



ENGINEERING MANUAL

Electrode Steam Humidifier
Nortec **EL-Series**

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1 Nortec EL Electrode Steam Humidifier

1.1 General Description

The Nortec EL humidifier is an atmospheric steam generator, which operates on the electrode heating principle – heat is generated by the resistance to flow of electric charge between electrodes immersed in water. The Nortec EL humidifier is designed for direct room humidification using a blower pack, or humidification through the ducts in an air handling unit using a steam distributor. It is suitable for a variety of humidification applications including commercial offices, hospitals, computer rooms, museums, clean rooms, schools, printing plants, and other applications where reliability is required.

The Nortec EL humidifier comes in three different housing sizes – small, medium and large depending on the steam output. The small model has capacities ranging from 5 lb/h (2 kg/h) to 30 lb/h (14 kg/h), the medium model from 50 lb/h (23 kg/h) to 100 lb/h (45 kg/h), and the large model from 150 lb/h (68 kg/h) to 200 lb/h (91 kg/h). The small and medium size models can be ordered with a built-on blower pack. Refer to [Figure 1](#), [Table 8 on page 24](#), [Table 9 on page 26](#) and [Table 10 on page 27](#) list the specifications for each model.

The large model has two steam cylinders instead of one. The construction is similar to the single cylinder units except that it has two fill and drain connections, and two driver boards and low voltage terminal strips – one for each steam cylinder (designated "A" and "B"). The separate driver boards and low voltage terminal strips allow the large model to handle two separate sets of control signals. This gives the large Nortec EL humidifier the flexibility to operate in independent mode, parallel mode or series mode so it can control humidity in up to two different zones.

In independent mode, each steam cylinder operates independent of the other to control humidity in two separate zones. The control signals are wired to the driver board and low voltage terminal strip that controls the corresponding zone.

In parallel mode, one set of control signals is wired to the driver board and low voltage terminal strip for steam cylinder "A", which controls the humidity in both zones. Both steam cylinders respond equally to the demand for humidity.

In series mode, one set of control signals is wired to the driver board and low voltage terminal strip for steam cylinder "A", which control the humidity in both zones. In this mode, both steam cylinders operate in a staged fashion – steam cylinder "A" can be configured to handle output from 0-50% of demand, and cylinder "B" from 50-100% of demand. The advantage is that it permits the unit to vary its output from 25-100% of its capacity – 25% being the minimum output capacity of each steam cylinder.

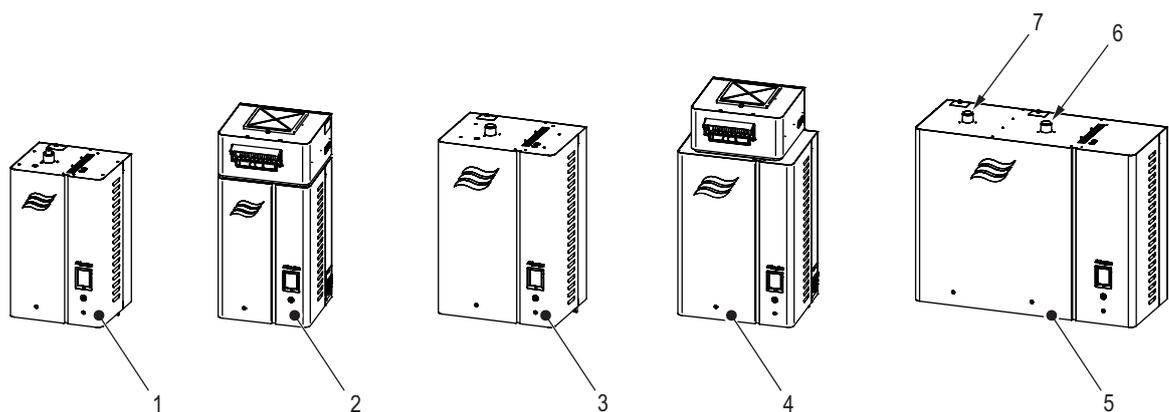


Figure 1: Nortec EL Humidifier Models

- | | | | |
|---|--|---|---|
| 1 | EL005-030 – small model with single steam cylinder | 5 | EL150-200 – large model with dual steam cylinders |
| 2 | EL005-030 – small model with single steam cylinder and built-on blower pack | 6 | Steam cylinder "A", large model |
| 3 | EL050-100 – medium model with single steam cylinder | 7 | Steam cylinder "B", large model |
| 4 | EL050-100 – medium model with single steam cylinder and built-on blower pack | | |

1.2 Features

The Nortec EL humidifier has many advanced features that set it apart from other humidifiers.

- Pure, clean steam at an economical price.
- Easiest commercial humidifier to install and maintain. Fully configured and packaged unit that is ready to install out-of-the-box.
- Patented Auto-adaptive Control minimizes water usage.
- State-of-the-art touchscreen controller provides great user experience and advanced user controls.
- Robust product from the company that has been in the market for over 40 years, and continues to perfect humidification technology.
- Zero side clearance for small installation footprint.
- Certified to meet OSHPD seismic requirements.
- Extremely efficient boiling process, electrical current passes directly through water.
- Standard integration into building management systems (BMS) using Modbus, BACnet MS/TP or BACnet IP. Other protocols are available as options.
- Standard drain water cooling which tempers drain water to meet local plumbing code requirements before it is emptied into the drain.
- USB port for loading software updates and downloading performance data.
- Connect up to 12 steam cylinders together in a "Main-Extension" configuration using Condair Linkup to satisfy large humidification needs.
- SIM card for storage of operating parameters and settings.
- Aesthetic cabinet design.
- Remote interface to control and modify humidifier settings.

Refer also to the detailed features listed in [Table 1](#).

1.2.1 Detailed Features List

Table 1: Nortec EL Features

	Feature	Description	Nortec EL	
			Standard	Optional
Control and User Interface Features	Touchscreen interface	Intuitive user interface to configure and monitor the humidifier.	✓	
	Digital graphic display	Displays visual feedback of the humidifier inputs (conditioned environment humidity and setpoints).	✓	
	On/Off control	Operate the equipment with simple On/Off controls.	✓	
	Up to two modulating control inputs per cylinder	Allows modulating humidifier output to improve accuracy of supply humidity.	✓	
	Integrated PI controller	Provides direct compatibility with humidity transducers (RH sensor) with adjustable setpoints and P/I parameters.	✓	
	Demand signal acceptance	Provides direct compatibility with modulating demand signals.	✓	
	Digital communication protocols	Provides BMS interface with integrated BACnet IP, BACnet MS/TP and Modbus protocols.	✓	
	BTL-certified protocols	Provides BTL-certified BACnet IP, BACnet MS/TP connectivity, and enables use of LonWorks.		✓
	Remote fault indication board	Allows dry contact feedback on unit operation.		✓
	Accessory relay board	Allows enabling/disabling of accessory devices such as fans and valves.		✓
	Remote interface	Allows direct Ethernet access to the humidifier through a PC.	✓	
	Independent circuits on multi-cylinder humidifiers	Allows for independent control of multiple humidifier cylinders through a common control system.	✓	
	Status indicator LED	Provides quick feedback on operating status of the unit.	✓	
	Adjustable units of measure	Display settings in metric or imperial units of measure.	✓	
Manual output adjustment	Provides the ability to limit the maximum steam output of the humidifier.	✓		
Operation and Maintenance	Auto pulse drain valve	Clears potential drain obstructions.	✓	
	Disposable cylinder	Allows for fast, clean, simple service of the humidifier.	✓	
	Auto-adaptive control system	Efficient water consumption and humidifier performance.	✓	
	Drain water cooling	Drain water tempered to 140 °F (60 °C) during normal and manual operation.	✓	
	Extreme drain water cooling	Drain water tempered to 120 °F (49 °C) during normal and manual operation.		✓
	Potable drinking water usage	Compatible with standard potable water supplies.	✓	
	Foam detection	Standard foam detection and correction capability.	✓	
	Advanced foam detection	Advanced foam detection and correction capability.		✓
	Backflow prevention	Integrated air gap in fill cup provides protection for supply water systems.	✓	
	Extended fill cup	Accommodates backpressure up to 10 in H ₂ O (2.49 kPa).		✓
	Keep Warm function	Provides improved humidifier response time.	✓	
	Short cycling detection and correction	Prevents operational problems associated with seasonal shifts in humidity load.	✓	
Other	C-UL-US Listed	Certified to meet product standards as detailed by Underwriters Laboratories.	✓	
	OSHPD seismic certification	Certified to meet OSHPD seismic requirements.	✓	
	Warranty	Provides guarantee against manufacturer defects. Refer to "Warranty".	✓	
	Choice of steam distribution*	Allows for distribution to the conditioned environment directly with the Nortec EL Space model, or indirectly through duct distributors.	✓	
	Wall mounting	Provides a convenient means of integrating humidification needs.	✓	

* The Nortec EL Space model includes a steam distributor.

1.3 Options

Table 2 lists the options available for the Nortec EL humidifier. Detailed installation instructions are supplied with each option.

Table 2: Nortec EL Options

Option	Availability		Description
	Factory Installed	Field Install Kit	
Built-on blower pack	✓		A blower pack is used to distribute steam generated by the humidifier directly into a conditioned environment. The Nortec EL Space model comes with a factory-installed blower pack and internal steam and condensate connections. A remote-mounted blower pack is also available. Refer to "Blower Packs" on page 41 for more information.
Mounting bar	✓	✓	Provides two mounting bars which fit into each other for wall mounting. One bar is fastened to the humidifier, and the other bar is fastened to the wall. The unit can be hung onto the wall by engaging the two mounting bars. Note: The unit can also be wall-mounted (without this option) using the keyhole cutouts on the back of the humidifier housing.
Mounting rack		✓	Stand-alone rack for mounting the Nortec EL humidifier.
Remote fault indication board	✓	✓	Printed circuit board (PCB) with relay contacts for connecting remote status displays for "Unit On", "Steam", "Error" and "Service". Refer to "Remote Fault Indication Board" on page 54 .
Accessory board	✓	✓	PCB with relay contacts for connecting other accessories such as fans and supply water flushing valves. Refer to "Accessory Board" on page 55 .
Factory-configured control settings	✓		The humidifier can be factory-configured for the requested control signal acceptances. The humidifier can also be reconfigured in the field, as needed. Refer to Table 6 on page 13 for standard part numbers.
Internal primary fusing	✓		Internal fuse for heating voltage power supply. Only available as a factory-installed option. Note: This is NOT a substitute for a dedicated external disconnect switch. Refer to Table 5 on page 12 for part numbers.
Fill cup extension		✓	Kit for extending the fill cup so the humidifier can accommodate backpressure up to 10 in H2O (2.49 kPa).
Extreme drain water cooling	✓	✓	Kit for cooling drain water to less than 120 °F (49 °C) before it is discharged into the drain.
Advanced foam detection	✓	✓	Kit for extending the ability of the humidifier to handle a wider range of water supply quality.
BTL-certified BACnet MS/TP digital communications	✓	✓	PCB to provide BTL-certified BACnet MS/TP connectivity. This option also enables full Master functionality when using BACnet MS/TP.
BTL-certified BACnet IP digital communications	✓	✓	PCB to provide BTL-certified BACnet IP connectivity.
LonWorks digital communications	✓	✓	Supplementary board to provide LonWorks connectivity.
Spare steam cylinder		✓	Spare steam cylinders to ensure minimal downtime. Refer to Table 8 on page 24 for standard steam cylinders.
Remote blower pack power kit	✓	✓	Kit consists of a transformer, fusing, and a terminal block to supply power to the remote-mounted blower pack. Without this option, a separate 110-120 V supply must be supplied for the remote-mounted blower pack.

1.4 Accessories

Table 3 lists the accessories available for the Nortec EL humidifier. Detailed installation instructions are supplied with each accessory. Standard part numbers are also listed below.

Table 3: Nortec EL Accessories

Accessory	Description
External condensate cooling	Self-actuated and electric condensate waste water coolers are used to reduce waste water temperatures to below 140 °F (60 °C) before it is discharged into drains.
Steam distributor	Steam distributors are used for adding steam into ventilation ducts. They are available in three different steam capacities and various lengths to suit duct dimensions. Refer to Steam Distributor Installation Manual (document 2556592) for additional details and part numbers.
SAM-e and Mini SAM-e distribution manifolds	The SAM-e distribution manifolds are used for adding steam into ventilation ducts larger than 24 in (6 cm) where either higher steam capacity or short absorption distance is required. The Mini SAM-e is available in dimensions under 24 in (61 cm). They are available in a range of sizes and steam capacities to match duct and humidifier requirements. Refer to SAM-e Engineering Manual (document 1503529) for additional details and part numbers.
Remote blower pack	Blower packs are used for direct humidification of the conditioned environment. Blower packs are capable of distributing up to 100 lb/h (45 kg/h), should be selected to match or exceed humidifier capacity. Refer to Blower Pack Installation, Operation and Maintenance Manual (document 2582277) for additional details.
On/Off humidistats	Condair offers a range of digital and mechanical On/Off duct and wall-mounted humidistats for use with control and high limit applications. Refer to Table 7 on page 13 .
Modulating humidistats	Condair offers a range of digital modulating duct and wall-mounted humidistats for use with control and high limit applications. Refer to Table 7 on page 13 .
Outdoor temperature sensors	Provides automatic humidistat setpoint reduction to prevent condensation on windows/surfaces adjacent to outdoor air. Refer to "Outdoor Temperature Setback" on page 52 for additional details. 2520263 – Duct-mounted temperature sensor 2553858 – Outdoor mounted temperature sensor
Humidity transducers	Condair offers a range of digital humidity sensors for duct and wall-mounting for use with control and high limit applications. Refer to Table 7 on page 13 .
Air proving switch	Provides a mechanical differential pressure switch to enable humidifier operation when there is airflow through the ventilation ducts. Adjustable for pressures 0.05-12 in H ₂ O (0.01-2.99 kPa). Refer to "Air Proving Switch" on page 51 for additional details.
Steam line reducers	Provides a means of adapting steam line diameters to match the diameter of the steam distributor. 1507846 – Steam line reducer (1-3/4 in to 7/8 in) copper 1508165 – Steam line reducer (1-3/4 in to 7/8 in) stainless steel
Condair flexible steam and condensate hose	Steam hoses can be used as steam distribution lines or as couplers between 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. Condensate hose can be used for draining condensate, or coupling to copper or stainless steel condensate lines. 1328810 – Steam hose (7/8 in I.D.) per foot (30 cm) 1328820 – Steam hose (1-3/4 in I.D.) per foot (30 cm) 1328840 – Condensate hose (3/8 in I.D.) per foot (30 cm)
Large/small condensate trap tee	Condensate trap tee must be used to remove condensate that forms in steam distribution lines. Condair offers tees to match large and small steam lines. 1329634 – Condensate trap tee – small (7/8 × 7/8 × 3/8 in) 1329635 – Condensate trap tee – large (1-3/4 × 1-3/4 × 3/8 in)
In-line water filter and replacement filter elements	In-line water filter to remove sediments in the supply water that can obstruct the fill valve strainer or drain fittings. 1329505 – In-line water filter (5 micron) 1329561 – Replacement filter elements (1 micron) 1329506 – Replacement filter elements (5 micron)

Table 3: Nortec EL Accessories, continued...

Accessory	Description
Condensate pump	High temperature condensate pump for pumping waste water from the Nortec EL or condensate from the distributor systems. 1429527 – Drain water sump pump, low flow 2524504 – Electric sump pump, medium flow 2576898 – Electric sump pump, high flow
Drain air gap reducer	All Nortec EL humidifiers require an air gap in the drain line as close as possible to the humidifier. The air gap reducer is a 2-1/2 in to 7/8 in (63.5 mm to 22 mm) fitting that can provide the required air gap. 2522172 – External drain air gap reducer
Pocket hygro-thermometer digital display	The pocket hygro-thermometer provides a means to check the humidity and temperature in a space. It is a useful tool for troubleshooting humidity problems. 1469595 – Pocket hygro-thermometer digital display
Transformer, plug-In, 120 VAC to 24 VAC	“Wall Wart” AC adaptor 120 VAC to 24 VAC, 40 VA for providing power to remote electronics/controls. 1603032 – Transformer, plug-In, 120 VAC to 24 VAC

1.5 Humidifier Components

Figure 2 shows the various components of the Nortec EL humidifier. The door panels have been removed for clarity.

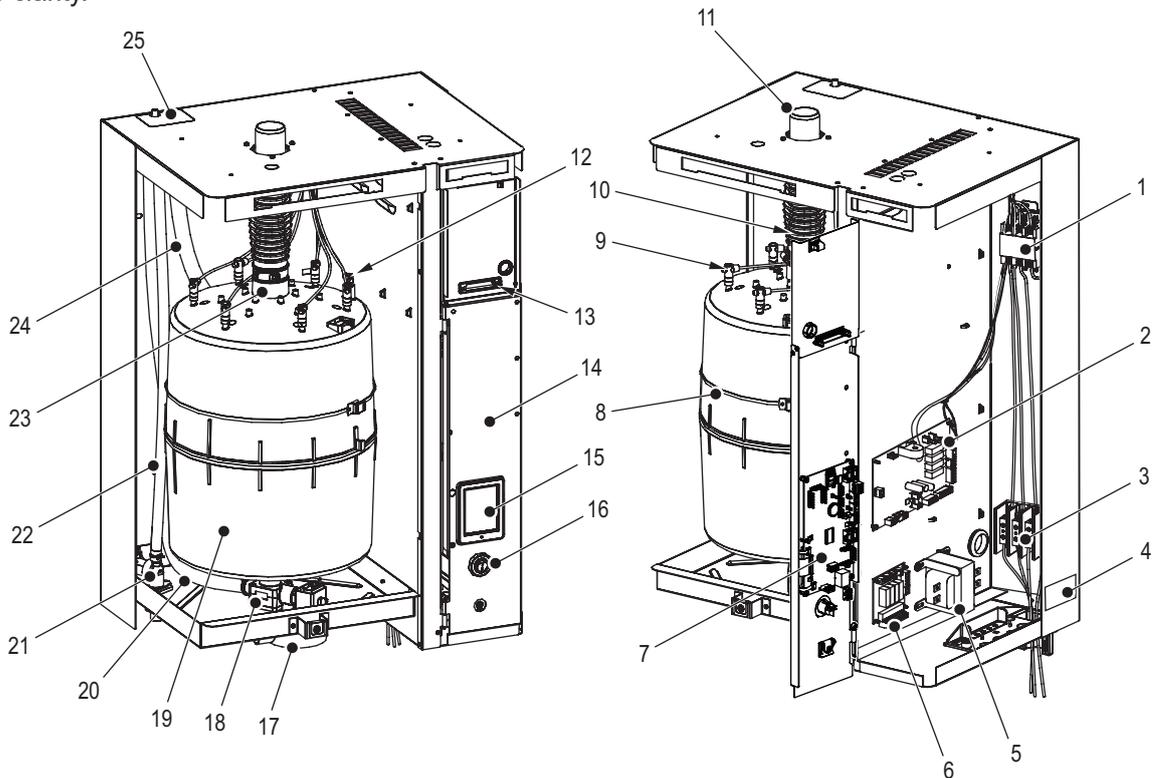


Figure 2: Nortec EL Humidifier Components (Medium Size Model Shown)

- | | | | |
|----|--|----|------------------------------------|
| 1 | Contactur | 14 | Front panel |
| 2 | Driver board | 15 | Touchscreen display |
| 3 | Terminal block, high voltage supply | 16 | On/Off switch |
| 4 | Specification label | 17 | Drain canal |
| 5 | Transformer | 18 | Drain valve |
| 6 | Remote fault indication PCB | 19 | Steam cylinder |
| 7 | Integrated control board | 20 | Fill hose (fill cup to cylinder) |
| 8 | Cylinder strap | 21 | Fill valve |
| 9 | Electrode plug | 22 | Fill hose (fill valve to fill cup) |
| 10 | Steam outlet hose (optional) | 23 | Steam outlet, steam cylinder |
| 11 | Steam adaptor (optional) | 24 | Overflow hose |
| 12 | Sensor, high water level (orange wire) | 25 | Fill cup |
| 13 | Low voltage terminal strip | | |

The Nortec EL humidifier housing contains two cabinets – the plumbing cabinet (on the left) and the controls cabinet (on the right) – refer to [Figure 2 on page 10](#). [Table 4](#) summarizes the functions of the main components in these two cabinets.

Table 4: Nortec EL Humidifier Component Functions

	Component	Function
Plumbing cabinet	Steam cylinder	Water reservoir in which boiling takes place. It houses a set of electrodes that are used to boil the water. It has a steam outlet at the top, and a water inlet/outlet at the bottom.
	Electrode plug	Insulated connector that feeds electric current to the electrodes housed in the steam cylinder.
	High water sensor	Detects maximum water level in the steam cylinder.
	Drain canal	Combined drain outlet for discharge from the steam cylinder, and overflow from the fill cup.
	Drain valve	Controls the flow of feed water from the fill cup into the steam cylinder, and drain water out of the steam cylinder. The stem of the steam cylinder (which houses its water inlet/outlet) fits into the valve body.
	Fill cup	Provides a gravity feed means to fill the steam cylinder through the drain valve. A built-in air gap prevents backflow.
	Fill valve	Controls the flow of feed water into the fill cup.
	Fill cup extension (optional)	Optional kit for extending the fill cup so the humidifier can accommodate backpressure up to 10 in H ₂ O (2.49 kPa).
	Extreme drain water cooling valve (optional)	Optional kit for cooling the drain water to less than 120 °F (49 °C) before it is discharged into the drain.
	Foam detection kit (optional)	Optional kit for extending the ability of the humidifier to operate with a wider range of water quality.
Controls cabinet	High voltage terminal block	Primary power connection from the external disconnect switch to the humidifier.
	Contactors	Activates/deactivates power to the electrodes in the steam cylinder.
	Driver board	Provides input and output connections to the humidifier components.
	Integrated control board	Controls all functions of the humidifier, and provides a user interface through the integrated touchscreen display. It also permits connection to multiple humidifiers, as well as to the BMS. An on-board USB port also permits exchange of data.
	Touchscreen display	User interface to monitor and control the humidifier.
	On/Off switch	Allows the user to turn the humidifier On and Off.
	Low voltage terminal strip	Terminal strip for connecting control signal inputs to the humidifier.
	Remote fault indication PCB	Optional printed circuit board with dry contacts to connect remote status displays for "Unit On", "Steam", "Error" and "Service".
	Accessory relay PCB (not shown)	Optional printed circuit board with dry contacts to enable/disable other accessories such as fans and supply water flushing valves.
	Transformer	Steps down primary voltage to 24 VAC to power the on-board low voltage electronics.

