Instruction Manual

Model ADS
Aerosol Diluters

QVA Test Solutions

1281 Colony Drive
New Bern, NC 28562 USA
PH: 919.567.3208
www.qvats.com

Introduction

This manual describes the operation of the Model ADS style aerosol diluters. Please note that this manual gives a general overview of the units and that some features of custom aerosol diluters may not be covered. All units are inspected prior to shipping. Please visually inspect each unit after receiving to ensure that the unit was not damaged during transport. Please immediately contact QVA Test Solutions if any defects are noted or if you have questions about the aerosol diluters. The diluters require no maintenance and contain no serviceable or adjustable parts. Any attempt to repair or make adjustments to components of the unit will likely result in compromising the diluter's accuracy.

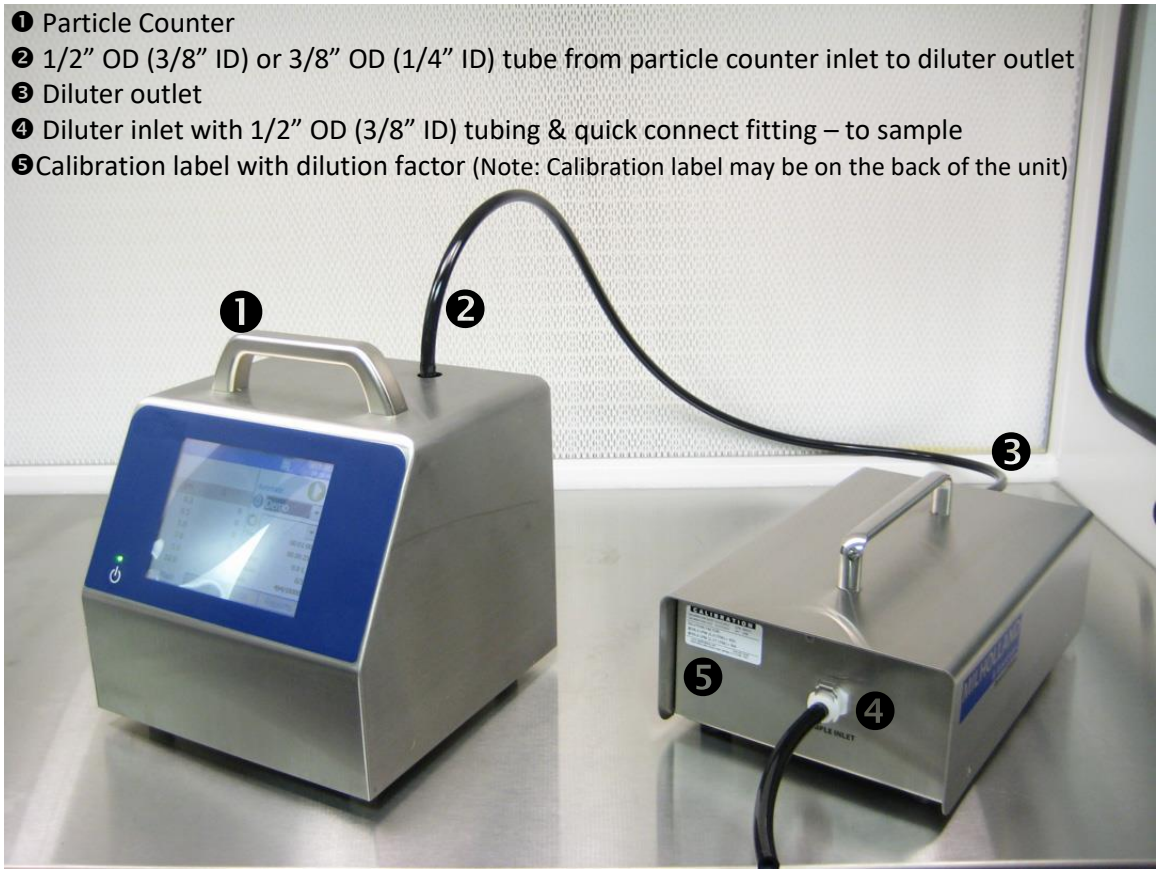
The Model ADS aerosol diluters are instruments to be used in conjunction with particle counting systems when the aerosol concentration of 0.1µm → 1.0µm particles to be measured exceeds the maximum concentration limit of the particle counter. Please contact your particle counter manufacturer to determine the concentration limits of your specific instrument.

Principle of Measurement

The aerosol diluter delivers a small volume of unfiltered sample through a capillary while supplying clean dilution makeup air to satisfy the volumetric flow requirements of the particle counter. The undiluted sample flow is determined by monitoring the differential pressure across the capillary tube when the particle counter is in operation. All units are calibrated by the manufacturer. Calibration of flow is performed using HEPA filtered air and NIST traceable standards. Each unit possesses its own unique calibration curve.

