

## [High pressure adiabatic humidifier: humiFog multizone]

### 1. GENERAL

#### a. DESCRIPTION

- i. High pressure atomising adiabatic humidifier, ideal for rooms/AHUs/ducts; works on drinking and demineralised water. Pressure is provided by a piston pump (max. pressure 80 bars) without the aid of compressed air.

#### b. WORK REQUIRED

- i. Installation according to the manufacturer's specifications, performed by technical personnel *[selected by the customer]*.
- ii. System commissioning performed by *[manufacturer's technical personnel, or technical personnel authorised by the manufacturer]*.

#### c. DOCUMENTATION

- i. Technical manual for installation, instructions on safety, configuration and operation, complete with dimensions, technical specifications, performance, water circuit and wiring diagrams, standards and specifications for safe installation, guide for commissioning and operation, diagnostics, list and identification of spare parts.

#### d. QUALITY

- i. CE (EMC: EN 61000-6-2, EN 61000-6-4; LVD: EN 60204-1; RoHS: EN 50581)
- ii. ETL (in accordance with UL 998 and UL 508A)
- iii. EAC
- iv. VDI 6022 part 1: 2018-01
- v. VDI 3803 part 1: 2020-05
- vi. SWKI VA 105-1: 2015-08
- vii. ÖNORM H 6021: 2016-08
- viii. WaterMark WMTS 101
- ix. ISO 9001:2015 - ISO 14001:2015 - ISO 45001:2018 (manufacturer)
- x. ISO 2041 in compliance with the following standards: IEC 60068-2-6, IEC 60068-2-57, IEC 60068-2-64, GR-63-CORE, NEBS.

### 2. PRODUCT

#### a. [generic definition of the apparatus, technology]

- i. High pressure atomising adiabatic humidifier, consisting of:
  - a *main* cabinet containing the controller and the volumetric pump
  - a *secondary* cabinet containing the controller for each zone in addition to the one controlled by the *main* cabinet (up to a maximum of 5 *secondary* cabinets)
  - a high pressure *rack* atomisation system, customised for each application.

#### b. [general features and construction]

- i. Volumetric piston pump.
- ii. Pressure controller upstream of the pump.
- iii. Micrometric filter (60 µm) to protect the pump from any residues that may form when installing the water supply pipes.
- iv. Feedwater and outlet water pressure gauges
- v. Built-in conductivity meter
- vi. Minimum pressure switch (1 bar) to avoid air lock inside the pump
- vii. Safety valve (4 bars) on pump bypass
- viii. Safety valve (80 bars) on outlet