Part numbers and quantities for ordering Nortec EL options are shown in [Table 5](#).

Table 5: Nortec EL Options, Part Number Matrix

Voltage and Phase	Steam Capacity lb/h (kg/h)	Part Number and Quantity									
		Remote Fault Indication Board	Accessory Board	Mounting Bar	Mounting Rack	Fill Cup Extension	Extreme Drain Water Cooling	Power Kit – Remote Blower Pack	Built-on Blower Pack	Advanced Foam Detection	Internal Primary Fuse
120 V, 1 Ph.	5 (2.2)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK1-1 ×1
208 V, 1 Ph.	10 (4.5)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK1-1 ×1
	20 (9)										FK1-3 ×1
220-240 V, 1 Ph.	10 (4.5)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK1-1 ×1
	20 (9)										
277 V, 1 Ph.	10 (4.5)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK1-1 ×1
	20 (9)										
380 V, 1 Ph.	10 (4.5)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK1-2 ×1
	20 (9)										
440-480V, 1 Ph.	10 (4.5)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK1-2 ×1
	20 (9)										
550-600V, 1 Ph.	10 (4.5)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK1-2 ×1
	20 (9)										
208 V, 3 Ph.	20 (9)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK3-1 ×1
	30 (14)						DWC1.2 ×1				FK3-3 ×1
	50 (23)						DWC2.0 ×1				FK3-5 ×1
	75 (34)			MP-M ×1	MR-M ×1	OPS ×1	DWC3.3 ×1	BPP-L ×1	-	FD ×2	FK3-6 ×1
	100 (45)										
	150 (68)										
200 (91)	MP-L ×1	MR-L ×1	OPS ×2	DWC2.0 ×2	DWC3.3 ×2						
220-240 V, 3 Ph.	20 (9)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK3-1 ×1
	30 (14)						DWC1.2 ×1				FK3-3 ×1
	50 (23)						DWC2.0 ×1				FK3-5 ×1
	75 (34)			MP-M ×1	MR-M ×1	OPS ×1	DWC3.3 ×1	BPP-L ×1	-	FD ×2	FK3-6 ×1
	100 (45)										
	150 (68)										
200 (91)	MP-L ×1	MR-L ×1	OPS ×2	DWC2.0 ×2	DWC3.3 ×2						
380 V, 3 Ph.	20 (9)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK3-2 ×1
	30 (14)						DWC1.2 ×1				FK3-4 ×1
	50 (23)						DWC2.0 ×1				
	75 (34)			MP-M ×1	MR-M ×1	OPS ×1	DWC3.3 ×1	BPP-L ×1	-	FD ×2	FK3-7 ×1
	100 (45)										
	150 (68)										
200 (91)	MP-L ×1	MR-L ×1	OPS ×2	DWC2.0 ×2	DWC3.3 ×2						
440-480 V, 3 Ph.	20 (9)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK3-2 ×1
	30 (14)						DWC1.2 ×1				FK3-4 ×1
	50 (23)						DWC2.0 ×1				
	75 (34)			MP-M ×1	MR-M ×1	OPS ×1	DWC3.3 ×1	BPP-L ×1	-	FD ×2	FK3-7 ×1
	100 (45)										
	150 (68)										
200 (91)	MP-L ×1	MR-L ×1	OPS ×2	DWC2.0 ×2	DWC3.3 ×2						
550-600 V, 3 Ph.	20 (9)	RFI ×1	ACC ×1	MP-S ×1	MR-S ×1	OPS ×1	DWC0.5 ×1	BPP-SM ×1	BOBP ×1	FD ×1	FK3-2 ×1
	30 (14)						DWC1.2 ×1				FK3-4 ×1
	50 (23)						DWC2.0 ×1				
	75 (34)			MP-M ×1	MR-M ×1	OPS ×1	DWC3.3 ×1	BPP-L ×1	-	FD ×2	FK3-7 ×1
	100 (45)										
	150 (68)										
200 (91)	MP-L ×1	MR-L ×1	OPS ×2	DWC2.0 ×2	DWC3.3 ×2						

Part numbers for ordering control signal configurations for the Nortec EL humidifier are shown in [Table 6](#).

Table 6: Nortec EL Control Signal Acceptance Part Numbers

Signal	Standard Part Numbers – Demand Signal Acceptance		Standard Part Numbers – Transducer Signal Acceptance	
	Single Channel	Dual Channel	Single Channel	Dual Channel
0-5 VDC	2523060	2523061	2523100	2523101
0-20 mA	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	2523094	2523116	2523117
0-20 VDC	2523096	2523097	2523118	2523119

Part numbers for ordering other accessories are shown in [Table 7](#).

Table 7: Humidistat Part Numbers

Part Number	Demand		Transducer		Digital	Mechanical	0-10 VDC	2-10 VDC	On/Off	Fan Start
	Duct-mounted	Wall-mounted	Duct-mounted	Wall-mounted						
2548732	✓	–	–	–	✓	–	–	–	✓	✓
2548731	–	✓	–	–	✓	–	–	–	✓	✓
2520273*	✓	–	–	–	✓	–	–	–	✓	✓
1510142	–	✓	–	–	✓	–	✓	–	–	✓
2520266*	✓	–	–	–	✓	–	✓	–	–	✓
1329102	–	✓	–	–	–	✓	–	–	✓	–
1329108	✓	–	–	–	–	✓	–	–	✓	–
1509858	–	–	–	✓	✓	–	–	✓	–	–
1509857	–	–	✓	–	✓	–	–	✓	–	–

* Remote-mounted digital controller included for ease of access.

1.6 User Interface

The Nortec EL humidifier has an interactive touchscreen display which can be used to configure and monitor its operation. Refer to [Figure 3](#).

In addition, the unit can also be configured and monitored remotely using the built-in BMS connectivity (BACnet, Modbus).

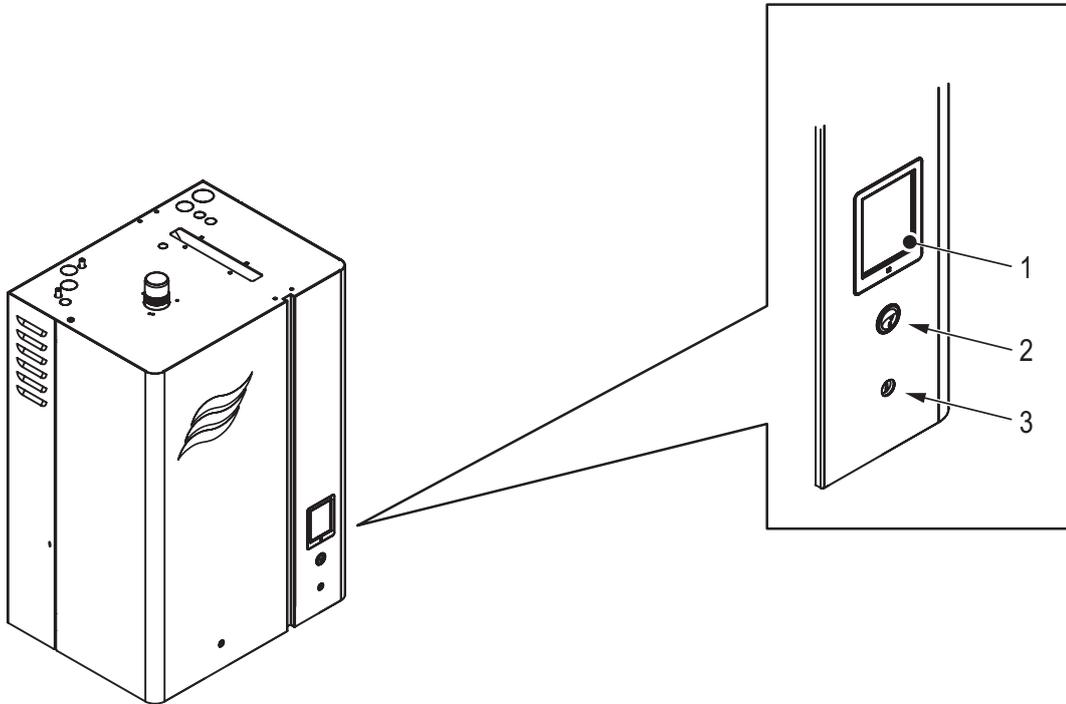


Figure 3: Nortec EL User Interface

- 1 Touchscreen display – user interface to configure the humidifier, and access status information
- 2 Status LED – multi-function LED changes color to indicate operating status of the unit
- 3 On/Off switch – allows user to turn humidifier On/Off

2 Operation

2.1 General

The Nortec EL humidifier produces pure steam at a variable output rate of 25-100% of its rated capacity, to within a tolerance of $\pm 5\%$. It employs the following general principle to generate steam – when water in the steam cylinder makes contact with energized electrodes, electric current flows between the electrodes through the water. The resistance to the flow of electrical current heats the water and turns it into steam. The amount of heat generated is controlled by regulating the current draw.

Two factors affect the current draw:

- Surface area of the electrode in contact with the water – the current draw increases as more of the electrode is in contact with the water.
- Total dissolved solids (TDS) in the water – higher TDS results in increased conductivity of the water, but when the concentration level reaches a saturation point the current draw begins to level off. Low TDS may prevent proper operation of the unit.

The fill valve stops filling the steam cylinder when the current draw reaches the optimal level (Fill Off Amps) for the requested level of humidity. As the water continues to heat and evaporate, the current draw starts to drop off as less electrode is exposed to the water. When the current draw drops down to 80% of the Fill Off Amps level, the fill valve starts filling the cylinder. Refer to [Figure 4](#). The humidifier continues this cycle to fulfil the humidity demand.

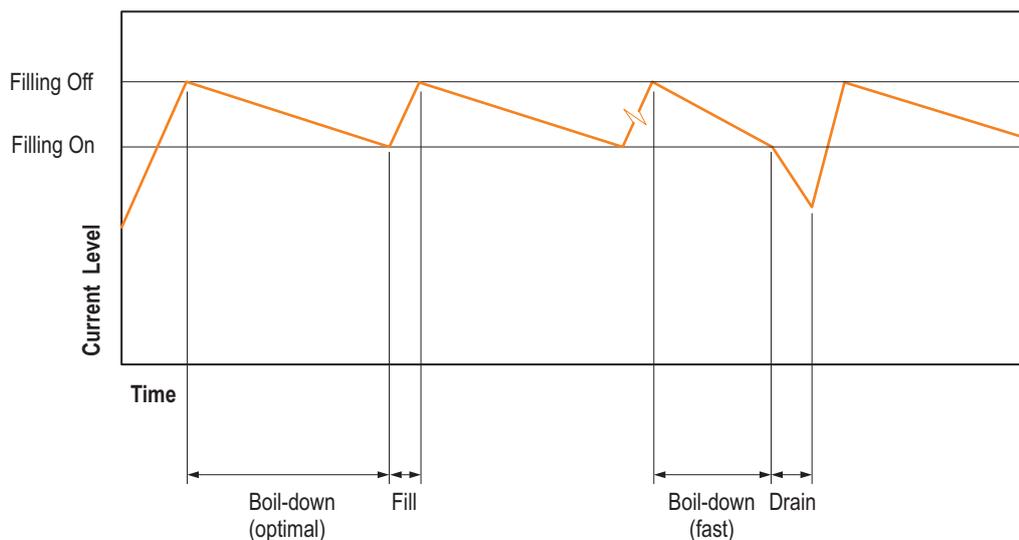


Figure 4: Humidifier Fill-Boil-Drain Operation

As boiling continues, the concentration of TDS increases in the cylinder. This causes the current draw to increase, which results in faster boil-down time. To maintain efficiency, the Nortec EL humidifier utilizes the Auto-adaptive Control algorithm (refer to ["Drain Cycles" on page 18](#)) based upon the trending boil-down cycles to perform a drain cycle in order to maintain the concentration of TDS at an optimum level. This algorithm permits better adaptation to various water conditions and ensures that the steam cylinder is only drained when necessary, thus minimizing wastage of water and maintaining optimum operating conditions.

If the unit is not operated for three days, the humidifier drains automatically to prevent growth of organic matter in the steam cylinder.

Eventually, the minerals dissolved in the water build up as scale deposits on the electrodes, which reduces its efficiency and shortens the cylinder life (refer to ["Steam Cylinders" on page 20](#) for additional details). When this happens, the steam cylinder is easily removed and replaced.

2.2 Sequence of Operation

The following is a general sequence of operation – the actual sequence may vary depending upon operating conditions and user-configurable parameters. Refer to [Figure 5 on page 17](#).

1. When the humidifier receives a valid humidity demand signal, the contactor(s) closes and directs power to the electrodes in the steam cylinder(s).
2. The current sensor on the driver board then monitors the current draw for 60 seconds.
If the current draw is less than the optimal current draw for the requested level of humidity, and the high water sensor is not activated, the operating sequence continues to [step 3](#). If the high water sensor is activated, the operating sequence skips to [step 4](#).
If the measured current draw is higher than the optimal current draw for the requested level of humidity, but does not exceed 115% of the Full Load Amps (Full Load Amps is the current draw at the full rated capacity of the unit), the operating sequence skips to [step 5](#).
3. The humidifier displays the status message “Filling” and activates the fill valve, which causes feed water to flow through the fill valve into the fill cup. The water then flows from the fill cup into the steam cylinder through the stem at the bottom of the cylinder.
As soon as the electrodes come in contact with the water, current begins to flow between the electrodes, generating heat. As the water level continues to rise, more surface of the electrodes come in contact with the water, which results in a higher current draw. The fill valve remains open until the current draw matches the optimal current draw for the requested level of humidity, or the high water sensor is activated.
4. Once the fill/drain cycles stop, the water in the cylinder continues to heat until it turns into steam. As water level in the steam cylinder drops due to evaporation, the surface area of the electrodes exposed to the conductive water is also reduced, which results in a lower current draw.
If the filling cycle in [step 3](#) was interrupted by activation of the high water sensor, the operating sequence returns to [step 2](#) once the water level drops below the high water sensor pin. Otherwise, it continues onto [step 5](#).
5. As the humidifier continues to operate, the current draw begins to decrease due to a combination of two factors related to evaporation – reduced surface area of electrodes in contact with the water, and the increased concentration of TDS in the water. To offset this, the control software measures the time for the current draw to decrease across a predetermined threshold (refer to ["Drain Cycles" on page 18](#)), and performs the following action:
 - a. If the time for the boil-down cycle is shorter than optimal, the Auto-adaptive Control algorithm initiates a drain cycle to replace some of the concentrated water in the steam cylinder with fresh water in order to lower the concentration levels of TDS. The fill valve is active during this drain cycle to lower the temperature of the waste water to below 140 °F (60 °C).
 - b. If the time for the boil-down cycle is optimal or longer, the humidifier does not perform a drain cycle to lower the concentration levels of TDS.
6. The operating sequence loops back to [step 2](#) and continues steam production as long as there is a valid humidity demand signal.

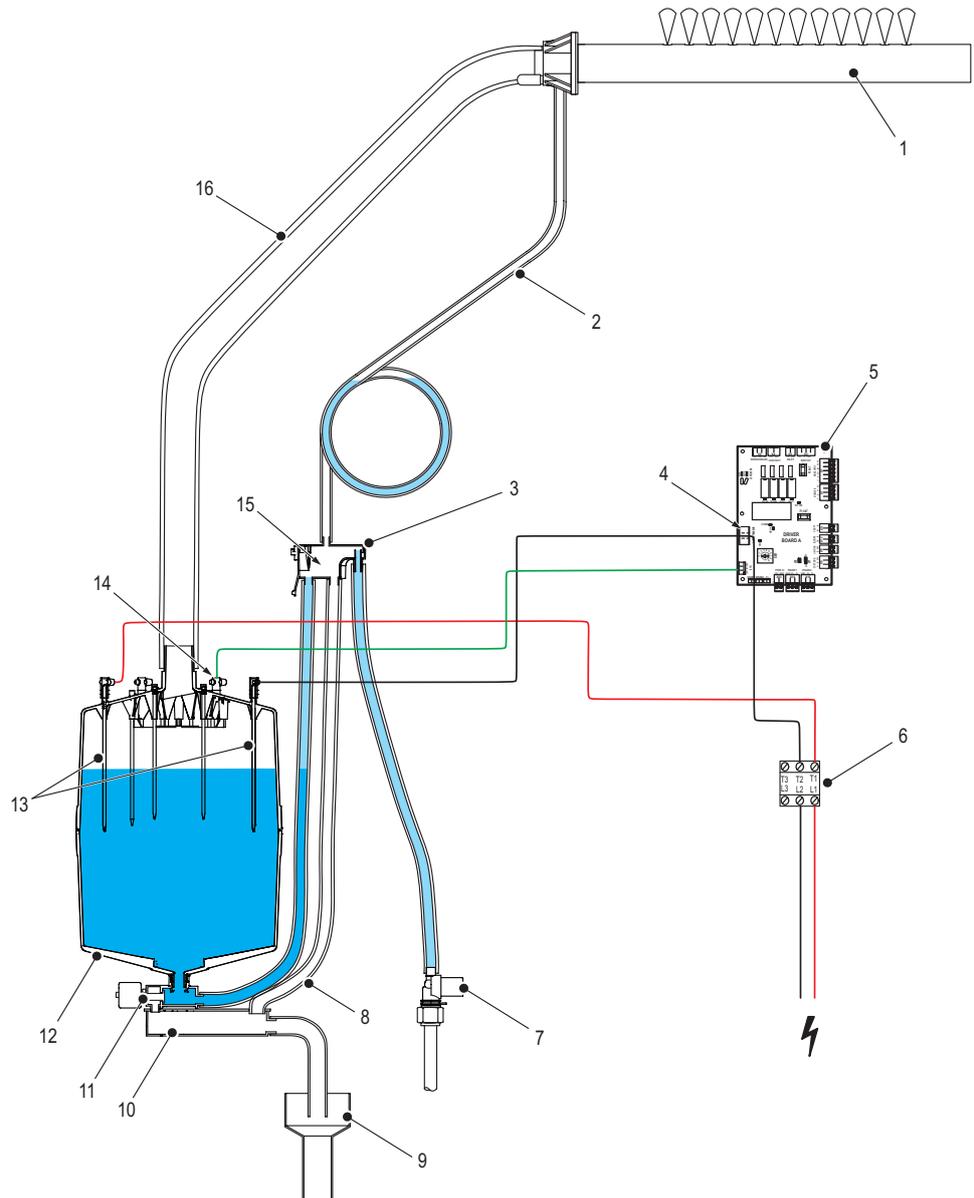


Figure 5: Humidifier Schematic

- 1 Steam distributor
- 2 Condensate drain line
- 3 Fill cup
- 4 Current sensor
- 5 Driver board
- 6 Contactor
- 7 Fill valve
- 8 Overflow
- 9 Air gap funnel
- 10 Drain canal
- 11 Drain valve
- 12 Steam cylinder
- 13 Electrodes
- 14 High water sensor
- 15 Air gap
- 16 Steam line

2.3 Drain Cycles

Minerals dissolved in the water can accumulate in the steam cylinder over time and reduce its efficiency and shorten cylinder life. To minimize this, the Nortec EL humidifier utilizes the Auto-adaptive Control algorithm to initiate a drain cycle that dilutes the concentration of mineral in the cylinder only when required, and only drains a minimum volume of water to maintain optimal operating conditions.

2.3.1 Drain Cycle Activation

Once the humidifier has achieved the desired current draw, the water in the cylinder will evaporate reducing the water level, and therefore the current draw. This reduction in current draw will happen at different speeds depending upon the conductivity and volume of the water. More dissolved minerals will reduce the resistance of the water and allow for a smaller volume of water to maintain the same heat production/evaporation rate as a larger volume of lower conductivity water. The water level change associated with evaporating the smaller volume of more conductive water will have a greater impact on current draw, and therefore reduce the current draw faster with higher conductivity water. The integrated control board monitors the time required for the current draw to cross a pre-determined threshold.

- If the Actual Time (T_a) for the boil-down across the predetermined thresholds is longer than the pre-determined Optimal Time (T_o), it indicates that the water has not yet accumulated excessive amounts of minerals, and hence a mineral dilution drain is not yet required.
- If the Actual Time (T_a) is shorter than a predetermined Optimal Time (T_o) it indicates that the water has accumulated an excessive amount of dissolved minerals, and hence a demineralization drain is initiated. Refer to [Figure 6](#).

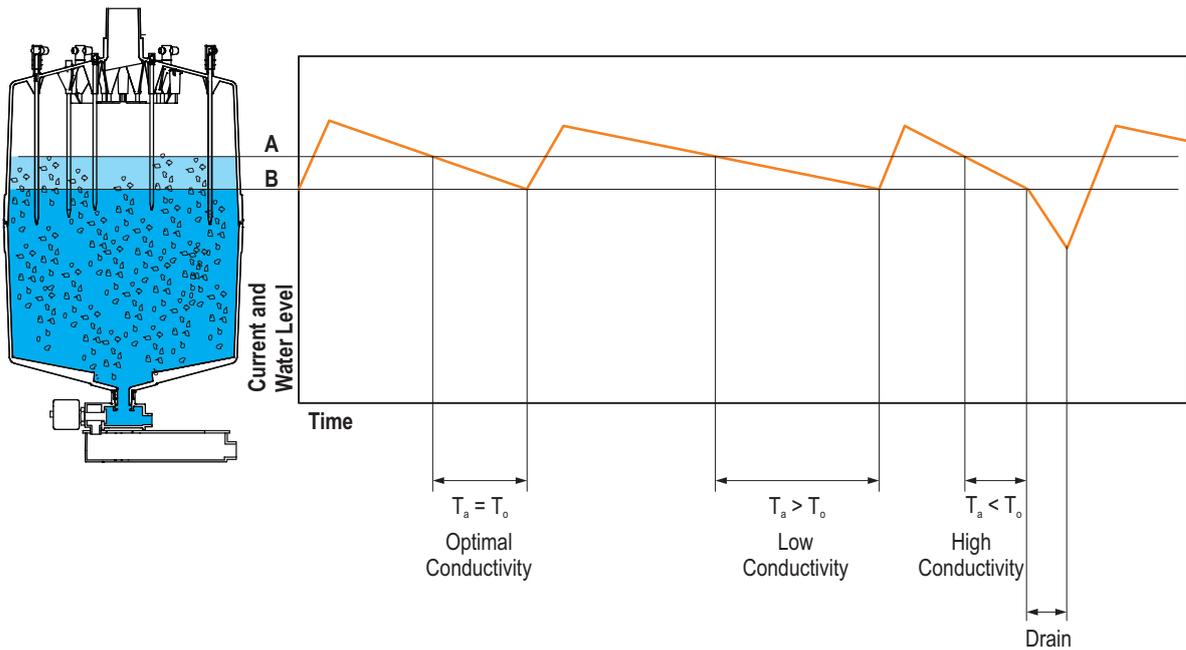


Figure 6: Conductivity Measurement

2.3.2 Drain Volume

The volume of water that must be drained is calculated by the Auto-adaptive Control algorithm. This algorithm establishes a proportional drain component based on the difference between the actual time of the latest boil-down cycle (T_a) minus an optimal time (T_o). It then adds an integral drain component accumulated from previous drain cycles that will increase or decrease subsequent drain cycles, ensuring more stable prolonged operation.

