



air humidification systems  
adiabatic humidification



humiFog multizone  
high pressure atomised water  
humidifier

# The new generation of high pressure atomised water humidifiers

Simple and powerful control cabinet for a rational humidification and evaporative cooling system

Optimised costs  
and  
energy saving

The evolution to the multizone model allows systems to be developed where just one pumping unit serves multiple systems or rooms, thus rationalising the investment.

Another important innovation is the dual heating/cooling function: a humiFog multizone unit can both cool the air during the summer and humidify during the winter. 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 intuitive and easy to use even for less expert users. It is available in 5 languages (Italian, English, French, Spanish and German) and can be activated at any time).



## Very low power consumption

Consumption of just 4 W per litre/hour of capacity, less than 1% of any steam humidifier



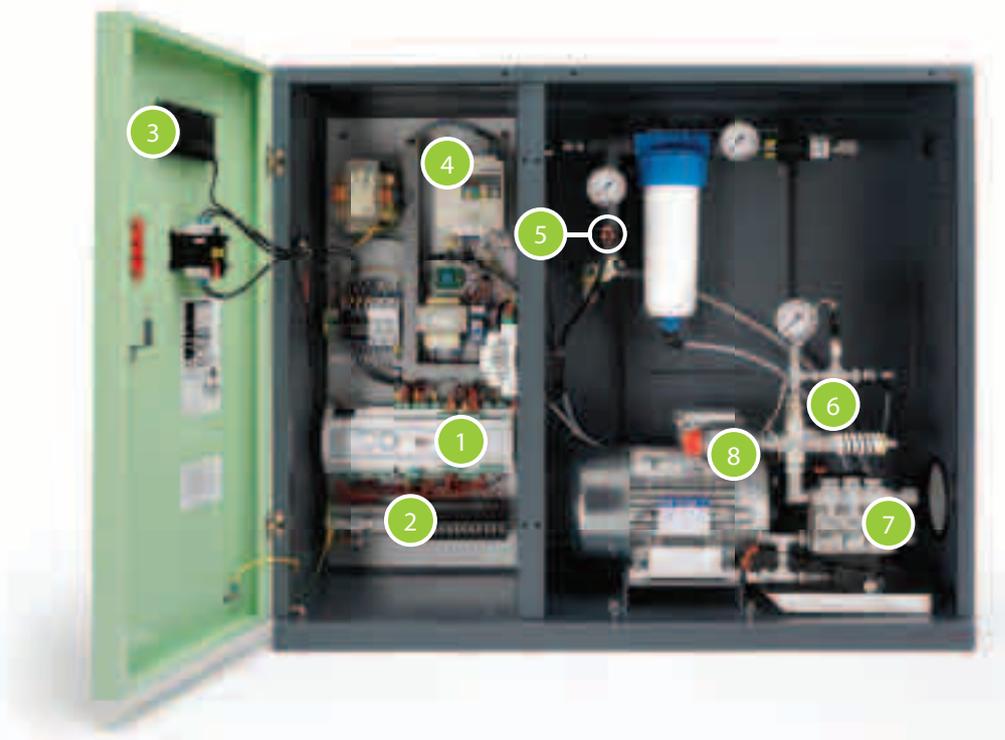
## Heating/cooling operation

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



## Maximum hygiene

Product certified by ILH Berlin using pure and simple water



- 1 *electronic controller*
- 2 *terminals for probe inputs and control of the atomised water distribution system*
- 3 *pGD¹ 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 pressurise the water, which is atomised 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 atomise the water, across a wide range of flow-rates.

The unit can be 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 25 and 70 bars to ensure very fine atomisation, 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, mutually exclusive);**

- **at constant pressure:** the water pressure is kept constant (70 bars) 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 100, 200, 320, 460 and 600 kg/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

Humidification and cooling system 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.

## Duct distribution system

### Rack

This is supplied to measure based on the AHU/duct and is made up of manifolds with atomisation nozzles and capacity control and drain valves. The stainless steel nozzles are supplied with pressurised demineralised 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.

