



# Diffusion Dryer Model 250

## Instruction Manual



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# **Diffusion Dryer**

## **Model 250**

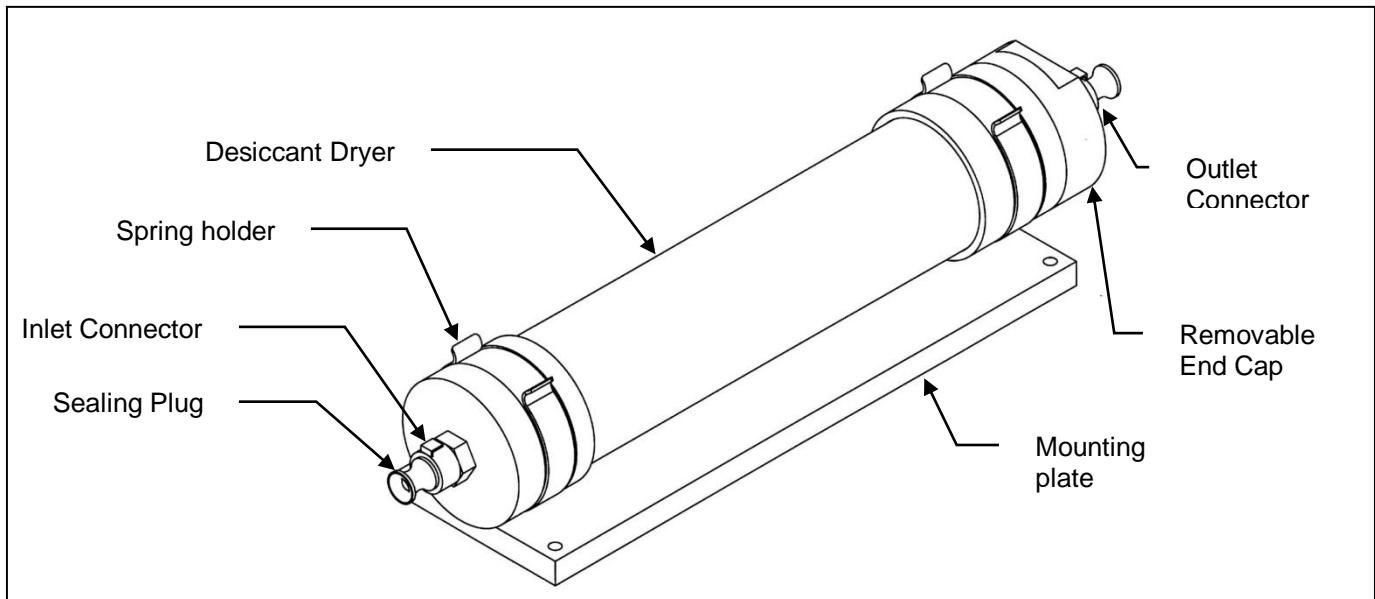
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### **Introduction**

The Diffusion Dryer is designed as a general-purpose aerosol dryer. A water trap at the inlet of the dryer removes coarse water droplets. The aerosol is then passed through a removable cartridge containing the silica gel. The cartridge is formed by two concentric cylinders, an inner fine wire mesh screen and an outer wire mesh screen.

As the aerosol goes through the inner cylinder of the cartridge, the water vapor diffuses into the silica gel through the mesh screen. Silica gel is an amorphous form of silicon dioxide, which is synthetically produced in the form of hard irregular granules or hard irregular beads. A micro porous structure of interlocking cavities gives a very high surface area (800 square meters per gram). It is this structure that makes silica gel a high capacity desiccant. Water molecules adhere to the gels surface because it exhibits a lower vapor pressure than the surrounding air. When pressure equilibrium is reached, no more adsorption occurs. The beauty of silica gel is the physical adsorption of water vapor into its internal pores. There is no chemical reaction, no by products or side effects. Even when saturated with water vapor, silica gel still has the appearance of a dry product, its shape unchanged. The silica gel is easily regenerated in an oven at 250°F for three hours.

Particle loss is minimized because the particles do not come into contact with the silica gel.



**Figure 1**  
Diffusion Dryer

## Unpacking

The Diffusion Dryer consists of a desiccant dryer assembly with fittings attached, a silica gel cartridge and accessories, including the following:

**Table 1**

Packing List for the Diffusion Dryer Model 250

Qty.	Item	Part Number
1	Desiccant Dryer Assembly	0200289
1	Spare Desiccant Cartridge	0200293
1	Instruction Manual	1800114
1	Mounting template for the dryer holders	1700157
1	MSDS Silica Gel	N/A
2	Fitting Kit	N/A

After unpacking, if anything is missing or appears to be damaged, contact ATI Customer Service at (410) 363-9696.

