EVAPORATIVE COOLING AND HUMIDIFICATION
High-Pressure System

- Energy efficient
- Provides both direct and indirect evaporating cooling
- Multiple zone capabilities in air handlers, ducts, and open spaces
- Complete water treatment options available from DriSteem
The DriSteem® High-Pressure System provides evaporative cooling and humidification in multiple zones and in a wide variety of applications. Humidify to enhance indoor air quality, manufacturing processes, material longevity, and comfort while taking advantage of the free cooling and energy savings inherent with this technology.

The DriSteem High-Pressure System handles every aspect of the application from the potable supply water source to the cooled/humidified conditions in the air handler, duct, or space.

**ENERGY EFFICIENT**
Heat already present in the air is used to evaporate the tiny, evenly-distributed water droplets dispersed by the system, saving on energy costs compared to steam humidification.

**REDUCES COOLING LOAD**
As atomized water droplets are absorbed in the air, the evaporative cooling effect reduces the building’s cooling load. This provides significant energy savings in applications requiring both cooling and humidification.

**LOW MAINTENANCE**
The stainless-steel, high-pressure pump is designed to run for 8000 hours before its first maintenance check, and the stainless steel dispersion nozzles and manifolds are maintenance free.

Water treatment options available from DriSteem provide ultra-pure water that leaves no white dust. Reverse osmosis (RO) system automatically backflushes for extended membrane life.

**Application versatility**
- Data centers
- Industrial manufacturing
- Printing and distribution
**THE MOST ADVANCED TECHNOLOGY**

- Micro-turbines in precision-machined atomizing nozzles fragment water droplets into ultra-fine particles (90% are ten microns or less)
- Water delivered to nozzles at up to 1200 psi (8.27 MPa) requires no pressurized air
- Integral check valve in nozzle ensures no dripping when system shuts off

**COOLING EFFECT SAVES ENERGY**

- Every pound of atomized water absorbed in the airstream removes approximately 1000 Btu of heat from the air (every kg absorbed removes approximately 2250 kJ of heat)
- Significant energy savings when cooling and humidifying simultaneously
- Utility rebates can offset costs

**LOW MAINTENANCE**

- Stainless-steel pump is cooled by purified supply water; 8000 hours before maintenance check
- Stainless steel nozzles and manifolds require no maintenance
- Thorough water filtration protects stainless-steel components from corrosion and undue wear
- Final evaporation media as close as three feet (0.9 m) downstream from heating coil prevents downstream wetting

**COMPREHENSIVE SYSTEM CONTROL AND MULTIPLE ZONE CAPABILITY WITH VAPOR-LOGIC® CONTROL**

- Accurate, responsive RH control; PID control tunes system for maximum performance
- Set up, view, and adjust system functions with intuitive keypad/display or Web interface
- Integrates into any building automation system via Modbus® and optional BACnet® or LonTalk® communication protocols
- Individual zone monitoring and modulated staging valves provide tight control in all zones with optimized absorption and minimal water waste
- One system cools and humidifies multiple zones with separate demands

**VERSATILE**

- Cools and humidifies in air handlers, ducts, and open spaces
- Nozzle staging and pulsed modulation allow high turndown of system output
- Capacities up to 5500 lbs/hr (2495 kg/h), multiple systems can be combined for larger capacities
- Flexibility accommodates even the most challenging applications; extensive network of DriSteem Representatives available to assist with system layout and design

**COMPLETE WATER TREATMENT SOLUTION**

- Water treatment options available from DriSteem include RO hyperfiltration, particulate filtering, dechlorination, and duplex water softening
- Automatic back-flush technology ensures long RO membrane life
- Ultra-pure water eliminates white dust fallout and bacteria/virus proliferation that can occur when using potable water
Sequence of operation

A COMPLETE SYSTEM THAT INCLUDES WATER TREATMENT

1. Water enters system from municipal water supply
2. Dechlorinator (wall-mounted on smaller models)
3. Duplex water softener
4. RO station with particulate filter and RO membranes
5. Pressurized RO holding tank
6. High-pressure pump station:
   - All-stainless-steel axial-piston high-pressure pump delivers purified, high-pressure water to atomizing nozzles
   - Vapor-logic controller optimizes absorption in multiple humidification zones
7. Main water line feeds network of high-pressure, stainless-steel piping
8. Humidified zones: purified, ultra-fine water droplets exit micro-turbine nozzles and disperse in AHUs, ducts, and/or open spaces
9. Final evaporation media (shown on Page 10) installed downstream of AHU heating coil prevents downstream wetting
**Sequence of operation**