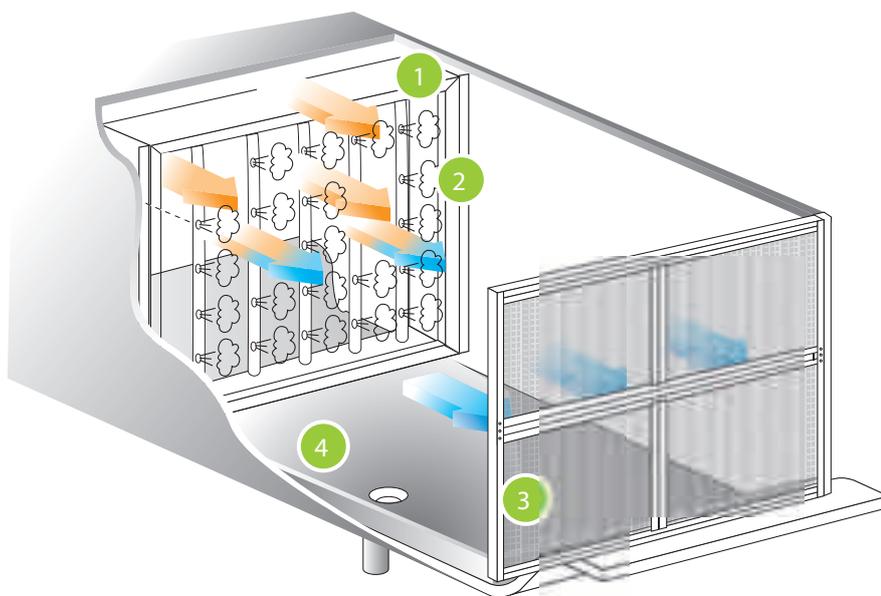
## Room distribution system

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

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



1 stainless steel atomising rack

2 high efficiency atomising 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% lower than a traditional solution with one pumping unit for each AHU.

### Single zone

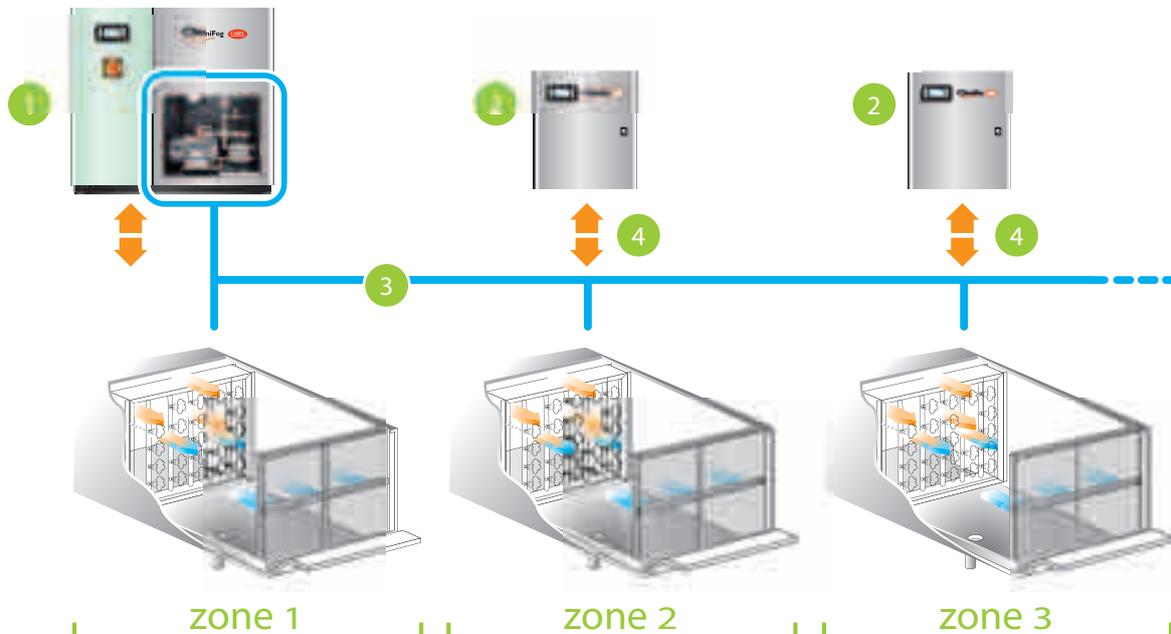
For humidification and/or cooling applications in an AHU, industrial environment or outdoor air-conditioning system: a pumping unit independently controls the temperature/humidity in the controlled environment. Continuous modulation of capacity to minimise water and power consumption. Suitable for precision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

