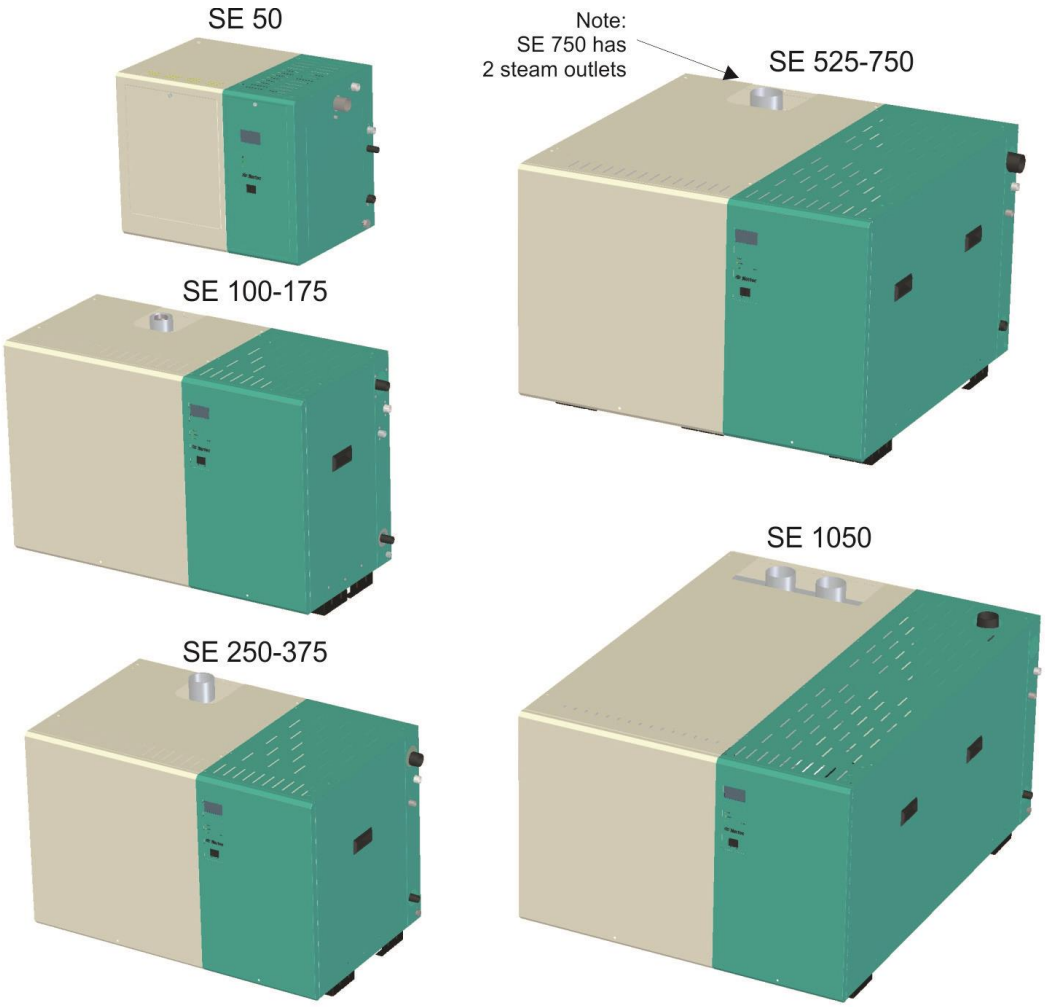



**Figure 2: SE Series Indoor Models**

## 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 upon capacity. See Figure 8: SETC Outdoor Dimensions on page 12 for dimensional information.

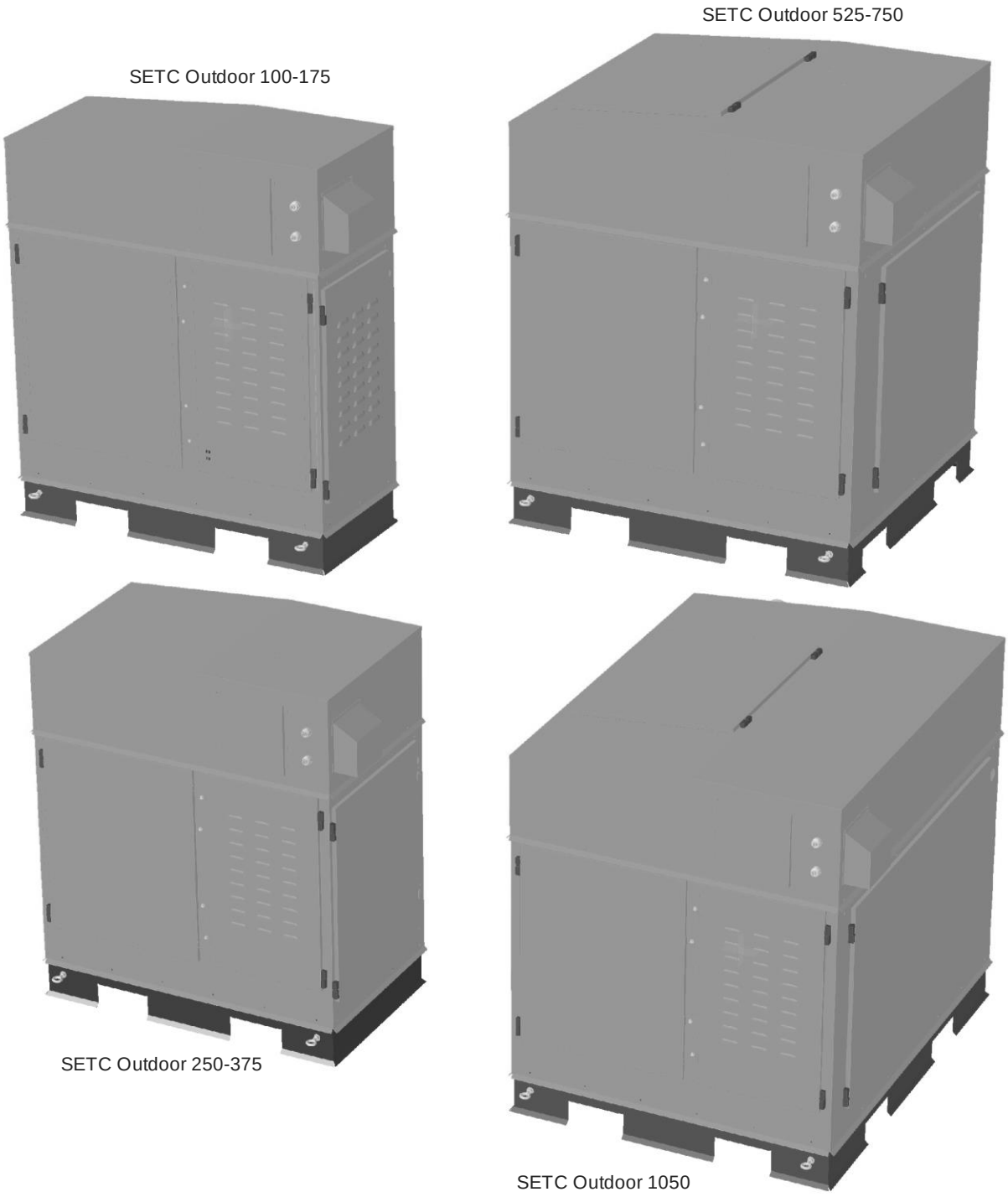



**Figure 3: SE Series Outdoor Models**

## The SETC

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 Condair Online. See Table 1: SETC Features for a listing of the two control systems features.

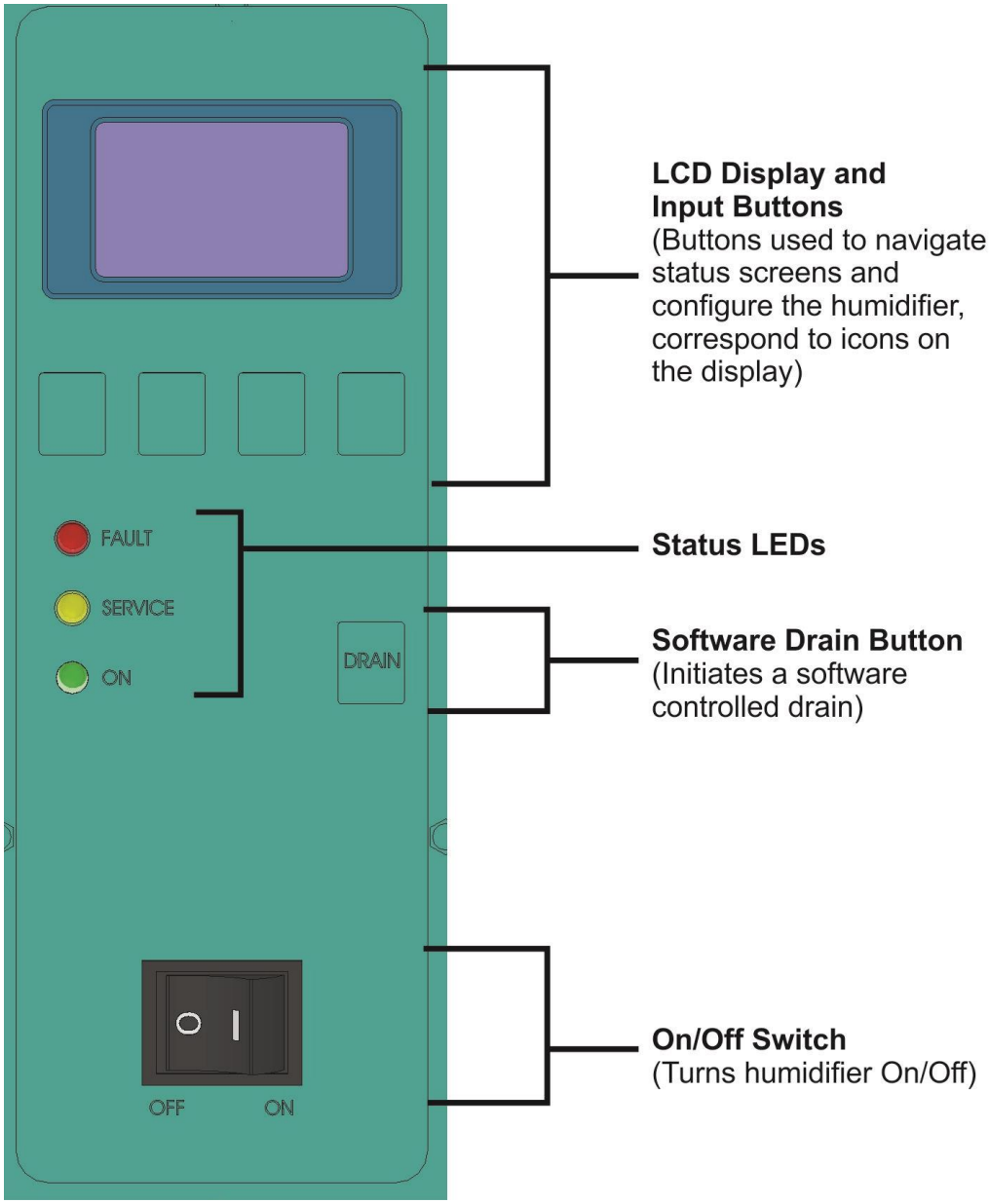



**Figure 4: SETC User Interfaces**

*The SETC LCD screen and keypad* - Allows 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

The SETC humidifier includes many advanced features that sets it apart from other humidifiers. The following list outlines some of the SE series key features.

**Table 1: SETC Features**

| General | SETC | SETC Outdoor |
|---|---|---|
| High efficiency stainless steel heat exchangers | X | X |
| Internal steam trap on each heat exchanger | X | X |
| Control Valve, actuator, and wye strainer included | X | X |
| Modulating output for excellent humidity control | X | X |
| Range of capacities to match load requirements | X | X |
| 50 to 10,500 lb/hr (23 – 4770 kg/hr) output with staged modulation. | X | X |
| Standard 230 VAC power requirement | X | X |
| C-UL-US | X | X |
| 30 month warranty | X | X |
| Clean and atmospheric steam | X | X |
| **Installation / Maintenance** | | |
| Heat exchanger with flat sides for easy cleaning. | X | X |
| Wide range of water management options | X | X |
| Floor or optional stand mounting | X | (Curb Mount) |
| Choice of steam distribution (BP, Distributor, SAM-e) | X | X |
| **Electronics** | | |
| Graphic Display Screen with Keypad input | X | X |
| LED status indicators | X | X |
| Remote status via dry points | X | X |
| Proportional and Integral Control | X | X |
| Internal control from humidity sensor inputs | X | X |
| Manual Capacity Adjustment | X | X |
| On/Off operation | X | X |
| Compatible with all standard Industrial controls | X | X |
| Single and dual channel control | X | X |
| BMS integration via Links 2 / Links XPS / e-Links to Lonworks, BACnet, Johnson | Option | Option |
| Modbus Protocol included as standard | X | X |
| **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 |

# SE Humidifier Components

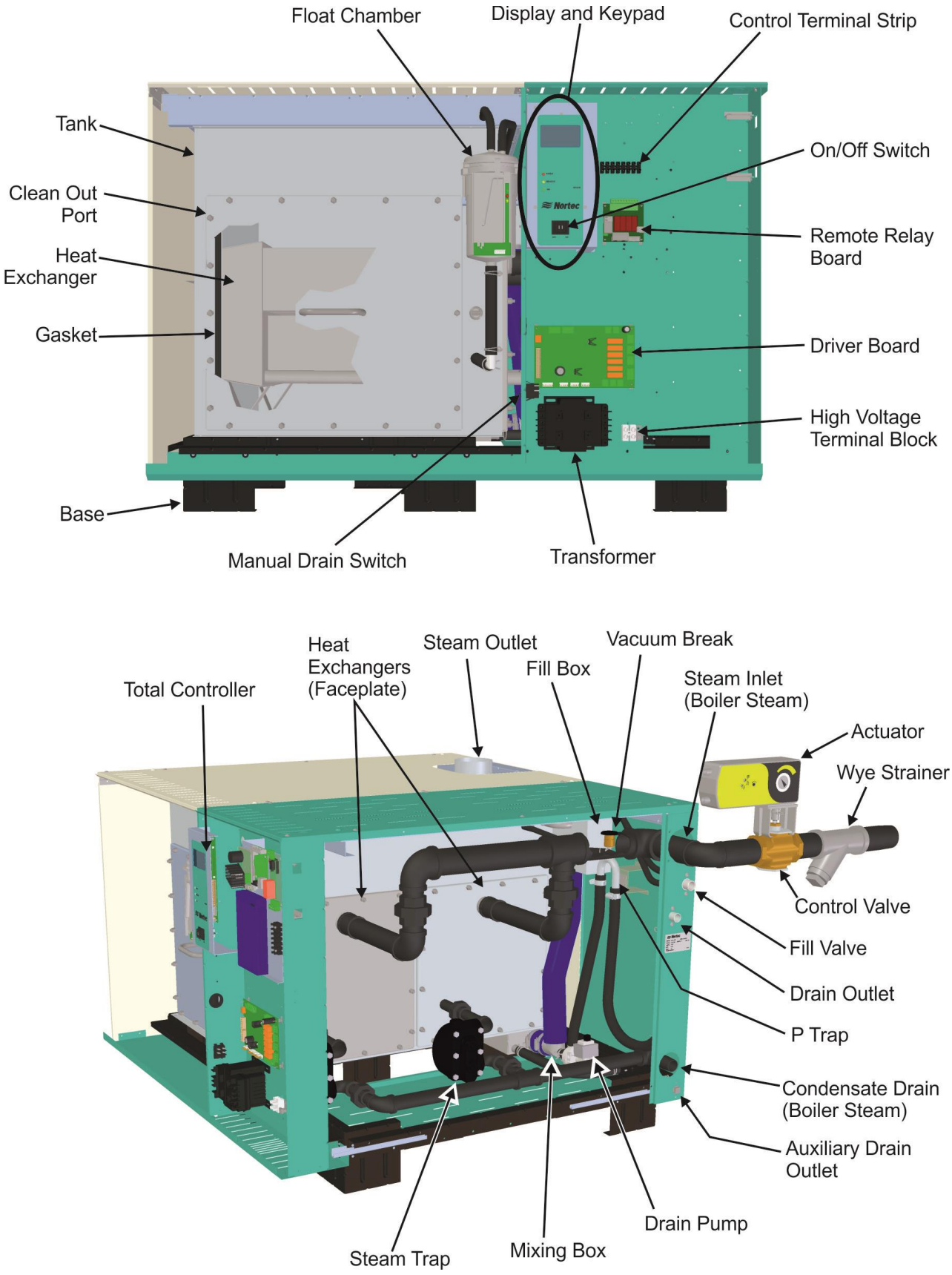



**Figure 5: SETC Humidifier Components**

# Description of Components

**Table 2: Humidifier Components**

| Component | Function of Component |
|---|---|
| Actuator | Opens and closes the control 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(s) | 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, blower pack, and actuator to humidifier. |
| Control 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 atmospheric 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 230 volts down to 24 volts for the controller and internal components such as the fill valve and drain valve. |
| Vacuum 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