In cases where a long drain is required the Auto-adaptive Control algorithm breaks the drain time down into several small drains to prevent a reduction in the humidifier output capacity, that would otherwise result from a long drain. During these multiple partial drains, the fill valve is energized to assist in reducing the drain water temperature below 140 °F (60 °C), and at the same time the drain valve is energized. Refer to [Figure 7](#).

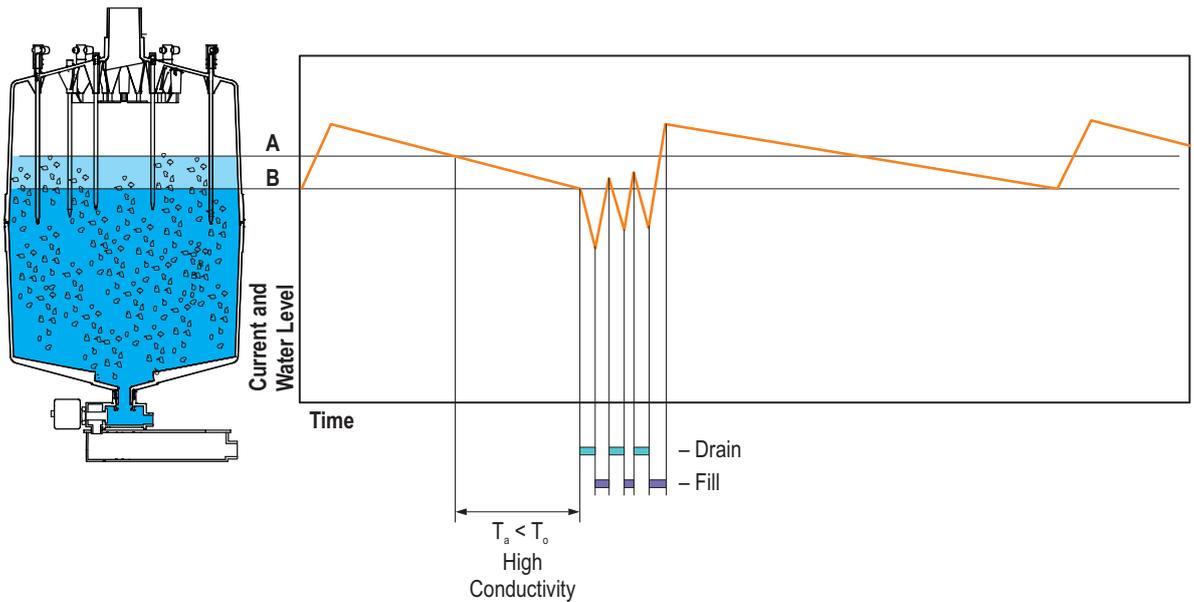


Figure 7: Multiple Short Drains

2.4 Steam Cylinders

The steam cylinder is the water reservoir for the humidifier. It consists of a plastic canister with a steam outlet, water inlet/outlet with strainer, separators and mounts for various electrodes to be immersed into the water. The Nortec EL humidifier ships with the standard cylinder listed in [Table 8 on page 24](#), [Table 9 on page 26](#) and [Table 10 on page 27](#). The standard cylinder has been developed for optimum performance in the conductivity range of most potable water systems 330-670 $\mu\text{Siemens/cm}$ ($\mu\text{S/cm}$). If required, the humidifier can be easily adapted to operate with water conductivities outside this ideal range. This allows for operation with a total range of 150-1200 $\mu\text{S/cm}$.

Consult your local Condair representative for details on adapting the humidifiers operation to accommodate water conductivity outside the standard operating range.

Low Conductivity Cylinder

For improved operation using potable water between 150 and 330 $\mu\text{S/cm}$, select a lower conductivity cylinder. **Note:** An alternate for the 200 series cylinders is not available for units operating at 208-277 V.

High Conductivity Cylinder

For improved operation on potable water between 670 and 1200 $\mu\text{S/cm}$, select a higher conductivity cylinder. **Note:** An alternate steam cylinder is not available for units operating at 480-600 V.

2.4.1 Water Conditions Versus Cylinder Life

The atmospheric steam output of the humidifier is pure and clean steam. During operation, the dissolved minerals in the water supply are left behind in the cylinder. Much of these minerals will be removed during periodic drain cycles of the cylinder (for drain frequencies refer to ["Drain Cycles" on page 18](#)).

[Figure 8](#) generalizes the effect of water hardness, and demand on cylinder life. Cylinder life is ultimately determined by the water chemistry, the unit running time, and steam output capacity setting.

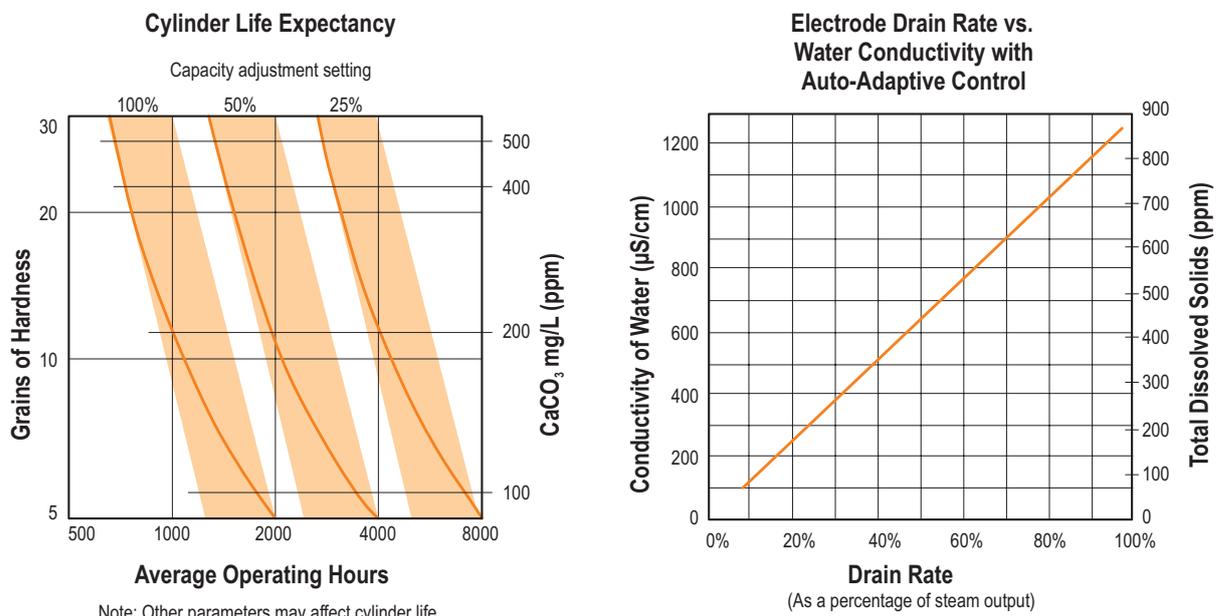


Figure 8: Water Conditions vs. Steam Cylinder Life and Drain Rates

2.4.2 Output Versus Cylinder Life

The Nortec EL humidifier maintains full output capacity for the full life of the cylinder. [Figure 9](#) illustrates the expected end-of-cylinder-life performance. As minerals build up on the electrodes in the cylinder, the patented Auto-adaptive Control algorithm automatically raises the water level slightly in the cylinder. This exposes fresh electrode surface to water and maintains peak output and efficiency from the humidifier. Once the electrode surface is completely electrically insulated, the user is alerted to replace the cylinder. The performance of other competitive humidifiers may degrade gradually as the minerals adhere to the cylinder. By increasing the water level to expose fresh electrode surface, the Nortec EL humidifier will maintain maximum output throughout its cylinder life.

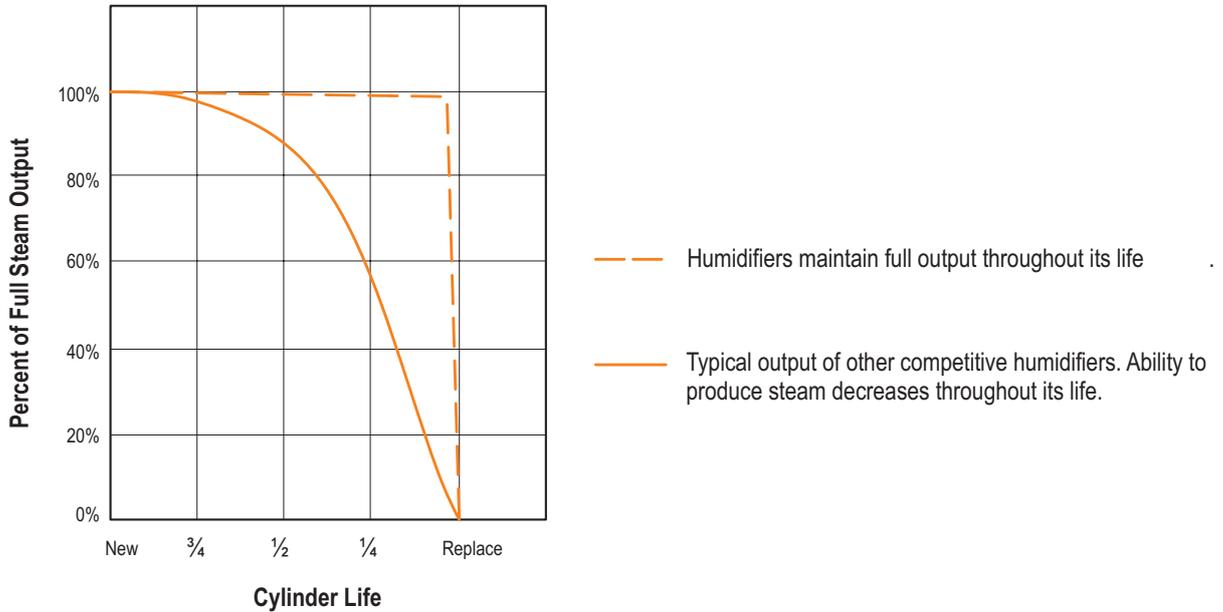


Figure 9: Steam Output vs. Steam Cylinder Life

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3 Product Specifications

3.1 Model Specifications

3.1.1 Model Designation

The specification label on the side (and the underside) of the Nortec EL humidifier shows its model number, serial number and ratings – refer to [Figure 2 on page 10](#). The breakdown of the model number is shown in [Figure 10](#).

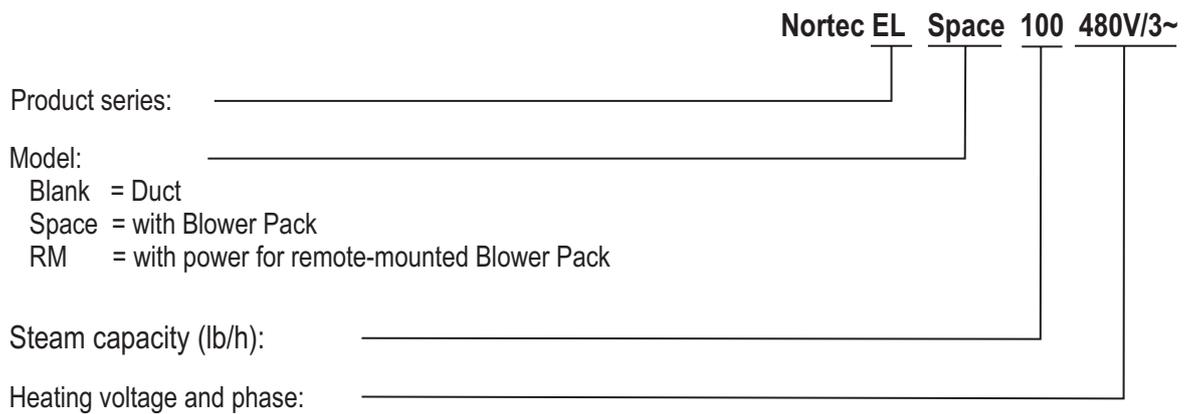


Figure 10: Model Number Breakdown

3.1.2 Nortec EL Specifications

The Nortec EL humidifier is available in a range of output capacities, voltages and configurations. Refer to [Table 8 on page 24](#) for the Nortec EL (Duct) specifications, [Table 9 on page 26](#) for the Nortec EL Space specifications, and [Table 10 on page 27](#) for Nortec EL RM specifications.

In addition, the short-circuit current rating (SCCR) for all Nortec EL humidifiers is 5 kA. With the internal primary fusing option (refer to [Table 2 on page 8](#)), the SCCR is 100 kA.

Table 8: Nortec EL Specifications

Phase	Steam Capacity lb/h (kg/h)	Voltage V	Amperage A	Maximum External Fuse A	Wattage kW	Standard Steam Cylinder	Fill Rate gpm (L/min)	Drain Rate gpm (L/min)	Net/Full Operating Weight lb (kg)			
Single-Phase	5 (2.2)	110-120	15.6	20	1.9	202	0.2 (0.8)	1.6 (6.1)	45/55 (21/25)			
	10 (4.5)	208	18.0	25	3.7							
		220-240	15.6	20	3.7							
		277	13.5	20	3.7							
		380	9.0	15	3.7							
	20 (9)	440-480	7.8	15	3.7					203		
		550-600	6.2	15	3.7	204						
	Three-Phase	20 (9)	208	36.0	45	7.5			321	0.3 (1.2)	1.7 (6.4)	45/65 (21/30)
			220-240	31.2	40	7.5						
			277	27.0	35	7.5						
			380	18.0	25	7.5			305			
			440-480	15.6	20	7.5			309			
550-600		12.5	20	7.5								
30 (14)		208	20.8	25	7.5	303						
		220-240	18.0	25	7.5							
		380	10.4	15	7.5	311						
		440-480	9.0	15	7.5							
	550-600	7.2	15	7.5								
50 (23)	208	31.1	40	11.2	421							
	220-240	27.0	35	11.2								
	380	15.6	20	11.2	407							
	440-480	13.5	20	11.2	411							
	550-600	10.8	15	11.2								
75 (34)	208	51.9	70	18.7	621							
	220-240	45.0	60	18.7								
	380	26.0	35	18.7	603							
	440-480	22.5	30	18.7	605							
	550-600	18.0	25	18.7								
100 (45)	208	77.9	100	28.1	621							
	220-240	67.5	90	28.1								
	380	39.0	50	28.1	603							
	440-480	33.7	45	28.1	605							
	550-600	27.0	35	28.1								
100 (45)	208*	93.4	125	33.7	621							
	220-240	90.0	125	37.4								
	380	52.0	70	37.4	603							
	440-480	45.0	60	37.4	605							
	550-600	36.0	45	37.4								

Table 8: Nortec EL Specifications, continued...

Phase	Capacity lb/h (kg/h)	Voltage V	Amperage A	Maximum External Fuse A	Wattage kW	Standard Steam Cylinder	Fill Rate gpm (L/min)	Drain Rate gpm (L/min)	Net/Full Oper- ating Weight lb (kg)
Three- Phase	150 (68)	208	155.7	200	56.1	621	0.5** (2.0**)	2.0** (7.6**)	120/245 (55/112)
		220-240	135.0	175	56.1				
		380	78.0	100	56.1	603			
		440-480	67.5	90	56.1	605			
		550-600	54.0	70	56.7				
	200 (91)	208***	186.9	250	67.3	621	0.9** (3.3**)	2.3** (8.7**)	
		220-240	180.0	225	74.8	603			
		380	104.1	150	74.8				
		440-480	90.0	125	74.8				
		550-600	72.0	90	74.8				

* Steam capacity for Nortec EL 100 unit running on 208V/3~ is 90 lb/h (41 kg/h)

** Per steam cylinder

*** Steam capacity for Nortec EL 200 unit running on 208V/3~ is 180 lb/h (82 kg/h)

Table 9: Nortec EL Space Specifications

Phase	Capacity lb/h (kg/h)	Voltage V	Amperage A	Maximum External Fuse A	Wattage kW	Standard Steam Cylinder	Fill Rate gpm (L/min)	Drain Rate gpm (L/min)	Net/Full Oper- ating Weight lb (kg)
Single-Phase	5 (2.2)	110-120	16.8	25	2.0	202	0.2 (0.8)	1.6 (6.1)	83/93 (38/42)
	10 (4.5)	208	18.7	25	3.9				
		220-240	16.2	25	3.9				
		277	14.0	20	3.9				
		380	9.4	15	3.9				
		440-480	8.1	15	3.9				
	550-600	6.5	15	3.9	203				
	20 (9)	208	36.7	50	7.6	321			
		220-240	31.8	40	7.6				
		277	27.5	35	7.6				
		380	18.4	25	7.6	305			
		440-480	15.9	20	7.6	309			
		550-600	12.7	20	7.6				
	Three-Phase	20 (9)	208	21.5	30	7.7			303
220-240			18.6	25	7.7				
380			10.8	15	7.7				
440-480			9.3	15	7.7	311			
550-600			7.4	15	7.7				
30 (14)		208	31.9	40	11.5	421			
		220-240	27.6	35	11.5				
		380	16.0	20	11.5	407			
		440-480	13.8	20	11.5	411			
		550-600	11.0	15	11.5				
50 (23)		208	52.6	70	19.0	621			
		220-240	45.6	60	19.0				
		380	26.4	35	19.0	603			
		440-480	22.8	30	19.0	605			
		550-600	18.2	25	19.0				
75 (34)		208	78.6	100	28.3	621			
		220-240	68.1	90	28.3				
		380	39.4	50	28.3	603			
		440-480	34.1	45	28.3	605			
	550-600	27.2	35	28.3					
100 (45)	208*	94.2	125	33.9	621				
	220-240	90.6	125	37.7					
	380	52.4	70	37.7	603				
	440-480	45.3	60	37.7	605				
	550-600	36.2	50	37.7					

* Steam capacity for Nortec EL Space 100 unit running on 208V/3~ is 90 lb/h (41 kg/h)

Table 10: Nortec EL RM Specifications

Phase	Capacity lb/h (kg/h)	Voltage V	Amperage A	Maximum External Fuse A	Wattage kW	Standard Steam Cylinder	Fill Rate gpm (L/min)	Drain Rate gpm (L/min)	Net/Full Oper- ating Weight lb (kg)
Single-Phase	5 (2.2)	110-120	16.8	25	2.0	202	0.2 (0.8)	1.6 (6.1)	45/55 (21/25)
	10 (4.5)	208	18.7	25	3.9				
		220-240	16.2	25	3.9				
		277	14.0	20	3.9				
		380	9.4	15	3.9				
		440-480	8.1	15	3.9				
	550-600	6.5	15	3.9	204				
	20 (9)	208	36.7	50	7.6	321			
		220-240	31.8	40	7.6				
		277	27.5	35	7.6				
		380	18.4	25	7.6	305			
		440-480	15.9	20	7.6	309			
550-600		12.7	20	7.6					
Three-Phase	20 (9)	208	21.5	30	7.7	303			
		220-240	18.6	25	7.7				
		380	10.8	15	7.7				
		440-480	9.3	15	7.7	311			
		550-600	7.4	15	7.7				
	30 (14)	208	31.9	40	11.5	421			
		220-240	27.6	35	11.5				
		380	16.0	20	11.5	407			
		440-480	13.8	20	11.5	411			
		550-600	11.0	15	11.5				
	50 (23)	208	52.6	70	19.0	621			
		220-240	45.6	60	19.0				
		380	26.4	35	19.0	603			
		440-480	22.8	30	19.0	605			
		550-600	18.2	25	19.0				
	75 (34)	208	78.6	100	28.3	621			
220-240		68.1	90	28.3					
380		39.4	50	28.3	603				
440-480		34.1	45	28.3	605				
550-600		27.2	35	28.3					
100 (45)	208*	94.2	125	33.9	621				
	220-240	90.6	125	37.7					
	380	52.4	70	37.7	603				
	440-480	45.3	60	37.7	605				
	550-600	36.2	50	37.7					

Table 10: Nortec EL RM Specifications, continued...

