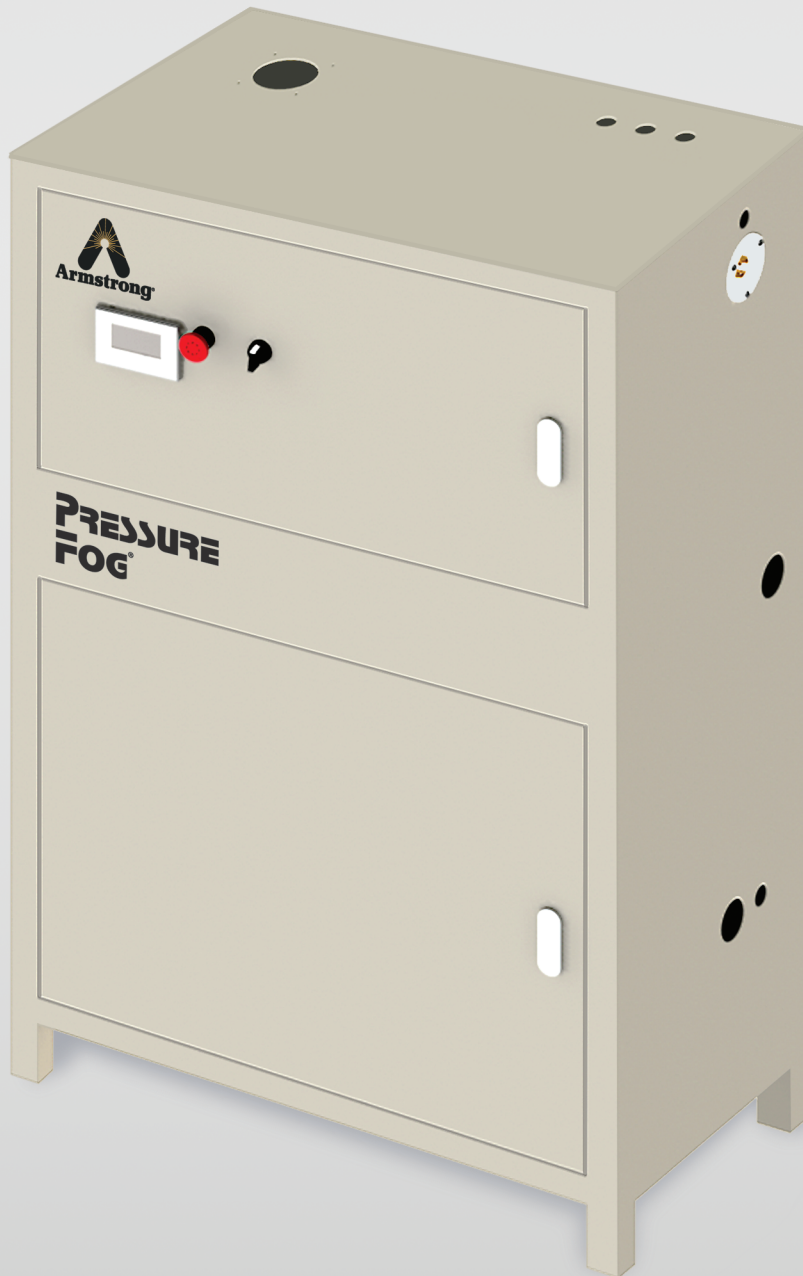


PressureFog™  
High Atomizing  
Humidification System



**PRESSURE  
FOG®**



Energy efficient, low maintenance, reliable, precisely controlled, and clean. Armstrong believes these five industry needs are priority for humidification systems. Since 1938, Armstrong has been a leading supplier of humidification solutions for corporate environments, museums, hospitals, universities, semiconductor manufacturing, and electronics manufacturing. Customers' needs are constantly changing and while many of the humidification products are successful in providing desirable indoor air quality, Armstrong is committed to developing and engineering new technology to best suit our customers' demands.

## High Pressure Atomization Without An Air Compressor

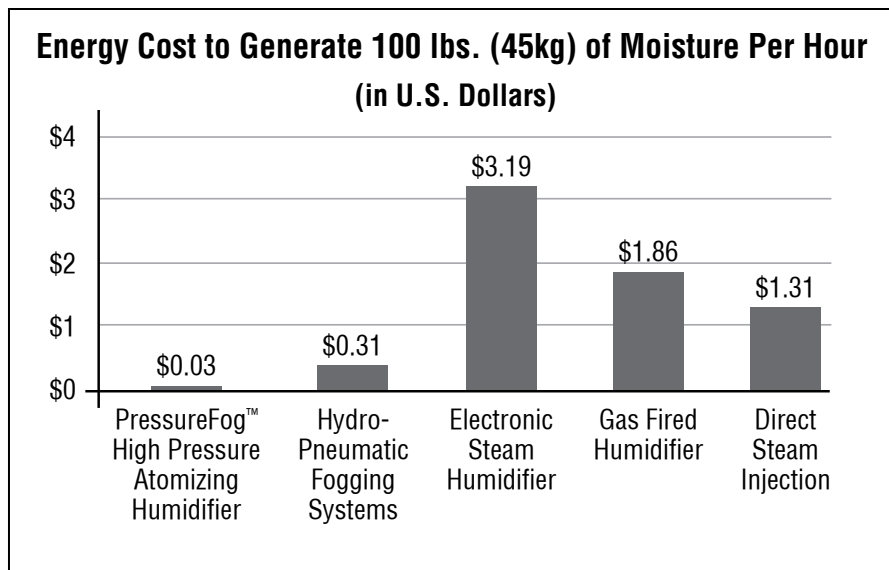
PressureFog™ is Armstrong's most efficient high pressure atomizing humidification solution. PressureFog™ efficiently produces a rich fog to raise relative humidity without the need of an air compressor, keeping energy costs low and environments cool. PressureFog™ is a humidifying system that is ideal for applications that require high water volume with minimum energy use.

