

## **SUGGESTED ENGINEERING SPECIFICATIONS** ***HumiSteam ELECTRODE STEAM HUMIDIFIERS***

### **15781 HUMIDIFIERS**

#### **I. GENERAL**

##### **A. Scope**

1. Furnish and install as indicated on the drawings and plans, in-duct [space] electrode steam humidifiers.
2. Furnish owner's manuals and blueprints covering installation, start up, maintenance and operating instructions, complete in every way to permit efficient operation and maintenance of the system.
3. Manufacturer shall warrant the system to be free from defects in materials and workmanship for a period of 2 years after the sale.
4. Capacities are as shown on the drawings and plans.

#### **II. PRODUCT**

##### **A. Humidifiers**

1. The humidifiers shall be of the self generating electrode type, electrically producing atmospheric steam in a plastic cylinder without the use of immersion type electric heating elements.
2. The humidifier cabinet shall be constructed of corrosion resistant materials with all metal surfaces powder coated and designed to be aesthetically pleasing. The unit cover when removed should allow 180° access for easy maintenance.
3. The electrodes shall be constructed of expanded low carbon steel, zinc plated and dynamically formed for precise current control, and minimization of arcing points. Electrical connection to the electrodes shall be by screw down connectors. Spark plug type connectors can loosen and are therefore unacceptable.
4. The steam generating cylinder shall be constructed of a UL listed plastic having at least a 94HB safety rating when disposable, and 94V0 when cleanable.
5. The steam generating cylinder shall have twin cylinder full electrodes operating as an independent circuit from the main power electrodes. No artificial neutral circuits shall be required. Additionally, the cylinder full electrodes shall be used to detect foaming of the water.
6. Units producing over 33 lbs/hr capacity shall incorporate a power drain pump instead of drain solenoid to provide for more efficient flushing of the cylinder.
7. All internal electrical controls and components shall be prewired to appropriately marked terminals for field connection. All internal components and the cabinet shall be properly grounded and shielded to prevent any line or radiative interference.

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8. The humidifiers shall incorporate a true microprocessor control providing the following functions:
- a) Automatic flushing of the steam generating cylinder based on conductivity, not just amperage draw, to extend the life of the electrodes. The humidifier shall read AND display the incoming water conductivity.
  - b) Pushbutton selection of drainage under power or timed drain to eliminate current leakage through the drain.
  - c) The humidifier shall be programmable to empty the steam generating cylinder after an extended period of non-use, to prevent corrosion of the electrodes and contamination of the water.
  - d) The humidifier shall be programmable to force periodic drains to handle water with abnormal qualities that become corrosive on overconcentration.
  - e) The humidifier shall be programmable to allow for a modulating hi-limit humidity sensor or outdoor temperature sensor for automatic trimming of the output to avoid condensation.
  - f) The humidifier shall have an hour counter with programmable maintenance alarm schedules.
  - g) Digital LCD Display of:
    - Incoming water conductivity
    - Electric current draw in Amps
    - Output of the humidifier
    - Selected output limit
    - Model No. and unit configuration
    - Sensed %RH when configured
    - Display of %RH setpoint when configured
    - Display of differential when configured
9. The humidifier shall have the AFS anti-foaming system to allow automatic detection and correction of water foaming. The humidifier shall be capable of operating on water qualities ranging from 125-1250 micromhos conductivity. Softened water should not be used.
10. The humidifier microprocessor control shall incorporate complete diagnostics, including the following alarms and prealarms which shall be shown on the LCD display:
- High electric current in the steam cylinder
  - Low current electrolysis condition
  - Reduced steam output, unable to reach setpoint
  - High water level in cylinder
  - Humidity sensor defective
  - Water foaming in cylinder
  - Improper cylinder fill rate
  - Improper cylinder drain rate
  - Diagnostic memory test fail
- All prealarms shall be self-correcting.

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11. The humidifiers shall be configured for  
[On/Off control]  
[Proportional control from DDC signal]  
[Stand-alone Proportional with humidity readout]  
[Stand-alone Proportional with humidity readout and dehumidifier output]  
operation.
12. Each humidifier shall have a built in serial adapter connection allowing future interface to computer or EMS systems if required. This shall be complete serial communication of all setpoints, status and alarms, not just acceptance of a modulating signal. Manufacturer shall have available graphic monitoring/control software capable of running in Windows.
13. [Optional] The humidifiers shall be provided with a direct [remote] mount Room Distribution Unit for direct discharge of humidifying steam into the area to be humidified.
14. [Optional] The humidifiers shall be provided with a condensate pump to pump the drain water to an overhead or remote drain.

#### **B. Installation**

1. The humidifiers shall be installed as per the plans and drawings, connected to a potable cold water feed line, and a hot water drain line and electrical service sized appropriately for the maximum current draw of the unit. All wiring shall be in accordance with national and local electrical codes.
2. [Manufacturer shall provide a control sensor reading from 0-100%RH, compatible with the humidifier system.]
3. [Manufacturer shall supply a duct mounted air flow proving device to prevent system operation on loss of air flow.]
4. [Manufacturer shall supply a duct mounted high limit humidistat to prevent condensation in the duct.]

#### **C. General Operating Sequence And Control**

1. All humidity sensors shall continuously send their signals to the control cabinet for processing and indication.
2. On a signal indicating a requirement for humidity, the humidifier shall read the feed water conductivity and initiate the diagnostic sequence. Upon completion, the conductivity shall be entered into memory to control the cylinder flushing cycle and the power contactor shall be energized. The fill valve shall be activated as required to reach output and replenish water being boiled off or drained.
3. If the current exceeds the maximum level, due to warming of the water in the steam generating cylinder, the humidifier shall automatically drain to reduce the current to the setpoint level.
4. If the water is of low conductivity, the humidifier will automatically initiate a special low conductivity startup algorithm which will concentrate the minerals to permit output capacity to be reached sooner.

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5. If the humidifier is operating on proportional control, it shall track with the control signal, filling and draining as required to supply the humidity requirements. Tracking with the signal shall be immediate, without delay.
6. The humidifier shall incorporate "adaptive intelligence" to prevent it from hunting and reduce fluctuations to minimum automatically zeroing to the setpoint and maintaining precise chemistry control in the steam generating cylinder.
7. The humidifier shall automatically control the cylinder chemistry to prevent premature plate out of the minerals on the electrodes, and through precise chemical control shall help to keep the drain lines clean. The unit shall indicate when the cylinder is approaching the end of its useful life, but without shutting down.
8. [The humidifier shall use a 2<sup>nd</sup> humidity sensor in the supply duct in place of a high-limit humidistat, which shall allow the unit to modulate the output capacity in response to the high-limit set point. This allows better control in VAV systems.]
9. [The humidifier shall use a temperature sensor input to read the outside air temperature and automatically reduce the indoor humidity set point, when the outside temperature drops, to avoid condensation on windows and materials.]

**III. EXECUTION**

**A. General**

1. Install the humidifiers as detailed in the installation drawings and schedules and/or as recommended by the manufacturer.
2. Manufacturer to furnish complete submittal drawings before installation and operating manuals after.
3. Humidifiers shall be the Carel HumiSteam series electrode steam humidifiers as manufactured and distributed by:

CAREL USA, LLC  
385 South Oak Street  
Manheim, PA 17545

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