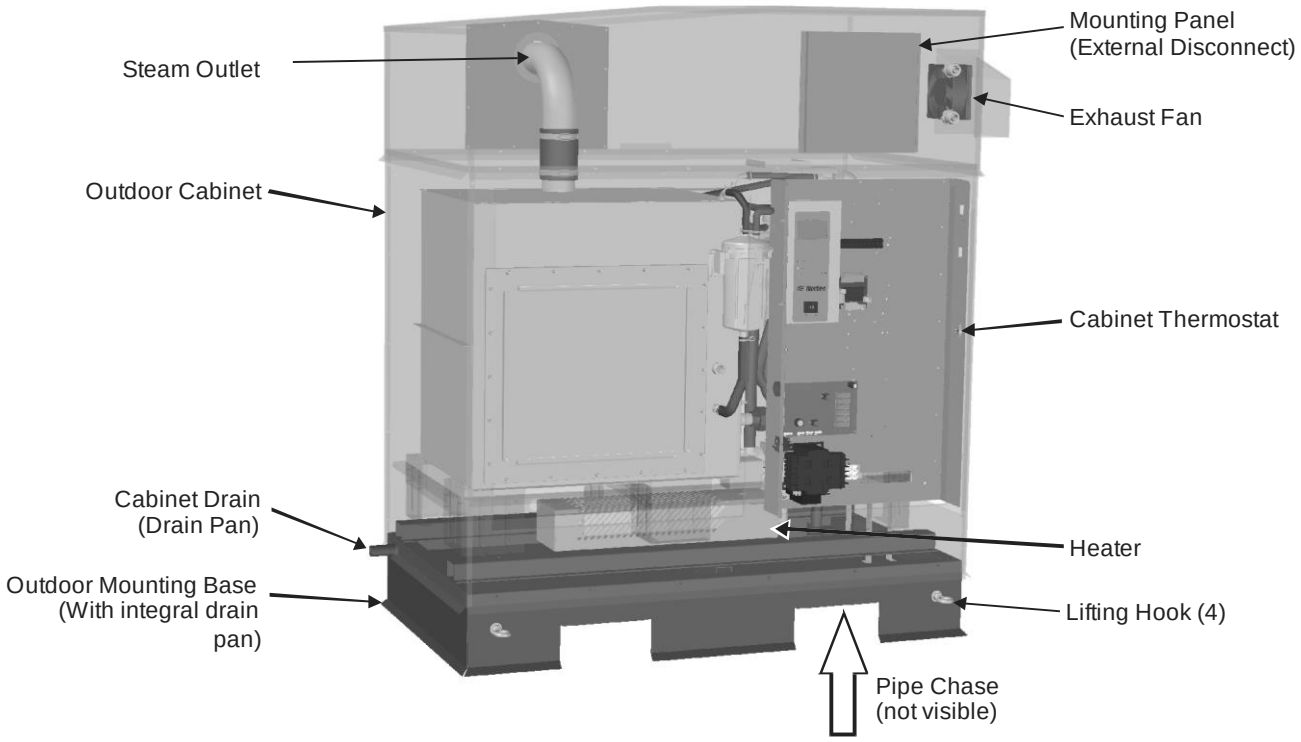



**Figure 6: SETC Outdoor Components**

**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 Specifications**

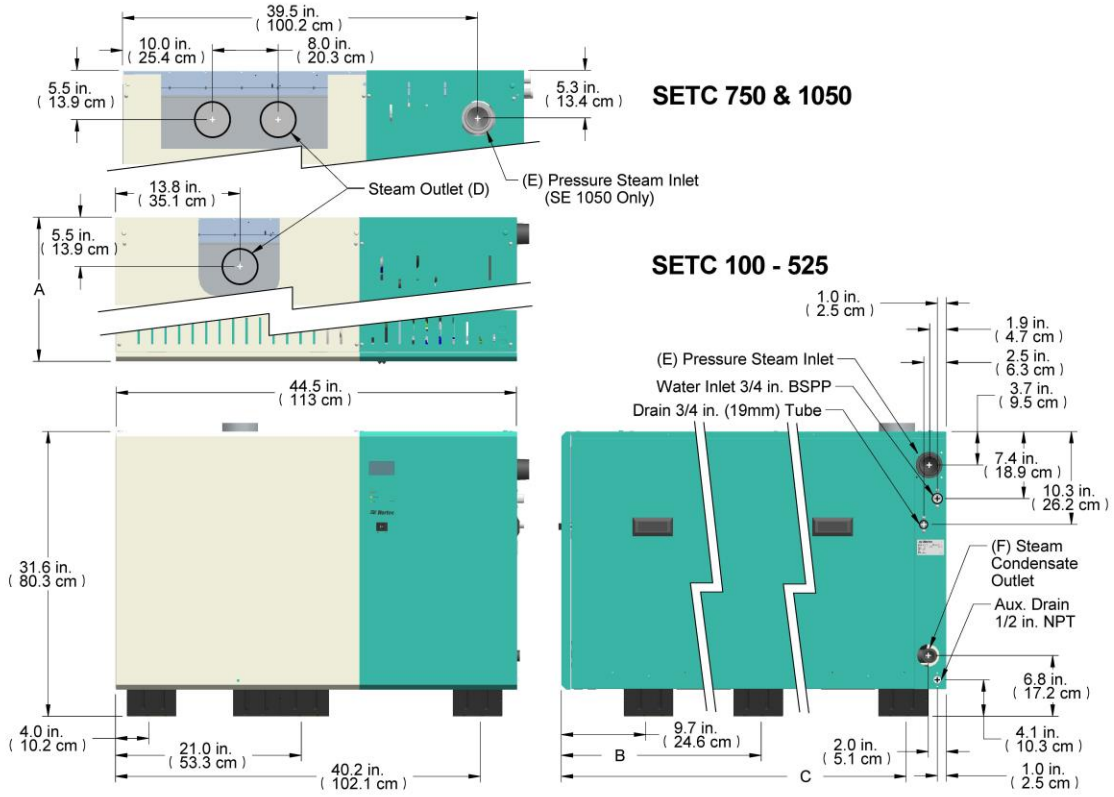
| Model | Control Valve kV (CV) | Control Valve, Steam Inlet, Wye Port (BSP) | Cond-ensate Port (BSP) | Net/Full Weight lb (kg) | Required fill line flow gal (l) /min | Required Drain capacity gal (l) /min | Electrical |
|---|---|---|---|---|---|---|---|
| 50 | 2.51 (2.9) | 1/2 | 3/4 | 125/180 (57/82) | 2.6 (10) | 5.2 (20) | Voltage 230 Phase 1 Amps 0.65 A Power 0.15 KW Max Disconnect 10 A |
| 100 | 4.76 (5.5) | 3/4 | 3/4 | 267/423 (121/192) | | | |
| 175 | 8.65 (10) | 1 | 3/4 | | | | |
| 250 | 10.38 (12) | 1 | 3/4 | 355/599 (161/272) | | | |
| 375 | 17.3 (20) | 1 1/4 | 3/4 | | | | |
| 525 | 24.22 (28) | 1 1/2 | 1 | 529/992 (240/450) | | | |
| 750 | 34.6 (40) | 2 | 1 | | 4.5 (17) | 8 (29) | |
| 1050 | 56.22 (65) | 2 1/2 | 1 1/4 | 703/1384 (318/628) | | | |

**Table 5: SETC Capacities and Water Consumption**

| Model | *Supply Steam Pressure Psig (Bar) | *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 (0.35) | 13 (6) | 15 (7) | 2.3 (9) | 0.8 (3) |
| | 10 (0.69) | 32 (14) | 36 (16) | 5.7 (21) | 1.9 (7) |
| | 15 (1.034) | 50 (23) | 58 (26) | 9.0 (34) | 3.0 (11) |
| 100 | 5 (0.35) | 26 (12) | 30 (14) | 4.7 (18) | 1.6 (6) |
| | 10 (0.69) | 63 (29) | 72 (33) | 11.3 (43) | 3.8 (14) |
| | 15 (1.034) | 100 (45) | 115 (52) | 18.0 (68) | 6.0 (23) |
| 175 | 5 (0.35) | 46 (21) | 52 (24) | 8.2 (31) | 2.7 (10) |
| | 10 (0.69) | 110 (50) | 127 (58) | 19.8 (75) | 6.6 (25) |
| | 15 (1.034) | 175 (80) | 201 (91) | 31.5 (119) | 10.5 (40) |
| 250 | 5 (0.35) | 65 (30) | 75 (34) | 11.7 (44) | 3.9 (15) |
| | 10 (0.69) | 158 (72) | 181 (82) | 28.3 (107) | 9.4 (36) |
| | 15 (1.034) | 250 (114) | 288 (131) | 44.9 (170) | 15.0 (57) |
| 375 | 5 (0.35) | 98 (44) | 112 (51) | 17.5 (66) | 5.8 (22) |
| | 10 (0.69) | 236 (107) | 272 (123) | 42.5 (161) | 14.2 (54) |
| | 15 (1.034) | 375 (170) | 431 (196) | 67.4 (255) | 22.5 (85) |
| 525 | 5 (0.35) | 137 (62) | 157 (71) | 24.5 (93) | 8.2 (31) |
| | 10 (0.69) | 331 (150) | 380 (173) | 59.5 (225) | 19.8 (75) |
| | 15 (1.034) | 525 (239) | 604 (274) | 94.4 (357) | 31.5 (119) |
| 750 | 5 (0.35) | 195 (89) | 224 (102) | 35.1 (133) | 11.7 (44) |
| | 10 (0.69) | 473 (215) | 543 (247) | 84.9 (321) | 28.3 (107) |
| | 15 (1.034) | 750 (341) | 863 (392) | 134.8 (510) | 44.9 (170) |
| 1050 | 5 (0.35) | 273 (124) | 314 (143) | 49.1 (186) | 16.4 (62) |
| | 10 (0.69) | 662 (301) | 761 (346) | 118.9 (450) | 39.6 (150) |
| | 15 (1.034) | 1050 (477) | 1208 (549) | 188.7 (714) | 62.9 (238) |

* Supply steam pressure must be present at the control 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 BSP | F BSP |
|---|---|---|---|---|---|---|
| 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 |

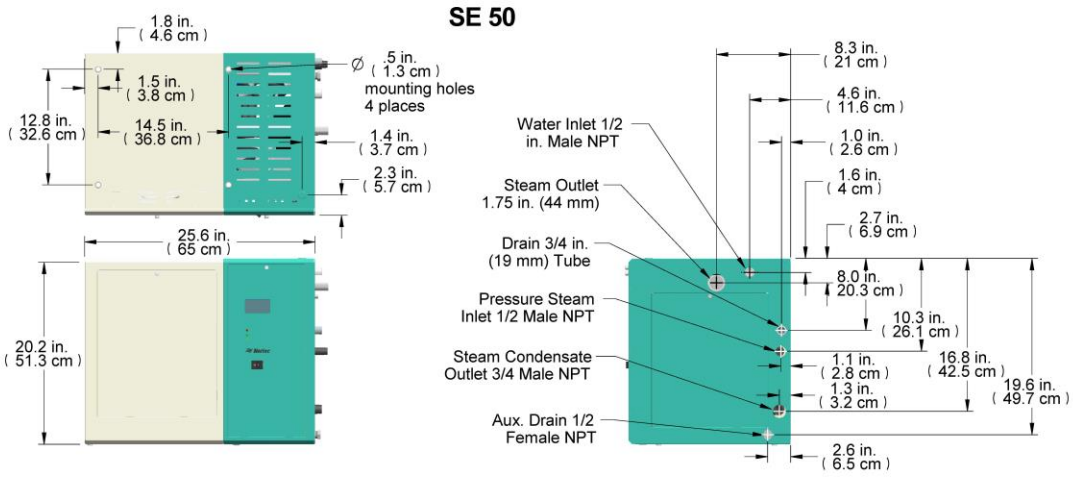
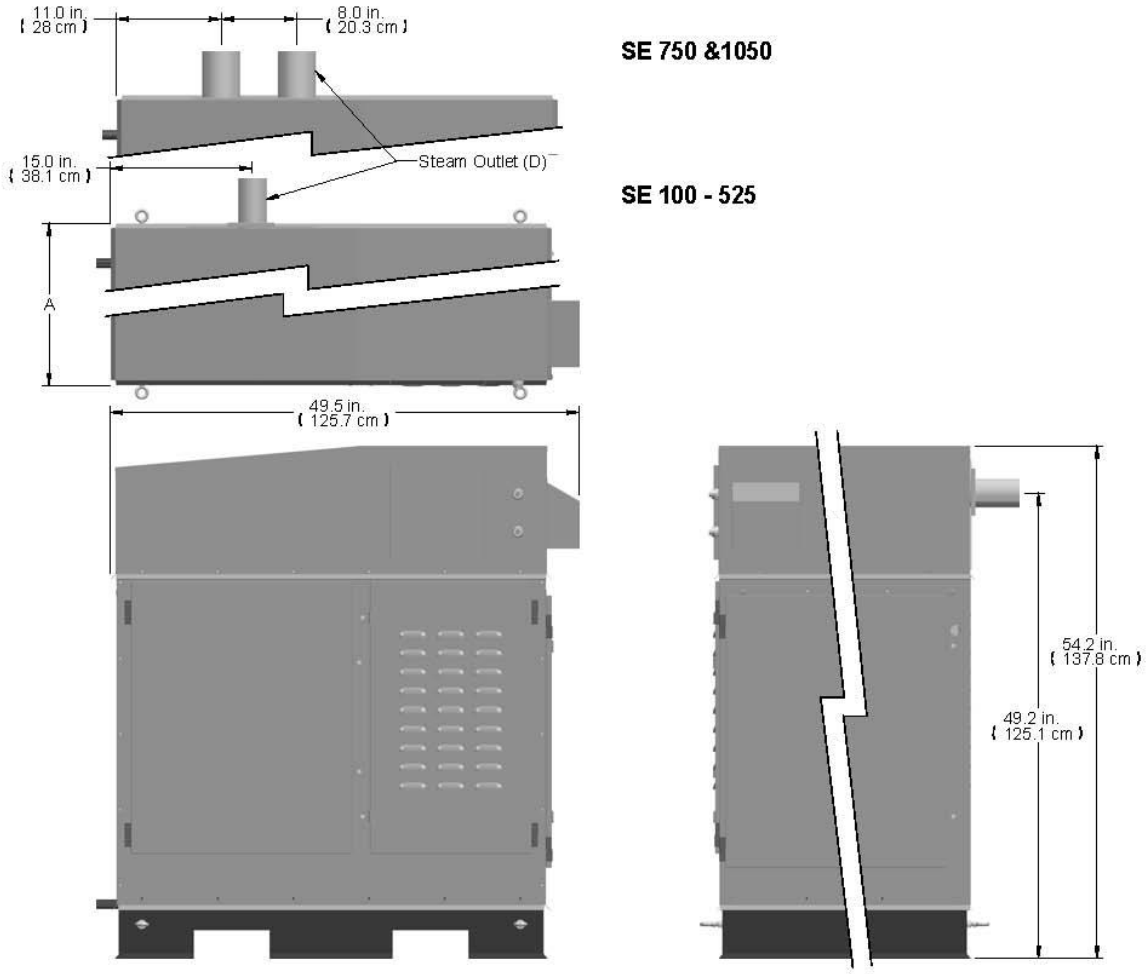



**Figure 7: SE Indoor Dimensions**

**Table 6: SETC Outdoor Specifications**

| Model | Net/Full Weight lb (kg) | Amps A | Power KW | Max. Disconnect A | Voltage and Phase |
|---|---|---|---|---|---|
| 100 | 267/423 (121/192) | 2.7 | 0.65 | 10 | Voltage 230 Phase 1 Hertz 50 |
| 175 | | 2.7 | 0.65 | 10 | |
| 250 | 355/599 (161/272) | 2.7 | 0.65 | 10 | |
| 375 | | 2.7 | 0.65 | 10 | |
| 525 | 529/992 (240/450) | 4.8 | 1.15 | 10 | |
| 750 | | 4.8 | 1.15 | 10 | |
| 1050 | 703/1384 (318/628) | 6.9 | 1.65 | 10 | |

Note: See Table 4: SETC Specifications and Table 5: SETC 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 | ¾" BSPP | 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

## 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 _____kg/hr =
Humidification Load _____ + Supply Line Losses_____+ Distribution Losses_____

**Supply Steam Pressure** _____ **BAR** Capacity at Supply Pressure _____

Humidity Control
- ☐ Demand ☐ Transducer ☐ On/Off Signal Type _____
- ☐ By Others ☐ By Condair, Part No_____

High Limit
- ☐ Demand (SETC Only) ☐ Transducer ☐ On/Off Signal Type _____
- ☐ By Others ☐ By Condair, 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** (See Table 8: Options and Accessories)

_____

_____

# Humidifier Load

The SE Series humidifiers are available with capacities ranging from 50 to 1050 lb/hr (23 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.

