HumidiClean Series HC-4000 Humidifier

Revolutionary ionic bed technology that carries a lot of weight

The Ionic Bed. The Final Resting Place Of Ordinary Humidifiers.

Brace yourself. The Armstrong HumidiClean™ is going to change everything you know about humidifiers. The process starts with an extraordinary new technology that will make traditional humidifiers obsolete. Leave them dead in their tracks, you might say.

The ionic beds you see on this page are made of a fibrous medium: the ionic bed. There are five such beds per tank in a HumidiClean humidifier (more in the Model HC-4500). They attract solids from the water as its temperature rises – minimizing the buildup of solids on inner tank walls and heating elements. So you have a humidifier that stays clean except, of course, for the ionic beds. And once they have absorbed their capacity of solids, the unit even tells you to change them. It takes about 15 minutes and is absolutely hassle free.

Over Traditional Units

As Table 124-1 illustrates, maintaining a HumidiClean with patented ionic bed technology is more economical than caring for either traditional cleanable or non-cleanable electronic units. When you combine costs for labor and materials and calculate the differences for seasonal maintenance, the new Armstrong HumidiClean is the obvious winner.

But to get an idea of just how big your advantage could be, multiply your savings by the number of units you have and project your answer over a few years. Can you think of a better reason to choose HumidiClean? We can't either, but we can think of several more reasons.

See For Yourself How Much HumidiClean Could Save

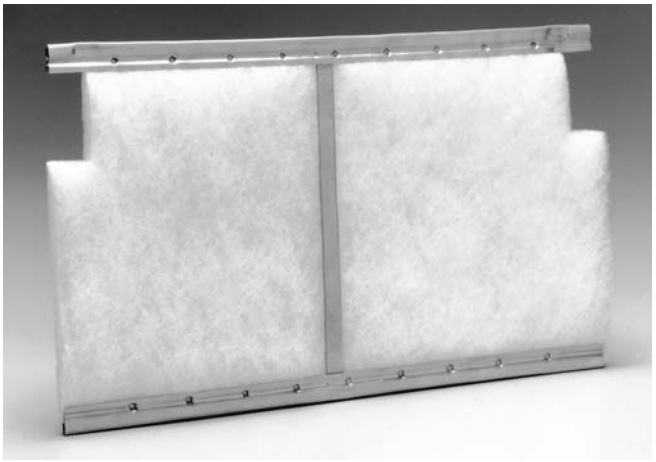
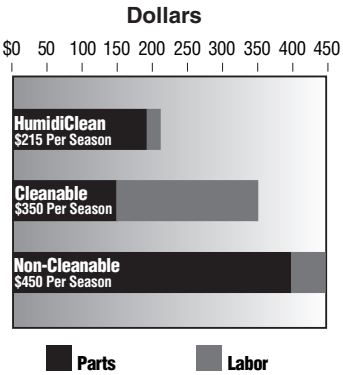


Table 124-1. Maintenance Cost Comparison

Maintenance cost comparison for a humidifying season using Model HC-4100. Results may vary depending on your parts and labor costs.



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HumidiClean Passes No Current Through Water

HumidiClean's resistance-type design has a proven track record for safety. Totally different compartments keep plumbing completely separated from electrical components.

In addition, Armstrong has built several other safety features into HumidiClean. These include a key-locked access door, error light, continual-checking diagnostic routines, high- and low-water level detection, internal tank temperature sensing, overcurrent protection and connections for a Class 2 alarm device.

HumidiClean uses submersed electric heating elements to generate steam. In other words, water quality or conductivity do not affect the unit's ability to generate full output on demand. Although normally used with tap water, HumidiClean can, upon request, be installed with deionized, demineralized, softened or reverse osmosis water sources. Said another way: You get the benefit of a humidifier capable of operating over a wide range of water quality without frequent replacement of parts or bothersome, messy cleaning.

Less Scale Means Greater Efficiency

Capacity is the first victim of the scale that quickly builds up in traditional evaporative or steam-generating humidifiers. As scale gathers in the pan or on heating elements or electrodes, output declines. This gradually leads to a loss of humidity control. From this point on, things get steadily worse – until cleaning or the replacement of parts occurs.

HumidiClean with its remarkable ionic bed technology builds up deposits on its ionic bed inserts instead of tank walls or heating elements. As a result, it operates efficiently longer, its tank stays cleaner longer, and it maintains nearly maximum output throughout its service life.

Ionic Bed Technology Saves Energy

Because of carbonate buildup, most humidifiers drain every 20-45 minutes. HumidiClean's ionic beds attract these carbonates from water, so the primary reason to drain the tank is to eliminate sodium. Since this is typically only necessary approximately once every 24 hours, the unit wastes much less hot water,thereby saving energy dollars.