## Installation

Two spring-action holders coated with white nylon are provided to mount the dryer horizontally. See the included sheet for mounting instructions.

To install the silica gel cartridge in the dryer, refer to the section "Inserting the Desiccant Cartridge" page 7.

The dryer is conveniently fitted with CPC™ Quick Couplings with a 1/8" nominal flow. Matching couplings with hose barb connection are provided to connect the dryer to 1/4" inside diameter tubing. Before using the dryer, remove the sealing plug from the inlet and outlet of the dryer.

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# The Diffusion Dryer Components

## Inlet and Outlet Connectors

The inlet and outlet connectors are CPC™ quick coupling connectors with 1/8" nominal flow path. A matching set of quick coupling insert is provided that connect to 1/4" ID tubing. A set of sealing plugs is also provided to prevent moisture from entering the dryer while not in use.

## Desiccant Dryer

The Diffusion Dryer is a general-purpose aerosol dryer consisting of a Plexiglas cylinder terminated by two Delrin® end caps. The inlet end cap has a removable cover allowing the desiccant cartridge to be easily replaced.

The silica gel in the desiccant cartridge maintains a dry atmosphere within the dryer. Passing the aerosol through this tube dries the aerosol particles without substantial particle loss.

## The silica gel cartridge

The desiccant cartridge is made of two perforated end caps joined together by two wire mesh cylinders. The inner cylinder is made of very fine wire mesh screen allowing moisture to diffuse in the silica. The outer cylinder is made of a much larger wire mesh screen allowing the user to view the silica gel while still retaining it inside the cartridge. The annular space between the two wire mesh and the end caps is filled with yellow silica gel. This silica gel turns from a yellow color when dry to a dark green color when fully saturated.

## Why not use regular blue indicating silica gel?

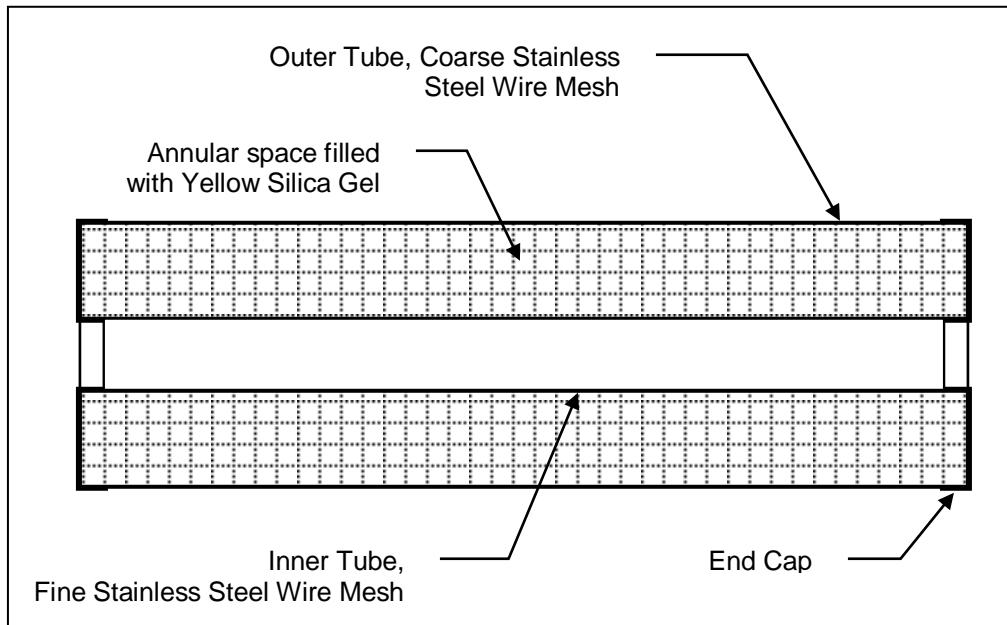
ATI is taking the safety of its customer very seriously. Standard blue indicating silica gel contains Cobalt Chloride in small concentrations (0.5 to 1.0% by weight). As of July 1, 2000, British Chemical Regulations have required that indicating silica gel be labeled and disposed of as a hazardous material. While cobalt chloride has not yet been listed on any U.S.-based hazardous materials registries, its change in status suggests that this material should be treated with the same level of protection as is required elsewhere. Cobalt is a skin and respiratory system sensitizer. The cancer status varies on Material Safety Data Sheet (MSDS) reports provided by manufacturers and suppliers from "no reports" to "Cobalt and its compounds have been shown to cause cancer in laboratory animals." The threshold limit value (TLV) is 0.01 mg/m<sup>3</sup>

Although the concentration of cobalt is small in indicating silica gel, concerns revolve around the possible contamination of silica gel dust with cobalt chloride. There also are hazards stemming from the inhalation of silica dust. That is why ATI turned to "Silica Gel Yellow", an indicator gel with phenolphthalein (0.01% by weight concentration).



