



® Knowledge Beyond Measure.

# Aerosol Diluter

Model 3302A



## An Aerosol Diluter for TSI's Aerodynamic Particle Sizer™ (APS) spectrometers.

The Aerosol Diluter Model 3302A interfaces directly with TSI Aerodynamic Particle Sizer™ (APS) spectrometers. It reduces particle concentrations in high-concentration aerosols, providing researchers with a representative sample that meets the recommended operational requirements for these high-resolution time-of-flight spectrometers.

The Aerosol Diluter Model 3302A uses a closed system of operation. It isolates a small sample of particles in an aerosol flow and reunites it with filtered, "clean" gas from the same original aerosol. This eliminates the effects of introducing unknown gas characteristics such as temperature, pressure, relative humidity, or elemental makeup into the aerosol. The 3302A minimizes particle loss during the dilution process by constantly transporting the aerosol sample in a downward direction and optimizing the geometry of the flow path. This helps reduce particle losses due to sedimentation and turbulent deposition, and provides a sample that is highly representative of the original aerosol.

The diluter outlet mates directly with the spectrometer\* inlet for on-line dilution and analysis of high-concentration aerosols. Because aerosol introduced for dilution is drawn through the Model 3302A by the spectrometer, the diluter requires no power or compressed gas.

### Applications

- APS Accessory

### Features and Benefits

- Standard dilution ratios of 100 to 1 and 20 to 1 (two diluters may be used in tandem for ratios up to 10,000 to 1)
- Very low particle loss in the 0.5- to 10  $\mu\text{m}$  size range
- Highly repeatable performance
- Original aerosol's gas characteristics maintained during operation
- Totally self-contained design
- No outside power or compressed-gas requirements
- Durable, rugged construction
- Simple maintenance procedures
- Dual pressure gauges (indicate correct operation or signal need for maintenance)

\*Model 3302A works with all APS spectrometers. However, TSI recommends the earlier Model 3302 for use with Models 3300, 3310, and 3310A.



## Specifications

# Aerosol Diluter

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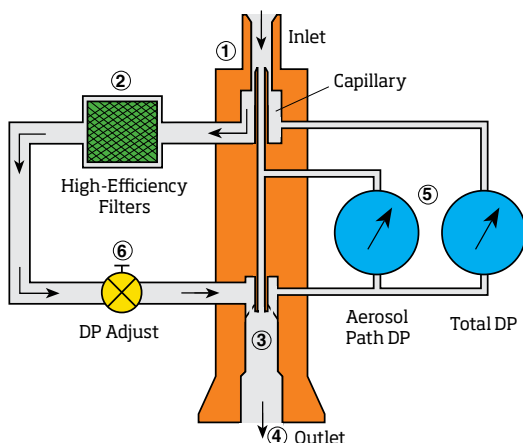
### Operation

Aerosol is drawn through the diluter by the time-of-flight spectrometer at a total flow rate of 5 liters per minute. Upon entering the diluter inlet, the concentrated aerosol flow divides into two paths. In one path, the majority of the original aerosol is cleansed of virtually all particles. In the other, the remaining small fraction of the aerosol retains its particle concentration. These two paths then re-combine to produce the desired dilution.

Inside the Model 3302A (using a 100-to-1 capillary)

1. At the point where the original aerosol flow path is split in two, a flow of 0.05 liter per minute enters a capillary tube isokinetically and passes through.
2. The remaining 4.95 liters per minute of aerosol travels through a high-efficiency particulate air (HEPA) filter where particles are removed.†
3. The filtered portion of the gas flow then recombines with the aerosol flow released from the capillary tube, achieving a 100-to-1 dilution ratio of the original aerosol.‡ A mixing cone ensures a uniform distribution in the diluted aerosol.
4. Well-mixed, diluted aerosol exits the Model 3302A and enters the APS spectrometer.
5. The aerosol-path  $\Delta P$  gauge measures flow through the capillary. The total  $\Delta P$  gauge measures pressure drop across the whole system. This two-gauge approach allows detection of conditions like a clogged capillary, loaded filter, or leak in the instrument.
6. To obtain the correct dilution ratio, the operator simply adjusts the regulating valve until the desired reading is indicated on the aerosol-path- $\Delta P$  gauge.

The manifold and filters require periodic maintenance as particles are deposited continually during repeated dilution procedures. Flow paths and internal components are designed for easy, trouble-free cleaning. This highly human-engineered instrument can be serviced in less than one-half hour by an experienced operator.



### Dilution Ratio

100:1 and 20:1 standard

### Flow Rate

5 L/min total flow (drawn by APS spectrometer)

### Penetration Efficiency

>93% for respirable particles, lower efficiency can be expected for larger particles (efficiency correction curves are built into the spectrometer software)

### Pressure Drop

Approximately 1.2 cm H<sub>2</sub>O (0.47 in. H<sub>2</sub>O) total

### Construction Materials

Anodized aluminum, stainless steel, Buna-N, fiberglass, nylon

### Power and Compressed-Air Requirements

None (flow created by APS spectrometer)

### Dimensions (L x W x H)

28 cm x 37 cm x 22 cm (11 in. x 14.5 in. x 8.5 in.)

### Weight

5.9 kg (13 lbs)

### To Order

#### Porous Tube Thermodiluter

Specify	Description
3302A	Aerosol Diluter

The Model 3302A interfaces easily with Model 3320 and 3321 APS spectrometers. The spectrometer, which creates the flow through the diluter, must be ordered separately.

† The manufacturer's rating of HEPA filters in the diluter is less than 0.03% penetration for particles of 0.3-micrometer diameter. Performance tests done by TSI Incorporated indicate actual penetrations less than 0.001%.

‡ A 20-to-1 dilution ratio is achieved by changing the capillary-tube assembly. This combines 4.75 liters per minute of cleansed aerosol with 0.25 liter per minute of original aerosol.

Specifications are subject to change without notice.

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