4 **RO station:**
- Particulate filter
- RO membranes

5 **Pressurized RO holding tank**

6 **High-pressure pump station:**
- High-pressure stainless steel pump
- Vapor-logic controller

7 **Main water line**

- Zone 2 control cabinet
- Zone 3 control cabinet
- Zone n control cabinet

To network

To solenoid valves
Table 6-1: DriSteem High-Pressure System dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inches</td>
<td>mm</td>
<td>inches</td>
<td>mm</td>
<td>inches</td>
<td>mm</td>
<td>inches</td>
<td>mm</td>
</tr>
<tr>
<td>250</td>
<td>150</td>
<td>3810</td>
<td>24^3</td>
<td>610^3</td>
<td>55</td>
<td>1397</td>
<td>24</td>
<td>610</td>
</tr>
<tr>
<td>500</td>
<td>160</td>
<td>4064</td>
<td>24^3</td>
<td>610^3</td>
<td>55</td>
<td>1397</td>
<td>24</td>
<td>610</td>
</tr>
<tr>
<td>1000</td>
<td>176</td>
<td>4470</td>
<td>24^3</td>
<td>610^3</td>
<td>55</td>
<td>610</td>
<td>24</td>
<td>610</td>
</tr>
<tr>
<td>1750</td>
<td>176</td>
<td>4470</td>
<td>24^3</td>
<td>610^3</td>
<td>55</td>
<td>610</td>
<td>24</td>
<td>610</td>
</tr>
<tr>
<td>2500</td>
<td>197</td>
<td>5004</td>
<td>30</td>
<td>762</td>
<td>80</td>
<td>2032</td>
<td>24</td>
<td>610</td>
</tr>
<tr>
<td>3500</td>
<td>221</td>
<td>5613</td>
<td>30</td>
<td>762</td>
<td>72</td>
<td>1829</td>
<td>30</td>
<td>762</td>
</tr>
<tr>
<td>5500</td>
<td>239</td>
<td>6071</td>
<td>30</td>
<td>762</td>
<td>90</td>
<td>2286</td>
<td>30</td>
<td>762</td>
</tr>
</tbody>
</table>

Notes:
1. Water treatment component sizing is based on city-treated water, 20-grain hardness, and 50 °F (10 °C) or higher. City-treated water or well water with different hardness or temperature may require different components/dimensions. Call DriSteem with your water characteristics for component sizing.
2. Dimension given is maximum dimension when all components are located sequentially. Component locations are flexible; components may be placed in front of each other if floor space allows.
3. Add 6" (152 mm) when redundant high-pressure water pump option is used.
4. Wall-mounted dechlorinator.
DIMENSIONS

60” (1524 mm)
Add 16” (406 mm) when redundant high-pressure water pump option is used

See Table 6-1

MINIMUM RECOMMENDED CLEARANCES

36” (915 mm)

48” (1220 mm)

8” (203 mm)

36” (915 mm)

8” (203 mm)
## Specifications

### Table 8-1: High-pressure pump station specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>1750</th>
<th>2500</th>
<th>3500</th>
<th>5500</th>
</tr>
</thead>
<tbody>
<tr>
<td>System capacity, lbs/hr (kg/h)</td>
<td>250 (113)</td>
<td>500 (227)</td>
<td>1000 (454)</td>
<td>1750 (794)</td>
<td>2500 (1134)</td>
<td>3500 (1588)</td>
<td>5500 (2495)</td>
</tr>
<tr>
<td>System voltage/phase, Amp draw</td>
<td>240/1, 5.2 480/3, 1.6 600/3, 1.3</td>
<td>240/1, 7.3 480/3, 2.2 600/3, 1.8</td>
<td>240/1, 13.8 480/3, 4.0 600/3, 3.2</td>
<td>480/3, 6.6 600/3, 5.3</td>
<td>480/3, 9.2 600/3, 7.3</td>
<td>480/3, 12.6 600/3, 10.1</td>
<td></td>
</tr>
<tr>
<td>Fuse size (see Note 1)</td>
<td>240/1, 25 480/3, 16 600/3, 6</td>
<td>240/1, 35 480/3, 10 600/3, 6</td>
<td>240/1, 50 480/3, 15 600/3, 10</td>
<td>480/3, 30 600/3, 15</td>
<td>480/3, 35 600/3, 20</td>
<td>480/3, 40 600/3, 20</td>
<td></td>
</tr>
<tr>
<td>Dimensions (W/D/H), inches (mm)</td>
<td>24/24/60 (610/610/1524)</td>
<td>24/24/60 (610/610/1524)</td>
<td>24/24/60 (610/610/1524)</td>
<td>24/24/60 (610/610/1524)</td>
<td>24/30/76 (610/762/1930)</td>
<td>24/30/76 (610/762/1930)</td>
<td>24/30/76 (610/762/1930)</td>
</tr>
<tr>
<td>Dimensions (W/D/H) with redundant high-pressure pump option, inches (mm)</td>
<td>24/30/76 (610/762/1930)</td>
<td>24/30/76 (610/762/1930)</td>
<td>24/30/76 (610/762/1930)</td>
<td>24/30/76 (610/762/1930)</td>
<td>24/30/76 (610/762/1930)</td>
<td>24/30/76 (610/762/1930)</td>
<td>24/30/76 (610/762/1930)</td>
</tr>
<tr>
<td>Weight, lbs (kg)</td>
<td>275 (125)</td>
<td>300 (136)</td>
<td>325 (147)</td>
<td>325 (147)</td>
<td>350 (159)</td>
<td>400 (181)</td>
<td>450 (204)</td>
</tr>
<tr>
<td>Weight with redundant high-pressure pump option, lbs (kg)</td>
<td>375 (170)</td>
<td>400 (181)</td>
<td>475 (216)</td>
<td>475 (216)</td>
<td>500 (227)</td>
<td>625 (284)</td>
<td>700 (318)</td>
</tr>
<tr>
<td>High-pressure water connection diameter, inches (see Note 2)</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>5-micron prefilter diameter x height, inches (mm)</td>
<td>4 × 20 (102 x 508)</td>
<td>4 × 20 (102 x 508)</td>
<td>4 × 20 (102 x 508)</td>
<td>4 × 20 (102 x 508)</td>
<td>4 × 20 (102 x 508)</td>
<td>4 × 20 (102 x 508)</td>
<td>4 × 20 (102 x 508)</td>
</tr>
<tr>
<td>High-pressure pump flow rate, gpm (L/m)</td>
<td>0.5 (1.89)</td>
<td>1.0 (3.78)</td>
<td>2.0 (7.57)</td>
<td>3.5 (13.2)</td>
<td>5 (18.9)</td>
<td>7 (26.5)</td>
<td>11 (41.6)</td>
</tr>
<tr>
<td>High-pressure pump motor power, hp (kW)</td>
<td>1 (0.75)</td>
<td>1.5 (1.1)</td>
<td>3 (2.2)</td>
<td>5 (3.7)</td>
<td>5 (3.7)</td>
<td>7.5 (5.5)</td>
<td>10 (7.5)</td>
</tr>
<tr>
<td>High-pressure pump motor rpm</td>
<td>1000–1500</td>
<td>1000–2550</td>
<td>1000–2250</td>
<td>1000–2550</td>
<td>1000–2250</td>
<td>1000–2550</td>
<td>700–2450</td>
</tr>
</tbody>
</table>

Notes:
1. Wiring and branch circuit protection (Type RK1, J, or T fusing) to be provided by installer in accordance with National Electrical Code (NEC) requirements.
2. High-pressure compression fittings.
3. Unit ships with 36" x 1/2" high-pressure flexible hose and a 1/2" union for easy connection to dispersion piping.
4. 25 psi [170 kPa] supply water pressure at 125% of maximum flow rate, 60 psi [415 kPa] maximum.

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mc_032213_1005
### Specifications

**Table 9-1: RO station specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>1750</th>
<th>2500</th>
<th>3500</th>
<th>5500</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>System voltage/phase, Amp draw with RO components (see Note 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>480/3, 3.2</td>
<td>480/3, 4.6</td>
<td>480/3, 5.0</td>
<td>480/3, 5.0</td>
<td>480/3, 5.0</td>
<td>480/3, 5.0</td>
<td>480/3, 5.0</td>
</tr>
<tr>
<td></td>
<td>220/1, 8.0</td>
<td>220/1, 16.0</td>
<td>220/1, 17.0</td>
<td>220/1, 17.0</td>
<td>220/1, 17.0</td>
<td>220/1, 17.0</td>
<td>220/1, 17.0</td>
</tr>
<tr>
<td>Fuse size with RO components (see Note 2)</td>
<td>480/3, 5</td>
<td>480/3, 10</td>
<td>480/3, 10</td>
<td>480/3, 10</td>
<td>480/3, 10</td>
<td>480/3, 10</td>
<td>480/3, 10</td>
</tr>
<tr>
<td></td>
<td>220/1, 15</td>
<td>220/1, 30</td>
<td>220/1, 30</td>
<td>220/1, 30</td>
<td>220/1, 30</td>
<td>220/1, 30</td>
<td>220/1, 30</td>
</tr>
<tr>
<td>Shipping weight, lbs (kg)</td>
<td>275 (125)</td>
<td>300 (136)</td>
<td>325 (147)</td>
<td>350 (159)</td>
<td>400 (181)</td>
<td>475 (215)</td>
<td>575 (261)</td>
</tr>
<tr>
<td>RO system permeate water outlet connection dia., inches</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>3/4</td>
<td>3/4</td>
</tr>
<tr>
<td>Interface kit connections to pressurized RO storage tank and pump station supply water connection dia., inches</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>RO concentrate water outlet connection dia., inches</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>5-micron RO prefilter diameter x height, inches (mm)</td>
<td>2.5 x 20 (64 x 508)</td>
<td>2.5 x 20 (64 x 508)</td>
<td>2.5 x 20 (64 x 508)</td>
<td>2.5 x 20 (64 x 508)</td>
<td>4 x 20 (102 x 508)</td>
<td>4 x 20 (102 x 508)</td>
<td>4 x 20 (102 x 508)</td>
</tr>
<tr>
<td>Minimum RO pump flow rate, gpd (L/d) (see Note 4)</td>
<td>750 (2839)</td>
<td>1500 (5678)</td>
<td>3000 (11,536)</td>
<td>5250 (19,873)</td>
<td>7500 (28,390)</td>
<td>10,500 (39,746)</td>
<td>16,500 (62,459)</td>
</tr>
<tr>
<td>RO pump motor power, hp (kW)</td>
<td>1 (0.75)</td>
<td>1 (0.75)</td>
<td>3 (2.2)</td>
<td>3 (2.2)</td>
<td>3 (2.2)</td>
<td>3 (2.2)</td>
<td>3 (2.2)</td>
</tr>
<tr>
<td>Qty. of RO membranes</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>RO membrane diameter x height, inches (mm)</td>
<td>4 x 40 (102 x 1016)</td>
<td>4 x 40 (102 x 1016)</td>
<td>4 x 40 (102 x 1016)</td>
<td>4 x 40 (102 x 1016)</td>
<td>4 x 40 (102 x 1016)</td>
<td>4 x 40 (102 x 1016)</td>
<td>4 x 40 (102 x 1016)</td>
</tr>
</tbody>
</table>

**Notes:**

1. 220V/1-phase systems can operate on 208V/1-phase and 240V/1-phase power.
2. Wiring and branch circuit protection (Type RK1, J, or T fusing) to be provided by installer in accordance with NEC requirements.
3. 40 psi (280 kPa) minimum supply water pressure.
4. RO systems are sized for 50 °F (10 °C) incoming water temperature.
EVAPORATION EFFICIENCY IN AIR HANDLERS AND DUCTS

Once water is dispersed into a moving airstream, many factors affect evaporation efficiency, or how much of that water will evaporate. Factors affecting evaporation efficiency are included in the following example.

The following are known:
• Humidification load = 385 lbs/hr (175 kg/h)
• Available evaporation distance = 4 ft (1.2 m)
• Leaving air temperature = 55 °F (12.8 °C)
• Air velocity = 500 fpm (2.54 m/s)
• Entering air grains of moisture per pound of dry air = 15
  (Entering air grams of moisture per kilogram of dry air = 2.1)
• Entering air dew point temperature = 20 °F (–6.7 °C)
• Leaving air RH = 55%

AHU INSTALLATION EXAMPLE

* Evaporation efficiency increases as distance between dispersion manifold and final evaporation media increases.
**USING THE EVAPORATION EFFICIENCY CHART**

Using 55% leaving air RH and 15 grains of moisture per pound of dry air, the chart identifies:
- Required entering air temperature = 68 °F (20 °C)
- Evaporation efficiency = 70%

From these values, required system capacity can be calculated:

\[
\frac{\text{Load}}{\text{Evaporation efficiency}} = \text{Required system capacity}
\]

\[
\frac{385 \text{ lbs/hr}}{0.7} = 550 \text{ lbs/hr} \quad \text{or} \quad \frac{174.6 \text{ kg/h}}{0.7} = 249.4 \text{ kg/h}
\]

**EVAPORATION EFFICIENCY CHART**

To accurately size a High-Pressure System, first define all the values, as shown in this section. This will ensure a system that maximizes efficiency and delivers consistent output.

*Evaporation efficiency shown here is based on 4-ft evaporation distance, 55 °F leaving air temperature, and 500 fpm air velocity.*
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