### Multizone

For applications in which a pumping unit (master) is used to supply pressurised 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 atomisation 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 atomisation system to maintain the

humidity or temperature level completely independently. The Multizone configuration rationalises the use of the humiFog pumping unit as, despite the lower precision due to stepped modulation ( $\pm 5\%$ ), 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 and 2 zone controllers.



1 pumping unit and zone controller

3 pressurised water line

2 zone controller

4 local probe signals and solenoid valve control outputs

# Energy saving: indirect evaporative cooling

Summer/winter operation:

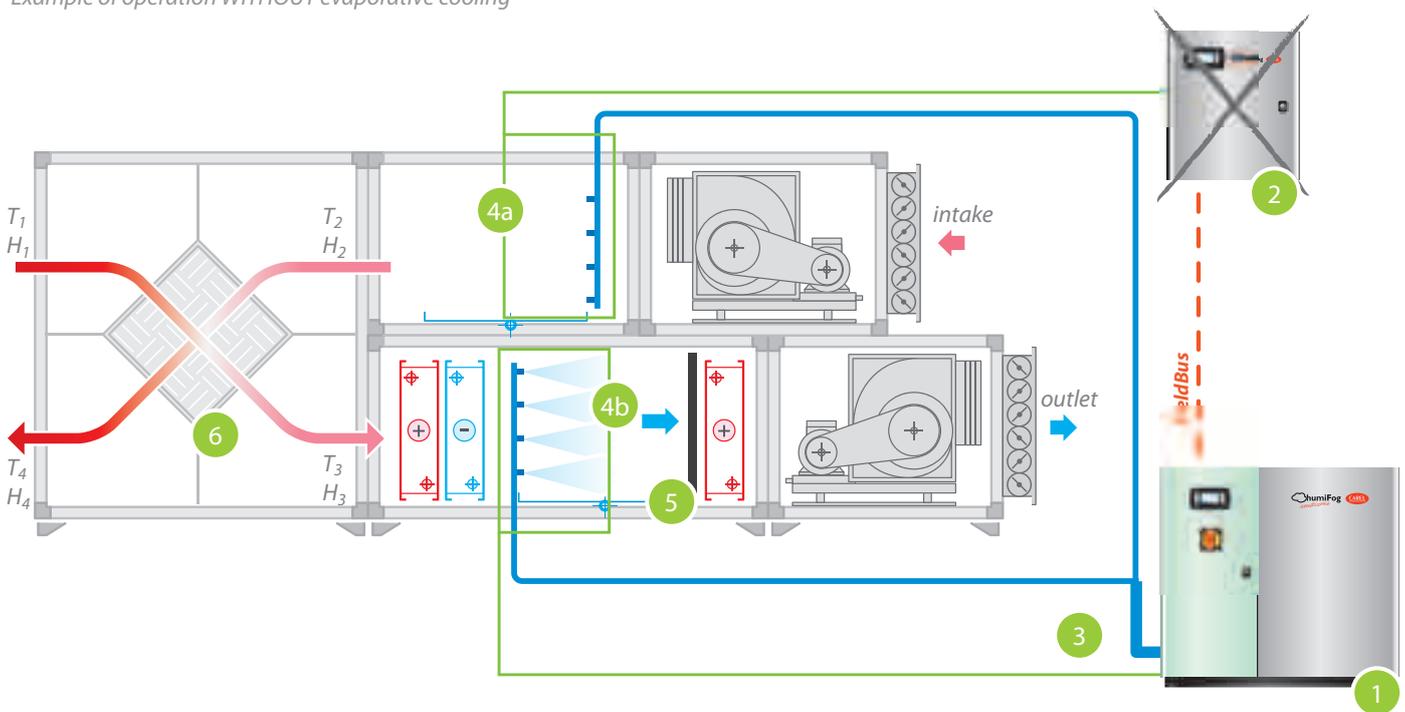
one pumping unit can be used to humidify the inlet air in winter, and to cool the inlet air in summer without increasing the humidity

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 kg/h of water evaporated, 69 kW of heat is absorbed from the air. The exhaust air can be cooled by several degrees without humidity limits, as this

is discharged by the AHU. This cooling capacity can be exploited to cool the fresh air, via a heat exchanger, with an efficiency, depending on the heat recovery unit, that easily exceeds 50%! 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.

Example of operation WITHOUT evaporative cooling



|                             | Outside air    |                | Exhaust air    |                | Cooled outside air |                | Outlet air     |                | Cooling capacity* |
|-----------------------------|----------------|----------------|----------------|----------------|--------------------|----------------|----------------|----------------|-------------------|
|                             | T <sub>1</sub> | H <sub>1</sub> | T <sub>2</sub> | H <sub>2</sub> | T <sub>3</sub>     | H <sub>3</sub> | T <sub>4</sub> | H <sub>4</sub> | P                 |
| WITHOUT evaporative cooling | 35 °C          | 40% r.H.       | 25 °C          | 50% r.H.       | 29 °C              | 56% r.H.       | 31 °C          | 36% r.H.       | 58 kW             |
| WITH evaporative cooling    | 35 °C          | 40% r.H.       | 18 °C          | saturation     | 25 °C              | 70% r.H.       | 28 °C          | 55% r.H.       | 100 kW            |

Additional capacity 42 kW

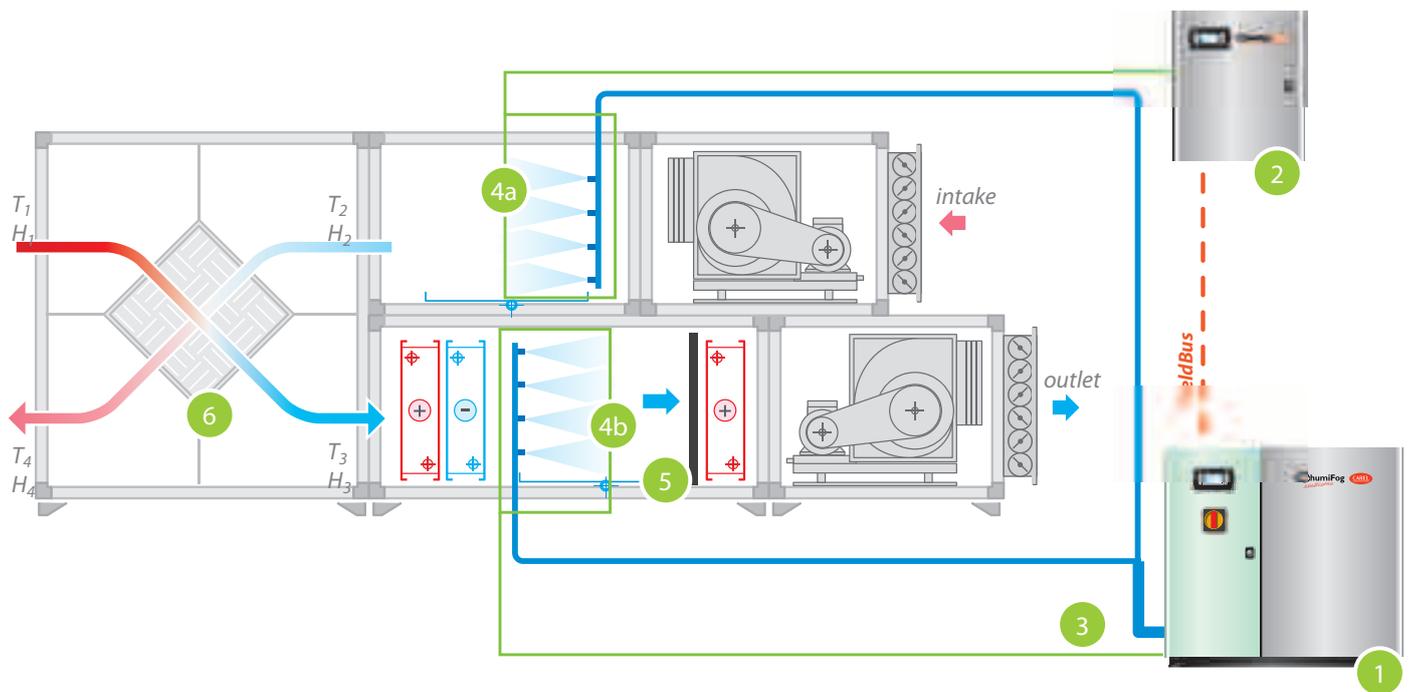
In the example shown in the table, the exhaust air is pre-cooled to 18 °C and then used by the heat exchanger to cool the outside air from 35 to 25 °C, a decrease of 10 °C, without increasing absolute humidity.

\*: The cooling capacity is calculated based on an outside air flow-rate of 30000 m<sup>3</sup>/h, atomising 100 kg/h of water, and a heat recovery unit with an efficiency of 58%.



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

Example of operation WITH evaporative cooling



An additional 42 kW of capacity is recovered, consequently the cooling coil and the chiller can be 42 kW smaller and their power consumption will be around 15 kW lower, for humiFog power consumption of just 1 kW.

**-15 kW**

- 1 pumping unit and zone controller for humidification in winter
- 2 zone controller for cooling in summer
- 3 pressurised water line
- 4 a: rack for cooling in summer; b: rack for humidification in winter
- 5 droplet separator
- 6 heat recovery unit

# Maximum hygiene

Thanks to the special droplet separator with stainless steel mesh, humiFog has received VDI6022 certification operating on simple demineralised 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 demineralised water?

- minimum maintenance;
- no blockage of the nozzles;
- no dust (using normal mains water, 15 to 30 kg of dust is introduced into the environment for every 100 m<sup>3</sup> of water);
- greater hygiene (the membrane in the reverse osmosis system represents a physical

barrier to bacteria, viruses and spores).



CAREL can supply, upon request, the WTS water treatment systems for the Italian market, complete with pre-treatment, dechlorination, reverse osmosis demineraliser, storage tank, pumping system and UV sanitisation. Using mains drinking water, it produces demineralised water with physical/chemical characteristics, flow-rate and pressure suitable for supplying the humidifiers. WTS optimises costs and space and is easy to install on site.

# 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 (Italian, English, French, German and Spanish), 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
- Esc** to browse the menus

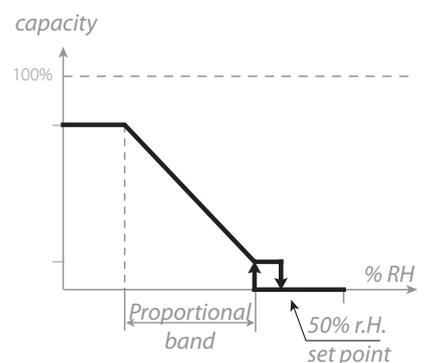


# Precise temperature and humidity control

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 humidified and/or cooled adiabatically by atomising demineralised 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 fibres, 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* |
|--|---|--------|--------|--------|--------|
| <b>Features</b>  |   |        |        |        |        |
| Control models   | Single zone pumping unit, multizone pumping unit, zone controller   |        |        |        |        |
| Rated capacity kg/h  | 100   | 200    | 320    | 460    | 600    |
| 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   | 1T40 °C <80 % RH non-condensing   |        |        |        |        |
| Storage conditions   | 1T50 °C <80 % RH non-condensing   |        |        |        |        |
| Index of protection  | IP20  |        |        |        |        |
| <b>Certificazioni</b>  |   |        |        |        |        |
| 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)  |        |        |        |        |
| <b>Water inlet</b>   |   |        |        |        |        |
| Connection   | G3/4" (NPT3/4F for UL versions)   |        |        |        |        |
| Temperature limits   | 1T40 °C / 34T104 °F   |        |        |        |        |
| Pressure limits  | 0.3 to 0.8 Mpa  |        |        |        |        |
| Total hardness (ppm CaCO <sub>3</sub> )                          | 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  |        |        |        |        |
| <b>Water outlet</b>  |   |        |        |        |        |
| Connection   | M16.5m DIN 2353 (G3/8" (NPT3/8F for UL versions)  |        |        |        |        |
| <b>Water drain</b>   |   |        |        |        |        |
| Connection   | Stainless steel pipe, OD 10 mm/ 0.4 inch  |        |        |        |        |
| Serial communication   | CAREL, Modbus® protocol (others optional)   |        |        |        |        |
| <b>Control</b>   |   |        |        |        |        |
| 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   |        |        |        |        |
| <b>Dimensions and weights</b>                                    |   |        |        |        |        |
| Pumping unit dimensions (LxWxH) mm                               | 1030 x 400 x 860 mm   |        |        |        |        |
| Pumping unit weight kg   | 85  | 85     | 95     | 95     | 100    |
| Zone controller dimensions (LxWxH) mm                            | 500 x 150 x 580 mm  |        |        |        |        |
| Zone controller weight kg  | 19.5  |        |        |        |        |

\*: 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                              | M12 x 1 male  |
| Water outlets                            | M12 x 1 male or TNF 6x8 for DLxxSDxxxx and DLxxMDxxxx                               |
| Fan power supply                         | 230 Vac, 50 Hz  |
| Capacity (kg/h)                          | 5, 11, 16, 22, 32   |
| Air flow-rate                            | 700 m <sup>3</sup> /h for 4 nozzle model, 1500 m <sup>3</sup> /h for 8 nozzle model |
| Dimensions                               | 850 for 4 nozzle model, 1500 for 8 nozzle model, 200x200 mm                         |
| Material                                 | stainless steel   |
| Nozzle capacity at 70 bars (kg/h)        | MTP0= 1.45 kg/h, MTP1= 2.8 kg/h, MTP2= 4 kg/h                                       |
| Nozzle fittings                          | 4 or 8  |
| Rack fittings                            | 1/4" G female   |
| Rack dimensions                          | 2.450 mm, dia. 14 mm  |
| Maximum length of distribution lines (m) | 50 (contact CAREL for longer lines)   |

# Water treatment systems

| Code       | Description   |
|------------|---|
| CMROUV0250 | 250 kg/h reverse osmosis system, with sanitisation by UV lamp |
| CMROUV0500 | 500 kg/h reverse osmosis system, with sanitisation by UV lamp |
| CMROL00000 | 25 kg container of Antiscalant descaler liquid*               |

\* the sequestration and particle dispersion action drastically reduces the precipitation of salts on the osmotic membranes, extending their working life. This is required for correct operation of the system.

## Headquarters ITALY

**CAREL INDUSTRIES Hqs.**  
Via dell'Industria, 11  
35020 Brugine - Padova (Italy)  
Tel. (+39) 0499 716611  
Fax (+39) 0499 716600  
carel@carel.com

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