The dilution factor for the particular setup is determined by taking the ratio of the particle counter's total flow to the total flow through the capillary during the sampling period. The ADS style diluters have single point dilution factors based on the specified flow rate (typically 1.0 cfm (28.3 lpm)) of the particle counter that will be used with the diluter.

Overview



Operation

1. Place the diluter on a flat level surface and remove the dust cap from the 3/8” quick connect fittings at the sample inlet and outlet of the diluter.

2. Attach a 1/2” OD (3/8” ID) or a 3/8” OD (1/4” ID) sample tube (Bev-A-Line or Hytrel tubing recommended) to the inlet of a 1.0 cfm (28.3 lpm) particle counter.

Note: The diluter is calibrated based on a flow rate of 1.0 cfm (28.3 lpm). Particle counters with flow rates other than 1.0 cfm (28.3 lpm) or counters that will not adjust to maintain 1.0 cfm (28.3 lpm) may require a custom diluter.

3. Attach the other end of the 1/2” OD (3/8” ID) or 3/8” OD (1/4” ID) tube to the diluter outlet using the supplied quick connect fitting.

NOTE: Improper installation or alteration of the fittings could potentially result in a leak that would impact the particle counter readings.

4. Attach a 1/2” OD (3/8”ID) sample tube to the inlet of the diluter using the supplied quick connect fitting.

NOTE: It is good practice to keep the sample inlet tube as short as possible to reduce particle settling and diffusion losses within the tube. We recommend that the sample inlet tube should be no longer than 4 meters and that the inlet tube dimensions remain fixed at 1/2” OD and 3/8” ID.

5. Set the 1.0 cfm (28.3 lpm) particle counter to sample for 20 seconds (corresponding volume 0.33 f^{t3}), 30 seconds (corresponding volume 0.5 f^{t3}) or 60 seconds (corresponding volume 1.0 f^{t3}).

NOTE: It is good practice to set a delay (>10 seconds) on the particle counter prior to taking sample counts. The delay will allow the sample lines to purge and the particle counter pump to reach its optimal state.

6. When the counter stops, adjust the counts to read particles per cubic foot. That is, if a 20 second count was taken, multiply the displayed reading by 3. If a 30 second count was taken, multiply the displayed reading by 2.

NOTE: If sampling from a positive pressure plenum or source, disconnect the diluter from the source after sampling has completed. This will prevent premature loading of the internal filter.

7. To determine the aerosol concentration, multiply the counts per cubic foot by the dilution factor specified for on your diluter.

Example:

1. The particle counter having a sample rate of 1.0 cfm is set up to take 30 second samples
2. The diluter is attached and the sample is started.
3. The particle counter display reads 4,000 particles after 30 seconds (0.5 cubic feet)
4. Normalize 4,000 particles per 0.5 cubic foot of air (4000/0.5 = 8,000 particle per cubic foot of air.
5. The diluter has a dilution factor of 600 at 1.0 cfm.
6. Multiply 8,000 particles /cu. ft. x 600 = 4,800,000 particles per cubic foot

Therefore, you were able to measure the true concentration of an aerosol as 4.8 million particles / ft^3 with a counter that would not be cable of doing this alone due errors associated with exceeding the particle counter's upper concentration limits.

NOTES:

1. It is good practice to take several readings, discard the initial reading, and average the remaining. Air inside the diluter is purged by the initial sample and may thus result in an inaccurate particle count. Multiple samples will provide the operator information on the stability and consistency of the aerosol generator. The readings should be repeatable.

2. For accurate data, the reading on most 1.0 cfm particle counters should not exceed 80,000 particles per minute in the most sensitive channel. (This is 40,000 counts in 30 seconds or 8,000 counts in six seconds, etc.) Concentrations greater than this may result in coincidence counting and thus an under estimation of the true aerosol concentration. Additional dilution of the aerosol will be required for extremely high aerosol concentrations.

3. The added resistance of the diluter may result in a reduced sample flow to the particle counter. The concentration is based entirely on the capillary sample air volume which is a direct function of the pressure across the capillary tube. In the event the flow to the particle counter is reduced you should adjust the flow of the particle counter to 1.0 cfm with the diluter attached to the sample tubing. The counter and diluter were calibrated at this flow. Remember to readjust the counter flow rate after removing the diluter. Without the diluter, one must sample at a rate of 1.0 cubic feet of air per minute for accurate data.

4. The diluter should be recalibrated at least annually, and possibly more often if used in extreme conditions. There are no electronic or moving parts, however, filter loading, an accumulation of particulate on the walls of the capillary or a partial restriction of the capillary by lint or fiber may result in erroneous data.

5. The diluter is a rugged instrument designed for field use. However, it should be handled as a test instrument. Avoid dropping or extreme shock. Use the vinyl tubing caps when the instrument is not being used to prevent gross contamination of the device.