



**Product selection guide**  
air humidification systems



# Humidification solutions

## What is humidity?

Humidity is simply the presence of water vapour in the air.

Relative humidity is the quantity of moisture present in the air at a certain temperature (e.g., 50% rH at 20 °C) as a proportion of the maximum quantity of water vapour that the air can hold at that temperature when it is saturated (100% rH at 20 °C).

## Why is dry air a problem?

When the outside temperature falls below the inside temperature, the cold and moist air that enters a heated building becomes hot and dry. This is the consequence of a phenomenon by which equilibrium is established between the moisture in the objects inside the building and in the air that these are in contact with.

The reduction in the moisture in the air may cause well known problems, such as:

- dimensional and quality variations in hygroscopic materials;
- static electricity;
- reduced comfort (dryness of the upper airways);

Air-conditioning or refrigeration systems may also cause an increase in the dryness of the air, as they cool the air below its dew point, remove moisture (dehumidification) and subsequently reheat the air.

## Hygroscopic materials

Hygroscopic is the term given to materials whose cells absorb moisture, leading to a variation in their dimensions. Hygroscopic materials tend to reach equilibrium with the surrounding environment.

It is therefore the variation in the dimensions of the materials, due to the change in relative humidity, that affects the workability of the materials and the production processes even more significantly than the temperature.

The same effect can be seen in paper, fabrics, some plastic materials, wax, fruit and vegetables and other materials that have the property to absorb or release moisture.

## Static electricity

Static electricity is reduced significantly when the relative humidity is maintained above 35%. There are many sectors of industry that are especially sensitive to this problem, as are electronic devices, such as computers, which may be damaged by electrostatic discharges.

## Well-being and comfort

In today's complex society, well-being and comfort have assumed crucial importance. Correct humidification, as well as a reduction in the amount of dust in suspension, ensures that the people present in closed rooms can breathe correctly, without problems deriving from the dryness of the upper airways. In addition, the reduction of cutaneous evaporation resulting from correct humidification reduces the feeling of cold and consequently allows the temperature of the room to be kept lower, saving on heating bills and limiting the dispersion of heat between the inside and the outside of the building.

## Applications

Numerous applications require precise humidity control, in industrial and civil environments. These applications can be grouped into five main categories:

### • comfort

The right level of humidity in the rooms affects the level of comfort perceived by people and reduces the risk of respiratory illnesses. Humidification is generally required during the winter period, as heating systems decrease the relative humidity of the air, leaving the throat dry, the eyes irritated and an unpleasant feeling of fatigue.

This segment includes the humidification of homes, offices, shops, hospitals and clinics, museums and art galleries, libraries and large public spaces such as airports, theatres, cinemas etc.

### • process

High precision and reliability are the main features required in the humidity control systems for production processes. The right and constant level of humidity over time reduces dryness of the materials and substances used in the process, prevents weakening and changes to the mechanical characteristics, eliminates adhesion and electrostatic discharges, thus ensuring maximum productivity.

This segment includes humidity control for high tech industries (DVD production, coatings for sunglass lenses, chemical processes, ...), operating theatres, cleanrooms of pharmaceutical or microelectronics industries, computer rooms, test laboratories, etc

### • OEM kits

Humidity control systems for electronic appliances and special high tech applications: the main objective is to avoid electrostatic discharges and maintain the optimum humidity level for the operation of the electronic devices. This segment includes humidification systems built into close control units for computer rooms and shelters, communications systems and special applications.

### • Industry and storage

In many industrial processes, the right level of humidity ensures high performance and thus higher profitability. In cold rooms and stores, the right level of humidity avoids damaging the appearance and quality of foodstuffs. Many applications come under this segment: printing, textiles, adiabatic cooling, cold rooms and stores, food processing, winemaking, woodworking and tobacco processing, glasshouses, painting booths, ...

### • Steam bath

Steam humidifiers are essential for creating the desired conditions of the air inside a steam bath, that is, 40 to 43°C and 100% relative humidity. These systems are used in gyms, wellness centres, hotels, etc.

## Evaporative cooling

Adiabatic humidifiers atomise water into very fine droplets that evaporate spontaneously in the air, absorbing heat and consequently cooling the air. Evaporative cooling may be direct or indirect, using a heat exchanger, the latter without increasing the moisture content in the air.

This type of cooling system thus features very low power consumption and is ideal for applications such as data centers, cooling metropolitan railway stations, etc.



### Printing industry

The right level of humidity must be maintained to avoid variations in the size of the paper and consequent print misalignments, electrostatic problems, adhesion and attraction of dust. With humidification, the separation of the sheets of paper is improved, curving or corrugation is avoided, and productivity increases, due to the higher speed of the machinery and less rejects. In addition, adiabatic humidification reduces the thermal load by adiabatic cooling.



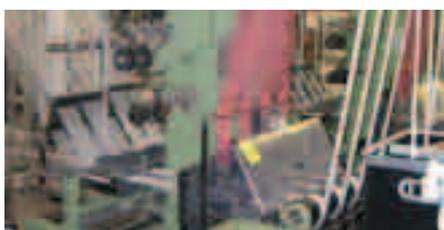
### Cold rooms

In cold rooms for organic products, such as fruit and vegetables, the humidity is kept very high, between 90 and 95%, to avoid deterioration and weight loss. The main task of the humidification system is to make up for the moisture that condenses on the evaporators in the cooling system; without this, the air would become dry very quickly, causing deterioration of the foodstuffs.



### Timber industry

As wood is a hygroscopic material, the right level of humidity is essential for preventing variations in the moisture content of the wood that would cause deformations, cracks and breakage of the fibres. Humidity control is essential during storage (of both boards and finished products such as window and door frames) and processing. Humidification, in addition, minimises the dispersion of dust in the air.



### Textiles industry

The right level of humidity minimises the breakage of threads and dust problems, eliminates static electricity and adhesion, decreases twisting of the materials and therefore increases the operating speed of the machinery. Adiabatic humidification, moreover, removes some of the heat generated by the looms from the air.



### Food industry

Foodstuffs are hygroscopic materials, that is, they exchange moisture with the surrounding environment. Controlling the humidity helps avoid weight loss, increases conservation time, and preserves the outer appearance and aromas. Maturing/seasoning processes also benefit from the right level of humidity in the air.



### Tobacco industry

Dry air causes the leaves to shrink, leading to a loss in weight, an increase in fragility, cracks and tears. This has negative effects on the production process, as it causes the tobacco to come out of the cigarettes, the cigarette paper to get caught in the machinery, and the tobacco leaves used in the production of cigars to break.



### Adiabatic cooling

In adiabatic humidification, the droplets of water that are atomised and introduced into the environment evaporate, absorbing heat from the air and consequently reducing the temperature. A 100 l/h humidifier produces the equivalent of 70 kW cooling capacity, while consuming less than 1 kW of electricity. In factories that generate a lot of heat, for example steelworks, a localised adiabatic cooling system increases the comfort of workers and consequently their attention level, reducing errors and increasing productivity.



### Ageing of wine

Winemakers have always seen considerable losses from their barrel cellars, due to low humidity levels. As the wine evaporates from the barrels, up to 15% of the volume of wine may be lost in two years. Appropriate humidity control limits the loss of wine due to spontaneous evaporation.



### Glasshouses

Humidity control, together with temperature control, is essential for recreating the optimum environment that ensures the growth of flowers, plants, mushrooms, vegetables, and so on. The correct humidity level thus ensures increased production.



### Offices

With proper humidification in winter, the concentration of dust can be reduced due to decreased fragmentation of fibres and the greater tendency of the particles to accumulate and thus be removed more effectively by the filtering systems.



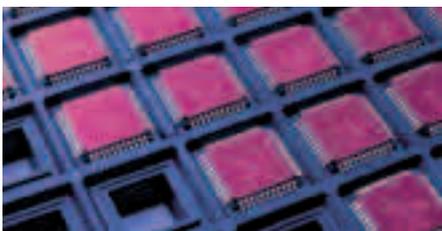
### Computer rooms

Poor humidity control in a computer room means potential accumulation of static electricity, which when discharged can damage the electronic components in the computers. The heat generated by the computers and insufficient recirculation of the air can easily cause the relative humidity to fall below 35%, the limit value for avoiding the risk of discharges.



### Hospitals and operating theatres

According to legislation, the ventilation and air-conditioning systems in operating theatres must ensure the ideal temperature-humidity conditions for the activity of the surgeons, while also assuring the needs of the patients. Accurate humidity control is therefore not only an additional feature, but rather a legal requirement.



### Hi-tech microchip manufacturing

Chips are becoming increasingly smaller, and the distances are now measured in Angstroms. Even a slight variation in the dimensions of a silicon wafer during the photographic masking process causes unacceptable misalignments and the consequent malfunction of the components.



### Painting booths

The automobile industry uses waterborne enamel paints to coat the bodywork of cars, which requires precise control of the ambient temperature-humidity conditions. In fact, too low relative humidity causes the early evaporation of the water contained in the droplets of spray paint, decreasing the fluidity and the covering capacity. On the other hand, too high humidity leads to defects due to the excessive dilution of the layer of enamel deposited on the body and the formation of small craters on the painted surface.



### Cleanrooms

Relative humidity is one of the fundamental ambient parameters that defines the standard operating conditions of a cleanroom, and often the tolerances are very limited (in some applications, just 1%). Relative humidity affects the main factors that determine the performance of the rooms: risk of electrostatic discharges; proliferation of biological contaminants; speed of the chemical reactions; increase in capillary forces; personal comfort.



### Museums and art galleries

The correct stabilisation of the environment is essential for preserving works of art over time. If canvases were to constantly change dimensions, paintings could be irreversibly damaged; in addition works made from wood or on parchment could start to deteriorate in a short time if the surrounding environment were too dry.



### Antiques

The problems relating to the hygroscopic characteristics of wood are further accentuated in the case of antiques or valuable items of furniture. Inappropriate humidity control will cause cracks in the wood, detachment of the joints in the furniture and separation of the decorations; in the case of paintings, the paint may peel.



### Pharmaceutical industry

The pharmaceutical industry makes considerable use of chemical processes that are highly affected by the environmental conditions. The speed of many chemical reactions, including processes such as corrosion, depend on the relative humidity. Precise humidity control means greater control over the processes and thus increased efficiency.

## humidification-for-life.com

humidification for Life is the CAREL website entirely dedicated to the world of humidification, now completely upgraded in both content and style, detailing the advantages obtainable by controlling humidity, such as increasing productivity and quality of industrial processes and saving energy.

The new website focuses on applications, information and services to help understand and resolve the problems relating to poor relative humidity.

The site proposes the most suitable product for each application, allowing users to easily identify the ideal solution for correct air humidification.

Moreover, anyone who has questions or wants further clarifications in relation to the products and services offered by the company can easily make direct contact with CAREL by simply completing and sending a web form.



## humiTOOLS

humiTOOLS is the on line help tool from CAREL to simplify the choice of the humidifier and the corresponding accessories and documents.

humiTOOLS is available free-of-charge from the CAREL web site, after signing in, and includes:

- **humidifier configuration tool:** this powerful software is used to size and choose the best humidifier;
- **water acceptability:** this indicates which humidifier is most suitable for the type of water available;
- **steam distributors:** suggests the most suitable linear distributor for the duct/AHU based on the required capacity and details of the duct. Also provides the absorption distance.



### Humidifier configuration tool

humiTOOLS uses a historic climate database of hundreds of locations all over the world.

The user simply chooses the location where the humidifier will be installed, the inside humidity and temperature set point and the type of application (ducted humidification or directly into the room, steam baths or centralised steam systems): humiTOOLS then automatically calculates the humidity requirement and lists the suitable humidifiers that the user can choose from for the application; the user can also download up-to-date documents (manuals, specifications, etc.), and select the probes, steam distributors and other accessories. Finally, a quotation can be requested via internet, with a simple click.



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# Isothermal humidification

The isothermal humidification process involves introducing steam into the environment that is generated by boiling water.

This procedure requires an external source of energy to change the state of the water.

As the mass of the steam is much lower than the mass of the air it is absorbed into, the temperature of the air increases slightly, and for this reason it is improperly called isothermal humidification.

Steam humidifiers ensure maximum hygienic safety, as the temperature of the steam ensures the absence of any potentially harmful microorganisms.





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## Immersed electrode humidifiers

The operation of immersed electrode humidifiers is based on a very simple physical principle.

As common drinking water contains a certain quantity of dissolved mineral salts, and is consequently slightly conductive, applying a voltage to metal electrodes immersed in the water creates an electric current that heats the water until producing steam (Joule effect).

The quantity of steam produced is proportional to the electric current, which is in turn proportional to the level of water. This electric current is measured by a current transformer: by varying the level of water using a fill and drain electrovalve, the current, and consequently the steam production, can be precisely modulated.

As the steam does not carry minerals, the salt concentration in the water and therefore the conductivity increases, the water is periodically diluted and part of it is discharged through the discharge pump and replaced with supply water.

In addition, lime scale is deposited over time and covers part of the cylinder, which must be replaced or cleaned.

The principle is simple, however the development of an immersed electrode humidifier that ensures safe operation and reliability over time requires careful analysis and extended testing.

Compared to the complementary immersed element heater or gas humidifiers, immersed electrode humidifiers:

- are less expensive to purchase;
- operate with drinking water (not completely demineralised or softened);
- require the periodical replacement (or cleaning) of the cylinder;
- feature modulation suitable for comfort or industrial applications, without extreme requirements.

CAREL has been manufacturing immersed electrode humidifiers since the 1970s and can draw benefit from its know-how in the field of electronic controllers: precision control, reliable electronics and sophisticated and complete control software.

The CAREL solutions for immersed electrode humidifiers are humiSteam and compactSteam.

Its reliability and flexibility, together with the completeness of the range and the excellent technical specifications, make humiSteam the logical choice for a vast series of applications.



## humiSteam

UE\*

humiSteam is suitable for civil environments, offices, hospitals, industrial facilities, and steam baths. humiSteam is suitable for both installation in the room, using the steam blower, and for installation in the air duct, using the new range of linear steam distributors. humiSteam works on mains water with a conductivity between 75 and 1250  $\mu\text{s}/\text{cm}$ , and its control software automatically adjusts operation according to the characteristics of the water, so as to optimise operating life without maintenance.

The new range of humiSteam humidifiers is divided into two lines that mainly differ due to the type of control:

- humiSteam Xplus (X), suitable for all types of applications that require independent control with humidity probe, range from 1.5 to 130 kg/h;
- humiSteam basic (Y), ideal for applications in which the humidity is controlled by an external device, such as a BMS or a humidistat, with a range from 1.5 to 65 kg/h.

The new range is completed by the "Wellness" model for steam baths, which features the same control electronics as the new Xplus (X) model.

CAREL decided to upgrade this important product for a number of reasons:

- **ease of use:** the familiarity with the operation of consumer electronics has made us all more demanding performance as regards the user interface. Both new models of humiSteam feature a large LCD,

with graphic symbols and up to 8 rows of text in the Xplus (X), with more complex functions, and complete and clear graphics on the Basic model, simple and intuitive yet highly attractive. The position of the user terminal can be adjusted and is now more ergonomic;

- **reliability:** for the new humiSteam CAREL has developed power connections that mean no tools are required when changing the cylinder: no more overheating due to less accurate maintenance. In addition, all models, are fitted with a drain pump to ensure more reliable operation, independently of the characteristics of the water;
- **performance:** years of experience and feedback have allowed the control software to be refined. The new algorithm makes the humidifier much faster to start and respond to variations in humidity demand, thus extending the range of possible applications. All while maintaining the same hygiene and safety features (for example, the antifoam system) and indeed adding specific functions for operation on "problematical" water;
- **completeness of the range and the functions:** both new models, humiSteam Xplus (X) and humiSteam basic (Y), offer the Modbus® RS485 connection as standard, while the Xplus high-end controller (deriving from the CAREL pCO family programmable controllers) includes a series of optional communication protocols and several advanced functions, such the

possibility to program operation and set points according to daily and weekly time bands, the event history (recording events and alarms with the date and time) and the possibility of remote diagnostics via a GSM connection. Furthermore, a new 18 kg/h model is also available.

### Advantages

- AFS system (Anti Foaming System): detects foam to prevent the release of droplets together with the steam;
- large cylinders with galvanised electrodes and anti-scale filter on the bottom, for longer maintenance-free operation. Openable and fireproof cylinders are also available;
- steam production with continuous modulation from 20% to the max. flow-rate (from 10% for the models with two cylinders);
- built-in conductivity sensor and control software to optimise energy efficiency and operating life, with constant performance over the life of the cylinder;
- choice between controllers: "basic" (Y) (proportional or ON/OFF from external controller); "Xplus" (X) (modulating with built-in controller based on pCO technology), "W" (similar to the "Xplus" (X) controller, however designed for steam baths);
- model "Xplus" (X) manages a second "limit" probe to reduce production and prevent any condensate forming in the air duct.



## Controllers

The humiSteam series humidifiers are available with 4 different types of control unit:

- **type “basic” (Y)** (from 1.5 to 65 kg/h): managed by a humidistat or an external controller;
- **type “Xplus” (X)** (from 1.5 to 130 kg/h): based on pHc technology, derived from the pCO, with all the consequent advantages, these have a built-in controller for stand-alone applications or use with an external controller;
- **type “W”**: as for the “Xplus” (X) models, but designed for steam baths.

All models are fitted with a remote enabling input and an alarm relay.

### Type basic (Y) controller: ON/OFF or proportional

Steam production is controlled by an external signal:

- ON/OFF mode: a simple contact (for example, a humidistat) provides the on/off signal for steam production.
- proportional mode: the humidifier produces a quantity of steam that is directly proportional to the 0 to 10 V, 2 to 10 V, 0 to 20 mA, 4 to 20 mA signal generated by the external controller, always between 20% and 100% of maximum capacity.

The type “basic” (Y) humidifiers have a simple 3 LED display that shows the normal operating conditions and any diagnostic information.

In addition, they are fitted with an RS485 interface using the Modbus® protocol for configuration and remote control from a BMS.

### Type Xplus (X) controller: modulating with built-in controller

The type “Xplus” (X) humiSteam humidifiers have a built-in controller with graphic display and keypad for programming and controlling operation. The following modes can be selected at any time:

- ON/OFF by external humidistat;
- proportional based on an external signal;
- proportional based on an external signal plus a probe to limit the maximum humidity in the duct;
- modulating based on the set point and the reading of a humidity or temperature probe (Wellness model);
- modulating based on the set point, the reading of a humidity probe and a limit probe in the duct.

The steam flow-rate is modulated continuously from 20 to 100% of maximum capacity (10 to 100% in the 90 and 130 kg/h models), except for in ON/OFF mode, when production is “all-or-nothing”. The type “Xplus” (X) humiSteam humidifiers can accept the following external signals, selected on the keypad: voltage-free contact from a humidistat, 0 to 1 V, 0 to 10 V, 2 to 10 V, 0 to 20 mA, 4 to 20 mA.

The type “Xplus” (X) controllers exploit all the advantages of pHc technology (pCO):

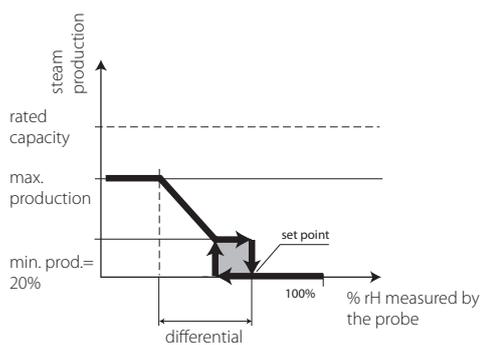
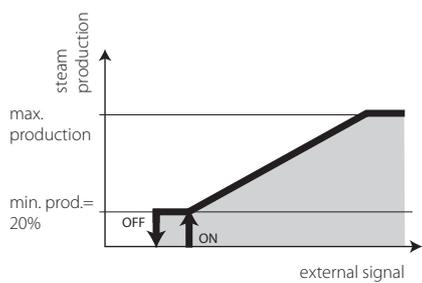
- simplicity for the user thanks to the graphic display with clear messages and icons;
- definition of daily and weekly time bands;
- connectivity via various types of LAN (e.g.: Modbus®, BACnet™, LON®);
- ON/OFF from the keypad;
- alarm log management;
- remote diagnostics via GSM (optional).

### Type W controller: same as the type Xplus model, but for steam baths.

The type “W” humiSteam humidifiers derive from the type “Xplus” (X) models (see above), however are designed for steam baths. As well as the advantages listed above, these models also feature:

- definition of daily and weekly time bands;
- definition of different temperature set points for the different time bands;
- management of essences (3) and a “sanitation” cycle;
- management of fans (inside and exhaust) and the light.