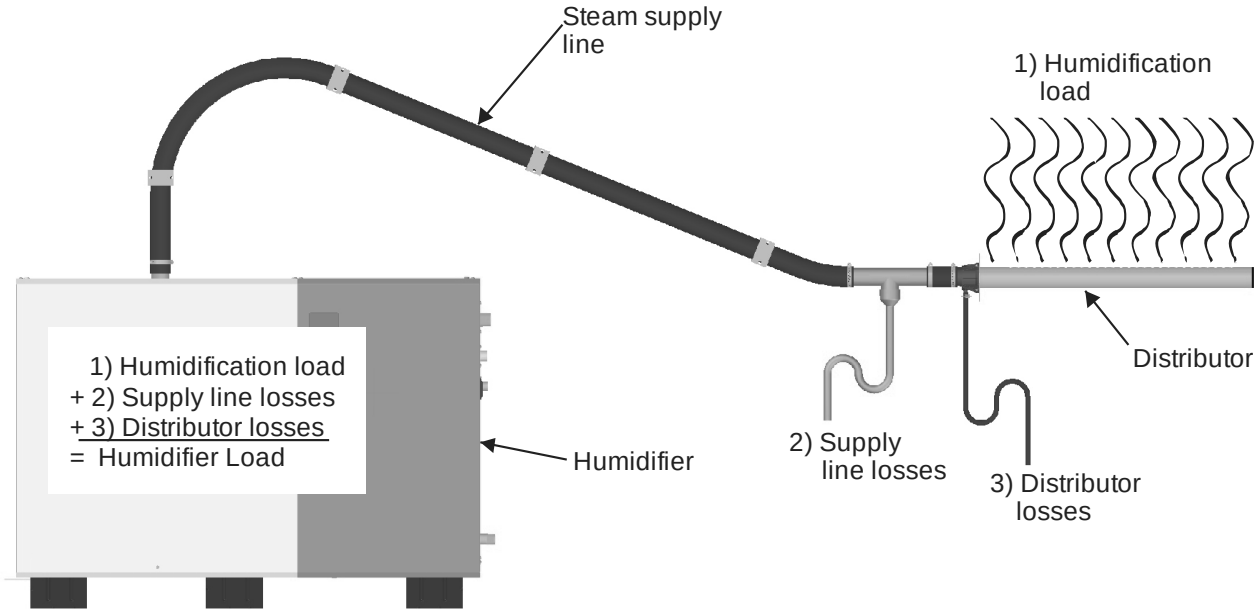



**Figure 9: Humidifier Load**

## Humidification Load

The easiest way to calculate the humidification load for any application is to use Condair's Humidifier Engineering and Load-sizing Program. Many engineering handbooks, such as the ASHRAE Handbook, also provide 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 44 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 (9.15 m) x 3 in. (76 mm) steam line with one 90° elbow.

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

A = 0.24 kg/hr/mor 0.16 lb/hr/ft

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

*B = 9.15m + 1.53m = 10.68m or 30 ft + 5 ft = 35 ft.*

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

*C = B x A*

*= 10.68 x 0.25 = 2.67 kg/hr*

*or*

*= 35 x 0.16 = 5.6 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. Distributor loss estimation depends on the type and configuration of the distributor being used. Consult the documentation for the distributor for more information.

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 (1.034 Bar). An SETC 1050 will produce 1050 lb/hr (477 Kg/hr) of steam when supplied with 15 psi (1.034 Bar) steam. If the available steam supply pressure is lower than 15 psi (1.034 Bar) measured at the control valve, then the output will be reduced as shown in Figure 10. Table 5: SETC Capacities and Water Consumption on page 10 also provides steam output at 0.69 and 0.35 BAR (10 and 5 psi) supply pressures.

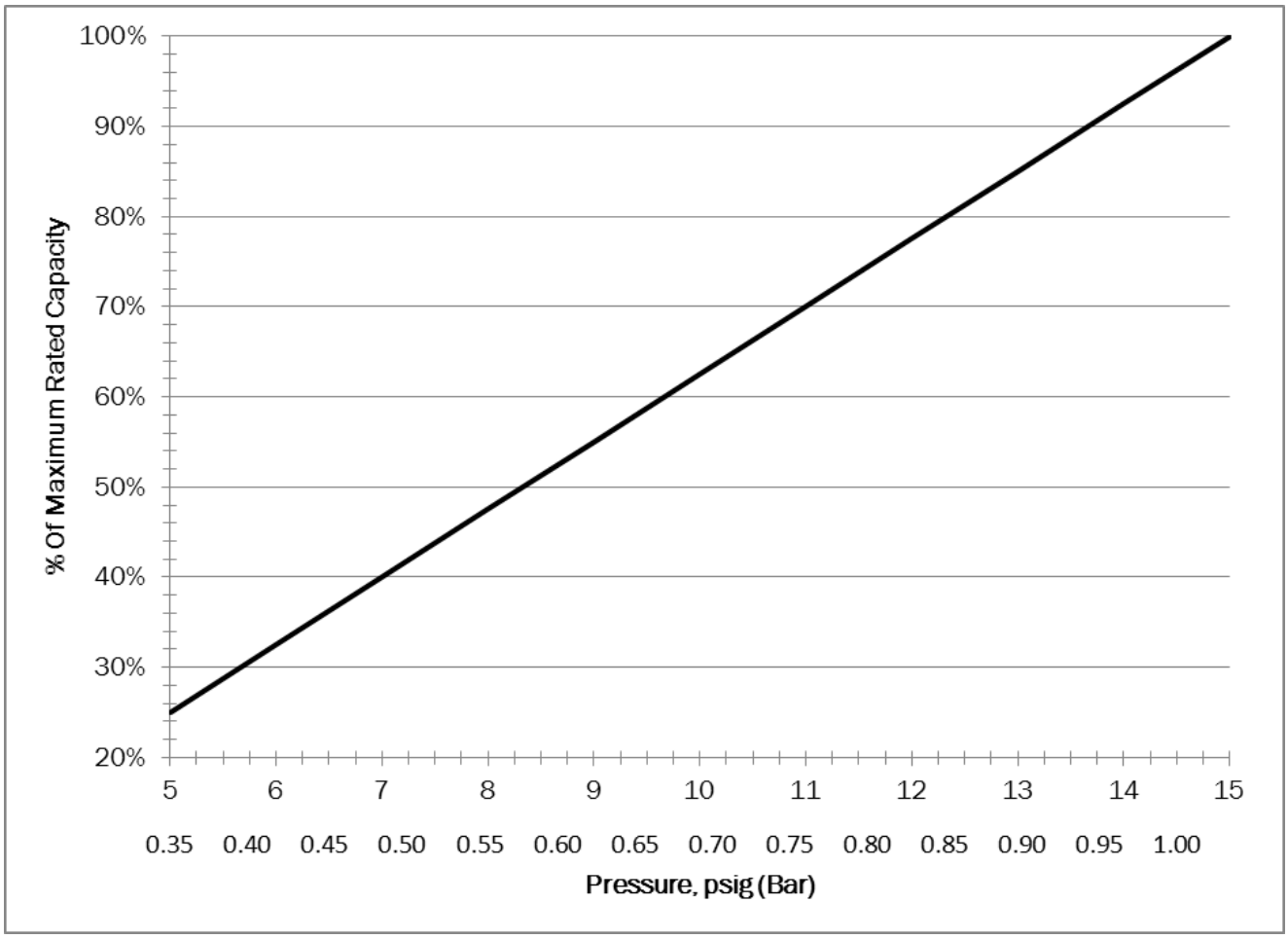



**Figure 10: Output as a Function of Supply Steam Pressure**

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 (1.034 Bar).

*Note:.*

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

*Example 2: SE 250 Output* – What is the maximum capacity of an SE 250 supplied with 12 psi (0.83 bar) steam pressure?

1. From Figure 10 the output will be reduced to 78% at 12 (0.83 bar) psi supply pressure.
2. Multiply the capacity at 15 psi (1.03 bar) by 78% to get max capacity at 12 psi (0.83 bar).

   *Max Capacity (12 psi) = 0.78 x 250 = 195 lb/hr*
   *Max Capacity (0.83 bar) = 0.78 x 114 = 89 kg/hr*

## Humidifier Controls

See SETC Controls on page 46 for a listing of controls offered by Condair and installation requirements. The SETC humidifier can be operated with one or two modulating inputs and can be operated as On/Off. Controls can be supplied by Condair or by others. SE humidifiers are compatible with the following control inputs.

**Table 7: SE Series Control Signals**

| Control Signal | SETC |
|---|---|
| 0-10 V | Demand and Transducer |
| 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 |
| On/Off | Dry Contact 24 VAC |

The control signal type can be configured by Condair at the factory or can be user configured. For the SETC the configuration is done with the LCD and keypad.

## Installation Location

Refer to the section on Location on page 29 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 Condair Steam Distributors or short absorption manifolds. Steam can also be added directly into a space by using remote mounted blower packs. Refer to the section Steam Distribution starting on page 41 for information about steam distribution methods and the steam lines used to connect the SE humidifier to steam distributors.

## SE Series Options and Accessories

Condair 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 function. A complete list of the options which can be used with the SE Series, along with corresponding part numbers, are given in the Chapter titled Submittals.

**Table 8: Options and Accessories**

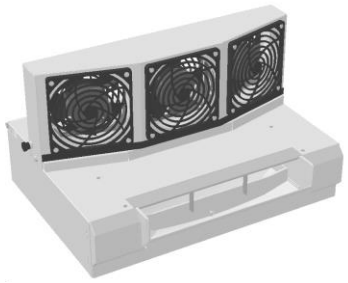
| Option / Accessory | Used For |
|---|---|
| Steam Distributors  | Steam Distributors are used for adding steam into air duct and are available in different sizes and capacities. Distributor length should be chosen to fit the full width of the duct leaving installation clearance. |
| Remote Blower Pack  | Remote blower packs are used for adding steam directly into a space remote from the humidifier. The remote blower pack has capacities of up to 100 lbs/hr (45 kg/hr). For SE units with outputs higher than this, multiple blower packs must be used. |

**Table 8: Options and Accessories (Continued)**

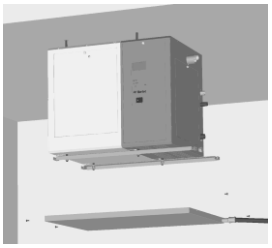
| Option / Accessory | Used For |
|---|---|
| Short Absorption Steam Distribution Manifold  | A short absorption steam distribution manifold is used for adding steam into air ducts where either higher steam capacity or short absorption is required.<br>Short absorption manifolds are available in a range of sizes to match duct dimensions and steam capacity as closely as possible.<br>Refer to the engineering manual for the particular manifold being used for more information. |
| SE 50 Ceiling kit  | The Condair SE-050 ceiling mount model includes a ceiling mounting kit (part number 2520345) which allows the it to be ceiling mounted with zero clearance to the ceiling.<br>2520345- Ceiling Mount Kit c/w Drip Pan, SE 050<br>(See also Ceiling Mounting (SE50 Only) on page 31) |
| On/ Off Humidistats  | 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.<br>(See On/Off Controls on page 47) |
| Modulating Humidistats  | 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.<br>(See Modulating Humidistats on page 47 ) |

**Table 8: Options and Accessories (Continued)**

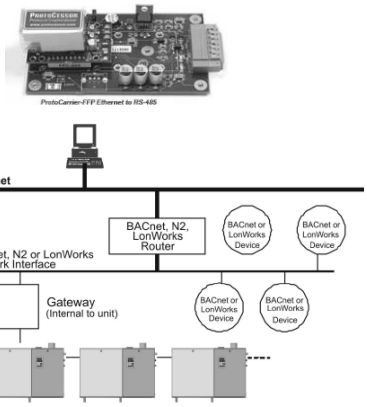
| | |
|---|---|
| Humidity Transducers<br>  | Digital Humidity Transducers communicate RH in a space or duct to the humidifier. When used with an SETC the humidifier displays the sensed RH on its LCD display screen, setpoints are entered using the humidifier keypad and the humidifier's software calculates required output based on setpoint and sensed RH. Transducers are available for room or duct installation.<br>(See Humidity Transducers on page 48) |
| Outdoor Temperature Sensor<br>  | An outdoor temperature sensor is used in conjunction with a 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.<br>(See Outdoor Temperature Reset on page 48) |
| Air Proving Switches<br>  | 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.<br>(See On/Off Controls on page 47) |
| Control Setting at Factory<br>  | The SETC can be factory ordered configured for the type of controls that will be used. Factory configuration eliminates the need to configure the SETC in the field and makes it plug and play with respect to software configuration. Part numbers are available for each available control configuration.<br>(See Control Acceptance Configured at Factory on page 48) |
| Condair e-Links / Links XPS / LINKS 2<br>  | Condair e-Links provides connectivity to BACnet, Lonworks, or Johnson N2 building management systems. A separate part number must be selected to specify the type of building management system. (SETC only)<br>(See Condair e-Links (Optional SETC)on page 52) |

**Table 8: Options and Accessories (Continued)**

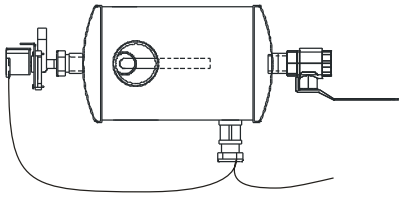
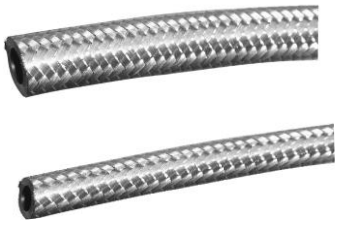
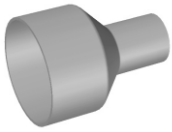
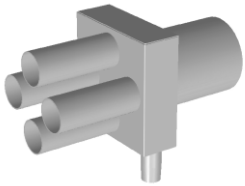
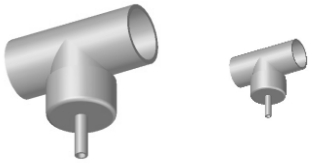
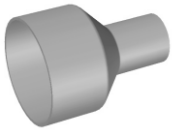
| | |
|---|---|
| External Drain water Cooler<br>  | The external drain water cooler can be used for cooling hot water such as condensate before feeding it to drain. The cooler includes a tank, water valve (electric or pneumatic) and thermostat.<br>1710010 – Drain Water Cooler Self Actuated<br>1710020 – Drain Water Cooler Electric |
| Steam and Condensate Hose<br>  | 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.<br>Condensate hose can be used for draining condensate or for connecting to copper or stainless steel condensate lines.<br>1328810 – Steam Supply Hose7/8 in. ID. 1 ft (30 cm)<br>1328820 - Steam Supply Hose 1 3/4 in. D 1 ft (30 cm)<br>1328840 – Condensate Hose 3/8 in. ID 1 ft (30 cm)<br>( See also Steam Lines and Condensate Returns on page 42) |
| Steam Line reducers<br>  | Condair 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.<br>1507846 – Steam Line Reducer 1¾ to 7/8 in. Copper<br>1508165 - Steam Line Reducer 1¾"o 7/8 in. Stainless Steel |
| Steam Line Adapters<br>  | 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. Condair offers a range of adapters suitable for combining up to 8 x 1 ¾ in. steam lines.<br>1502569 – Adapter 3 in to 2 x 1 3/4 in<br>1505270 – Adapter 3 in to 3 x 1 3/4 in<br>1505271 – Adapter 4 in to 3 x 1 3/4 in<br>1505272 – Adapter 4 in to 4 x 1 3/4 in. |

**Table 8: Options and Accessories (Continued)**

| | |
|---|---|
| Large / Small Condensate Trap<br>  | Condensate traps must be used to remove condensate that forms in steam distribution lines. Condair offers copper condensate traps to match its large and small steam hose.<br>1329634 – Steam Line Reducer 7/8 x 7/8 x 3/8<br>1329635 - Steam Line Reducer 1 3/4 x 1 3/4 x 5/8 OD<br>(See also Figure 24: Condensate Traps on page 43) |
| Double Check Valve<br>  | The SETC 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.<br>1458807 – 3/8" NPT Double Check Valve For Water Inlet Line |
| In Line Water Filter and replacement Filters<br>  | The inline water filter can be used for supply water which contains a large amount of sediment that could block the SETC fill valve strainer.<br>1329505 - In-Line Water Filter 5 Micron Filter<br>1329561 - Replacement Water Filters 1 Micron<br>1329506 - Replacement Water Filters 5 Micron |
| Condensate Pump<br>  | The condensate pump can be used for pumping either drain water from the SETC or condensate where gravity feed to a drain is not possible.<br>1429527 - Drain Water Sump Pump (High Temperature) |
| Air Gap Reducer<br>  | All SETC 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.<br>2522172 - Factory Provided External Drain Air-Gap Reducer |
| Pocket Hyrgo Thermometer<br>  | The pocket hygro thermomenter provides a means for easily checking the humidity and temperature in a space and is a useful tool for troubleshooting humidity problems.<br>1469595 - Pocket Hygro-Thermometer Digital Display |

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. Condair 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. Products to comply with CE Directives. 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.