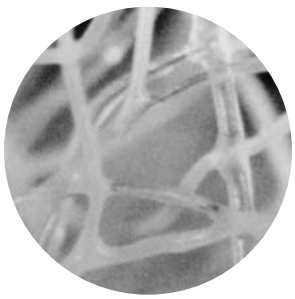
Why Humidify?

As the temperature of indoor air goes up, its relative humidity (RH) goes down. When RH falls to levels commonly found in heated indoor environments, moisture-retaining materials such as wood, paper, textile fibers and a wide range of food and chemicals begin to deteriorate.

Dry air can also increase static electricity buildup, potentially impacting production or the use of office equipment. Computer rooms, printing operations, clean rooms and laboratories are especially sensitive to static charges due to dry air. Low RH also affects indoor air quality.

Steam is virtually a sterile medium offering many sanitation benefits over other types of humidification. It is recommended for essentially all commercial, institutional and industrial applications.

Ionic Bed Technology



New ionic bed

After 400 hours

After 800 hours

These microscopic photos show how the ionic bed fibers (magnified 52.5X) collect solids throughout their service life. A new ionic bed weighs approximately 1/3 pound. When it reaches its capacity, an ionic bed may weigh more than 2-1/2 pounds. A light on the control panel indicates when to replace HumidiClean's beds.

How HumidiClean Works

When power is supplied to the unit, the water fill valve energizes, and water enters the tank. Once the level reaches the low-water switch, the heating elements are energized (assuming there's a call for steam output). The unit continues to fill until the high-water switch is energized. The humidifier then produces steam in response to the humidistat's input signal. The tank will fill at regular intervals if all conditions remain constant. Periodic tank drainage is based on active time of the heating elements, but may be field-adjusted to water conditions.

The HumidiClean power module accepts a proportional signal and, in response, pulses power to the heating elements to provide fully modulated output. Steam output is continuously adjusted to satisfy necessary humidity requirements.

The standard HumidiClean includes the Armstrong modulating control humidistat with a 0-10 Vdc control signal. The unit is field-adjustable to accept any of the following common control signals as the main control signal: on/off (SPST relay), 1.9-3.9 Vdc, 4-20 milliamp, 0-5 Vdc or 0-135 ohms. Additional input terminals are provided for on/off air flow and duct high-limit humidity controls.

Completing A Service Life Cycle

After the ionic beds have absorbed 90% of their capacity, the PC board will flash the "SERVICE LIFE" LED on the control panel. (See control panel photo.) If the HumidiClean is not serviced by replacing the ionic beds and manually depressing the reset switch, the unit will continue to produce steam on demand for the remaining 10% of ionic bed capacity. During this period, the unit will display a flashing "SERVICE LIFE" LED. After the ionic beds have reached 100% capacity, the unit will shut down by draining the tank and will not respond to any call for humidity. Servicing the unit is now required. The service life cycle is field-adjustable to accommodate varying water quality and the specifics of the individual application.

Simple Bed Removal

Push "STEAM GENERATION" switch to tank drain and steam OFF position. This will cause the unit to drain. When this drain is complete, turn the main power off at the disconnect. Open key-locked right side cabinet door (Models HC-4100, HC-4300, HC-5100 and HC-5300). Use caution as tank will still be quite warm. Unscrew the large black knobs that hold the tank access panel in place.

Remove old beds by pulling them up and off the holding pins in the tank, sliding them out through the access opening. Further cleaning of the tank or heating element surface is typically not required.

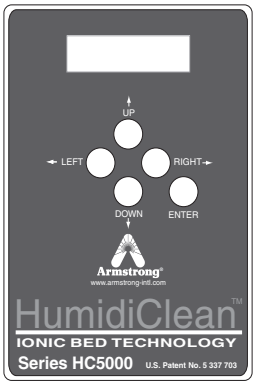
Install new beds in the same manner, sliding them through the access panel and positioning them on the holding pins. After all five (more with Model HC-4500 and HC-5500) have been replaced, replace the tank access panel. When the new ionic beds are replaced and the cabinet door is closed and locked (Models HC-4100, HC-4300, HC-5100 and HC-5300 only), turn the power on at the main power disconnect. Depress the reset button for 20 seconds. Then push the "STEAM GENERATION" switch to ON. Unit will fill with water and return to normal operation. Total service time is usually no more than 15 minutes. (Used ionic beds contain no environmentally hazardous material and may simply be thrown away.)

Drying Cycle

If there is no demand for steam for a continuous 72-hour period, HumidiClean initiates a routine to dry ionic beds by draining and energizing the heating elements for short intervals. This drying cycle eliminates standing water concerns and improves indoor air quality.

Consider the following factors to select and order the proper unit.

Series HC-4000 Control Panel

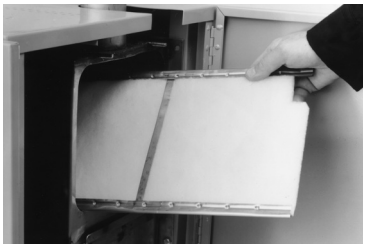


Series HC-5000 Control Panel

The HumidiClean control panel is designed to quickly and simply display operating conditions. If an error is detected, a diagnostic display indicates the specific condition.

