



## Operating Instructions

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### SKC User-loaded Disposable Parallel Particle Impactors (PPI)

The patented<sup>†</sup> impaction-based SKC Disposable Parallel Particle Impactor (PPI<sup>®</sup>) Samplers are designed to match precisely the collection efficiency curves for respirable and thoracic dust specified by ISO 7708/CEN and adopted by ACGIH, CEN, and other occupational hygiene organizations. Performance data of the PPI Samplers relative to the ISO 7708/CEN criteria was published in the *Journal of Physics*, Conference Series 151, 2009, and the data was made part of the OSHA Docket used to develop the OSHA final silica rule (final rule page 16439).

The thoracic model meets the requirements of NIOSH Method 5524 for metalworking fluids and compounds with ACGIH<sup>®</sup> thoracic TLV<sup>®</sup>s.

Disposable PPI Samplers offer the convenience of single use to eliminate sampler assembly and cleaning; small size for worker comfort, even under helmets or other PPE; and a choice of flow rates for maximum flexibility in pump options, sample duration, and contaminant concentration. **These instructions are for PPI models that are NOT preloaded with filters and supports; these models contain only impaction substrates.**



### Performance Profile

**Sampling Rate:** 2 L/min respirable or thoracic and 4 or 8 L/min respirable

**Sample Pump:** • Universal or AirChek<sup>®</sup> Series for 2 and 4 L/min  
• Leland Legacy for 8 L/min

**Sample Time:** *Dependent on method used. Note: SKC tests indicate that a particulate mass of up to 6.8 mg on the four impaction substrates would not affect PPI performance. This amount is equivalent to sampling for 6 hours at 4 L/min in environments where respirable mass concentration is 4.76 mg/m<sup>3</sup> and equals 50% of total dust. However, labs have reported to SKC that they prefer no more than 2 mg on the filter for analytical reasons. Therefore, SKC recommends that you work with your lab to determine optimum sample times for your unique sampling conditions.*

**Sample Media (recommended):** 37-mm, 5.0- $\mu$ m PVC filter, 37-mm, 2.0- $\mu$ m PTFE filter\* (NIOSH 5524), or 37-mm, 0.8- $\mu$ m MCE filter

Use cellulose or stainless steel screen for support

**Impaction Substrate:** Four 3/8-in diameter pre-oiled porous plastic discs (assembled in all Disposable PPIs)

**Analysis:** Gravimetric and/or chemical

**Body Material:** Conductive ABS plastic

**Dimensions:**

**Height:** 4.25 in (10.8 cm) - clip to exhaust

**Diameter:** 1.8 in (4.6 cm)

**Depth:** 1.2 in (3 cm)

**Weight:** 1.1 oz (31.2 gm)

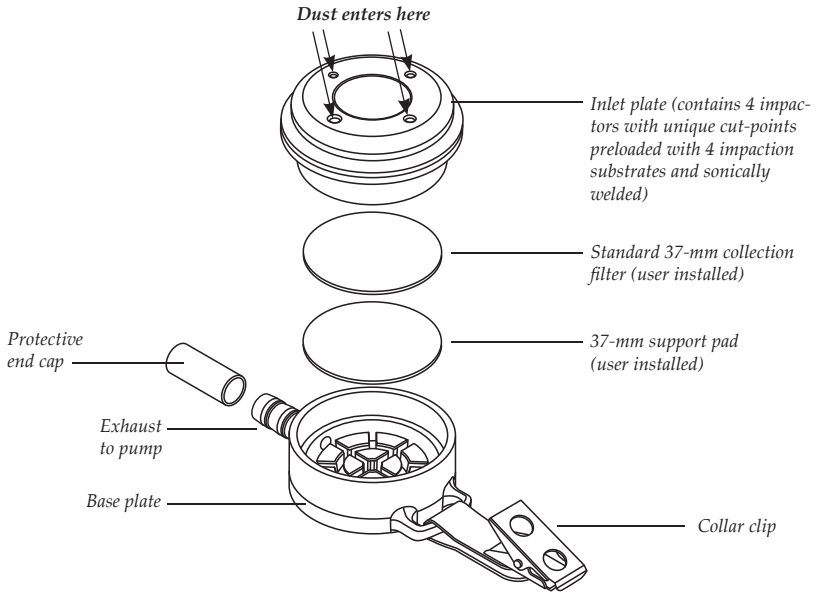
**Shelf-life:** 18 mos from date of manufacture

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

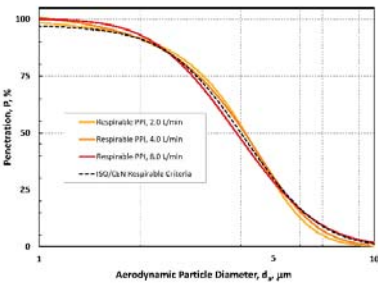
\* Back pressure on PTFE filters can vary within the same lot.