## Low Maintenance, Energy Efficient Evaporative Cooling

PressureFog™ compliments the Armstrong humidification family by offering a low maintenance, energy efficient solution for evaporative cooling that uses an ultra-clean source of deionized or reverse osmosis water to ensure no blockage of the nozzle orifices, no dust from fog evaporation, and to promote better hygiene. And because of an all stainless steel construction that prevents corrosion or buildup of deposits, PressureFog™ commits to long-lasting service life. All electrical components are UL certified and all motors have CE certification.

Compared to other humidification methods like hydro-pneumatic fogging systems and electric steam humidifiers, PressureFog™ is the most efficient solution in its appropriate operational environment.

Energy Savings	
PressureFog™	.284 kW
Hydro-pneumatic Fogging Systems	3.365 kW
Electric Steam Humidifiers	34.5 kW



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# PressureFog™ Unitary Package

## Nozzle Dispersion Manifold

Stainless steel, atomizing nozzles are welded uniformly onto the tubing of a manifold. Nozzles have orifices that range from .006-.012" (.15-.3 mm) and can output 7-16 lbs/hr (3.2-7.3 kg/hr) of nebulized water. The nozzles do not require adjustment, and have an anti-drip body which closes the orifice to avoid dripping and prevent any ambient contamination when the nozzle is off. PressureFog's dispersion manifolds can also be installed as a Direct Area Discharge system.

Nozzle Dispersion Manifold

## Solenoid Valves

Control solenoid valves are used to modulate which groups of nozzles are to be utilized. They are all stainless steel and are controlled automatically or manually through the PLC. They are normally closed, so if power is ever lost to the unit, they will automatically shutoff the supply to the nozzles.

Valves

## PLC and VFD

The programmable logic controller (PLC) and variable frequency drive (VFD) control the pump's motor to adjust the speed of the pump so that pressure and output of the nozzles are precisely modulated according to the demand. Control can be stand-alone using humidity sensors, or the system can be manually controlled.

