Energy Savings Cooling Solutions

CAREL

Electronic High Pressure Water Atomizer

humiFog multizone®

High Pressure Atomized Water Cooling & Humidifier Systems

Innovative Systems Solution and Energy Savings

An energy savings solution for cooling applications

Whether its a data center, air handling unit or customized cooling requirement Carel offers energy savings solutions that are environmentally friendly.

Optimized costs
and
energy savings

The design of our multiltizone model allows systems to be developed where just one pumping unit serves multiple duct or room appplications.

Indirect evaporative cooling technology ensures significant energy savings, meaning the investment can be paid back very quickly.

Humifog multizone is suitable for all applications that require a high level of hygiene: the unit is in fact certified in accordance with VDI6022/VDI3803/ DIN1946, and does not use chemical biocides, but rather pure and simple water.

The user interface is easy to use even for less expert users. It is available in 5 languages (English, Spanish ,French,Italian and German).

Very low power consumption

Consumption of just 1 KW/Hour per 105,000 BTU's of cooling capacity.

Cooling operation

Cools the air in summer without increasing the humidity, exploiting indirect evaporative cooling

Pure and safe operation

100% stainless steel components and no need for costly and bacteria prone media filtration.

1. *electronic controller*
2. *terminals for probe inputs and control of the atomized water distribution system*
3. *pGD[1] graphic interface*
4. *inverter to control pump capacity*
5. *conductivity meter*
6. *pressure and temperature sensors*
7. *piston pump; available in brass, stainless steel & silicon free versions*
8. *vibration damper*

Pumping unit

humiFog uses a volumetric pump to pressurize the water, which is atomized by special stainless steel nozzles.

The sophisticated control system combines the action of an inverter, which controls the speed and consequently the flow-rate of the pump, with a series of solenoid valves that activate only the nozzles that are necessary, allowing the system to always operate at the ideal pressure to atomize the water, across a wide range of flow-rates.

The unit can configured to operate:

- **with flow control:** for air handling unit applications, the capacity of the humidifier is controlled continuously across a wide range by the combined action of an inverter and controlling the number of nozzles using solenoid valves (up to 4 circuits). The water pressure is kept between 363 to 1015 psi to ensure very fine atomization, with droplets from 10 to 15 µm in diameter. This guarantees maximum precision and minimum power and water consumption.
- Ideal for precision humidification applications in winter (1 rack) or in combination with indirect evaporative cooling (two racks);
- **at constant pressure:** the water pressure is kept constant (1015 psi) regardless of the capacity demand in the zone being served. The capacity of the distribution system is modulated in steps, up to 64, thus guaranteeing quite fine precision. The inverter is used to limit the power consumption of the pump motor when demand is less than maximum.
- Ideal for applications directly in rooms or in ducts in multiple zones.

The pumping unit is available with 220, 441, 106, 1014, 1323 lbs/h capacities, in individual or multizone versions. The pump can be supplied in the brass, stainless steel and silicon free version, essential for painting applications.

Zone controller

The pumping unit (master) controls one zone: it receives signals from external controllers or probes and manages the solenoid valves on the distribution system. All other zones have their own controller (slave electrical panel), which communicate with the master: in relation to probe readings or external control signals, this guarantees independent local control.

A solution for all applications

Cooling system solutions in air handling units or directly in the room.
Multizone systems to use one pumping unit in a series of AHUs with independent set points. For applications requiring humidification, add ons are simple and efficient.

Duct distribution system

Rack
This is supplied to measure based on the AHU/duct and is made up of manifolds with atomization nozzles and capacity control and drain valves. The stainless steel nozzles are supplied with pressurized demineralized water to generate very fine droplets, average diameter 10-15 µm, which are readily absorbed by the air.