F. Products specified below are to be manufactured in an ISO 9001-2000 certified facility.

### 1.3 Submittals:

A. Submit product data including 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 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.

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

## PART 2 - PRODUCTS

STEAM EXCHANGE HUMIDIFIERS

2.1 The CONDAIR SETC steam exchange system uses all water types including, De-Ionized (DI), Reverse Osmosis (RO), potable and softened water.

2.2 Packaged unit, wall mounted, steam exchange humidifier operating with boiler steam pressures between 5 psi to 15 psi (0.34 to 1.03 bar), with output capacities up to 1050 lbs/hr (477 kg/hr).

2.3 Unit [s] to be complete with:

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

B. 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.

C. 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 water seal.

D. Blow-down p-trap, factory installed, enclosed in cabinet, prevents steam leakage to drain. Field installation not acceptable.

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

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

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

H. Stainless steel heat exchangers shall be heat treated to increase corrosion resistance and carry a 3 year warranty.

I. Stainless steel tank lid with gasket, easily removed for maintenance.

J. Float and thermostatic (F & T) trap[s], must be included internal to the unit.

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

L. 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.

M. 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.

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

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

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

Q. 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.

2.4. Optional accessories:

A. 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.

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



*NOTE:*
The following sections provide an outline of the installation requirements. For detailed installation instructions refer to SE Series Installation and Operation Manual and to 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 Specifications and Table 6: SETC Outdoor Specification.)
- 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. Condair does not accept responsibility for installation code violations.

## Indoor Location

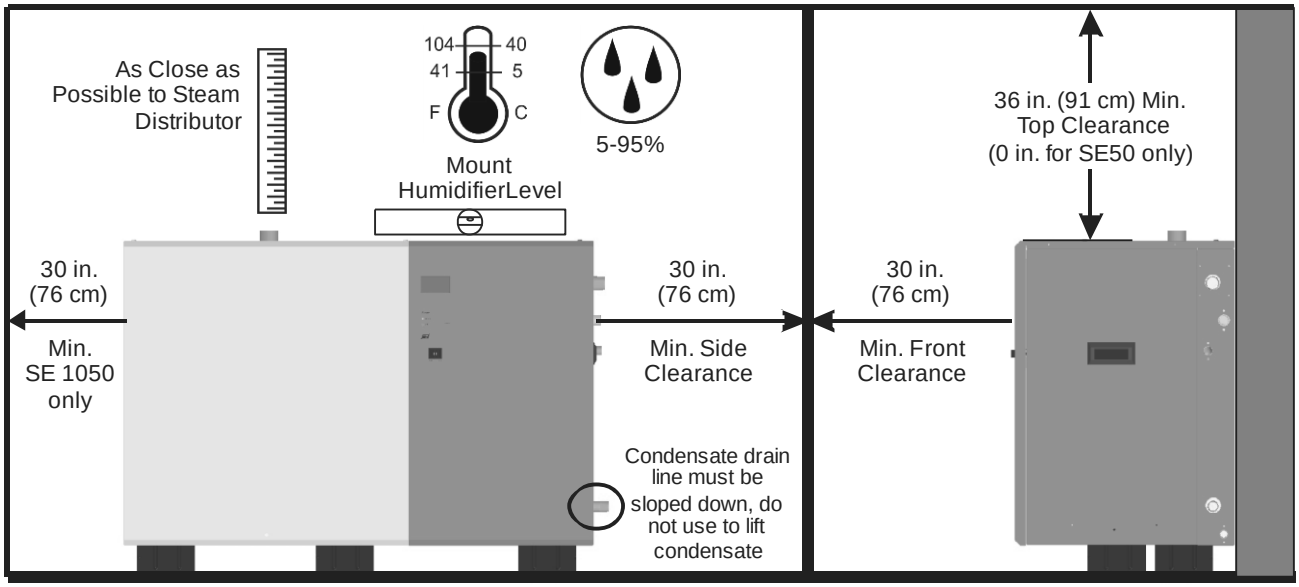



**Figure 11: SE Indoor Installation Location / Clearance**

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

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

## Mounting on Optional Stand

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 to 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.

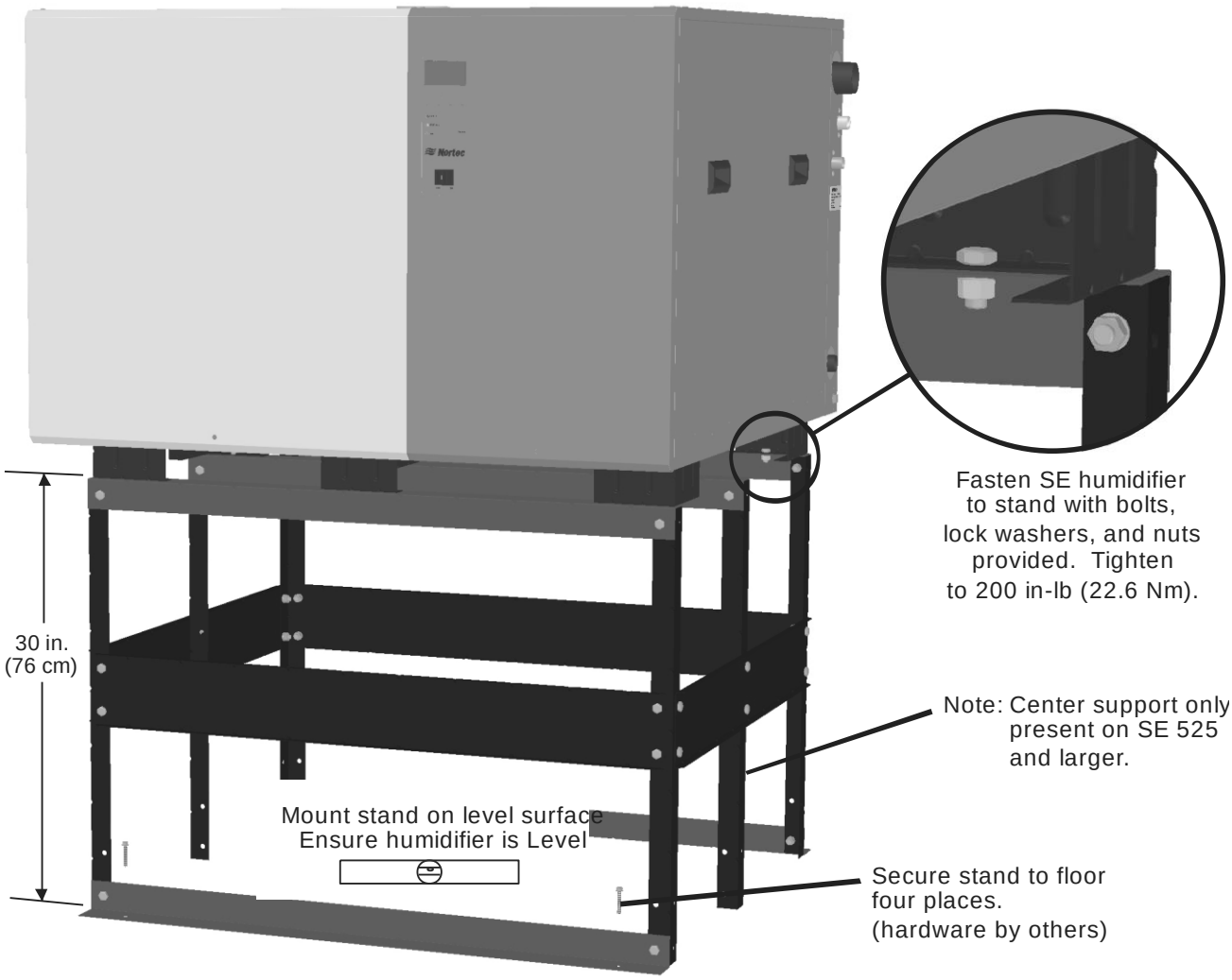



**Figure 12: Optional SE Indoor Stand**

## Ceiling Mounting (SE50 Only)

Condair 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, 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. Condair recommends a minimum 1/2 in. (13 mm) 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.

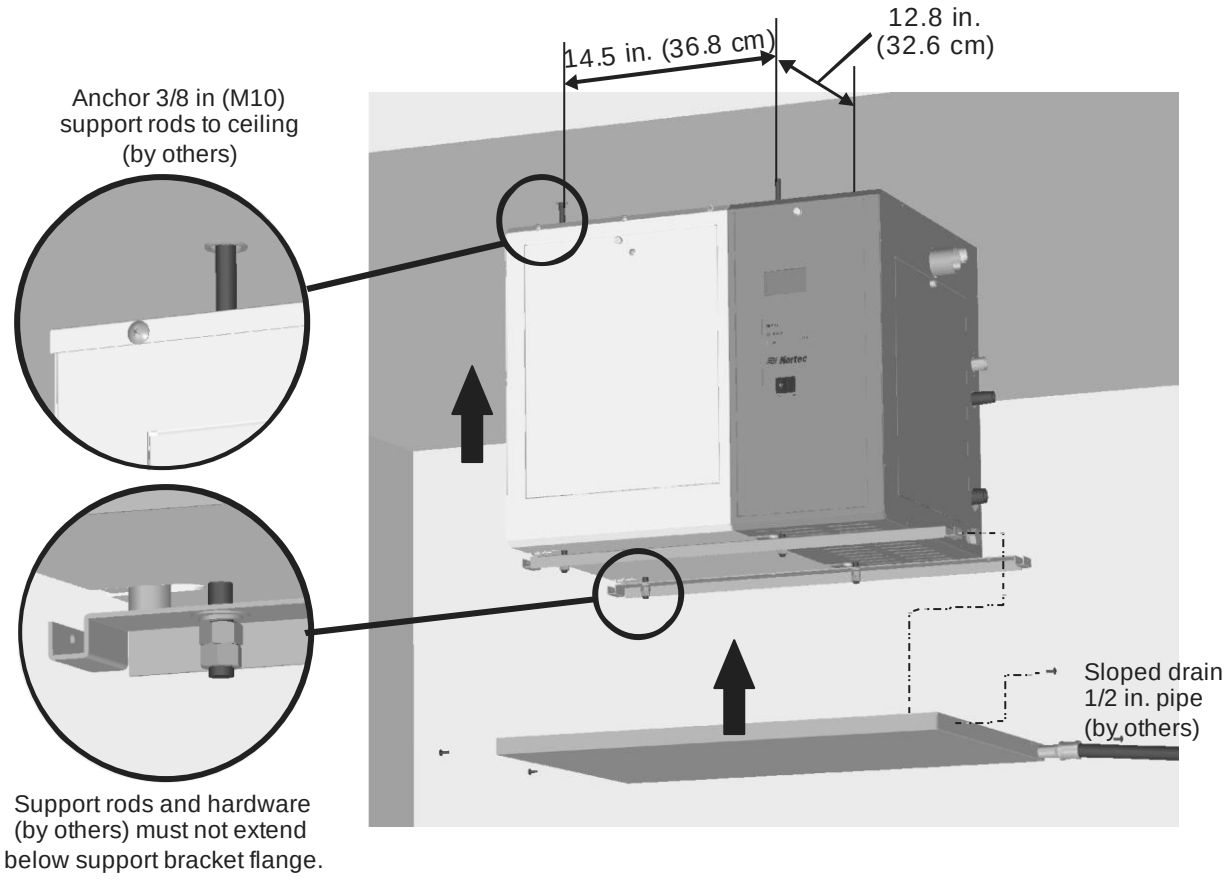



**Figure 13: Ceiling Mounting the SE50**

## Outdoor Location

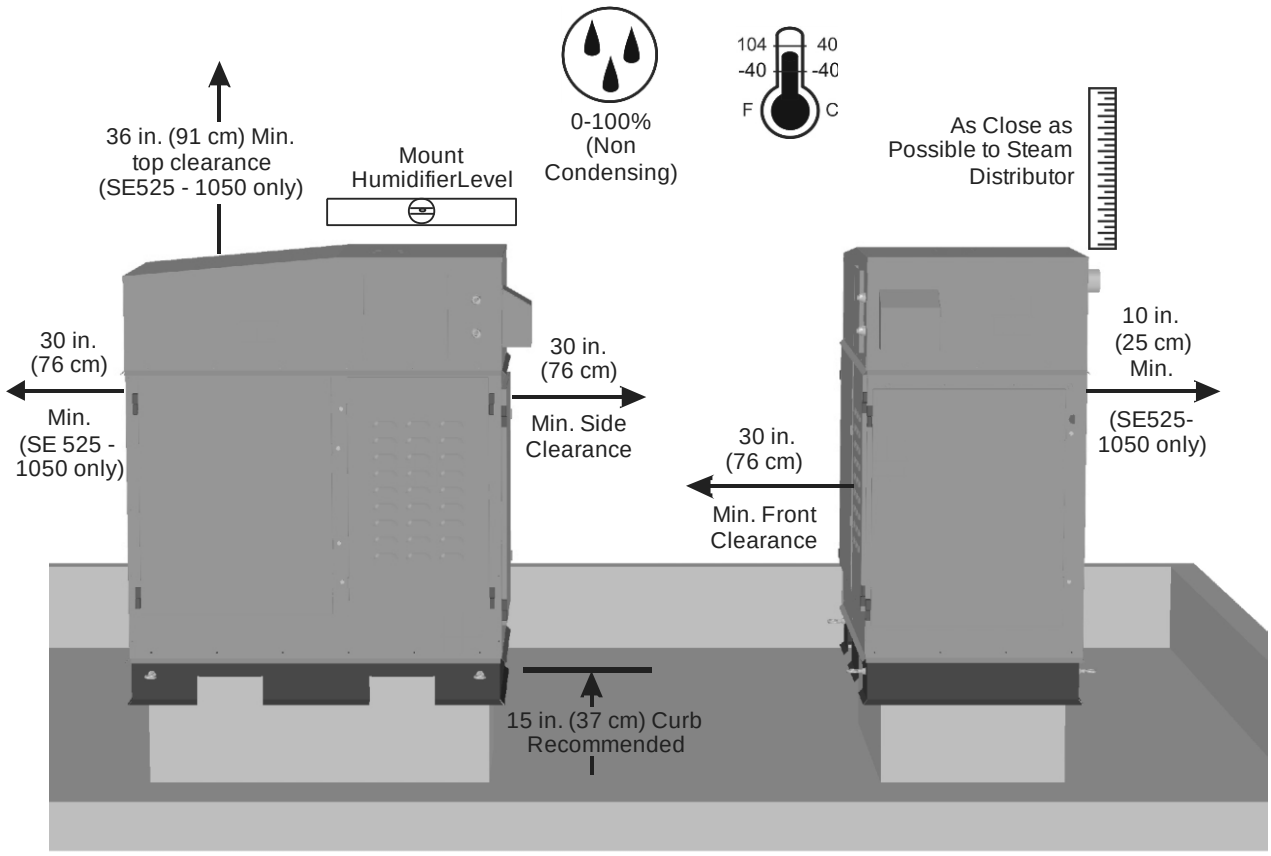



**Figure 14: SETC Outdoor Installation Location / Clearance**

*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 15: 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 and that hot moist air is not allowed to vent into the humidifier cabinetry.
- 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.