## TEXT FOR CONTRACT SPECIFICATIONS

- ix. Bypass water temperature probe, drain solenoid valve and thermostatic valve (63°C, redundant safety) to avoid pump overheating
- x. Maximum pressure switch (90 bars, redundant safety on outlet safety valve) for unit shutdown and safety drain
- xi. Pulsation damper in models where featured
- c. [models, capacities and variants]**
  - i. model capacities:
    - 100, 200, 320, 460, 600, 1000 kg/h.
  - ii. controller model:
    - Single zone:
      - a. variable flow-rate control
      - b. constant pressure control
    - Multi zone(up to 6 independent zones)
  - iii. pump material variants:
    - Model with brass volumetric pump;
    - Model with AISI 316 stainless steel volumetric pump;
    - Model with silicone-free AISI 316 stainless steel volumetric pump.
- d. [feedwater and drain water]**
  - i. The humidifier must only use demineralised drinking water (0.054 - 50 µS/cm).
- e. [power supply specifications]**
  - i. Cabinet-pumping station power supply:
    - 230 VAC 1-phase 50 Hz on sizes 100 - 600 kg/h
    - 230 VAC 1-phase 60 Hz on sizes 100 - 600 kg/h
    - 400 VAC 3-phase 50 Hz on size 1000 kg/h
    - 460 VAC 3-phase 60 Hz on size 1000 kg/h
- f. [control, characteristics]**
  - i. 2 analogue inputs for humidity/temperature probes or external request signal. The type of electrical signal for both can be selected on the keypad between: on/off (humidistat), NTC, 0- 10 V, 0- 1 V, 0- 20 mA and 4- 20 mA
  - ii. Analogue input for auxiliary temperature probe
  - iii. ON/OFF digital input to enable the remote pumping station
  - iv. ON/OFF digital input to enable the remote high pressure atomising rack connected to the pumping station.
  - v. ON/OFF digital input to enable signal from external air flow/pressure switch.
  - vi. ON/OFF digital input reserved for any alarm signals from an external reverse-osmosis water treatment system.
  - vii. ON/OFF digital output to signal high pressure atomising rack status, active/inactive.
  - viii. ON/OFF digital output to control start/stop of an external reverse osmosis water treatment system.
    - i. ON/OFF digital output to signal low temperature inside the cabinet and possibly start/stop an external frost protection device.
    - ii. Cumulative alarm relay to signal faults and/or malfunctions to a supervisory system. The relay logic is selectable (NO or NC).
    - iii. Heat recovery signal: configurable analogue/digital signal associated with the position of the heat recovery damper.
    - iv. Pump status contact: digital output with configurable logic that indicates pump status, on/off
      - i. Backup/rotation: pump heartbeat signal to enable backup/rotation function on humiFog systems. The function allows one system two have two pumping stations, in order to create redundancy and thus guarantee service continuity and distribute operating hours between the two cabinets

## TEXT FOR CONTRACT SPECIFICATIONS

- ii. 13 algorithms available to the user:
  - on/off
  - on/off - modulating based on humidity limit probe rH%
  - on/off - modulating based on temperature limit probe T
  - on/off - modulating based on air flow limit probe
  - Production proportional to external analogue signal
  - Production proportional to external analogue signal + temperature limit probe
  - Production proportional to external analogue signal + humidity limit probe
  - Production proportional to external analogue signal with air flow limit
  - Production proportional to temperature probe reading
  - Production proportional to humidity probe reading
  - Production proportional to temperature probe reading + temperature/humidity limit probe
  - Production proportional to humidity probe reading + temperature/humidity limit probe
  - Production proportional to temperature probe reading with air flow limit
- iii. The humidifier must be able to control atomised water production by reading the air temperature downstream of the AHU preheater
- iv. Intuitive graphical display (easily understandable icons and messages). humiFog can display: demand, room probe reading, limit probe reading, preheating probe reading, water flow-rate, alarms and system parameters.
- v. The display with buttons can be used to view and modify the system parameters, as well as reset any warnings or alarms.
- vi. Flow-rate control mode: continuous modulation from 14% to 100% of the distribution system water flow-rate (the outlet pressure varies from 25 to 70 bars depending on the water flow-rate).
- vii. Pressure control mode: the outlet pressure is kept at the set point (70 bars), varying the pump speed when the load in the downstream water circuit changes; the pressure can be set by the user.
- viii. Pressure control mode: up to 64 flow-rate control values.
- ix. The pumping station can control:
  - Up to 22 (models UA100 - 460\*\*\*) external fill or drain valves.
  - Up to 32 (models UA600 - 1K0\*\*\*) external fill or drain valves.
- x. The pipes that make up the atomising rack are automatically emptied by opening the drain valves every time the system stops atomising, as required by the strictest applicable regulations, while also preventing the nozzles from dripping
- xi. The pipes that make up the atomising rack are automatically washed when the humidifier is switched on
- xii. The pipes that make up the atomising rack are automatically emptied and washed periodically during periods of inactivity (the washing cycle can be set in relation to the needs of the application directly by the user); this guarantees compliance with the highest hygiene standards
- xiii. Atomisation is preceded by a complete filling cycle on all of the lines making up the system, until reaching the correct atomisation pressure. This ensures that there are no leaks from the nozzles during transient phases
- xiv. Display of feedwater conductivity
- xv. Display of water bypass temperature
- xvi. Selection of unit of measure (SI or IP)
- xvii. Automatic maintenance warning
- xviii. The humidifier supplies water at constant pressure, even without any directly-controlled external valve