# Principle of Operation

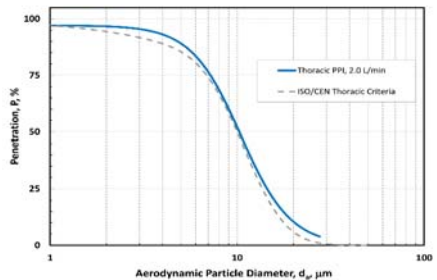
SKC Disposable PPI Samplers are impaction-based filter samplers that perform precise size-selection for either thoracic or respirable dust, depending on the model. PPI Samplers contain four small impactors in the inlet section of the device. Each impactor features a unique 50% cut-point to target a specific one-quarter segment of the ISO/CEN curve resulting in a precise fit along the entire curve. A sample pump operating at 2, 4, or 8 L/min (2 L/min only for thoracic) pulls air through the inlet nozzle of each impactor in the inlet plate. Particles larger than each impactor's 50% cut-point are scrubbed and retained by impaction onto the porous oiled impaction substrate contained in each impactor. Smaller particles continue to the standard 37-mm collection filter for analysis.



# PPI Performance



Collection efficiency of the 2, 4, and 8 L/min respirable PPI Samplers compared to the ISO respirable curve



Collection efficiency of the 2 L/min thoracic PPI Sampler compared to the ISO thoracic convention

# Media and Sampler Preparation

## Media Preparation

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

## Sampler Preparation

The PPI will arrive with the inlet plate shrink wrapped and base plate separated.

1. Remove shrink wrap from inlet plate.



2. Using forceps, insert first a 37-mm support pad and then a conditioned and weighed 37-mm collection filter (if using gravimetric analysis) into the base plate.



3. Lay base plate on a flat surface, align inlet plate with base, and press down firmly to achieve an even seal.



4. Write sample ID on sampling label. Adhere sampling label to **bottom** of base plate.



5. Remove protective end cap from exhaust.

## Technical Tidbits:

- Use forceps to carefully insert or remove collection filter and support pad. See *Accessories* for forceps.

# Calibration and Sampling

**Tip** 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.

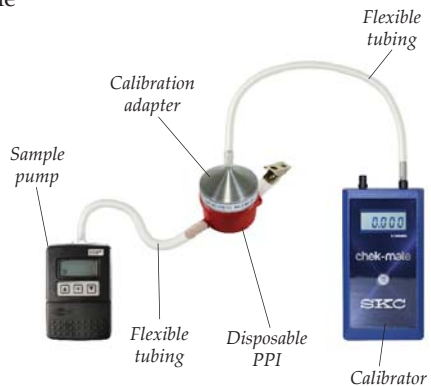
## Calibration

Calibrate pump flow rate with a representative Disposable PPI (support and filter loaded) in line. *See pump and calibrator operating instructions.*

1. Ensure the pump has run for 5 minutes before calibrating.
2. Ensure representative impactor is loaded with a support and collection filter and that it is fully assembled. *See Sampler Preparation on page 3.*
3. Align the bottom of the calibration adapter with the inlet plate of an assembled, loaded representative Disposable PPI and press down firmly until the calibration adapter's O-ring is engaged and creates an even seal.
4. Use flexible tubing to connect the exhaust of the Disposable PPI to the inlet of a sample pump.
5. Use flexible tubing to connect the inlet of the calibration adapter to the suction port (outlet) of a calibrator.
6. Calibrate to 2 L/min for the 2 L/min respirable and thoracic model PPIs, 4 L/min for the 4 L/min respirable model, or 8 L/min for the 8 L/min respirable model. Follow the calibration instructions in the pump and calibrator operating instructions.
7. When calibration is completed, disconnect the tubing from the calibrator and calibration adapter.
8. Grasp the Disposable PPI with one hand and the calibration adapter with the other hand. Firmly pull/twist to remove the calibration adapter from the Disposable PPI inlet plate.
9. Replace the representative Disposable PPI used to set the flow with a new loaded Disposable PPI for sample collection.



*Using excessive pressure to seal the calibration adapter to the Disposable PPI may make the calibration adapter difficult to remove.*



## Sampling



SKC tests indicate that a particulate mass of up to 6.8 mg on the four impaction substrates would not affect PPI performance. This amount is equivalent to sampling for 6 hours at 4 L/min in environments where respirable mass concentration is 4.76 mg/m<sup>3</sup> and equals 50% of total dust. However, labs have reported to SKC that they prefer no more than 2 mg on the filter for analytical reasons. Therefore, SKC recommends that you work with your lab to determine optimum sample times for your unique sampling conditions.

