EVAPORATIVE COOLING AND HUMIDIFICATION

High-Pressure System Wetted Media System

- Energy efficient
- Provides both direct and indirect evaporative cooling
- Multiple zone capabilities in air handlers, ducts, and open spaces
- Complete water treatment options available from DriSteem
- Simple, reliable operation



Advanced, efficient cooling and humidification

ENERGY EFFICIENT

Evaporative cooling and humidification systems draw heat from air to evaporate unheated water introduced by either high-pressure nozzles or wetted media. This process raises the relative humidity (RH) level and lowers the air temperature (dry bulb). Consequently, these systems tend to be very energyefficient ways to humidify and/or cool air.

REDUCES COOLING LOAD

As water is absorbed in air, the evaporative cooling effect reduces the building's cooling load. Twelve pounds of unheated evaporated water (vapor) reduces the cooling load by about one ton, saving about 12,000 Btus.

LOW MAINTENANCE

High-Pressure and Wetted Media Systems are very low maintenance systems.

The High-Pressure System's stainless-steel pump is designed to run for 8,000 hours before its first maintenance check, and the stainless-steel dispersion nozzles and manifolds are maintenance free.

High-Pressure System water treatment options available from DriSteem provide ultra-pure water that leaves no white dust. The reverse osmosis (RO) system automatically backflushes for extended membrane life.

Wetted Media Systems recycle water, after it flows through the media, with robust centrifugal pumps. The Vapor-logic controller manages the concentration of dissolved solids in recirculated supply water to minimize scaling and lengthen media life. When required, new media cassettes easily drop in to place.



Direct evaporative cooling adds moisture to the supply air. Indirect evaporative cooling occurs in the heat exchanger without adding moisture. A High-Pressure System is shown here. See page 14 for an illustration of direct/indirect cooling using a Wetted Media System.

HIGH-PRESSURE SYSTEM



The DriSteem® High-Pressure System delivers evaporative cooling and humidification to multiple zones in air handlers, ducts, and/ or open spaces. The Vapor-logic controller provides comprehensive management of all system variables including water treatment and meeting tight space condition requirements.

WETTED MEDIA SYSTEM



The DriSteem[®] Wetted Media System delivers evaporative cooling and humidification to air handlers and ducts. The Vapor-logic controller's sophisticated water and scale management capabilities optimize water and media life.

Features and benefits

Feature	High-Pressure System	Wetted Media System							
Application versatility	Suitable for any application; commonly used in data centers, industrial manufacturing, and printing facilities; and applications using air-side economizers								
Advanced technology	Micro-turbines in precision-machined atomizing nozzles fragment water droplets into ultra-fine particles (90% are ten microns or less)	Controller anticipates cooling requirements, maximizes system on-time, predicts media replacement, and provides temperature control							
	Water delivered to nozzles at up to 1200 psi (8.27 MPa) requires no pressurized air	Water concentration management maximizes media life and water utilization							
	Integral check valve in nozzle ensures no dripping when system shuts off	Multiple compact recirculation pumps provide redundancy with low system energy usage							
Cooling effect	Every pound of atomized water absorbed in air removes approximately 1000 Btu of heat from the air (every kg absorbed removes approximately 2300 kJ of heat)								
saves energy	Significant energy savings when cooling and humidifying simulto	neously							
	Utility rebates can offset costs								
	Stainless-steel pump is cooled by purified supply water; 8000 hours before maintenance check	Uses potable water, eliminating water treatment maintenance							
Low	Stainless-steel nozzles and manifolds require no maintenance	Water concentration management minimizes media scaling, extending media life							
maintenance	Thorough water filtration protects stainless-steel components from corrosion and undue wear	Easy-to-replace media cassettes drop into frames in seconds							
	Final evaporation media as close as three feet (0.9 m) downstream from heating coil prevents downstream wetting	Powerful pumps keep solids in the holding tank in motion to be easily drained away							
	Accurate, responsive RH control; PID control tunes system for maximum performance								
Comprehensive system control with Vapor-logic®	Set up, view, and adjust system functions with intuitive keypad/display or Web interface								
will tupor logic	Integrates into any building automation system via Modbus® and optional BACnet® or LonTalk® communication protocols								
Multiple zone	Individual zone monitoring and modulated staging valves provide tight control in all zones with optimized absorption and minimal water waste	Not available							
control capability	One system cools and humidifies multiple zones with separate demands								
	Cools and humidifies in air handlers, ducts, and open spaces	Cools and humidifies in air handlers and ducts							
Versatile	Nozzle staging and pulsed modulation allow high turndown of system output	Media staging and predictive operation allow high turndown c system output							
	Capacities up to 5500 lbs/hr (2495 kg/h), multiple systems can be combined for larger capacities	Media sizes from 4 ft ² (0.4 m ²) to 100 ft ² (9.3 m ²); multiple systems can be combined for larger capacities							
	Flexibility to accommodate the most challenging applications; ex with system layout and design	tensive network of DriSteem Representatives available to assist							
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	Not required							
	Ultra-pure water eliminates white dust fallout and bacteria/virus proliferation that can occur when using potable water								