Service As Easy As One, Two, Three

Step 1. Open HumidiClean cabinet door and remove tank access panel. Remove the old ionic bed inserts.



Step 2. Install new inserts in place of the old ones.

Step 3. Reinstall tank access panel. Close and lock the unit. Restart HumidiClean.

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Selection and Ordering Procedure

1. Compute the capacity required.

You must compute the maximum amount of moisture required to determine that HumidiClean is properly sized for service.

For detailed information on calculating humidification loads, refer to the Humidification Engineering section of this catalog or Armstrong's Humid-A-ware™ humidification sizing and selection software. Both may be downloaded from Armstrong's web site at www.armstrong-intl.com. Humidification loads are generally sized on a worst-case basis where design conditions exist for a limited time and do not require a safety factor. HumidiClean is designed to drain infrequently, because accumulation of tank solids is not as problematic as with other humidifiers. This conserves water and energy. There will be a short period during this drain cycle when there will be no steam output. Consult your Armstrong Representative or the factory if this poses a control problem for your system.

Example: Assume the humidification load is 38 lbs/hr (17.3 kg/hr) and available power supply is 480 volt/3 phase. Referring to Table 131-3, Page 131, we find a 15 kW Model HC-4100 HumidiClean is required. The branch circuit should be rated for 25 amps. See Table 131-2, Page 131.

2. Specify electrical characteristics of unit required.

Specify the voltage, kW, phase and cycles for unit on the order. Determine total amperage for installation purposes.

3. Specify the humidity level and range.

The standard Armstrong humidistat is 0-10 Vdc control and is adjustable by a front-mounted dial from 5-95% RH. Specify room or duct type humidistat. Or you may provide your own humidistat and/or controller. If you are providing your own controller, specify control signal type.

4. Use proper connecting materials.

Two short hose cuffs per dispersion tube are provided to be used with 2" (nom.) hard copper tube to connect the tank to the steam dispersion tube (if applicable). Armstrong recommends using insulated copper tubing. The maximum recommended distance is 40 feet (12 meters) of equivalent length copper tubing. See Installation, Operation and Maintenance Bulletin 537 for additional guidelines.

5. Specify spare ionic bed inserts.

If HumidiClean is going to be in continuous service on a year-round basis, Armstrong recommends the purchase of a spare set of beds.

Duct Unit

6. Specify steam dispersion tube (Table 127-1).

Select the proper steam dispersion tube that meets the duct requirements. As an example, if the duct in which you are installing the humidifier has a width between 17" and 22", you should use the steam dispersion tube D-1.5 (DL-1.5 for HC-4300 or HC-4500).

Alternatively, specify HumidiPack™ and indicate the following:

- Duct height and width
- CFM
- Duct air temperature
- Final duct RH%
- Non-wettable vapor distance available
- Maximum allowable air pressure drop (inches W.C.)

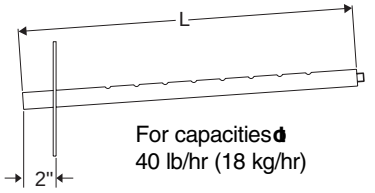
7. Specify water source.

Specify if the service will include tap, deionized, demineralized, softened or reverse osmosis water.

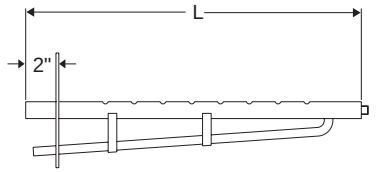
8. Specify options required.

- **Duct high-limit humidistat.** (Recommended). You may order

Figure 127-1. Dispersion Tube



For capacities of 40 lb/hr (18 kg/hr)



For capacities above 40 lb/hr (18 kg/hr)

Table 127-1. Selecting Proper Steam Dispersion Tube

Steam Disp. Tube Model #		Steam Disp. Tube Length		Duct Width				Weight	
				Min.		Max			
HC-4100 & HC-4100DI HC-4145 & HC-4145DI HC-5100 & HC-5100DI HC-5145 & HC-5145DI	HC-4300 & HC-4300DI HC-4500 & HC-4500DI HC-5300 & HC-5300DI HC-5500 & HC-5500DI	in	mm	in	mm	in	mm	lb	kg
D-1	DL-1	12	304	11	279	16	406	3	1.4
D-1.5	DL-1.5	18	457	17	432	22	559	3	1.4
D-2	DL-2	24	609	23	584	34	864	4	2
D-3	DL-3	36	914	35	889	46	1168	6	3
D-4	DL-4	48	1219	47	1194	58	1473	8	3.6
D-5	DL-5	60	1524	59	1499	70	1778	9	4
D-6	DL-6	72	1829	71	1803	82	2083	10	4.5
D-7	DL-7	84	2133	83	2108	94	2388	11	5
D-8	DL-8	96	2438	95	2413	106	2693	12	5.5
D-9	DL-9	108	2743	107	2718	118	2998	13	6
D-10	DL-10	120	3048	119	3023	130	3302	14	6.4

*Minimum of two type DL dispersion tubes required for HC-4500 and HC-4500DI.