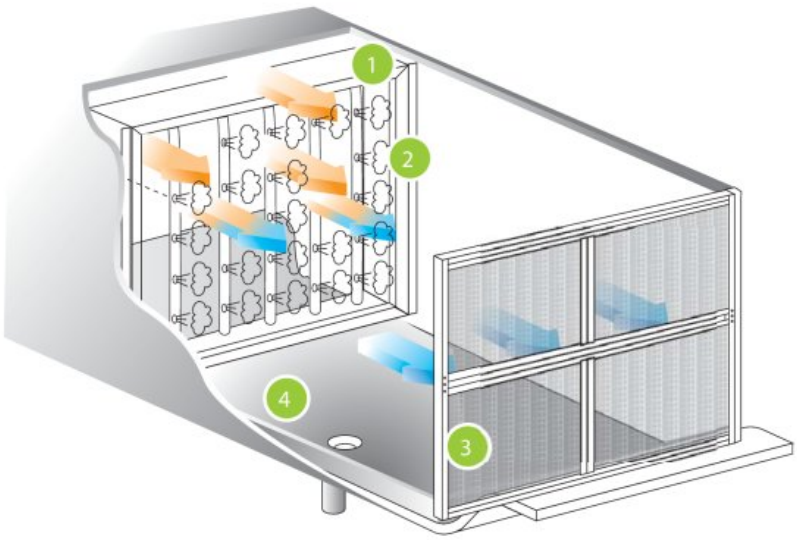
Droplet separator
The droplet separator has the purpose of trapping the droplets of water that are not completely evaporated, to prevent them from leaving the humidification chamber. It is made completely from AISI304 stainless steel, both the filtering material and the drain structure.

Room distribution system

This is made up of stainless steel manifolds with nozzles installed inside the room being humidified/cooled. Blowers with tangential fans to generate a flow of air are also available. The flow of air assists evaporation of the droplets and carries the droplets on a cushion of air, ensuring an essentially horizontal trajectory. Humifog multizone controls solenoid valves to control the capacity of the system and to drain and automatically wash the system.

PATENT PENDING

atomizing head with atomizing nozzles and tangential fan to create a flow of air that supports the droplets.



1. *stainless steel atomizing rack*
2. *high efficiency atomizing nozzles*
3. *droplet separator made completely from stainless steel*
4. *collection basin with drain (not supplied by CAREL)*

–20%

In a multizone system the cost of the installation is over 20% less than competitors solution with one pumping unit for each AHU.

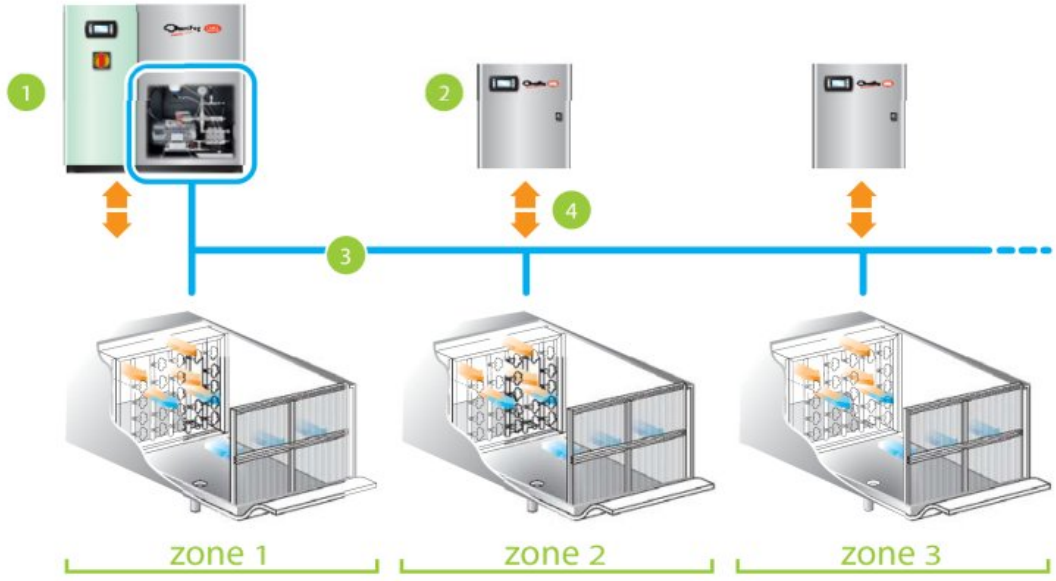
Single zone

For cooling and humidification applications in an AHU, industrial environment or outdoor air-conditioning system: a pumping unit independently controls the temperature/humidity in the controlled environment. Continuous modulation of capacity to minimize water and power consumption.
Suitable for precision applications (±2%).