Phase	Capacity lb/h (kg/h)	Voltage V	Amperage A	Maximum External Fuse A	Wattage kW	Standard Steam Cylinder	Fill Rate gpm (L/min)	Drain Rate gpm (L/min)	Net/Full Weight lb (kg)
Three-Phase	150 (68)	208	156.9	200	56.5	621	0.5** (2.0**)	2.0** (7.6**)	120/245 (55/112)
		220-240	136.0	175	56.5				
		380	78.6	100	56.5	603			
		440-480	68.0	90	56.5	605			
		550-600	54.4	70	56.5				
	200 (91)	208***	188.1	250	67.8	621	0.9** (3.3**)	2.3** (8.7**)	
		220-240	181.0	250	75.2				
		380	104.7	150	75.2	603			
		440-480	90.5	125	75.2	605			
		550-600	72.4	100	75.2				

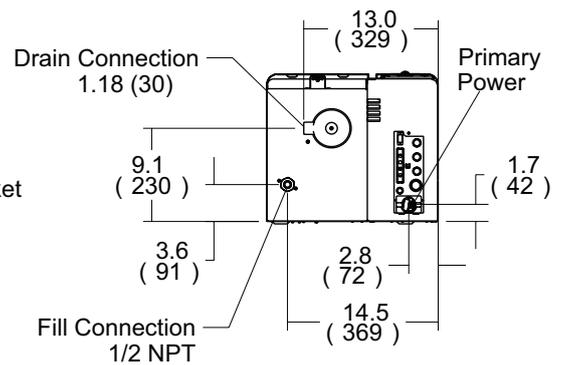
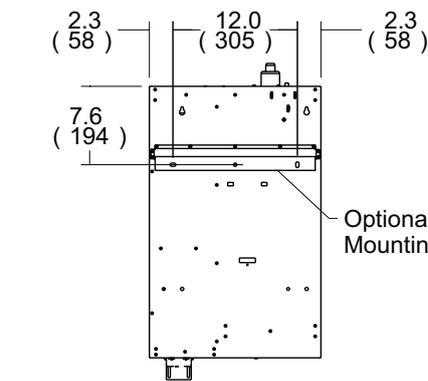
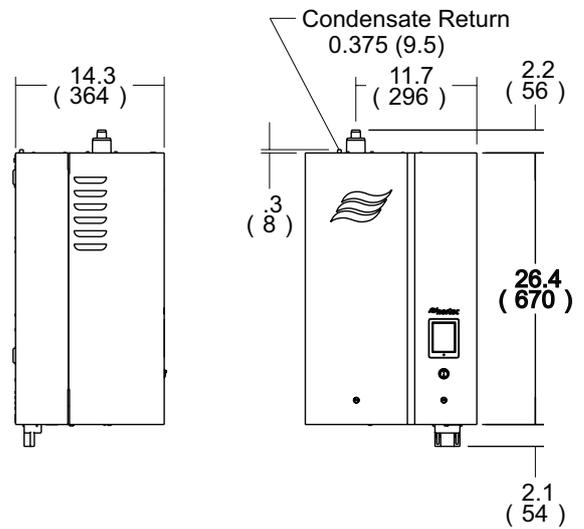
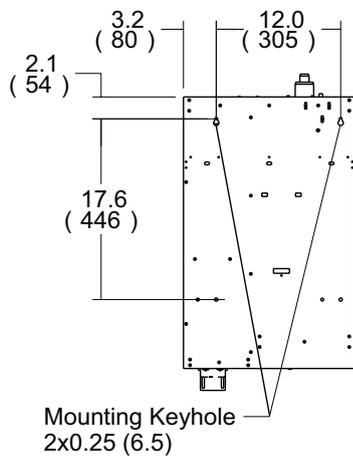
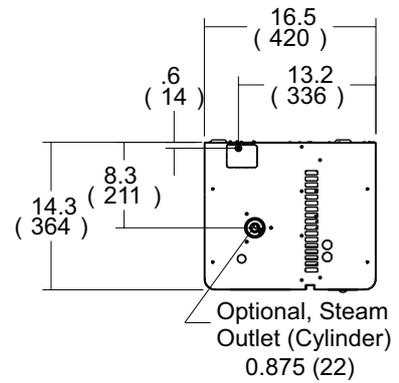
* Steam capacity for Nortec EL RM 100 unit running on 208V/3~ is 90 lb/h (41 kg/h)

** Per steam cylinder

*** Steam capacity for Nortec EL RM 200 unit running on 208V/3~ is 180 lb/h (82 kg/h)

3.2 Specification Drawings

Empty Weight	45 lbs
Full Weight	55 lbs
Front Clearance	36 in.
Ceiling Clearance	12 in.
Left/Right Clearance	0 in.
Floor Clearance	24 in.
Water Inlet Pressure	30-80 psig



ALL UNITS IN INCHES (mm)

Figure 11: Nortec EL 005-030 Physical Data and Dimensions

Empty Weight	85 lbs
Full Weight	150 lbs
Front Clearance	36 in.
Ceiling Clearance	12 in.
Left/Right Clearance	0 in.
Floor Clearance	24 in.
Water Inlet Pressure	30-80 psig

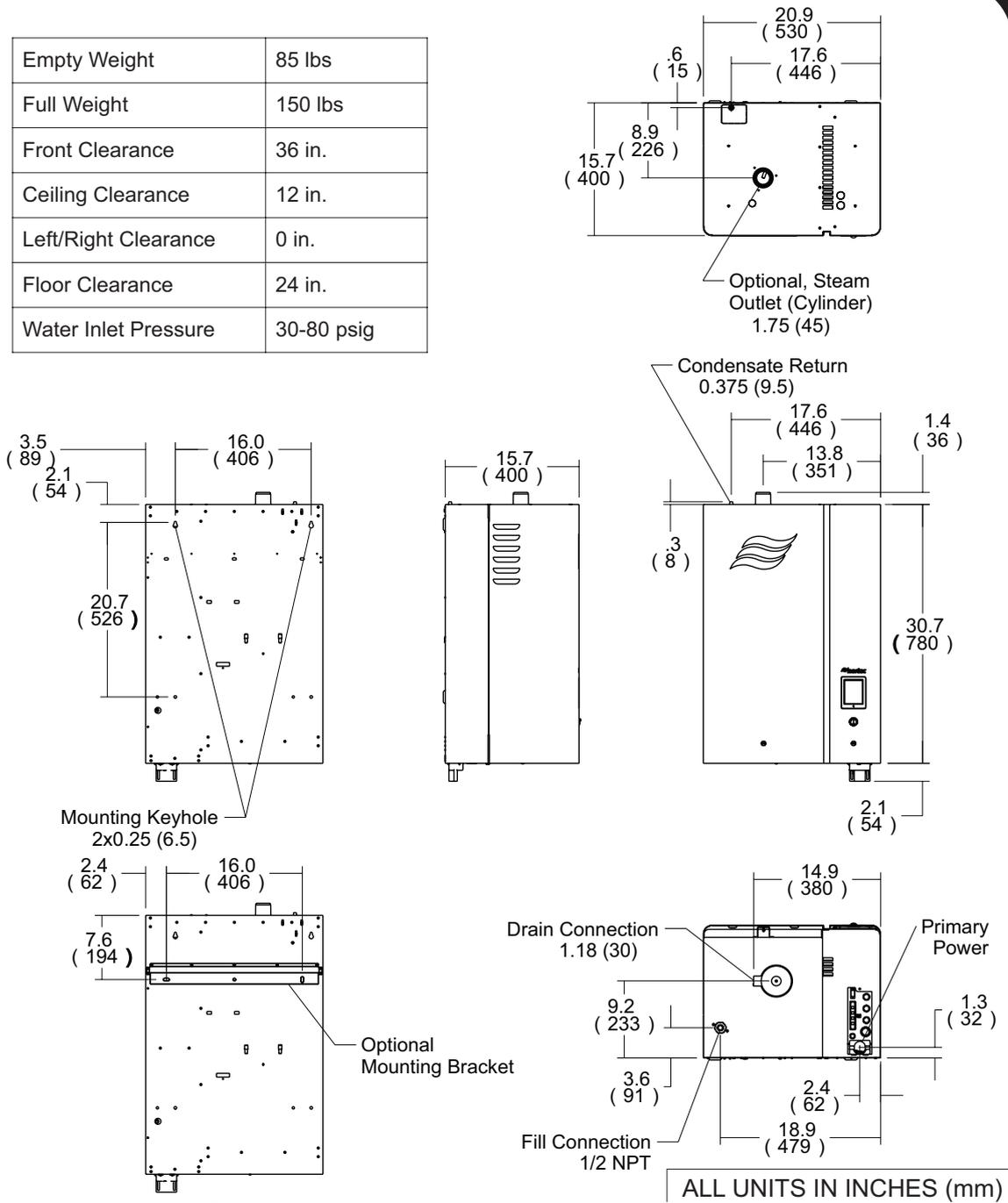


Figure 12: Nortec EL 050-100 Physical Data and Dimensions

Empty Weight	120 lbs
Full Weight	245 lbs
Front Clearance	36 in.
Ceiling Clearance	12 in.
Left/Right Clearance	0 in.
Floor Clearance	24 in.
Water Inlet Pressure	30-80 psig

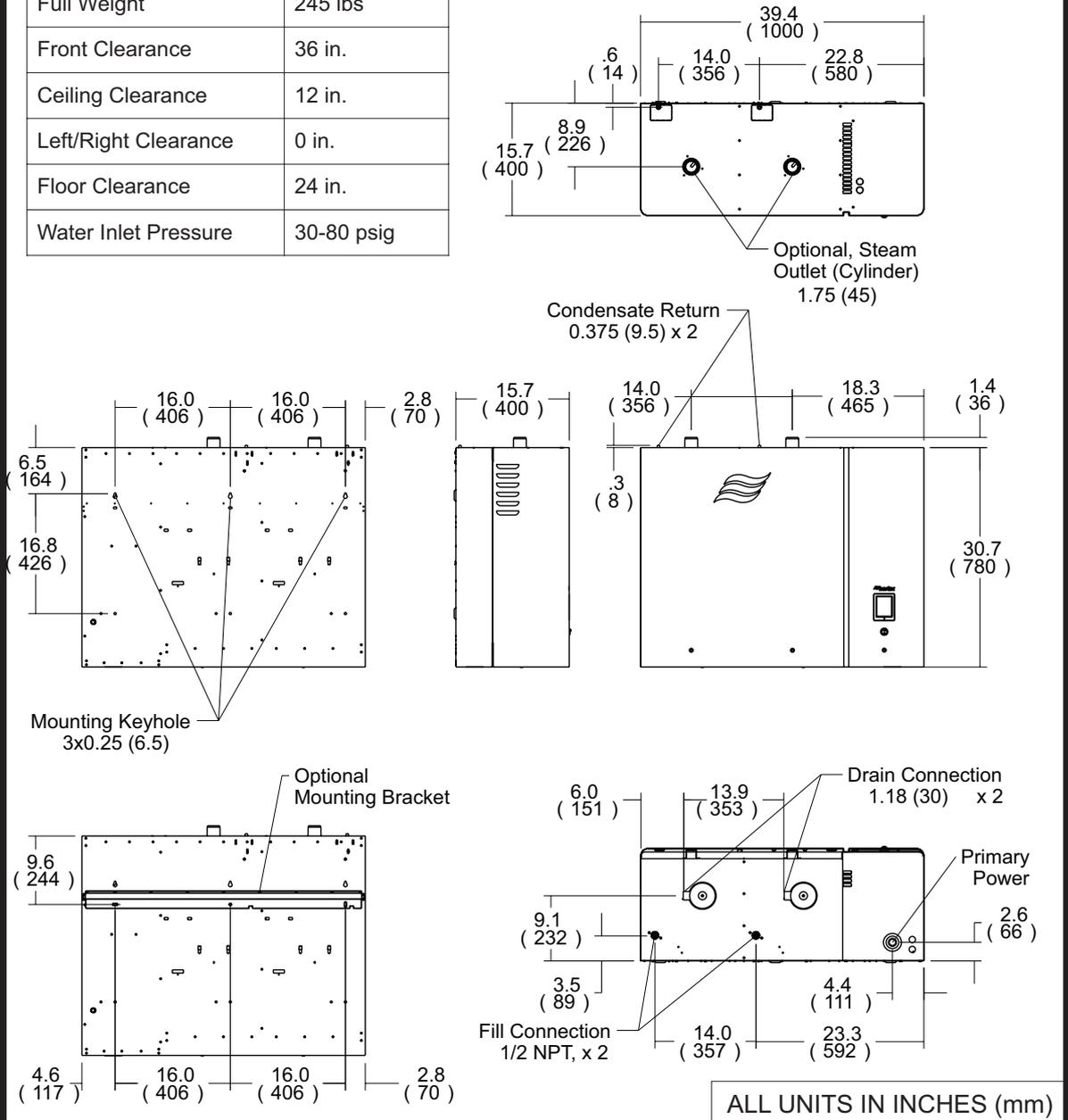
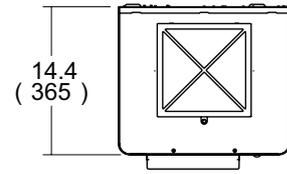
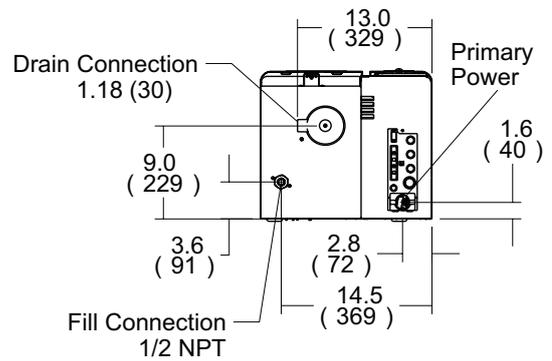
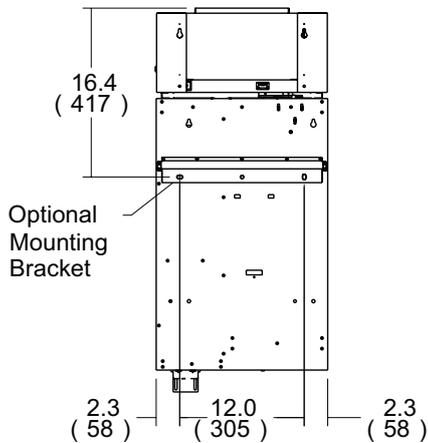
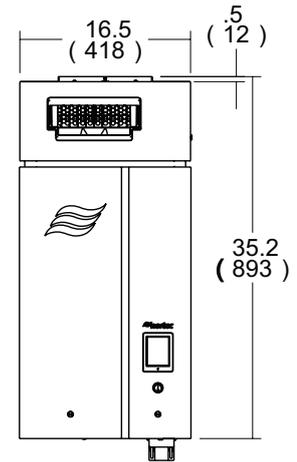
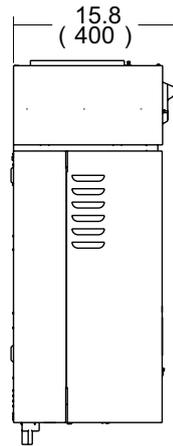
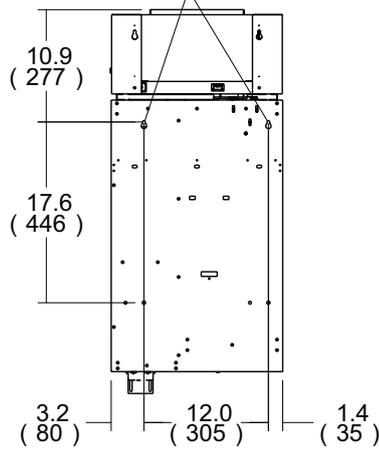


Figure 13: Nortec EL 150-200 Physical Data and Dimensions

Empty Weight	83 lbs
Full Weight	113 lbs
Front Clearance*	005-010: 6 in. 020: 60 in. 030: 71 in.
Ceiling Clearance*	12 in.
Left/Right Clearance*	12 in.
Floor Clearance*	96 in. (to bottom of blower pack)
Water Inlet Pressure	30-80 psig



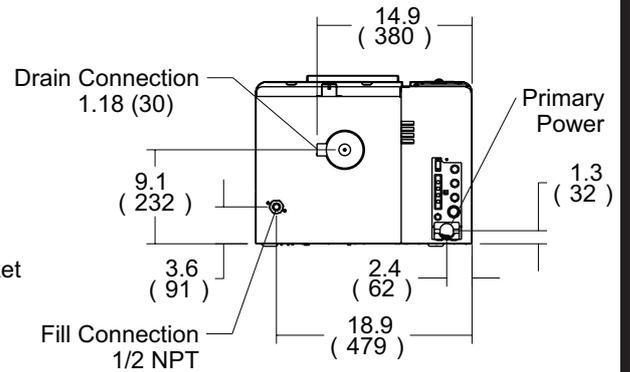
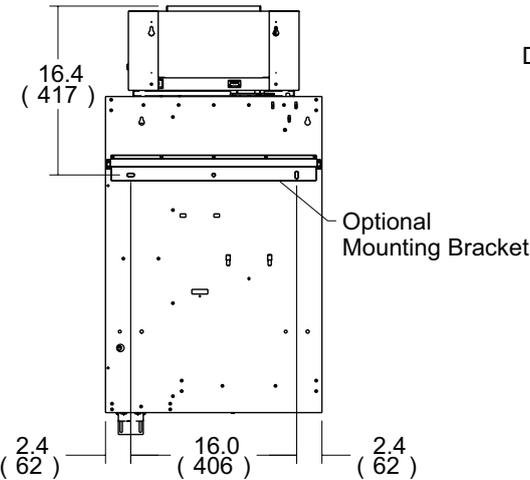
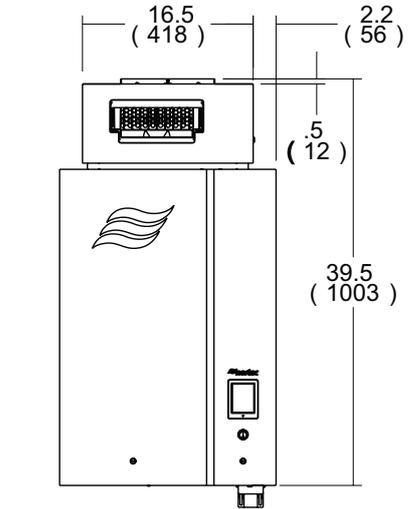
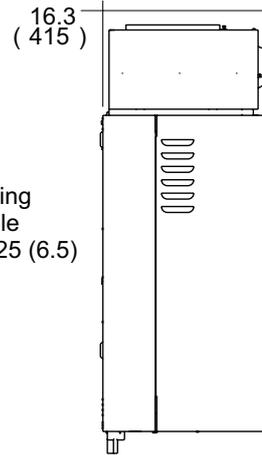
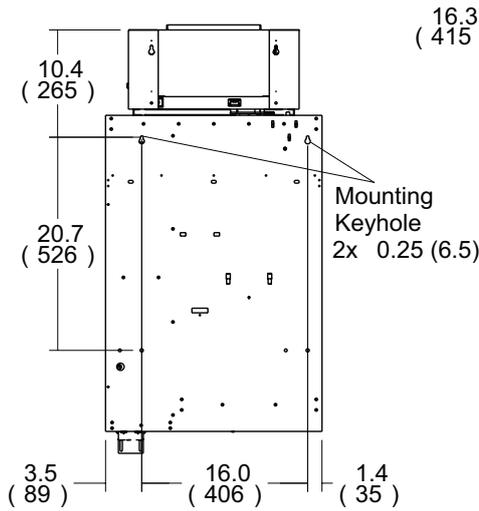
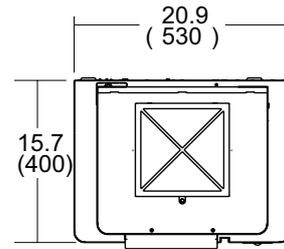
Mounting Keyhole
2x0.25 (6.5)



* Clearances with blower pack on HIGH
ALL UNITS IN INCHES (mm)

Figure 14: Nortec EL Space 005-030 Physical Data and Dimensions

Empty Weight	123 lbs
Full Weight	188 lbs
Front Clearance*	050: 132 in. 075: 153 in. 100: 218 in.
Ceiling Clearance*	12 in.
Left/Right Clearance*	050: 12 in. 075-100: 30 in.
Floor Clearance*	96 in. (to bottom of blower pack)
Water Inlet Pressure	30-80 psig



* Clearances with blower pack on HIGH
 ALL UNITS IN INCHES (mm)

Figure 15: Nortec EL Space 050-100 Physical Data and Dimensions

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4 Planning

This chapter contains planning information for selecting the location, as well as provisioning of services for the Nortec EL humidifier. It also describes the installation requirements for mounting, plumbing, electrical and steam connections. Design of the control systems and preventative maintenance for the Nortec EL humidifier are also discussed.

4.1 Location and Clearances

- When selecting the location of the humidifier, choose a location that is close as possible to the steam distributor. This will minimize heat loss through the steam line. Locate the humidifier below the steam distributor, when possible.
- Allow adequate clearances around the humidifier for ease of maintenance. Although the Nortec EL humidifier requires no side clearance, Conair recommends minimum clearances of 6 in (150 mm) on the side. A clearance of 24 in (610 mm) between the humidifier and the ground is also required. Refer to [Figure 16](#) and [Table 11 on page 36](#), which also show the clearances required for the Nortec EL Space unit. Observe all local and national installation codes. Conair is not responsible for any installation code violations.

Refer to the Blower Pack Installation, Operation and maintenance Manual (document 2582277) for clearances required for remote-mounted blower packs. All Nortec documents are available from www.humidity.com.

- The selected location should permit proper routing of services, as well as steam and condensate lines.
- The Nortec EL humidifier should only be installed in a drip-proof location within buildings, where the ambient temperature is 41-104 °F (5-40 °C) and the relative humidity is 5-95% (non-condensing).

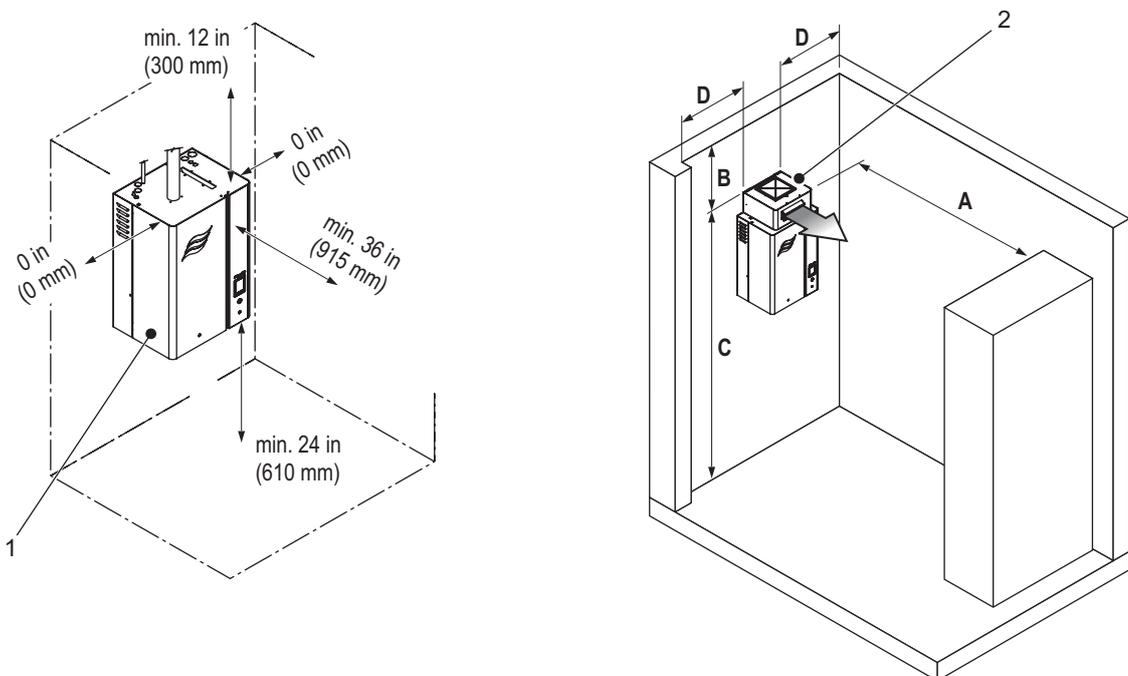


Figure 16: Location and Clearances

- 1 Nortec EL humidifier
- 2 Nortec EL Space humidifier (with built-on blower pack)

Table 11: Minimum Clearances for Blower Packs

Steam Capacity lb/h (kg/h)	Blower Pack Speed Setting	Min. Frontal Clearance – "A" in (m)	Min. Overhead Clearance – "B" in (m)	Min. Height Above Ground – "C" in (m)	Suggested Left Side Clear- ance – "D" in (m)	Suggested Right Side Clearance – "D" in (m)
5 (2.3)	Low	9 (0.23)	12 (0.31)	90 (2.3)	12 (0.31)	
	High	6 (0.16)	12 (0.31)			
10 (4.5)	Low	18 (0.46)	12 (0.31)			
	High	6 (0.16)	12 (0.31)			
20 (9)	Low	75 (1.91)	12 (0.31)			
	High	60 (1.53)	12 (0.31)			
30 (13.5)	Low	86 (2.19)	12 (0.31)			
	High	71 (1.81)	12 (0.31)			
50 (22.5)	Low	174 (4.42)	12 (0.31)			
	High	132 (3.36)	12 (0.31)			
75 (34)	Low	189 (4.81)	48 (1.22)		30 (0.77)	
	High	153 (3.89)	12 (0.31)			
100 (45)	Low	248 (6.30)	84 (2.14)			
	High	218 (5.54)	12 (0.31)			

Data based upon nominal conditions 72 °F (22 °C), 40% RH.