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

a duct high-limit stat. A typical setting for the high-limit stat is 85% RH. Stat opens when relative humidity exceeds settings. A modulating high-limit stat is also available for VAV systems.

- **Fan interlock.** (Recommended). You may order a duct pressure switch to activate the humidifier by sensing air flow in a duct system. The pressure switch prevents humidifier operation if there is insufficient air movement in the duct system.

Area Unit

9. Specify a fan package for each HumidiClean.

The EHF-3 offers a remote mounted, direct area discharge option for use with HumidiClean (See Figure 128-3). EHF-3 offers capacities to 120 lbs/hr (54 kg/hr). A minimum of two EHF-3 fan units are required for Model HC-4500.

Figure 128-1. HC-4100/4145/4300 Duct Type Distribution

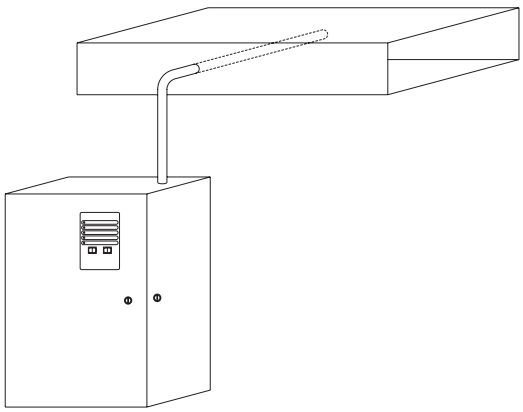


Figure 128-2. HC-4100/4145/4300 with Duct Located below HumidiClean

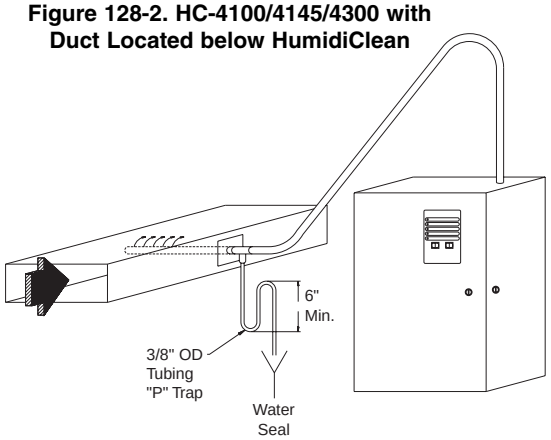


Figure 128-3. HC-4100/4145/4300 with EHF-3 Fan Package Mounted on Wall

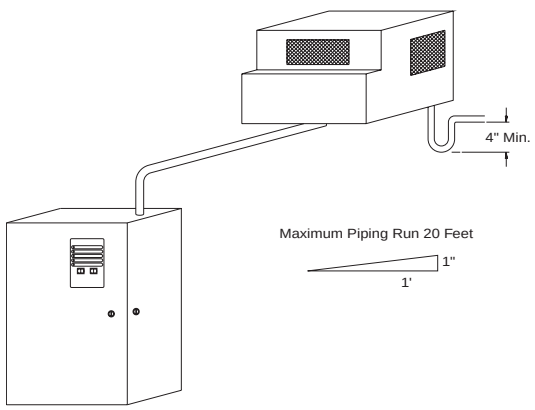


Figure 128-4. HC-4100/4145/4300 HumidiClean Piped to HumidiPack

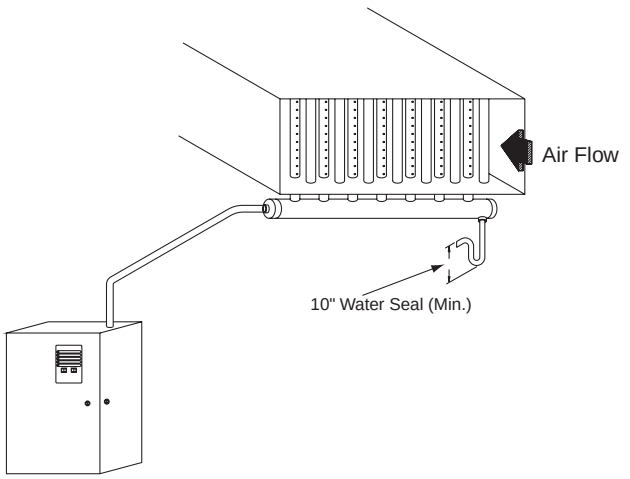
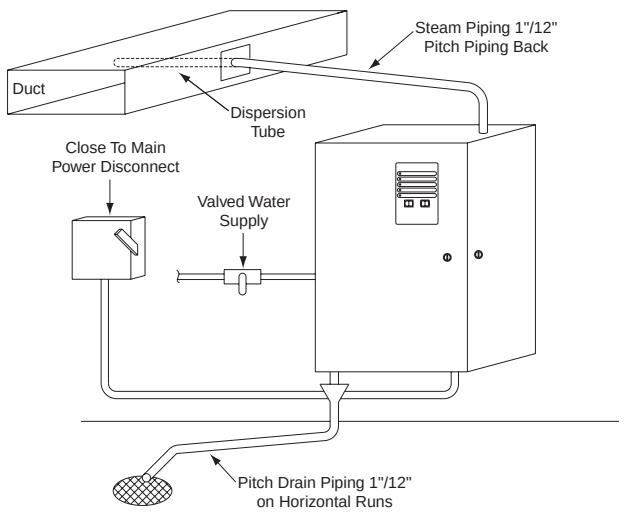


Figure 128-5. HC-4100/4145/4300 General Installation Concept



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Electronic steam humidifiers must be installed in locations that allow routine inspection and accessibility for maintenance operations.

Do not place electronic steam humidifiers in locations where unusual instances of malfunction of the humidifier or the system might cause damage to non-repairable, unreplaceable or priceless property.

Duct Type Distribution

Where an existing duct system is available, steam is commonly discharged into the duct through a dispersion tube. Selection of the dispersion tube should meet the duct requirements in Table 125-1, Page 125. If the steam dispersion tube is to be located below the humidifier, install a drip leg with water seal (See Figure 126-2, Page 126).