## TEXT FOR CONTRACT SPECIFICATIONS

- xix. Weekly scheduler
  - xx. Manual procedure for testing individual devices
  - xxi. Procedure for cooling the pipes inside the cabinet during extended periods of inactivity, which can be activated in the event of exposure of the cabinet or the equipment room to sunlight.
- g. [performance data]**
- i. relative humidity control accuracy must be:
    - Up to +/- 1 - 2% for single zone models.
    - Up to +/- 5% for multi-zone models
- h. [safety, protection and hygiene devices]**
- i. No biocides need to be added to the water.
- i. [communication interfaces, display, connectivity]**
- i. RS485 serial port to communicate with CAREL devices or via Modbus® RTU, without requiring an additional gateway.
- j. [distribution systems]**
- i. High pressure atomisation system for AHUs/ducts:
    - High pressure atomising rack with AISI 304 nozzles and customised according to the inside dimensions of the duct.
    - The atomisation system must be automatically emptied when atomisation ends.
    - Suitable for operation up to 100 bars, suitable for demineralised water with conductivity 0.054 - 50 µS/cm and microbiologically inert.
    - Water racks and solenoid valve coils in compliance with DIN EN 846 and DVGW W 270
    - NC fill valves, 24 VAC
    - NO drain valves, 24 VAC
    - Atomising nozzles available with flow-rates 1.45; 2.8; 4.0 l/h at 70 bars, made from AISI 316, anti-drip ball valve and rotating internal body
  - ii. High pressure atomisation system for rooms:
    - Suitable for operation up to 100 bars, suitable for demineralised water with conductivity 054 - 50 µS/cm and microbiologically inert
    - Water racks and solenoid valve coils in compliance with DIN EN 846
    - NC fill valves, 24 VAC
    - NO drain valves, 24 VAC
    - Atomising nozzles available with flow-rates 1.45; 2.8; 4 l/h at 70 bars, made from AISI 316, anti-drip ball valve and rotating internal body
    - Atomisation system with blower comprising nozzle rack and fan powered at 230 Vac 50 Hz
    - Atomisation system comprising nozzle rack and fan controlled by the cabinet and powered at 230 VAC 50 Hz. Also available for combinations of multiple systems (blowers). Several blowers must be able to be connected in sequence, with 1 fill valve at the start of the line and 1 drain valve at the end of the line
- k. [accessories]**
- i. Humidity probe rH% or temperature probe T for civil environments (rH% 10% - 90%; T -10°C - 60°C)
  - ii. Humidity probe rH% or temperature probe T for industrial environments, min. protection rating IP54 (rH% 10% - 90%; T -20°C - 70°C)
  - iii. Humidity probe rH% for ducts, min. protection rating IP40 (rH% 10% - 90%)
  - iv. Humidity limit probe rH% for ducts, min. protection rating IP40 (rH% 0% - 100%)

## TEXT FOR CONTRACT SPECIFICATIONS

- v. Rack distribution system temperature probe: humiFog can manage a probe positioned upstream of the rack so that atomisation is enabled when the temperature is optimal for correct absorption.
  - vi. The humidifier must be able to communicate via the following protocols:
    - BACnet Serial/IP
    - ModBus Serial/IP
  - vii. *Secondary* zone cabinet for stand-alone control of up to 6 zones:
    - The zone cabinet must guarantee the same control logic as the *main* cabinet.
- l. The type of apparatus shall be the CAREL [humiFog]**
- m. Approved manufacturers: Carel Industries SpA**

### 3. EXECUTION

- a. Installation in compliance with the manufacturer's specifications
- b. Installation in compliance with applicable local laws and regulations
- c. Water quality as per manufacturer's specifications, under the responsibility of the user