High-Pressure System sequence of operation

A COMPLETE SYSTEM THAT INCLUDES WATER TREATMENT

- 1 Water enters system from municipal water supply
- 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 highpressure, 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
- Zone 1 To solenoid valves Zone 1 control cabinet To network Municipal water inlet 2 Dechlorinator 3 Duplex water softener
- 8 Humidified zones: one, two, or three stages per zone

High-Pressure System sequence of operation



High-Pressure System dimensions

Table 6-1:

DriSteem High-Pressure System dimensions ¹																
	Dimension															
Model	A	2	E	3	(2	[C		E	F	=	(3	ŀ	4
	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
250	150	3810	24³	610 ³	55	1397	24	610	24	610	18	457	12	305	44	1024
500	160	4064	24³	610³	55	1397	24	610	24	610	24	610	14	356	44	1024
1000	176	4470	24³	610³	55	610	24	610	32	813	24	610	16	406	16	406
1750	176	4470	24³	610 ³	55	610	24	610	32	813	24	610	16	406	16	406
2500	197	5004	30	762	80	2032	24	610	32	813	30	762	21	533	21	533
3500	221	5613	30	762	72	1829	30	762	40	1016	39	991	24	610	24	610
5500	239	6071	30	762	90	2286	30	762	46	1168	39	991	30	762	30	762

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.

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High-Pressure System dimensions



High-Pressure System specifications

Table 8-1: High-Pressure System pump station specifications								
Model	250	500	1000	1750	2500	3500	5500	
System capacity, lbs/hr (kg/h)	250 (113)	500 (227)	1000 (454)	1750 (794)	2500 (1134)	3500 (1588)	5500 (2495)	
System voltage/phase, Amp draw	240/1, 5.2 480/3, 1.6 600/3, 1.3	240/1, 7.3 480/3, 2.2 600/3, 1.8	240/1, 13.8 480/3, 4.0 600/3, 3.2	480/3, 6.6 600/3, 5.3	480/3, 6.6 600/3, 5.3	480/3, 9.2 600/3, 7.3	480/3, 12.6 600/3, 10.1	
Fuse size (see Note 1)	240/1, 25 480/3, 16 600/3, 6	240/1, 35 480/3, 10 600/3, 6	240/1, 50 480/3, 15 600/3, 10	480/3, 30 600/3, 15	480/3, 30 600/3, 15	480/3, 35 600/3, 20	480/3, 40 600/3, 20	
Dimensions (W/D/H), inches (mm)	24/24/60 (610/610/1524)	24/24/60 (610/610/1524)	24/24/60 (610/610/1524)	24/24/60 (610/610/1524)	24/30/60 (610/762/1524)	24/30/60 (610/762/1524)	24/30/60 (610/762/1524)	
Dimensions (W/D/H) with redundant high-pressure pump option, inches (mm)	24/30/76 (610/762/1930)	24/30/76 (610/762/1930)	24/30/76 (610/762/1930)	24/30/76 (610/762/1930)	24/30/76 (610/762/1930)	24/30/76 (610/762/1930)	24/30/76 (610/762/1930)	
Weight, lbs (kg)	275 (125)	300 (136)	325 (147)	325 (147)	350 (159)	400 (181)	450 (204)	
Weight with redundant high-pressure pump option, Ibs (kg)	375 (170)	400 (181)	475 (216)	475 (216)	500 (227)	625 (284)	700 (318)	
Supply water connection diameter, inches (see Note 2)	3/4	3/4	3/4	3/4	3/4	3/4	3/4	
High-pressure water connection diameter, inches (see Note 2)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	
5-micron prefilter diameter x height, inches (mm)	4 × 20 (102 × 508)	4 × 20 (102 × 508)	4 × 20 (102 × 508)	4 × 20 (102 × 508)	4 × 20 (102 × 508)	4 × 20 (102 × 508)	4 × 20 (102 × 508)	
High-pressure pump flow rate, gpm (L/m)	0.5 (1.89)	1.0 (3.78)	2.0 (7.57)	3.5 (13.2)	5 (18.9)	7 (26.5)	11 (41.6)	
High-pressure pump motor power, hp (kW)	1 (0.75)	1.5 (1.1)	3 (2.2)	5 (3.7)	5 (3.7)	7.5 (5.5)	10 (7.5)	
High-pressure pump motor rpm	1000-1500	1000-2550	1000-2250	1000-2550	1000-2250	1000-2550	700-2450	