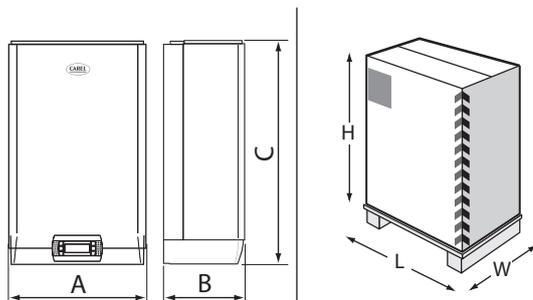
### Adjustable display for easier reading



## Models

	UE001*	UE003*	UE005*	UE008	UE009*
<b>General</b>					
Rated steam production (kg/h)	1.5	3	5	8	9
Power input (kW)	1.12	2.25	3.75	6.00	6.75
Power supply (other voltages upon request)	•	•	•	•	•
<ul style="list-style-type: none"> <li>• 200, 208 or 230 Vac (+10 to -15%), 50/60 Hz 1-phase</li> <li>• 200, 208, 230 Vac (+10 to -15%), 50/60 Hz three-phase</li> <li>• 400, 460, 575 Vac (+10 to -15%), 50/60 Hz, three-phase</li> </ul>					
Steam connection (mm)	Ø 22/30	Ø 22/30	Ø 30	Ø 30	Ø 30
Outlet pressure limits (Pa)	-600 to 1500	-600 to 1500	-600 to 1300	-600 to 1300	-600 to 1350
Number of boilers	1				
Operating conditions	1T40 °C, 10 to 90% rH non-condensing				
Storage conditions	-10T70 °C, 5 to 95% rH non-condensing				
Index of protection	IP20				
<b>Water fill</b>					
Connection	3/4"G male				
Temperature limits (°C)	1T40				
Water pressure limits (MPa - bar)	0.1 to 0.8 - 1 to 8				
Instant flow-rate (l/m)	0.6	0.6	0.6	1.1	0.6
Total hardness (°fH) (*)	10...-40				
Conductivity limits (µS/cm) (*)	75 to 1250				
<b>Water drain</b>					
Connection	Ø 40				
Temperature (°C)	≤100				
Instant flow-rate (l/m)	7				
<b>Steam blower</b>					
Number	1	1	1	1	1
Type	VSDU0A*				
Power supply (Vac)	24	24	24	24	24
Rated power (W)	37	37	37	37	37
Rated air flow (m³/h)	192	192	192	192	192
<b>Network</b>					
Integrated network connections	UEX* & UEY*: Modbus®				
Optional network connections	UEX* & UEW*: RS485, BACnet™, LON®, Ethernet®, RS232 + GSM (optional)				
Controller	UEY* / UEX* / UEW*				

### Dimensions (mm) and weights (kg)



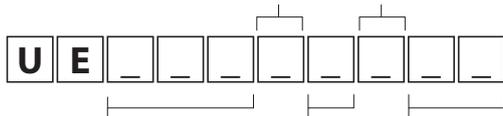
Mod.	AxBxC	weight	LxWxH	weight
UE001 to UE018	365x275x712	17	500x400x850	20
UE025 to UE045	545x375x815	34	665x465x875	39
UE065	635x465x890	44	750x600x940	51
UE090 to UE130	1150x465x890	70 to 74	1270x600x940	77 to 81

UE010*	UE015*	UE018*	UE025*	UE035*	UE045*	UE065*	UE090*	UE130*
10	15	18	25	35	45	65	90	130
7.50	11.25	13.5	18.75	26.25	33.75	48.75	67.5	97.5
• •	• •	•	• •	• •	• •	•	•	•
Ø 30	Ø 30	Ø 30	Ø 40	Ø 40	Ø 40	Ø 2x40	Ø 2x40	Ø 4x40
-600 to 1350	-600 to 1350	-600 to 1350	-600 to 2000					
1						2		
1T40 °C, 10 to 90% rH non-condensing								
-10T70 °C, 5 to 95% rH non-condensing								
IP20								
3/4"G male								
1T40								
0.1 to 0.8 - 1 to 8								
1.1	1.1	1.1	5.85	5.85	5.85	7	14	14
10...-40								
75 to 1250								
Ø 40								
≤100								
7	7	7	22.5	22.5	22.5	22.5	45	45
1	1	1	1	1	1	2	2	2
VSDU0A*			VRDXL*					
24	24	24	230	230	230	230	230	230
37	37	37	35	35	35	35	35	35
192	192	192	650	650	650	650	650	650
UEX* & UEY*: Modbus®								
UEX* & UEW*: RS485, BACnet™, LON®, Ethernet®, RS232 + GSM (optional)								
UEX* / UEY* / UEW*							UEX*	

## Unit code

type of controller:  
 X= X-plus controller  
 W= Wellness controller  
 Y= basic controller

options:  
 Ø = standard cylinder  
 C= standard openable cylinder  
 1= cylinder for low conductivity  
 2= openable cylinder for low conductivity



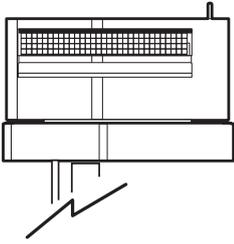
steam production:  
 001= 1.5 kg/h  
 003= 3 kg/h  
 005= 5 kg/h  
 008= 8 kg/h  
 009= 9 kg/h  
 010= 10 kg/h  
 015= 15 kg/h  
 018= 18 kg/h  
 025= 25 kg/h  
 035= 35 kg/h  
 045= 45 kg/h  
 065= 65 kg/h  
 090= 90 kg/h  
 130= 130 kg/h

power supply:  
 U= 208 V 1~  
 D= 230 V 1~  
 W= 208 V 3~  
 K= 230 V 3~  
 L= 400 V 3~  
 M= 460 V 3~  
 N= 575 V 3~

01 = European version  
 U1= UL certified version  
 for the American market

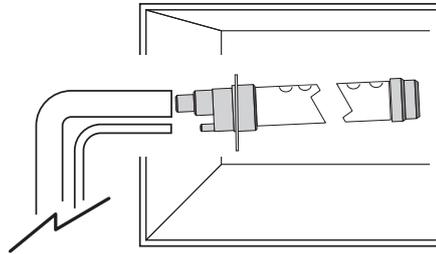
# OVERVIEW DRAWING

## room applications



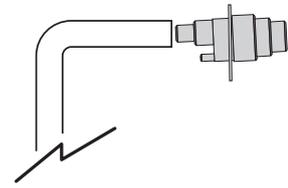
VSDU0A0002 & VRDXL0000:  
steam blower  
VSBAS0001: remote installation  
support for VSDU0A

## duct applications

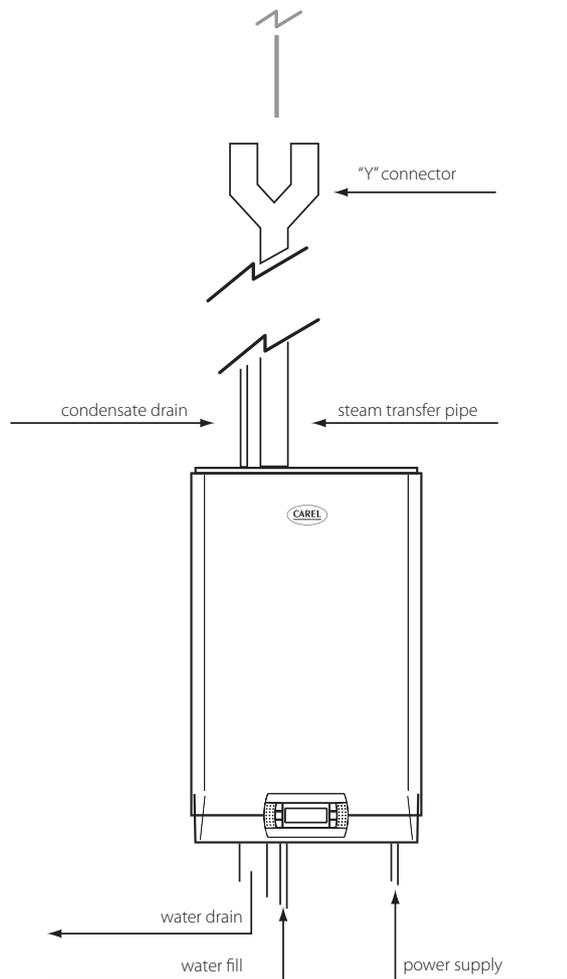


DP\*: linear steam distributor (inlet  $\varnothing$  22 mm,  
 $\varnothing$  30 mm,  $\varnothing$  40 mm)

## steam bath applications



SDP\*: plastic nozzle up to 18 kg/h steam



## Probes



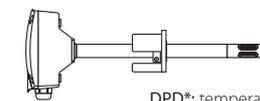
DPW\*: temperature and humidity  
probe for civil environments



DPP\*: temperature and humidity  
probe for industrial environments



ASET\*: temperature and humidity  
probe for steam baths



DPD\*: temperature and humidity  
probe for ducts

## The range of humiSteam cylinders

All the CAREL immersed electrode humidifiers feature sophisticated control software that automatically adapts the operating parameters to the characteristics of the water; nonetheless, the optimum balance between cylinder life, variation of steam production and speed of response depending on the type of water and the power supply can only be achieved by changing the shape and the position of the electrodes. For this reason, the CAREL immersed electrode humidifiers today feature the widest choice of cylinders, with specific electrodes for water with conductivity between 75  $\mu\text{S}/\text{cm}$  and 1250  $\mu\text{S}/\text{cm}$ , for capacities between 1 and 65 kg/h, and for power supply voltages between 208 V and 575 V.

This extraordinary range of cylinders is the result of years of research and tens of thousands of hours of tests in the CAREL Humidification Laboratory under the widest possible range of uses. This ensures the right solution in every circumstance.

All the humiSteam cylinders feature large galvanised electrodes, positioned inside the cylinder so as to optimise duration and constant performance over the working life of the cylinder.

In addition, significant attention has been paid to operation on water with more critical characteristics, to reduce the phenomenon of arcing.

All cylinders are also fitted with filters to avoid the formation of lime scale in the base, which may cause the blockage of the drain.

### Openable cylinders

The new humidifiers can be fitted with "disposable" cylinders made from flame-retardant plastic, class HB according to UL94, or alternatively openable and therefore cleanable cylinders, made from class V0 flame-retardant plastic (UL94 standard). The openable cylinders feature quick closing, with a rubber gasket to ensure perfect water-tight seal between the two parts of the cylinder.

### Cylinders: new quick connector

CAREL has developed a new type of quick connector rapid for the power cables to the humiSteam and OEM kit electrodes. The new connectors are snap-on (that is, they click onto the specially shaped terminal on the electrodes) and ensure higher reliability, safety and reduce maintenance times.

The new connectors have been designed to (A):

- avoid the risk of overheating due to incorrect tightening of the nuts when replacing the cylinder, as the correct tightening force is ensured and kept constant by a harmonic steel spring;
- reduce the time taken to replace the cylinder, as the connections can be made in just a few seconds, with no tools required.

To allow the new cylinders to be used on units that are already installed in the field, CAREL has created an adapter for the old power cables with eyelet lugs.

Two codes have been created for the adapter kits, made up of snap-on connector, gasket and fastening screw; these will initially be distributed together with the spare cylinders (B):

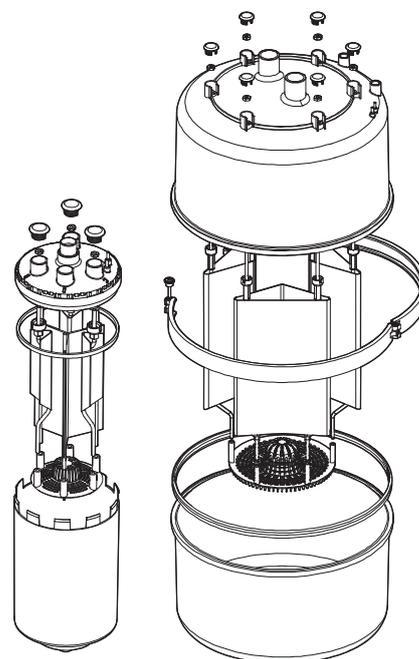
- **98C615P004** quick connector adapter for eyelet lugs, 5 mm pin (BL0\*1\* and BL0\*R\*);
- **98C615P005** quick connector adapter for eyelet lugs, 6 mm pin (BL0\*2\*, BL0\*3\*, BL0\*4\*).



A



B



## Disposable cylinder selection tables

humiSteam single-phase 230 Vac (220 to 240 V)			
	water conductivity		
	low	medium	high
Capacity kg/h	75/350 µS/cm	350/750 µS/cm	750/1250 µS/cm
1, 3 reduced	BLOSRE00H2	BLOSRF00H2	
1, 3	BLOS1E00H2	BLOS1F00H2	
5	BLOS2E00H2	BLOS2E00H2	
9	BLOS3E00H2	BLOS3F00H2	

humiSteam three-phase 400 Vac (380 to 415 V)			
	water conductivity		
	low	medium	high
Capacity kg/h	75/350 µS/cm	350/750 µS/cm	750/1250 µS/cm
3	BLOT1A00H2	BLOT1C00H2	BLOT1D00H2
5, 8	BLOT2B00H2	BLOT2C00H2	BLOT2D00H2
10, 15, 18	BLOT3B00H2	BLOT3C00H2	BLOT3D00H2
25, 35	BLOT4C00H2	BLOT4D00H2 (*)	
45, 90 (2x)	BLOT4B00H2	BLOT4C00H2 (*)	
65, 130 (2x)	BLOT5B00H0	BLOT5C00H0	

humiSteam single-phase 208 Vac			
	water conductivity		
	low	medium	high
Capacity kg/h	75/350 µS/cm	350/750 µS/cm	750/1250 µS/cm
1, 3 reduced	BLOSRE00H2	BLOSRF00H2	
1, 3	BLOS1E00H2	BLOS1F00H2	
5	BLOS2E00H2	BLOS2E00H2	
9	BLOS3E00H2	BLOS3F00H2	

humiSteam three-phase 208 & 230 V			
	water conductivity		
	low	medium	high
Capacity kg/h	75/350 µS/cm	350/750 µS/cm	750/1250 µS/cm
3	BLOT1A00H2	BLOT1B00H2	
5, 8	BLOT2A00H2	BLOT2A00H2	
10, 15	BLOT3A00H2	BLOT3A00H2	
25	BLOT4B00H2	BLOT4C00H2 (*)	
35	BLOT4B00H2 (*)		
45	BLOT5A00H0	BLOT5A00H0 (BLOT5B00H0 for 230 V)	

humiSteam three-phase 460 V			
	water conductivity		
	low	medium	high
Capacity kg/h	75/350 µS/cm	350/750 µS/cm	750/1250 µS/cm
3	BLOT1B00H2	BLOT1D00H2	
5, 8	BLOT2C00H2	BLOT2D00H2	
10, 15, 18	BLOT3C00H2	BLOT3D00H2	
25	BLOT4D00H2 (*)		
35, 45, 90, (2x)	BLOT4C00H2	BLOT4D00H2 (*)	
65, 130 (2x)	BLOT5C00H0	BLOT5D00H0	

humiSteam three-phase 208 & 230 V			
	water conductivity		
	low	medium	high
Capacity kg/h	75/350 µS/cm	350/750 µS/cm	750/1250 µS/cm
5, 8	BLOT2C00H2	BLOT2D00H2	
10, 15, 18	BLOT3C00H2	BLOT3D00H2	
25, 35, 45, 90 (2x)	BLOT4D00H2 (*)		
65, 130 (2x)	BLOT5D00H0		

## Openable cylinder selection tables

humiSteam three-phase 400 V (380 to 415 V)			
	water conductivity		
	low	medium	high
Capacity kg/h	75/350 µS/cm	350/750 µS/cm	750/1250 µS/cm
3	BLCT1A00W2	BLCT1C00W2	BLCT1D00W2
5, 8	BLCT2B00W2	BLCT2C00W2	BLCT2D00W2
10, 15, 18	BLCT3B00W2	BLCT300W2	BLCT3D00W2
25, 35	BLCT4C00W2	BLCT4D00W2	
45, 90 (2x)	BLCT4B00W2	BLCT4C00W2	
65, 130 (2x)	BLCT5B00W0	BLCT5C00W0	

humiSteam single-phase 230 V (220 to 240 V)			
	water conductivity		
	low	medium	high
Capacity kg/h	75/350 µS/cm	350/750 µS/cm	750/1250 µS/cm
1, 3	BLCS1E00W2	BLCS1F00W2	
5	BLCS2E00W2	BLCS2F00W2	
9	BLCS3E00W2	BLCS3F00W2	

(\*) for models UE 25, 35, 45 kg/h made before October 2003 or serial number less than 501,000, use the 'Y' connection.

(\*\*) as well as the voltages shown, openable cylinders are available for: 208 V single-phase, 230 V three-phase, 460 V three-phase, 575 V three-phase.

**Warning:** In models UEH and UEP that have cylinders with an electrical bridge between two or more electrodes, the snap-on connectors cannot be used, as it is impossible to connect multiple cables to the same pin. Consequently, for these units the spare cylinders will keep the threaded pins and the same product codes will need to be purchased. The following models of cylinder are affected: BLOS2F00H0, BLCS2F00W0, BLOS2E00H0, BLCS2E00W0, BLOT2B00H0, BLCT2B00W0, BLOT2A00H1, BLCT2A00W1, BLOT3B00H0, BLCT3B00W0, BLOT3A00H1 and BLCT3A00W1.



## compactSteam

CH\*

In the rooms where we live and work, ensuring correct humidity is not a luxury but rather a factor of well-being, health and productivity. Humidity control also protects furniture and wooden floors, panels and antiques against the damage caused by dry air.

compactSteam is the new CAREL solution for the humidification of more prestigious residential environments, professional offices or small and medium retail premises.

compactSteam is an immersed electrode humidifier that contains all the best that CAREL experience has to offer, in compact dimensions.

The main features are:

- elegant and discrete design, ideal for installation in any environment;
- built-in steam distributor, with adjustable louvers and very silent fan;
- large graphic LCD for straightforward understanding;
- market-leading functionality, safety and user friendliness;
- models from 1.5 to 3.2 kg/h.

Considerable care has been paid to installation not in "utility rooms": the electrical and water connections can be completely hidden from view, and the drain water temperature never exceeds 60 °C. In addition, if no humidification is required for more than 3 consecutive days, the water is automatically drained for maximum hygiene.

A version without built-in distributor is also available, designed for air-conditioning systems with steam distribution in the duct.

In this case, compactSteam may:

- use a special sensor to measure whether there is air flow in the duct, or alternatively
- activate the fan in the duct using a dedicated relay.

A remote steam blower is also available, which allows steam distribution in the room when the humidifier is installed in a utility room.

### Features

- user-friendly LCD;
- maximum capacity selectable in steps of 5%;
- 0 to 10 V proportional control and modulation from 20 to 100%;
- diagnostics with numeric codes and icons;
- automatic management of water concentration and foam;
- remote enable input and alarm relay;
- built-in steam distributor with fan;
- drain tempering (60 °C);
- automatic emptying due to inactivity (3 days);
- cylinder operating hour counter, resettable;
- concealed electrical/water connections.

## Steam cylinders with electrodes

### standard cylinders for compactSteam (conductivity 350 to 1250 µS/cm)

code	description
CY0S1A0000	1.6 to 2.5 kg/h cylinder, 110 Vac, single-phase, type A
CY0S1B0000	1.6 to 3.2 kg/h cylinder, 230 Vac, single-phase, type B

### low conductivity cylinders for compactSteam (conductivity 125 to 350 µS/cm)

code	description
CY0S1A0000	1.6 to 2.5 kg/h cylinder, 110 Vac, single-phase, type A
CY0S1C0000	1.6 to 3.2 kg/h cylinder, 230 Vac, single-phase, type B



## Controller

The sophisticated microprocessor controller automatically manages all the functions of the unit, and includes a self-diagnostic system with simple and straightforward indications, both numeric and using icons, on the large LCD.

The controller allows a reduction in the maximum capacity so as to adapt the unit to the size of the environment being humidified. It includes an ON/OFF and proportional 0 to 10 V input, a remote enabling input, an alarm relay, an input for a flow sensor and a 24 V power supply output. The steam production is modulated continuously from 20% to maximum capacity, while the water level is controlled by a fill valve solenoid and a drain pump.

The built-in fan is only on when steam is being produced, and is stopped with a delay to prevent condensation.

Ambient humidity control is managed by an external humidistat.

The best solution is installation together with the new CAREL clima electronic humidistat, which can manage the compactSteam in proportional mode, for even more precise and comfortable control of the humidity. clima, which manages the temperature as well as the humidity, also handles the daily and weekly timer functions, and is even able to compensate the humidity set point depending on the outside climatic conditions.

The 24 V supplied by compactSteam makes the installation of the humidistat easy and safe. compactSteam is available with or without the steam blower, with capacities from 1.5 to 3.2 kg/h.

The product concept, the completeness of the functions and the quality of construction make compactSteam the leader in its market segment.



## clima

ADC\*

The new room humidistat with built-in humidity sensor, or remote sensor for applications, is fitted with an LCD with alphanumeric characters and icon graphics for simple use. The 24 Vac supply allows direct connection to the humidifier without the need for additional transformers.

The functions that can be selected range from simple thermostat and humidistat with ON/OFF or modulating logic, to the management of temperature and humidity with compensation, using an external sensor. The built-in clock allows the automatic management of an ON and OFF period over a 24 h interval. The same function can be managed by an external timer, by the digital input which, alternatively, can be used for the alarm signal from the humidifier. In the hotel type applications, the LOCK terminal function, selectable by parameter is very useful, as it allows the terminal to be locked at various levels.

Technical specifications

**Power supply:** 24 Vac +10 to -15% 50/60 Hz 1 VA, 22-35 Vdc 0.5 W

**Operating conditions:**

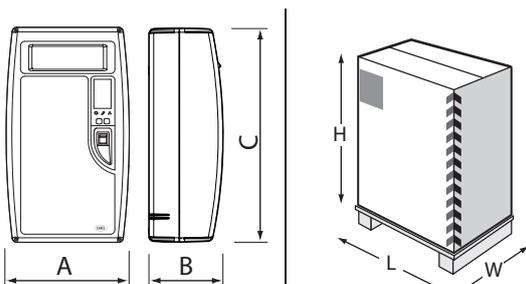
0T60°C, 10 to 90% rH non-cond.

**Storage conditions:**

-20T70°C, 10-90% rH non-cond.