Alternative for Shortened Non-Wettable Vapor Trail… HumidiPack™

Use of a traditional dispersion tube (See Figures 127-1, Page 127, 128-1 and 128-2, Page 128) typically provides satisfactory non-wettable vapor trail performance in duct applications with HumidiClean. However, for applications with particularly limited downstream absorption distance, HumidiPack may be considered. HumidiPack is a prefabricated separator/header and multiple dispersion tube assembly (See Figures 128-4, Page 128, and 129-1). It provides uniform distribution and a shortened non-wettable vapor trail. Refer to Page 82 or contact your Armstrong Representative for more information.

Area Distribution Method

The Armstrong EHF-3 fan package provides humidity distribution where an air handling system is not available. The fan package (See Figure 128-3, Page 128) is designed to be hung on a wall to operate as a remote-mounted, direct area discharge option for use with HumidiClean. The EHF-3 incorporates a blower rated at 120 V-2.90 amps. CFM rating is 465. The standard fan package requires a separate 120 volt power supply. The EHF-3 can be used (upon request) with power supplied to HumidiClean through a step-down transformer.

Note: A minimum of two EHF-3 fan units are required for Model HC-4500.

Note: Models HC-4500 and HC-4500DI are shipped as freestanding units. They are not intended to be wall mounted.

Note: For all Series HC-4000 units: Please contact factory for duct applications offering high static pressure (>4" W.C.) or velocities over 2,000 FPM. Avoid placing dispersion tubes in downward, high-velocity airflow. Please contact your local Armstrong representative with questions.

Figure 129-1.
HC-4500 HumidiClean Piped to HumidiPack

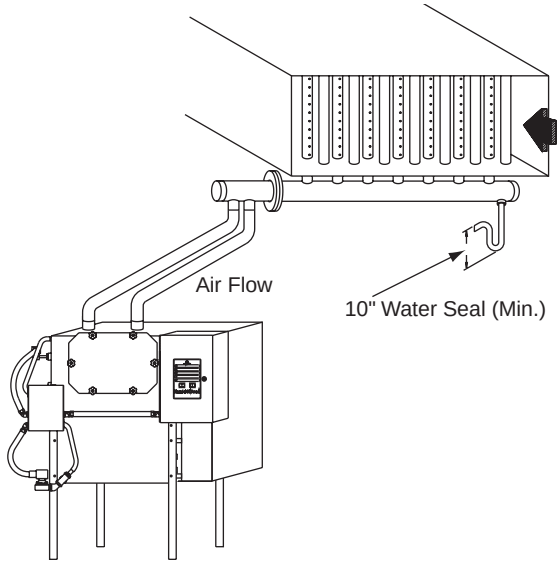
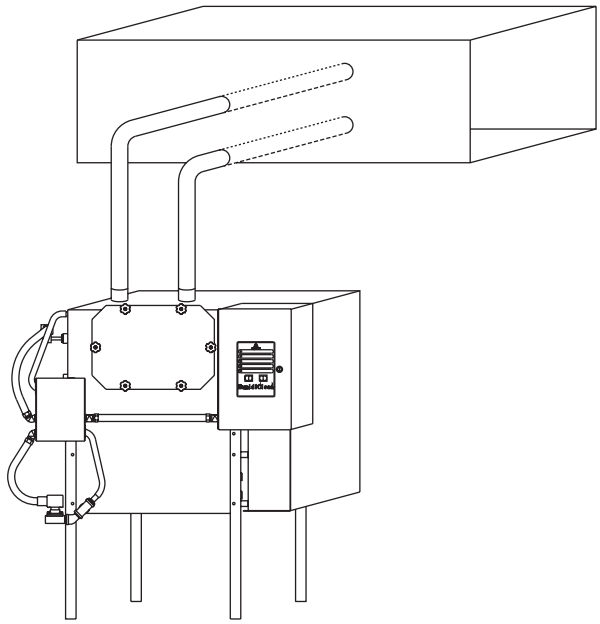