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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High-Pressure System specifications

Table 9-1: RO station specifications								
Model	250	500	1000	1750	2500	3500	5500	
System voltage/phase, Amp draw with RO components (see Note 1)	480/3, 2.3 220/1, 8.0 120/1, 16.0	480/3, 4.6 220/1, 16.0 120/1, 16.0	480/3, 5.0 220/1, 17.0	480/3, 5.0 220/1, 17.0	480/3, 5.0 220/1, 17.0	480/3, 5.0 220/1, 17.0	480/3, 5.0 220/1, 17.0	
Fuse size with RO components (see Note 2)	480/3, 5 220/1, 15 120/1, 30	480/3, 10 220/1, 30 120/1, 30	480/3, 10 220/1, 30	480/3, 10 220/1, 30	480/3, 10 220/1, 30	480/3, 10 220/1, 30	480/3, 10 220/1, 30	
Dimensions (W/D/H), inches (mm)	20/24/55 (508/610/1397)	20/24/55 (508/610/1397)	20/32/55 (508/813/1397)	20/32/55 (508/813/1397)	20/32/55 (508/813/1397)	20/40/55 (508/1016/1397)	20/46/55 (508/1168/1397)	
Shipping weight, lbs (kg)	275 (125)	300 (136)	325 (147)	350 (159)	400 (181)	475 (215)	575 (261)	
Supply water connection dia., inches (see Note 3)	3/4	3/4	3/4	3/4	3/4	3/4	3/4	
RO system permeate water outlet connection dia., inches	1/2	1/2	1/2	1/2	1/2	3/4	3/4	
Interface kit connections to pressurized RO storage tank and pump station supply water connection dia., inches	1	1	1	1	1	1	1	
RO concentrate water outlet connection dia., inches	1/2	1/2	1/2	1/2	1/2	1/2	1/2	
5-micron RO prefilter diameter x height, inches (mm)	2.5 × 20 (64 × 508)	2.5 × 20 (64 × 508)	2.5 × 20 (64 × 508)	2.5 × 20 (64 × 508)	2.5 × 20 (64 × 508)	4 × 20 (102 × 508)	4 × 20 (102 × 508)	
Minimum RO pump flow rate, gpd (L/d) (see Note 4)	750 (2839)	1500 (5678)	3000 (11,536)	5250 (19,873)	7500 (28,390)	10,500 (39,746)	16,500 (62,459)	
RO pump motor power, hp (kW)	1 (0.75)	1 (0.75)	3 (2.2)	3 (2.2)	3 (2.2)	3 (2.2)	3 (2.2)	
Qty. of RO membranes	1	2	3	4	6	8	12	
RO membrane diameter x height, inches (mm)	4 × 40 (102 × 1016)	4 × 40 (102 × 1016)	4 × 40 (102 × 1016)	4 × 40 (102 × 1016)	4 × 40 (102 × 1016)	4 × 40 (102 × 1016)	4 × 40 (102 × 1016)	

Notes:

220V/1-phase systems can operate on 208V/1-phase and 240V/1-phase power.
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.