VFD

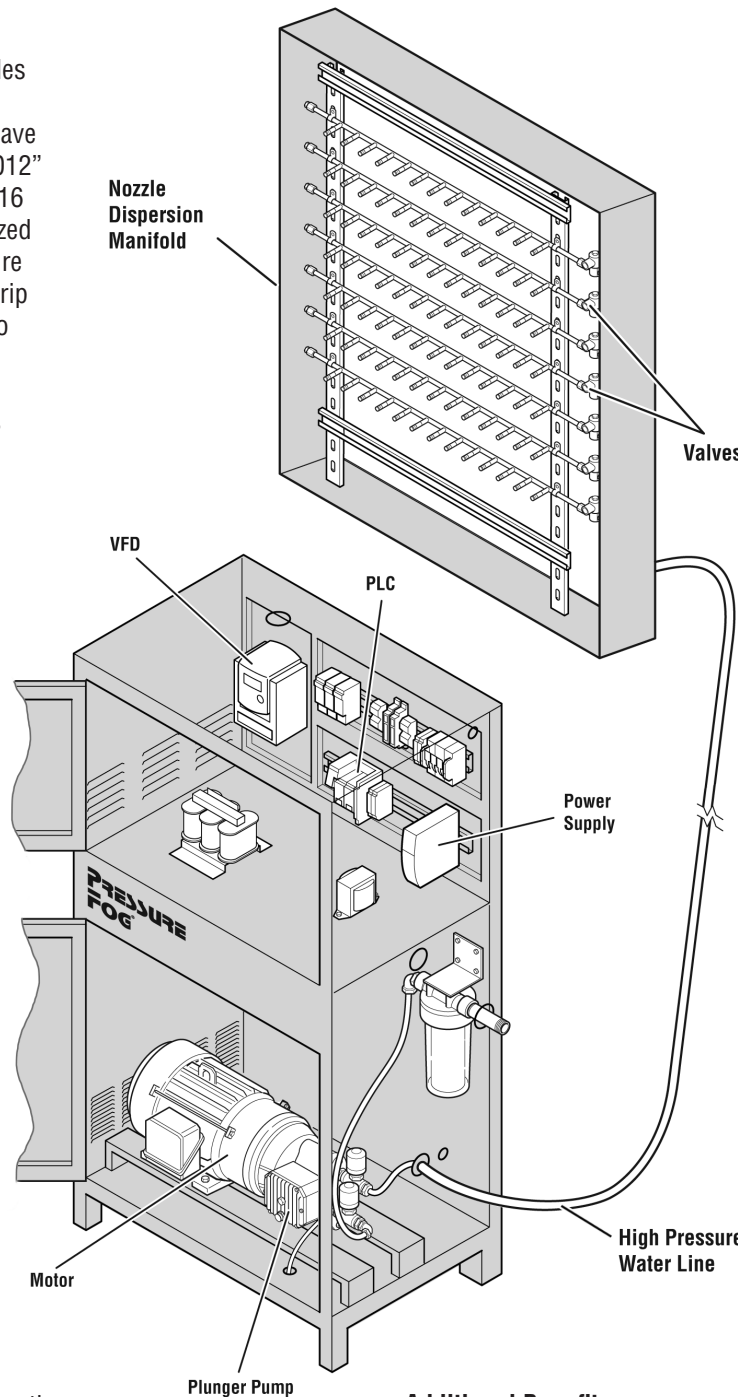
PLC

Power Supply

- Uses ultra-pure water (deionized/ reverse osmosis, filtered) as a humidification source. No re-boiling is necessary thus saves energy.

- Power voltage supply: 240, 380, 480, or 600 VAC, all 3-phase, and 4-wire ground.

- Unit has a human-machine interface, houses plunger pump and motor and contains the electrical cabinet.



Motor

Plunger Pump

High Pressure Water Line

## Plunger Pump

Driven by an inverter duty motor, the reciprocating plunger pump delivers demineralized water at 1,000-1,200 psi (69-83 bar). It is able to maintain a high, constant pressure to supply water to multiple AHUs/ducts or rooms.

## Additional Benefits

- Large capacity range: 250 (113), 500 (227), 1000 (454), 1500 (680), 2000 (907), and 3000 (1361) lbs/hr (kg/hr).
- Auto or Manual Mode Option.
- Silent operation.
- Odor control.
- Dust compression.
- All wetted parts are stainless steel and plastic.

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## Why Humidification?

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### **Humidification reduces heating costs.**

All forms of humidification provide a variety of benefits, not the least of which is a reduction in heating load for human comfort. Studies indicate people are generally most comfortable when relative humidity is maintained between 35% and 55%. When air is dry, moisture evaporates more readily from the skin, producing a feeling of chilliness even with temperatures of 75°F (23°C) or more.

Because human perception of RH is often sensed as temperature differential, it's possible to achieve comfortable conditions with proper humidity control at lower temperatures. The savings in heating costs are typically very significant over the course of just a single heating season.

### **Efficient use of internal heat gain and waste heat can yield up to a 90% reduction of energy costs compared to steam humidification.**

Large commercial offices and manufacturing facilities can have an extended cooling season or year round cooling load. In such situations, a mixed air economizer system can be employed to exhaust warmer return air and replace it with cooler outside air. Although free cooling is achieved, the dryer outside air actually increases the humidification load and humidification energy consumption.

Instead of exhausting the warmer return air, foggers use the warm return air to evaporate water. Humidification is achieved without the energy required to boil water and economizer cooling is still achieved without mechanical refrigeration.

### **50-60% reduction of economizer humidification load and associated energy costs.**

Because of the cooling experienced with fogging systems, economizer systems can run at higher mixed air temperatures which means less outside air is required. Therefore, the humidification load is greatly reduced compared to the conventional steam humidification load.

### **Efficient use of warm, dry outside air reduces cooling costs.**

Some outdoor climates require both cooling and humidification to achieve the desired indoor conditions. Obviously, economizers cannot deliver free cooling when the outside air is warmer than the desired zone temperature. However, if the humidity levels are low, such as in dry environments, significant free cooling may be achieved with an evaporative humidification system.

This is true for both mixed air and 100% make-up air systems. In fact, many non-desert climates experience significant cooling and humidification hours each year.

### **Ultra clean humidification source.**

Deionized water is used for an ultra-pure source of humidification to maintain a non-contaminated environment.

### **Energy savings with clean rooms.**

PressureFog™ is clean room humidification that requires ultra-pure water as a humidification source. As ultra-pure water is considered corrosive at elevated temperatures, PressureFog™ is all stainless steel constructed, eliminating corrosion.

In many applications, a stainless steel re-boiler would be used to accomplish clean room humidification with ultra-pure water. Due to the inefficiencies of the heat exchange process in re-boilers, PressureFog™ is more energy efficient.



# What is Fogging?

PressureFog™ high pressure atomizing humidifier atomizes water particles to produce fog. When the fog is sprayed into a warm, dry air stream or space, the water rapidly evaporates leaving the space moist and cool. The process is also referred to as evaporative cooling and follows the wet bulb line (i.e. constant enthalpy) on the psychrometric chart.