Figure 129-2.
HC-4500 Duct Type Distribution with Dispersion Tubes



Suggested Specification for Series HC-4000 and HC-5000 HumidiClean™

Steam humidifier for steam distribution of humidity (steam vapor) into air handling system or directly into space shall be of the self-contained, electrically controlled design.

A. Vapor shall generate steam from demineralized, deionized, reverse osmosis, softened or ordinary tap water (specify DI model for DI or RO water).

B. Humidifier shall utilize disposable ionic bed inserts for tap water service to attract solids from boiling water. Ionic beds ensure controllability through responsive and consistent humidity output regardless of water quality and minimize downtime required for tank cleaning.

C. Humidifier shall have all internal components contained in a steel cabinet with key-locked access doors to prevent unauthorized access.

D. Humidifier shall monitor tank operating history, and display will indicate when unit needs ionic bed replacement. Service life cycle may be field-adapted to match water quality.

E. Humidifier shall have modulating control to provide 0% to 100% of maximum capacity. Humidifier is field-adaptable to 0-10 Vdc, 4-20 mA, 0-5 Vdc, or an on/off input signal.

F. Tank drain shall cycle based on operating history in order to conserve water and energy. Drain cycle shall be field-adjustable and drain will be tempered by the fill valve.

G. Unit shall monitor tank water level and will shut down power to the heating elements to prevent unsafe operation upon failure of the drain system, fill system, or upon an overcurrent condition.

H. Humidifier tank shall utilize a thermal safety switch that senses temperature within a heating element to prevent overheating.

I. Humidifier shall incorporate stainless steel conductance-actuated probes with Teflon™ insulation for liquid level control on tap water service. For deionized (DI) or reverse osmosis (RO) water, humidifier shall use a float switch for liquid control.

J. Series HC-4000 humidifier shall include lights indicating the unit has power on, is in the process of steam generation, has a diagnostic error or that ionic beds are at the end of their service life.

   Series HC-5000 shall include password protected programmable keypad with backlit alphanumeric display offering menu selectable diagnostics, ionic bed service life selection, and tank drain program.

K. Humidifier fill water line shall have an air gap to prevent backflow (siphoning) of tank water in the potable water supply system.

L. Humidifier shall incorporate electrical terminals for installation of controlling stat, duct high-limit stat, fan interlock switch and Class 2 alarm device.

M. Humidifier shall be supplied with stainless steel steam dispersion tube(s) which provide uniform steam distribution over the entire tube length and shall be supplied at various lengths (through 6') to adequately span the widest dimension of the duct. Alternately, humidifier shall be supplied with HumidiPack prefabricated separator/ header and multiple dispersion tube assembly designed for the application in order to shorten the non-wettable vapor trail.

N. When applicable, humidifier(s) shall have provisions for discharging steam vapor directly into room area using factory-available fan distribution units as an accessory. These units shall be designed for remote mounting.

O. Humidifier shall be supplied with hose cuffs for connection to hard copper tube (customer-supplied).

P. Humidifier tank shall be constructed of stainless steel and the heating elements shall include an incoloy sheath for tap water service or stainless steel sheath for RO (reverse osmosis) or DI (deionized) water.

Q. Only series HC-5000 humidifiers allow for remote control and, upon request, may be monitored through BACnet.

Additional options include VAV control (modulating high limit humidistat), outdoor temperature cold snap reset, aqua-sta freeze protection, and real time clock for programming drainage at preset times.