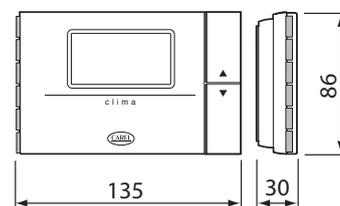
**Index of protection:** IP20

### Dimensions (mm) & weights (kg)

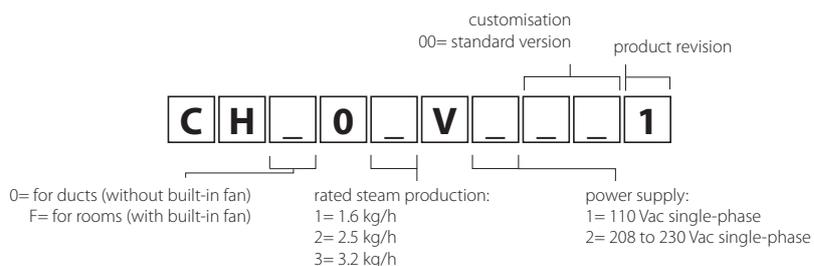


Mod.	AxBxC	weight	LxWxH	weight
CH001*	341x204x600	8	520x380x740	10
CH002*	341x204x600	8	520x380x740	10
CH003*	341x204x600	8	520x380x740	10

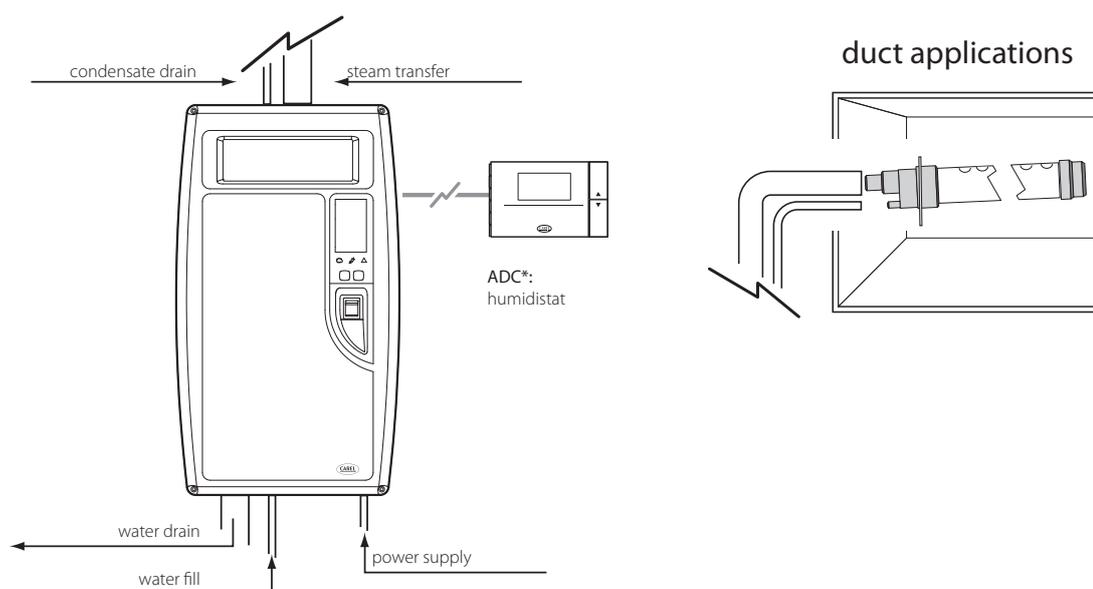
### Dimensions (mm)



## Unit code



## OVERVIEW DRAWING



### Models

Specifications	CH001*	CH002*	CH003*
<b>General</b>			
Production kg/h (lbs/hr)	1.6 (3.5)	2.5 (5.5)	3.2 (7)
Power input (kW)	1.18	1.86	2.36
Power supply			
• 110 Vac single-phase (-15 to 10%) 50/60 Hz	●	●	●
• 208/230 Vac single-phase (-15 to 10%) 50/60 Hz	●		●
Steam outlet mm (outside diameter)	Ø 22		
Outlet pressure limit (Pa) for duct model	950		
Number of boilers	1		
Operating conditions	1T40 °C, 10 to 90% rH non-condensing		
Storage conditions	-10T70 °C, 5 to 95% rH non-condensing		
Index of protection	IP20		
<b>Supply water</b>			
Water fill	3/4"G male		
Temperature limits (°C)	1T40		
Water pressure limits (MPa-bar)	0.1 to 0.8 - 1 to 8		
Instant flow-rate (l/m)	1.1		
Total hardness (°fH)	15 to 40		
Conductivity at 20 °C (µS/cm)	125 to 1250 µS/cm		
<b>Water drain</b>			
Connection mm (outside diameter)	Ø 32		
Temperature (°C)	<100		
Instant flow-rate (l/m)	5		



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## Heater humidifiers

Immersed heater humidification is becoming increasingly required in work specifications where:

- humidity must be controlled precisely (museums, laboratories, clean rooms);
- the quality of the water is not constant or is problematic (for example, aboard ships);
- periodical maintenance needs to be minimised (using demineralised water).

Immersed heater humidifiers, unlike immersed electrode units, can operate on demineralised water, as they do not exploit the electrical conductivity of the water.

Periodical maintenance can therefore be greatly reduced, due to the minimum formation of lime scale.

Weighing against this, the resistive elements must always be completely immersed in the water, to avoid overheating, unlike the situation with electrodes, in which the water level is adjusted to modulate the flow-rate of steam.

The operation of an immersed heater humidifier then requires water level sensors to ensure the complete immersion of the electrodes, as well as components (solid state relays) that adjust the amount of heat

transferred to the water so as to precisely modulate the steam flow-rate.

These characteristics make the heater units more complex than their counterparts with electrodes, yet independent of the characteristics of the water, and with much more precise modulation of the flow-rate. In addition, as heater humidifiers are intrinsically subject to overheating, the quality of design and the presence of safety systems are essential to ensure reliable service over time.

The CAREL solution in this market segment offers the maximum in constructional quality and performance, meaning excellent reliability over time and extreme precision of control for the more critical applications.



## heaterSteam

UR\*

The new range of heaterSteam immersed heater humidifiers includes models producing from 2 to 60 kg/h of steam, and can operate on drinking water or demineralised water. The use of demineralised water practically eliminates the need for maintenance.

heaterSteam features exclusive and patented technological solutions, such as the electric heaters embedded in corrosion-proof aluminium alloy casting with a large heat exchange surface, and built-in temperature sensors to prevent overheating. The temperature sensor has the dual function of protection against overheating, for maximum reliability over time, and detecting excessive lime scale deposits amply in advance, so as to allow correct preventive maintenance. The modulating control with solid state relays ensures high precision humidity control, making heaterSteam the ideal solution even for more demanding applications.

For each model there are two variants: basic and full optional.

The full optional units, compared to the basic versions, have heat insulation around the boiler for maximum energy savings, and heating elements coated in non-stick material to facilitate the separation of lime scale.

In addition, a water temperature sensor is fitted for managing the useful preheating function, giving a rapid response to all humidification demands.

All models have an automatic system for measuring the conductivity of the supply water, which optimises the management of the drain cycles without requiring the analysis of the water in the installation. This function also means energy savings and a reduction in maintenance.

The models from 2 to 10 kg/h have a cylindrical stainless steel boiler, which is easy to remove for cleaning.

The larger models, from 20 to 60 kg, have a stainless steel boiler with a rectangular base and large openings (front and top) for easy maintenance without having to remove the boiler.

heaterSteam is particularly compact for its capacity.

The smaller models, 2 and 4 kg/h, the only units of their type available, are the perfect solution for smaller applications (specialist clinics, professional studios) where high electrical power ratings are often not available.

### Advantages:

- extreme precision, up to  $\pm 1\%$  rH in rooms with 500 V/h air change;
- the electric heaters are embedded in a corrosion-proof light alloy casting with a large surface area, guaranteeing perfect diffusion of the heat and exceptional reliability over time;
- temperature sensors inserted into the heating elements prevent any overheating, and detect well in advance the need for cleaning any lime scale deposits (patented method);
- heating elements coated with Niflon, a non-stick and corrosion-proof material (full optional models) are very easy to clean;
- models H and T, with solid state relays, allow continuous modulation of steam production starting from 10% of capacity, with very precise control; model C provides ON/OFF operation;
- the patented "Anti Foaming System" detects foam and prevents the release of any droplets of water together with the steam;
- type H control supports the limit probe to prevent any condensate forming in the duct (better hygiene!);
- in models H and T the preheating function allows a rapid response to the request for steam production;
- model H can also control an external dehumidification device.



## Controllers

All the heaterSteam series humidifiers are available with three different types of control unit, identified by a letter:

- C: ON/OFF control;
- H: built-in humidity control and network port;
- T: built-in temperature control and network port for stand-alone applications (for example, steam baths).

The heaterSteam humidifiers are fitted for communication with external monitoring and control networks. In fact, all the units have a serial port for connection to Modbus® and Ethernet™ networks via an external gateway. Alternatively, the same serial port can be used to connect up to 4, via a proprietary network, to humiVisor, the small yet complete CAREL supervisor that can control the operation and configuration of the units over distances of up to 1 km.

### Type C: ON/OFF controller

The unit works at 0% or 100% of maximum production, which can be set to 30%, 50%, 75% or 100% of the rated capacity. The controller comes with a straightforward icon-based display.

### Type H: built-in humidity controller

The built-in controller features a display and keypad for programming. The type H heaterSteam models can be configured at any time to operate in the following modes:

- ON/OFF, from an external signal;
- proportional to an external signal;
- modulating based on the reading from an external humidity probe;
- modulating based on the reading from an external humidity probe and a limit probe in the duct.

At all times, the special software prevents disturbance to steam production by optimally managing all the normal activities of an isothermal humidifier, such as water fill and drain cycles, foam detection, etc. This ensures precision of  $\pm 1\%rH$  even with a large number of air changes (up to 500 V/h).

Steam production is modulated linearly from

10% to 100% of the maximum flow-rate (see the graph at the foot of the page), except in ON/OFF mode. heaterSteam type H and T models can accept a wide range of external signals, selected from the keypad: voltage-free contact i.e. humidistat, 0 to 1V, 0 to 10 V, 2 to 10 V, 0 to 20 mA, 4 to 20 mA.

The preheating function (models H and T) can be activated to maintain the water at a set temperature (from 70 to 90 °C) so as to ensure an immediate start of steam production. In addition, heaterSteam provides clear indications of any malfunctions, using a complete set of alarms and an alarm relay. Finally, the dehumidification relay means that type H models can call the activation of an external dehumidifier if the humidity is too high (dedicated set point).

The vast range of accessories also includes the infrared remote control.

### Type T: built-in temperature controller

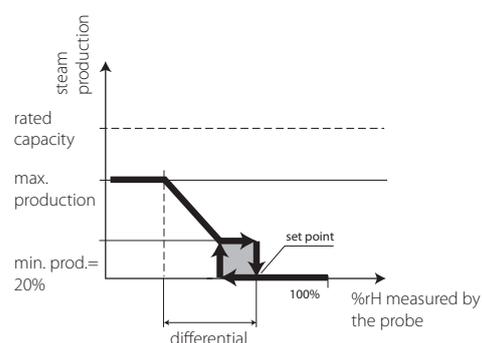
This works in the same way as model H, with the difference that production is controlled according to the temperature rather than the relative humidity (suitable for steam baths).



1. heater in aluminium casting with embedded PTC sensor;
2. descaler bag;
3. heat insulation around the boiler.



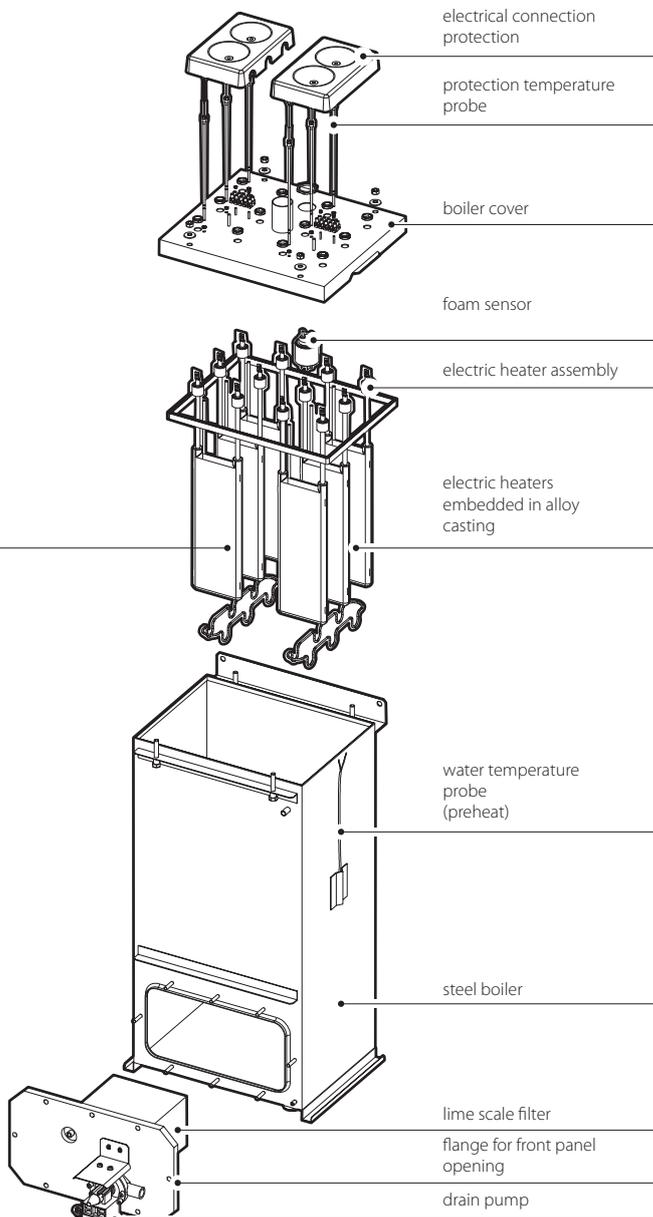
New heaters with Niflon non-stick lining: combine the effectiveness of nickel in protecting metal against corrosion, with the non-stick effect of Teflon®



## Models with rectangular boilers

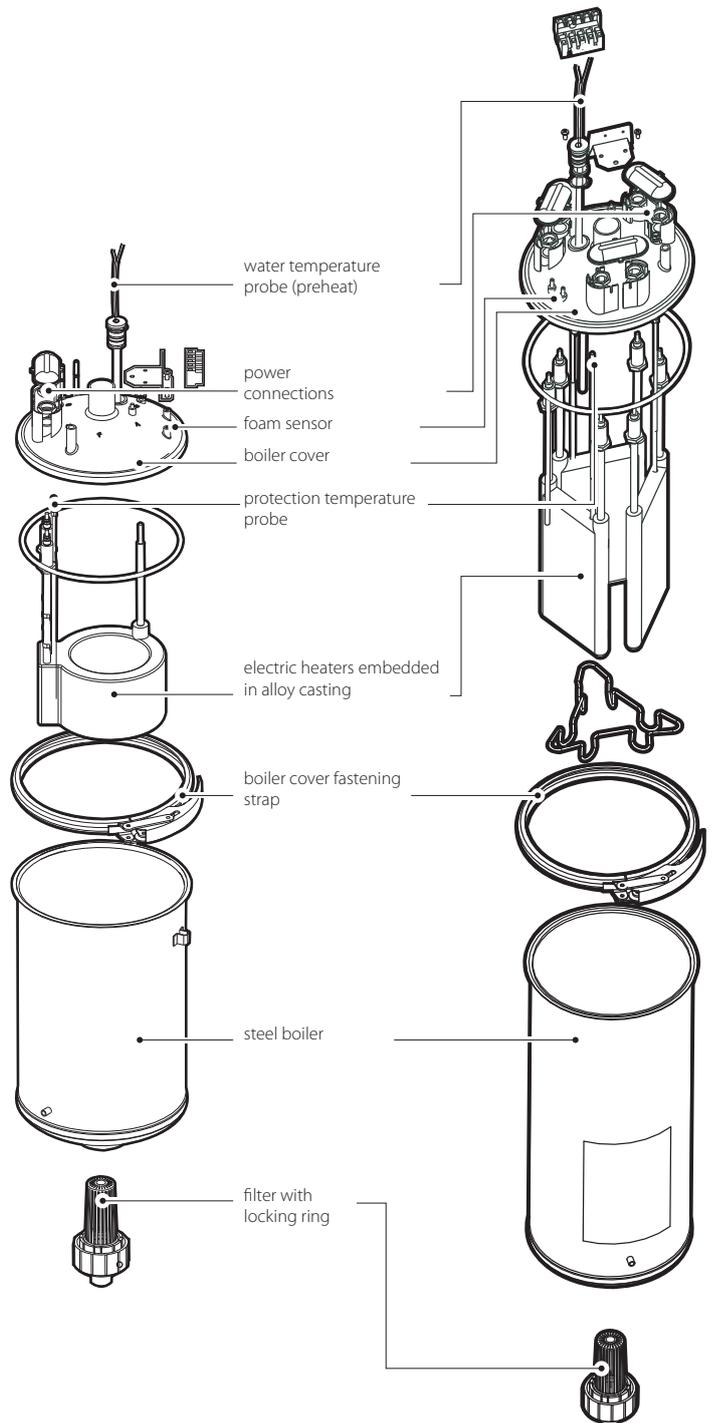
The heaterSteam 20, 27, 40 and 60 kg/h models feature, for maximum compactness, a boiler with a rectangular base, and with multiple heaters (9 for the 60 kg/h model, 6 for the other models). The full optional models have heaters coated in non-stick material and heat insulation around the boiler.

Cleaning is performed in these models by removing the large front cover of the boiler, which holds the electric drain pump and the scale filter. The top cover, which supports the heaters, is very easy to remove, as is the top panel of the body, guaranteeing optimum accessibility.



## Models with cylindrical boilers

The heaterSteam 2 and 4 kg/h (single-phase) models, the 6 kg/h (single-phase and three-phase) model and the 10 kg/h (three-phase) model, are all made with a cylindrical stainless steel boiler, which can be easily dismantled for cleaning outside of the unit. Every boiler features a level sensor and each heating element is protected by a PTC temperature sensor inserted in the light alloy casting. The full optional models (code ending in 10\*) have non-stick elements, insulation around the cylinder to limit the dispersion of heat, and a removable descaler bag on the inside, to simplify cleaning.



## Models

Specifications	UR002*	UR004*	UR006*	UR010*	UR020*	UR027*	UR040*	UR060*
<b>General</b>								
Rated steam production (kg/h)	2	4	6	10	20	27	40	60
Power input (kW)	1.5	3	4.5	7.5	15	22.5	30	45
Power supply (other voltages upon request)								
• 230 Vac (-15 to +10%), 50/60 Hz single-phase	●	●	●	-	-	-	-	-
• 400 Vac (-15 to +10%), 50/60 Hz three-phase	-	-	●	●	●	●	●	●
Steam connection (mm)	Ø 30	Ø 30	Ø 30	Ø 30	Ø 40	Ø 40	Ø 40	2x Ø 40
Steam pressure (Pa)	0 to 1500	0 to 1500	0 to 1500	0 to 1500	0 to 2000	0 to 2000	0 to 2000	0 to 2000
Number resistance	1	1	3	3	6	6	6	9
Operating conditions	1T40 °C, 10 to 60% rH non-condensing							
Storage conditions	-10T70 °C, 5 to 95% rH non-condensing							
Index of protection	IP20							
<b>Water fill</b>								
Connection (mm)	3/4"G male							
Temperature limits (°C)	1T40							
Water pressure limits (MPa - bar)	0.1 to 0.8 - 1 to 8							
Instant flow-rate (l/m)	0.6	0.6	1.2	1.2	4	4	4	10
Total hardness (°fH) (*)	5 to 40							
Conductivity limits (µS/cm) (*)	0 to 1500							
<b>Water drain</b>								
Connection	Ø 40							
Temperature (°C)	<100							
Instant flow-rate (l/m)	5	5	5	5	22.5	22.5	22.5	22.5
<b>Steam blower</b>								
Number	1	1	1	1	1	1	1	2
Type	VSDU0A*	VSDU0A*	VSDU0A*	VSDU0A*	VRDXL*	VRDXL*	VRDXL*	VRDXL*
Power supply (Vac)	24	24	24	24	230	230	230	230
Rated power (W)	37	37	37	37	35	35	35	35
Rated air flow (m³/h)	192	192	192	192	650	650	650	650
<b>Network</b>								
Network connections	RS485, Modbus® (with optional Gateway)							

(\*) heaterSteam can be supplied with completely demineralised water (0 °fH). If supplied with softened water, the minimum hardness value indicated must be observed, and the instructions described in the manual must be followed.

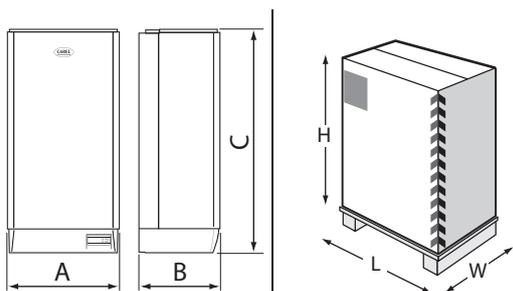
## Controller

Specifications	C	H	T
Continuous modulation (with SSR)	-	10 to 100%	10 to 100%
Integrated control (sensors not included)	-	● (rH)	● (temp.)
External ON/OFF signal	●	●	●
External proportional signal	-	●	●
Limit probe supported	-	●	●
Dehumidification control	-	●	●
Remote ON/OFF	●	●	●
Alarm relay	●	●	●
Type of signal (probe or external controller)	-	0 to 10 V; 0 to 1 V; 2 to 10 V; 0 to 20 mA; 4 to 20 mA	
Alphanumeric display	-	●	●
RS485 interface	-	●	●

## Versions

Specifications	base	full option
Heater embedded in aluminium casting	●	●
Heaters with non-stick lining	-	●
Heat insulation	-	●
Preheat function	●	●
Descaler bag	-	up to 10 kg/h

### Dimensions (mm) & weights (kg)

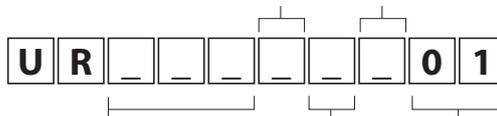


Mod.	AxBxC	weight	LxWxH	weight
UR002*	365x275x620	21	520x380x730	26
UR004*	365x275x620	21	520x380x730	26
UR006*	365x275x710	26	520x410x870	31
UR010*	365x275x710	26	520x410x870	31
UR020*	690x438x887	63	680x460x1090	73
UR027*	690x438x887	63	680x460x1090	73
UR040*	690x438x887	67	680x460x1090	77
UR060*	876x438x887	87	946x510x1050	98

### Unit code

type of controller:  
 C= ON/OFF  
 H= modulating  
 T= for steam baths

options:  
 0= basic version  
 1= full optional version



rated instant steam production:  
 002= 2 kg/h  
 004= 4 kg/h  
 006= 6 kg/h  
 010= 10 kg/h  
 020= 20 kg/h  
 027= 27 kg/h  
 040= 40 kg/h  
 060= 60 kg/h

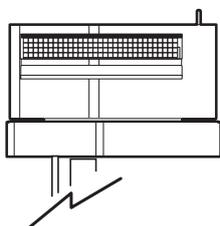
power supply:  
 D= 230 Vac 1~  
 U= 208 Vac 1~  
 L= 400 Vac 3~  
 W= 208 Vac 3~  
 K= 230 Vac 3~  
 M= 460 Vac 3~  
 N= 575 Vac 3~

changes only for custom products  
 0S= UR020 only

**NB:** not all the combinations of codes are available.

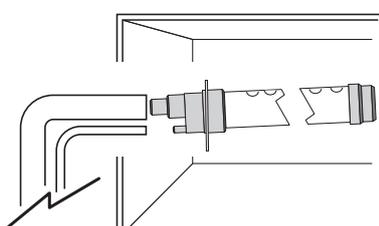
## OVERVIEW DRAWING

### room applications



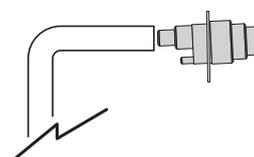
VSDU0A0002 & VRDXL0000:  
 steam blower  
 VSDBAS0001: remote support for  
 VSDU0A\*

### duct applications

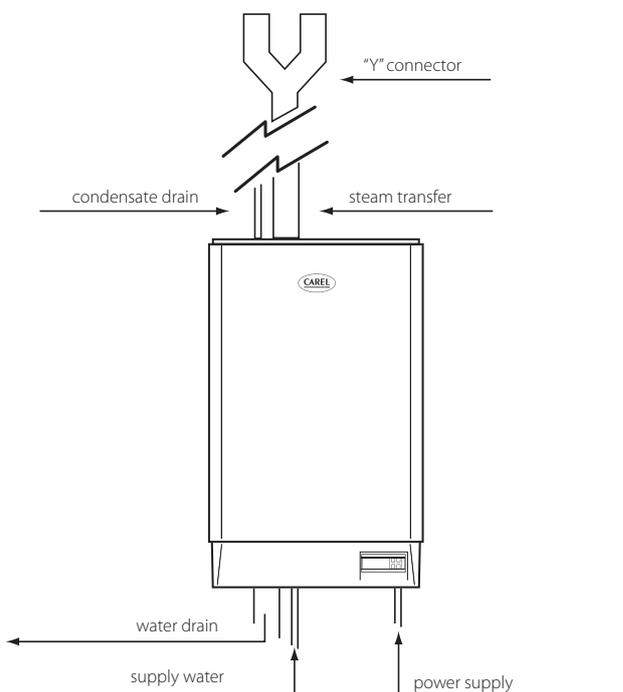


DP\*: linear steam distributor (inlet  $\varnothing$  22 mm,  
 $\varnothing$  30 mm,  $\varnothing$  40 mm)

### steam bath applications



SDP\*: plastic nozzle up to  
 15 kg/h steam



### Probes



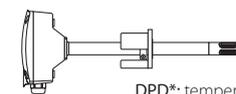
DPW\*: temperature and humidity  
 probe for civil environments



DPP\*: temperature and humidity  
 probe for industrial environments



ASET\*: temperature and humidity  
 probe for steam baths



DPD\*: temperature and humidity  
 probe for ducts



POCC IT.AI150.B02565



CE-0085BM0395

## Gas-fired humidifiers

CAREL's extensive experience in the humidification sector, combined with Ecoflam technology in the field of gas heating, has allowed the development of the gaSteam range of humidifiers that run on gas, a source of energy that is more economical than electricity. The humidifiers now have updated controllers, and the smallest model has now been upgraded to 45 kg/h (still below the 5 kW limit). The range thus now features the 45 kg/h, 90 kg/h and 180 kg/h models.

