

[Immersed electrode isothermal humidifier: humiSteam]

1. GENERAL

a. DESCRIPTION

- i. Air humidification apparatus for the production of aseptic steam, with immersed electrode technology, supplied with untreated mains drinking water.

b. WORK REQUIRED

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

c. DOCUMENTATION

- i. Technical manual for installation with instructions on safety, configuration and operation, complete with dimensions, technical specifications, operating principles and 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
- ii. cETL_{US} (UL standards)
- iii. TÜV PRODUCT SERVICE
- iv. AHRI Standard 640-2005
- v. EAC
- vi. WaterMark
- vii. ISO 9001:2015 - ISO 14001:2015 - ISO 45001:2018 (manufacturer)

2. PRODUCT

a. [definition of the apparatus, technology]

- i. Stand-alone immersed electrode isothermal humidifier for the production of steam at atmospheric pressure using untreated mains drinking water.
- ii. The water is heated due to the conduction of electricity and boils to produce steam. The controller measures the current, which is automatically adjusted by varying the water level in the cylinder.
- iii. Steam production, water drain and refill are managed by the control program completely automatically according to actual feedwater conductivity, without the need for prior analysis or settings.

b. [general features and construction]

- i. Painted steel supporting structure with separate sections for the water circuit and the electrical parts, front panels that can be removed for maintenance
- ii. electrical section separated by a metal partition, with electrical panel including electrical components and electronic control
- iii. polypropylene steam production cylinder containing thick anodised steel mesh electrodes with a high heat exchange surface.
- iv. the cylinder features a special device to detect any excess foam on the surface of the water

c. [model capacities and variants]

- i. model capacities:
 - 1.5, 3, 5, 8, 9, 10, 15, 18, 25, 35, 45, 65, 90, 130 kg/h
- ii. steam cylinder variants:

TEXT FOR CONTRACT SPECIFICATIONS

- disposable or openable for internal cleaning with replaceable electrodes;
 - disposable cylinders made from HB grade plastic in accordance with UL947; openable cylinders made from V0 grade plastic in accordance with UL94
 - variants for water with medium, low or high conductivity, for operation in all situations yet differentiated to optimise cylinder life;
- d. [feedwater and drain water]**
- i. feedwater: mains drinking water with conductivity between 75 and 1250 $\mu\text{S}/\text{cm}$
 - ii. water inlet via solenoid valve with air gap greater than 25 mm (1") or double-check valve to prevent backward contamination
 - iii. water drain by pump; on request, a drain tempering device is available to limit the drain water temperature to 60°C
- e. [power supply specifications]**
- i. available voltages:
 - (single phase): 208 V, 230 V
 - (three-phase): 230 V, 208 V, 400 V, 460 V, 575 V
 - ii. The power supply for the electronic controller is taken internally from the main power supply: SOLUTIONS THAT REQUIRE A POWER SUPPLY IN ADDITION TO THE MAIN POWER SUPPLY ARE NOT PERMITTED.
 - iii. for three-phase power supplies NEUTRAL MUST NOT BE REQUIRED IN ADDITION TO THE PHASES
 - iv. the power consumption is specified according to the model in the instruction manual and on the humidifier's rating plate
- f. [control, characteristics]**
- i. input signal from probe or external controller: 0-1 V, 0-10 V, 0-20 mA, 4-20 mA, ON/OFF contact, 0-135 Ohms, 135-10,000 Ohms, NTC.
 - ii. ON/OFF digital input for remote enabling.
 - iii. cumulative alarm relay for remote alarm signalling
 - iv. A second "limit" humidity probe must be able to be connected so as to continuously modulate production based on the humidity downstream in the duct, and prevent condensation during temperature transients. A SIMPLE ON/OFF ENABLING INPUT IS NOT ACCEPTABLE FOR THIS PURPOSE.
 - v. selectable control algorithms: stand-alone with room probe, stand-alone with main probe + modulating limit probe, secondary with external proportional signal, with external signal + local limit probe, ON/OFF, with temperature probe for steam baths.
 - vi. graphic display with buttons for programming and monitoring unit status, humidity level, steam production, current draw, water conductivity, parameters and alarms using text and icons; can be mounted up to 50 m away
 - vii. guided initial configuration via wizard
 - viii. maximum flow-rate settable by parameter; continuous production control between 20% and 100% of the maximum set capacity
 - ix. complete diagnostics, alarm log, hour counter for cylinder maintenance
 - x. daily and weekly programming of operation with differentiated set points.
 - xi. automatic and timed maintenance alerts (the latter can be set according to requirements)
 - xii. manual activation of digital outputs for maintenance
 - xiii. 90 and 130 kg/h models with 2 cylinders: selection between series or parallel operation of the two cylinders
 - xiv. select unit of measure (SI or Imperial).
- g. [performance data]**
- i. the specified production in kg/h must be effective and measured in a laboratory in accordance with the AHRI 304-2005 standard: in addition to the specific energy for boiling

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the water, the energy required to initially heat the water and the energy dissipated by the boiler through conduction in the air must be taken into account

- ii. relative humidity control accuracy must be up to +/- 5%.

h. [safety, savings and hygiene]

- i. the cylinder foam sensor and a patented software algorithm detect and manage the formation of foam to prevent the emission of boiling water together with the steam. SOLUTIONS WITHOUT PROTECTION AGAINST EMISSION OF BOILING WATER ARE NOT PERMITTED.
- ii. the conductivity meter installed in the feedwater supply circuit and the software algorithm optimise water change based on actual water quality, allowing significant savings in water consumption
- iii. automatic water draining due to inactivity (factory-set every 3 days) and modifiable in the field to comply with any local regulations, avoids hygiene problems due to stagnant water.
- iv. management of interruptions to feedwater supply with automatic restart when water supply returns
- v. periodic emptying of the cylinder (settable) when using water with high amounts of suspended substances

i. [interfaces]

- i. Modbus, CAREL protocols for BMS and remote control; optional: communication with BACnet™ over Ethernet, BACnet™ over IP, BACnet™ over MS/TP, BMS LON®,
- ii. RS485 serial port

j. [accessories]

- i. steam delivery hoses, food safety certified quality, with embedded steel spiral to prevent choking, diameters 22, 30 and 40 mm
- ii. AISI 304 stainless steel duct steam distributors with connection flange and 22, 30 and 40 mm inlet diameters, lengths between 35 and 205 cm, flow-rates from 1 to 45 kg/h, with separate condensate drain
- iii. in-room steam blowers
- iv. 10 mm drain pipes for condensate and 40 mm/50 mm for humidifier water
- v. wide range of relative humidity and temperature sensors, duct and room models, ranges 10-90% rH or 0-100% rH, with current or voltage signal
- vi. range of wireless sensors for installation in critical locations

k. The type of apparatus shall be the CAREL humiSteam

l. 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**