Note: The High speed setting on the blower pack permits shorter absorption distances, whereas the Low setting permits the blower to run quieter but requires longer absorption distances. Visit www.NortecHelp.com and use the free online program - Humidifier Engineering and Load-sizing Program (H.E.L.P.) to assist with absorption distance and other calculations.

4.2 Services

Water Supply

- Water supply to the humidifier must be cold potable drinking water, and not reverse osmosis (RO) or deionized (DI) water. The water quality requirements are listed in [Table 12](#) below.

Table 12: Water Quality Requirements

Conductivity (µS/cm)	Hardness (gpg)	Silica (ppm)	Alkalinity (pH)
150-1200*	0-12	0-4	7-7.5
	0-3	4-14	

* Default humidifier configuration supports approximately 330-670 µS/cm.

- The water supply should also be free of additives such as corrosion inhibitors, disinfectants, etc., which may affect the performance of the humidifier.
- The water supply should have a minimum flow rate of 0.9 gpm (3.3 L/min), and should be pressure regulated to 30-80 psig (207-550 kPa), with spike pressure limited to 120 psig (827 kPa).
- Water temperature should be 34-104 °F (1-40 °C).
- The water supply should be filtered to 5 µm (optional, but recommended).
- The diameter of the water supply piping should be 1/2 in, and must have a 1/2 in NPT female end.
- The water supply line should be made of copper, stainless steel or plastic certified for drinking water systems.
- A shutoff valve and a union fitting must be supplied in the water supply line for ease of maintenance.

Drainage

- The humidifier should be connected to a dedicated building drain (recommended) with a minimum drainage rate of 2.3 gal/min (8.7 L/min) per steam cylinder. For safety reasons, drain water from the humidifier should not empty into a sink used by personnel. The drain line must allow free and easy draining. A restricted drain can cause water in the humidifier to over-concentrate and result in poor operation, or cause water to back up at the air gap funnel. Refer to ["Water and Drainage Connections" on page 39](#).
- The building drain pipe should be made of either copper or stainless steel (minimum DIN 1.4301) so it can handle drain water temperatures up to 212 °F (100 °C).
- The space in which the humidifier is to be installed should have a floor drain. However, if a floor drain is not available, a leakage monitoring device must be supplied to permit interruption of the water supply in case of a leakage.

Power Supply

- The power supply to the humidifier should match the full voltage and current draw listed in the specifications. Refer to [Table 8 on page 24](#) for the Nortec EL power requirements, [Table 9 on page 26](#) for the Nortec EL Space power requirements, and [Table 10 on page 27](#) for Nortec EL RM power requirements.
- The power supply must have an external dedicated fused disconnect switch. The fusing must not exceed the maximum circuit protection listed in the tables referenced above.

4.3 Installation Requirements

4.3.1 Humidifier Mounting

The Nortec EL humidifier can be mounted on a wall or equivalent support using the keyholes on the back of the unit. 1/4×2 lag bolts are used to secure the unit to 2×4 studs in the wall (or equivalent support). Refer to [Figure 17](#).

The unit can also be mounted on the wall (or equivalent support) using the optional mounting bar. Refer to the Nortec EL Installation Manual (document 2582302 available from www.condair.com) for other mounting details, including how to mount the unit to meet OSHPD (seismic) requirements.

The following is a list of installation requirements for mounting the Nortec EL humidifier:

- The humidifier should not be mounted on hot surfaces, or surfaces that can freeze, or near vibrating components, or on the floor. The Nortec EL Space units should not be installed near cold surfaces or where the dew point may be reached.
- The mounting surface must be able to withstand temperatures of 140-158 °F (60-70 °C) that can be generated during operation of the humidifier.
- The humidifier should be mounted on a wall or other suitable vertical surface that offers a sufficiently high load-bearing capacity to support the full operating weight of the humidifier and accessories. Refer to [Table 8 on page 24](#) for the full weights of Nortec EL units, and [Table 9 on page 26](#) for the Nortec EL Space units.
- The humidifier should not be used as a structural member. All piping connected to the unit must be supported independently.

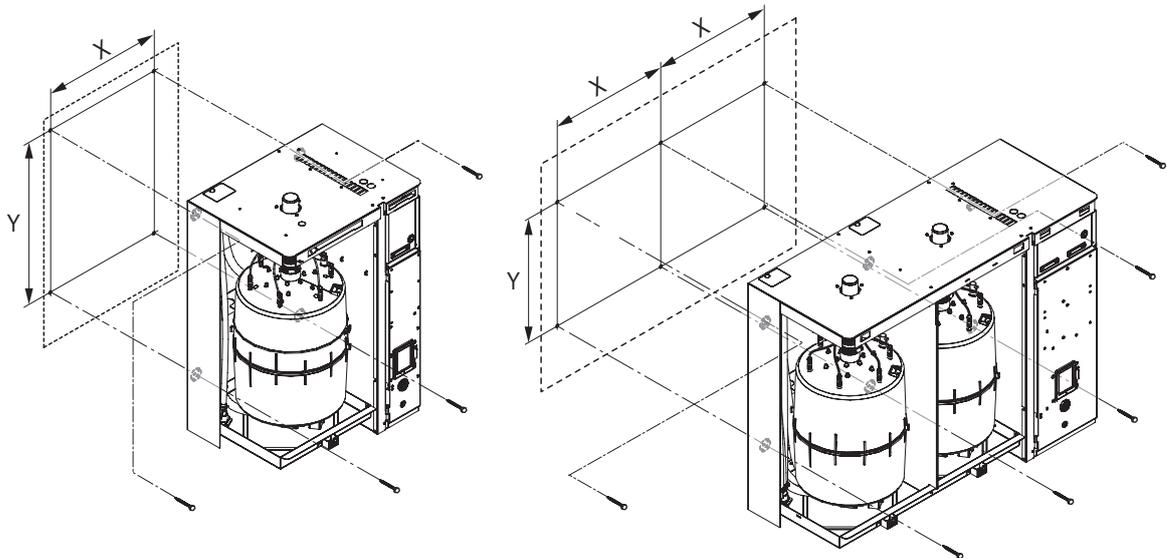


Figure 17: Standard Humidifier Mounting

Table 13: Keyhole Spacing

Dimension	Housing Size in (mm)		
	Small	Medium	Large
X	12 (305)	16 (406)	16 (406)
Y	17.5 (446)	20.7 (526)	16.75 (426)

4.3.2 Water and Drainage Connections

The water and drain connections on the Nortec EL humidifier are located at the bottom of the unit. Refer to [Figure 18](#).

The flexible bent hose (supplied) connects a short length of 7/8 in (22 mm) drain line to the drain canal on the humidifier. The drain hose then empties into an air gap funnel connected to the building drain.

The water supply line connects to the fill valve through a NPT-to-BSPP adaptor (supplied).

The following is a list of installation requirements for the water and drainage connections:

- The drain line from the humidifier should be as short as possible, and empty into an air gap funnel (with optional trap) before connecting to the building drain.
- The drain line should have a constant minimum downslope of 1 in/48 in (1.2°) to the air gap funnel without touching its sides or bottom.
- The drain line should have a minimum inner diameter of 7/8 in (22 mm), and must be made of stainless steel, or copper pipe to handle temperatures up to 212 °F (100 °C).
- The air gap funnel should be located away from the humidifier control cabinet to prevent rising steam from damaging the electrical components in the cabinet.
- Drain lines from large humidifiers with dual steam cylinders must empty into separate air gap funnels before connecting to the drain. The combined drain line should have a minimum inner diameter of 1.5 in (38 mm).
- All water supply and drain connections must be installed to local plumbing codes.

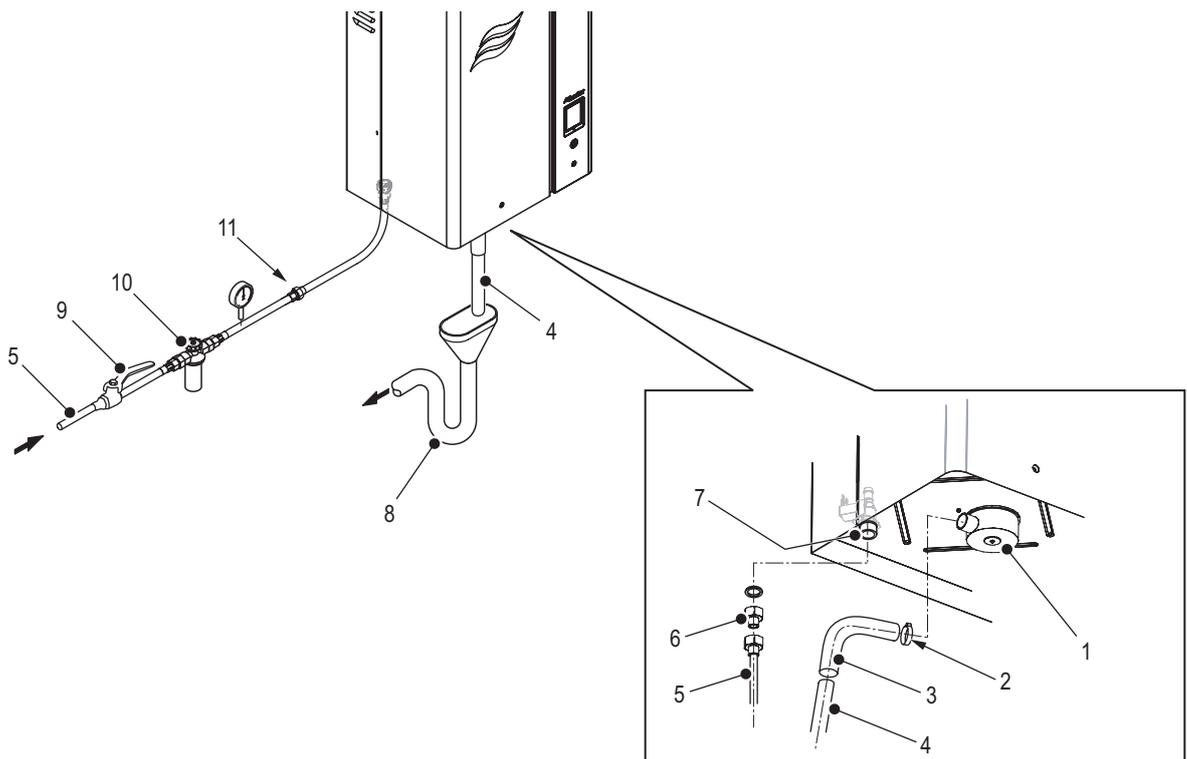


Figure 18: Nortec EL Water and Drain Connections

- | | | | |
|---|--|----|--|
| 1 | Drain canal (un-threaded), 1-3/16 in (30 mm) O.D. | 7 | Fill valve (3/4 in BSPP plastic threads) |
| 2 | Hose clamp (supplied) | 8 | Air gap funnel with optional trap (not supplied) |
| 3 | Flexible bent hose (supplied) | 9 | Shutoff valve (not supplied) |
| 4 | Drain line, minimum 7/8 in (22 mm) I.D. (not supplied) | 10 | Filter, 5 µm (optional, but recommended) |
| 5 | Water supply line, 1/2 in (not supplied) | 11 | Union fitting (not supplied) |
| 6 | Adaptor, 3/4 BSPP to 1/2 in NPT (supplied) | | |

4.3.3 Steam Distribution

The steam generated by the Nortec EL humidifier can be distributed into the conditioned environment by duct distributors installed on air handling units or within supply ducts, or through built-on blower packs (Nortec EL Space humidifier) or remote-mounted blower packs. In all cases, the steam distributors must have a dispersal capacity equal to or greater than the humidifier steam output.



Visit www.condairhelp.com and use the free online program - **Humidifier Engineering and Load-sizing Program (H.E.L.P.)** to assist you with absorption distance calculations, selection of humidifiers, steam distributors, controls and accessories.

Additional information on the effects of humidity, relative humidity calculations, load calculations, and recommended design conditions can be found in the Humidification Load Calculation Manual (document 2553856).

4.3.3.1 Duct Distributors

A variety of duct distributors are available for the Nortec EL humidifier to accommodate duct dimensions, humidifier capacities and steam absorption distances. For more information on available duct distributor systems refer to the documents listed in [Table 14](#), which are available from www.condair.com.

Table 14: Duct Distributor Models

Model	Steam Capacity lb/h (kg/h)	Duct Dimensions in (mm)		Condair Document Number
		Minimum**	Maximum**	
ASD Tube	0-25* (0-11)	10 (255)	66 (1675)	2556592
BSD Tube	0-35 (0-16)	12 (305)	102 (2590)	
CSD Tube	0-115 (0-52)	24 (610)	138 (3503)	
SAM-e	Maximum 1200** (545)**	18×18 W (457×457 W)	360×360 W (9145×9145 W)	1503529
Mini SAM-e	Maximum 210** (95)**	8×12 W (203×305 W)	36×36 W (914×914 W)	

* Max 22 lb/h (10 kg/h) for 10 in (255 mm) ASD tubes.

** Available in various standardized configurations.

The following is a list of installation requirements for duct distributors to ensure steam is properly absorbed, and condensation does not occur in the ducts:

- Steam distribution capacity must be equal to or greater than the humidifier steam production capacity, less steam line condensate losses. Multiple distributors can be utilized, as needed.
- Air flow in the duct across the distributor must be laminar over the entire calculated absorption distance downstream of the distributor. Excessive turbulence may cause air stream collisions with internal duct walls/components, which must be avoided.
- The air velocity in the duct must be greater than 300 ft/min (92 m/min) to prevent steam migrating to, and colliding with, the duct ceiling.
- An air proving switch and high limit humidistat must be installed in the system. Refer to ["Duct Distribution Control Design" on page 51](#).
- Backpressure in the steam line combined with duct static pressure should not exceed exceed 5.5 in H₂O (1.37 kPa), or up to 10 in H₂O (2.49 kPa) with the optional fill cup extension.
- The atmospheric steam lines between the Nortec EL humidifier and the steam distributor must be installed as described in ["Atmospheric Steam and Condensate Lines" on page 42](#).

4.3.3.2 Blower Packs

Blower packs create an air stream to allow absorption of the atmospheric steam in the conditioned environment. Once the steam is absorbed, the humidity will disperse evenly throughout most conditioned environments without the need of further mechanical assistance (except when mechanical obstructions, localized variances in temperature, infiltrating air, or materials that have equalizing moisture effects on the surrounding atmosphere are present). Refer to ["Space Distribution Control Design" on page 53](#).

The Nortec EL Space humidifier comes fully factory-assembled with its own built-on blower pack (with internal power supply, steam and condensate connections). The remote-mounted blower pack is capable of dispersing 5-100 lb/h (2-45 kg/h) of steam, and requires an external 120 VAC, 15 A power supply, as well as atmospheric steam line and condensate connections. Refer to [Figure 19](#).

The blower pack has two speed settings – High speed setting which provides shorter absorption distances, and the Low speed setting which offers quieter operation but requires longer absorption distance. For more information refer to the Blower Pack Installation Operation and Maintenance Manual (document 2582277, available from www.condair.com).

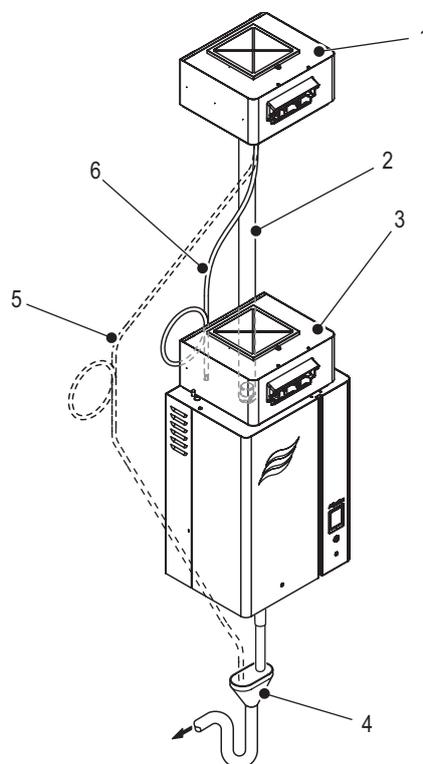


Figure 19: Blower Pack

- 1 Remote-mounted blower pack
- 2 Steam line – must rise straight up 12 in (300 mm) before any bends
- 3 Built-on (Space) blower pack
- 4 Air gap funnel connected to building drain
- 5 Condensate line (alternate) with trap for remote-mounted blower pack routed to building drain
- 6 Condensate line with trap for remote-mounted blower pack connected to humidifier fill cup

The following is a list of requirements for installing remote-mounted blower packs:

- The atmospheric steam line must rise straight up 12 in (300 mm) from the Nortec EL humidifier before continuing on to the blower pack. Other steam line installation requirements are described in ["Atmospheric Steam and Condensate Lines" on page 42](#).
- The condensate line from the blower pack can be routed to either an external drain or the humidifier fill cup. It must have a constant minimum downslope of 1.2°, with no restrictions. The condensate trap should have a diameter of 4 in (100 mm) and must be located minimum 12 in (300 mm) below the blower pack condensate port. The condensate line from small steam adaptors should have a trap with diameter of 2 in (50 mm).

4.3.3.3 Atmospheric Steam and Condensate Lines

The Nortec EL humidifier can handle backpressures up to 5.5 in H₂O (1.37 kPa), or up to 10 in H₂O (2.49 kPa) with the optional fill cup extension. When the combined effect of backpressure in the steam line and the duct static pressure exceed this limit, it can adversely affect operation of the humidifier. The steam line material, its diameter, length, slope and the number of bends in the line affect the backpressure, which must be considered carefully when planning. Other factors such as insulation of the steam line to reduce efficiency losses caused by the formation of condensate, as well as condensate drainage to permit free venting of steam must also be considered.

The following is an overview of the requirements for atmospheric steam and condensate lines. For more details refer to "Best Practices for Installing Steam and Condensate Lines" in the Nortec EL Installation Manual (document 2582302).

Steam Lines

- ❑ Steam lines must be made of copper (MED Type-L) or stainless steel (minimum DIN 1.4301) exclusively. Use a Condaire-supplied steam hose for short distances only. Steam lines made of any other materials may adversely affect operation of the unit.

- ❑ The length of the steam line and the number of bends in the line should be kept to a minimum to minimize backpressure and reduce efficiency loss. The maximum recommended length of steam line is listed in [Table 15 on page 43](#).

Refer to [Table 16 on page 43](#) for equivalent length of some common fittings when calculating total equivalent length of the steam lines. Also refer to "[Condensate Loss](#)" on page 61 when calculating efficiency losses based on total equivalent length of the steam line.

- ❑ The steam line should not have any restrictions, as it can increase backpressure. Backpressure in the line combined with duct static pressure should not exceed 5.5 in H₂O (1.37 kPa), or up to 10 in H₂O (2.49 kPa) with the optional fill cup extension.
- ❑ Steam lines (from Nortec EL 150/200 with dual steam cylinders or multiple humidifiers) should not merge except at the steam distributor, and ONLY if the steam cylinders operate in parallel mode. Refer to "[Combining Steam Lines](#)" on page 45.
- ❑ The steam line should be connected to the steam outlet on the humidifier and the steam distributor with short lengths of steam hose, and secured with hose clamps. Refer to [Table 15 on page 43](#).
- ❑ The steam line must be supported independently so there is no load on the humidifier.
- ❑ The steam line must have a constant minimum upslope of 10°, or a constant minimum downslope of 2°, as shown in [Figure 20](#).
- ❑ The steam line must be insulated with a minimum of 1 in (25 mm) pipe insulation over its entire length to minimize the formation of condensate.