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

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Table 131-1. List Of Materials

Generator Tank	304 Stainless Steel	
Generator Tank Gasket	Closed Cell Silicone	
Cabinet Material	HC-4100/4145/4300 18 ga. CQCRS	
	HC-4500 Electrical Cabinets in 16 ga. Steel	
Cabinet Finish	HC-4100/4145/4300 Powder Coating	
	HC-4500 Electrical Cabinets Powder Coated Only	
Elements	Incoloy	
Ionic Bed Material	Inert Fiber	
Ionic Bed Frame	304 Stainless Steel	
Hose Cuffs	EPDM (Ethylene Propylene) Rubber	
Dispersion Tubes	Type 18-8 Stainless Steel	
Weights	**HC-4100/4145/4300**	**HC-4500**
Approx. Shipping Weight	112 lb/51 kg	175 lb/80 kg
Tank Weight - Dry	28 lb/13 kg	—
Cabinet Weight - Dry	84 lb/38 kg	—
Maximum Operating Weight - Full	186 lb/84 kg	370 lb/172 kg
EHF-3 Fan Package	33 lb/15 kg	33 lb/15 kg

Table 131-2. Recommended Branch Circuits

Nominal Amp Rating	Wire (Gage)	Circuit Breaker
1-12	14	15
13-15	12	20
16-20	10	25
21-24	10	30
25-32	8	40
33-40	8	50
41-48	6	60
49-64	4	80
65-80	3	100
81-100	1	125
101-120	0	150
121-140	00	175
141-160	000	200

Table 131-3. Steam Capacities And Nominal Amp Ratings

	Models HC-4100, HC-4100DI, HC-5100 and HC-5100DI			Models HC-4100, HC-4100DI, HC-4145, HC-4145DI HC-5100, HC-5100DI, HC5145, and HC-5145DI					Models HC-4300, HC-4300DI, HC-5300 and HC-5300DI			
	3 kW Unit			9 kW Unit			15 kW Unit		18 kW Unit		30 kW Unit	
Voltage (Vac)	Nominal Amps		Steam Output	Nominal Amps		Steam Output	Nominal Amps	Steam Output	Nominal Amps	Steam Output	Nominal Amps	Steam Output
	Single Phase	Three Phase	lb/hr (kg/hr)	Single Phase	Three Phase	lb/hr (kg/hr)	Three Phase	lb/hr (kg/hr)	Three Phase	lb/hr (kg/hr)	Three Phase	lb/hr (kg/hr)
208	13.3	7.7	8.3 (3.8)	39	22	24 (11)	37	40 (18)	44	48 (22)	74	80 (36)
240	12.9	7.5	9.0 (4.1)	38	22	27 (12)	36	45 (20)	44	54 (25)	72	90 (41)
380	–	4.7			14		23		28		46	
480	–	3.8			11		18		22		36	
600	–	3			9		15		18		30	

Note: Capacities may vary in proportion to power supply.

Table 131-3. Continued. Steam Capacities And Nominal Amp Ratings

	Model HC-4500, HC-4500DI, HC-5500 and HC-5500DI																	
	40 kW Unit			45 kW Unit			48 kW Unit			50.3 kW Unit			60 kW Unit			72 kW Unit		
Voltage (Volts)	Nominal Amps	Steam Output		Nominal Amps	Steam Output		Nominal Amps	Steam Output		Nominal Amps	Steam Output		Nominal Amps	Steam Output		Nominal Amps	Steam Output	
	Three Phase	lb/hr	kg/hr	Three Phase	lb/hr	kg/hr	Three Phase	lb/hr	kg/hr	Three Phase	lb/hr	kg/hr	Three Phase	lb/hr	kg/hr	Three Phase	lb/hr	kg/hr
208	—	—	—	125	135	61	—	—	—	—	—	—	—	—	—	—	—	—
240	96	120	54	—	—	—	—	—	—	—	—	—	144	180	82	—	—	—
380	—	—	—	—	—	—	73	144	65	77	150	68	—	—	—	110	216	98
480	—	—	—	—	—	—	58	144	65	—	—	—	—	—	—	87	216	98
600	—	—	—	—	—	—	47	144	65	—	—	—	—	—	—	70	216	98

Note: Capacities may vary in proportion to power supply.