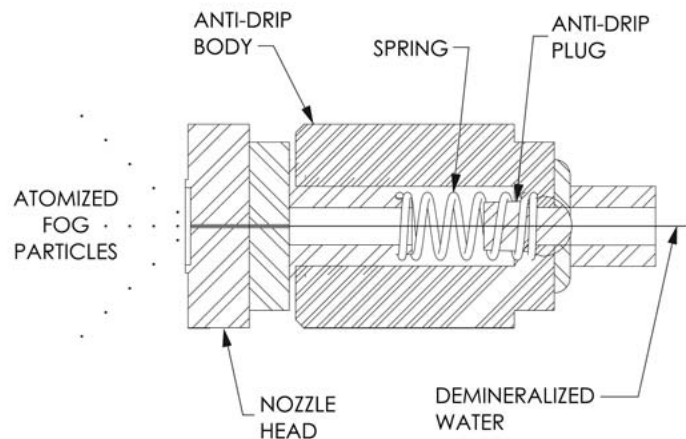
Because no heat is added to evaporate the water, there is a cooling effect that is directly proportional to the amount of water evaporated. This is also referred to as adiabatic or constant enthalpy cooling and humidification.

## How PressureFog™ Works

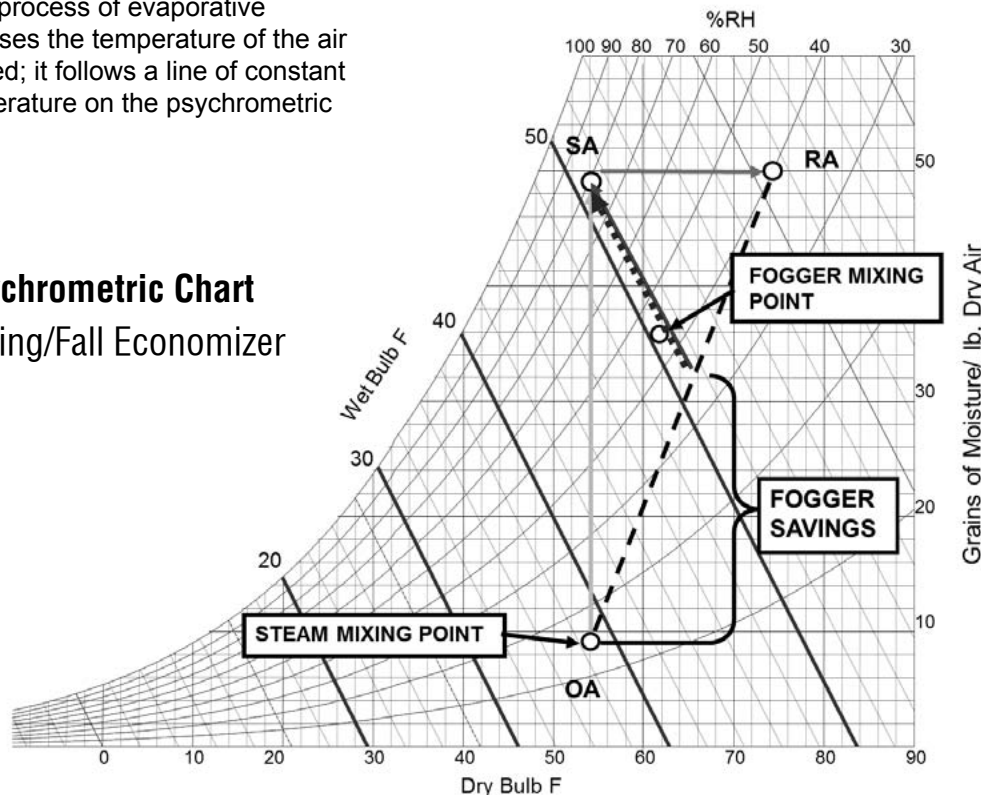
PressureFog™ boosts demineralized water to 1,000-1,200 psi (68.9- 82.7 Bar) using a plunger pump, which transmits the pressurized water to atomizing nozzles. The nozzles then nebulize the water into an array of super fine particles, down to 10 microns in diameter. These minutely sized particles create a fog that allows for quick evaporation and cooling by absorbing heat from the surrounding ambient air.

This adiabatic process of evaporative cooling decreases the temperature of the air being humidified; it follows a line of constant wet-bulb temperature on the psychrometric chart.

## PressureFog™ Nozzle



## Psychrometric Chart Spring/Fall Economizer



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# Selection and Ordering Procedure

Consider the following factors to select and order the proper unit. Consult factory for pricing information.

## 1. Compute capacity required.

You must compute the maximum amount of moisture required to determine the properly sized model for service. For detailed information on calculating humidification loads, refer to Armstrong's Humid-A-ware™ Humidification Sizing and Selection Software which are useful tools in sizing load requirements. Humid-A-ware™ may be downloaded from Armstrong's website at [www.armstronginternational.com](http://www.armstronginternational.com).