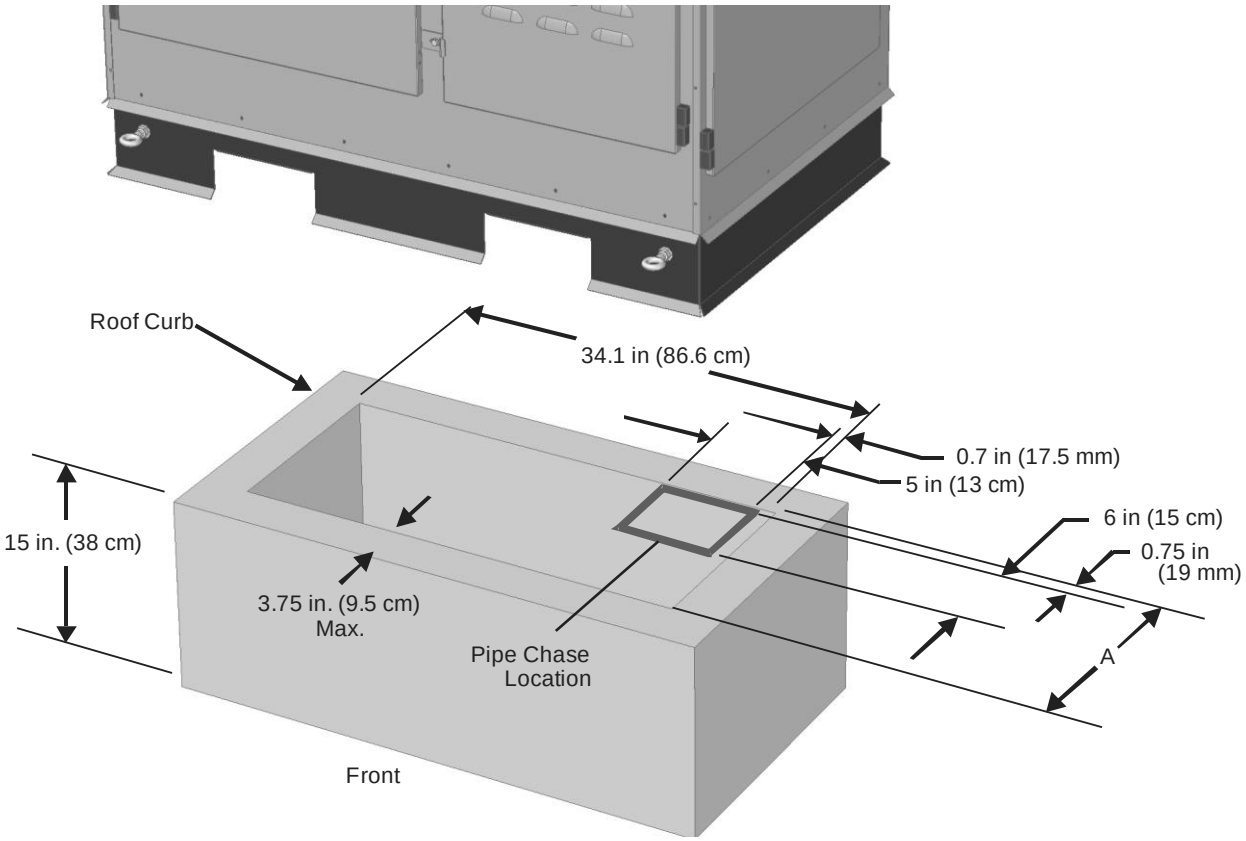
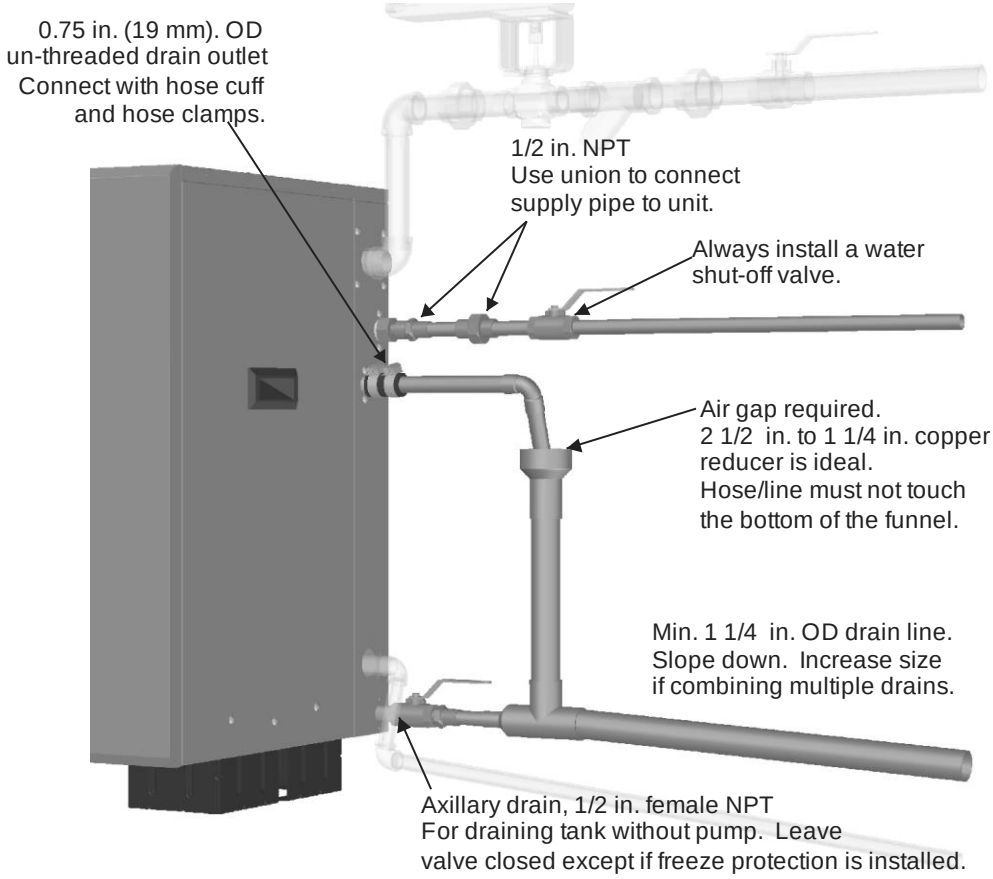



**Figure 15: SETC Outdoor Roof Curb**

**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



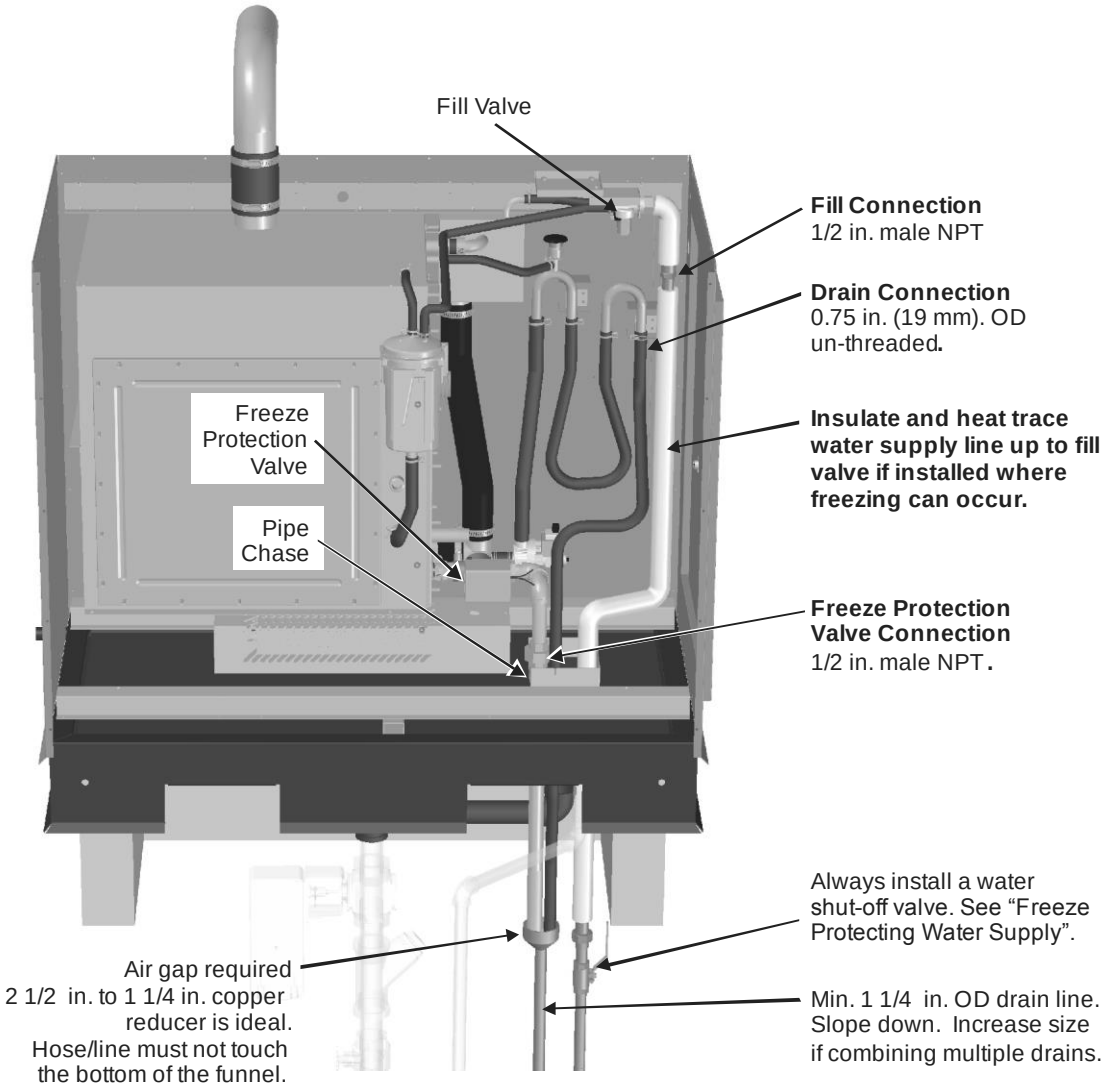

*Pipe, unions, and water shut-off valve supplied by others.

**Figure 16: SE Indoor Water Supply and Drain Connection**

*Note:* Supply cold potable water, deionized water or reverse osmosis water at 30 - 80 PSIG. (2.0 – 5.5 Bar)

**Hardness** 5 - 7 grain or 90 – 120 mg/l (as $Ca^{+2}$ as $CaCO_3$)
**Total Dissolved Solvents** (TDS) 0.5-3 mg/l **Conductivity** 1 to 70 mho/cm
**Chlorides** 0 - 40 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.
- Ensure 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 17: 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 ºF (0 ºC) 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.

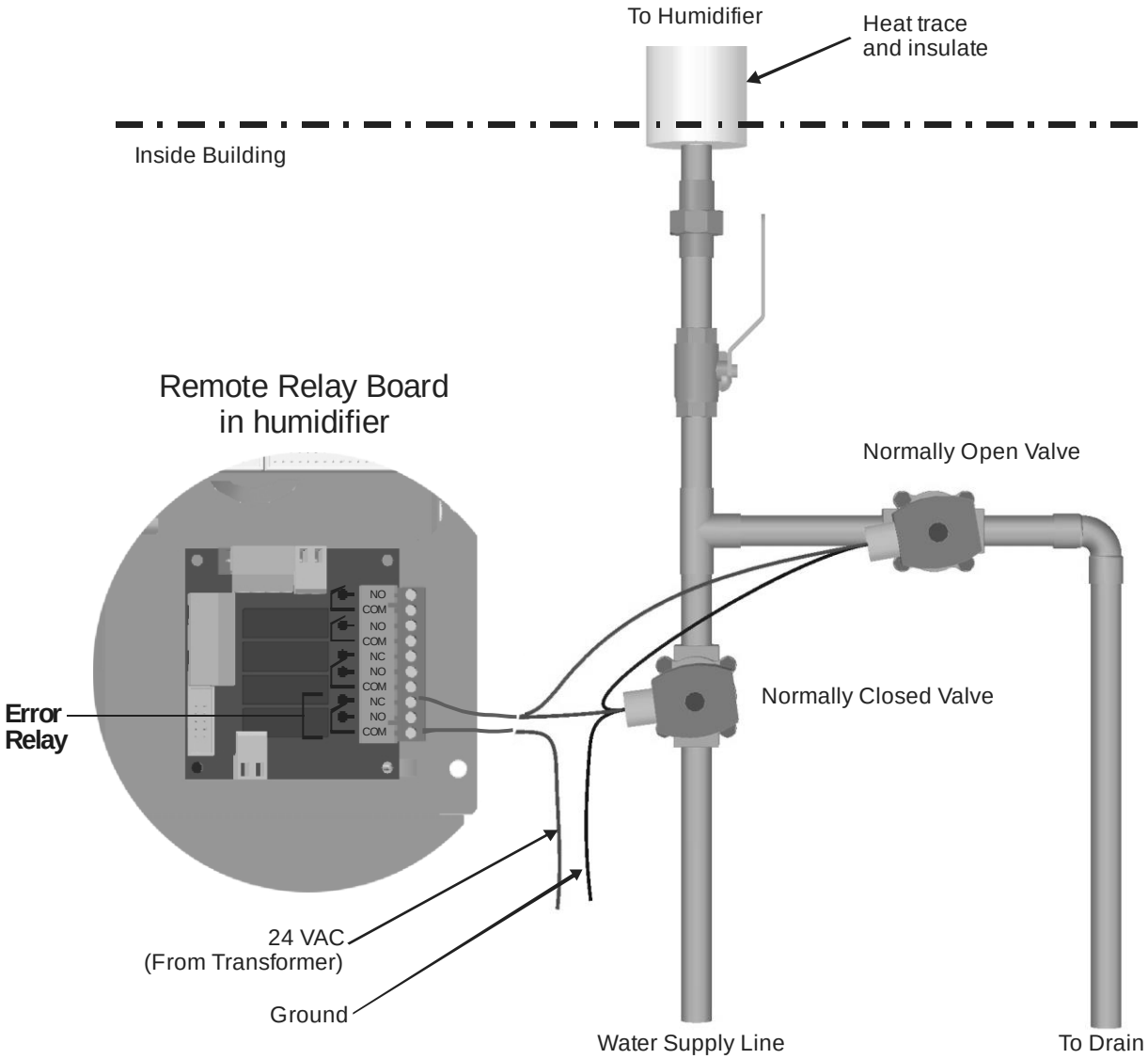



**Figure 18: Freeze Protecting Water Supply**

# Boiler Steam and Boiler Condensate Return

Note:.

- Damage to SE heat exchanger will occur if it is exposed to pressure above 20 psi (1.38 Bar). A safety relief valve must be installed to prevent the SE from being exposed to pressure in excess of 15 psi (1.03 Bar) 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 (control 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.

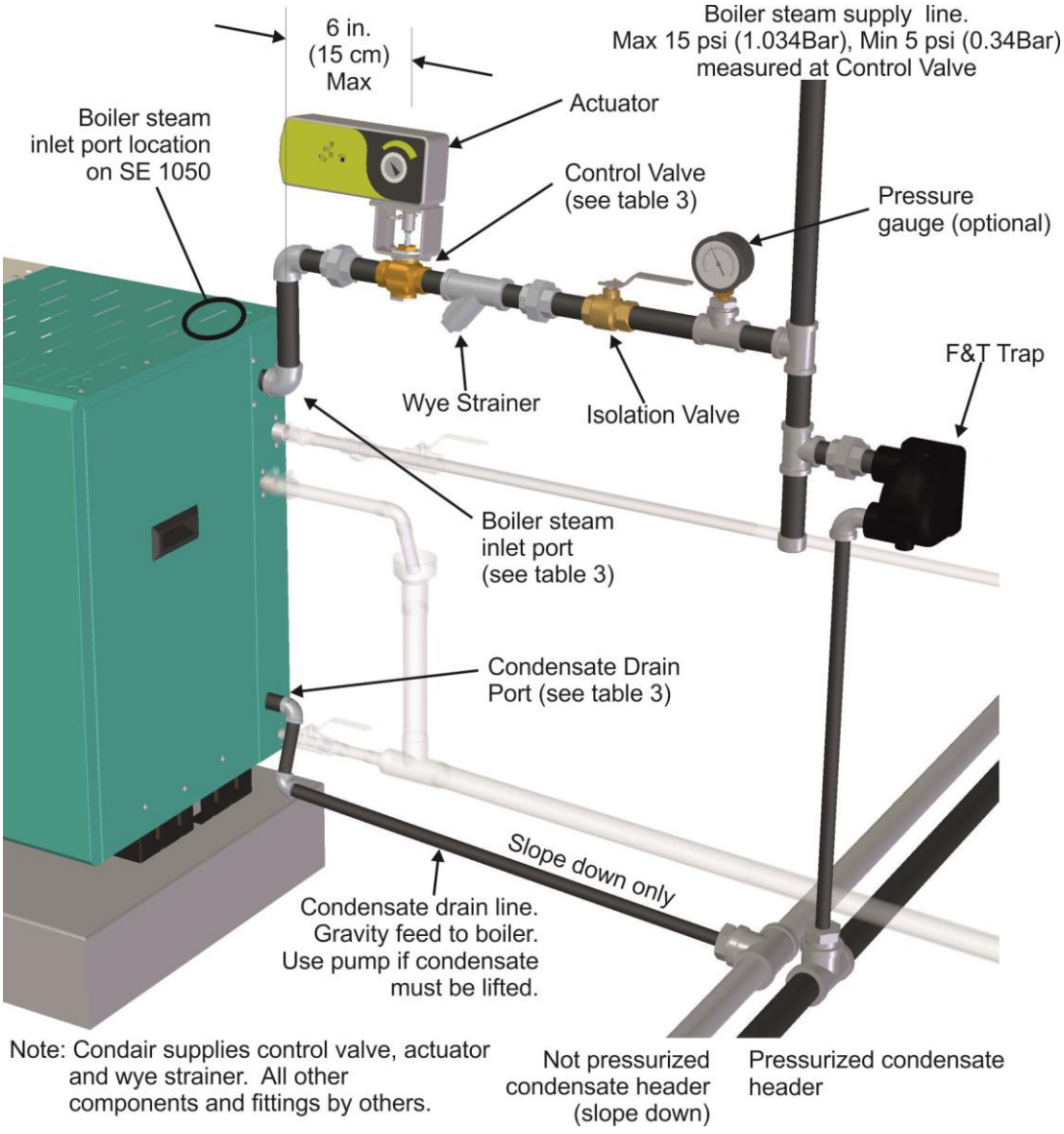



**Figure 19: SE Indoor Boiler Steam and Condensate Connection**

The port sizes of the control valve, boiler steam inlet port, and condensate drain port are given in Table 4: SETC 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 control valve when the control valve is completely open (100% demand). The diameter of the supply line up to the wye strainer may have to be oversized to ensure proper steam pressure.
- The SE will operate on supply steam pressures between 0.35 and 1.034 BAR (5 and 15 psi) measured at the control valve. Lower steam supply pressures will result in lower output. See Table 5: SETC 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.