The CAREL gas-fired humidifiers can run on both natural gas and LPG: the changeover is made by simply modifying a number of parameters, without the need to replace any parts.

### Cost effectiveness

To generate 1 kg of steam at atmospheric pressure, considering all the various factors, requires around 750 Wh of energy, either electrical or from other sources. One of the main factors when choosing solutions in the field of isothermal humidification is therefore the cost of energy, particularly for heavy-duty uses. To completely exploit the advantage of gas in terms of energy costs, a system with high thermal efficiency is required, capable of minimising the loss of heat. Thanks to Ecoflam know-how, the efficiency of our humidifiers is

between 92 % and 95%.

The graph shows the economic comparison between a gaSteam and an immersed electrode humidifier, expressed in terms of total cash flow in euro, including purchase, energy and of maintenance costs. Even considering the higher purchase price compared to an immersed electrode humidifier, the break even point for gas-fired humidifiers is reached quite quickly.

This graph compares the costs based on 2000 operating hours/year using 90 kg/h humidifiers, and with the costs of gas and electricity applied in Italy. The break-even point is easily reached before two years, after which there are significant savings. In many other countries, the break-even point is reached even earlier, making gaSteam even more cost effective.



### Certification

CAREL has paid significant attention to the approval of gaSteam, so as to be able to guarantee the complete safety of the product and achieve all major certification. gaSteam is approved according to the European CE standards, the German TÜV standards and the American ETL standards. For Europe, specific DVGW certification has been obtained for appliances operating on gas.

In addition, thanks to the low NOx emissions, gaSteam is approved as a class 5 appliance for models UG045 and UG090, and class 4 for model UG180: this means it can be installed in countries with very strict legislation in force.

As regards the applications, refer to the following standards:

- directive 90/396/EEC;
- for premises requiring certification by the relevant bodies, the reference Italian standard is: Min. Decree dated 12 April 1996;
- for the gas line the reference is: UNI - CIG 7129 of 1972.



## gaSteam

UG\*

The family of gaSteam humidifiers includes the 45 kg/h, 90 kg/h and 180 kg/h models. Each of these features the highest thermal efficiency, so as to fully exploit the cost savings of gas. The heat exchanger, which is easily removable for cleaning, is made from aluminium alloy coated with a special corrosion-proofing and non-stick treatment that prevents the adhesion of lime scale. The gaSteam humidifiers all come with the new pHc electronic microprocessor controller that adopts all the best features of the pCO programmable controllers, one of CAREL's main points of excellence. The user interface is made up of a backlit display that features the simultaneous and flexible use of graphic icons and texts in various languages. The pHc controller also comes with network connection: via the pCO family pLAN protocol (RS485 interface included), or the Modbus®, Echelon®, BACnet™, RS485 and GSM communication protocols using optional interfaces. The controller includes the independent control loop (humidity or temperature) with active probe and optional second limit probe, as well as the ON/OFF and proportional operating modes with signal from an external controller. It can also manage a dehumidifier, and includes a complete set of diagnostics for maintenance.

### Safety

gaSteam is fitted with various safety devices, including:

- premix, room-sealed burner with forced ventilation;
- an air/gas control valve with double closing;

- safety negative pressure switch on combustion air intake;
- temperature sensor in the flue gas outlet that checks for malfunctions, and signals excessive accumulation of lime scale on the exchanger in advance;
- a flame detector in the burner that closes the gas valve in the event of operating anomalies;
- the patented AFS antifoam system with corresponding sensor;
- a multi-stage water level sensor;
- an automatic water conductivity control system to avoid corrosion.

### Added advantages

- continuous modulation from 25-100% (12.5% for the 180 kg/h model);
- low NOx emissions;
- boiler and components in contact with the water in AISI 304L stainless steel;
- preheating function for a faster response;
- supply with mains water or demineralised water. The control can be set for use with softened water, within the limits described in the reference tables;
- antifreeze function;
- precision  $\pm 2\%$  rH.



### Heat exchanger

The advanced design, featuring a high exchange surface both internally and externally, offers unrivalled energy efficiency (between 92% and 95%, according to the model); made from aluminium alloy with a special Niflon lining, which is both corrosion-proof and prevents scale from attaching, is easily removable for cleaning on the bench.



### Burner head (90 kg/h model)

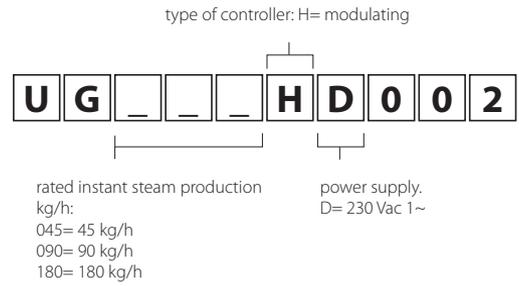
Including ignition and flame detection device. The controller manages the production of steam by adjusting the burner fan speed. The gas inlet valve controls the flow of gas as a consequence. The flame sensor controls both the automatic ignition device and gas valve: with no flame the flow of gas is shut off.

<b>Models</b>			
<b>Specifications</b>	<b>UG045*</b>	<b>UG090*</b>	<b>UG180*</b>
<b>General</b>			
Rated steam production (kg/h)	45	90	180
Modulation of steam production	25 to 100%	25 to 100%	12.5 to 100%
Gross input power (kW)	34.8	65	130
Net output power (kW)	33	62.5	125
Power supply	230 Vac (-15 to +10%), 50/60 Hz single-phase		
Power input at rated voltage (W)	250	285	201
Steam outlet pressure limits (Pa)	0 to 2000	0 to 2000	0 to 2000
Steam connection (Ø mm)	2x40	2x40	4x40
Gas connection	1"G	1"G	1" 1/4 G
Types of gas	natural gas (G20 & G25); propane (G31); butane (G30)		
Natural gas rate/pressure (G20) (m <sup>3</sup> St/h - Pa)	3.68 - 2000	7.21 - 2000	13.4 - 2000
Natural gas rate/pressure (G25) (m <sup>3</sup> St/h - Pa)	4.2 - 2000	8.7 - 2000	17.5 - 2000
Propane rate/pressure (G31) (m <sup>3</sup> St/h - Pa)	1.43 - 3000	2.68 - 3000	5.36 - 3000
Butane (rate/pressure G30) (m <sup>3</sup> St/h - Pa)	1.10 - 3000	2.06 - 3000	4.12 - 3000
Operating conditions	1T40 °C, 10 to 90% rH non-cond.		
Storage conditions	-10T70 °C, 5 to 95% rH non-cond.		
Index of protection	IP20		
<b>Water fill</b>			
Connection	3/4"G male		
Temperature limits (°C)	1T40		
Water pressure limits (MPa - bar)	0.1 to 0.8 - 1 to 8		
Instant flow-rate (l/m)	10	10	18
Total hardness (°fH) (*)	5 to 50		
Maximum conductivity limits (µS/cm) (*)	1500		
<b>Water drain</b>			
Connection (Ø mm)	40		
Temperature (°C)	≤100		
Instant flow-rate (l/m)	25		
<b>Flue gas</b>			
Intake pipe (Ø mm)	80	80	2x 80
Flue (Ø mm)	80	80	2x 80
Flue gas flow-rate (natural gas G20) (kg/s)	0.0163	0.0303	0.606
Flue gas temperature (natural gas G20) (°C)	123	175	165
NOx emissions class	5	5	4
<b>Network</b>			
Network connections	pLAN over RS485 included; optional Modbus®, Echelon®, BACnet™ & RS232+GSM		
<b>Controller</b>			
Built in-controller	●	●	●
External ON/OFF or proportional controller	●	●	●
Preheating	●	●	●
Alphanumeric display	●	●	●
Remote ON/OFF; alarm relay	●	●	●
Limit probe supported	●	●	●
(*) gaSteam can be supplied with completely demineralised water (0 °fH). If supplied with softened water, the minimum hardness value indicated must be observed, and the instructions described in the manual must be followed.			

**Dimensions (mm) & weights (kg)**

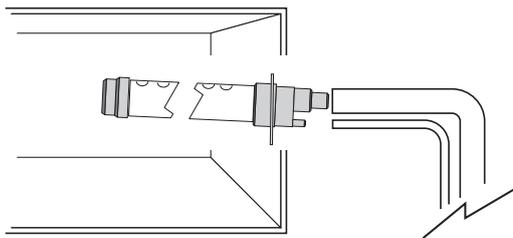
Mod.	AxBxC	weight	LxWxH	weight
UG045*	1020x570x1200	150	1090x620x1270	165
UG090*	1020x570x1200	150	1090x620x1270	165
UG180*	1020x930x1200	240	1090x980x1270	270

### Unit code



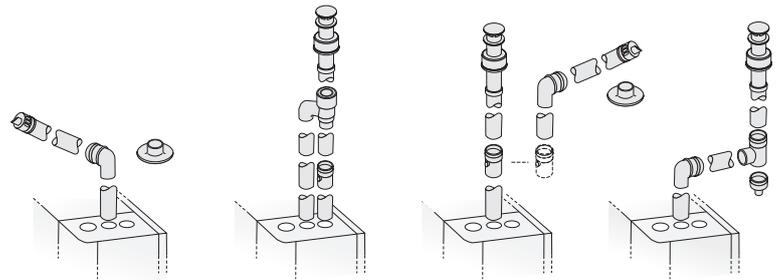
## OVERVIEW DRAWING

### duct applications

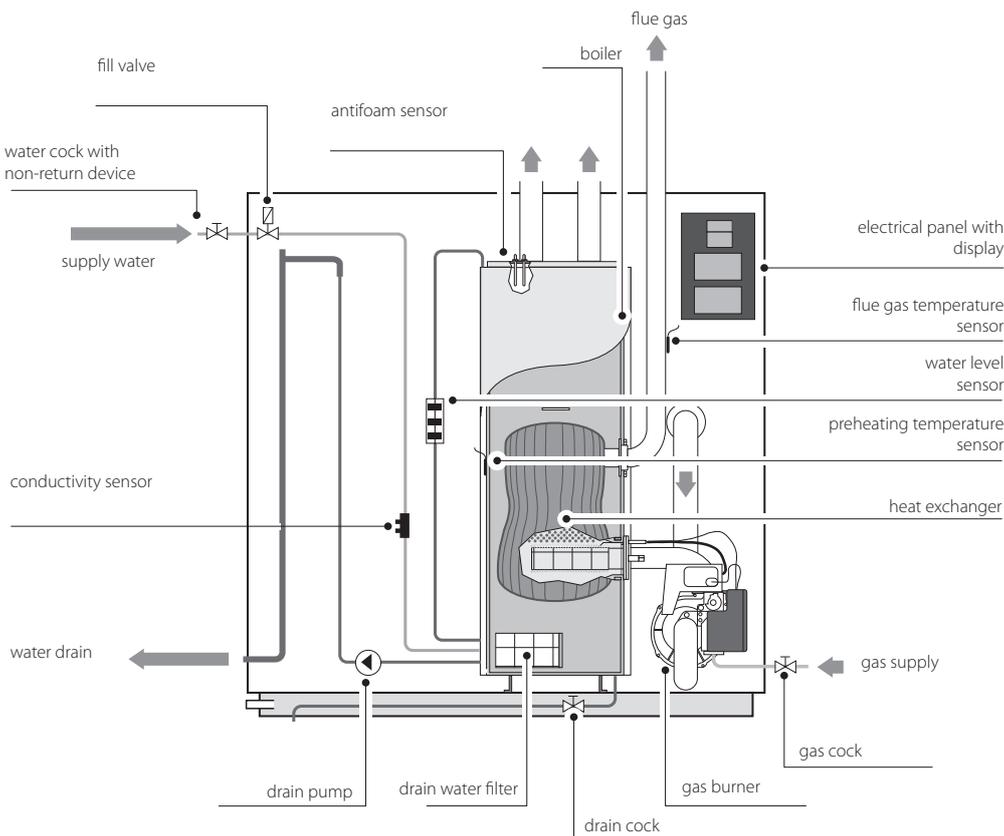


DP\*: linear steam distributor (inlet Ø 22 mm, Ø 30 mm, Ø 40 mm)

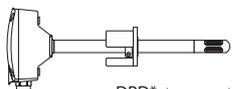
### flue accessories



EXH\* various flues and fittings



### Probes

-  DPW\*: temperature and humidity probe for civil environments
-  DPP\*: temperature and humidity probe for industrial environments
-  ASET\*: temperature and humidity probe for steam baths
-  DPD\*: temperature and humidity probe for ducts

## Accessories

These accessories are available for the humiSteam, homeSteam, heaterSteam and gaSteam humidifiers.

The CAREL range of accessories for isothermal humidifiers have been especially developed to allow the designer to create humidification systems that are complete and suitable for all types of application.

The fundamental idea is to guarantee the optimum operation of the humidification system by providing the installer, maintenance personnel and user all the auxiliary components that simplify installation, the distribution of steam, operation and control of the humidifier.

The accessories, described in the following paragraphs, are divided into:

- steam distribution accessories: steam hoses and distributors, for rooms and ducts;
- plumbing components, for filling and draining the water;
- humidifier and remote controls, for clear and immediate control of the operation of the humidifier;
- probes and external controllers (described in the chapter "Probes and control devices").



### Steam distributors for ducts (DP\*\*\*D\*\*R\*)

The wide range of linear steam distributors for ducts in the "DP" series is made up of perforated stainless steel pipes supported by a fastening bracket in Ryton®.

This material combines excellent mechanical characteristics with extraordinary resistance to high temperatures.

The new fastening bracket allows the steam distributor to be fastened vertically to a wall, guaranteeing the correct incline of the distributor for the drainage of the condensate.

The stainless steel linear steam distributors are available in 3 different diameters (35, 45 and 60 mm), which couple respectively to the 22, 30 and 40 mm diameter steam hoses used on the entire range of CAREL humidifiers.

The linear distributors are designed to release the steam in a uniform manner along the entire length of the distributor, so as to minimise the absorption distance.



### Fittings and connectors (UEKY\*\*\*\*\*)

The table describes the recommended models for each type of humidifier; the sizes in brackets (double) are to be used in the event of small ducts, however require the branching of the steam hoses.

For this purpose, two stainless steel Y fittings are available, one with a 40 mm inlet and two 30 mm outlets (UEKY000000) and one with a 40 mm inlet and two 40 mm outlets (UEKY40X400).



- |  |  |
|--|--|
| <input checked="" type="checkbox"/> UE | <input checked="" type="checkbox"/> UR |
| <input checked="" type="checkbox"/> CH | <input checked="" type="checkbox"/> UG |

### Steam nozzles (SDPOEM00\*\*)

A range of steam nozzles is also available for distributing the steam in small ducts or steam baths (SDPOEM0012 for models from 1 to 3 kg/h, SDPOEM0022 for models from 5 to 18 kg/h, SDPOEM0000).



- |  |  |
|--|--|
| <input checked="" type="checkbox"/> UE | <input checked="" type="checkbox"/> UR |
| <input type="checkbox"/> CH            | <input checked="" type="checkbox"/> UG |

### Steam blowers

New steam blowers for rooms (VSDU0A0002), for humidifiers up to 18 kg/h. The steam blower can be fitted directly onto the humidifier, or in a remote position. In the latter case, a support is required for mounting the blower (VSDBAS0001), as well as a steam hose to connect the blower to the humidifier (see below). The steam blower works in ON/OFF mode, and is controlled by a temperature device that is activated when steam is produced. When the production of steam ceases, the steam blower continues to operate for a short time to avoid condensation of the remaining steam.

For humidifiers larger than 18 kg/h, the steam blowers code VRDXL00000 are available, with 230 Vac power supply.

The VRDXL0000 distributors are designed for installation in a remote position from the humidifier, and require two steam hoses with a diameter of 30 mm.

Both models of steam blowers are designed to drain the condensate using a 7 mm diameter hose (see further on).



- |  |  |
|--|--|
| <input checked="" type="checkbox"/> UE | <input checked="" type="checkbox"/> UR |
| <input checked="" type="checkbox"/> CH | <input checked="" type="checkbox"/> UG |

### Fill hoses

FWHDCV0000: water fill kit  
 FWH3415000: hose L=1.5 m  
 FWH3430000: hose L= 3 m  
 9997\*ACA: straight and 90° quick connection  
 1312350APN: hose with 6 mm ID and 8 mm OD.

The FWHDCV0000 kit includes the FWH3415000 hose and a double non-return valve. The kit has been designed both to ensure conformity to standards that require the use of a double non-return valve upstream of the humidifier (WRAC), and to avoid breakages of the fill valve due to direct connection to the metal mains water pipes. The plastic fill solenoid valve may be damaged if connected directly to the metal mains water pipes: using the hoses with plastic fittings, FWH3\*\*\*000, eliminates this risk.

The FWH3\*\*\*000 hoses are available in two lengths: 1.5 m and 3 m, with two ¾" female GAS fittings (one straight and one elbow). Alternatively, the 6 mm hose and the quick connectors described below can be used.

The straight or elbow connection (999572\*ACA) is screwed onto the fill solenoid valve and can be quickly fitted by tightening a nut to the 6 mm water fill hose (1312350APN).



- |  |  |
|--|--|
| <input checked="" type="checkbox"/> UE | <input checked="" type="checkbox"/> UR |
| <input checked="" type="checkbox"/> CH | <input checked="" type="checkbox"/> UG |

### Steam hoses

1312360AXX - 1311365AXX - 1312367AXX hose for cylinders with 22/30/40 mm fitting and harmonic steel coil (outside diameter 32/41/52 mm)

The new steam distribution hoses are made from rubber resistant to 105 °C in continuous operation without the emission of odours, and suitable for use with foodstuffs. The harmonic steel coil immersed in the rubber gives the hose flexibility and strength, preventing it from being choked and blocking the flow of steam.



- UE     UR
- CH    UG

### Condensate drain hoses

1312353APG: 7 mm, 1312368AXX: 10 mm,  
1312357APG: 40 mm (1 m long)

The condensate that forms inside the steam distributors must be drained using the 7 mm hose for the steam blowers, and the 10 mm hose for the "DP" linear distributors for ducts.

The water drain hose is the same for all isothermal humidifiers and is made from rubber resistant to 100 °C.

### Distributors

	Distributors															special applications*						
	DP035D22R0	DP045D22R0	DP060D22R0	DP085D22R0	DP035D30R0	DP045D30R0	DP060D30R0	DP085D30R0	DPI05D30R0	DPI25D30R0	DPI65D30R0	DP085D40R0	DPI05D40R0	DPI25D40R0	DPI65D40R0	DP205D40R0	DP030D22RU	DP030D30RU	DP045D30RU	DP060D30RU	DP060D40RU	
Ø inlet (C) (mm)	22				30								40					22	30			40
size (B) (mm)	35				45								60					35	45			60
length (A)	350	450	600	850	350	450	600	850	1050	1250	1650	850	1050	1250	1650	2050	300	300	450	600	600	
CH001-CH005	1	1	1	1													1					
UE001	1	1	1	1													1					
UE003	1	1	1	1													1					
UE005					1	1	1											1	1	1		
UE008						1	1	1										1	1	1		
UE009							1	1	1									1	1	1		
UE010							1	1	1									1	1	1		
UE015								1	1	1	1										1	
UE018								1	1	1	1											
UE025								(2)	(2)	(2)	(2)	1	1							(2)	1	
UE035								(2)	(2)	(2)	(2)	(2)	1	1							1	
UE045												(2)	(2)	1	1	1					1	
UE065												(4)	2	2	2						2	
UE090												(4)	(4)	2	2	2					2	
UE130													4	4	4	4					4	
UR002					1	1												1	1			
UR004					1	1	1											1	1	1		
UR006						1	1	1										1	1	1		
UR010							1	1	1									1	1	1		
UR020							(2)	(2)	(2)	(2)	(2)	1	1	1					(2)	(2)	1	
UR027							(2)	(2)	(2)	(2)	(2)	1	1	1					(2)	(2)	1	
UR040												(2)	1	1	1						1	
UR060												(4)	2	2	2						2	
UG045												2	2	2	2						2	
UG090												(4)	(4)	2	2	2					2	
UG180														4	4	4					4	

Note: the quantity in brackets requires branched connections.

