

# ISOKINETIC COUPLER AND SAMPLING PROBE FOR THE 3330 OPTICAL PARTICLE SIZER SPECTROMETER

USER'S GUIDE

## Description

An isokinetic coupler and sampling probe (Part Number 1130011), used to connect the 3330 OPS to filter test ducts is described here. The components enable the use of the 3330 Optical Particle Sizer to sample out of high flow test ducts. The Model 3330 Optical Particle Sizer (OPS) has an inlet flow rate of 1 liter per minute (L/min). In applications where the OPS is sampling from a duct where the flow rates are high (such as ventilation filter test ducts) it is often desirable to sample from a duct at flow rates higher than the OPS flow rate of 1 L/min.

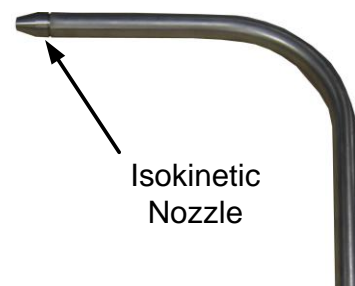
## Isokinetic Sampling

To achieve a representative sample of a particle size distribution sampled from a test duct it is necessary to sample isokinetically. An isokinetic sample requires that the gas velocity going into a probe matches the velocity going around the probe. Failure to match velocities will cause a sizing distortion. The distortion favors large particles if the probe velocity is lower than the duct velocity and favors small particles if the probe velocity is higher than the duct velocity. Equal velocities can be achieved by making the ratios of the flows to the cross sectional areas equal for the probe and the duct.

$$\text{Velocity} = \frac{\text{Probe Flow}}{\text{Probe Cross Sectional Area}} = \frac{\text{Duct Flow}}{\text{Duct Cross Sectional Area}}$$

## Isokinetic Sampling Probe

The sampling probe is designed to provide an isokinetic flow when the probe is sampling from the test duct such as what is used for the ASHRAE standard 52.2. An ASHRAE 52.2 duct is 2' x 2' (610 x 610 mm) in cross section and the typical flow rate is 2000 cubic feet per minute (cfm) or 3400 m<sup>3</sup>/h. Sampling Probe is designed to be an isokinetic sampler at that flow rate (500 feet per minute or 2.54 m/s face velocity).

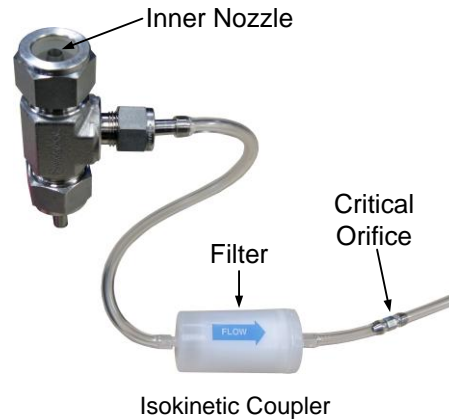


Isokinetic Sampling Probe



## Isokinetic Coupler

The Isokinetic Coupler is an interface that provides a second isokinetic sample between the sampling probe and the inlet to the 3330 OPS. A flexible plastic tube containing a critical orifice (protected by a filter) and an external pump (not supplied) are used to pull an auxiliary flow of 6 L/min through the isokinetic coupler. The flow into the inner nozzle is the 1 L/min sample flow of the OPS. The coupler is designed so that the 1 L/min is sampled isokinetically from the main flow. The total flow into the coupler is then 7 L/min ( $\frac{1}{4}$  cfm).



## Operation

1. Install the Isokinetic Sampling Probe into the filter test duct and secure. The probe tip must be parallel to the test duct to prevent sizing distortion.
2. Connect the Isokinetic Coupler to the **bottom** of the sampling probe.
3. The 3330 OPS can be connected with a piece of conductive tubing such as TSI part number 3001788 (conductive tubing – 3 foot length included).
4. Connect an external pump (e.g., TSI model 3032) to the end of the tubing from the isokinetic coupler that contains the critical orifice.
5. Switch on the external pump.



Probe and Coupler Connected to OPS

### Caution

When you are attaching the inlet of the OPS to a test duct, you should have the OPS pump turned on before connecting the OPS to the duct. This is best accomplished by using the "Keep Pump On" mode of the OPS (see Note below). If particles are introduced into the instrument without first having the pump running, the optics chamber is at risk of becoming contaminated, and/or the unit may not be able to start the measurement because of high background scattering light.

### Note

When the OPS is connected to a test duct, TSI recommends that "Keep Pump On" mode be enabled. In "Keep Pump On" mode, the OPS pump is always running any time the unit is turned ON. Further details regarding "Keep Pump On" mode can be found in the OPS user manual under **Setup | System | Flow Calibration**.

## **N o t e**

When sampling from a test duct it is also recommended that you connect the OPS exhaust back into the test duct downstream of the sample probe. This will ensure that the inlet and outlet pressures on the OPS are the same and the OPS sample and sheath flows are maintained at the desired flow rates.

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### **Parts List**

Isokinetic Coupler and Sampling Probe assembly (P/N 1130011) includes:

- Sampling Probe with isokinetic sampling probe tip
- Isokinetic Coupling containing critical orifice to set auxiliary flow
- Absolute filter to protect orifice
- Tubing

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### **Accessories Needed**

- External pump to maintain main flow through coupler (e.g., TSI model 3032).



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