Multizone

For applications in which a pumping unit (master) is used to supply pressurized water to multiple zones (up to 6). The master controls one zone, based on the zone probe readings or external control signal, and manages the distribution and atomization system to maintain the humidity or temperature level. All other zones have a controller (slave) that communicates with the master and based on the local probe readings or external control signal manages the distribution and atomization system to maintain the humidity or temperature level completely independently.
The Multizone configuration rationalizes the use of the humiFog pumping unit as, despite the lower precision due to stepped modulation (±5%), it can manage multiple zones at the same time, without having to install a pumping unit for each AHU or industrial environment.

Example of multizone system with 3 zones managed by one pumping unit (with a built in zone controller) and 2 additional controllers.



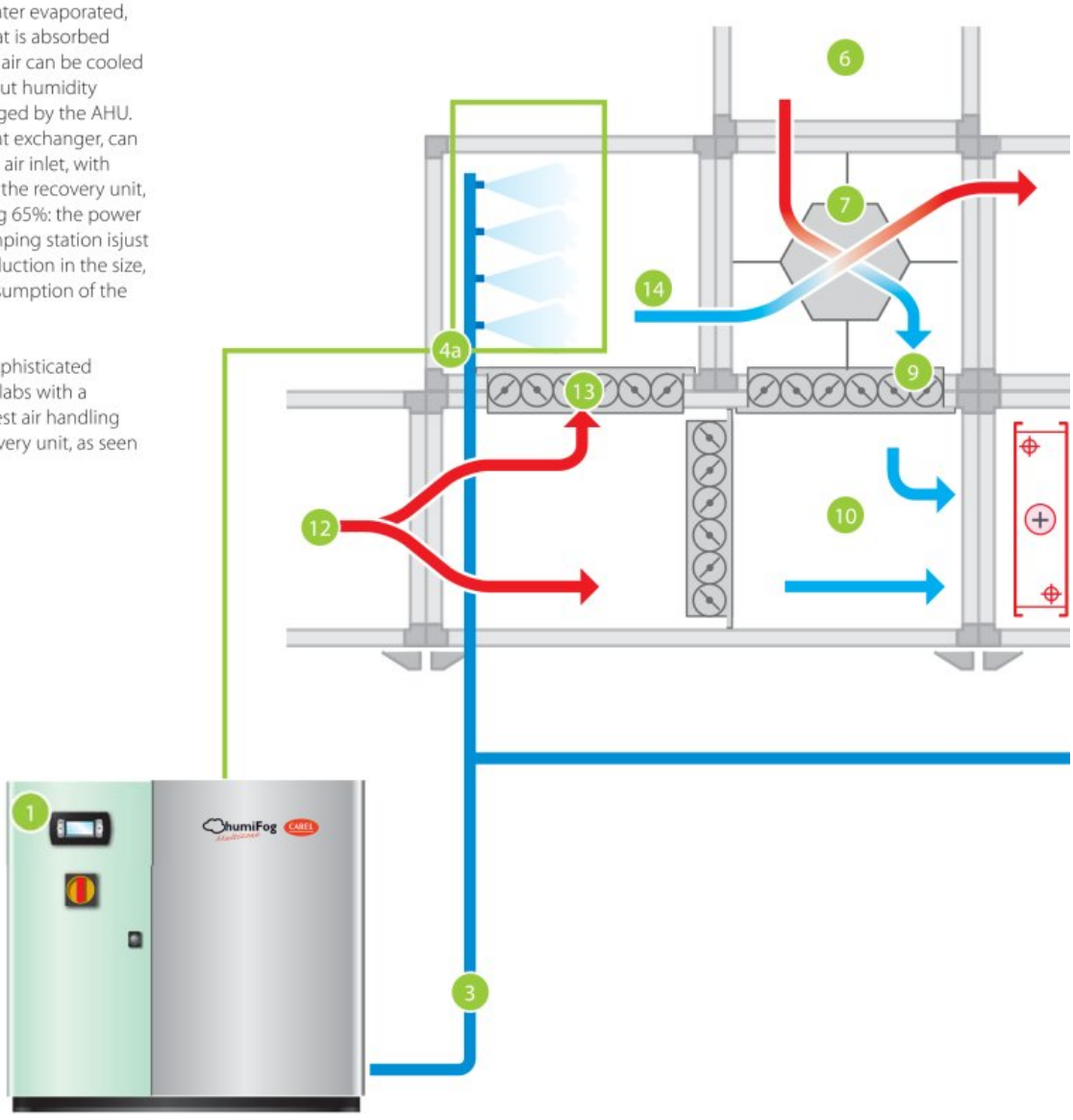
1. *pumping unit and zone controller*
2. *zone controller*
3. *pressurized water line*
4. *local probe signals and solenoid valve control outputs*