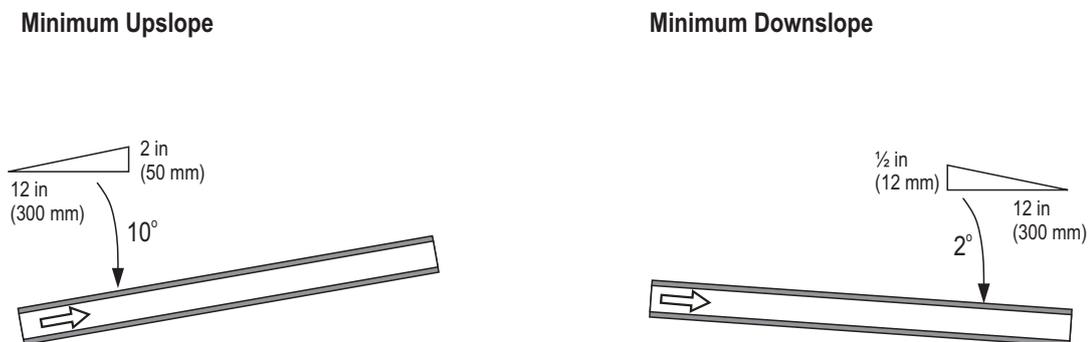


Figure 20: Steam Line Slope

Table 15: Steam Line Recommendations

Model	Steam Line			Over-sized Steam Line**			Steam Losses***
	Equivalent Maximum Steam Line Length	Copper Pipe (MED Type-L) Diameter	Stainless Steel (min. DIN 1.4301) Pipe Diameter	Equivalent Maximum Steam Line Length	Copper Pipe (MED Type-L) Diameter	Stainless Steel (min. DIN 1.4301) Pipe Diameter	
NortecEL005	7 ft (2 m)	3/4 in (20 mm)	7/8 in × 0.049 wall (22 mm × 1.25 mm wall)	14 ft (4 m)	1 in (25 mm)	1-1/8 in × 0.049 wall (29 mm × 1.25 mm wall)	0.06 lb/h/ft (0.09 kg/h/m)
NortecEL010	12 ft (3.5 m)			24 ft (7 m)			
NortecEL020	17 ft (5 m)			34 ft (10 m)			
NortecEL030	22 ft (6.5 m)			44 ft (13 m)			
NortecEL050	43 ft (13 m)	1-1/2 in (40 mm)	1-3/4 in × 0.065 wall (45 mm × 1.65 mm wall)	86 ft (26 m)	2 in (50 mm)	2 in × 0.065 wall (50 mm × 1.65 mm wall)	0.11 lb/h/ft (0.18 kg/h/m)
NortecEL075 NortecEL100	47 ft (14 m)			94 ft (28 m)			
NortecEL150* NortecEL200*	50 ft (15 m)	1-1/2 in (40 mm)	1-3/4 in × 0.065 wall (45 mm × 1.65 mm wall)	100 ft (30 m)	2 in (50 mm)	2 in × 0.065 wall (50 mm × 1.65 mm wall)	
Condair Steam Hose							
NortecEL005- NortecEL030	10 ft (3 m)	P/N 1328810 – 7/8 in (22 mm)					0.1 lb/h/ft (0.15 kg/h/m)
NortecEL050- NortecEL200	10 ft (3 m)	P/N 1328820 – 1-3/4 in (45 mm)					0.15 lb/h/ft (0.22 kg/h/m)

* Use a single steam line for each steam cylinder. Do not combine lines except at a distributor, and only if using the humidifiers in parallel mode.
 ** Over-sized lines may require a reducer at the humidifier and the steam distributor.
 *** Based on 1 in (25 mm) insulated copper pipe.

Table 16: Approximate Equivalent Length of Atmospheric Steam Line Fittings

Nominal Tube Size in (mm)	Standard 90° Elbow ft (m)	45° Elbow ft (m)	Side-outlet Tee ft (m)
0.75-0.875 (19-22)	2 (0.6)	1 (0.3)	4 (1.2)
1.5-1.75 (38-45)	3.5 (1.1)	1.75 (0.5)	7 (2.1)
3 (76)	5 (1.5)	2.5 (0.8)	11 (3.4)
4 (102)	8 (2.4)	4 (1.2)	15 (4.6)

Condensate Lines

- Condensate line and trap must be made of 1/4 in copper (MED Type-L) or 3/8 in stainless steel (minimum DIN 1.4301), or 3/8 in (9.5 mm) Condair condensate hose.
- Condensate lines must connect into full size "Tee" fittings in the steam line. Refer to [Figure 21](#).
- Condensate lines must be installed at all low points in the steam line, and at horizontal-to-vertical transitions in the steam line.
- Condensate lines and traps must be installed at regular intervals on long steam runs, and the maximum distance between condensate lines is 15 ft (4.5 m). Refer to [Figure 22 on page 45](#).
- The condensate trap must be located a minimum of 12 in (300 mm) below the condensate port on the steam distributor or the "Tee" fitting in the steam line. The trap diameter should be 8 in (200 mm).
- The condensate drain line must have a constant minimum downslope of 1.2°, and may be connected to the fill cup port on the top of the humidifier, or to the building drain.

Condensate from a SAM-e steam distributor or larger steam line should be connected to a drain water cooler (if required by code) before emptying into the building drain.

Large volumes of condensate from multiple humidifiers or SAM-e systems should never be returned to a single humidifier.

- For safety reasons, condensate should not be routed to a sink used by personnel.
- Individual condensate drain lines must be trapped independently before connecting into a single line.
- Condensate lines should not have any restrictions, and all traps must be primed with water.

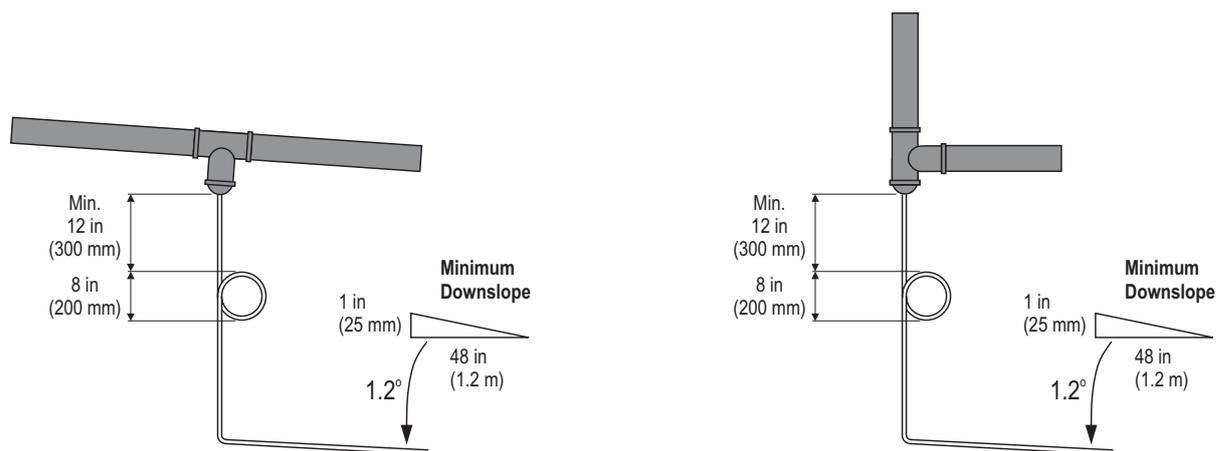


Figure 21: Condensate Drain Lines

Combining Steam Lines

The following is a list of installation requirements for combining steam lines:

- Multiple steam lines (from a Nortec EL 150/200 with dual steam cylinders, or multiple humidifiers) must not merge except at the steam distributor, and ONLY if the steam cylinders operate in parallel mode – refer to [Figure 22](#). If necessary, a specifically designed optional Condairst adaptor must be used to connect the steam lines to the steam distributor.
- All requirements for steam and condensate lines must be satisfied. Refer to ["Steam Lines" on page 42](#) and ["Condensate Lines" on page 44](#).

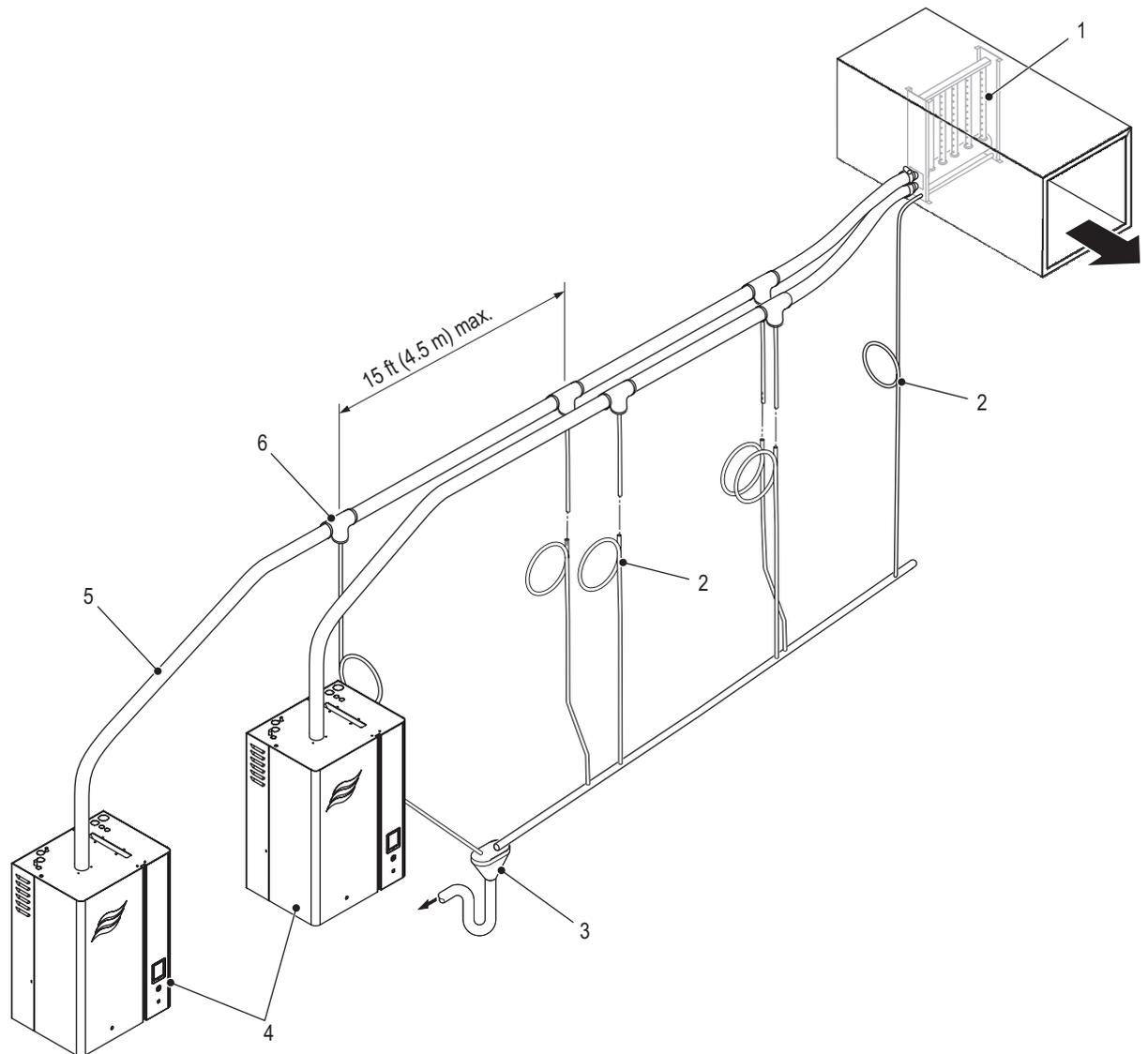


Figure 22: Combining Multiple Steam Lines

- 1 SAM-e steam distributor
- 2 Condensate drain line, trap diameter 8 in (200 mm) and located minimum 12 in (300 mm) below condensate port or "Tee" fitting
- 3 Air gap funnel connected to building drain
- 4 Condairst humidifier – must operate in parallel mode
- 5 Steam line – constant minimum upslope of 10°, or a constant minimum downslope of 2°
- 6 "Tee" fitting, full size

4.3.4 Electrical Connection

The power supply to the Nortec EL humidifier is routed into the bottom of the control cabinet. Refer to [Figure 23](#).

The following is a list of installation requirements for power connections:

- The power supply cables should be sized to match the full voltage and current draw listed in the specifications (refer to ["Specifications" on page 24](#)).
- The external dedicated fused disconnect switch must be installed close to the humidifier so it can be readily accessible when servicing the unit. The fusing must not exceed the maximum circuit protection listed in the specifications.
- All wiring must be in accordance with national and local electrical codes.

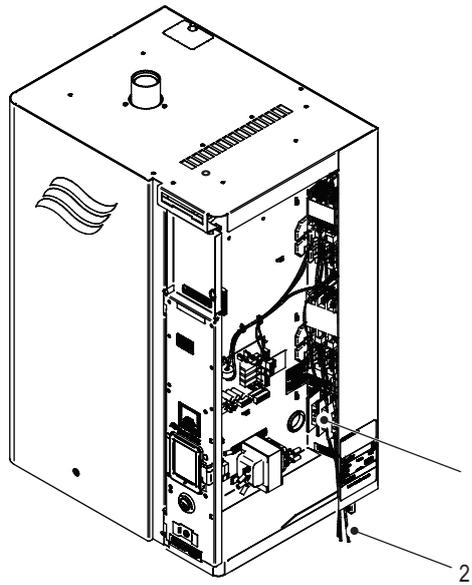


Figure 23: Power Connection (door and front panel removed for clarity)

- 1 Terminal block, high voltage supply
- 2 Power cable

4.4 Control System Design

The Nortec EL humidifier is designed to be regulated by an automated control system utilizing either analog or digital signals. All analog and digital control signal cables are routed to the humidifier through the top of the unit – refer to [Figure 24](#). Analog control signals (refer to ["Analog Control Signals" on page 48](#)) are connected to the low voltage terminal strip in the humidifier, and digital signals (see ["Digital Control Signals" on page 49](#)) from a computer or the BMS are communicated directly to the integrated control board in the humidifier using a compatible digital communication protocol.

Regardless of the type of control signals, control components for the conditioned environment will vary primarily depending upon the steam distribution method – duct or space (refer to ["Duct Distribution Control Design" on page 51](#) and ["Space Distribution Control Design" on page 53](#)). All modulating input signals to the humidifier must be of the same type – either transducers (RH sensor), or humidistats (demand signals).

IMPORTANT! In addition to the analog or digital control signals, the 24 VAC security loop (consisting of On/Off devices) connected to Pin 1 and Pin 2 on the low voltage terminal strip must be closed for the Condair humidifier to operate. Condair highly recommends the use of a high limit humidistat and an air proving switch in the security loop for duct installations – refer to ["Duct Distribution Control Design" on page 51](#).

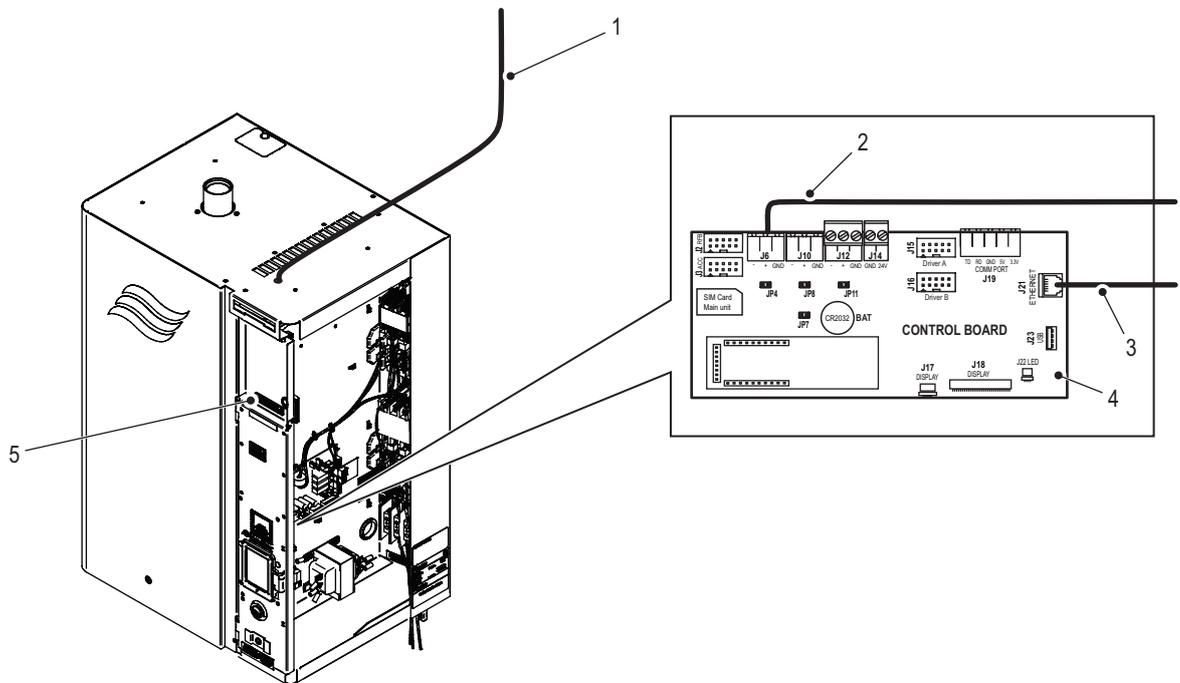


Figure 24: Control Signal Connections

- 1 Control signal cables, analog and digital
- 2 Digital signal from BMS – Modbus or BACnet MS/TP
- 3 Digital signal from BMS – BACnet IP
- 4 Integrated control board (located behind touchscreen display)
- 5 Low voltage terminal strip, for analog signals

4.4.1 Control Signal Input

4.4.1.1 Analog Control Signals

The Nortec EL humidifier can be regulated using up to two modulating analog input signals, and multiple On/Off input signals for each steam cylinder. Analog controls can be supplied by Condair or by others.

The Nortec EL humidifier can be factory-configured to enable/disable modulating and On/Off control signals, and set the signal range (refer to [Table 17](#)). The unit can also be field-configured using the touchscreen display.

Table 17: Nortec EL Acceptable Analog Control Signals

Control Type	Control Signal Type	Acceptable Signal
Modulating control and high limit signals	Demand or transducer	0-5 V, 0-10 V, 1-5 V, 2-10 V, 0-20 V, 0-16 V, 3.2-16 V, 0-20 mA, 4-20 mA
On/Off control and high limit signals	On/Off	Dry contact, 24 VAC or 10 VDC
	Security loop	Dry contact, 24 VAC

Nortec EL 150/200 humidifiers with dual steam cylinders have two low voltage terminal strips (designated "A" and "B") to supply separate sets of control signals to each steam cylinder, so the unit can be operated in series, parallel or independent mode, as described in ["General Description" on page 5](#).

- All control signal wiring must use a minimum of 18 AWG, and the cable length should be kept as short as possible.

Modulating Control

The Nortec EL humidifier can be operated with one or two modulating analog input signals per steam cylinder. If two modulating input signals are used, both signals must be of the same type: demand signals from an external controller, or transducer (RH sensor) signals from an external humidity sensor. In both cases, the humidifier will not start steam production until the calculated system demand exceeds 26%.

Demand Signals: If the humidifier receives a demand signal, it calculates the desired steam production level (as a percentage of the total humidifier capacity) proportional to the incoming demand signal (as a percentage of the signal range). When two demand signal inputs are used, the humidifier responds to the lowest of the two demand signals.

Transducer Signals: If modulating transducers (RH sensor) are used, the humidifier uses an internal PI (proportional-integral) controller to calculate system demand for each channel input. The calculated system demand value for each input channel will vary depending upon the configurable humidity set-points, as well as proportional and integral functions of the internal controller. If two transducer signals are used, two system demand values are calculated and the humidifier responds to the lowest of the two calculated values. Transducers with a possible zero input are not recommended. The Nortec EL humidifier also supports an optional low and high humidity alarm warning with re-configurable humidity triggers.

Security Loop

The security loop connected between Pin 1 and Pin 2 on the low voltage terminal strip consists of 24 VAC On/Off input devices that are part of the humidification system. The Nortec EL humidifier will not operate unless this circuit is closed. The security loop also allows On/Off control of the humidifier, and can be used as feedback to indicate the functional status of the humidification system components critical to the proper and safe operation of the humidifier.

4.4.1.2 Digital Control Signals

The digital communications interface in the Nortec EL humidifier can be used to control the humidifier output and change system configurations, or monitor its operation. Digital communication can be used in conjunction with analog devices to regulate the humidifier operation. Condair recommends the use of transducers for the control and high limit signals when using digital communications.

The Nortec EL humidifier integrates support for standard communication protocols such as BACnet IP, BACnet MS/TP and Modbus RTU. The supported communication protocol can be selected and configured from the touchscreen display. With optional hardware kits, the Nortec EL humidifier can also be configured to communicate using LonWorks, or BTL-certified BACnet IP and BACnet MS/TP (Master) protocols – refer to [Table 2 on page 8](#).

Note: If using BACnet MSTP (slave), verify PICS/BIBBs details with the building network operator to ensure compatibility. Refer to the BACnet manual (document 2574199) for PICS/BIBBs settings.

BACnet

The Nortec EL humidifier uses the connector (J6) on the integrated control board to connect with the BMS using the BACnet Master/Slave Token Passing (MS/TP) communications protocol, and the Ethernet port (J21) to connect with the BMS using the BACnet IP communications protocol. Refer to BACnet, LonWorks Supplemental Installation and Operation Manual (document 2574199) for control points and connection details.

The following is a list of installation requirements for BACnet communications:

- 18-24 AWG shielded, twisted pair cable with 120 Ω impedance is recommended for BACnet MS/TP communications. Refer to the BMS supplier for recommended maximum length of communication cables.
- Category (CAT) -5, -5E, or -6 cable with RJ-45 terminations is recommended for BACnet IP communications.

Modbus RTU

The Nortec EL humidifier uses a three-pole connector (J6) on the integrated control board to facilitate Modbus EIA-485, 2-wire communications with the BMS.

Refer to Modbus Installation and Operation Manual (document 2560599) for the list of supported Modbus parameters and connection/configuration details.

The following is a list of installation requirements for Modbus communications:

- 18-24 AWG shielded, twisted pair cable with 120 Ω impedance is recommended. CAT-5 cable is also acceptable, but only uses two conductors and the cable shield – refer to the Modbus manual for details.
- To minimize signal loss, the cable run should not exceed 2200 feet (670 m).
- To ensure communication reliability, Condair recommends that no more than 8 nodes are connected to a single chain/bus.

LonWorks and BTL-Certified BACnet IP, Bacnet MS/TP

LonWorks and BTL-certified BACnet IP and BACnet MS/TP use an optional interface card mounted on the integrated control board. Refer to BACnet/LonWorks Supplemental Installation and Operation Manual (Condair document 2574199).

The following is a list of installation requirements for LonWorks and BTL-certified BACnet IP and BACnet MS/TP communications:

- CAT-5 or better cable with RJ-45 terminations is recommended for BTL-certified BACnet IP communications.

- 18-24 AWG shielded, twisted pair cable with 120 Ω impedance is recommended for LonWorks and BTL-certified BACnet MS/TP.
- To use the BTL-certified BACnet or LonWorks protocols, jumper J7 on the integrated control board must be Off. When the jumper J7 is On, the native Modbus protocol is enabled.

4.4.2 Condair Linkup

The Linkup function allows linking of up to six integrated control boards (for a maximum of 12 steam cylinders) in a "Main-Extension" configuration through the connector J10 on the integrated control board. One set of control signals (analog or digital) is connected to the unit designated as the "Main" unit.

