Cleanroom Fogger, Model 2001 and Model 2010 Ultrapure, Portable, Cleanroom Foggers

These Ultrapure Cleanroom Foggers provide the ultimate in purity, cleanliness, and fog density unmatched by any other fog generating techniques. They produce a high purity DI (de-ionized) water fog by condensing purified steam with liquid nitrogen by a unique, patented process. The ultrapure water fog is neutrally buoyant, non-contaminating, and highly visible. Other fog generators based on ultrasonic atomization or the dry-ice CO2 process create invisible residue particles when the droplets evaporate, making them unsuitable for use in Class 1/10/100 cleanrooms. The Ultrapure Cleanroom Foggers from MSP create fogs that are truly non-contaminating and no residue particles are produced when the droplets evaporate. They are the only fogger suitable for used in Class 1/10/100/ 1000/10000 cleanrooms for airflow and turbulence visualization, flow balancing, and contaminant transport studies around process tools.

Features

- UltraPure DI water fog
- High fog density
- Truly non-contaminating
- No measurable residue upon evaporation of water droplets
- Compact, easily transportable package with stream or fog rake output
- Model 2001 Portable, Ultrapure Cleanroom Fogger™ - A compact, ultrapure fogger with high fog volume and density at 15 cfm for up to 50 minutes. Designed for Class 1, 10, 100, 1000, 10000 Cleanrooms.
- Model 2010 Portable, Ultrapure Cleanroom Fogger™ - A compact ultrapure fogger with high fog volume and density at 10 cfm for up to 24 minutes. Designed for Class 1, 10, 100, 1000, 10000 Cleanrooms.
- Ultrapure, visualization of airflow turbulence in cleanrooms
- Exhaust and ventilation studies around process tools
- Air balance studies in Cleanrooms

Specifications (Subject to change without notice)

	Model 2001	**Model 2010**
FOG Duration	About 50 minutes	About 24 minutes
FOG Volume	About 15cfm	About 10cfm
FOG Type	Ultra-pure	Ultra-pure
Class Room	Class 1 or higher	Class 1 or higher

Boiler capacity	3 liters	2 liters
Dewar capacity	9 liters	3 liters
LN2 Weight	6.4 kg (14 lb.) LN2	2.2 kg (4.8 lb.) LN2
Power	115 VAC, 60 Hz, 14A	115 VAC, 60 Hz, 10A
Optional	230 VAC, 50 Hz, 8A	230 VAC, 60 Hz, 6A
Dimensions	609 x 432 x 1142 cm	380 x 300 x 300 mm
(L x W x H)	24' x 17'' x 45"	15" x 12" x 12"
Dry Weight	18.6 kg (41 ib.)	18.8 kg (37 lb.)
Full Weight	25 kg (55 lb.)	20 kg (45 lb.)

Model 2001/2010 Fogger Comparisons and Cost Analysis

There are three types of foggers typically manufactured for use in the semiconductor and pharmaceutical industry: all three are described below.

Ultrapure Fogger: This type of fogger produced by MSP provides the highest volume, density and purity of fog. Purity is created by bringing the water to a boil, creating a vapor, while simultaneously using gravity to remove the residual mass from the vapor. This process removes any bacterial agents and residual particulate matter from the vapor. The pure vapor is then passed over an LN2 bath, which naturally boils at room temperature. The water molecules quickly attach to the nitrogen molecules (quenching process), creating a nominal 3um fog droplet. The volume of water and nitrogen molecules that combine is extremely high in quantity, creating a dense, high volume, ultrapure fog output with exit temperatures of about 80 degrees F with an exit pressure of = 0.5 lbs, so as not to disturb the surrounding airflow. The fog is ultrapure leaving minimal, if any, trace particles behind. It evaporates to its gaseous hydrogen, oxygen and nitrogen components, which are natural to the Cleanroom environment. The high density of the droplets increases the duration and travel distance of the fog. This fogger can be used in any class Cleanroom environment.

