

## IN-STACK CASCADE CYCLONES

Andersen Instruments Series 280 are in-stack, multi-stage cyclone samplers which easily attach to EPA Method 5 or other stack samplers and measure the complete size distribution of particulate emissions.



The CASE-PM 10, CASE-PM 2.5 and CASE-PM 10/2.5 are used to determine particulate emissions at 10 and 2.5 micrometers. CASE-PM 10 complies with US EPA Method 201A (PM 10) and the CASE-PM 2.5 and CASE-PM 10/2.5 comply with the Draft Method for PM10 and PM 2.5. These methods apply to the measurement of particulate matter at an aerodynamic size of 10 and/or 2.5 micrometers by using in-stack cyclones operated at a constant flow rate. Samples are separated by the cyclones and collected on pre-weighed filter media.

## Applications

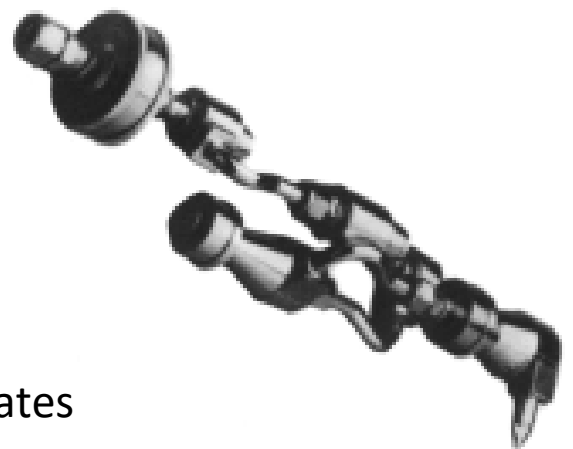
- Complete particle size distributions
- Inhalable, PM10, and fine particulate emissions
- Performance specifications of control equipment
- Particle deposition after leaving the stack
- Respirable fraction and health effects

## Features

- High capacity - collects grams of particulates
- Accurate gravimetric and chemical analysis
- Longer sampling times for better averaging
- Saves manpower, no reloading at each sampling point

## Principle of Operation

Particles suspended in the stack gas are sampled isokinetically through the sampling nozzle. The gas enters the cyclone body tangentially and creates a vortex flow pattern. Centrifugal forces cause particles larger than the cut-point of the cyclone to move radially outward to the wall of the cyclone body. As deposits on the inner wall build up, they move downstream into the collection cup and are retained. Thus, extremely large samples are collected.





Since the centrifugal forces are greater than gravitational forces, the cyclone can be operated in any orientation. Particles smaller than the cut-point pass through the cyclone to the second cyclone, which has smaller dimensions. This creates a stronger vortex pattern, and smaller particles are collected from the gas stream, and so on for each successive cyclone stage. The backup filter collects all particles smaller than the cut-point of the last cyclone in the series.

### **Model Numbers**

**CASE-PM 10** : 10 micrometer (Method 201A) sampling kit

**CASE-PM 2.5** : 2.5 micrometer sampling kit

**CASE-PM 10/2.5** : 10 and 2.5 micrometer sampling kit

**Cyclone Kits** : SE285-K, SE286-1-K, SE286-2-K

The CASE-PM 10 Cyclone Kit is designed to meet all requirements of U.S. EPA Method 201A Determination of PM<sub>10</sub> Emissions (Constant Sampling Rate [CSR]). Method 201A is applicable to the in-stack measurement of particulate matter (PM) emissions equal to or less than an aerodynamic diameter of nominally 10 micrometers (PM<sub>10</sub>) from stationary sources. A gas sample is extracted at a predetermined constant flow rate through an in-stack cyclone that separates particulate matter greater than 10 microns. A flow rate of approximately 0.5 cfm (14.2 lpm) gives the 10 micrometer cut-point; the precise flow rate depends on actual stack conditions. Variations from isokinetic sampling conditions are maintained within well-defined limits. The particulate mass is determined gravimetrically after removal of uncombined water.

With the exception of the PM 10 in-stack cyclone and filter holder, the sampling system for Method 201A is the same as EPA Method 5 or 17. The CASE-PM 10/2.5 Cyclone Kit includes two cyclones to meet requirements of the "draft method" (10/15/98) for the measurement of particulate matter equal to or less than an aerodynamic diameter of nominally 10 micrometers and 2.5 micrometers from stationary sources. The sampling system is identical to Method 201A except the PM 2.5 cyclone is inserted between the PM10 cyclone and the filter holder.

### **PM 10/2.5 Sampling Head**



All CASE-PM 10 and CASE-PM 2.5 Cyclone Kits are supplied with a set of 11 nozzles, a 64 mm in-stack filter holder with glass fiber filters, a pitot tube extension and a protective carrying case.

## Specifications

Flow Rate	Nominal 14, 23, and 28 actual liters per minute lpm (0.5, 0.8, and 1.0 cubic feet per minute cfm)
Range	5 to 35 lpm (0.2 to 1.25 cfm)
Stack Velocity Range	3 to 50 meters per second (500 to 10,000 feet per minute)
Isokinetic Sampling Nozzles	Set of ten with inlet diameters of 3.5, 3.8, 4.2, 4.6, 5.0, 5.5, 5.9, 6.7, 7.6, 8.7, and 9.9 mm
Back-Up Filter	Model 65-642F; 64 mm (2.5") diameter; glass fiber media (400 C [750 F] maximum temperature)
Construction	All 316 Stainless Steel, including fittings. Standard Viton <sup>®</sup> O-rings. Optional stainless steel C-rings and other materials available
Exit Fittings and Adapter	1/2" FPT in filter holder; includes 5/8" O.D. x 6" L straight adapter tube for EPA Method 5 stack sampler probe