The humidifiers can then be configured to operate in parallel or in series mode to satisfy humidity demand, as described in "General Description" on page 5. Humidifiers operated in series mode permit a lower turn-down ratio (when the smallest capacity unit in the Linkup chain is designated as the "Main" unit, the overall steam output can be varied down to 25% of that unit's capacity). In parallel mode, all steam output from the units in the chain connect to a common steam distribution system, which offers even wear on the units.

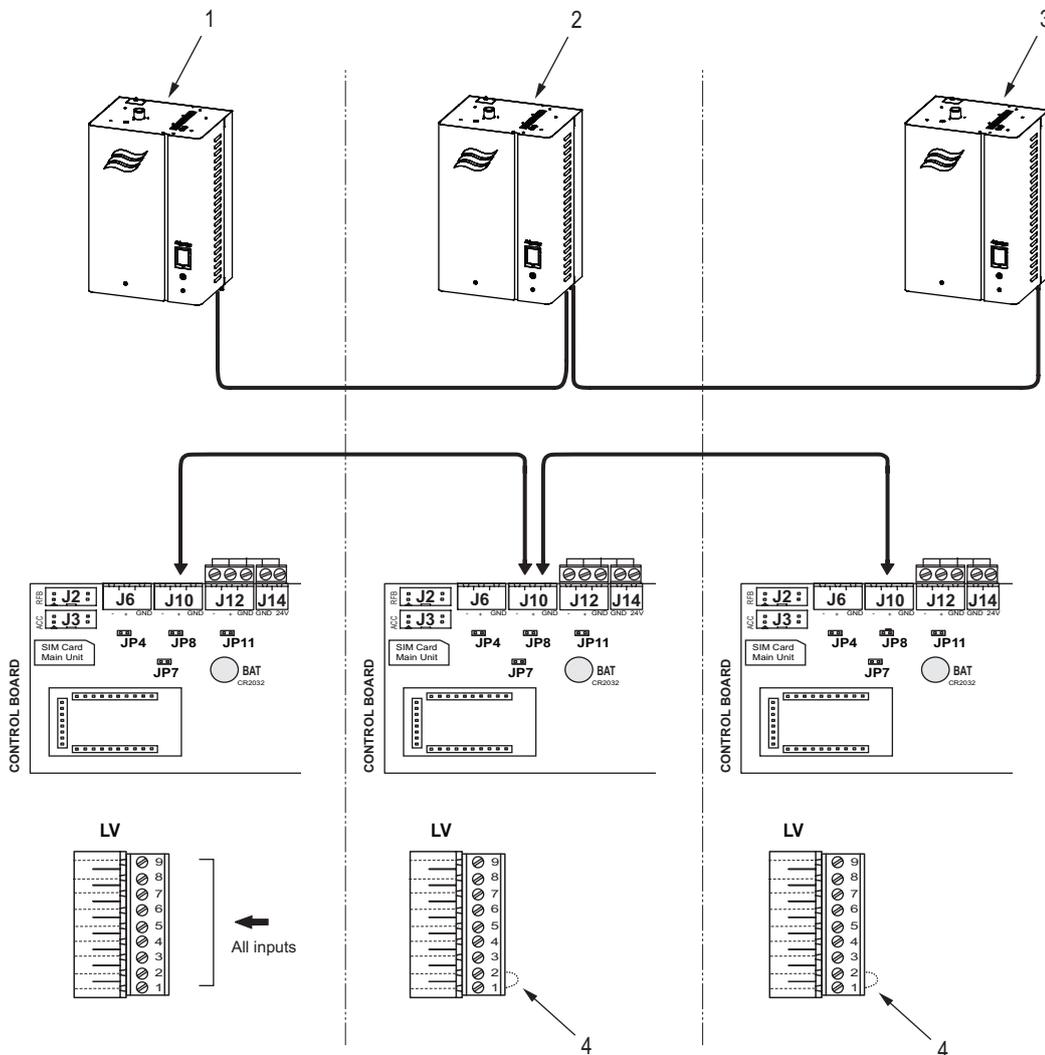


Figure 25: Linkup Wiring

- 1 Main unit (all control signals to unit)
- 2 Extension unit#1 (no control signals to unit)
- 3 Extension unit#X (no control signals to unit)
- 4 Jumper (on all Extension units)

The following is a list of installation requirements for connecting humidifiers in a Linkup chain:

- ❑ Up to 12 steam cylinders (equivalent of 1200 lb/h or 550 kg/h) can be connected together in the Linkup chain.
- ❑ 18-24 AWG multi-strand, twisted pair, shielded cable must be used to connect the units.
- ❑ All control signal inputs (humidistats/transducers and security loop) must be connected to the "Main" unit only.
- ❑ A jumper must be installed between the security loop pins "1" and "2" in the low voltage terminal strip on all "Extension" units.
- ❑ All control signal inputs must be connected to the low voltage terminal strip designated "A" in Nortec EL 150/200 humidifiers with dual steam cylinders.

4.4.3 Humidity Control Design

4.4.3.1 Duct Distribution Control Design

When using the supply air duct for steam distribution, Condair highly recommends the use of an air proving switch and a high limit humidistat in addition to a humidity controller. Environments with exterior walls should also consider using an outdoor temperature sensor in the system. Refer to [Figure 26](#).

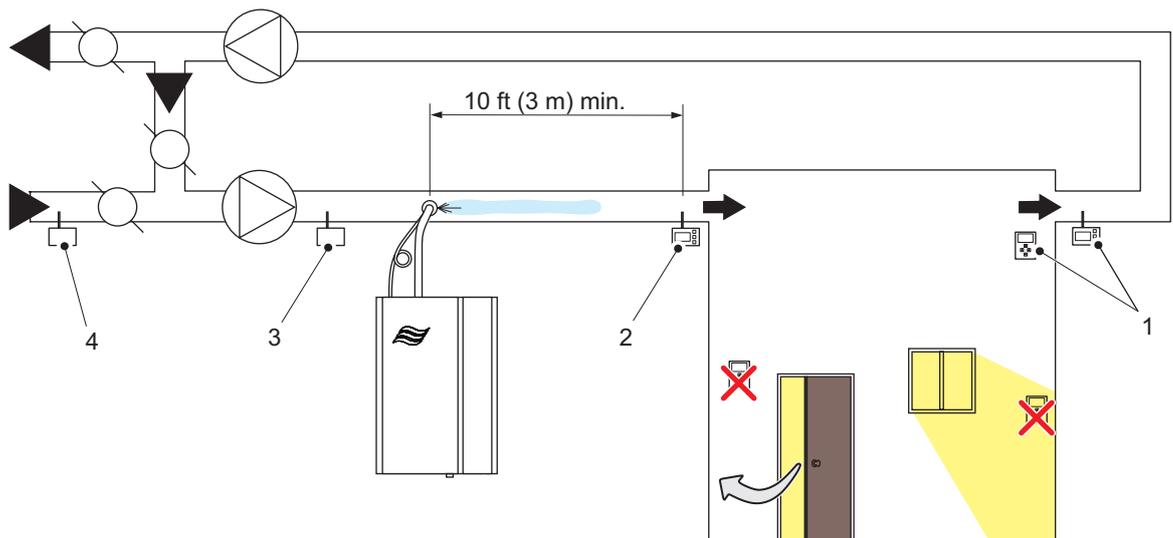


Figure 26: Duct Humidity Control Location

- 1 Humidity controller (return air duct or inside the room)
- 2 High limit switch
- 3 Air proving switch
- 4 Outdoor temperature sensor (situated outdoors)

Air Proving Switch

Airflow is required for steam vented into the air supply duct to be absorbed before it can be distributed. The normally-open dry contact Condair air proving switch connected to the humidifier's security loop prevents humidification when the air handler is not operational.

High Limit Switch

A high limit switch connected to the humidifier's security loop is used to limit the humidity in the supply air from reaching saturation conditions, which can lead to water damage. Typically an On/Off duct humidistat will suffice for this application, but there are several applications where modulating transducers or humidistats should be used, including the following:

- When using a variable air volume (VAV) air handling system.
- When a high limit switch must be installed after a bend or obstruction in the supply duct.
- Applications that require very high air exchange rate, or 100% outdoor air.
- Installations with short steam absorption distances.

The following installation requirement must be observed when using a high limit switch in a duct distribution system:

- The distance between the steam distributor and the Condair duct humidistat or transducer should be minimum 10 ft (3 m), or greater than the calculated absorption distance. Refer to [Figure 26 on page 51](#).

Humidity Controller

The humidity controller detects the relative humidity in the conditioned environment and provide feedback to the humidifier. The Nortec EL humidifier is compatible with On/Off humidistats, and transducers (RH sensor), but there are several applications where modulating transducers or humidistats should be used, including the following:

- When using an economizer, or variable air volume (VAV) air handling system.
- Applications that require very high air exchange rate, or 100% outdoor air.
- Applications that require narrow humidity tolerances.

The following installation requirements must be observed when using humidity controllers in a duct distribution system:

- Must be installed in a location representative of the conditioned environment. Controls installed in exhaust or return ducts are preferred.
- Wall-mounted controls can also be installed in the conditioned environment. However, they should be located in an area that is not exposed to infiltrating air, and where there are no discharge diffusers or localized variations in temperatures.

Outdoor Temperature Setback

An outdoor temperature sensor should be used to prevent condensation on windows or other surfaces that are exposed to outdoor air. Condair outdoor temperature sensors are used in conjunction with Condair humidistats that limit setpoints based upon outdoor temperature – refer to [Table 3 on page 9](#) for part numbers.

The default setback for the outdoor temperature sensor is shown in [Figure 27 on page 53](#), which can be reconfigured depending on the insulation quality of windows.

The following installation requirement must be observed when outdoor temperature sensor in a duct distribution system:

- The outdoor sensor must be installed in an area that is representative of the outdoor air temperatures – such as a fresh air intake duct, or located directly outside.

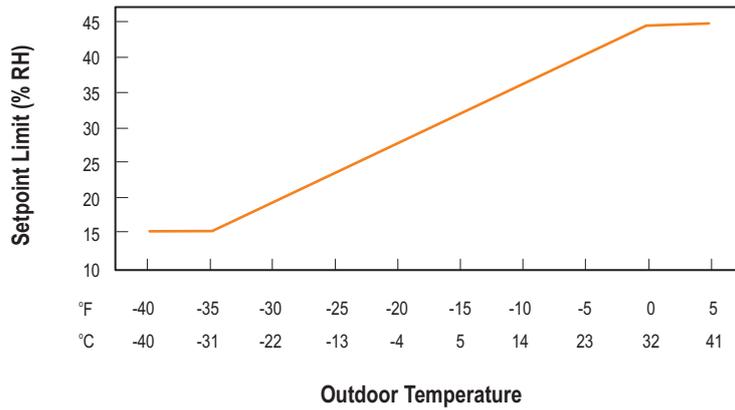


Figure 27: Default Temperature Setback

4.4.3.2 Space Distribution Control Design

When distributing steam directly into the conditioned environment the humidification system will require a wall-mounted On/Off humidistat or transducer (RH sensor). Condair also recommends a high limit switch. Environments with exterior walls should consider using an outdoor temperature sensor to prevent condensation on windows/walls.

The following installation requirement must be observed when using humidity controllers in a space distribution system:

- Wall-mounted controls should be located in an area that is not exposed to infiltrating air, and where there are no discharge diffusers or localized variations in temperatures.

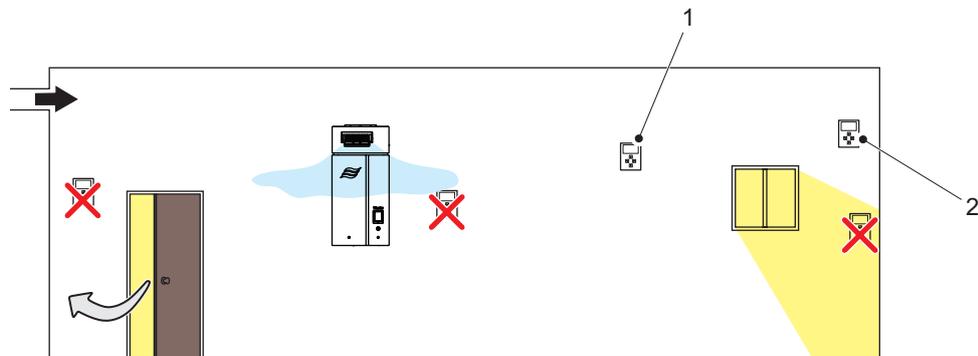


Figure 28: Space Humidity Control Location

- 1 High limit switch (recommended)
- 2 Humidity controller (inside the space)

4.4.4 Remote Fault Indication Board

The optional remote fault indication board includes four relays that can be used to provide remote status indication. Refer to [Figure 29](#).

Each relay is described below:

- Unit On The normally open relay is closed when the humidifier has power and the On/Off switch is set to the On position.
- Steam The normally open relay is closed when the board detects that the cylinder is drawing current and steam is being produced.
- Service The relay can be wired to open (NC) or close (NO) when a warning is displayed on the humidifier display and the yellow service LED is illuminated.
- Error The relay can be wired to open (NC) or close (NO) when a fault is detected by the humidifier controls.

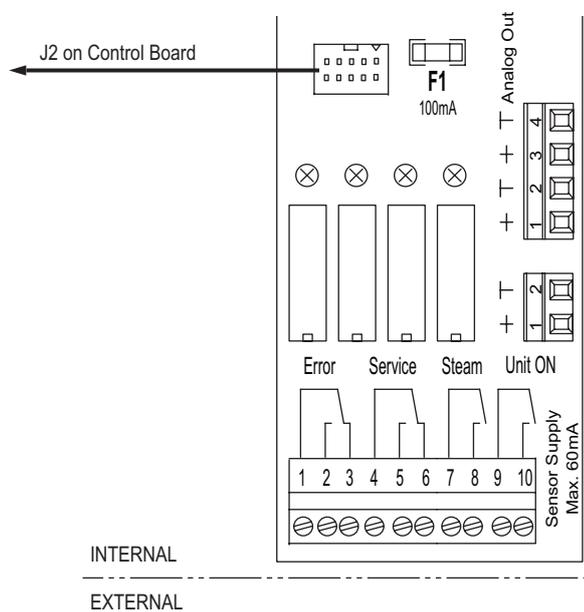


Figure 29: Optional Remote Fault Indication Board

4.4.5 Accessory Board

The optional accessory board includes four relays that can be used to control other accessory devices. Refer to [Figure 30](#).

Each relay is described below:

- Flush A The normally open relay can be wired to activate or deactivate the optional valve for flushing the water supply line for steam cylinder A.
- Flush B The normally open relay can be wired to activate or deactivate the optional valve for flushing the water supply line for steam cylinder B.
- Fan B The normally open relay can be wired to activate or deactivate an external fan of the air handling unit connected to steam cylinder B.
- Fan A The normally open relay can be wired to activate or deactivate an external fan of the air handling unit connected to steam cylinder A.

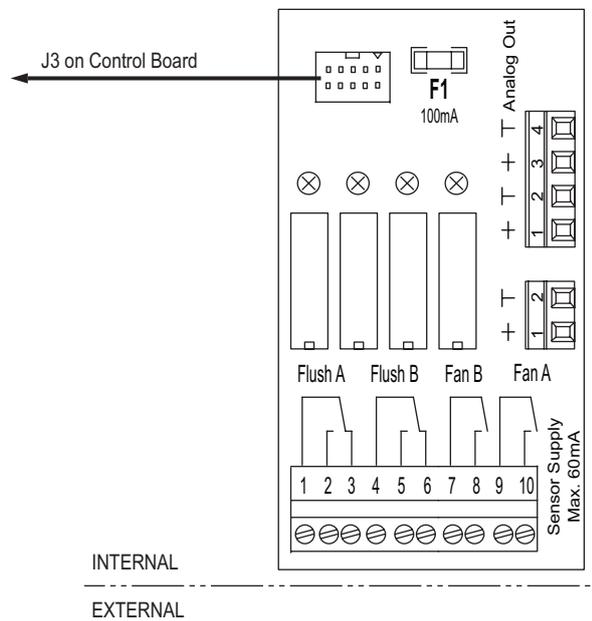


Figure 30: Optional Accessory Board

4.5 Preventative Maintenance

Regular maintenance of the Nortec EL humidifier is a requirement for maintaining the safety and operational efficiency of the humidifier. Maintenance of the humidifier is broken down into two categories – regular replacement of the steam cylinder(s), and regular maintenance of the humidifier.

The control software in the Nortec EL humidifier monitors the performance of the steam cylinder(s) and displays a service notification when the steam cylinder(s) is spent, and can no longer achieve full output. The cylinder(s) must be replaced within 72 hours of the service notification, after which a fault message appears and the humidifier stops production.

Refer to the Operation and Maintenance Manual (document 2582954) for the regular maintenance requirements for the Nortec EL humidifier.

5 Total Humidification Load Calculation

5.1 Total Humidification Load

The total humidification load is the sum of the three primary considerations: base humidification load, moisture content equilibrium, and condensate losses. Each of these is described below.

Base Humidification Load

The base humidification load is defined as the humidification load required to increase the humidity of the unconditioned supply air, from the worst case scenario, to meet the design requirements for the conditioned environment. This is typically the largest contributing factor to the total humidification load, and is described in "[Calculating Base Humidification Load](#)" on page 58.

Moisture Content Equilibrium

When materials stored in a conditioned environments retain moisture content that is out of equilibrium with the moisture content of that environment, it may have an equalizing effect on the environment (depending upon the hygroscopic properties of the material), thereby increasing or decreasing the relative humidity. This must be taken into consideration when calculating the total humidification load. Refer to "[Moisture Content Equilibrium](#)" on page 60 for details.

Condensate Losses

Some steam in the steam distribution system will condense back to a liquid state due to convection heat transfer, which reduces the gross output of the humidifier. These losses, as discussed in "[Condensate Loss](#)" on page 61, must be taken into consideration when calculating the total humidification load.

Once the above considerations have been taken into account, it may be prudent to increase the capacity of the humidifier, to allow for a safety margin, especially if the design conditions will require the unit to regularly operate at or near or its maximum capacity.



Visit www.condairhelp.com and use the free online program - **Humidifier Engineering and Load-sizing Program (H.E.L.P.)** to assist you with absorption distance calculations, selection of humidifiers, steam distributors, controls and accessories.

Tutorials on using this program are available from the Literature & Media section of the website – www.condair.com.

Additional information on the effects of humidity, relative humidity calculations, load calculations, and recommended design conditions can be found in the Humidification Load Calculation Manual (document 2553856) from www.condair.com.

5.1.1 Calculating Base Humidification Load

5.1.1.1 Total Unconditioned Air Supply Volume

The total volume of incoming unconditioned air (ft³/h), forced and naturally ventilated, depends on the construction of the conditioned environment and the type of air circulation system used.

Forced Ventilation

Typically, an air handler system will exchange a fixed percentage of conditioned air for unconditioned air. This unconditioned air is the volume of air that requires humidification.

Air handler systems vary by design, but will rely upon adding or removing volumes of air from a controlled environment. Air handling systems that add air to the conditioned environment will have a total forced air volume equivalent to the unconditioned supply air volume. Air handling systems that exhaust air from the conditioned environment must have at least an equal volume of unconditioned air reintroduced, which is equal to the total forced air volume.

Accounting for Economizer Cycles

Under normal heating conditions, the unconditioned supply air volume is usually relatively small to avoid large heating and conditioning treatments. However when the economizer cycle is in operation, the unconditioned air volume may be as high as 100% of the total ventilation. To calculate the humidification load for a system with an economizer cycle, the air ventilation and thermal load must be calculated for each month in which the economizer mode may operate to determine the highest humidification load.

Natural Ventilation

A natural ventilation system is one that does not rely upon direct mechanical means to provide air ventilation to the conditioned environment. Air enters the conditioned environment through openings in the building envelope. The amount of makeup air is calculated based on the volume of the conditioned space and an estimate of air changes per hour.

5.1.1.2 Unconditioned Supply Air Moisture

Once the total volume of unconditioned supply air is known, the moisture content of the air supply must be determined. To ensure the humidifier capacity will be able to satisfy design conditions, the calculations must be based on the lowest unconditioned supply air temperatures and humidity that can be expected on a yearly basis. In applications where the unconditioned supply air will be drawn from the local atmosphere, Condair advises utilizing the weather data compiled by geographic location published by the ASHRAE Climate Data Centre.

Once the lowest temperature for the given geographic location is known, the moisture content of the unconditioned air supply can be determined as follows:

$$\text{Supply Air Moisture (lb/ft}^3\text{)} = \text{Maximum Supply Air Moisture (lb/ft}^3\text{)} \times \text{Lowest Humidity (\% RH)}$$

where,

- Maximum Supply Air Moisture is the moisture content (lb/ft³) at 100% RH, obtained from [Table 18 on page 59](#) (imperial units) or [Table 19 on page 60](#) (metric units) corresponding to the lowest anticipated supply air temperature for the unconditioned air supply;
- Lowest Humidity is the lowest anticipated humidity (% RH) for the unconditioned supply air source.

5.1.1.3 Conditioned Air Moisture

The moisture content for the designed air conditions must be determined next. To ensure the humidifier capacity will be able to satisfy design conditions, the calculations must be based on the highest desired design air temperatures and humidity.

Once the highest design temperature and highest design humidity for the application are known, the moisture content of the conditioned air supply can be determined as follows:

$$\text{Conditioned Air Moisture (lb/ft}^3\text{)} = \text{Maximum Supply Air Moisture (lb/ft}^3\text{)} \times \text{Design Humidity (\% RH)}$$

where,

- Max Supply Air Moisture is the moisture content at 100% RH, obtained from [Table 18 on page 59](#) (imperial units) or [Table 19 on page 60](#) (metric units) corresponding to the highest design air temperature for the conditioned environment;
- Design Humidity is the highest required humidity (% RH) for the conditioned environment.

5.1.1.4 Base Humidification Load

The base humidification load is the moisture required to bring the unconditioned supply air to meet the conditioned air requirements, and is calculated as follows:

$$\text{Base Load (lb/h)} = \text{Total Supply Air Volume (ft}^3\text{/h)} \times \{\text{Conditioned Air Moisture (lb/ft}^3\text{)} - \text{Supply Air Moisture (lb/ft}^3\text{)}\}$$

where,

- Total Supply Air Volume is the total volume of incoming unconditioned air (ft³/h), as described in ["Total Unconditioned Air Supply Volume" on page 58](#).
- Conditioned Air Moisture is the moisture content (lb/ft³) of the conditioned air supply, as calculated in ["Conditioned Air Moisture" on page 59](#);
- Supply Air Moisture is the moisture content of the unconditioned air supply, as calculated in ["Unconditioned Supply Air Moisture" on page 58](#).