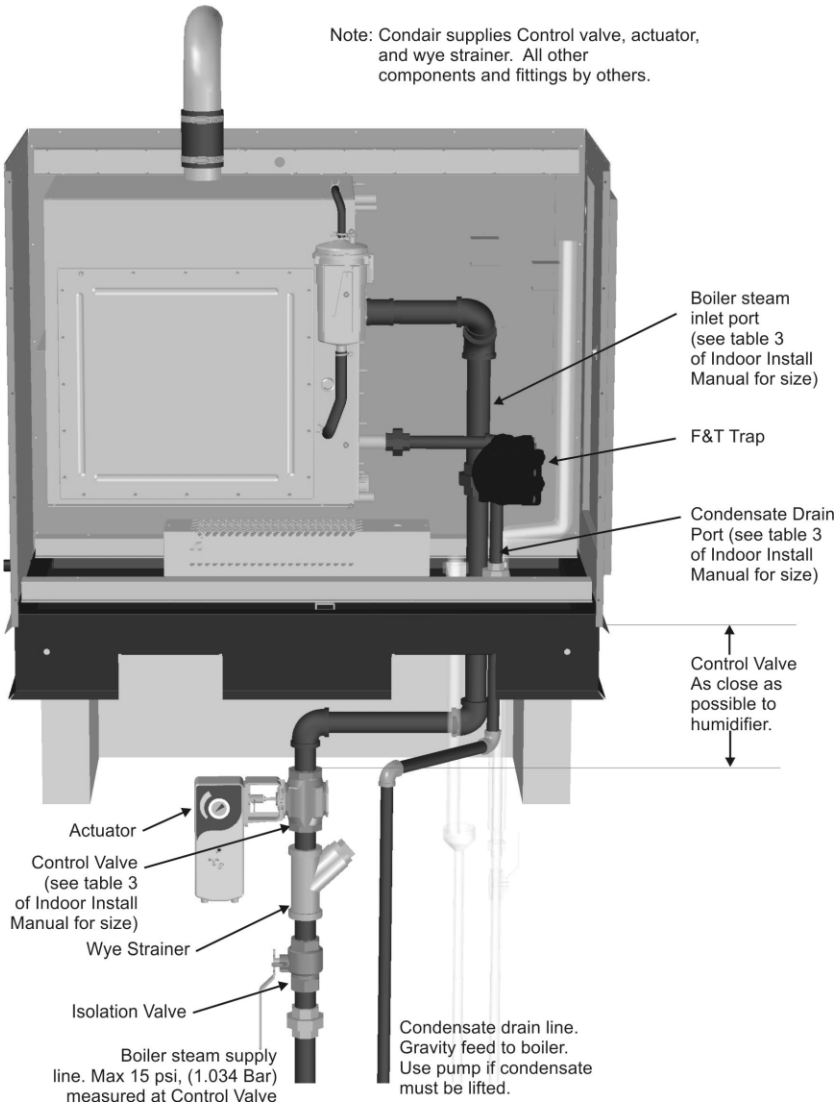
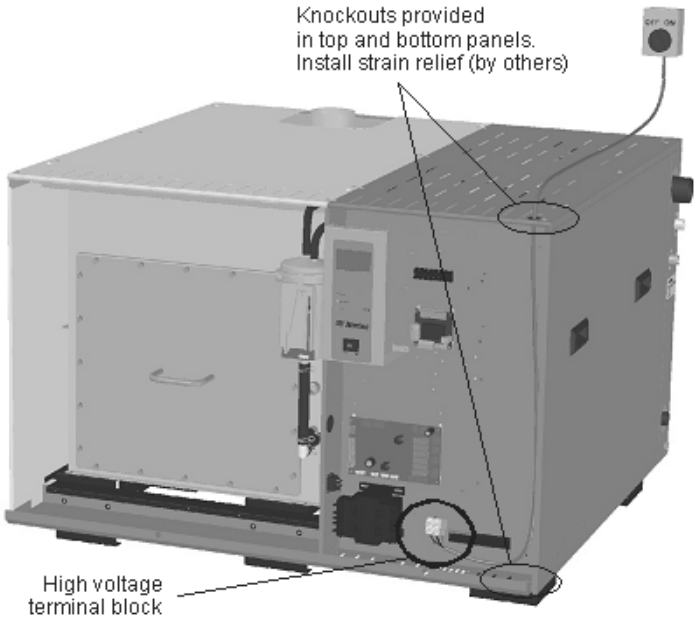



**Figure 20: SE Outdoor Boiler Steam and Condensate Connection**

# Electrical

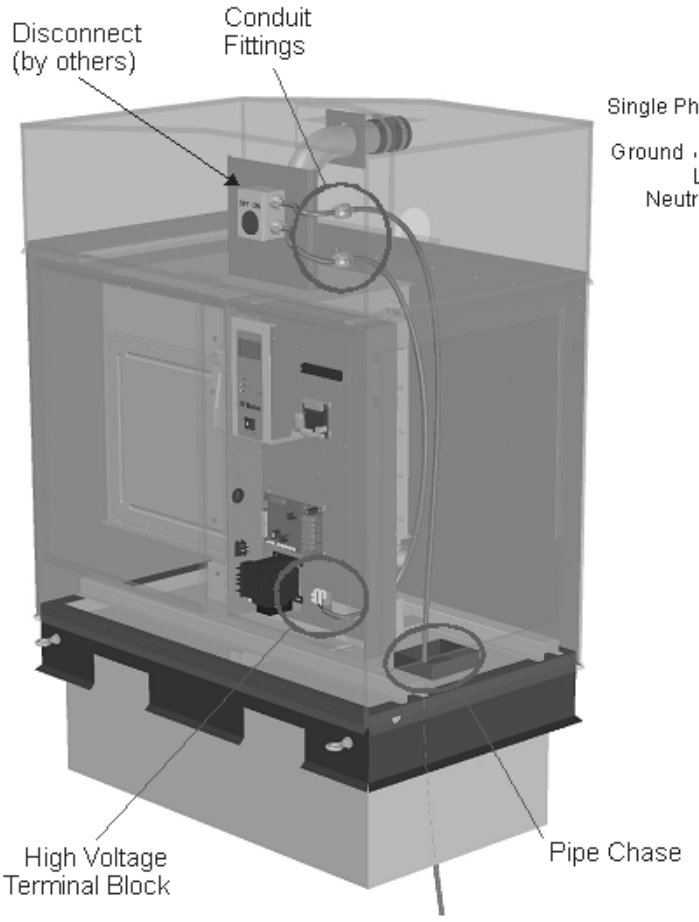
*Caution:*

All SE humidifiers operate on 230 VAC, single phase, 50 HZ power. Refer to specification label for power requirements.




**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.



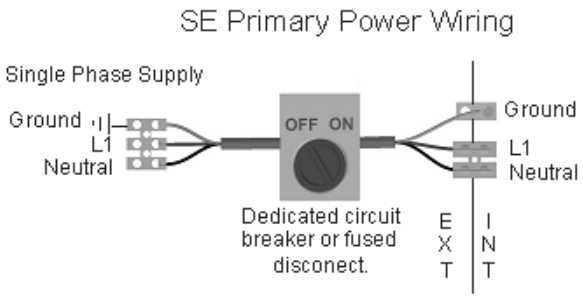




**Figure 21: Primary Power Connections**

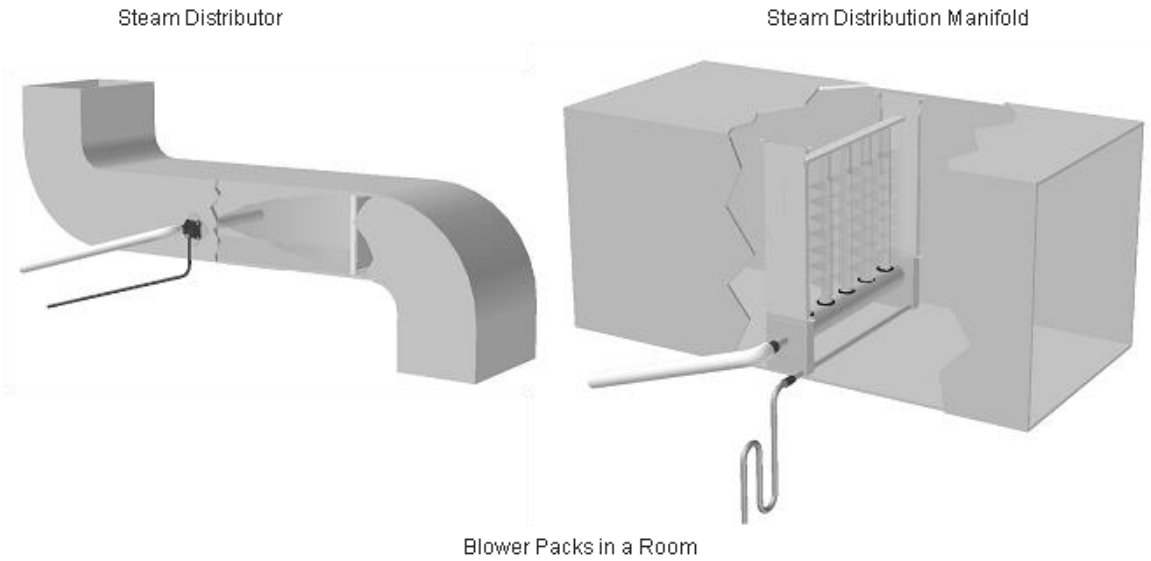
## Steam Distribution

The best way to add steam into a conditioned environment is to add it in a supply air duct or an air handler. Condair offers both single steam distributors as well as short absorption steam distribution manifolds for adding air to ducts and air handlers (see Figure 22).

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. Fan built into the blower packs help disperse the steam directly into the space being humidified.

Refer to the engineering manual for the specific distributor being considered for more information.

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



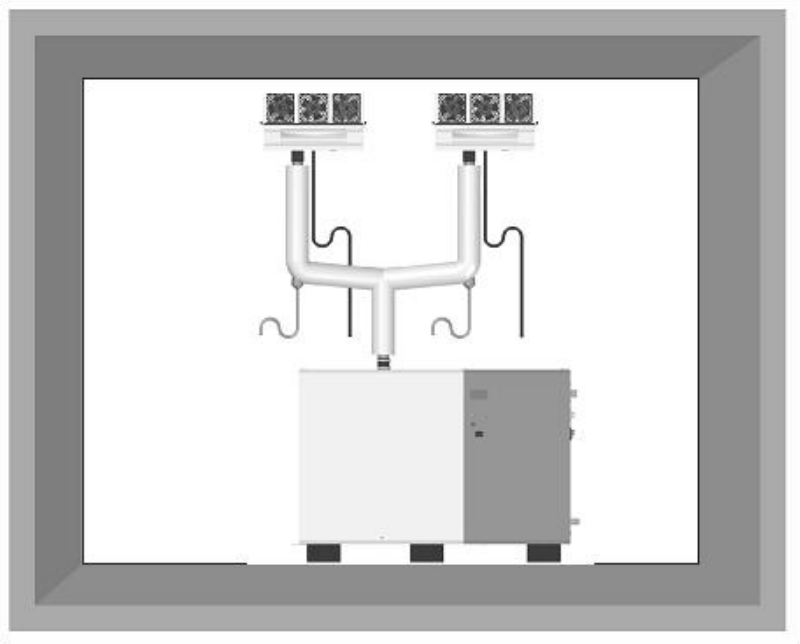




**Figure 22: Methods of Steam Distribution**

# Steam Lines and Condensate Returns

### Steam Line Length

The SETC 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 atmospheric steam line between the tank steam outlet and the distributor may be Condair 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 is an atmospheric steam generator so it is very important no restrictions are present in the atmospheric 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.

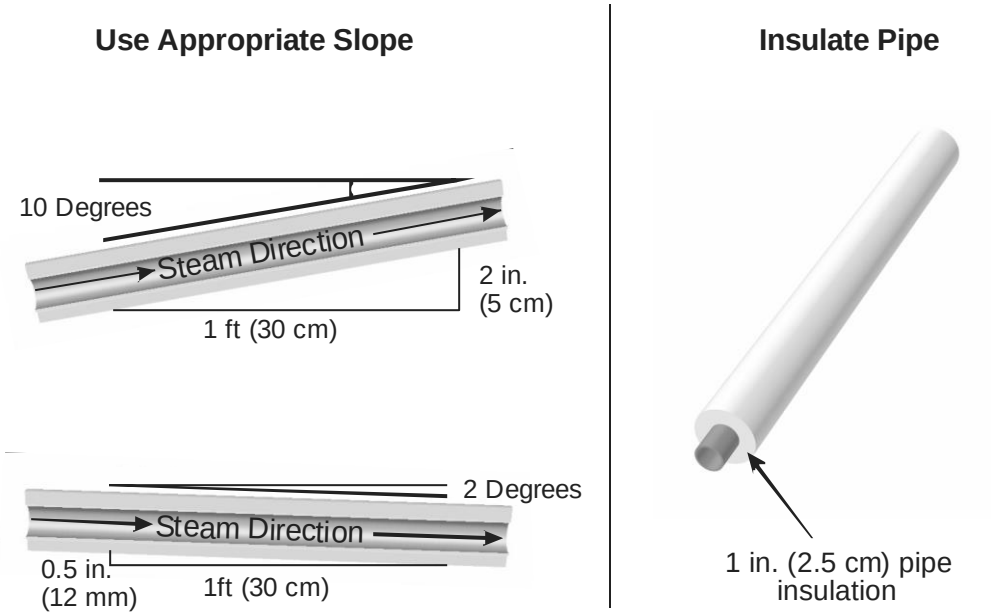



**Figure 23: Main Steam Line Requirements**

### *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 ft | Steam Line Length m | Steam Line Description |
|---|---|---|---|---|
| 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 |
| Condair Hose | 31-100 (14-45)** | <15 | <4.5 | ***Part Number 1328820 (1 3/4") |

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

### Condensate Returns

- 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 steam distribution maifold 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.