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

Figure 132-1. Models HC-4100/4145/4300/5100/5145/5300

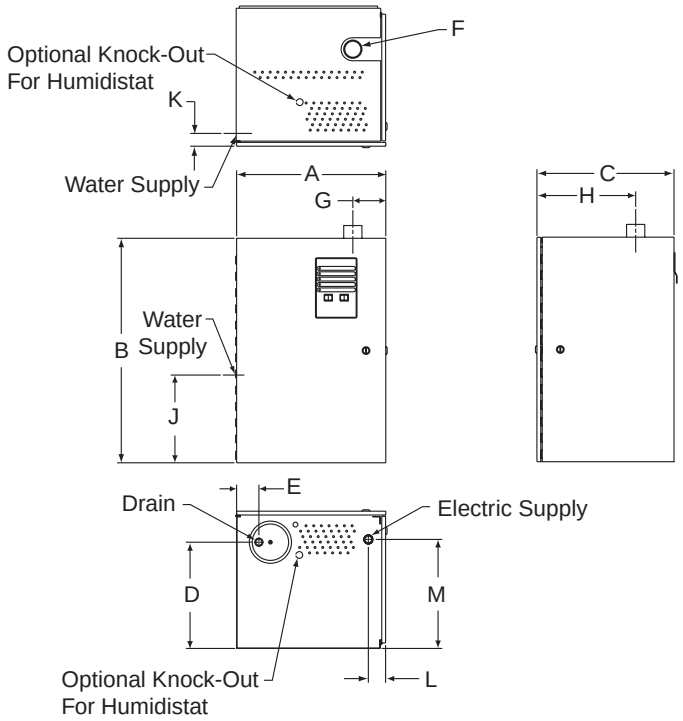

Table 132-1. Physical Data

	HC-4100, HC-4100DI, HC-4145, HC-4145DI, HC-4300, HC-4300DI, HC-5100, HC-5100DI, HC-5145, HC-5145DI, HC-5300, HC-5300DI		HC-4500, HC-4500DI HC-5500, HC-5500DI	
	Inches	**mm**	**Inches**	**mm**
"A"-Width	19-7/16	494	36-1/2	927
"B"-Height	29-1/4	743	44-1/4	1123
"C"-Depth	17-7/8	454	23-1/4	591
"D"-Drain - Back	13-7/8	352	—	—
"E" Drain - Side	2-15/16	74	14-1/4	361
"F"-Steam Discharge Tube	2-3/8	60	2-3/8	60
"G"-Steam Outlet - Side	4-5/16	109	14-13/16	375
"H"-Steam Outlet - Front	12-7/8	327	9-7/16	240
"J"-Supply Water - Bottom	11-7/16	290	40-1/8	1019
"K"-Water Supply - Front	1-3/4	44	6	152
"L"-Electrical Supply - Side	2-1/4	57	3-1/2	89
"M"-Electrical Supply - Back	14-7/32	361	3-1/2	89
"Q"-Steam Dispersion Outlets	—	—	9-5/8	244
Water Supply Connection	3/8 compression fitting	10	1/8 NPT	3

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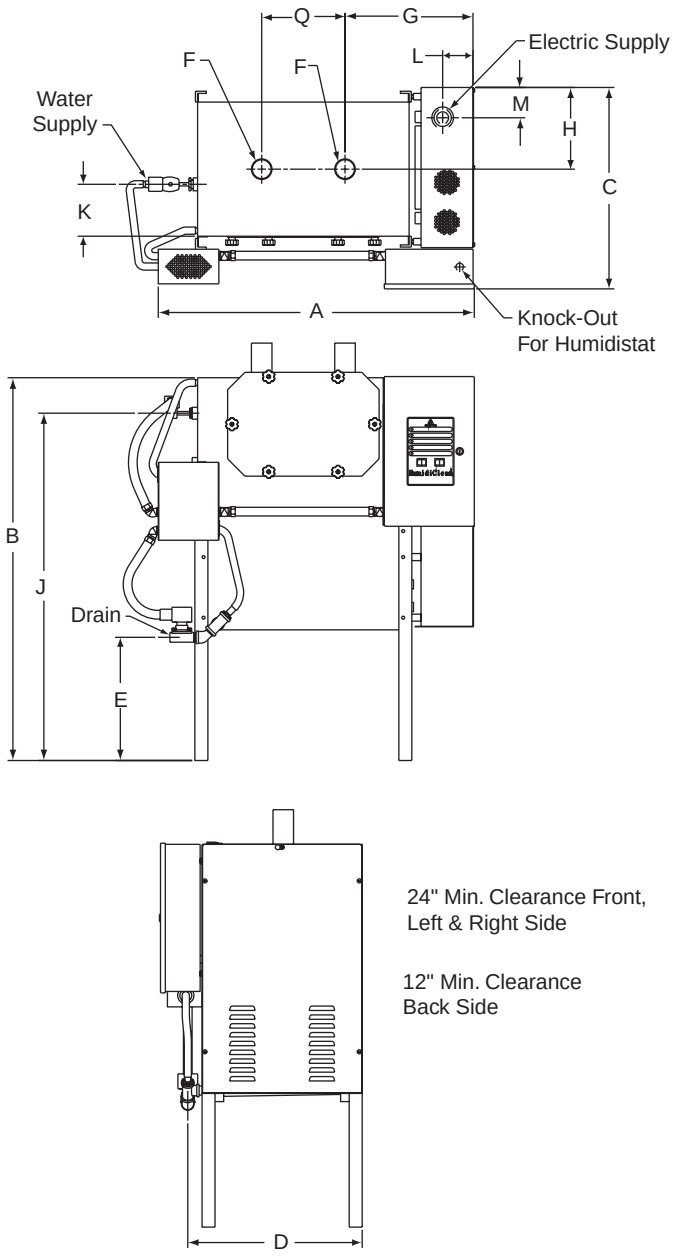
NEXT

Figure 133-1. Models HC-4500 and HC-5500 — Front, Side, Top Views



All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.