1. As per good industrial hygiene practice, replace representative sampler used for calibration with a new, unused loaded sampler. See *Media and Sampler Preparation*.
2. Record sample start time on label.
3. Clip Disposable PPI onto a worker's collar or lapel in the breathing zone or in the area to be sampled.
4. Clip sample pump at the worker's waist or close to the Disposable PPI.



5. Use flexible tubing to attach the Disposable PPI exhaust to the inlet of the sample pump.
6. Turn on pump and record pertinent sample data.
7. After the desired sample time has elapsed, turn off the pump and unclip sampler from sampling location.



8. Apply Post-use label to inlet plate to seal the sampler.
9. Record sample stop time on label on the bottom of sampler.
10. Disconnect sampler from pump and reinstall protective end cap on the exhaust.



11. Reinstall calibration train with representative Disposable PPI and verify flow rate. See *Calibration*.

# Sample Transport and Analysis

Package and transport samples and blanks to an accredited laboratory for gravimetric or chemical analysis.

## 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)

Reference 2 is an author-created, non-copyrighted version of an article accepted for publication in the *Journal of Physics*; Conference Series 151. IOP Publishing Ltd. is not responsible for any errors or omissions in this version of the manuscript or any version derived from it. The definitive publisher authenticated version is available online. Go to <http://dx.doi.org>, enter doi: 10.1088/1742-6596/151/1/012060.

Trakumas, S., "High-flow Personal Respirator Dust Sampler for Increased Sensitivity," Poster 261, AIHce 2010, Denver, CO

Trakumas, S., "High-flow Personal Sampler to Monitor Exposure to Respirable Crystalline Silica at New Lower TLV," IOHA 2010 8th Conference Book of Abstracts, Rome, p. 59

Trakumas, S., Salter, E., "High-Flow Personal Sampler to Monitor Exposure to Respirable Crystalline Silica at New Lower TLV" PowerPoint Presentation

OSHA Final Rule on Respirable Crystalline Silica, [www.osha.gov/silica/](http://www.osha.gov/silica/)

ISO 7708:1995 (2008), *Air Quality — Particle Size Fraction Definitions for Health-related Sampling*, [www.iso.org](http://www.iso.org), search on 7708

Stacey, P., Thorpe, A., and Echt, A., "Performance of High Flow Rate Personal Respirable Samplers When Challenged with Mineral Aerosols of Different Particle Size Distributions," *Ann. Occup. Hyg.*, 60, 2016, pp. 479-492, <http://annhyg.oxfordjournals.org/content/60/4/479.full.pdf>

Görner, P., Simon, X., Boivin, A., Bau, S., "Sampling Efficiency and Performance of Selected Thoracic Aerosol Samplers," *Annals of Work Exposure and Health*, 2017, Vol. 61, No. 7, 784-796

## Ordering Information

<b>User-loaded Disposable Plastic PPI Samplers</b> , <i>select the PPI for the desired convention. Designed for one-time use.</i>	<b>Cat. No.</b>
<b>User-loaded Disposable PPI Samplers</b> contain four porous disc impaction substrates. <i>Require collection filter and support; see information below and select based on application</i>	
<b>Respirable PPI (red)</b> , 8 L/min, plastic	<b>225-384</b>
<b>Respirable PPI (orange)</b> , 4 L/min, plastic	<b>225-387</b>
<b>Respirable PPI (gold)</b> , 2 L/min, plastic	<b>225-385</b>
<b>Thoracic PPI (blue)</b> , 2 L/min, plastic	<b>225-386</b>
<b>Recommended Collection Filters for User-loaded Disposable PPI</b> , <i>required for sampling. Select a filter based on your application.</i>	
<b>PVC Filters</b> , 37 mm, 5.0- $\mu$ m pore size, pk/100	<b>225-5-37</b>
<b>PTFE Filters</b> ,* 37 mm, 2.0- $\mu$ m pore size, with laminated PTFE support, for metalworking fluids (NIOSH 5524), pk/50	<b>Contact SKC</b>
<b>MCE Filters</b> , 37 mm, 0.8- $\mu$ m pore size, pk/100	<b>225-5</b>
<b>Filter Supports</b> , <i>required for User-loaded Disposable PPI sampling. Select either cellulose or stainless steel.</i>	
<b>Support Pads</b> , cellulose, 37 mm, pk/100	<b>225-27</b>
<b>Support Pads</b> , stainless steel, 37 mm, wide mesh, ea	<b>225-26</b>
<b>Accessories</b>	
<b>Calibration Adapter for Disposable PPI</b>	<b>225-389</b>
<b>Forceps</b> , stainless steel, non-serrated flat tips	<b>225-8371</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>.

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*Form 38055 Rev 1901*