DI Water Fogger: This type of fogger has less fog density (less capability to visualize airflow) than the UltraPure Fogger described above, but more density than the CO2 fogger described below. The DI water fog is generated by atomizing DI water into water droplets, which are nominally 3-10um in size. The water droplets contain residual particulate matter from the DI water, and when the water droplet evaporates in the Cleanroom, the particulate matter remains as a "haze particle 10nm to 100nm in diameter" adrift in the air currents. If the facility manager operates a class 10000 (or worse) Cleanroom, the use of this fogger poses no problem. However, Cleanroom Engineers who manage facilities operating at Class 1 to Class 1000 performance should not use DI water fog, since the resulting Haze particles have a potential to affect the semiconductor yield or the pharmaceutical drug process. **Although some DI Water foggers are described as ultrapure, unless the DI water is vaporized to remove bacterial agents and residual particulate matter, the fog is not ultrapure**. The 3-5lb output pressure of a DI water fogger also distorts the airflow patterns, thus adding to the turbulence. The temperature output is typically less than the surrounding room temperature, thus a fog generated

from the atomized water droplets will sink in a typical 70 degree room temperature.

CO2 Fogger: This type of fogger is designed for low volume, non-process critical applications such as bench airflow testing. The fog is created using CO2 ice as the fogging agent. The fog contains elements of the CO2 and the user must determine if the residual CO2 components are acceptable in a process environment operating Class 1 to Class 1,000. The 2-3lb output pressure of a CO2 fogger also distorts the airflow patterns, thus adding to the turbulence.

	CO2 Model	DI H2O Fogger	Model 2010/2001 Ultrapure Fogger
Fog Volume	1cfm	7-9cfm	10cfm/15cfm for 2001
Contaminants	CO2 crystal	H20 residuals	none, vapor quench
Temp. Output	50-70 degrees	60-70 degrees	80 degrees
Droplet Size	4-10um	2-10um	3um nominal
Fog Density	low density	med. density	high density
Fog Time	30-45 min.	30 min.	24 min./50 min for 2001
Fog Distance*	3 feet	10 feet	15-20 feet
Output Pres.	2-3 lbs	3-5 lbs	< 0.5lbs
Weight	24lbs	37lbs	45lbs/55lbs for 2001
WxHxD"	12 x 12 x 12"	13 x 16 x 8"	22x16x16/24x18x18"
Electrolus SS Coating**	not specified	not specified	standard
Safety Alerts	yes	yes	yes

Volume of fog is desired as high as possible to visualize as much airflow turbulence as possible. Contaminants should be minimized to near zero so as not to affect the process and not require wipe downs after fogging

Temperature output is desired as close to or slightly above room temperature as possible to ensure cold fog does not create its own turbulence. Droplet size is desired as small as possible and as uniformly sized as possible

Fog density is desired as high as possible to increase visibility of airflow

Fog time is desired as high as possible to increase time on site testing

Fog distance is desired as far as possible to extend effects of fog in the airflow

Fog output pressure is desired as low as possible so that pressurized fog does not create its own turbulence

Electrolus coating of metal components are desired so as to prevent metal contamination to the fog

The Fog Tube should be flexible and made of material that does not add particulate contamination to the fog

Green = technical benefit; Red = technical drawback

*Fog distance measured at typical 40% humidity and air velocity of 90fpm. Fog distance decreases as humidity decreases or as airflow velocity increases.

**Electrolus SS coatings prevents metal contact with fog, thus minimizes possibility of metal contamination to the fog output.

References

A sample of Pharmaceutical Customer References

1) Eli Lilly
2) Steris Labs
3) Novocal Pharmaceuticals
4) Proctor and Gamble
5) Vitrolife
6) Abbott Laboratories
7) Gruppo Lepetit
8) Schering Plough
9) Merck & Co
10) Bayer Corporation

A Sample of Semiconductor Customer References

1) Fujitsu Microelectronics
2) Samsung
3) IBM
4) Intel
5) Eastman Kodak
6) Fairchild
7) Dongbu Electronics
8) AMD
9) Motorola
10) Micron Semiconductor