



## Operating Instructions

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### SKC Parallel Particulate Impactors (PPI)

The unique patented<sup>†</sup> SKC Parallel Particulate Impactors (PPI) offer the closest match to the entire ACGIH/CEN/ISO respirable or thoracic curve when compared to other samplers available. In one small sampler, get the precision of four impactors targeting specific segments of a curve to sample closely to the entire respirable or thoracic convention. PPI minimizes the negative effects that particle buildup and bounce have on sample accuracy. PPI sampling efficiency is not dependent on the type of particle collected. PPI models are available for respirable or thoracic sampling at 2 L/min and respirable sampling at 8 L/min. The thoracic model meets the requirements of NIOSH 5524 for metalworking fluids and compounds with ACGIH<sup>®</sup> thoracic TLV<sup>®</sup>s. The 8 L/min model is sensitive enough to sample respirable silica at the new lower ACGIH TLV.



#### Performance Profile

**Sampling Rate:** 2 L/min respirable or thoracic and 8 L/min respirable

**Sample Pump:**

- Universal or AirChek<sup>®</sup> Series for 2 L/min
- Leland Legacy for 8 L/min

**Sample Time:** Dependent on method used

**Sample Media:** 37-mm PVC filter, 5.0- $\mu$ m pore size or  
37-mm PTFE filter\*, 2.0- $\mu$ m pore size (NIOSH 5524) or  
37-mm MCE filter, 0.8- $\mu$ m pore size  
Use cellulose pad or stainless steel screen for support.

#### Impaction

**Substrate:** Four 3/8-in diameter pre-oiled porous plastic discs

**Analysis:** Gravimetric or other

**Body Material:** Conductive aluminum

#### Dimensions:

**Height:** 3.74 in (9.4 cm) - clip to exhaust

**Diameter:** 1.7 in (4.3 cm)

**Depth:** 1.1 in (2.8 cm)

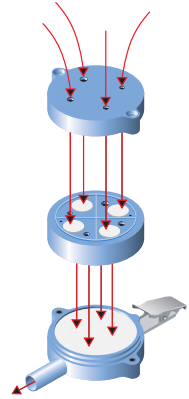
**Weight:** 3.3 oz (94 gm)

<sup>†</sup> U.S. Patent No. 7,073,402

\* Back pressure on PTFE filters can vary within the same lot.

## Principle of Operation

The SKC PPI contains four separate impactors arranged in parallel. A sample pump operating at 2 L/min or 8 L/min pulls air through the inlet nozzle of each impactor in the inlet plate. Particles larger than the impactor 50% cut-point are impacted on the porous oiled impaction substrate in each impactor and retained while smaller particles continue to the collection filter. The flow rate through each impactor is equal (one quarter of the overall flow rate of L/min). The 50% cut-off size of each impactor differs and is selected so that each impactor simulates a different segment (one quarter) of the preselected curve resulting in an overall performance of the sampler that follows closely the respirable or thoracic curve (model dependent).



## Media Preparation

**Filters:** Condition and weigh filters according to method used. Record the weight as the pre-sample weight.

**Impaction Substrate:** Using an oiled impaction substrate reduces particle bounce. Replacement pre-oiled disposable porous plastic discs are available as SKC Cat. No. 225-388 (pk/200).

## Inserting a Collection Filter into the PPI

The PPI will arrive already assembled. Disassemble it to insert collection filter.

1. Unscrew and remove two screws that hold the inlet plate to the base plate.



2. Lift off inlet plate to expose impaction plate.



3. Lift off impaction plate to expose base plate.



- Using forceps, insert a 37-mm support pad and a 37-mm collection filter into the base plate.



## Inserting Impaction Substrates into the PPI

- Ensure a support and collection filter have been loaded into the base plate (see *Inserting a Collection Filter*).
- Using forceps, insert a pre-oiled impaction substrate into each of the four indentations in the impaction plate.



*Impaction substrates have a smooth/shiny side and a rough/dull side. For optimum particle capture efficiency, place substrate smooth/shiny-side down in the impaction plate.*



- Align pins in inlet plate with holes in impaction plate and press together.



**Pins will allow impactor to be assembled one way only.**



- Grip impaction plate and inlet plate together and twist on base plate until screw holes are aligned.



- Replace and tighten two screws to secure inlet plate to base plate.



### *Technical Tidbits:*

- Use forceps to carefully insert or remove impaction substrate and collection filter. See *Accessories for forceps*.
- SKC recommends using new impaction substrates for each sample period.

## Calibration and Sampling



As the particle load on the filter increases during sampling, the pressure drop will also increase. Therefore, use a compensating sample pump such as the AirChek Series or Leland Legacy depending on flow rate requirements.

### Calibration

#### Option 1: Using a Calibration Jar

Calibrate pump flow rate with the PPI (support, filter, and impaction substrates loaded) in line. *See pump and calibrator operating instructions.*

1. Ensure impactor is loaded with a support, collection filter, and impaction substrates and that it is fully assembled (*see Inserting a Collection Filter into the PPI and Inserting Impaction Substrates into the PPI*).
2. Use a calibration jar to calibrate pump flow rate.
  - a. Unscrew jar lid and remove.



- b. Using supplied adapter, attach soft tubing end to PPI outlet. Attach rigid end of adapter to Luer adapter in center of jar lid.



- c. With PPI attached, place lid on jar and screw down until tight.