Energy savings example: Indirect Evaporative Cooling

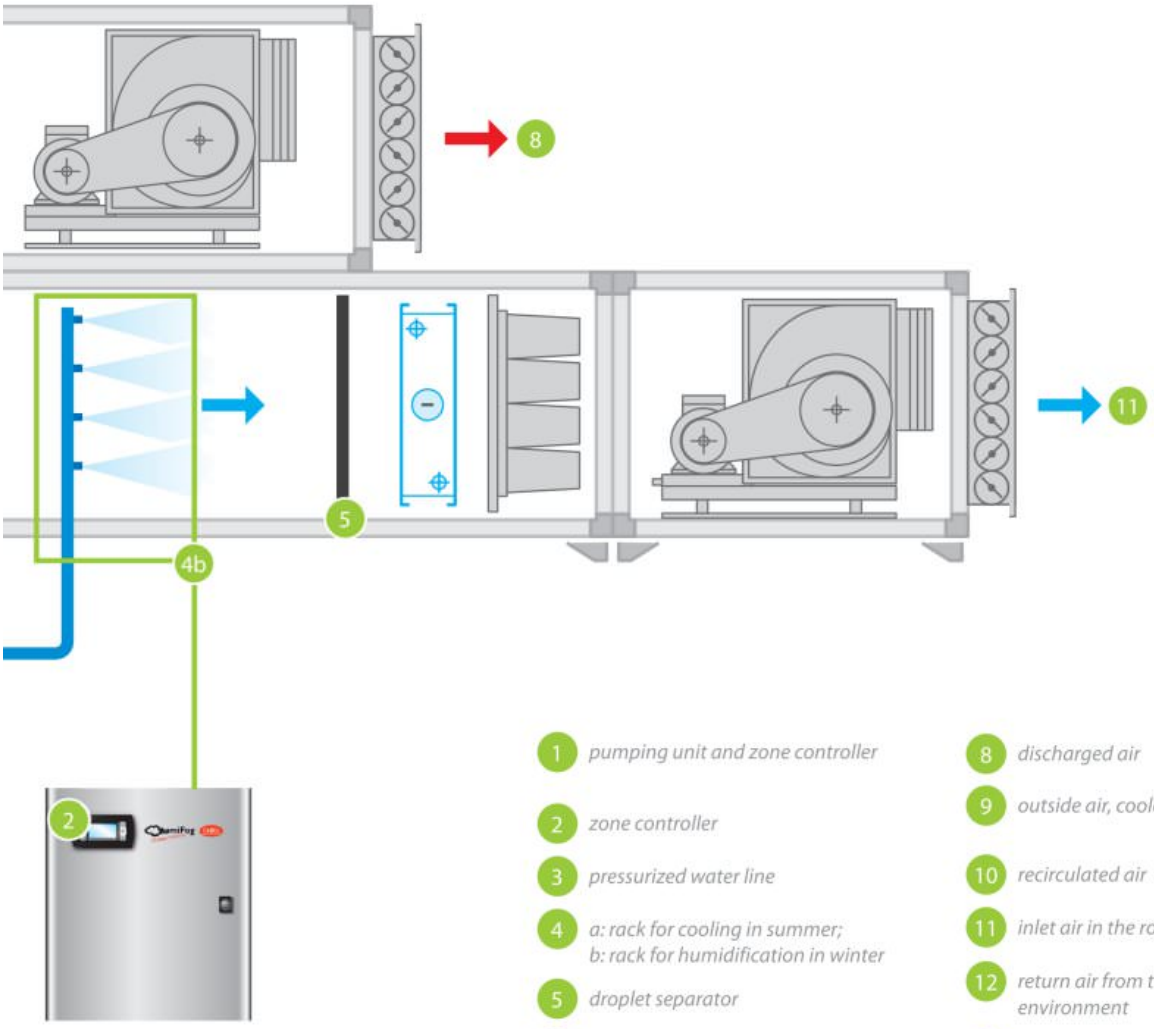
One pumping unit can be used to humidify the inlet air in winter, and to cool the inlet air in summer without increasing the humidity

The effect of cooling the air is due to the spontaneous evaporation of the droplets of water: the change in state from liquid to steam occurs by subtracting energy from the air that, as a consequence, is cooled. For each 100 lbs/hr of water evaporated, over 105,000 BTU's of heat is absorbed from the air. The exhaust air can be cooled by several degrees without humidity change, as this is discharged by the AHU. This capacity, using a heat exchanger, can be used to cool the fresh air inlet, with efficiency depending on the recovery unit, however easily exceeding 65%: the power consumption of the pumping station isjust 0.95 kW! This allows a reduction in the size, capacity and power consumption of the cooling coil.