\* use in normal applications is not recommended



# Adiabatic humidification

The adiabatic humidification process involves the direct evaporation of water in the air without the addition of energy from the outside: the water is finely atomised to maximise the heat exchange surface and then introduced into the environment.

The heat required for vaporisation is not supplied by external sources, but rather by the air being humidified, whic





## Pressurised water humidifiers

humiFog Multizone represents the new generation in high pressure atomised water humidifiers.

The "Multizone" version has introduced two important innovations:

- summer/winter operation means humiFog can be used to humidify the air in winter and adiabatically cool the air in summer. The energy savings obtained guarantee a very short term return on investment.
- the installation of one pumping unit serving several air handling units or rooms further rationalises the investment.

humifog Multizone is suitable for all applications that require high hygienic safety: it's in fact certified as compliant to standards VDI6022/VDI3803/DIN1946, does not atomise recirculated water and does not use chemical biocides but rather pure and simple water.

### Advantages

- very low energy consumption: consumes just 4W per l/h capacity, less than 1% of any steam humidifier;
- summer/winter operation: cools the air by direct and indirect evaporative cooling;
- maximum hygiene: product certified by ILH of Berlin using pure and simple water
- high capacity: standard models are available with capacities from 100 to 600 kg/h and custom models up to 5000 kg/h;
- very fine atomisation that requires minimum evaporation space;
- flow control: precise and continuous capacity modulation for humidifying in AHU/ducts;
- constant pressure: capacity modulation in steps at stable water pressure (70 bars): operating mode for humidification and cooling in rooms and multizone applications;
- hygiene: certification to the most recent European standards (VDI6022) obtained for AHU/ducts make humiFog suitable for all applications as regards hygiene, even the most demanding such as hospitals;
- silicone-free versions for painting applications.

### System composition

humiFog multizone is made up of:

- pumping unit with continuous pump modulation (inverter);
- rack with water atomisation nozzles, easy to install inside the AHU/duct;
- stainless steel droplet separator (for certified installations);
- zone controller: in multizone applications the pumping unit (master) controls one zone, receives signals from external controllers or probes and manages the solenoid valves on the distribution system. The other zones have their own zone controller (slave electrical slave) that communicates with the master. The zone panel guarantees independent local control based on the readings from probes or external controllers.
- high pressure connection pipes;
- humidity probes;
- water treatment system (reverse osmosis).



pumping unit



zone controller

## humiFog multizone

UA\*H\*, UA\*Z\*

### Pumping unit

humiFog multizone uses a volumetric pump to pressurise the water, which is atomised by special stainless steel nozzles.

The sophisticated control system allows two different types of operation to be selected:

- **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) in summer;
- **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 silicone-free version, essential for painting facilities.

### 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 and, based on the input signal, 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 signals 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 ( $\pm 5\%$  against the  $\pm 2\%$  guaranteed by the single zone solution), it can manage multiple zones at the same time, without having to install a pumping unit for each AHU or industrial environment.

### Hygiene aspects

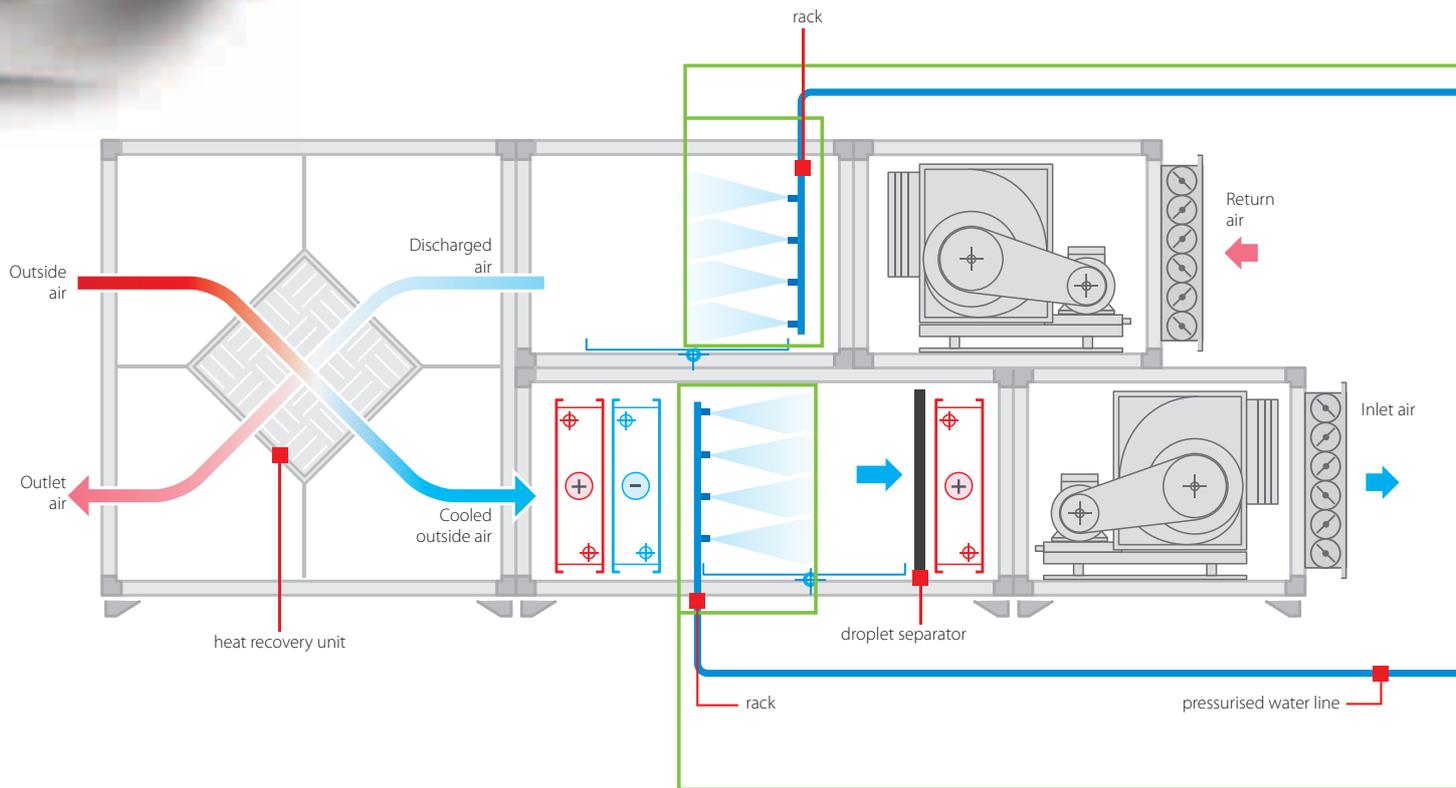
Special attention has been paid to the hygiene of the solution proposed: combining humiFog with the reverse osmosis demineralisation and UV lamp sanitation system guarantees maximum hygiene of the supply water. The built-in controller moreover automatically fills the water lines only when humidification is required. At the end of the humidification cycle, all the lines are emptied avoid stagnation of water in the system. In the event where there is no humidification request for an extended time, automatic periodical washing cycles are activated on the water lines.

All the components of the distribution system in contact with water are made from AISI304 stainless steel.

### Hygiene certification

humiFog for AHU/ducts, thanks to:

- the special atomising rack that allows complete emptying;
  - fully stainless steel droplet separator made by CAREL;
- has received VDI6022 certification: "Hygienic standards for ventilation and air conditioning systems, Offices and assembly rooms", from ILH Berlin. In addition, the product is certified to DIN1946, VDI3803, SWKI2003-5 (CH), ÖNORM H 6021 (A).



## Direct and indirect evaporative cooling

Summer-winter operation means the appliance can be used for air humidification in winter and to adiabatically cool the air in summer.

The cooling effect is 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 evaporated absorbs 68 kW of heat from the air.

Direct evaporative cooling can extend the operating range of freecooling by adiabatically cooling the inlet air, while maintaining the relative humidity set point. Indirect evaporative cooling, on the other hand, is performed on the discharge air leaving the building, cooling this by several degrees without humidity limits. Before being discharged the air flows through a cross-flow heat exchanger at the same time as the fresh inlet air, thus reducing the air inlet temperature and allowing a smaller and lower capacity cooling coil on the chiller, with reduced power consumption.

The efficiency of this solution depends on the heat recovery unit, however easily exceeds 50%!

## Applications

### Humidification:

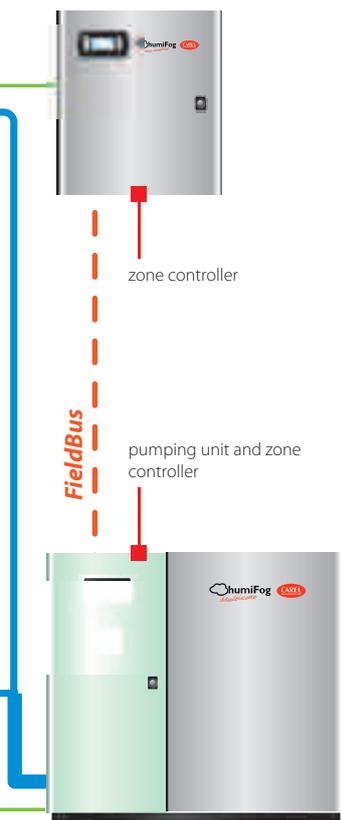
- office buildings;
- hospital applications
- printing industry;
- textiles industry;
- microelectronics and pharmaceuticals industry;
- automobile industry (painting booths).
- fruit/vegetable cold stores;
- paper, timber, tobacco stores, etc.

### Cooling:

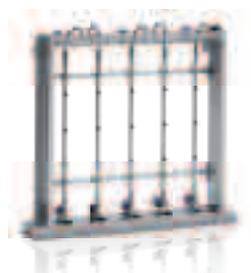
- industrial, especially textiles, printing, wood processing, machining;
- cooling outdoor environments.

## Installation suitable for all environments

humiFog multizone is the ideal system for direct humidification into rooms. By keeping the water pressure high (70 bars), each nozzle generates a cone of very fine droplets (average dia. 10 to 15  $\mu\text{m}$ ) that evaporate completely in a short time and space. The air temperature and humidity conditions, together with the presence of objects, may represent limits that must be considered in the installation to prevent the droplets from wetting objects, machinery and people in the room. When these limits are not satisfied, blowers can be used that, due to the cushion of air generated by the built-in tangential fan, carry the droplets of water in a substantially horizontal trajectory.



### Solution for installation in AHU/duct



#### Rack made-to-measure for the AHU/duct (RACK\*)

Atomising rack made to measure for the AHU/duct. This is made up of nozzle manifolds, atomising nozzles, manifold on-off valves, manifold drain valves, vent valve and the main drain valve. All the metal parts are made from stainless steel. The on-off solenoid valves control the number of nozzles that are open, while the drain and vent solenoid valves are used to empty the rack.



#### Certified droplet separator for AHU/ducts (UAKDS\*, SPFR\*)

The droplet separator has the purpose of trapping the droplets of water that are not completely evaporated, so as to prevent them from leaving the humidification chamber. The separator is supplied in standard modules that can be assembled to cover the cross-section of the AHU/duct. It is available in two versions: with fibreglass or AISI304 steel filtering material, the latter required for VDI6022 certified installations. The pressure drop is very low and, with air speeds up to 3.5-4m/s, varies from 30 Pa when dry to around 70 Pa when wet. The structure of the droplet separator is always in stainless steel, and guarantees fast and effective water drainage.



### Supply water characteristics

For correct operation, the humiFog multizone system should be supplied with demineralised water (0 to 50  $\mu\text{S}/\text{cm}$ ). To reach these values, a reverse osmosis system is required. This treatment involves having the water pass through a special membrane that, being permeable only to molecules the same size as  $\text{H}_2\text{O}$ , eliminates almost all the mineral salts present. As well as representing a physical barrier to bacteria, reverse osmosis water treatment removes mineral salts, and limits maintenance requirements inside the duct to simple periodical inspections!

### Water treatment system

CAREL supplies reverse osmosis water treatment systems complete with pre-filtration, dechlorination, reverse osmosis treatment and UV sanitisation. Supplied with mains drinking water, these systems produce suitable demineralised water for supplying humidifiers.

### Solution for installation in rooms



#### Steam blowers for all environments (DL\*)

This consists of a tangential fan located behind a manifold (pipe) with nozzles. The tangential fan generates a flow of air that assists the evaporation of the droplets and the sustains the droplets with a cushion of air, so as to produce an essentially horizontal trajectory. The entire assembly is enclosed in a metal structure that also contains the on-off and solenoid drain valves, controlled by the pumping assembly.

The steam blowers have capacities that reach 32 kg/h in just 1.5 m in length! The "Master" version, with a built-in pressure switch, can independently manage the on-off and drain solenoid valves. The steam blowers can be connected in series to make up a distribution line.



#### Room distributors (UAKC\*FP\*)

These consist of stainless steel manifolds (pipes) with nozzles that are installed inside the room being humidified/cooled. The manifolds are available in various models, to fit nozzles from one side only or on two opposing sides. A series of manifolds make up a line in the distribution system. The stainless steel manifolds are 2450 mm long, with an outside diameter of 16 mm. Each distribution line can be connected directly to the pumping unit or shutoff by a solenoid valve. By controlling these solenoid valves, humiFog manages the capacity of the distribution system, thus obtaining stepped modulation in the capacity (up to 6 steps). Each line has a drain valve that is mainly used to quickly discharge the water pressure when the line stops atomising: when opening the drain valve, the pressure quickly drops from 70 to 0 bars and the line is emptied, preventing the nozzles from dripping. In addition, the drain valves are used for the periodical automatic washing cycles managed by humiFog.

The on-off solenoid valves are made from stainless steel in the normally closed version, up to 100 bars, while the normally open valves open automatically at around 15 bars; both have 1/8" GAS F fittings.



## Controllers

Simple and intuitive user interface

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:

**i** 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

## Accessories and options



### Pulsation damper

The damper reduces the peaks in pressure generated by the pump pistons so as to limit pulsation along the pipes and the distribution system. Recommended for high capacity systems starting from 200 kg/h.



### Liquid Teflon (5024612AXX)

Liquid Teflon for high pressure water fittings, 100 ml package. This is used to seal the nozzles and all the fittings on the rack and the blowers pre-assembled by CAREL



### Connection pipes and fittings (UAKT)

CAREL can supply hoses or stainless steel pipes for connection between the pumping assembly and the rack or the room distribution system, as well as high pressure (up to 100 bar) compression fittings for stainless steel pipes.



### Junction boxes (UAKDER\*0000)

Junction box for the solenoid valves fitted on the atomising rack in the duct. Models available for 4 to 8 solenoid valves.

## Spare parts



### Filter kit (UAKFW60MLO)

The filter located in the pumping unit removes any impurities from the water. It should be replaced if the pressure drop exceeds 0.5 bar. The kit includes:

- 60 µm water filter, 9" high.



### Valve and gasket kits for pumps

(UAKVGO1500, UAKVGO1800, UAKVGX1500, UAKVGX1800)

The valve kit for the pump pistons includes the valves and the gaskets for the three pistons. The valves should be replaced approximately every 3,000 operating hours. To avoid water leaks, the pump gaskets should also be replaced approximately every 3,000 operating hours.

Each kit contains all the items required.



### Nozzles (UAKMTP\*)

Stainless steel, 1/8 NPT M fittings, with 60 µm filter and non-return valves. Available with capacities of 1.45, 2.8 and 4 kg/h at 70 bars.



### Pump oil (5024646AXX)

Special oil is available for the pump. A 1 l bottle is sufficient for a complete oil change, to be performed every 3,000 operating hours.

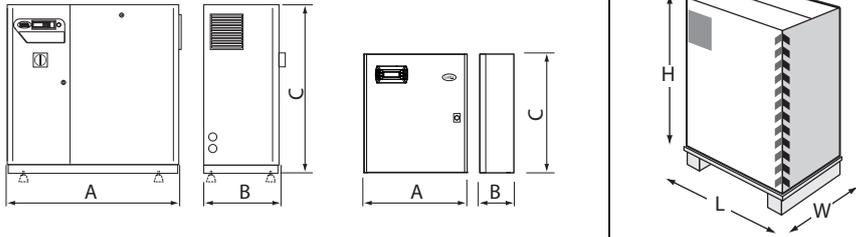
Models					
Features	UA100*	UA200*	UA320*	UA460*	UA600*
<b>General</b>					
Rated capacity kg/h	100	200	320	460	600
Power supply	230 V, 1 phase, 50 Hz or 208 V, 1 phase, 60 Hz				
Power consumption, pumping unit (kW)	0.955	0.955	1.15	1.15	1.95
Power consumption, zone controllers (kW)	0.28				
Operating conditions	1T40 °C <80 % RH non-condensing				
Storage conditions	1T50 °C <80 % RH non-condensing				
Index of protection	IP20				
<b>Water fill</b>					
Connection	G3/4" F (NPT3/4F for UL versions)				
Temperature limits	1T40 °C / 34T104 °F				
Water pressure limits (MPa)	0.3 to 0.8				
Total hardness (ppm CaCO <sub>3</sub> )	0 to 25				
Conductivity limits (µS/cm)	0 to 50 µS/cm (stainless steel pump) – 30 to 50 µS/cm (brass pump)				
<b>Water outlet</b>					
Connection	M16.5m DIN 2353 (G3/8" F) (NPT3/8F for UL versions)				
<b>Water drain</b>					
Connection (dia. mm)	Stainless steel pipe OD 10 mm/ 0.4 inch				
<b>Network</b>					
Network connection	RS485; Modbus® (others upon request)				
<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>Certification</b>					
Hygiene certification for generic air-conditioning 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)				
Hygiene 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)				

Steam blower models	
Specifications	DL*
Water inlet	M12 x 1 male
Water outlet	M12 x 1 male or TNF 6x8 for DLxxSDxxxx & 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 model w/ 4 nozzles, 1500 m <sup>3</sup> /h model w/ 8 nozzles
Dimensions	850 model with 4 nozzles, 1500 model w/ 8 nozzles, 200x200 mm
Material	stainless steel
Capacity of the nozzles at 70 bars (kg/h)	MTP0= 1.45 kg/h, MTP1= 2.8 kg/h, MTP2= 4 kg/h
Nozzle housings	4 or 8
Manifold fittings	1/4" G female
Manifold dimensions	2.450 mm, Ø14 mm
Maximum length of distribution lines (m)	50 (contact CAREL for longer lines)

Water treatment systems	
CMROUV0320	320 kg/h reverse osmosis system with UV lamp sanitation, for humiFog, mc and ChillBooster adiabatic humidifiers
CMROUV0600	600 kg/h reverse osmosis system with UV lamp sanitation, for humiFog, mc and ChillBooster adiabatic humidifiers
CMROUV1200	1200 kg/h reverse osmosis system with UV lamp sanitation, for humiFog, mc and ChillBooster adiabatic humidifiers
CMROL00000	confezione da 25 kg di liquido antiincrostante Antiscalant *

\*: The Antiscalant R.O.1 liquid can be used for the supply water to reverse osmosis systems; its sequestration and particle dispersion action drastically reduces the precipitation of salts on the osmosis membranes, extending their working life. This is required for the correct operation of the system.

### Dimensions (mm) & weights (kg)



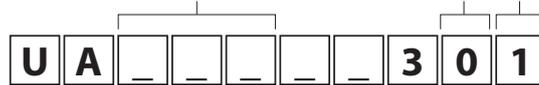
Mod.	AxBxC	weight	LxWxH	weight
UA*H*	1030x400x860	85 to 100	1100x455x1020	100 to 120
UA*S*	515	19,5	605x255x770	21

### Unit code

Capacity:  
 100= 100 kg/h  
 200= 200 kg/h  
 320= 320 kg/h  
 460= 460 kg/h  
 600= 600 kg/h

Pulsation damper:  
 0= no damper  
 1= with damper

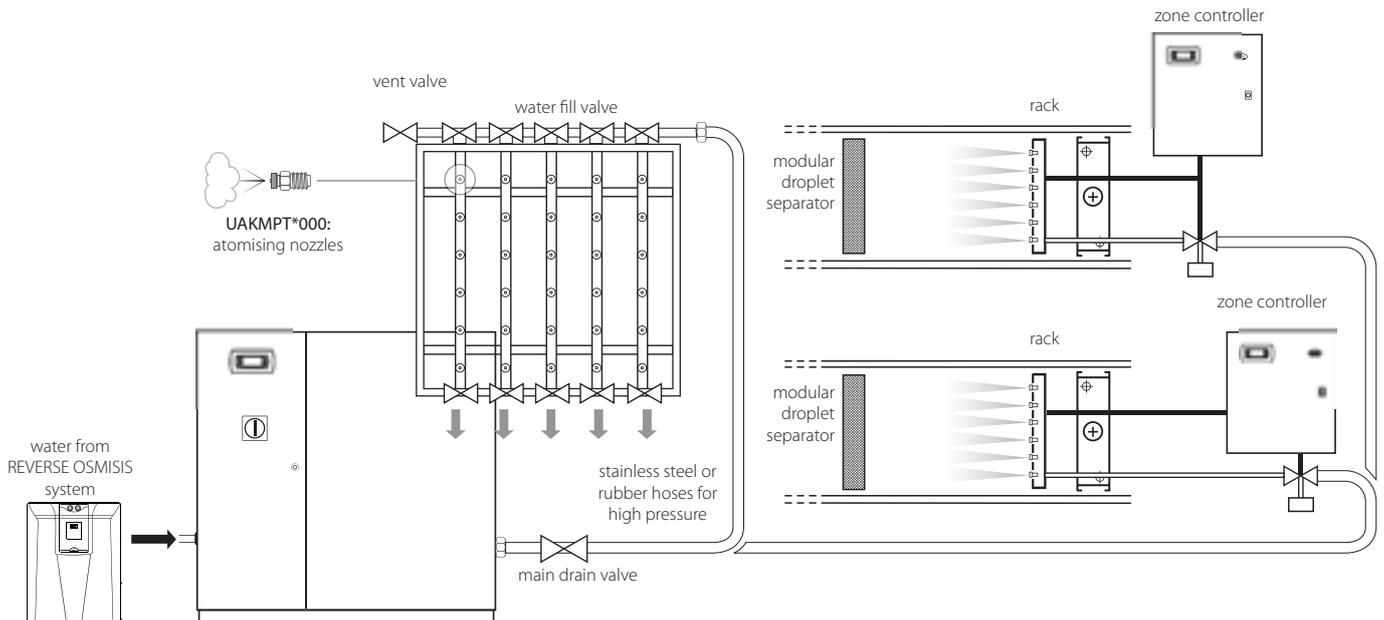
Material:  
 0= brass  
 1= stainless steel  
 2= stainless steel, silicone free