Selection and Ordering Procedure				
Capacity		Power Supply Voltage (3 phase)		
lbs/hr	kg/hr	240	380-480	600
250	113	PF250-240	PF250-480	PF250-600
500	227	PF500-240	PF500-480	PF500-600
1000	454	PF1000-240	PF1000-480	PF1000-600
1500	680	PF1500-240	PF1500-480	PF1500-600
2000	907	PF2000-240	PF2000-480	PF2000-600
3000	1361	PF3000-240	PF3000-480	PF3000-600

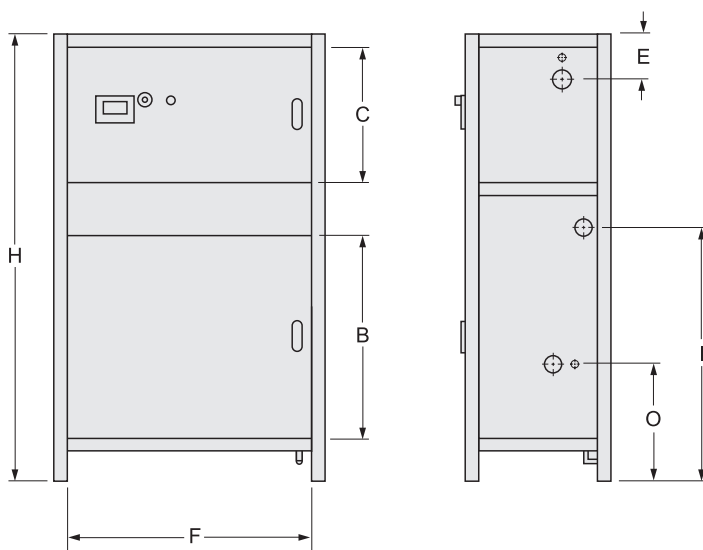
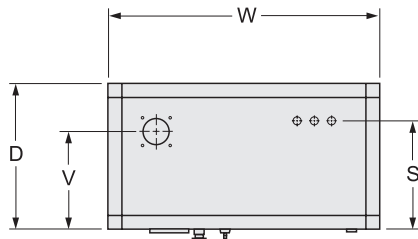
## 2. Specify electrical characteristics of unit required.

Specify the voltage and phase for unit on the order. Determine total amperage for installation purposes.

## 3. Consult factory for assistance in selecting proper number of manifolds and nozzles.

Refer to the PressureFog™ Installation Details Form (IDF) for required information. The IDF can be downloaded at [www.armstronginternational.com/files/common/idf/pressure\\_fog\\_idf.pdf](http://www.armstronginternational.com/files/common/idf/pressure_fog_idf.pdf) or refer to page 10.

# Dimensional Drawings & Physical Data



Physical Data		
Item	Inches	Millimeters
B - Bottom Door Height	23.7	602
C - Top Door Height	15.8	401
D - Cabinet Depth	16.9	429
E - Electrical Supply	5.3	135
F - Door Width	28.4	721
H - Cabinet Height	52.0	1321
I - Water Inlet	31.2	792
O - Water Outlet	12.2	309
S - Solenoid Valves Port	12.3	313
V - VFD Vent	11.3	288
W - Cabinet Width	31.5	800
Unit Dimensions	16x31.5x52	432x800x1321

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# Specifications, Materials and Nozzles

Armstrong®

Specifications						
Model	PF250	PF500	PF1000	PF1500	PF2000	PF3000
Capacity lbs/hr (kg/hr)	250 (113)	500 (227)	1000 (454)	1500 (680)	2000 (907)	3000 (1361)
Motor Power	1	1	3	3	5	5
Main Unit Weight lbs (kg)	200 (91)	220 (100)	270 (122)	270 (122)	290 (132)	290 (132)
Unit Shipping Weight lbs (kg)	250 (113)	270 (122)	320 (145)	320 (145)	340 (154)	340 (154)
Inlet Pressure	40 to 100 psig (2.8 to 6.9 bar)					
Outlet Water Pressure	1000-1200 psig (69-83 bar)					
Unit Dimensions LxWxH in (mm)	17x31.5x52 (432x800x1321)					
Sound Level (dB)	70 - 85					

Electrical Specifications							
Model		PF250	PF500	PF1000	PF1500	PF2000	PF3000
Voltage	240, 3 phase, 50/60 Hz	6.5 A	6.5 A	12.0 A	12.0 A	17.5 A	17.5 A
	380-480, 3 phase, 50/60 Hz	4.5 A	4.5 A	7.0 A	7.0 A	10.0 A	10.0 A
	600, 3 phase, 60 Hz	4.0 A	4.0 A	6.25 A	6.25 A	8.5 A	8.5 A

Piping Specifications						
Model	PF250	PF500	PF1000	PF1500	PF2000	PF3000
Flow Rate gpm (l/m)	0.5 (1.9)	1 (3.8)	2 (7.6)	3 (11.4)	4 (15.1)	6 (22.7)
Load lbs/hr (kg/hr)	250 (113)	500 (227)	1000 (454)	1500 (680)	2000 (907)	3000 (1361)
Inlet Pressure	40 to 100 psig (2.8 to 6.9 bar)					
Temperature	35°F to 110°F (2°C to 43°C)					
Inlet Connection	3/4" NPTM					
Outlet Connection	3/8" NPTM			1/2" NPTM		
Drain Connection	1/2" ID, 3/4" OD Silicon Tubing					

List of Materials	
Part	Material
Cabinet	16 Ga. Steel
Cabinet Finish	Powder coating
Plunger Pump	316 SS
Pressure Transducers	316 SS
Inlet Tee	316 SS
Inlet Pipe Adapter	304 SS
Inlet Tubing	Nylon 11
Inlet Tube Adapter	Polypropylene
Outlet Tee	304 SS
Outlet Pipe Adapter	316 SS
Drain Valve	316 SS
Water Filter	Polypropylene
Manifold	304 SS
Nozzles	303 SS

Nozzles					
Nozzle (Part Number)	Orifice in (mm)	Threads	Capacity lbs/hr (kg/hr)		
			1,000 psi (69 bar)	1,100 psi (76 bar)	1,200 psi (83 bar)
D17983	0.006 (0.15)	10-24 UNC/2A	6.6 (3.0)	6.9 (3.1)	7.3 (3.3)
D17984	0.008 (0.2)		9.6 (4.4)	10.2 (4.6)	10.7 (4.9)
D17985	0.012 (0.3)		14.4 (6.5)	15.3 (6.9)	16.6 (7.5)

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# Typical Specification

## Master SECTION 15810

### HUMIDIFIER

#### PART 1, GENERAL

##### 1.01 WORK INCLUDED

A. Adiabatic Humidifier, Control Cabinet, Manifolds with Nozzles, Piping and Controls.

##### 1.02 RELATED WORK

A. Electrical distribution Division 16000

B. Plumbing water distribution and drainage. Section 15400

C. Ductwork Insulation. Section 15290

D. Air Handling Section 15850

##### 1.03 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01300.

B. Shop drawings shall indicate assembly, dimensions, weights, construction details and all field connection details and all mounting and housing details.

C. Product data shall indicate dimensions, weights, capacities, ratings, construction details, electrical characteristics.

D. Submit manufacturer's installation instructions and operating and maintenance manuals.

##### 1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site in factory fabricated protective containers.

B. Store in a clean dry place and protect from weather and construction traffic, handle carefully to avoid damage to components, enclosures and finish.

##### 1.05 ENVIRONMENTAL CONDITIONS

A. Do not operate unit for any purpose, temporary or permanent until all water supply and drainage connections have been made and all safety controls are functioning properly.

##### 1.06 WARRANTY

A. Provide manufacturer's two year standard warranty.

#### PART 2, PRODUCTS

##### 2.01 ACCEPTABLE MANUFACTURERS

A. Armstrong

##### 2.02 SPECIFICATION FOR PLC CONTROLLED HIGH PRESSURE

FOGGING SYSTEMS

### HUMIDIFIER:

A. Approved Manufacturer: Armstrong

B. The manufacturer shall furnish all required equipment (including control panels, factory assembled fogger manifolds, etc...) for installation by the Contractor. Field assembly of manifolds will not be accepted.

C. System requires the use of DI or RO water.

D. Atomizing nozzles that will nebulize the high pressure water down to 10 micron fog particles.

E. A positive displacement, reciprocating plunger pump that will boost water pressure to 1,000 – 1,200 psi (69-83 bar) will be included.

F. Integrated with a comprehensive programmable logic controller (PLC) which controls the solenoid valves to all manifolds for best control of water output from the plunger pump.

G. Precise control of the water pressure is achieved by modulation of the variable frequency drive for the inverter duty motor.

H. Stainless steel fogger manifolds to have welded construction.

I. Cabinet to be constructed of 16 Ga., powder coated, steel.

1. Includes all major components:

a. Programmable Logic Controller

b. Motor & Reciprocating Plunger Pump

c. Variable Frequency Drive

d. Water Filter

2. Includes Touch Screen Keypad

3. Compact size allows it to be transported through standard door ways

J. Droplet separator installed downstream of the manifolds ensures the service life of the AHU or duct by catching non-evaporated fog.

K. Output to be controlled by 0-10Vdc or 4-20mA signal.

L. Approved by a Nationally Recognized Testing Laboratory.

M. Optional Equipment:

1. Airflow proving switch can be provided for field installation

2. High limit humidistat can be provided for field installation

3. Wall or Duct mounted controlling humidistat can be provided for field installation.

#### PART 3, EXECUTION

##### 3.01 INSTALLATION

A. Install Armstrong humidifiers as indicated on drawings and as indicated in schedules in accordance with manufacturer's instructions.

##### 3.02 MANUFACTURERS FIELD SERVICES:

A. Supply services of factory trained representative to check installation for compliance with manufacturer's requirements and to supervise start-up and testing of humidifiers.