When developing this sophisticated product, CAREL fitted its labs with a complete and modern test air handling unit, including heat recovery unit, as seen here on the side.



Tests in the duct performed at the CAREL labs: up to 95% of the atomized water is absorbed by the air, which is efficiently humidified and cooled, minimizing water and energy consumption.



1. *pumping unit and zone controller*
2. *zone controller*
3. *pressurized water line*
4. *a: rack for cooling in summer; b: rack for humidification in winter*
5. *droplet separator*
6. *outside air (hot)*
7. *heat exchanger*
8. *discharged air*
9. *outside air, cooled indirectly*
10. *recirculated air*
11. *inlet air in the room*
12. *return air from the air-conditioned environment*
13. *exhaust air*
14. *exhaust air, cooled adiabatically*

Maximum hygiene

With our special droplet separator with stainless steel mesh, humiFog has received VDI6022 certification operating on simple demineralized water, without needing to use costly biocide additives (such as silver ions).

Special attention has been paid to the hygiene aspects of humiFog. The built-in controller automatically:

- fills the lines only humidification is required;
- empties the lines when there is no humidification demand for some time;
- periodically washes the lines there is no humidification demand for an extended time.

The wash cycle, unlike on competing products, is performed using dedicated solenoid valves, and not by spraying the water being drained.

Humifog multizone for AHU/ducts has received the following certification:

Air-conditioning standard	
VDI 6022, page 1 (04/06)	☒
VDI 3803 (10/02)	☒
ÖNORM H 6021 (09/03)	☒
SWKI VA104-01 (04/06)	☒
DIN EN 13779 (09/07)	☒

Hospital applications	
DIN 1946, part 4 (01/94)	☒
ÖNORM H 6020 (02/07)	☒*
SWKI 99-3 (03/04)	☒

In Italy, refer to: "Guidelines for the definition of technical preventive maintenance protocols on air-conditioning systems" - Official Gazette no. 256 of 3 November 2006, approximation of VDI6022.

* In accordance with H 6020 (02/07), chapter 6.13.2 in Austria the use of steam humidifiers or equivalent humidification systems is required.

Why demineralized water?

- minimum maintenance;
- no blockage of the nozzles;
- no dust (using normal mains water, 33 to 66 lbs of dust is introduced into the environment for every 26,000 gals/hr of water);
- greater hygiene (the membrane in the reverse osmosis system represents a physical barrier to bacteria, viruses and spores).

Simple and intuitive user interface

A large display shows easily understandable messages even for users without detailed knowledge of the product

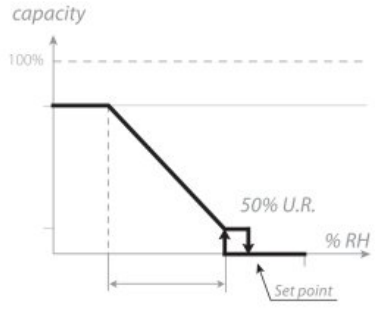
The user interface is available in 5 languages (English Spanish, Italian, French and German), while the menus can be browsed simply using the buttons with icons:

- to display the status of the humiFog multizone, valves, calendar, remote zones, etc. and to browse the menus
- to set the set point or confirm the value entered
- to display warnings and browse the menus;
- to display/reset alarms
- **Prg** to access the parameters menu, with a tree structure based on the type of user
- to browse the menus

Precision temperature control

The built-in electronic controller in the pumping unit and the zone units features independent humidity or temperature control inputs, plus a further limit probe input

For each zone, for example, a humidity set point (main probe) and a limit value in the duct (limit probe) can be set, i.e. a typical humidification application in winter. Alternatively, in a typical summer application, a temperature and maximum humidity limit set point can be set, so as to cool the air without producing excess humidity.
Humifog multizone also accepts signals from external controllers, both ON/OFF and proportional, and via serial connections (Modbus included). This means the unit can be easily integrated into the control AHU systems.