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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 = $20 \degree F (-6.7 \degree C)$
- Leaving air RH = 55%

AHU INSTALLATION EXAMPLE



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:



EVAPORATION EFFICIENCY CHART*



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

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.

Wetted Media System sequence of operation

SEQUENCE OF OPERATION

- 1 Water enters from the municipal water supply and fills the tank.
- 2 The recirculation pump cycles tank water through the Ultra-violet (UV) lamp and then through the tank to keep solids in suspension for easy drainage.
- 3 Dedicated pumps supply water to each stage of media (up to three stages available).
- 4 Distribution headers evenly distribute water over each media stage.
- 5 Air flowing through the wetted media is cooled and humidified.
- 6 Probe measures water level and usage.
- 7 System draining is optimized to minimize water usage and media scaling.
- 8 Vapor-logic controller manages staged response to system demand and water cycles of concentration.



Wetted Media System dimensions

DIMENSIONS AND MINIMUM RECOMMENDED CLEARANCES



Wetted Media System specifications

Table 14-1:

Wetted Media	System	specifications
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Item	Specification
System capacity	Varies with application. See graph on page 15 for system efficiencies and to calculate system capacity.
System voltage/phase/Amp draw	120 Volts, 1 phase: 1 stage: 3.0 Amps 2 stages: 4.2 Amps 3 stages: 5.5 Amps
Fuse size*	120 Volts,1 phase: 15 Amps
Height	30" - 120" (762 mm - 3048 mm)
Width	24" - 120" (610 mm - 3048 mm)
Depth	23" (584 mm)
Tank/Frame Weight, Operating – lbs (kg) **	75 lbs x system width(ft) [111.6 kg x system width (m)]
Media Weight, Operating – Ibs (kg) **	10 lbs x[system width (ft) x (system height (ft) – 1 ft)] (14.9 kg x [system width (m) x (system height (m) – 1 m)])
Tank/Frame Weight, Shipping – Ibs (kg) **	30 lbs x system width(ft) [111.6 kg x system width (m)]
Media Weight, Shipping – Ibs (kg) **	2 lbs x[system width (ft) x (system height (ft) – 1 ft)] (3.0 kg x [system width (m) x (system height $(m) - 1 m$])
Supply water pressure	25 – 80 psi (166 – 552) kPa
Supply water connection, diameter	3/8" – 3/4", (DN10 – DN20) depending on flow rate
Drain connection, diameter	1" (DN25), copper
Recommended inlet water flow rate	3x system capacity or 11 gpm (42 L/m) max.
Airflow velocity, maximum recommended	700 fpm (3.5 m/s) through wetted media without mist eliminator. (Contact DriSteem for airflow velocities above 700 fpm.)
Water quality requirements	System recycle rate depends on water quality. Contact DriSteem for more information.
* Wiring and branch circuit protection (Type RK	1, J, or T fusing) to be provided by installer in accordance with National Electrical Code

(NEC) requirements. ** System weight = tank/frame weight + media weight

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DIRECT OR INDIRECT EVAPORATIVE COOLING



Direct evaporative cooling adds moisture to the supply air. Indirect evaporative cooling occurs in the heat exchanger without adding moisture. A Wetted Media System is shown here. See page 2 for an illustration of direct/indirect cooling using a High-Pressure System.

Wetted Media System cooling efficiency and pressure drop

WETTED MEDIA SYSTEM COOLING EFFICIENCY AND PRESSURE DROP



Performance data courtesy of Munters corporation

DriSteem Corporation

A subsidiary of Research Products Corporation An ISO 9001:2000 certified company

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EXPECT QUALITY FROM THE INDUSTRY LEADER

For more than 45 years, DriSteem has been leading the industry with creative and reliable humidification solutions. Our focus on quality is evident in the construction of DriSteem Evaporative Cooling Systems. DriSteem leads the industry with a Two-year Limited Warranty and optional extended warranty.

For more information www.dristeem.com sales@dristeem.com

For the most recent product information visit our website: www.dristeem.com

Your DriSteem representative is:



