High
Efficiency
Solutions.

CAREL


# humiFog multizone

## adiabatic humidifier

The energy of water used to cool the air

# humiFog, the high-pressure atomised water humidifier

Powerful and upgraded control cabinet for a rational humidification and evaporative cooling system. Newly-designed distribution system to improve performance and simplify assembly.

- Reliability and precision up to 1000 kg/h
- Redundancy and rotation
- Energy saving
- New user interface

humiFog has recently been perfected from several points of view. Externally, with restyling of the cabinet and a new interface. Internally, with a rationalised layout to simplify maintenance. The main news concerns the extension of the range up to 1000 kg/h, satisfying applications with high humidification loads, such as painting booths, and the introduction of redundancy and rotation functions.

The established multizone model can be used to develop installations in which a single pumping unit can serve several systems or rooms, thus rationalising the investment. Other important existing functions have been retained, such as the summer/winter function.

Indirect evaporative cooling technology in fact brings significant energy savings, meaning a much faster return payback on investment. humiFog multizone is suitable for all applications that require hygienically safe humidification: the system is in fact certified in accordance with VDI6022 (published in the Italian Official Gazette), VDI3803 / DIN1946, and does not require the use of chemical biocides; rather it operates on pure and simple water.
The new intuitive user interface is easy to use even for non-experts, and is available in 7 languages (Italian, English, French, Spanish, German, Chinese and Czech, all pre-loaded for selection at any time).


### Very low power consumption

The unit consumes just 4 W of power per litre/hour of capacity, less than 1% of any steam humidifier

### Multizone function

Optimised investment with master + slave solution

### 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 for pump capacity control*
5. *conductivity meter*
6. *pressure and temperature sensors*
7. *piston pump; brass, stainless steel and silicone-free versions*
8. *vibration damper*

## Pumping unit

humiFog uses a volumetric pump to pressurise the water, which is atomised by AISI 316 special stainless steel nozzles. The sophisticated and upgraded control system combines the action of an inverter, which controls pump flow-rate, with a series of solenoid valves that only activate the required nozzles, meaning the system always works at the ideal pressure for atomising the water (up to 70 bars) across a wide range of flow-rates.

Pumping unit operation can be set in the following modes:

• **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). Water pressure is kept between 25 and 70 bars to ensure very fine atomisation, with 10 µm droplets.

This guarantees maximum precision (± 2% around the relative humidity set point) and minimum power consumption.

Ideal for precision humidification applications in winter (1 rack) or in combination with indirect evaporative cooling (two racks, mutually exclusive) in summer;

• **constant pressure:** 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, thus guaranteeing excellent precision. The inverter is used to supply the exact flow-rate required by the different zones.
Ideal for applications directly in rooms or in ducts in multiple zones.

The pumping unit is available with 100, 200, 320, 460, 600 and 1000 kg/h capacities, in individual or multizone versions. The pump can be supplied in the brass, stainless steel and silicone-free version, the latter essential for painting booths.


## Zone controller

The pumping unit (Master) controls one zone: it receives signals from external controllers or probes and manages the solenoid valves of the distribution system. All other zones have a controller (slave panel) that communicates with the Master: based on the probe readings or external control signals received, this guarantees independent local control.

# A solution for every application

Humidification and cooling system in air handling units or directly in rooms.

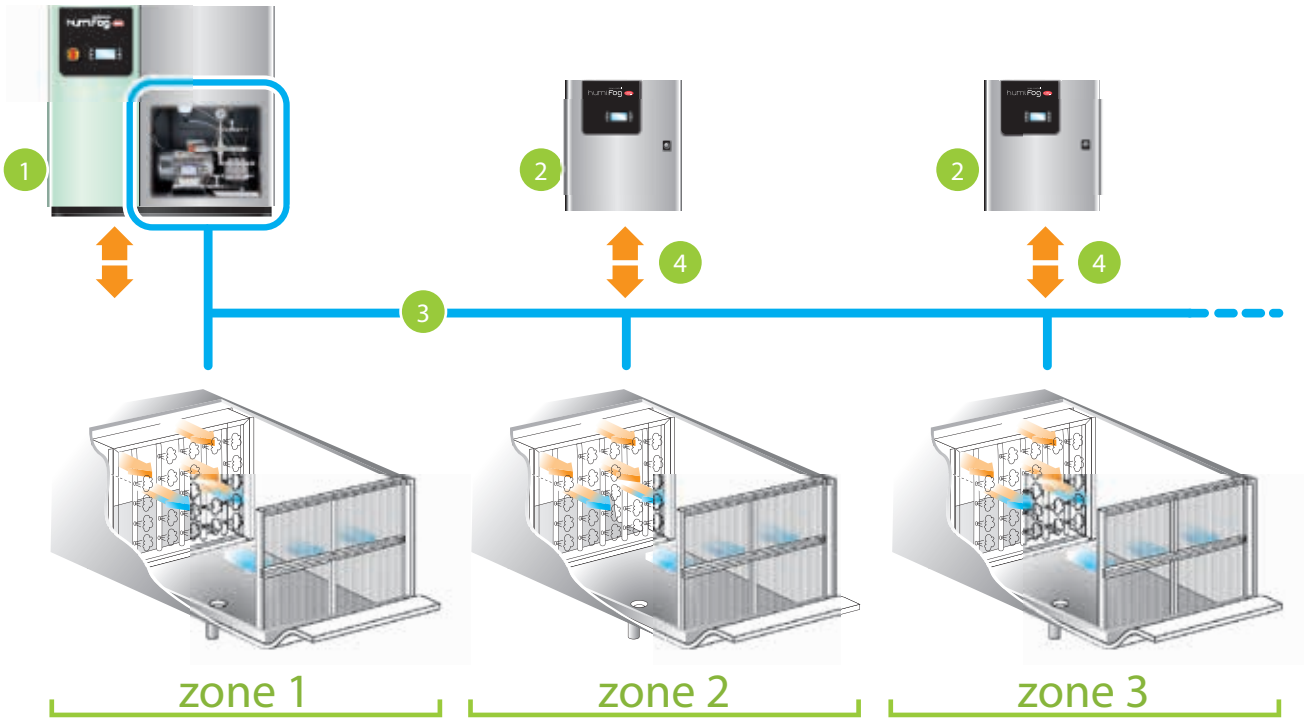
## Single zone

Used for humidification applications where high precision is needed (±2% RH).
It is recommended to independently manage humidification or evaporative cooling in a single zone.

## Multizone

Recommended for applications with more than one air handling unit. A single pumping unit (Master) can control up to six zones, communicating with the local Slaves. The advantage of the multizone configuration is rationalised use of the humiFog pumping unit, as it can manage multiple zones at the same time, without having to install a pumping unit for each AHU or industrial environment, thus optimising the investment. This is the ideal solution in cases where a slight decrease in precision is acceptable, due to stepped modulation (±5% UR).

*Example of multizone system with three zones, with one pumping unit and two zone controllers.*




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

**–20%**

In a multizone system, installation costs are more than 20% lower compared to the traditional solution with one pumping unit for each AHU.

## Duct distribution system

**Rack**

Designed to measure according to the AHU where it is installed. This is made up of vertical nozzle manifolds, each with a drain solenoid valve to easily empty the water and prevent stagnation, in compliance with hygiene regulations.
The fill solenoid valves, on the other hand, are needed for modulation and capacity control.
The AISI 316 stainless steel nozzles (available in three sizes: 1.5 - 2.8 and 4.0 l/h) are supplied by demineralised water to generate very fine droplets that are readily absorbed by the air.

**Droplet separator**

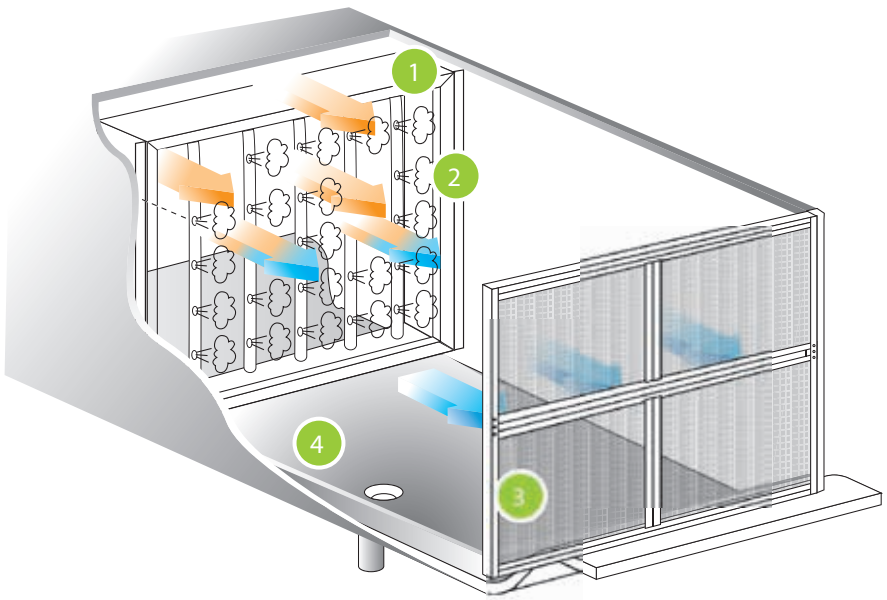
The droplet separator, installed in the AHU, has the purpose of trapping the droplets of water that are not completely evaporated, so as to prevent them from leaving the humidification section. Available with fibreglass or AISI304 steel filtering material and drain system.

## Room distribution system

Blowers are available with tangential fans to generate an air stream. The air stream assists the evaporation of the droplets of water and carries them along an essentially horizontal trajectory. humiFog Multizone controls the solenoid valves to adjust system capacity and to empty and automatically wash the installation.

Rack features:

- design tailor-made to order
- supplied assembled and tested with pressurised water
- entirely made from stainless steel
- nozzle sizes 1.5 - 2.8 - 4.0 l/h
- easy to assemble and install
- flexibility and accessibility for maintenance
- nozzle designed to operate on demineralised water




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

# Precise temperature and humidity control

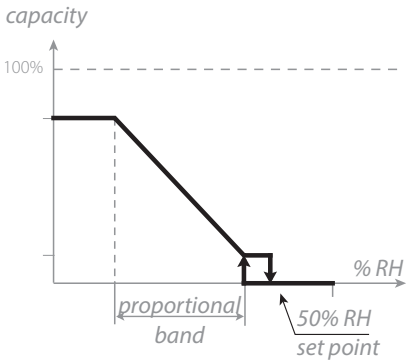
## The electronic controller and cutting-edge software make humiFog even more effective and competitive

The built-in pCO5 plus electronic controller on the Master and Slave cabinets features numerous independent analogue and digital inputs, and has new software specifically for managing humidification, evaporative cooling and all the new functions, above all redundancy.
For each zone, a humidity set point (main probe) and a limit value in the duct (limit probe) can be set, typical of humidification applications in winter. Alternatively, for typical summer applications, a temperature set point and a maximum humidity limit can be set, so as to cool the air without exceeding the humidity limit.

humiFog Multizone can also accept signals from external controllers, both ON/OFF and proportional, and an external control signal via serial connection (Modbus as standard). This ensures seamless integration into the AHU control system. Compared to the previous version, pCO5 plus processes data much faster and is therefore more precise in managing the capacity steps. In addition, it can control of multiple zones via the built-in fieldbus, without needing to fit additional cards.

**Innovative software**
pCO5 plus comes with new software that exploits experience in field and improves numerous aspects of system management, including:

- Management of indirect evaporative cooling
- Reading of pre-heating in the duct for optimum humidity control
- Addition of PI and PID control algorithms




*Graph of humidity control with continuous capacity modulation*

# Simple and intuitive user interface

## Used to simply program and control humiFog, showing any unit alarms on the display

The user interface is available in 7 languages (Italian, English, French, German Spanish, Chinese and Czech) and menu navigation is simplified by buttons associated with icons and indexed screens.

# Integrated backup and rotation functions

humiFog is now even more reliable and complete, for applications that require continuous service and non-stop humidification

## Backup

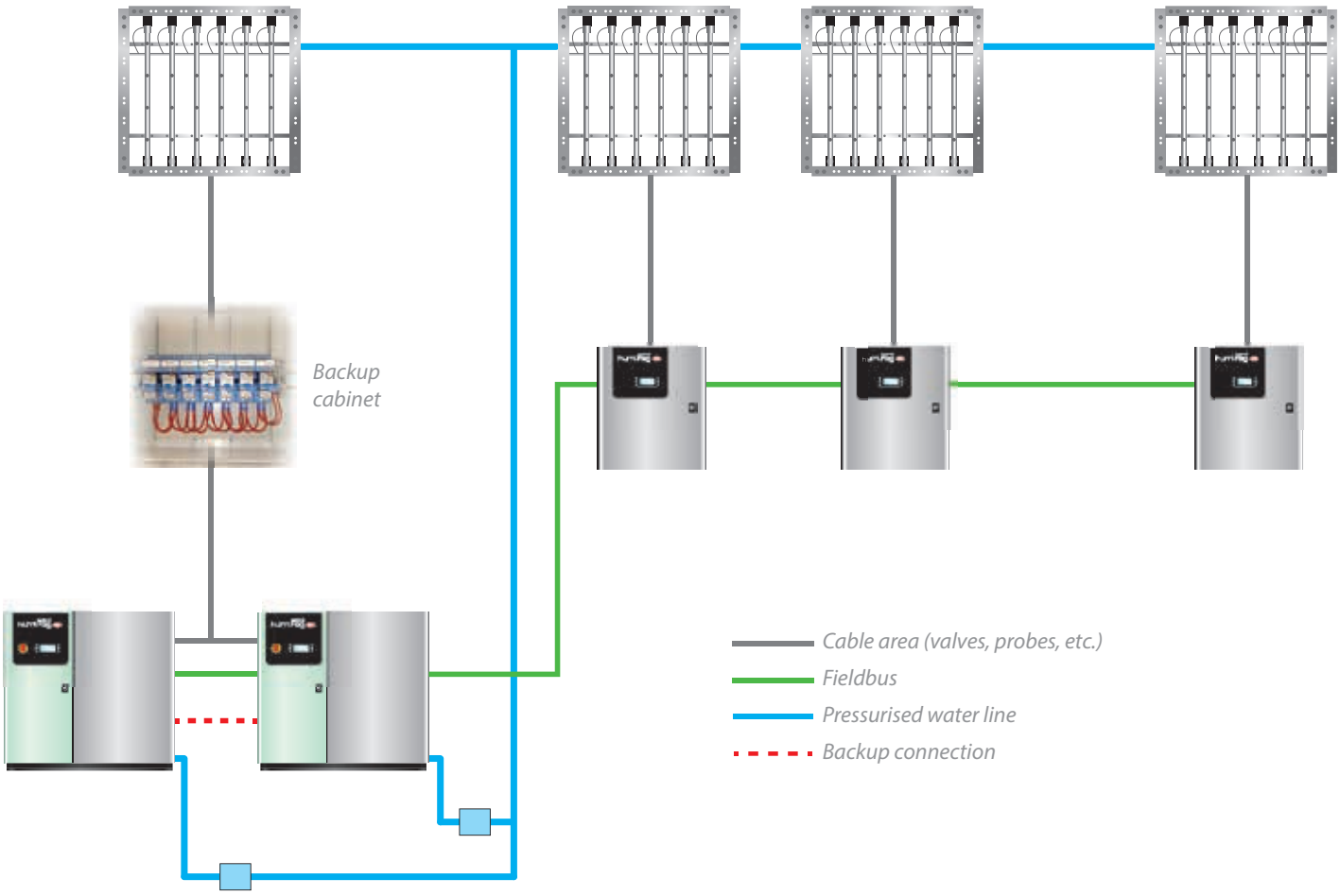
The backup function is essential when needing to ensure continuous service, avoiding any operation downtime in the event of breakage of mechanical or water circuit components, or even during simple maintenance. This is possible by connecting two perfectly interchangeable control cabinets (Master units) to the rack.

## Backup cabinet

The backup cabinet allows redundant operation, managing the changeover from one unit to the other.

## Rotation

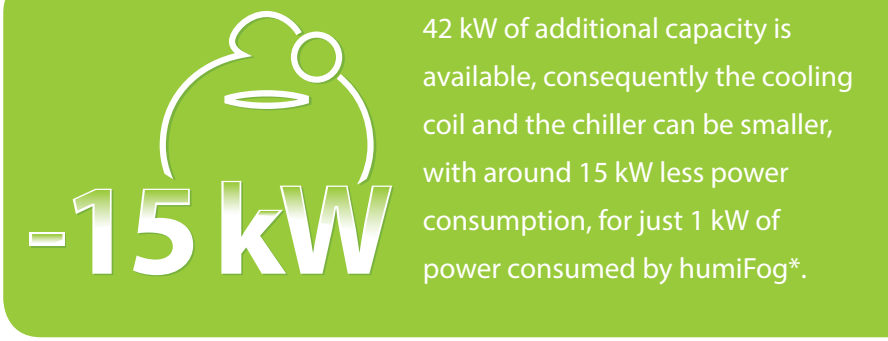
When the backup function is available, rotation can also be implemented so as to balance the operating hours between the two pumps, avoiding overloading one of the two.



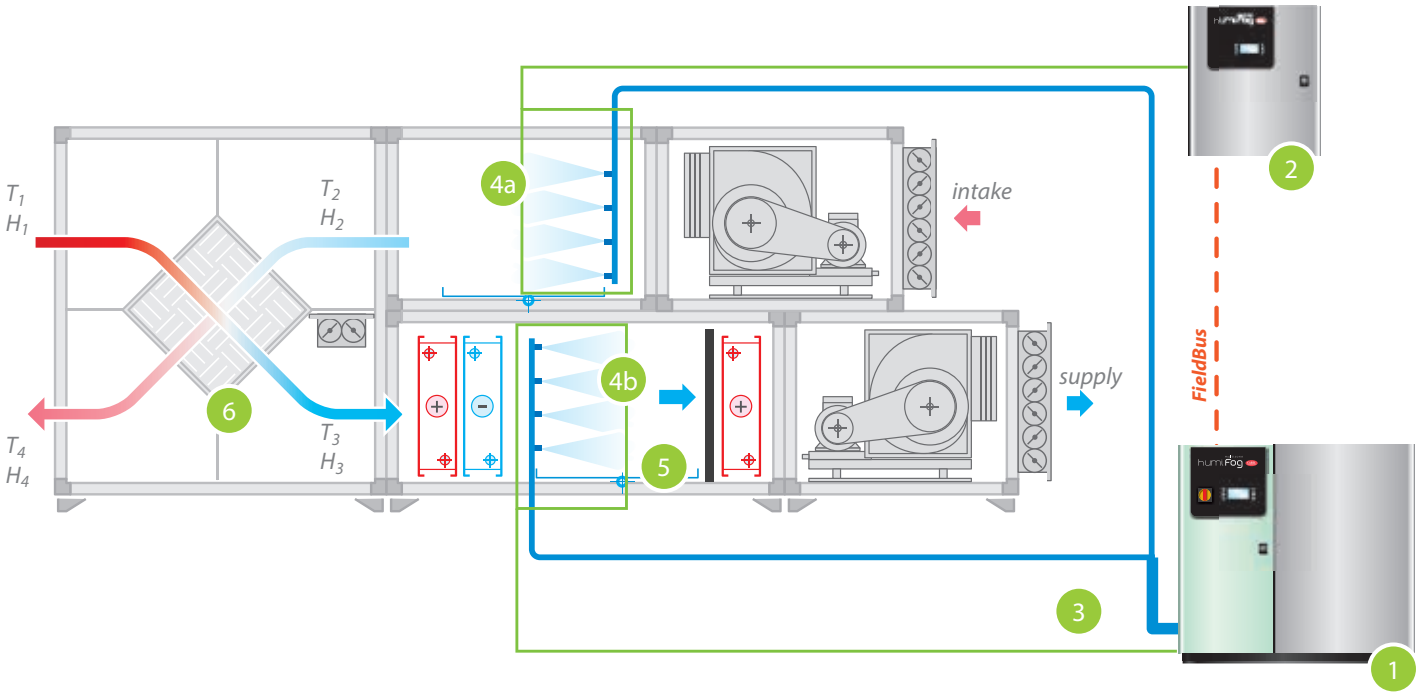
# Energy saving: indirect evaporative cooling

## Evaporative cooling allows lower running and investment costs

The air is cooled due to spontaneous evaporation of the droplets of water: the change in state from liquid to vapour absorbs energy from the air, which consequently is cooled. 100 kg/h of water absorbs 68 kW of heat from the air when evaporating. The exhaust air can be cooled by several degrees without limits in terms of humidity, being discharged by the AHU. This cooling capacity can be used to cool the fresh incoming air, via a heat exchanger, with an efficiency that easily exceeds 50%!
As a result, required capacity is lower, as is the energy consumption of the cooling coil and the chiller.




42 kW of additional capacity is available, consequently the cooling coil and the chiller can be smaller, with around 15 kW less power consumption, for just 1 kW of power consumed by humiFog*.




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*

| | Outside air (30,000 m³/h) | | Exhaust air (30,000 m³/h) | | Cooled outside air | | Supply air | | Cooling capacity* |
|---|---|---|---|---|---|---|---|---|---|
| | $T_1$ | $H_1$ | $T_2$ | $H_2$ | $T_3$ | $H_3$ | $T_4$ | $H_4$ | P |
| WITHOUT evaporative cooling | **35 °C** | 40% RH | 25 °C | 50% RH | **29 °C** | 56% RH | 31 °C | 36% RH | 58 kW |
| WITH evaporative cooling | **35 °C** | 40% RH | 18 °C | saturation | **25 °C** | 70% RH | 28 °C | 55% RH | 100 kW |
| | | | | | | | | Increased capacity | 42 kW |

In the example shown in the table, the exhaust air is pre-cooled to 18°C and used by the heat exchanger to cool the outside air from 35 to 25°C, without increasing absolute humidity.
*: the cooling capacity is calculated based on an outside air flow-rate of 30000 m³/h, atomising 100 kg/h of water, and a heat recovery unit with an efficiency of 58%.

# Maximum hygiene and safety

## Thanks to its inherent features and operation on demineralised water, humiFog has obtained VDI6022 certification

Carel, always careful to the safety of its users, has focused special attention on the hygiene aspects of humiFog. The built-in controller, in fact, automatically manages:

- filling of the water lines only when humidification is needed;
- emptying of the lines when no humidification is needed for an extended time;
- automatic periodical washing of the lines when no humidification is needed for an extended time.

The washing cycle, unlike on competing products, is performed using dedicated solenoid valves, rather than simply spraying the water being emptied. humiFog Multizone for use in AHU/ducts has obtained the following certification, published in the Italian Official Gazette:

### Air-conditioning standards

✓ 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)

### Hospital applications

✓ DIN 1946, part 4 (01/94)

✓ ONORM H 6020 (02/07)

✓ SWKI 99-3 (03/04)

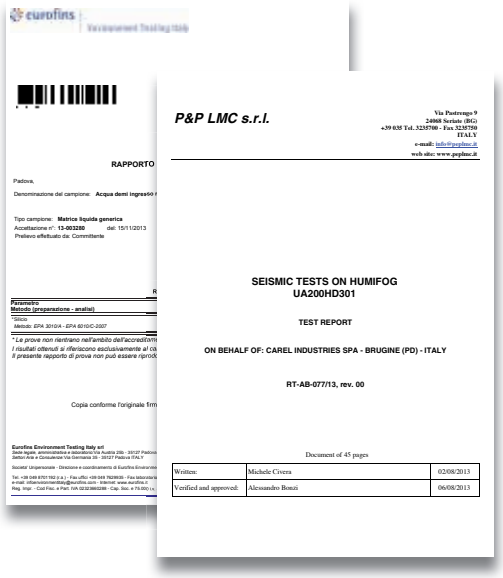
In Italy, see: "Guidelines for the definition of technical preventive maintenance protocols on air-conditioning systems", published in Italian Official Gazette no. 256 of 3 November 2006, the approximation of VDI6022.

### ✓ Seismic certification

humiFog has undergone seismic testing on a vibrating plate to simulate a vast range of earth movements, attesting its conformity in accordance with Italian decree of 14 January 2008 concerning "the approval of new building regulations", published in Italian Official Gazette no. 29 of 4 February 2008.

### ✓ Silicone-free certificatione

The humiFog pump is also available in a silicone-free stainless steel version.
The absence of silicone is essential in paint booth installations, to avoid defects in the finishes known as fisheye. This certification, accredited by an outside laboratory, is available on request.




## 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 m3 of water);
- greater hygiene (the membrane in the reverse osmosis system represents a physical barrier to bacteria, viruses and spores).