Graph of humidity control with continuous capacity modulation

Reliable, precise applications with low power consumption

The air can be cooled and/or humidified adiabatically by atomizing demineralized water

Office buildings

Humidification and/or cooling to ensure optimum comfort.

Food industry

Humidification for the production of biscuits, pasta and all other hygroscopic materials and ingredients.

Libraries and museums

Humidification for storing books, paintings, and works of art in ideal temperature-humidity conditions.

Cleanrooms

To maintain the required humidity level for the process and efficient evaporative cooling.

Paint systems/booths

To maintain the right humidity level and ensure quality and uniformity of the painted product.

Tobacco industry

For tobacco processing, maturing and storage at optimum humidity.

Evaporative cooling direct/indirect

An efficient system for cooling the air with extremely low power consumption.

Hotels and call centers

Humidification and/or cooling for optimum comfort and to prevent illnesses caused by dry air.

Textiles industry

Humidification to limit dust and the breakage of fibers, as well as evaporative cooling to "absorb" the heat generated by the looms.

Outdoor air-conditioning

Evaporative cooling outdoors.

Printing and paper processing

To ensure productivity and final product quality.

Timber industry

For timber processing and storage.

Technical specifications

	UA100*	UA200*	UA320*	UA460*	UA600*
Features					
Control models	Single zone pumping unit, multizone pumping unit, zone controller				
Rated capacity (lbs/h)	220	441	704	1012	1320
Power supply	230 V, 1 phase, 50 Hz or 208 V, 1 phase, 60 Hz				
Pumping unit power consumption kW	0.955	0.955	1.15	1.15	1.95
Zone controller power consumption kW	0.28				
Operating conditions	34 to 104 °F <80 % RH non-condensing				
Storage conditions	34 to 122 °F <80 % RH non-condensing				
Index of protection	Type 1				
Certifications					
Hygienic certification for air-conditioning generic applications	VDI 6022, page 1 (04/06), VDI 3803 (10/02), ONORM H 6021 (09/03), SWKI VA104-01 (04/06), DIN EN 13779 (09/07)				
Hygienic certification for hospital applications	DIN 1946, part 4 (01/94), ONORM H 6020 (02/07)*, SWKI 99-3 (03/04)				
Certification	CE and ETL998 (pumping unit); ETL508A (zone controllers)				
Water inlet					
Connection	G3/4"F (NPT3/4F for UL versions)				
Temperature limits	34 to 104 °F				
Pressure limits	43.5 to 116 psi				
Total hardness (ppm CaCO3)	0 to 25				
Conductivity limit µS/cm	0 to 50 µS/cm (stainless steel pump) – 30 to 50 µS/cm (brass pump)				
pH	6.5 to 8.5				
Water outlet					
Connection	M16.5m DIN 2353 (G3/8"F) (NPT3/8F for UL versions)				
Water drain					
Connection	Stainless steel pipe, OD 10 mm/ 0.4 inch				
Serial communication	CAREL, Modbus® protocol (others optional)				
Control					
Control	External signal, temperature or humidity control; plus temperature or humidity limit probe				
Type of input signals	0 to 1 V, 0 to 10 V, 2 to 10 V, 0 to 20 mA, 4 to 20 mA, NTC				
Dimensions and weights					
Pumping unit dimensions (LxWxH) inches	40.5 x 15.7 x 33.8				
Pumping unit weight lbs	187	187	209	209	220
Zone controller dimensions (LxWxH) inches	19.6 x 5.9 x 22.8				
Zone controller weight lbs	43				

*: In accordance with H6020 (02/07), chapter 6.13.2 is demanded in Austria the use of steam humidifiers or equivalent humidification systems.

Room blower unit models

Features	DL*
Water inlet	1/4" male tube
Water outlets	1/4" male tube or 6x8 mm for DLxxSID000
Fan power supply	110 Vac, 60 Hz
Capacity (lbs/h)	13, 24, 26, 35, 48, 70
Air flow-rate	412 CFM (700 m^3/hr) for 4 nozzle model and and 882 CFM (1500 m^3/hr) for 8 nozzle model
Dimensions	8"x 8" (200x200 mm)
Material	stainless steel
Nozzle capacity at 1015 psi (lbs/h)	MTP0= 3.2 lbs/h, MTP1= 6.2 lbs/h, MTP2= 8.8 lbs/hr
Nozzle fittings	4 or 8
Maximum length of distribution lines	164 ft

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