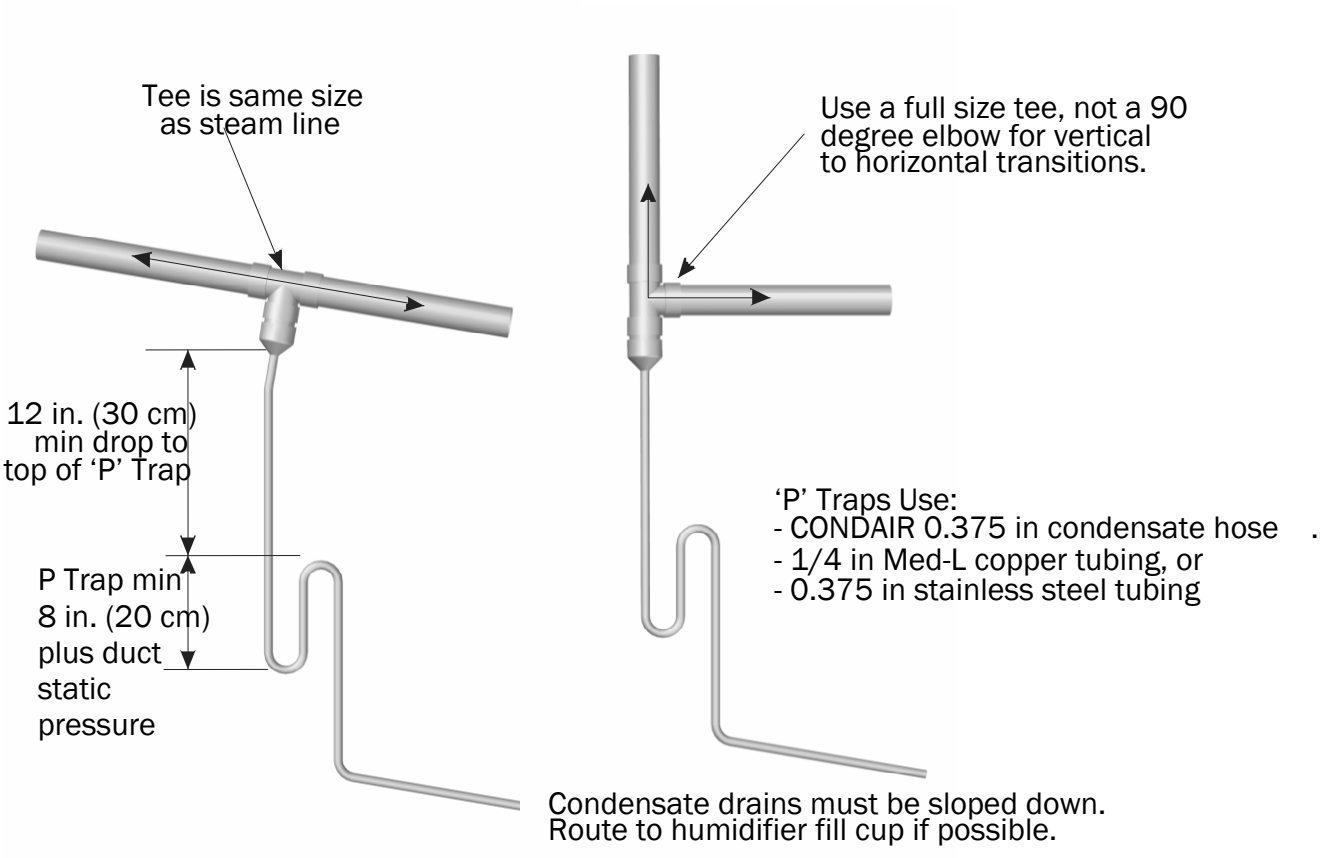


**Table 11: Maximum Recommended Length of Steam Line**

| 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 25: Steam Distributor Above Humidifier (Copper Steam Line) shows a typical steam line routing between a SE humidifier and a short absorption manifold. Refer to the design document for the specific distributor being used for more information.

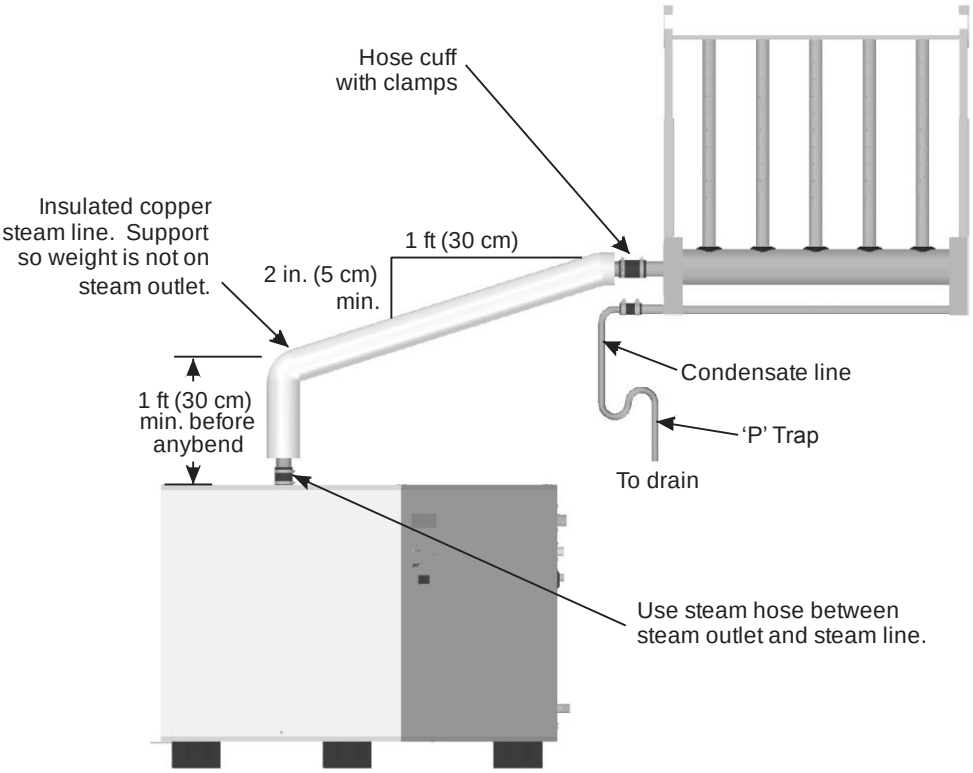



**Figure 25: Steam Distributor Above Humidifier (Copper Steam Line)**

## 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 26: SETC Outdoor Steam Outlet.
- The SETC Outdoor steam line must be insulated in all cases, even for very short runs.

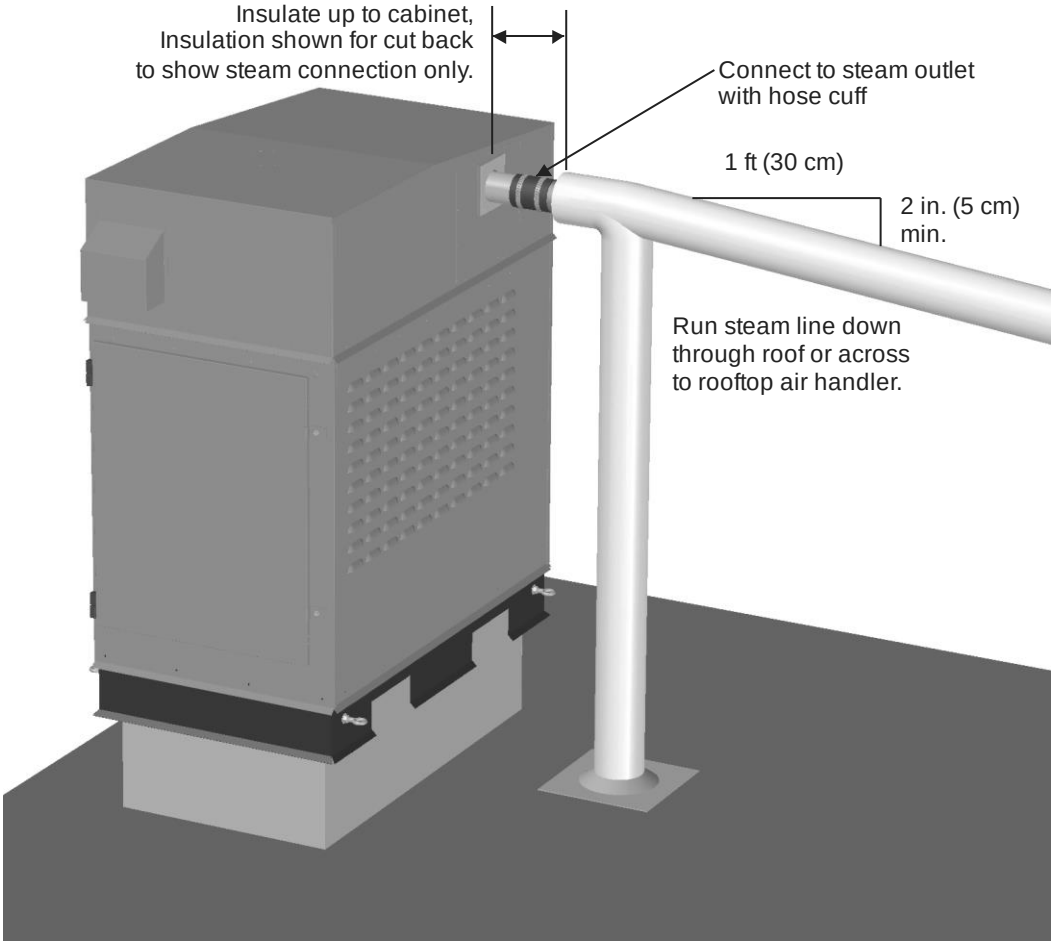



**Figure 26: SETC Outdoor Steam Outlet**

## SETC Controls

Controls are available from Condair 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 SETC can be operated as On/Off.
- The SETC humidifier control type can be configured via its LCD and keypad.
- The SETC 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 |
|---|---|---|
| Dual Channel | Modulating Demand<br>Modulating High Limit<br>On/Off Safety | 0-5, 1-5, 0-10, 2-10, 0-16, 3.2-16 VDC<br>0-20, 4-20 mA |
| | Transducer Control<br>Transducer high limit<br>On/Off Safety | 0-5*, 1-5, 0-10*, 2-10, 0*-16, 3.2-16 VDC<br>0-20*, 4-20 mA |
| Single Channel | Modulating Demand<br>On/Off High Limit **<br>On/Off Safety** | 0-5*, 1-5, 0-10*, 2-10, 0*-16, 3.2-16 VDC<br>0-20*, 4-20 mA |
| | On/Off **<br>Modulating High Limit<br>On/Off Safety** | 0-5, 1-5, 0-10, 2-10, 0-16, 3.2-16 VDC<br>0-20, 4-20 mA |
| | Transducer Control<br>On/Off High Limit **<br>On/Off Safety** | 0-5, 1-5, 0-10, 2-10, 0-16, 3.2-16 VDC<br>0-20, 4-20 mA |
| | On/Off **<br>Transducer High Limit<br>On/Off Safety** | 0-5, 1-5, 0-10, 2-10, 0-16, 3.2-16 VDC<br>0-20, 4-20 mA |
| On/Off | On/Off Control**<br>On/Off High Limit**<br>On/Off Safety** | 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, Condair humidifiers must have a closed circuit across their on/off security loop control terminal to operate. Condair highly recommends the use of a high limit humidistat and an air proving switch in series for this function.

# Condair Controls

Condair provides optional On/Off controls, modulating humidistats, or humidity transducers. 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 Condair 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 ±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 ±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.

## Modulating Humidistats

Modulating Controls are used to send a modulating demand signal to the Condair humidifier. Different models can accept different signals (see Table 13: Humidifier Control Configurations) Condair 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 ±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 ±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 ±3% at 25°C, outputs a 0-10 VDC signal.

## Humidity Transducers

Transducer Sensors are signals sent back to either a controller or back to the humidifier. The SETC, 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.

## 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 Condair 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 27). Install the temperature sensor near the fresh air intake.

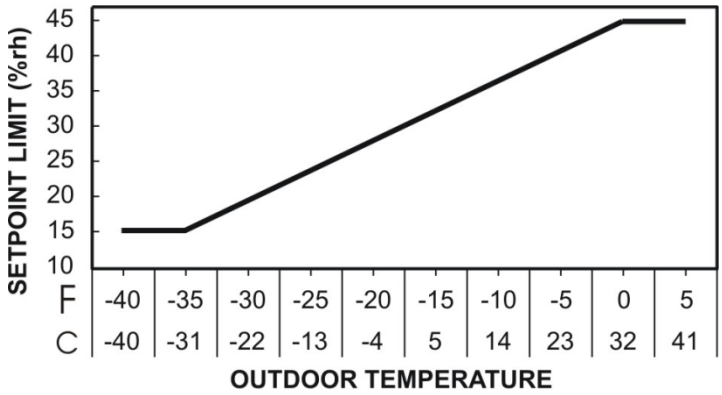



**Figure 27: Outdoor Temperature Reset**

## Control Acceptance Configured at Factory

Condair offers factory configuration of controls to match those that will be used at site. Factory configuration eliminates the need to configure the SETC 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 demand control 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 before any obstructions to laminar air flow. Installing the sensor too close to the distributor can result both in the humidifier short cycling and in damage to the sensor from saturation.

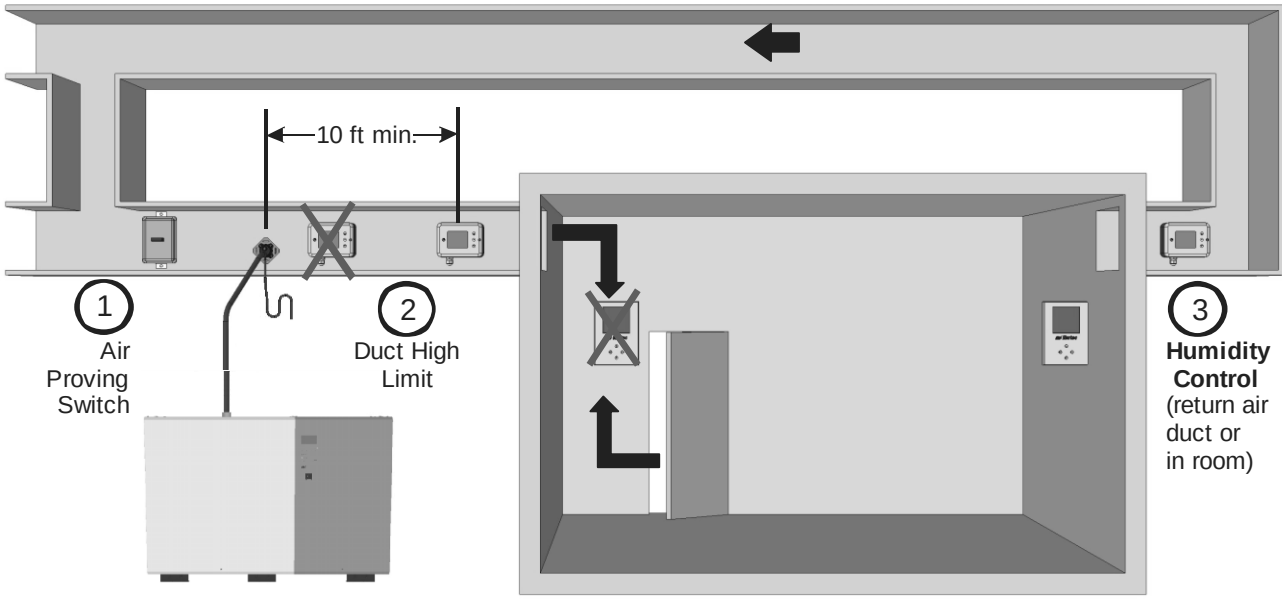



**Figure 28: Control Location**

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

## Control Wiring

The SE humidifier control terminal strip is shown in Figure 29 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.

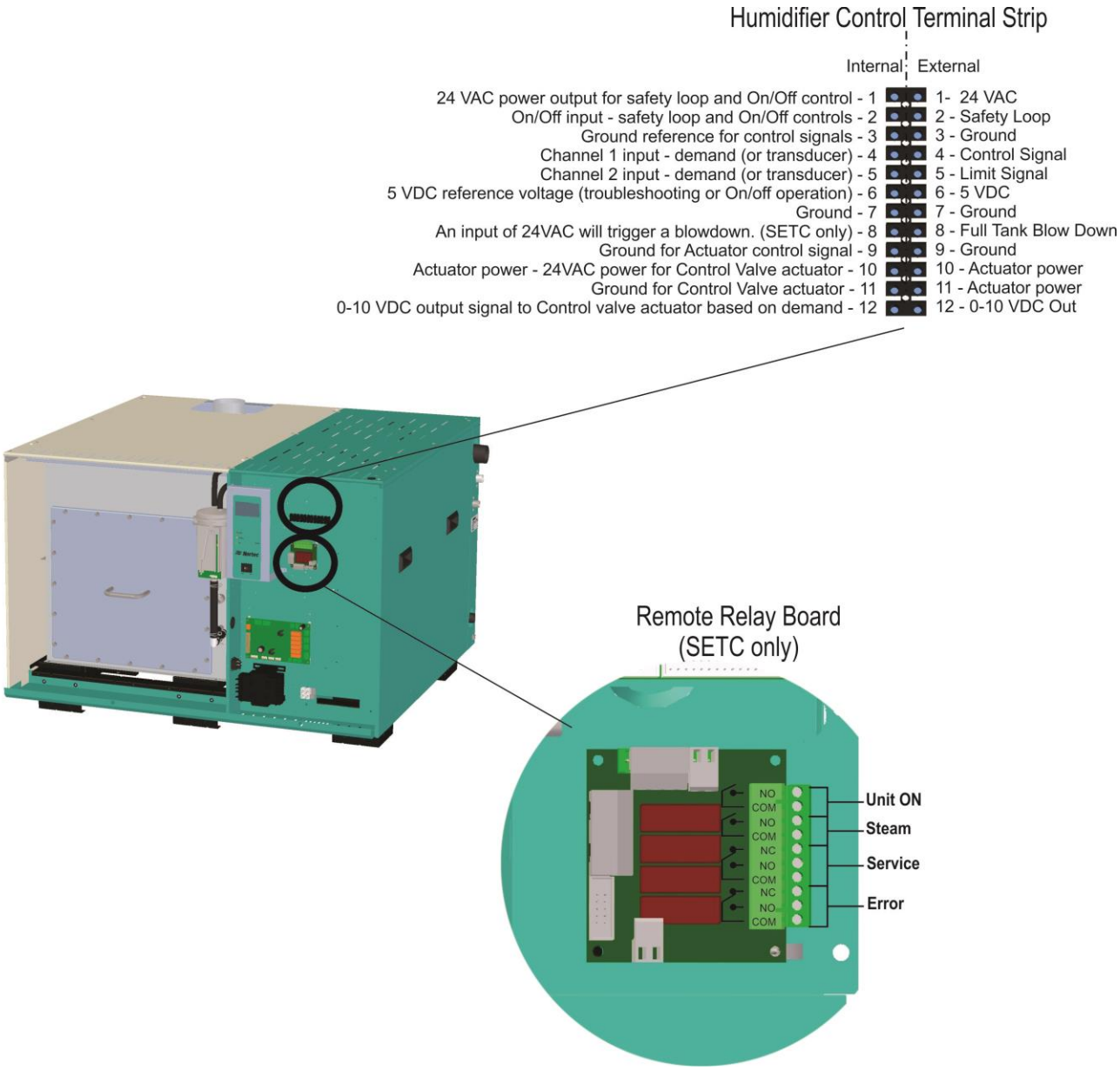



**Figure 29: SE Humidifier Control Terminal Strip**

## Staged Modulation

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.

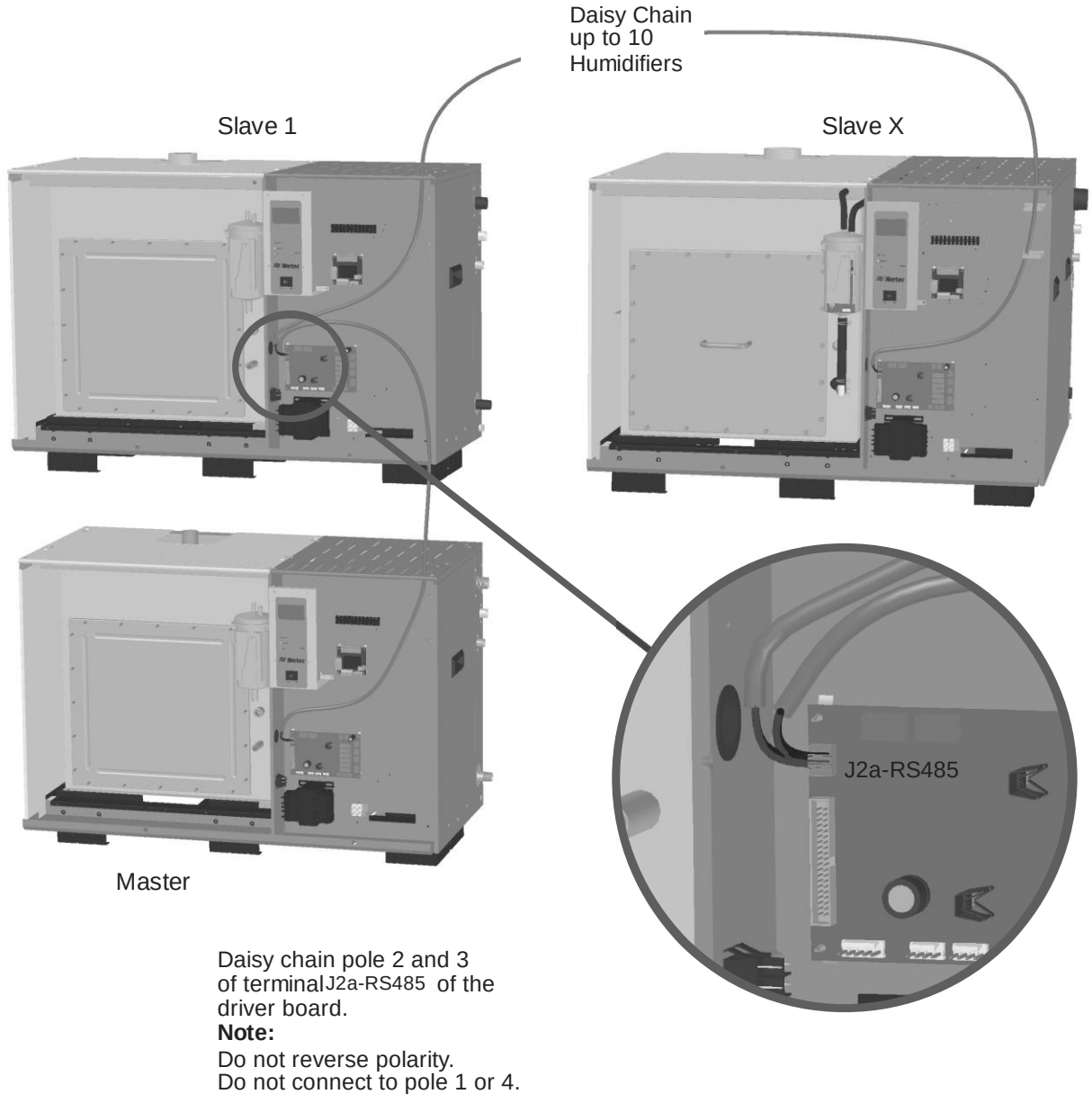



**Figure 30: Staged Modulation Wiring**

## Condair e-Links (Optional SETC)

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

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

**Table 15: Condair Links 2 Recommended Wire Types and Lengths**

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

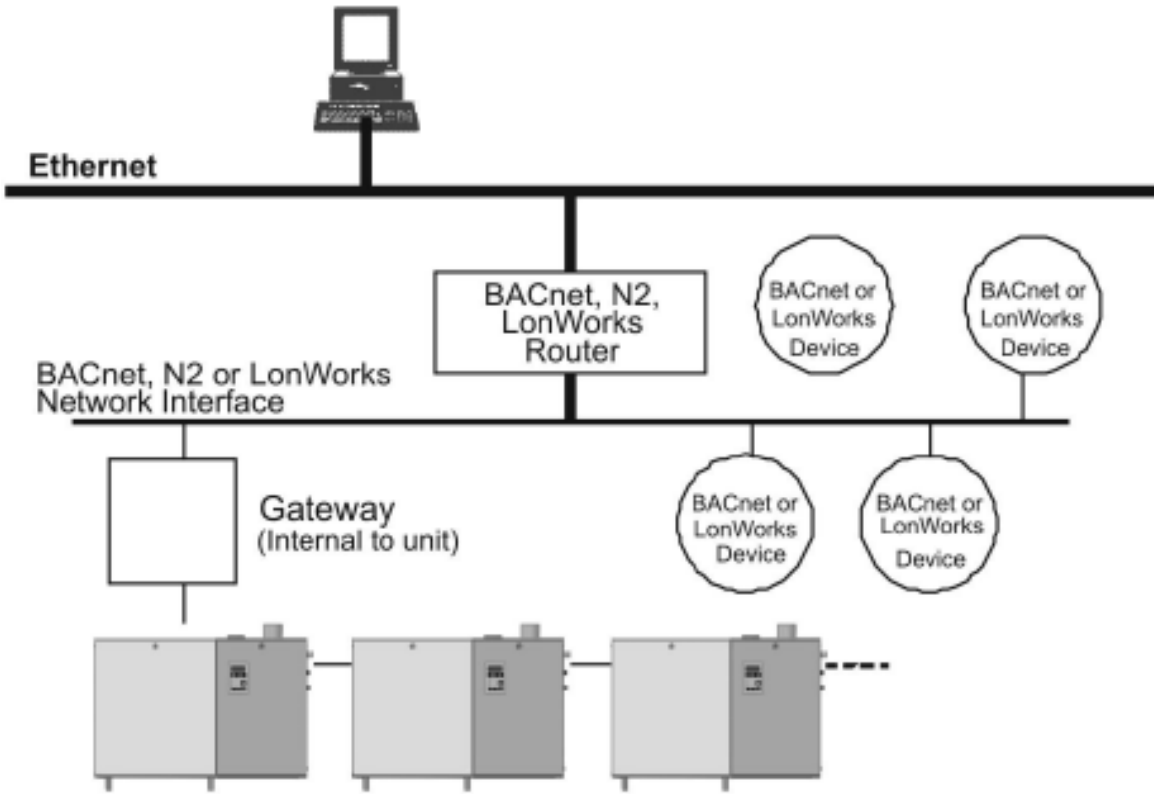



**Figure 31: Sample Network with Condair e-Links**

# Variable Definition

**Table 3. Variable Definitions**

| Variable Name | R=Read W=Write | Description | LonWorks SNVT |
|---|---|---|---|
| nvoRHDem1_*x* | R<br>Analog Value | Reads %RH in space or %demand to humidifier. (0%-100%) Choice determined by *nviInputType_x.* | SNVT_lev_percent |
| nvoSet1_*x* | R<br>Analog Value | Reads setpoint for relative humidity in space. (0%-100%) | SNVT_lev_percent |
| nvoRHDem2_*x* | R<br>Analog Value | Reads duct %RH or secondary space %RH, or secondary %demand to humidifier. (0%-100%)<br>Choice determined by *nviInputType_x.*<br>*Dip Switch 4/5 on humidifier's logic board must be ON.* | SNVT_lev_percent |
| nvoSet2_*x* | R<br>Analog Value | Reads setpoint for duct hi-limit relative humidity, or setpoint for secondary space relative humidity. (0%-100%)<br>*Dip Switch 4/5 on humidifier's logic board must be ON.* | SNVT_lev_percent |
| nvoSysDemand_*x* | R<br>Analog Value | Reads humidifier system demand. (0%-100%) | SNVT_lev_percent |
| nvoHourOpt_x | R<br>Analog Value | Indicates the number of hours the humidifier has been in operation. | SNVT_time_hour |
| nvoServHours_x | R<br>Analog Value | Indicates the number of hours remaining before the next service interval. | SNVT_time_hour |
| nviRHDem1_*x* | W<br>Analog Value | Writes %RH in space or %demand to humidifier. Choice determined by *nviInputType_x.* (0%-100%) | SNVT_lev_percent |
| nviRHDem2_*x* | W<br>Analog Value | Writes duct %RH or secondary space %RH, or secondary %demand to humidifier. (0%-100%)<br>Choice determined by *nviInputType_x.*<br>*Dip Switch 4/5 on humidifier's logic board must be ON.* | SNVT_lev_percent |
| nviSet1_*x* | W<br>Analog Value | Writes setpoint for relative humidity in space. (0%-100%) | SNVT_lev_percent |
| nviSet2_*x* | W<br>Analog Value | Writes setpoint for duct hi-limit %RH, or setpoint for secondary space %RH. (0%-100%)<br>*Dip Switch 4/5 on humidifier's logic must be ON.* | SNVT_lev_percent |
| nvoRHDem1_*x* | R<br>Analog Value | Reads %RH in space or %demand to humidifier. (0%-100%) Choice determined by *nviInputType_x.* | SNVT_lev_percent |

| Variable Name | R=Read<br>W=Write | Description | LonWorks SNVT |
|---|---|---|---|
| nvoSet1_*x* | R<br>Analog Value | Reads setpoint for relative humidity in space. (0%-100%) | SNVT_lev_percent |
| nvoRHDem2_*x* | R<br>Analog Value | Reads duct %RH or secondary space %RH, or secondary %demand to humidifier. (0%-100%)<br>Choice determined by *nviInputType_x.*<br>*Dip Switch 4/5 on humidifier's logic board must be ON.* | SNVT_lev_percent |
| nvoDisable_*x* | R<br>Binary Value | Reads remote disable status. 0=humidifier enabled, 1=humidifier disabled by network | SNVT_switch |
| nvoService_*x* | R<br>Binary Value | Reads service requirement status. 0=no service required, 1=service required | SNVT_switch |
| nvoStatus_*x* | R<br>Binary Value | Reads humidifier status. 0=standby, 1=humidifying. | SNVT_switch |
| nvoConnection_x | R<br>Binary Value | Indicates that the Nortec Links module is communicating with the Humidifier | SNVT_switch |
| nvoKeepWarm_x | R<br>Binary Value | Indicates that the KeepWarm feature has been enabled. | SNVT_switch |
| nvo3DayDrain_x | R<br>Binary Value | Indicates that the 3 day drain feature has been enabled | SNVT_switch |
| nviDisable_*x* | W<br>Binary Value | Writes remote disable status. 0=humidifier enabled, 1=humidifier disabled from network | SNVT_switch |
| nviInputType_*x* | W<br>Binary Value | Writes the input type status.<br>0=unit accepts a %demand signal<br>1=unit accepts a %RH reading | SNVT_switch |
| nviNetSensor _*x* | W<br>Binary Value | Writes configuration status for network-enabled sensing or control.<br>0=%RH or %demand input <u>is not</u> from the network<br>1=%RH or %demand input <u>is</u> from the network | SNVT_switch |

**Table 4. Humidifier Variable Addresses**
**Unit #1**

GSTC/SETC e-LINKS Variable Mapping

Default BACnet/IP Address: 192.168.10.11; Subnet: 255.255.255.0
Default BACnet/MSTP Address: 79
Default Johnson N2 Address: 175
Default unless otherwise requires at time of order.

| Unit #1 | BACnet | | Lonworks | | | | N2 | |
|---|---|---|---|---|---|---|---|---|
| **Variable Name** | **Type** | **Instance** | **SNVT** | **SNVT #** | **NV Index** | **Element** | **Type** | **Instance** |
| | | | | | | | | |
| nvoHourOpt_1 | AV | 1 | SNVT_time_hour | 124 | 1 | 1 | AI | 1 |
| nvoRHDem1_1 | AV | 2 | SNVT_lev_percent | 81 | 2 | 1 | AI | 2 |
| nvoSet1_1 | AV | 3 | SNVT_lev_percent | 81 | 3 | 1 | AI | 3 |
| nvoRHDem2_1 | AV | 4 | SNVT_lev_percent | 81 | 4 | 1 | AI | 4 |
| nvoSet2_1 | AV | 5 | SNVT_lev_percent | 81 | 5 | 1 | AI | 5 |
| nvoSysDemand_1 | AV | 6 | SNVT_lev_percent | 81 | 6 | 1 | AI | 6 |
| nvoServHours_1 | AV | 7 | SNVT_time_hour | 124 | 7 | 1 | AI | 7 |
| nviRHDem1_1 | AV | 8 | SNVT_lev_percent | 81 | 8 | 1 | AO | 8 |
| nviRHDem2_1 | AV | 9 | SNVT_lev_percent | 81 | 9 | 1 | AO | 9 |
| nviSet1_1 | AV | 10 | SNVT_lev_percent | 81 | 10 | 1 | AO | 10 |
| nviSet2_1 | AV | 11 | SNVT_lev_percent | 81 | 11 | 1 | AO | 11 |
| Analog Expansion | AV | 12 | N/A | N/A | N/A | N/A | N/A | N/A |
| Analog Expansion | AV | 13 | N/A | N/A | N/A | N/A | N/A | N/A |
| nviDisable_1 | AV | 14 | SNVT_switch | 95 | 20 | 2 | AO | 14 |
| | | | | | | | | |
| nvoInputType_1 | BV | 1 | SNVT_switch | 95 | 12 | 2 | BI | 1 |
| nvoFault_1 | BV | 2 | SNVT_switch | 95 | 13 | 2 | BI | 2 |
| nvoNetSensor_1 | BV | 3 | SNVT_switch | 95 | 14 | 2 | BI | 3 |
| nvoDisable_1 | BV | 4 | SNVT_switch | 95 | 15 | 2 | BI | 4 |
| nvoService_1 | BV | 5 | SNVT_switch | 95 | 16 | 2 | BI | 5 |
| nvoStatus_1 | BV | 6 | SNVT_switch | 95 | 17 | 2 | BI | 6 |
| nvoKeepWarm_1 | BV | 7 | SNVT_switch | 95 | 18 | 2 | BI | 7 |
| nvo3DayDrain_1 | BV | 8 | SNVT_switch | 95 | 19 | 2 | BI | 8 |
| Expansion1_1 | BV | 9 | N/A | N/A | | N/A | N/A | N/A |
| nviInputType | BV | 10 | SNVT_switch | 95 | 21 | 2 | BO | 10 |
| nviNetSensor | BV | 11 | SNVT_switch | 95 | 22 | 2 | BO | 11 |
| nvoConnection | BV | 12 | SNVT_switch | 95 | 23 | 2 | BO | 12 |
| Expansion2_1 | BV | 13 | N/A | N/A | | N/A | N/A | N/A |
| Expansion3_1 | BV | 14 | N/A | N/A | | N/A | N/A | N/A |

# Warranty

Condair AG. and/or Nortec Humidity 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, 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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