## Caution

All silica gel is listed as "hazardous waste" by the EPA (Resource Conservation Recovery Act) and must be disposed of appropriately. Contact your regional HAZMAT coordinator to obtain information on appropriate storage containers and disposal instructions.



**Figure 2**

Schematic of the desiccant cartridge assembly

(Patent Pending)

# Servicing the Diffusion Dryer

## Restoring the Desiccant Cartridge

The silica gel used in ATI desiccant cartridges is yellow when dry and turns green when saturated. To dry the silica gel, remove the cartridge from the diffusion dryer (see next section) and heat it in an oven at 250°F [120°C] for 3 hours or until the yellow color returns. If the yellow color does not return, the silica gel is no longer usable and must be replaced.



### Caution

Only use a dedicated oven to regenerate the silica gel. Do not use an oven that might also be used to reheat or cook food.

The operational time of the regenerated desiccant cartridge depends on the aerosol moisture content and flow rate through the diffusion dryer.

The following data represents the drying capacity of the dryer. It was tested using a constant output generator, at an aerosol flow rate of 4.0 liters per minute.

**Table 2**

Drying Capacity of the Diffusion Dryer (Model 250)

How Used	Measured Relative Humidity at Exit (%) at 74°F	Measured Relative Humidity at Exit (%) at 74°F
No diffusion dryer	80	60
With one diffusion dryer Model 250	22	21
With one diffusion dryer Model 250 (after 3 hours)	27	23

## Removing the Desiccant Cartridge

To remove desiccant cartridge, do the following:

1. Disconnect the inlet and outlet connection and remove the dryer from its holding brackets. (Refer to Figure 1)
2. Remove the end cap of the dryer by turning it counter clockwise.
3. Cover the open end with your hand and turn the dryer upside-down. Hold the desiccant cartridge as it is coming out of the dryer. (Refer to Figure 3)