##### 3.03 DEMONSTRATION

A. Demonstrate all humidifiers to be fully functional. See 15990 for testing procedure.

END OF SECTION 15810



# Typical Installation Layouts



Fig. 9-1  
Direct Area Discharge

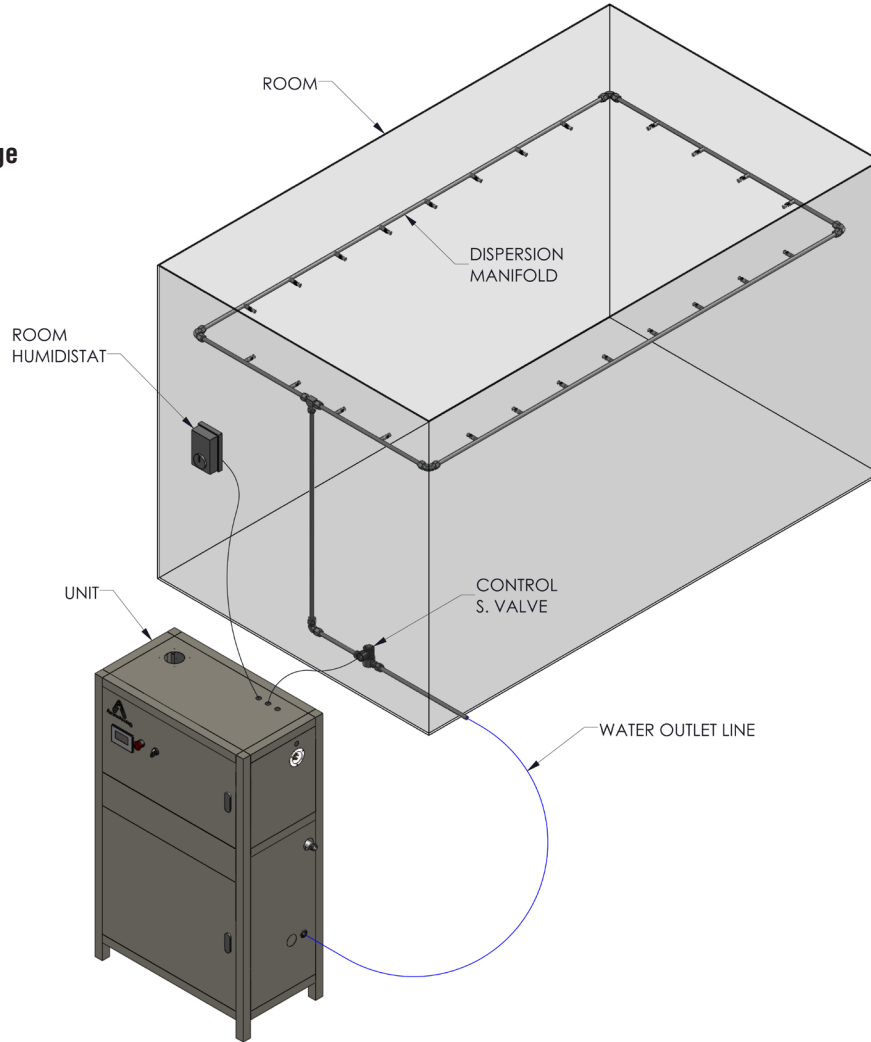
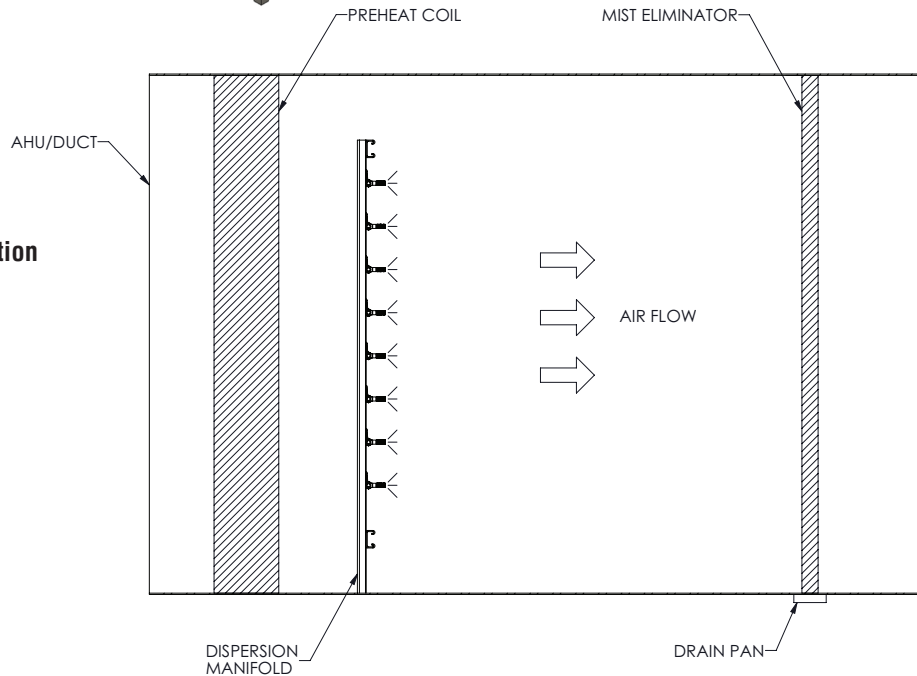


Fig. 9-2  
Duct Type Distribution



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# PressureFog™ Installation Details Form (IDF)

We ask that this form accompanies every PressureFog™ request. This does not pertain to repair parts purchase orders.

REPRESENTATIVE: \_\_\_\_\_ DATE: \_\_\_\_\_

PO# \_\_\_\_\_ JOB NAME: \_\_\_\_\_

Point of Order (Sold To): \_\_\_\_\_  
(eg: ABC Mechanical)

City: \_\_\_\_\_ State: \_\_\_\_\_ Rep Firm: \_\_\_\_\_

Point of Installation: \_\_\_\_\_  
(eg: Mercy Hospital)

City: \_\_\_\_\_ State: \_\_\_\_\_ Rep Firm: \_\_\_\_\_

Point of Specification: \_\_\_\_\_  
(eg: DEF Consulting Engineers)

City: \_\_\_\_\_ State: \_\_\_\_\_ Rep Firm: \_\_\_\_\_

Other Influence: \_\_\_\_\_  
(eg: point of installation recommended product to point of specification)

Number of Fogging Systems Required: \_\_\_\_\_

Water Supply is:  R.O.  D. I. Water Supply Pressure at Humidifier: \_\_\_\_\_

PSI Constant:  No  Yes Building Automation System (BAS) Present  No  Yes

Signal:  4-20mA  0-10Vdc  Other

### Air Handler Unit (AHU) Application:

a) AHU CFM: \_\_\_\_\_

b) AHU Type: Economizer: \_\_\_\_\_ Constant Volume: \_\_\_\_\_ VAV: \_\_\_\_\_ Makeup \_\_\_\_\_

c) Fog Chamber Dimensions: \_\_\_\_\_ W \_\_\_\_\_ H \_\_\_\_\_ L \_\_\_\_\_

d) Preheat Available? \_\_\_\_\_

e) Fog Chamber Location: \_\_\_\_\_

f) Minimum % of Outside Air: \_\_\_\_\_ Maximum % of Outside Air: \_\_\_\_\_

g) Desired Space DB/WB Set Point: \_\_\_\_\_ %

h) Entering Air DB/WB Conditions (into AHU) \_\_\_\_\_

i) Leaving Air DB/WB Conditions (supply form AHU) \_\_\_\_\_

j) Entering Air DB/WB Conditions (into fog chamber) \_\_\_\_\_

k) Leaving Air DB/WB Conditions (leaving fog chamber) \_\_\_\_\_

l) AHU Control is:  Discharge Temp.  Enthalpy  Mixed Air  Other

### Area Application

a) Total Area Volume: \_\_\_\_\_

b) Ceiling Heights: \_\_\_\_\_

c) Air Changes/Hour: \_\_\_\_\_

d) CFM Outside Air: \_\_\_\_\_

e) CFM Exhaust Air: \_\_\_\_\_

f) Desired Space DB/WB: \_\_\_\_\_

g) Outside Air DB/WB: \_\_\_\_\_

h) Type of space to be humidified: \_\_\_\_\_

i) Please attach a drawing (layout) of the area.

## Armstrong International Limited Warranty and Remedy

Armstrong International, Inc. ( Armstrong ) warrants to the original user of those products supplied by it and used in the service and in the manner for which they are intended, that such products shall be free from defects in material and workmanship for a period of one (1) year from the date of installation, but not longer than 15 months from the date of shipment from the factory, [unless a Special Warranty Period applies, as listed below]. This warranty does not extend to any product that has been subject to misuse, neglect or alteration after shipment from the Armstrong factory. Except as may be expressly provided in a written agreement between Armstrong and the user, which is signed by both parties, Armstrong **DOES NOT MAKE ANY OTHER REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

The sole and exclusive remedy with respect to the above limited warranty or with respect to any other claim relating to the products or to defects or any condition or use of the products supplied by Armstrong, however caused, and whether such claim is based upon warranty, contract, negligence, strict liability, or any other basis or theory, is limited to Armstrong's repair or replacement of the part or product, excluding any labor or any other cost to remove or install said part or product, or at Armstrong's option, to repayment of the purchase price.

As a condition of enforcing any rights or remedies relating to Armstrong products, notice of any warranty or other claim relating to the products must be given in writing to Armstrong: (i) within 30 days of last day of the applicable warranty period, or (ii) within 30 days of the date of the manifestation of the condition or occurrence giving rise to the claim, whichever is earlier. **IN NO EVENT SHALL ARMSTRONG BE LIABLE FOR SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF USE OR PROFITS OR INTERRUPTION OF BUSINESS.** The Limited Warranty and Remedy terms herein apply notwithstanding any contrary terms in any purchase order or form submitted or issued by any user, purchaser, or third party and all such contrary terms shall be deemed rejected by Armstrong.

Special Warranty Periods are as follows:

**PressureFog™ Series PF250, PF500, PF1000, PF1500, PF2000, and PF3000:** Two (2) years after installation, but not longer than 27 months after shipment from Armstrong's factory.

**Armstrong** provides intelligent system solutions that improve utility performance, lower energy consumption, and reduce environmental emissions while providing an “enjoyable experience.”



**Armstrong** International  
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