HD= single zone pumping unit 230 V 50 Hz single phase  
 HU= single zone pumping unit 208 V 60 Hz single phase  
 ZD= multizone pumping unit 230 V 50 Hz single phase  
 ZU= multizone pumping unit 208 V 60 Hz single phase  
 SD= zone control cabinet 230 V 50 Hz single phase  
 SU= zone control cabinet 208 V 60 Hz single phase

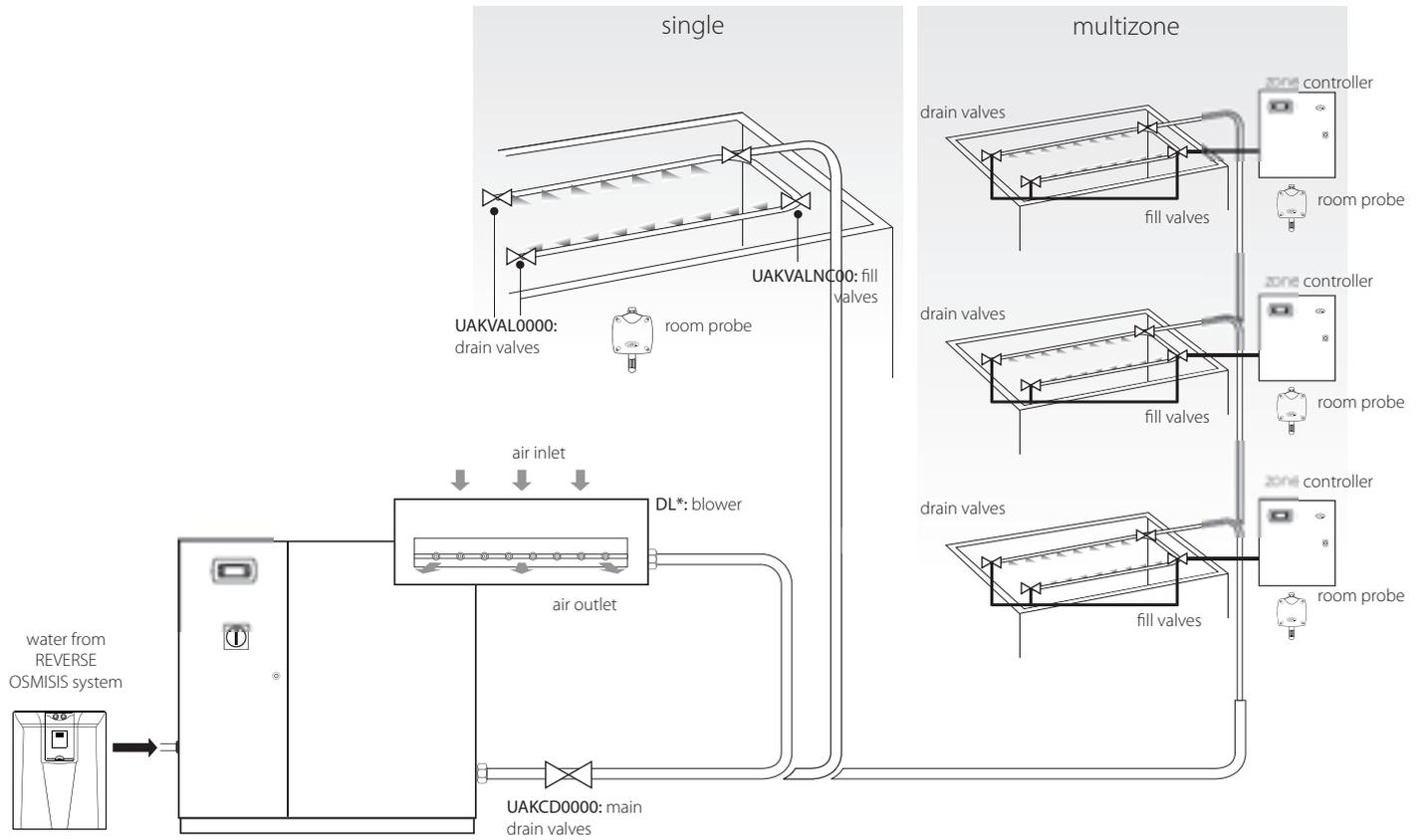
## OVERVIEW DRAWING

### humiFog DUCT



# OVERVIEW DRAWING

## humiFog ROOM





# Compressed air and water atomising humidifiers

The mc multizone adiabatic humidification system is ideal for the humidification of medium/large industrial environments and large volumes of air, in the duct and for air handling units.

The system uses compressed air to atomise the water into very fine droplets that evaporate spontaneously in the air, humidifying and cooling it. In fact, evaporation occurs by "absorbing" sensible heat from the air that, as a consequence, is cooled.

The system features the following main parts

- control cabinet, fitted with the electronic controller;
- special atomising nozzles. The nozzles can be installed in the AHU/duct or directly in the room being humidified/cooled;
- manifolds for installation in the duct;
- UV steriliser lamp and protective filters.

## Control cabinet

This contains the electronic controller that manages the supply of water and compressed air to the nozzles. The water is atomised based on an external control signal or, in the case of independent control, so as to maintain the humidity/temperature set point. This also manages all the automatic cycles, such as cleaning the nozzles and washing.

The system has the ability to control the humidity independently in multiple zones (rooms, AHUs, cold rooms) using a master-slave layout. The layout has one MASTER and multiple SLAVES, up to 5, connected in a pLAN (3 wires, digital communication). The Master is fitted with a display for accessing the readings, viewing the status and messages on the master and the slaves. The slaves have their own internal control and can be set to continue operating even if the connection to the master is interrupted.

The Master-Slave configuration can be used as follows:

- **high capacity applications:** applications in rooms or ducts where more than 230 kg/h of humidification is required, and thus more than one mc cabinet. The control signals (probes, external signals, limit probe) are connected to the MASTER only. The master and the slaves generate a humidification/cooling capacity that is proportional to demand and their capacity. In this way, a system can be developed with a capacity up to 1380 kg/h;
- **MULTIZONE applications:** applications in multiple zones, rooms or ducts, each with its own humidity/temperature set point. Note that, in the

case of installations in large spaces, these can be divided into zones, each with their own humidity/temperature probe, using the multizone Master-Slave system described here. Each cabinet, master and slave, receives the signals (probes or external signals) from the corresponding zone, and generates the capacity required to reach its own set point. All the parameters, the status and messages of all the cabinets can be viewed and edited from the user interface on the MASTER.

## Automatic nozzle self-cleaning system

Each cabinet, Master and Slave, periodically activates a cycle for drying and cleaning the atomising nozzles. A special piston driven by a powerful spring periodically removes any mineral salts deposited in the opening of the nozzles, thus significantly reducing the frequency of cleaning operations.

## Guaranteed hygiene

mc multizone ensures a very high level of hygiene, as a result of:

- automatic emptying of the water line whenever the unit stops;
- automatic periodical washing of the water line when the unit is not operating.

This prevents the nozzles from spraying stagnant water. In addition, an effective UV steriliser lamp, installed upstream of the MCmultizone, shines UV light on the flow of supply water, helping to eliminate any biological contaminants that may be present, such as bacteria, viruses, mould, spores and yeast.

Water quality for mc multizone systems:



## mc multizone

MC\*

The constructional and functional features of the mc multizone allow the use of untreated drinking water. Nonetheless, the quantity and the quality of dissolved minerals affect the frequency of the routine maintenance operations (mainly involving the periodical cleaning of the nozzles) and the quantity of mineral dust deposited by the droplets of water after these have completely evaporated. Demineralised supply water by reverse osmosis should be used. This is also recommended by the main standards, such as UNI 8884, VDI6022 and VDI3803.

### Air compressor

mc multizone requires compressed air, provided by an external compressor, not supplied by CAREL. The volume of air at standard atmospheric pressure required to atomise one litre of water is 1.27 Nm<sup>3</sup>/h, compressed to a pressure between 4 and 10 bars.

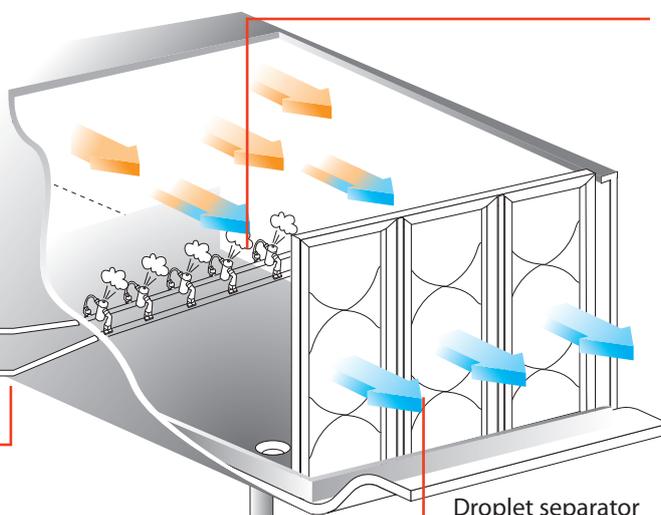
and can be fitted with additional boards for communication using BACnet™; Modbus®, LON, TCP/IP and SNMP.

### Other new features

As well as the alarm relay, a unit status relay and digital inputs are now available to enable mc multizone for operation based on a signal from the compressor, water treatment system and air flow sensor. In addition, mc multizone has a Modbus® port

### Cabinet

The cabinet is available in various models, according to the maximum capacity, type of control (on/off or modulating), type of supply water, Master/Slave and power supply. In the version for demineralised water, the water conductivity is less than 30 µS/cm, all the parts in contact with the water are made from stainless steel and/or corrosion-proof plastic.



### Nozzles

CAREL provides special atomising nozzles, plus an assembly kit for the installation of each nozzle. The nozzles atomise the water to create an extremely fine mist of minute droplets, with an average diameter of 10 µm, which are easily absorbed by the surrounding air, humidifying and cooling it.

### Manifolds

Upon request, CAREL can also provide stainless steel manifolds for installation in the ducts where the atomising nozzles are fitted. The manifolds for installations in the room are not supplied by CAREL.

### Droplet separator

With fibreglass or AISI304 filtering mesh (the same used for the humiFog).



## User interface

Special care has been paid to the user interface: mc multizone is fitted with a large LCD that provides immediately understandable messages even with only partial knowledge of the product. The buttons on the right have the following functions:

- **i** button: immediate access to the main information on the status of the unit (valve status, calendar, etc);
- **⊗** button: set the set point;
- **⊕** button: access a slave cabinet;
- **prog** button: the parameters are available depending on the type of user: user, installer and service, thus simplifying access.

## Water treatment system

CAREL supplies reverse osmosis water treatment systems complete with pre-filtration, dechlorination, reverse osmosis treatment and UV sanitisation. Supplied with mains drinking water, these systems produce suitable demineralised water for supplying humidifiers.



## Accessories



### UV lamp sanitation system and filters (MCKSUV0000, MCKFIL\* and MCC\*)

For optimum operation and to ensure maximum hygiene, a UV sanitising lamp and a water filter are installed upstream of the cabinet. For the compressed air line, CAREL supplies a filter to trap any solid particles, and an oil filter to remove any oil.



### Pressure gauge at the end of the line (MCKM\*)

This has the same purpose as the pressure sensor at the end of the line, described above. In this case, the pressure generated by the cabinet can be adjusted manually so as to reach a pressure of 2.1 bars on the gauge at the end of the line. A pressure gauge is also available for displaying the water pressure at the end of the line.



### Drain solenoid valve at the end of the line (MCKDVWL)

This useful accessory is installed at the end of the water line that supplies the nozzles. In this way, mc multizone can empty the line when the unit is off and perform the automatic periodical wash cycles. These procedures ensure a high level of hygiene by avoiding stagnated water in the line.



### Pressure sensor at the end of the line (MCKPT)

This is installed at the end of the longest compressed air line that supplies the nozzles. In this way, the controller can regulate the air pressure at the optimum value (2.1 bars) at the nozzle that is furthest away, making up for the inevitable pressure drop and enormously simplifying the commissioning of the installation, which will work perfectly right from the very first time. Supplied with 10, 50 or 100 m of cable for easy connection to the control cabinet.

### Nozzles and assembly kit (MCA\* and MCK1AW0000)

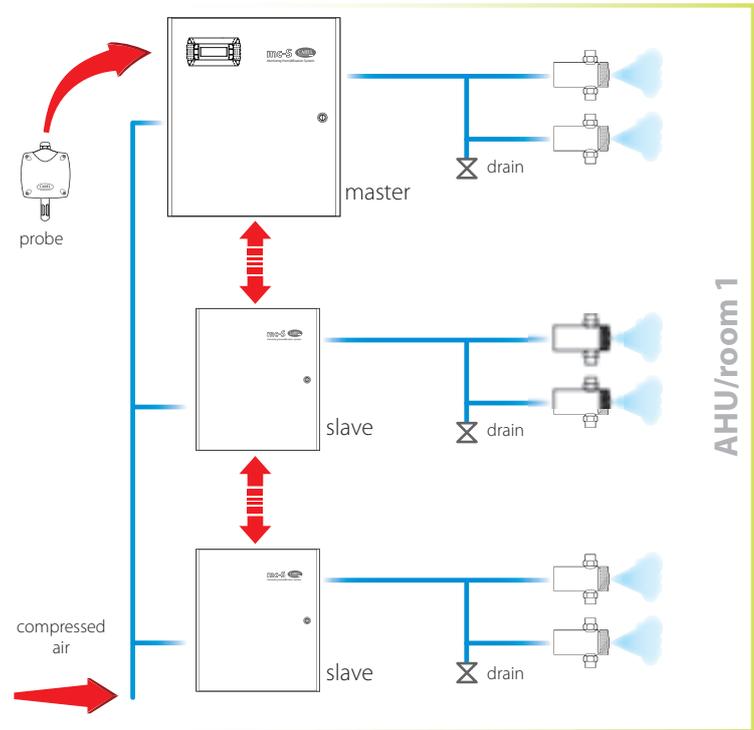
The nozzles, made from AISI316 stainless steel, are available for different flow-rates, but all with the same outside dimensions.

Model	Capacity
A	2.7 l/h
B	4.0 l/h
C	5.4 l/h
D	6.8 l/h
E	10 l/h

Compressed air consumption: each 1 kg/h of atomised water requires 1.27 Nm<sup>3</sup>/h of compressed air.

Dripping is avoided thanks to the closing mechanism in periods of inactivity. The nozzle assembly kit includes the components required for assembly of a nozzle between a manifold in the water line and a manifold in the compressed air line, and is suitable for all types of mc nozzles.

### Example of master/slave system: high capacities



### Spare parts

#### Air/water lines

(MCKA\*, MCKW\* & MCKN\*)

Spare air and water lines are available for the MCmultizone cabinet, including pressure gauges for controlling the compressed air and water pressure, and valves.

#### Gaskets for nozzles

(KITORING03)

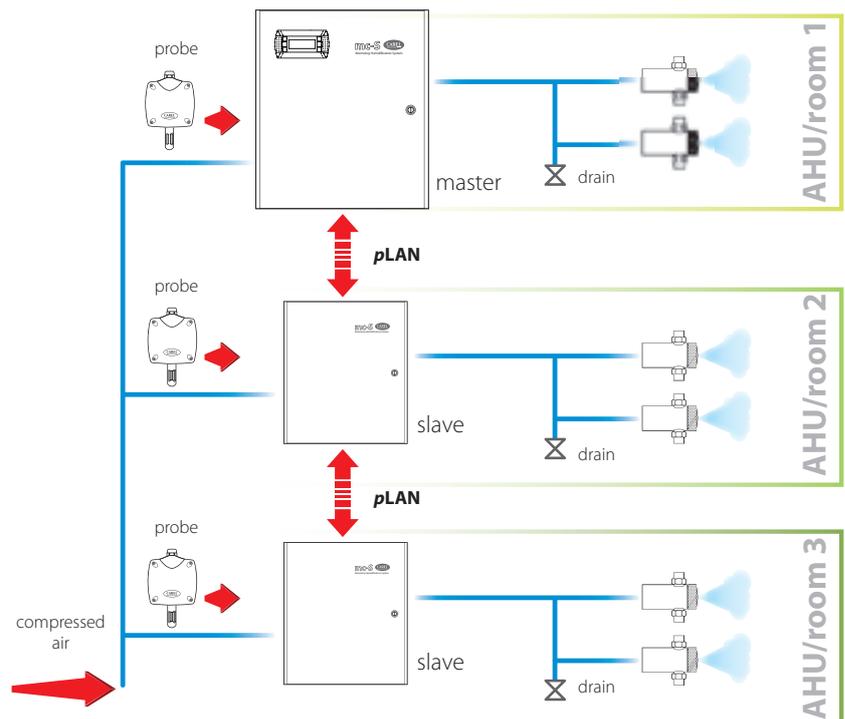
A single kit is available containing all the o-rings for the periodical maintenance of the nozzles.

#### Spare parts for the atomising nozzles

(MCKPIS1000, 1313635AXX, MCKNOZ1000, MCOx200000)

All the parts inside the nozzles are available as spare parts: piston with cleaning needle, spring and internal nozzle. In addition, the top part of the nozzle (cap with atomised water and air opening) is available, identified by the letter A/B.

### Example of master/slave system: multizone

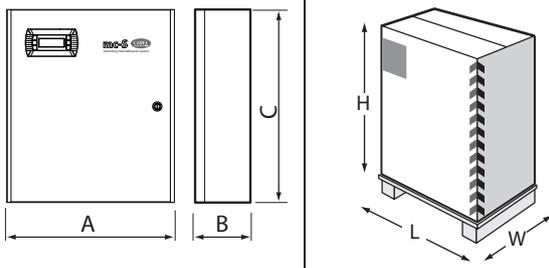


## Models

Specifications	MC060*	MC230*
<b>General</b>		
Maximum humidification capacity (kg/h)	60	230
Power supply	230 Vac single-phase, 50/60 Hz / 110 Vac single-phase 60 Hz, 37 to 48 W	
Operating conditions	1T40 °C, 0 to 80% rH non-condensing	
Storage conditions	-1T50 °C, 0 to 80% rH non-condensing	
Index of protection	IP40	
<b>Water fill</b>		
Connection	1/2" G	1/2" G
Temperature limits (°C)	1T50 °C	
Water pressure limits (MPa - bar)	0.3 to 0.7 - 3 to 7	
Instant flow-rate (l/h)	60	230
Total hardness (ppm CaCO <sub>3</sub> ) *	0 to 400	
Conductivity limits (µS/cm) *	0 to 1250	
<b>Water drain</b>		
Connection	TCF 8/10 or TCF 6/8 mod. with normal water TCF 8/10 mod. with demineralised normal water	
<b>Water outlet</b>		
Connection	1/2" G	1/2" G
Water pressure (MPa - bar)	0.035 + 0.01Δh - 0.35 + 0.1Δh (Δh: difference in height in metres between cabinet and nozzles)	
<b>Linea aria</b>		
Connection	1/2" G	1/2" G
Temperature limits (°C)	1T50 °C	
Water pressure limits (MPa - bar)	0.5 to 0.7 - 5 to 7	
Uscita	1/2" G	1/2" G
Air pressure (MPa - bar)	0.12 to 0.21 - 1.2 to 2.1 (only in the modulating versions does the pressure have intermediate values between the limits)	
<b>Nozzles</b>		
Material	stainless steel (AISI 316)	
Capacity of the nozzles at 2.1 bars (kg/h)	2.7 - 4.0 - 5.4 - 6.8 - 10	
<b>Network</b>		
Network connections	Modbus®, LON, TCP/IP, SNMP	
<b>Air filter</b>		
Dimensions	Ø 62 mm, H= 180 mm, weight= 0.4 kg	
Connections (inlet/outlet)	1/2" G female	
Filtering	5 µm	
<b>Oil filter</b>		
Dimensions	Ø 85 mm, H= 267 mm, weight= 2.1 kg	
Connections (inlet/outlet)	3/8" G female	
Filtering	1 µm	
<b>Water filter</b>		
Dimensions	Ø 50 mm, H= 175 mm, weight= 0.4 kg	
Connections (inlet/outlet)	1/2" G female	
Filtering	5 µm	
<b>UV sanitising lamp</b>		
Dimensions	270x80	
Connections	1/4" gas	
Power supply	25/50 Hz	

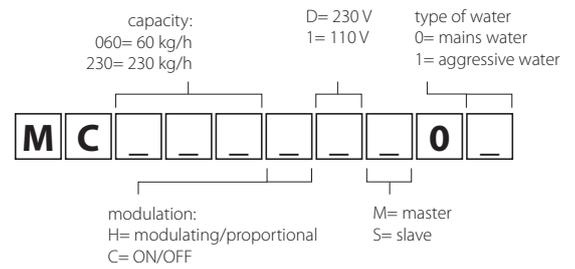
(\*) The constructional and functional features of the mc system allow the use of untreated drinking water. Nonetheless, the quantity and the quality of dissolved minerals affect the frequency of the routine maintenance operations (mainly involving the periodical cleaning of the nozzles) and the quantity of mineral dust deposited by the droplets of water after these have completely evaporated. For optimum operation, demineralised supply water by reverse osmosis should be used. Softened water, on the other hand, should not be used as it does not reduce the concentration of mineral salts. In any case, observe the provisions of the UNI8884 standard "Characteristics and treatment of the water in cooling and humidification circuits", according to which the main characteristics of the water are conductivity < 100 µS/cm and total hardness < 5 °fH (50 ppm CaCO<sub>3</sub>). Similar recommendations are also provided by VDI6022 and VDI3803.

### Dimensions (mm) & weights (kg)

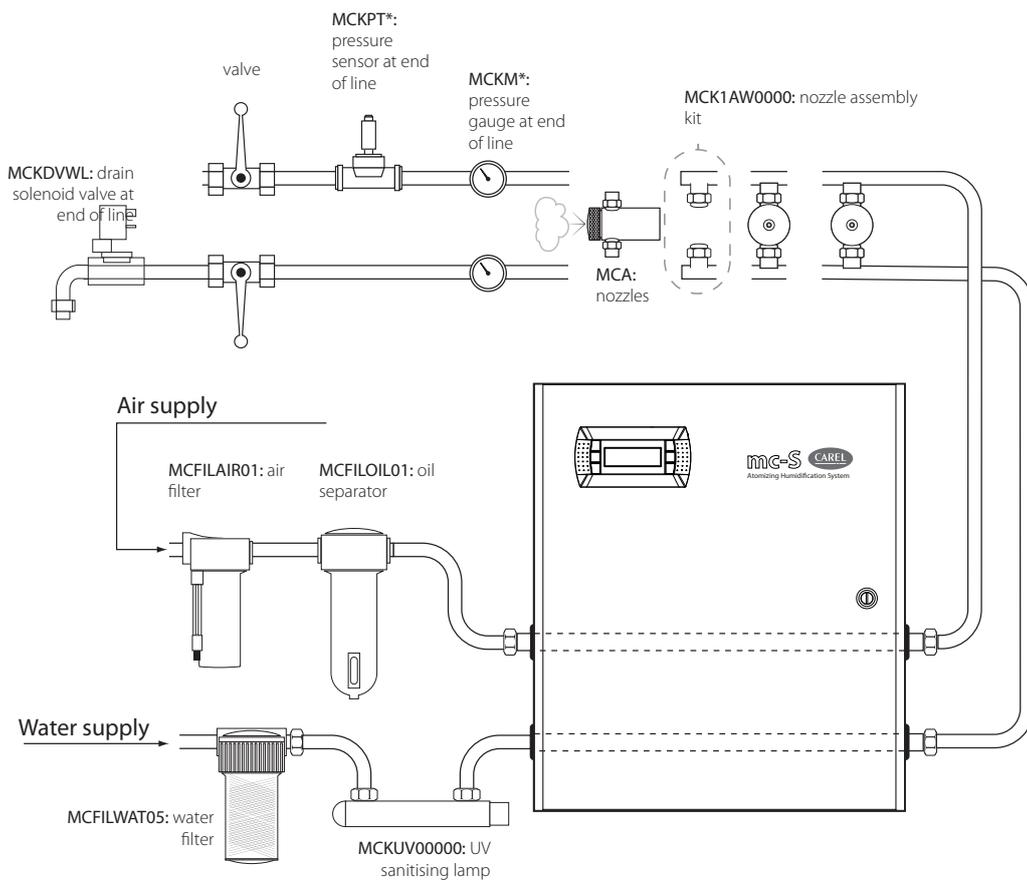


Mod.	AxBxC	weight	LxWxH	weight
MC*	515x165x580	19.5	605x255x770	21

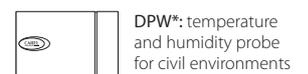
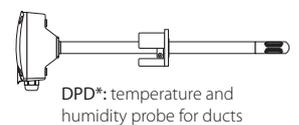
### Unit code



## OVERVIEW DRAWING



### Probes





POCC IT.AI50.B00491



## Centrifugal humidifiers

humiDisk is a small yet sturdy humidifier that uses a spinning disk to atomise the water and transform it into millions of very small droplets that, blown by a built-in fan, are introduced into the environment, where they evaporate, humidifying and cooling the air.

### Very low power consumption

humiDisk is a simple, economic and easy to maintain humidification system, with an energy consumption of just 220 W per 6.5 kg/h of capacity (31 W for the 1.0 kg/h model).

### Guaranteed hygiene

The water tank inside the humiDisk contains just 0.055 litres of water, which is atomised, at maximum capacity, in just 30 s for the 6.5 kg/h model and 3 minutes for the 1 kg/h model. The water in the tank is therefore changed very rapidly, meaning the humidifier substantially works with non-stagnant running water, so as to guarantee the best hygiene conditions.

### Adjustable capacity (humiDisk<sub>65</sub> only)

The operation of the humiDisk is controlled by an electronic board fitted with a trimmer for setting the capacity of the humidifier, from 1.1 to 6.5 kg/h, making it suitable for all applications.

### Automatic wash cycles (humiDisk<sub>65</sub> only)

The board, as well as managing the normal operation of the appliance, also performs a tank washing cycle when starting the unit, and an emptying cycle at the end of the humidification request. This avoids having stagnated water inside the unit.

**Important:** to ensure a higher level of hygiene, when using the CAREL electrical control panels, the humidifier also washes the water tank at the start of each humidification cycle.

### Water used

humiDisk can operate on both mains water or treated water. The quantity and quality of the minerals dissolved in the water affect the frequency of the routine maintenance operations and the amount of dust generated. For best operation, use demineralised water (do not use softened water, as this does not reduce the content of minerals dissolved in the water).

In any case, observe the provisions of the UNI8884 standard "Characteristics and treatment of the water in cooling and humidification circuits", according to which the main characteristics of the water are conductivity < 100 µS/cm and total hardness < 5 °fH (50 ppm CaCO<sub>3</sub>). Similar provisions are

also described in standards VDI6022, VDI3803.

### Advantages

- simplicity:
  - requires just the 230 Vac power supply and the mains water and drain lines;
  - Operation is ON/OFF;
- hygienically safe:
  - very small water tank, only 55 millilitres;
  - washing procedure at unit start;
  - emptying at the end of the humidification cycle;
  - washing procedure at the beginning of every cycle (with CAREL control panel only);
- modularity: 1 or 2 humiDisk<sub>65</sub> units can be controlled in parallel using the special control panel, or up to 10 humiDisk<sub>10</sub> units using the CAREL humidistat.



## humiDisk<sub>10</sub> & humiDisk<sub>65</sub>

UC\*

### Applications

- cold rooms, storage facilities and ripening rooms for produce, such as fruit and vegetables, where low humidity level causes weight loss and product spoilage;
- printing facilities, where the correct level of humidity must be maintained to avoid variation in paper size and consequent misprints; the correct humidity value reduces the probability of electrostatic discharges and adhesion of the sheets of paper;
- textile industries, where the maintenance of the required humidity according to the production process and the type of material used is fundamental.

### Installation and accessories

humiDisk can be installed on wall or hung by chains from the ceiling.

The humiDisk<sub>65</sub> is complete with accessories for wall and ceiling mounting, as well as the water fill and drain hoses.

The humiDisk<sub>10</sub> is available in two versions:

- with accessories for ceiling installation only;
- also complete with wall-mounting bracket and water fill and drain hoses.

### Accessories



#### UV lamp sanitation system (MCKSUV0000)

For optimum operation and to ensure maximum hygiene, a UV sanitising lamp is installed upstream of the cabinet. The lamp shines UV light on the flow of supply water, helping to eliminate any biological contaminants that may be present, such as bacteria, viruses, mould, spores and yeast.



#### Electrical panels with electronic humidity controller

CAREL supplies electrical panels fitted with electronic humidity controller. By connecting a humidity probe to the controller, this can activate one or two humiDisk<sub>65</sub> units, in parallel, so as to maintain the humidity level to the set value. The humidity measured by the probe can be read on the display of the controller. The humidity probe is not included in the electrical panel.



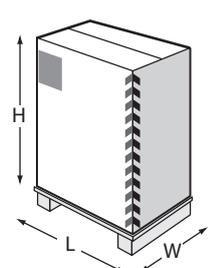
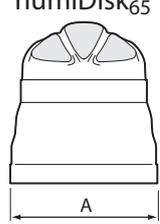
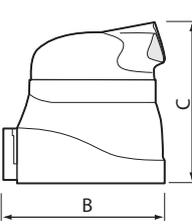
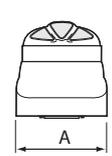
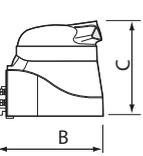
#### Humidistat

The simple and low-cost mechanical humidistat can be connected directly to one or more humidistat units (up to a maximum of 10 units in parallel, for humiDisk<sub>10</sub>, or one humiDisk<sub>65</sub>). Used to set the desired humidity by simply turning the knob.

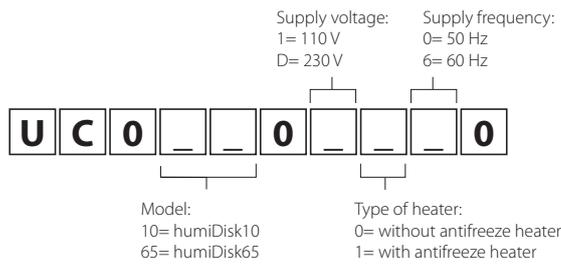
#### Antifreeze device (humiDisk<sub>65</sub> only)

humiDisk<sub>65</sub> can be supplied with an optional antifreeze device: an electric immersion heater, controlled by the electronic board and a temperature sensor that is activated when the temperature inside the unit approaches 0 °C. The appliance can operate at temperatures down to around 1 °C without the antifreeze device, and down to -2 °C with the device (optional). This is especially useful for applications in fruit and vegetable cold stores.

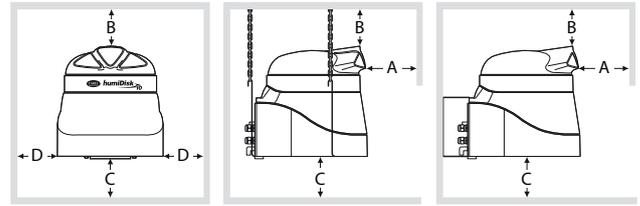
<b>Models</b>		
<b>Specifications</b>	<b>humiDisk<sub>10</sub></b>	<b>humiDisk<sub>65</sub></b>
<b>General</b>		
Capacity	1 kg/h at 230 V 50 Hz 1.2 kg/h at 110 V 60 Hz	6.5 kg/h adjustable from 0.85 to 6.5 kg/h
Power supply	230 V, 50 Hz - 110 V, 60 Hz	230 V, 50 Hz - 110 V, 60 Hz
Power input	31 W	230 W - (290 W with antifreeze heater)
Air flow-rate	80 m <sup>3</sup> /hr (47 CFM)	280 m <sup>3</sup> /hr (165 CFM)
Water content	0.055 litres	0.055 litres
Operating conditions	1T35 °C (34 to 95°F)	1T35 °C (34 to 95°F) WITHOUT antifreeze heater
	-	-2T35 °C WITH antifreeze heater (not available for the US version)
	0 to 100% rH non-condensing	0 to 100% rH non-condensing
Antifreeze device	no	yes (European version only)
Index of protection	IPX4	IPX4
Electronic board for capacity control	no	si
Electrical panel with mechanical humidistat	no	yes (optional)
Mechanical humidistat	yes (optional)	yes (optional)
Accessories for installation	accessories for ceiling installation only INCLUDED. accessories for wall mounting, water fill & drain hoses NOT included, available as options.	accessories for wall and ceiling mounting, water fill and drain hoses included.
Certification	CE and ETL	CE and ETL
Fill connections	Ø10 mm (external)	3/4 G
Drain connection	Ø10 mm (external)	3/4 G
<b>Water</b>		
Supply water pressure	100 to 1000 kPa	100 to 1000 kPa
Water temperature limits	1 to 50 °C (33.8 to 122 °F)	1 to 50 °C (33.8 to 122 °F)
Water total hardness limits (*) (**)	max 30 °FH (max. 300 ppm CaCO <sub>3</sub> )	max 30 °FH (max. 300 ppm CaCO <sub>3</sub> )
Water conductivity limits (**)	100 to 1200 µS/cm	100 to 1200 µS/cm
(*) not less than 200% of Cl <sup>-</sup> in mg/l		
(**) The quantity and quality of the minerals dissolved in the water affect the frequency of the routine maintenance operations and the amount of dust generated. For best operation, use demineralised water (do not use softened water, as this does not reduce the content of minerals dissolved in the water).		
In any case, observe the provisions of the UNI8884 standard "Characteristics and treatment of the water in cooling and humidification circuits", according to which the main characteristics of the water are conductivity < 100 µS/cm and total hardness < 5 °FH (50 ppm CaCO <sub>3</sub> ).		

<b>Dimensions (mm) &amp; weights (kg)</b>				
<b>humiDisk<sub>65</sub></b>		<b>humiDisk<sub>10</sub></b>		
				
Mod.	AxBxC	weight	LxWxH	weight
humiDisk10	302x390x312	4,3	400x400x350	5
humiDisk65	505x610x565	17,6	640x600x665	20

## Unit code



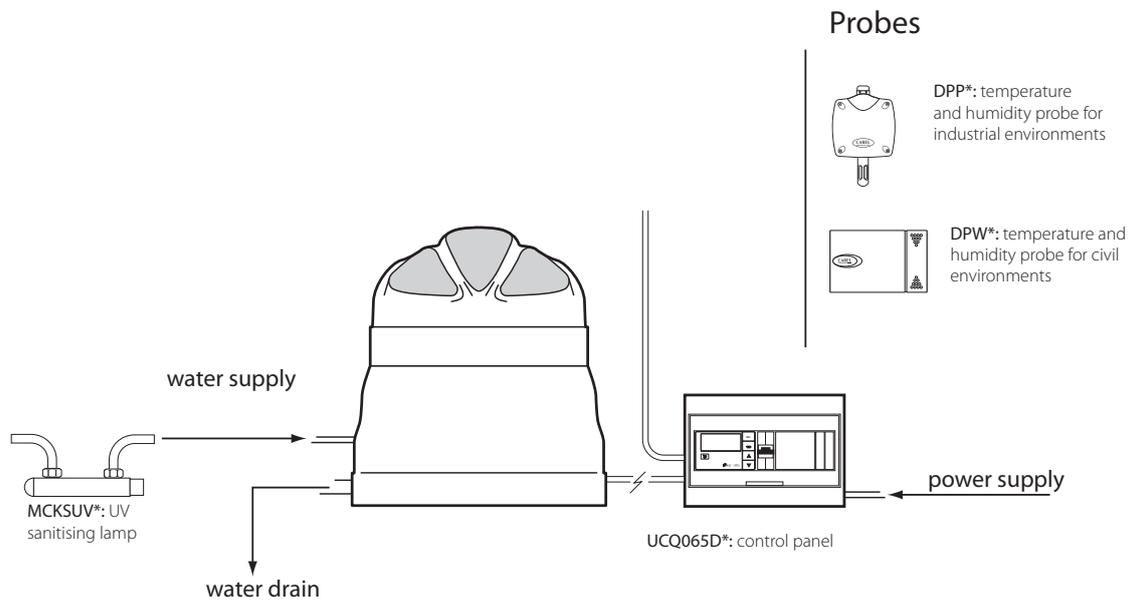
## Positioning



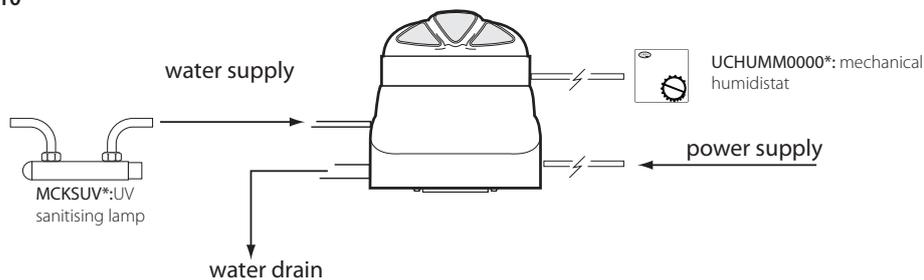
humidifier		A	B	C	D
humiDisk <sub>10</sub>	distance (m)	≥2	≥0.5	≥1.5	≥0.5
humiDisk <sub>65</sub>		≥3	≥1	≥1.5	≥0.5

# OVERVIEW DRAWING

## humiDisk<sub>65</sub>



## humiDisk<sub>10</sub>





# Evaporative cooling

Spontaneous evaporation of the finely atomised water absorbs energy, reducing air temperature.

Evaporative cooling may be direct or indirect, the latter without increasing the humidity of the air.

This gives an effective cooling system with very low power consumption.





## Atomisers - evaporative cooling

ChillBooster is an evaporative cooling system used by liquid coolers and condensers, such as chillers and drycoolers, for air-conditioning and refrigeration applications. ChillBooster can be used in ducts or sections of air handling units to create a simple evaporative cooling system.

ChillBooster atomises water into very small droplets that are absorbed by the air, which is cooled. Indeed, 1 litre of water atomised by ChillBooster creates droplets with a total surface area of 170 m<sup>2</sup>: the water evaporates quickly, removing sensible heat from the air and thus cooling it.

100 litres/h of atomised water absorb 68 kW of sensible heat from the air, for a power consumption of just 0.35 kW!

### Performance

The ChillBooster effect is significant:

- Evaporative cooling of the air: evaporation of the droplets cools the air by several degrees; 5-7 °C less, measured in real applications!
- Evaporation from coil fins: applied on chillers or drycooler, evaporative cooling of the air is augmented by the effect of water evaporating from the fins, giving an overall increase in capacity that can easily reach 60%!!

### Advantages

- **easy to install:** The water distribution system, thanks to the nozzle racks available in various lengths, quick fittings and connection hoses, means ChillBooster is easy to install without requiring special tools or welding.
- **hygiene:** ChillBooster has been designed with special attention to hygiene aspects:
  - Automatic drain due to inactivity: drain solenoid valve on the pumping unit and at the end of the line to empty the water whenever the unit stops;
  - Less biological contaminants: UV lamp disinfection (optional);
  - Can be used with demineralised water: ChillBooster is suitable for use with

demineralised water, intrinsically much safer due to the very low content of mineral salts, bacteria, algae, etc.

- **ideal for retrofit installations:** the IP55 pumping unit and the easy to install modular system make ChillBooster ideal for retrofitting chillers, drycoolers and liquid coolers.
- **very low energy consumption:** ChillBooster has extremely low power consumption; a system for drycoolers with an air flow-rate of 200,000 m<sup>3</sup>/h atomises 1000 litres/h, for a power consumption of less than 0.7 kW!



## ChillBooster

AC100D\*, AC050D\*, AC010D\*

ChillBooster is made up of a pumping unit and a water distribution and atomisation system:

- pumping unit that delivers pressurised water to the distribution system:
  - electrical panel for ON/OFF capacity control;
  - pump supply solenoid valve;
  - pump intake pressure reducer and adjacent pressure gauge;
  - water inlet pressure switch;
  - paddle pump with integrated pressure control valve set to 10 bars;
  - outlet pressure gauge;
  - thermal shut-off valve for high temperature protection;
  - drain solenoid valve for unit stoppage;
- modular stainless steel manifolds, 20 mm diameter;
- atomising nozzles;
- drain solenoid valve for distribution system at the end of the line;
- corrugated steel connection pipes;
- metal compression fittings;
- UV water sanitisation system inside the cabinet (optional).

The pumping unit is available in two versions: version for demineralised water, recommended, in stainless steel, or alternatively for normal water, with brass pump.

### Supply water and maintenance

ChillBooster can operate on untreated drinking water and demineralised water. Following the evaporation process, the minerals dissolved in the supply water will partly be carried by the flow of air, in the form of fine dust, and will thus accumulate on the surface of the heat exchanger fins or in the duct.

The nature and quantity of minerals contained in the supply water affect the frequency of the routine maintenance operations required due to fouling and, in extreme cases, corrosion of materials. These problems can be minimised by using demineralised water from reverse osmosis, as specified by the relevant standards, such as UNI 8884, VDI6022, VDI3803.

When coupled with a chiller/drycooler, to limit fouling on the coil surface when untreated water is used, ChillBooster operation should only be activated when strictly necessary and in any case typically no more than 200 hours a year.

### Water treatment system

CAREL supplies reverse osmosis water treatment systems complete with pre-filtration, dechlorination, reverse osmosis treatment and UV sanitisation. Supplied with mains drinking water, these systems produce suitable demineralised water for supplying humidifiers.





## ChillBooster for chillers or drycoolers

ChillBooster cools the air before it reaches the unit that cools the fluid in the coil. Atomisation is performed against the flow of air so that the droplets have more time to evaporate. The cooled air is then drawn in by the fans and increases the heat exchange capacity across the entire coil! Some of the water droplets also wet the fins on the coil: this water tends to evaporate, again absorbing heat and further boosting capacity. Some of the water then drops from the fins and needs to be drained.

ChillBooster allows liquid coolers and condensers to operate at rated capacity even in the hotter periods usually coincide with maximum load, avoiding the costly need to oversize the systems.

### pRack

pRack is the CAREL solution for the complete management of compressor racks, including many innovative functions to ensure energy saving, reduced installation costs and easy operation. pRack manages ChillBooster for air-cooled condensers, maximising performance during high summer temperatures and minimising energy consumption. Especially suitable for CO<sub>2</sub> gas coolers, ChillBooster can be activated as the last condenser step or as an emergency procedure.



## ChillBooster for ducts or air handling units

ChillBooster adiabatically cools the air in the duct or air handling unit using a simple and easy to install atomisation system: the manifolds are installed on vertical bars (not supplied by CAREL) in series, with the drain valve fitted at the lowest point. ChillBooster features simple on/off control that activates atomisation at a capacity that depends on the number of nozzles installed.

ChillBooster can be used to cool the inlet air, thus reducing the load on the cooling coil and the chiller, or alternatively to cool the discharge air that, via a cross-flow heat exchanger, can in turn be used to cool the inlet air.

The latter solution cools the air without increasing the humidity.

### Components



**Solenoid valve at the end of the line**  
Brass or stainless steel solenoid valve, 1/2" GAS, normally open to drain water due to inactivity.



**Quick fittings**  
Compression fittings for unthreaded 20 mm dia. pipes; brass or stainless steel.



**Nozzles**  
Nozzles with 5, 7.5 or 15 kg/h capacity, 10 bar operating pressure.

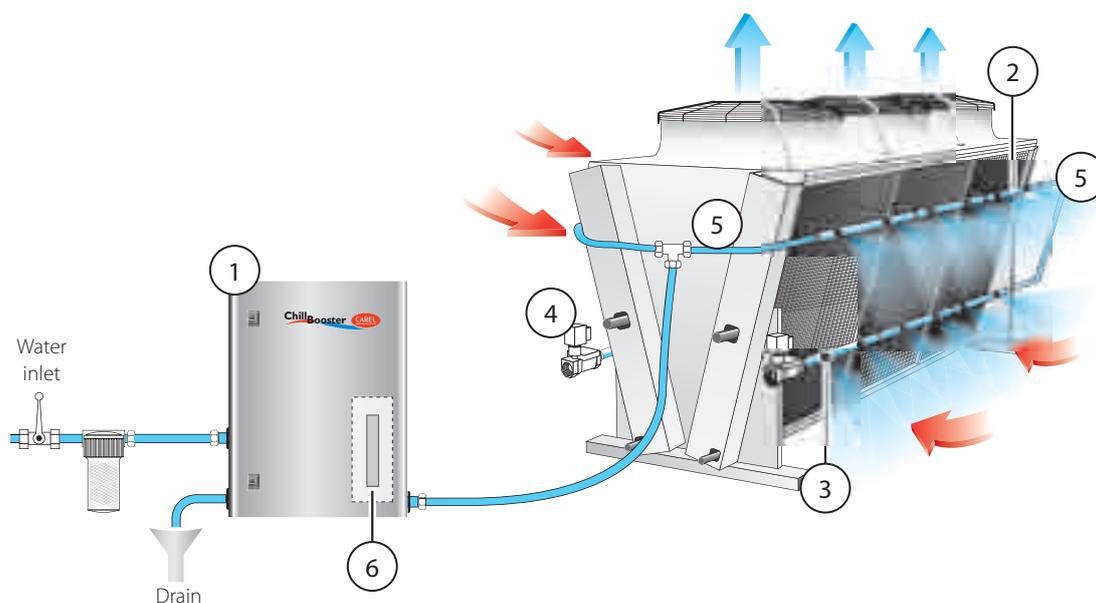


**Hoses**  
AISI304 stainless steel corrugated hoses.

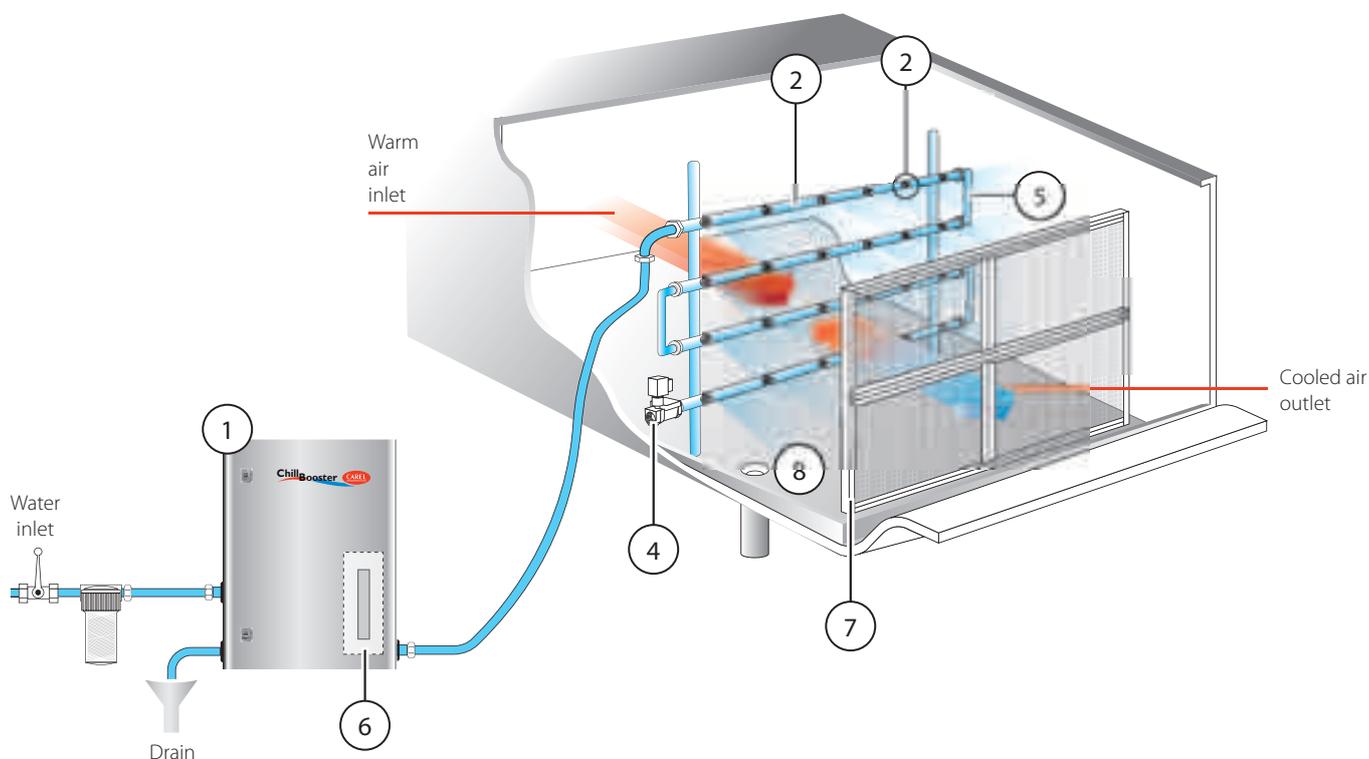


**Manifold**  
AISI304 stainless steel manifolds, 20 mm dia., with threaded holes for nozzles; available with 7 holes (1052 mm), 13 holes (1964 mm) or 19 holes (2876 m)..

## Example diagram for chiller or drycooler



## Example diagram for air handling unit (AHU)



### Key

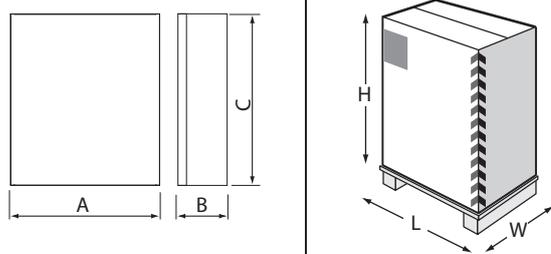
- |  |   |
|--|---|
| 1. pumping unit, ON/OFF control;             | 6. UV water sanitisation system inside of the cabinet (optional); |
| 2. modular stainless steel manifolds;        | 7. droplet separator;   |
| 3. spray nozzles;                            | 8. droplet collection tank.                                       |
| 4. distribution system drain solenoid valve; |   |
| 5. connection hoses and metal fittings;      |   |

## Models

Specifications	AC010****	AC050D****	AC100D****
<b>General</b>			
Flow-rate (l/h)	100	500	1000
Power consumption	0.4	0.5	0.6
Temperature	5T40 °C (40-104 °F)		
Thermal shut-off valve discharge connections	hose OD 10, ID 5		
Electrical specifications	230 V, 50/60 Hz (depending on the model)		
Certification	CE		
UV lamp life (optional)	4000 h		
Index of protection	IP55		
<b>Water fill</b>			
Connection	1/2"G female		
Pressure (min.-max.)	3-8 Bar, 0.3-0.8 Mpa, 40-115 Psi		
<b>Water drain</b>			
Connection	1/2"G female		
<b>Outlet</b>			
Connection	1/2"G female		
<b>Supply water*</b>			
Electrical conductivity	<100 µS/cm		
Total hardness	<5 °fH (50 ppm CaCO3)		

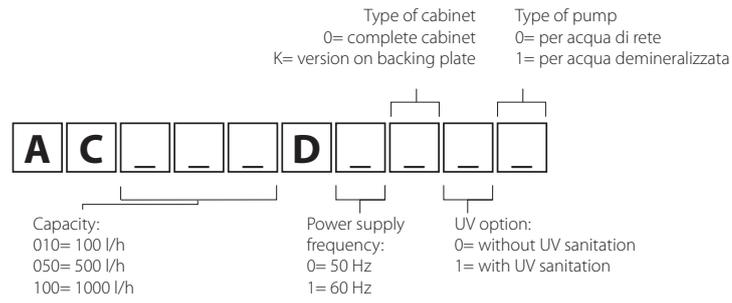
\* see paragraph "Supply water and maintenance"

### Dimensions (mm) & weights (kg)



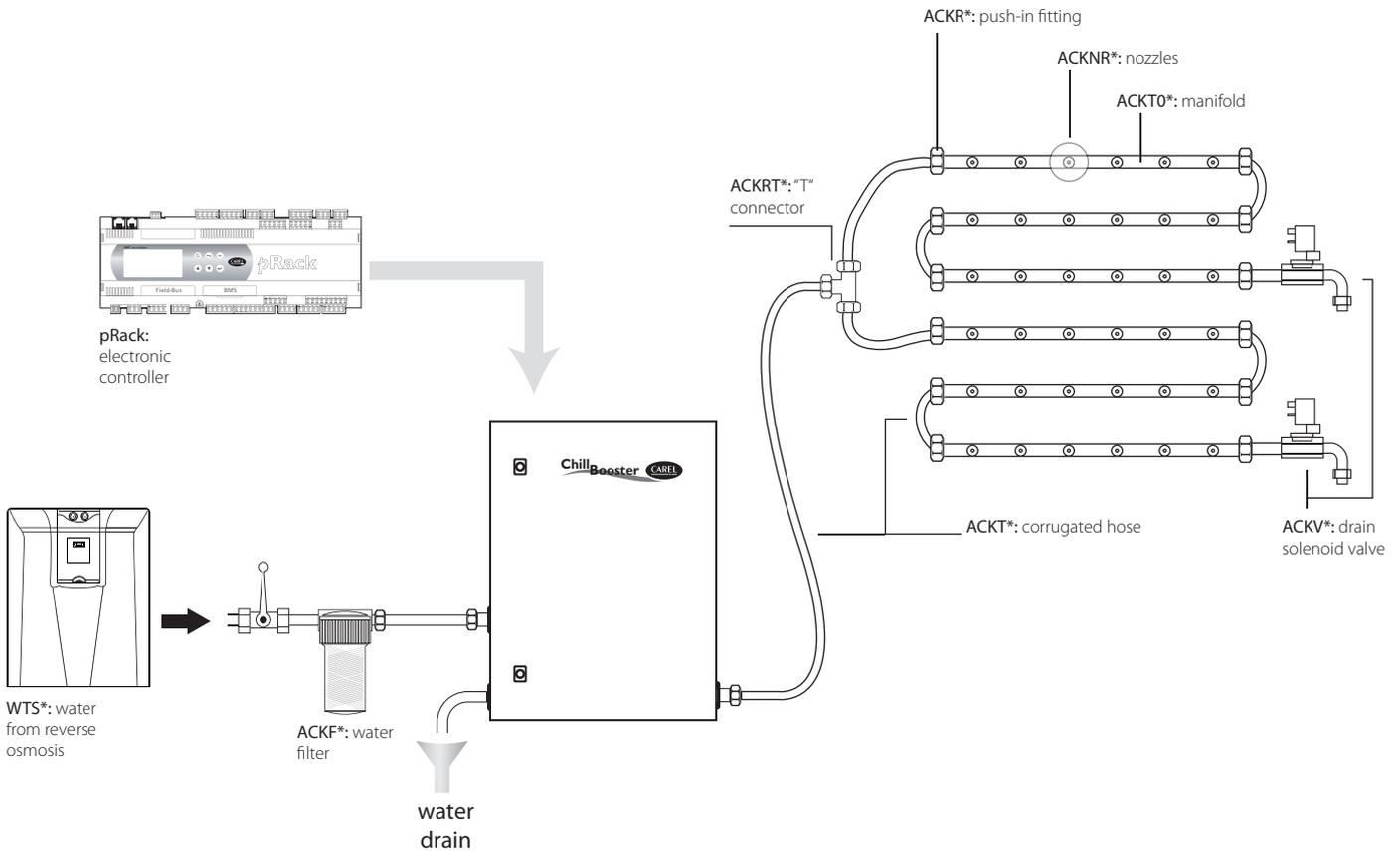
Mod.	AxBxC	weight	LxWxH	weight
AC****O**	600x300x800 (23.62x11.82x31.50)	49 (108)	720x410x1020 (28.5x16x40)	52 (115)
AC****O1*	600x300x800 (23.62x11.82x31.50)	53 (115)	720x410x1020 (28.5x16x40)	56 (125)
AC****K**	550x210x750 (21.65x8.30x29.53)	27 (60)	860x660x360 (34x26x14)	32 (70)
AC****K1*	550x210x750 (21.65x8.30x29.53)	32 (70)	860x660x360 (34x26x14)	37 (82)

## Unit code



# OVERVIEW DRAWING

## ChillBooster





# Sensors and protection devices

Sensors and protection devices are components used in refrigeration units

They measure a physical value (temperature, humidity, pressure, etc.) and convert the reading into an electrical signal to be sent to the electronic controller, allowing the unit to work within the required operating limits.

These components carry out a key role in the improvement of control and the optimised management of the installation.

They can interface with and be adapted to controllers supplied by third parties with standard output signals.



Integrated Control Solutions & Energy Savings



POCC.IT.AI50.B09036

## Sensors and protection devices

CAREL offers increasingly advanced and complete global solutions.

For this reason, CAREL has designed an entire range of probes that respond to the needs of HVAC/R installers and manufacturers, as well as for the control of its own line of humidifiers.

The range includes temperature and humidity sensors for various applications, with installation in sockets or ducts, in residential or industrial environments, guaranteeing high performance and compatibility with all CAREL controllers.

The range has been enriched with the most innovative technological solutions, offering new international standards at increasingly competitive prices

### Advantages

CAREL probes, as well as featuring the recognised performance that sets them apart, are very versatile and can satisfy various market requirements.

Indeed, all the probes have been especially designed to be compatible not only with all CAREL controllers, but also with the most commonly used standards around the world.

The temperature and humidity probes are available with different operating ranges and in special versions for corrosive or polluting environments.



## Active temperature, humidity and temperature/humidity probes

DPW\*: for room installation  
DPD\*: for duct installation

DPW: are used in civil and commercial environments where the design is an important aspect.

DPD: are used in ducted systems for relative humidity control, specifically on the intake as a control probe and on the outlet as a limit probe.

The range is made up of probes with 0/10Vdc output signals, or probes with selectable output signal, from 0 to 1Vdc to 4 to 20 mA. The latter allows remote installation up to 200 m from the controller, without affecting precision.

Models are also available with RS485 connection using the CAREL or Modbus® protocol.

### Technical specifications

**Power supply:** 12/24 Vac (-10 to 15%),  
9 to 30 Vdc (±10%) supplied by the humidifiers

#### Operating conditions:

- DPDC1\*: -10T60 °C, 10 to 90% rH non-condensing.
- DPDC2\*: -20T70 °C, 0 to 100% rH non-condensing.
- DPW\*: -10T60 °C, 10 to 90% rH non-condensing.

#### Storage conditions:

-20T70 °C, <90% RH non-cond.

**Connections:** screw terminal blocks for cables up to 1.5 mm<sup>2</sup>

#### Installation:

- DPW\*: wall
- DPD\*: duct



## Active temperature/humidity probes

DPP\*: for industrial environments

Specifically designed to measure high humidity levels with great precision.

The high index of protection of the sensor (IP54) and the case (IP55) the makes these especially suitable for measuring the temperature and humidity in special environments, such as cold rooms, pools and industrial environments in general.

The range is made up of probes with 0 to 10Vdc output signals, or probes with selectable output signal, from 0 to 1Vdc to 4 to 20 mA. The latter allows remote installation up to 200 m from the controller, without affecting precision.

Models are also available with RS485 connection using the CAREL or Modbus® protocol.

The technical solution involving both the temperature/humidity sensors in the same case is perfect for “adiabatic cooling” applications, i.e. controlling temperature with high humidity limits.

### Technical specifications

**Power supply:** 12/24 Vac (-10 to +15%),  
9 to 30 Vdc (±10%) supplied by the humidifiers

#### Operating conditions:

- DPPC1\*: -10T60 °C, 10 to 90% rH non-condensing.
- DPPC2\*: -20T70 °C, 0 to 100% rH non-condensing

#### Storage conditions:

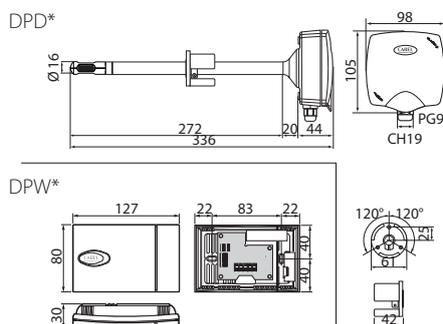
-20T70 °C, <100% RH non-cond.

**Connections:** screw terminal blocks for cables up to 1.5 mm<sup>2</sup>

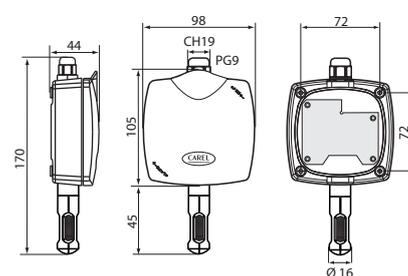
#### Installation:

**Index of protection:** IP55 (case); IP54 (sensor)

### Dimensions (mm)



### Dimensions (mm)





## Universal active temperature probes

ASET\*: universal

The universal temperature probes can be used in "steam bath" applications in which temperature control is required in an environment where the humidity is at saturation levels.

Their special structure means the electronics can be installed in the control compartment and only the temperature sensor located inside the saturated environment.

The range is made up of probes with 0/10Vdc output signals, or probes with selectable output signal, from 0 to 1Vdc to 4 to 20 mA. The latter allows remote installation up to 200 m from the controller, without affecting precision.

### Technical specifications

**Power supply:** 12/24 Vac (-10 to 15%),

9 to 30 Vdc ( $\pm 10\%$ ) supplied by the humidifiers

**Operating conditions:**

-30T90 °C or 30T150 °C, <100% RH non-cond.

**Storage conditions:**

-20T70 °C, <100% RH non-cond.

**Connections:** screw terminal blocks for cables up to 1.5 mm<sup>2</sup>

**Installation:** direct or with socket

**Index of protection:** IP55 (case); IP67 (sensor)

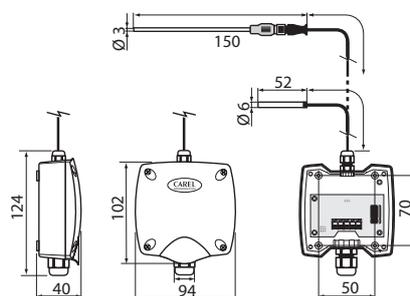


## Temperature probes with NTC thermistor

NTC\*HP\*, NTC\*WP\*, NTC\*WF\*,  
NTC\*HF and NTC\*HT, NTCINF\*

The precision reached thanks to the technical solutions adopted in the development of these sensors and the reliability proven by the tests performed make the CAREL NTC probes reliable and affordable transducers for measuring temperature in "steam bath" applications.

### Dimensions (mm)



## Differential pressure switch

DCPD0\*0\*00

CAREL supplies differential air pressure control units for filters, fans, air ducts, air-conditioning and ventilation systems.

The pressure switch is ideal for control and safety functions in air-conditioning systems to signal that the fans have stopped or the filters are blocked. It can be installed in environments with non-aggressive and non-flammable atmospheres, and comes in the version with assembly kit.



## Air flow switch

DCFL000100

CAREL supplies flow switches for controlling the flow of air or non-aggressive gases inside the distribution ducts of air-conditioning or air handling systems.

These devices feature a galvanised plate base and a sealed ABS cover, IP65 (on the side towards the outside of the duct), according to the EN60529 standard, class of protection 1 - EN 60335-1 standard.

For any products not included in the table, please contact CAREL or see the CAREL controls and systems guide.

### Specifications

Models	temperature range	humidity range	output
<b>Active room probes, power supply 9 to 30 Vdc/12 to 24 Vac</b>			
DPWT010000	-10T60 °C		select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA
DPWT011000	-10T60 °C		NTC 10 K at 25 °C
DPWC111000	-10T60 °C	10 to 90% rH	<ul style="list-style-type: none"> <li>• NTC 10 K at 25 °C (temperature)</li> <li>• select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA (humidity)</li> </ul>
DPWC110000	-10T60 °C	10 to 90% rH	select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA
DPWC115000	-10T60 °C	10 to 90% rH	<ul style="list-style-type: none"> <li>• NTC 10 K at 25 °C (temperature)</li> <li>• 0 to 10 Vdc (humidity)</li> </ul>
DPWC112000	-10T60 °C	10 to 90% rH	0 to 10 Vdc
DPWC114000	-10T60 °C	10 to 90% rH	opto-isolated RS485 serial
DPWT014000	-10T60 °C		opto-isolated RS485 serial
<b>Active probes for industrial environments, power supply 9 to 30 Vdc/12 to 24 Vac</b>			
DPPT010000	-20T70 °C		select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA
DPPT011000	-20T70 °C		NTC 10 K at 25 °C
DPPC111000	-10T60 °C	10 to 90% rH	<ul style="list-style-type: none"> <li>• NTC 10 K at 25 °C (temperature)</li> <li>• select. 0 to 1 V/-0.5 to 1 Vdc/4 to 20 mA (humidity)</li> </ul>
DPPC110000	-10T60 °C	10 to 90% rH	select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA
DPPC210000	-20T70 °C	0 to 100% rH	select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA
DPPC112000	-10T60 °C	10 to 90% rH	0 to 10 Vdc
DPPC212000	-20T70 °C	0 to 100% rH	0 to 10 Vdc
DPPT014000	-10T60 °C	0 to 100% rH	opto-isolated RS485 serial
DPPC114000	-10T60 °C	10 to 90% rH	opto-isolated RS485 serial
DPPC214000	-20T70 °C	0 to 100% rH	opto-isolated RS485 serial
<b>Active duct probes, power supply 9 to 30 Vdc/12 to 24 Vac</b>			
DPDT010000	-20T70 °C		select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA
DPDT011000	-20T70 °C		NTC 10 K at 25 °C
DPDC111000	-10T60 °C	10 to 90% rH	<ul style="list-style-type: none"> <li>• NTC 10 K at 25 °C (temperature)</li> <li>• select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA (humidity)</li> </ul>
DPDC110000	-10T60 °C	10 to 90% rH	select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA
DPDC210000	-20T70 °C	0 to 100% rH	select. 0 to 1 V or -0.5 to 1 Vdc or 4 to 20 mA
DPDC112000	-10T60 °C	10 to 90% rH	0 to 10 Vdc
DPDC212000	-20T70 °C	0 to 100% rH	0 to 10 Vdc
DPDT014000	-20T70 °C		opto-isolated RS485 serial
DPDC114000	-10T60 °C	10 to 90% rH	opto-isolated RS485 serial
DPDC214000	-20T70 °C	0 to 100% rH	opto-isolated RS485 serial
<b>Case index of protection</b>		IP30 for DPW IP55 for DPD, DPP	(wall) (duct and ind. env.)
<b>Sensor index of protection</b>		IP30 IP40 IP54	for DPW for DPD for DPP
<b>Temperature time constant</b>		in still air in moving air (3 m/s)	300 s 60 s
<b>Humidity time constant</b>		in still air in moving air (3 m/s)	60 s 20 s

### Specifications

Models	range of measurement	output
<b>Active universal probes, power supply 9 to 30 vdc/12 to 24 Vac</b>		
ASET030000	-30T90 °C	select. -0.5 to 1 Vdc or 4 to 20 mA
ASET030001	-30T90 °C	select. -0.5 to 1 Vdc or 4 to 20 mA
ASET030002	-30T150 °C	select. -0.5 to 1 Vdc or 4 to 20 mA









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