4. Dry the desiccant cartridge as described in the previous section or replace it with new desiccant cartridge.



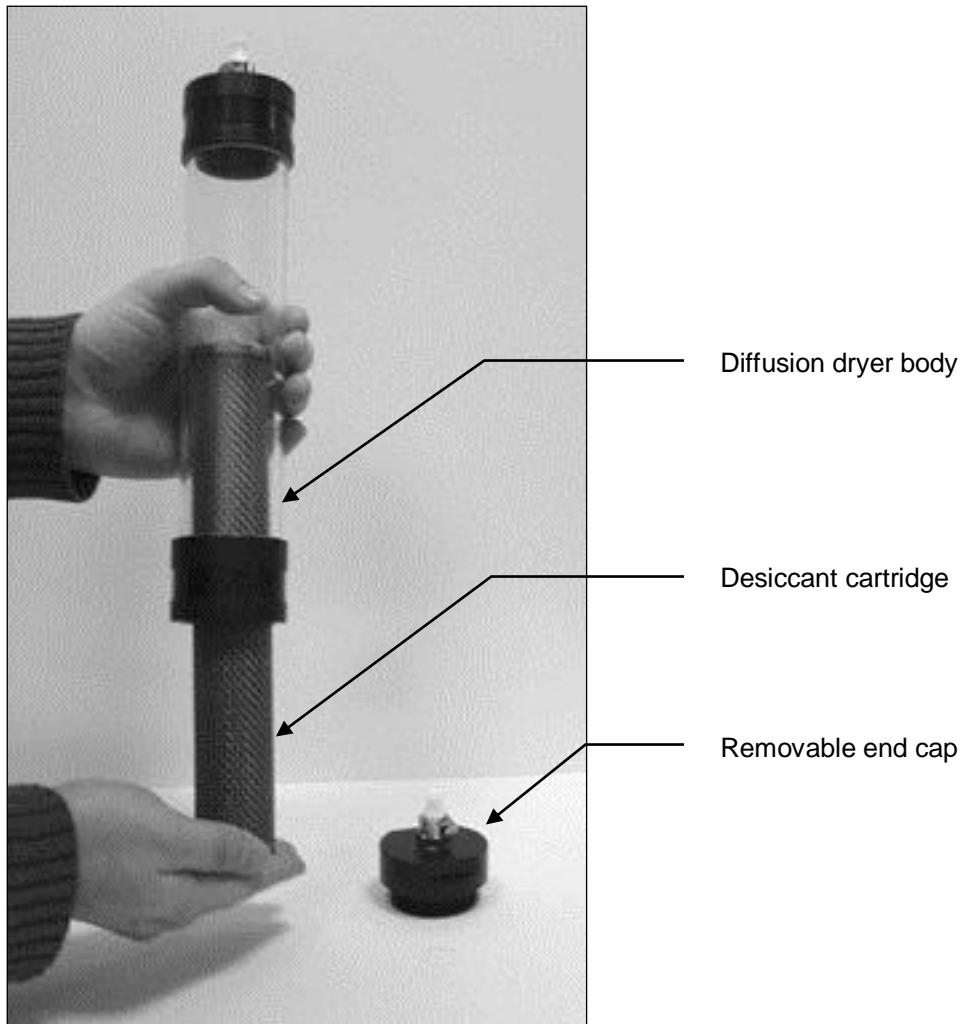
## Caution

Do *not* attempt to unscrew the extremities of the acrylic tubing. They have been epoxied in place and tested for leakage. Forcing them to unscrew could damage the dryer.

### Inserting the Desiccant Cartridge

To install the desiccant cartridge, do the following:

1. Disconnect the inlet and outlet connection and remove the dryer from its holding brackets. (Refer to Figure 1)
2. Remove the end cap of the dryer by turning it counter clockwise.
3. Install the desiccant cartridge by lowering it inside the dryer.
4. Make sure that the "O" ring is present on the end cap.
5. Replace the end cap on the dryer by turning it clockwise. Make sure that the end cap is completely threaded in place.
6. Replace the dryer in its holding bracket and reconnect the fittings to the inlet and outlet.



**Figure 3**  
Replacing the desiccant cartridge

# Specifications

The following specifications—which are subject to change—describe the most important data of the diffusion dryer.

**Table 3**

Specifications of the Diffusion Dryer Model 250

<b>Flow rate</b>	4 L/min
<b>Maximum pressure</b>	415 kPa (60 psig)
<b>Desiccant</b>	
<b>Type</b>	Silica gel (orange, green when saturated)
<b>Capacity</b>	0.250 kg
<b>Fittings</b>	CPC™ Quick Disconnect Coupling with hose barb for ¼" ID tubing
<b>Dimensions</b>	
<b>Length (without fittings)</b>	28.2 cm (11.1 in)
<b>Diameter (cylinder only)</b>	5.67 cm (2.23 in)
<b>Weight (with one cartridge)</b>	0.57 kg (1.26 lb)

Specifications are subject to change without notice.

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## Contacting ATI for Service

### **For Technical or Application Questions**

If you have any difficulty setting up the Diffusion Dryer Model 250, or if you have technical or application questions about this instrument, contact an applications engineer at ATI (410) 363-9696.

### **For Customer Service**

If the Diffusion Dryer is not operating properly, or if you are returning the instrument for service, contact ATI Customer Service (410) 363-9696. Customer Service will need this information when you call:

- The instrument model number
- The instrument serial number
- A purchase order number (unless under warranty)
- A billing address
- A shipping address.

Use the original packing material to return the Diffusion Dryer Model 250 to ATI. If you no longer have the original packing material, use sufficient packing material so the instrument is not damaged during shipping.

# MSDS Silica Gel

## Section I – Chemical Product and Company Information

**Company Name:** Air Techniques International  
**Revision Date:** 09/04/2003  
**Address:** 11403 Cronridge Drive  
Owings Mills, MD 21117-2247  
**Telephone:** (410) 363-9696  
**Emergency Telephone Number:** Chemtrec 1-800-424-9300

**Product Name:** INDICATOR SILICA GEL  
**Preparation Date:** 09/04/2003

## Section II – Composition/Information

Chemical	Concentration	Hazard data	CAS Number
Silica Gel (SiO <sub>2</sub> )	99%	Non Hazardous	112926-00-8
Phenolphthalein	100ppm	Hazardous	77-09-8

## Section III - Physical/Chemical Characteristics

<b>Boiling Point:</b> N/A	<b>Specific Gravity:</b> N/A
<b>Vapor Pressure @ 20°C:</b> N/A	<b>Melting Point:</b> 1713 +60°C
<b>Vapor Density:</b> N/A	<b>Evaporation Rate:</b> N/A
<b>Water Solubility:</b> Insoluble	<b>Bulk Density (g/m<sup>3</sup>):</b> 700-800
<b>Appearance:</b> Yellow beads or Granules ph 4-8	<b>Odor:</b> Odorless