- d. Attach center tubing on outside of jar lid to pump inlet.



- e. Use 1/4-inch tubing to attach calibrator to barbed elbow fitting on outside of jar lid.

3. Calibrate the sample pump to the specified flow rate. *See sample pump and calibrator operating instructions.*



4. Disconnect tubing and remove calibration jar and calibrator when calibration is completed.

### **Option 2 - Jarless Calibration**

*This calibration option is recommended when using a Defender primary standard calibrator to calibrate personal air sample pumps for size-selective particulate sampling using particulate samplers that do not have a calibration adapter.*

1. Use a length of flexible tubing to attach the inlet of the sample pump to the suction port of a Defender calibrator.
2. Use the shortest length of tubing possible to attach the outlet of the PPI sampler to the pressure port of the Defender.



3. Set the Defender to take at least 20 flow measurements in order to average out the flow variations caused by direct connection of the pump to the calibrator. *See calibrator operating instructions for details.*

### **Sampling**

1. If required, replace representative sample media used for calibration with new, pre-weighed media (*see Media Preparation*).
2. Clip PPI onto a worker's collar or lapel in the breathing zone or in the area to be sampled.
3. Clip sample pump at the worker's waist or close to the PPI.
4. Use flexible tubing to attach the PPI outlet to the inlet of the sample pump.
5. Turn on pump and record sample start time and other pertinent data.
6. After the desired sample time has elapsed, turn off the pump and record sample stop time.
7. Reinstate calibration train and verify flow rate (*see Calibration*).
8. Remove pump and tubing from the impactor.

## Removing the Collection Filter and Impaction Substrates

1. Unscrew and remove the two screws that hold the inlet plate to the base plate.



2. Lift off inlet plate to expose impaction plate.



3. Use a thin, flat implement to remove impaction substrates and discard.



4. Lift off impaction plate to expose base plate.



5. Use forceps to remove collection filter and place in an appropriate container for shipment to a laboratory.



## Transporting Samples

Package and transport samples and blanks in a manner that will prevent sample loss and contamination.

## Analysis

Gravimetric or other by an accredited laboratory.

## Cleaning

For optimum performance, the PPI inlet, impaction, and base plates should be cleaned after five runs or upon a noticeable buildup of material to remove oil and other residue built up from frequent sampling. Disassemble the PPI and wash parts in water with a liquid detergent or soap. Rinse and air-dry all parts thoroughly in a clean environment.



**Do not place any mechanical object in the inlet nozzles.**

## References

*Trakumas, S., Hall, P., Personal Respirable Sampler Containing Four Impactors Arranged in Parallel, Abstracts of 23rd Annual AAAR Conference, Atlanta, GA, 2004, p. 78*

*Trakumas, S., Salter, E., "Parallel Particle Impactor - Novel Size-selective Particle Sampler for Accurate Fractioning of Inhalable Particles," Journal of Physics: Conference Series 151 (2009), 16 pp., 012060, [www.skinc.com/instructions/Parallel Particle Impactor Paper.pdf](http://www.skinc.com/instructions/Parallel%20Particle%20Impactor%20Paper.pdf)*

## Ordering Information

<b>PPI Samplers</b> , <i>require filter, substrates, and support</i>	<b>Cat. No.</b>
<b>Respirable PPI (black)</b> , 2 L/min	<b>225-380</b>
<b>Thoracic PPI (blue)</b> , 2 L/min	<b>225-381</b>
<b>Respirable PPI (red)</b> , 8 L/min	<b>225-383</b>
<b>Recommended Collection Filters for PPI</b> , <i>required for sampling</i> <i>Select a filter based on your application.</i>	
<b>PVC Filters</b> , 37 mm, 5.0- $\mu$ m pore size, pk/50	<b>225-8-01-1</b>
<b>PTFE Filters*</b> , 37 mm, 2.0- $\mu$ m pore size, with support pad, for metalworking fluids, NIOSH 5524, pk/50	<b>225-27-07</b>
<b>MCE Filters</b> , 37 mm, 0.8- $\mu$ m pore size, with support pad, pk/100	<b>225-5</b>
<b>Filter Supports</b> , <i>required for sampling. Select either cellulose or stainless steel.</i>	
<b>Support Pads</b> , cellulose, 37 mm, pk/100	<b>225-27</b>
<b>Support Screen</b> , stainless steel, 37 mm, wide mesh, ea	<b>225-26</b>
<b>Impaction Substrates</b> , <i>4 required for each sample</i>	
<b>Porous Plastic Discs</b> , $\frac{3}{8}$ -inch diameter, pre-oiled, ready-to-use, disposable, pk/200 <i>Limited shelf-life</i>	<b>225-388</b>
<b>Accessories</b>	
<b>Multi-purpose Calibration Jar</b>	<b>225-111</b>
<b>Forceps</b> , stainless steel, non-serrated flat tips	<b>225-8371</b>
<b>Filter-Keeper™</b> , for transporting and storing 37-mm filter samples, pk/10	<b>225-8303A</b>

\* Back pressure on PTFE filters can vary within the same lot.

## SKC Limited Warranty and Return Policy

SKC products are subject to the SKC Limited Warranty and Return Policy, which provides SKC's sole liability and the buyer's exclusive remedy. To view the complete SKC Limited Warranty and Return Policy, go to <http://www.skcinc.com/warranty.asp>.

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