## Water Treatment System

CAREL can supply WTS reverse osmosis water treatment systems, complete with pre-filtering, dechlorination, reverse osmosis, storage tank, pumping system and UV disinfection.
Using mains drinking water, it produces demineralised water with features suitable for supplying the humidifiers. WTS optimises costs and space and is easy to install on site.
The WTS Large model is recommended for use in combination with humiFog.

# Reliable, precision and low power applications

The air can be humidified and/or cooled adiabatically by atomising demineralised water

### Office buildings

Humidification and/or cooling for 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.

### Painting 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.

### Direct/indirect evaporative cooling

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

### Hotels and call centers

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

### 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

Outdoor evaporative cooling.

### Printing and paper processing

To ensure productivity and final product quality.

### Timber industry

For timber processing and storage.

# Component part numbers

Material:
0= brass
1= stainless steel
2= stainless steel silicone free

Pulsation damper:
0= no damper
1= with damper

| U | A | _ | _ | _ | _ | _ | 4 | 0 | _ |
|---|---|---|---|---|---|---|---|---|---|

humiFog

Capacity:
100= 100 kg/h
200= 200 kg/h
320= 320 kg/h
460= 460 kg/h
600= 600 kg/h
1K0= 1000 kg/h

H= single zone
Z= multizone
S= slave

Power supply
D= 230 V - 50 Hz
U= 230 V - 60 Hz
L= 400 V - 50 Hz
M= 460 V - 60 Hz
(L & M 1000 l/h 3-phase

Release: series 4

| R | A | C | K | M | 0 | 4 | _ | _ | _ |
|---|---|---|---|---|---|---|---|---|---|

M0= assembled
SM= semi-assembled
00= not assembled
SW= semi-assembled no structure
0W= unassembled no structure

Specific serial number for individual unit

0= no speed controller
1= with speed controller

Power supply voltage
D= 230 V - 50 Hz

0= release

| D | L | _ | _ | M | D | _ | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|

Linear distributor

Flow-rate/nozzles:
06= 06 l/h 4 nozzles MTP0
12= 12 l/h 8 nozzles MTP0
11= 11 l/h 4 nozzles MTP1
22= 22 l/h 8 nozzles MTP1
16= 16 l/h 4 nozzles MTP2
32= 32 l/h 8 nozzles MTP2

M= master
S= slave

0= master
C= complete slave
F= first slave
I= intermediate slave
D= final slave

0= free

Type of power supply:
0= 1-phase (320 V)
T= 3-phase (400 V)

Accessories:
U= with UV lamp
0= no UV lamp

0= steel
B= brass

| R | O | L | 1 | 0 | 0 | 5 | U | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|

Reverse Osmosis

L= Wide
C= Compact

Flow-rate:
100= 100 l/h
200= 200 l/h
320= 320 l/h
460= 460 l/h
600= 600 l/h
1K0= 1000 l/h

Power supply frequency:
5= 50 Hz
6= 60 Hz
0= no pump

# Technical specifications

+3000007EN - 2.0 - 02.02.2015

| Features | UA100 | UA200 | UA320 | UA460 | UA600 | UA1000 |
|---|---|---|---|---|---|---|
| Rated capacity kg/h | 100 | 200 | 320 | 460 | 600 | 1000 |
| Power supply | 230 V, 1 phase. 50 Hz or 208 V, 1 phase. 60 Hz | | | | | 400 V 3 phase. 50Hz or 460 V 3 phase. 60Hz |
| Pumping unit power consumption (kW) | 0.955 | 0.955 | 1.15 | 1.15 | 1.95 | 2.75 (4 at 60Hz) |
| Zone controller power consumption (kW) | 0.28 | | | | | |
| **Controller** | | | | | | |
| Network connection | RS485; Modbus® (others upon request) | | | | | |
| Control | External signal, temperature or humidity control; additional temperature or humidity limit probe | | | | | |
| Type of input signals | 0 to 1 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA, NTC | | | | | |
| **Dimensions and weights** | | | | | | |
| Pumping unit dimensions, packaged (LxWxH) mm | 455 x 1100 x 1020 mm | | | | | |
| Weight of master when installed (kg) | 85 | 85 | 95 | 95 | 100 | 105 |
| Zone controller dimensions, packaged (LxWxH) mm | 255 x 605 x 770 mm | | | | | |
| Weight of slave when installed kg | 19.5 | | | | | |



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