## Section IV - Fire & Explosion Data

**Flash Point:** N/A  
**Method Used:** N/A

**Flammable Limits:** Non-flammable  
**UEL:** N/A  
**LEL:** N/A

**Extinguisher Media:** N/A  
**Special Firefighting Procedures:** N/A  
**Unusual Fire and Explosion Hazards:** N/A

## Section V - Physical Hazards (Reactivity Data)

<b>Stability:</b> Stable X      Unstable	<b>Conditions to Avoid:</b> N/A
<b>Hazardous Polymerization:</b> May occur      Will not occur X	<b>Conditions to Avoid:</b> N/A
<b>Hazardous Decomposition Products:</b> N/A	

## **Section VI - Health Hazards**

### **Route of Exposure**

Inhalation ->  
 Skin Absorption: ->  
 Skin Contact: ->  
 Eye Contact: ->  
 Ingestion: ->

**Signs and Symptoms of Exposure:** N/A

### **Effects of Overexposure:**

Acute Exposure:      N/A  
 Chronic Exposure:      N/A

**Medical Conditions Aggravated by Exposure:** N/A

### **Emergency and First Aid Procedures**

**Eyes:** Flush with large amounts of cold water.  
**Skin:** Wash affected area with soap and water.  
**Inhalation:** If inhaled, move to fresh air, get medical attention for any difficulty breathing.  
**Ingestion:** Administer plenty of water

## **Section VII – Safe Handling and Use**

**Spill Response:** Sweep up

**Waste Disposal:** Comply with local regulations for non-hazardous chemical disposal

## **Section VIII - Special Protection Information and Control Method**

<b>Respiratory Protection:</b>	NIOSH approved dust mask when working with powder.
<b>Ventilation:</b>	Natural ventilation
<b>Protective Gloves:</b>	Working gloves
<b>Eye Protection:</b>	N/A
<b>Other Protective Clothing or Equipment:</b>	N/A

## **Section X – Transportation and Shipping Requirements**

<b>DOT Shipping Name:</b>	N/A
<b>DOT Hazard Class:</b>	Non-hazardous
<b>DOT Identification Number:</b>	Not applicable
<b>DOT Packing Group:</b>	Not applicable
<b>Hazardous Waste:</b>	None

**Disclaimer:** This document has been prepared in good faith and from information provided to us by our suppliers and other sources considered to be reliable. No warranty, express or implied is given. The buyer is responsible to evaluate all available information when using this product for any particular use. The buyer is also responsible for complying with all Federal, State, Provincial, and Local Laws and regulations when using this product.

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## **Warranty**

<b>Part Number</b>	1800114 / Revision B/ November 2010
<b>Address</b>	Air Techniques International / 11403 Cronridge Drive / Owings Mills, MD 21117 / USA
<b>Phone No.</b>	(410) 363-9696
<b>Fax No.</b>	(410) 363-9695
<b>E-mail Address</b>	info@atitest.com
<b>Limitation of Warranty and Liability</b>	Air Techniques International, hereinafter referred to as ATI, warrants the equipment purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purpose for which it is designed, for a period of (1) one year from the date of shipment. ATI further warrants that the equipment will perform in accordance with the technical specifications accompanying the formal equipment offer.

ATI will repair or replace any such defective items that may fail within the stated warranty period, PROVIDED:

- a. That any claim of defect under this warranty is made within thirty (30) days after discovery thereof and that inspection by ATI, if required, indicates the validity of such claim to ATI's satisfaction.
- b. That the defect is not the result of damage incurred in shipment to or from our factory.
- c. That the equipment has not been altered in any way whether as to design or use, whether by replacement parts not supplied or approved by ATI, or otherwise.
- d. That any equipment or accessories furnished but not manufactured by ATI, or not of ATI design, shall be subject only to such adjustments as ATI may obtain from the supplier thereof.

ATI's obligation under this warranty is limited to the repair or replacement of defective parts with the exception noted above. If the equipment includes a scattering chamber, ATI's warranty does not extend to contamination of the scattering chamber by foreign material.

At ATI's option, any defective equipment that fails within the warranty period shall be returned to ATI's factory for inspection, properly packed with shipping charges prepaid. No equipment

shall be returned to ATI without prior issuance of a return authorization by ATI.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by ATI and the foregoing warranty shall constitute the Buyer's sole right and remedy. In no event does ATI assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of ATI products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

**Service Policy**

Our service policy is designed to give prompt attention to any problems. If you encounter a defective product or discover a malfunction, please call ATI Customer Service to obtain a return authorization at (410) 363-9696.





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Air Techniques International  
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Web: [www.air-techniques.com](http://www.air-techniques.com)