Table 18: Moisture Content of Air at 100% RH (Imperial Units)

°F	lb/ft ³	°F	lb/ft ³	°F	lb/ft ³	°F	lb/ft ³	°F	lb/ft ³
-20	0.0000343	41	0.000424	61	0.000857	81	0.00163	101	0.00293
-10	0.0000414	42	0.000440	62	0.000886	82	0.00168	102	0.00302
-5	0.0000500	43	0.000457	63	0.000916	83	0.00173	103	0.00310
0	0.0000686	44	0.000474	64	0.000946	84	0.00178	104	0.00319
5	0.0000871	45	0.000491	65	0.000979	85	0.00184	105	0.00328
10	0.000111	46	0.000509	66	0.00101	86	0.00190	106	0.00337
15	0.000141	47	0.000527	67	0.00104	87	0.00195	107	0.00347
20	0.000177	48	0.000547	68	0.00108	88	0.00201	108	0.00356
25	0.000223	49	0.000567	69	0.00111	89	0.00207	109	0.00366
30	0.000279	50	0.000587	70	0.00116	90	0.00213	110	0.00376
31	0.000291	51	0.000609	71	0.00119	91	0.00220	111	0.00387
32	0.000304	52	0.000630	72	0.00123	92	0.00226	112	0.00397
33	0.000316	53	0.000651	73	0.00127	93	0.00233	113	0.00408
34	0.000327	54	0.000674	74	0.00131	94	0.00240	114	0.00419
35	0.000340	55	0.000699	75	0.00135	95	0.00247	115	0.00430

°F	lb/ft ³	°F	lb/ft ³	°F	lb/ft ³	°F	lb/ft ³	°F	lb/ft ³
36	0.000353	56	0.000723	76	0.00139	96	0.00254	120	0.00491
37	0.000366	57	0.000747	77	0.00144	97	0.00262	125	0.00559
38	0.000380	58	0.000773	78	0.00149	98	0.00269	130	0.00634
39	0.000394	59	0.000800	79	0.00154	99	0.00277	135	0.00719
40	0.000409	60	0.000829	80	0.00158	100	0.00285	140	0.00812

Table 19: Moisture Content of Air at 100% RH (Metric Units)

°C	kg/m ³	°C	kg/m ³	°C	kg/m ³	°C	kg/m ³	°C	kg/m ³
-30	0.000578	-10	0.00218	10	0.00943	30	0.0303	50	0.0828
-29	0.000553	-9	0.00238	11	0.0100	31	0.0320	51	0.0867
-28	0.000540	-8	0.00259	12	0.0107	32	0.0337	52	0.0908
-27	0.000540	-7	0.00281	13	0.0114	33	0.0356	53	0.0951
-26	0.000551	-6	0.00305	14	0.0121	34	0.0375	54	0.0995
-25	0.000573	-5	0.00330	15	0.0129	35	0.0395	55	0.104
-24	0.000606	-4	0.00357	16	0.0137	36	0.0416	56	0.109
-23	0.000650	-3	0.00385	17	0.0145	37	0.0438	57	0.114
-22	0.000704	-2	0.00415	18	0.0154	38	0.0461	58	0.119
-21	0.000769	-1	0.00447	19	0.0163	39	0.0485	59	0.124
-20	0.000845	0	0.00481	20	0.0173	40	0.0510	60	0.130
-19	0.000931	1	0.00516	21	0.0183	41	0.0536	61	0.136
-18	0.00103	2	0.00554	22	0.0194	42	0.0563	62	0.142
-17	0.00113	3	0.00594	23	0.0206	43	0.0592	63	0.148
-16	0.00125	4	0.00636	24	0.0218	44	0.0621	64	0.154
-15	0.00138	5	0.00680	25	0.0230	45	0.0652	65	0.161
-14	0.00152	6	0.00727	26	0.0243	46	0.0685	66	0.168
-13	0.00167	7	0.00777	27	0.0257	47	0.0718	67	0.175
-12	0.00183	8	0.00829	28	0.0272	48	0.0753	68	0.182
-11	0.00200	9	0.00884	29	0.0287	49	0.0790	69	0.190

5.1.2 Moisture Content Equilibrium

Materials stored in conditioned environments may retain moisture content that is out of equilibrium with the moisture content of that environment. Depending upon the hygroscopic properties of the material, it may have an equalizing effect on the environment, thereby increasing (desorption) or decreasing (absorption) the relative humidity (RH) of the surrounding environment. Any materials stored in the conditioned environment that may release or absorb significant moisture from the atmosphere should have their hygroscopic properties assessed by the manufacturer. Once the severity of this influence is known, it should be incorporated into the total humidification load.



Hygroscopic regain is defined as the amount of water a completely dry material will absorb from the air through desorption or absorption. Any hygroscopic product that is purchased and sold by weight must be located in a carefully controlled environment.

5.1.3 Condensate Loss

Some steam in the steam distribution system will condense back to a liquid state due to convection heat transfer, which reduces the gross output of the humidifier. An estimate of the condensate losses throughout the distribution system should be determined to ensure the total humidifier capacity, less any condensate loss, will still satisfy the total load requirement. The factors that contribute to condensate losses are discussed below.

Steam Distributor Losses

The steam distributor is often the largest contributor to condensate losses in a steam distribution system. The amount of steam lost due to condensation is dependent upon the design of the distributor system. Refer to the steam distributor engineering guide for specific information on condensate loss.



Using stainless steel air-gap insulation is one way to reduce distributor losses and conserve energy. Additional information on calculating condensate losses, and savings from the use of insulating distributors can be found in the Condair white paper “Nortec Stainless Steel Air Gap Insulation R Value”.

To compensate for condensate losses when using a SAM-e distribution manifold, the calculated humidification must be increased accordingly. Refer to [Table 20](#) and [Table 21](#) for SAM-e condensate losses.

Table 20: Condensate Losses for Un-insulated SAM-e Distribution Manifold

Air Velocity fpm (m/s)	Atmospheric Steam Condensate Losses* (% of Maximum Capacity)	
	55 °F (13 °C)	70 °F (21 °C)
500 (2.5)	15%	12%
1000 (5.1)	20%	15%

* These values may change due to other unknown variables, and as such should only be used as a guideline.

Table 21: Condensate Losses for Insulated SAM-e Distribution Manifold

Air Velocity fpm (m/s)	Atmospheric Steam Condensate Losses* (% of Maximum Capacity)	
	55 °F (13 °C)	70 °F (21 °C)
500 (2.5)	5%	4%
1000 (5.1)	10%	8%

* These values may change due to other unknown variables, and as such should only be used as a guideline.

For more information on specifying SAM-e insulation, refer to SAM-e Engineering Manual (Condair document 1503529).

Supply Line Losses

Condensate losses per linear foot can be roughly estimated in a system with properly designed atmospheric steam lines. The total length of the atmospheric steam line must be taken into account, which is the sum of the linear length of the steam pipe and equivalent length of every fitting in the line. For equivalent lengths of common fittings see [Table 16 on page 43](#). For design information on steam lines refer to "[Atmospheric Steam and Condensate Lines](#)" on page 42.

Once total equivalent linear length is determined, [Table 22](#) can be used to estimate the humidifier capacity lost to supply line losses.

*Table 22: Approximate Condensate Per Foot of Atmospheric Steam Line**

Steam Capacity lb/h (kg/h)**	Nominal Steam Line Size – Copper Tube (MED Type-L) in (mm)	Nominal Steam Line Size – Stainless Steel Tube (wall thickness 0.065 in) in (mm)	Steam Loss in Condensation lb/h/ft (kg/h/m)
4-30 (1.8-14)	0.75 (19)	0.875 (22)	0.06 (0.09)
30-100 (14-45)	1.5 (38)	1.75 (45)	0.11 (0.18)
200-300 (91-136)	3 (76)	3 (76)	0.16 (0.23)
400-660 (181-299)	4 (102)	4 (102)	0.22 (0.33)

* Based on 1 in (25 mm) pipe insulation at 3 in H₂O (745 Pa) duct static pressure.

** Inclusive

6 Product Selection

The following checklist can be used to select the Nortec EL humidifier and its options and accessories. However, Condair strongly advises you to visit www.condairhelp.com and use the free online program – **Humidifier Engineering and Load-sizing Program (H.E.L.P.)** to assist you in sizing the humidifier and selecting options and accessories. All part numbers are also available from www.condairhelp.com.

6.1 Humidifier and Options

Humidifier

Refer to *"Total Humidification Load"* on page 57 for the required total capacity of the humidifier, then select an available model (or combination of available humidifier models) from *Table 8 on page 24*. Enter the selection below, making sure that the total capacity of the model(s) selected exceeds the total humidification load.

Humidifier Model and Capacity		Quantity
<input type="checkbox"/>	EL005 – 5 lb/h (2.2 kg/h)	<input type="checkbox"/>
<input type="checkbox"/>	EL010 – 10 lb/h (4.5 kg/h)	<input type="checkbox"/>
<input type="checkbox"/>	EL020 – 20 lb/h (9 kg/h)	<input type="checkbox"/>
<input type="checkbox"/>	EL030 – 30 lb/h (14 kg/h)	<input type="checkbox"/>
<input type="checkbox"/>	EL050 – 50 lb/h (23 kg/h)	<input type="checkbox"/>
<input type="checkbox"/>	EL075 – 75 lb/h (34 kg/h)	<input type="checkbox"/>
<input type="checkbox"/>	EL100 – 100 lb/h (45 kg/h)	<input type="checkbox"/>
<input type="checkbox"/>	EL150 – 150 lb/h (68 kg/h)	<input type="checkbox"/>
<input type="checkbox"/>	EL200 – 200 lb/h (91 kg/h)	<input type="checkbox"/>

- If more than one humidifier is to be supplied to satisfy the total humidification load, select this checkbox if all units are to be supplied with the same humidifier options.

Power

Refer to *Table 8 on page 24* for the available power configurations, then select the specific power configuration for your site.

Humidifier Power Requirements	
Voltage:	<input type="text"/>
Phase:	<input type="checkbox"/>

Options

Select optional internal primary fusing, if required. The internal primary fusing for the unit is NOT a substitute for a dedicated external disconnect switch. Refer to *Table 2 on page 8* for details of the option, and *Table 5 on page 12* for the part number.

Optional Internal Primary Fusing		Part Number
<input type="checkbox"/>	Yes – internal primary fusing required	<input type="text"/>
<input checked="" type="radio"/>	No – internal primary fusing not required	

Select optional extreme drain water cooling, if required. Refer to [Table 3 on page 9](#) for details of the option.

Optional Extreme Drain Water Cooling		Part Number
<input type="radio"/>	Yes – extreme drain water cooling required	DWC
<input checked="" type="radio"/>	No – extreme drain water cooling not required	

Select other options and accessories, as required. For details of the options and accessories refer to [Table 2 on page 8](#) and [Table 3 on page 9](#) respectively. Refer to [Table 5 on page 12](#) for option part numbers.

Humidifier Options and Accessories		Part Number
<input type="checkbox"/>	Remote fault indication board (refer to "Remote Fault Indication Board" on page 54 for additional details)	RFI
<input type="checkbox"/>	Accessory board (refer to "Accessory Board" on page 55 for additional details)	ACC
<input type="checkbox"/>	Advanced foam detection	<input type="text"/>
<input type="checkbox"/>	Mounting bar	<input type="text"/>
<input type="checkbox"/>	Mounting rack	<input type="text"/>
<input type="checkbox"/>	In-line water filter (refer to Table 3 on page 9 for part number)	<input type="text"/>

Controls

The humidifier can be factory-configured to accept specific analog control signals, and thus eliminate the need to configure it in the field. Refer to ["Analog Control Signals" on page 48](#) for additional details.

Select the required configuration for control signal and channels. Refer to [Table 6 on page 13](#) for part numbers.

Control Signal Acceptance		Single Channel	Dual Channel	Part Number
<input type="radio"/>	0-5 VDC	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
<input type="radio"/>	0-20 mA	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
<input type="radio"/>	4-20 mA	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
<input type="radio"/>	0-10 VDC	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
<input type="radio"/>	0-16 VDC	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
<input type="radio"/>	1-5 VDC	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
<input type="radio"/>	2-10 VDC	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
<input type="radio"/>	0-20 VDC	<input type="radio"/>	<input type="radio"/>	<input type="text"/>

Select control accessories, as required, for automated regulation of the humidifier. Refer to ["Control System Design" on page 47](#) for details of the control system, and [Table 3 on page 9](#) for details of accessories and part numbers.

Control Accessories		Part Number
<input type="checkbox"/>	Air proving switch	<input type="text"/>
<input type="checkbox"/>	Duct-mounted outdoor temperature setback sensor	<input type="text"/>

Control Accessories		Part Number
<input type="checkbox"/>	Exterior-mounted outdoor temperature setback sensor	<input type="text"/>
<input type="checkbox"/>	Plug-in transformer, 120 VAC to 24 VAC	<input type="text"/>
<input type="checkbox"/>	Control humidistat (refer to Table 7 on page 13 for part numbers)	<input type="text"/>
<input type="checkbox"/>	High limit humidistat (refer to Table 7 on page 13 for part numbers)	<input type="text"/>

Select a digital communications protocol, if required, for interfacing the Nortec EL humidifier with building automation systems. Refer to ["Digital Control Signals" on page 49](#) or BACnet/LonWorks Supplemental manual (document 2574199) for details.

Digital Communications Protocol		Part Number
	BACnet IP, BACnet MS/TP	Standard
	Modbus	Standard
<input type="checkbox"/>	BTL-certified BACnet MS/TP – Master	BAC-BTL-MSTP
<input type="checkbox"/>	BTL-certified BACnet IP – Master	BAC-BTL-IP
<input type="checkbox"/>	LonWorks	LON

6.2 Steam Distribution Equipment

Select a steam distributor that exceeds the production capacity of the humidifier(s), fits the duct/air handler size (if applicable), and accomodates the steam outlet connection to the humidifier. Refer to ["Steam Distribution" on page 40](#) for available methods.

If a SAM-e is required, refer to the SAM-e Engineering Manual (document 1503529) for selection information and part numbers, then make the appropriate selections below.

SAM-e Configuration		Quantity	Part Number
<input type="checkbox"/>	Steam inlet adaptor	–	<input type="text"/>
	SAM-e header	–	<input type="text"/>
	Steam tubes	<input type="text"/>	<input type="text"/>
	<input type="checkbox"/> Insulation (improves energy efficiency by as much as 70%)	–	<input type="text"/>
	<input type="checkbox"/> Mounting Frame (required for vertical duct installation)	–	<input type="text"/>

If a Steam Distributor is required, refer to the Steam Distributor Engineering Manual (document 1506117) for selection information and part number, then make the appropriate selection below.

Steam Distributor Configuration		Quantity	Part Number
<input type="checkbox"/>	Steam distributor	<input type="text"/>	<input type="text"/>

If a blower pack is required, refer to the Blower Pack Installation Operation and Maintenance Manual (document 2582277) for additional details, then make the appropriate selection below.

Blower Pack Configuration		Quantity	Part Number
<input type="checkbox"/>	Blower pack (built-on)	–	BOBP
<input type="checkbox"/>	Blower pack (remote-mounted) – 110-120 VAC, 1 Phase, wall outlet powered, for 1-3/4 in (45 mm) steam outlet	<input type="text"/>	2579400
<input type="checkbox"/>	Blower pack (remote-mounted) – 110-120 VAC, 1 Phase, wall outlet powered, for 7/8 in (22 mm) steam outlet	<input type="text"/>	2579401
<input type="checkbox"/>	Power kit (small) for remote-mounted blower pack – refer to Table 5 on page 12 for selection details.	<input type="text"/>	BPP-SM
<input type="checkbox"/>	Power kit (large) for remote-mounted blower pack – refer to Table 5 on page 12 for selection details.	<input type="text"/>	BPP-L

If steam and condensate hoses and accessories are required, make the appropriate selection below. Refer to ["Atmospheric Steam and Condensate Lines" on page 42](#) for additional details on steam hoses.

Steam and Condensate Hose and Accessories		Length (inches)	Part Number
<input type="checkbox"/>	Steam hose, 1-3/4 in (45 mm) I.D.	<input type="text"/>	1328820
<input type="checkbox"/>	Steam hose, 7/8 in (22 mm) I.D.	<input type="text"/>	1328810
<input type="checkbox"/>	Condensate hose, 3/8 in (9.5 mm) I.D.	<input type="text"/>	1328834
<input type="checkbox"/>	Self-Actuated Condensate Cooler, 140 °F (60 °C)	–	1710010
<input type="checkbox"/>	24 V Electric Condensate Cooler, 140 °F (60 °C)	–	1710020

If steam line reducers and tees are required, make the appropriate selection below. Refer to ["Atmospheric Steam and Condensate Lines" on page 42](#) for additional details on steam and condensate lines.

Steam Line Reducer and Tee		Quantity	Part Number
<input type="checkbox"/>	Steam line reducer, 1-3/4 to 7/8 in (45 to 22 mm) – copper	<input type="text"/>	1507846
<input type="checkbox"/>	Steam line reducer, 1-3/4 to 7/8 in (45 to 22 mm) – stainless steel	<input type="text"/>	1508165
<input type="checkbox"/>	Tee adaptor, 1-3/4 × 1-3/4 × 3/8 in (45 × 45 × 9.5 mm) – for condensate drainage	<input type="text"/>	1329635
<input type="checkbox"/>	Tee adaptor, 7/8 × 7/8 × 3/8 in (22 × 22 × 9.5 mm) – for condensate drainage	<input type="text"/>	1329634

Clear Form

Print Form

Save Form

To print the completed form (if using an electronic version of the manual), select the **Print Form** button above. In the Print dialog box that appears, select pages 59-62 under *Pages to Print*, and the **Fit** option under *Page Sizing & Handling*. Click **Print**.

To save the completed electronic form, first select the **Save Form** button above, and select "Adobe PDF" from the *Printer* drop-down list in the dialog box. Then select pages 59-62, and click **Print**. Finally, enter a file name in the next dialog box, and click **Save**.

To assist you with purchasing and installing a Nortec EL humidifier, a ["Sample Specification"](#) and ["Blank Schedule"](#) are included in [Appendix A](#) for your convenience.

A Appendix

A.1 Sample Specification

PART 1 - GENERAL

1.1 Work Included:

- a) Nortec EL Series electrode steam 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) Certifications, C-UL US Listed.
- b) ISO 9001-2008.
- c) ANSI/NFPA 70 - National Electrical Code.
- d) ARI 640, "Standard for Commercial and Industrial Humidifiers.
- e) ASHRAE SSPC 135 BACnet

1.3 Related Sections:

- a) 23 Mechanical General
- b) 23[] Piping Installation
- c) 23[] Control System

1.4 Submittals:

- a) Submit product data under provisions of Section 23. 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.

1.5 Schedules:

- a) Refer to information contained in schedule[s] attached to this specification.
- b) Humidifiers to be of type, capacity, and arrangement as listed in schedule[s].
- c) Include accessories listed in schedule[s] and those accessories required for type of unit.

ELECTRODE STEAM HUMIDIFICATION SYSTEM - Model Nortec EL

PART 2 - PRODUCTS

- 2.1 Provide Nortec EL electrode humidifier generating mineral-free, sterile steam from a potable water supply Packaged unit, wall mounted, atmospheric steam generation using an electrode steam cylinder[s]. Resistive element technology and boiler steam (pressure steam) technology not acceptable.
- 2.2 Unit[s] to be complete with:
- a) Touchscreen controller with standard building automation:
 - i. Intuitive touchscreen control with color graphic user interface.
 - ii. Standard building automation communication protocols BACnet IP, BACnet MSTP and Modbus. Additional hardware required for building automation communication not acceptable.
 - iii. Embedded web interface for easy configuration and remote monitoring from any computer with a web browser over a local area network (LAN) connection.
 - iv. USB interface for new software/feature upload and download of operational information.
 - v. Single or dual channel analog signal acceptance, supporting both demand and transducer control. Ability to control setpoint from humidifier control when using transducer controls.
 - b) Packaged system with Condair electrode cylinder technology:
 - i. Condair cylinder optimized for humidifier capacity and supply voltage. Cylinder must have welded seam to ensure watertight and have high water sensor to prevent overfilling.
 - ii. Durable powder coated steel cabinet with zero side clearance requirement for minimal footprint.
 - iii. Insulating air gap between plumbing and electrical compartment for increased electronic reliability.
 - iv. Standard internal drain water tempering to ensure maximum 140° F [60° C] drain water. External drain water cooler not acceptable.
 - v. Integral fill cup with minimum 1-inch [25 mm] air gap to prevent back siphoning.
 - vi. Full cylinder indication and pre-notification of automatic shutdown at end of cylinder life.
 - vii. Automatic pulse feature to clean any obstruction from the drain solenoid valve if required.
 - viii. Automatic off-season shut-down [after 3 days of "no call"] will completely drain the cylinder[s] and automatically restart on call for humidity. Adjustable on/off and time sequence. Provides extended cylinder life, while ensuring stagnant water does not remain in the system.
 - c) Condair Auto-Adaptive Control water management:
 - i. Advanced water management utilizing the patented Proportional plus Integral Auto-Adaptive Control system for optimal energy efficiency, water usage and cylinder life.
 - ii. 98% thermal efficiency from startup until end of cylinder life.
 - iii. Drains automatically optimized to water conditions to maximize cylinder and reduce water usage.
 - iv. Modulating output between 25% and 100% of rated capacity.
- 2.3 Optional Accessories
- a) Refer to 'Option schedule'

PART 3 - EXECUTION

3.1 Installation:

- a) Install humidifiers per manufacturers' instructions.
- b) Install with required clearance for service and maintenance.

3.2 Accessories:

- a) Install accessories in accordance with manufacturer's recommendations.

3.3 Commissioning:

- a) Start-up of humidifier to be by factory trained technician.

A.2 Blank Schedule

A blank schedule is included on the following page for your convenience.

Warranty

Condair Inc. and/or Condair 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 parts or materials that are considered consumables, including but not limited to: cylinders, filters, nozzles, membranes, media, gaskets, O-rings, etc. are NOT covered by the warranty.

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 quality of the water used.

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

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.

Extended Warranty

Extended warranties are available to purchase under the conditions listed above.



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