SKC

Operating Instructions

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SKC Reusable Parallel Particle Impactors (PPI)

The patented† impaction-based SKC Reusable Parallel Particle Impactor (PPI) Samplers are designed to match precisely the collection efficiency curves for respirable and thoracic dust specified by ISO/CEN 7708:1995 and adopted by ACGIH, CEN, and other occupational hygiene organizations. The performance of the respirable PPI samplers also meets the specifications in the 2013 OSHA Notice of Proposed Rule Making (NPRM) for respirable crystalline silica. The thoracic model meets the requirements of NIOSH Method 5524 for metalworking fluids and compounds with ACGIH® thoracic TLV®s. Constructed of conductive aluminum, these PPI Samplers may be reused and offer a choice of flow rates for maximum flexibility in pump options, sample duration, and contaminant concentration.

Performance Profile

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

Sample Pump:
- Universal XR or AirChek® Series for 2 and 4 L/min
- Leland Legacy® for 8 L/min

Sample Time: *Dependent on method used*

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

Impaction Substrate: Four 3/8-in diameter pre-oiled porous plastic discs, *limited shelf-life*

Analysis: Gravimetric or chemical

Body Material: Conductive aluminum

Dimensions:

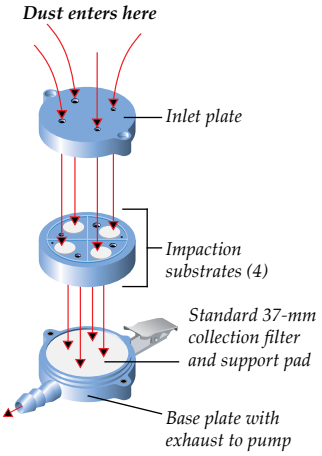
Height:	4.25 in (10.8 cm) - clip to exhaust
Diameter:	1.8 in (4.6 cm)
Depth:	1.2 in (3.0 cm)

Weight: 3.3 oz (93.6 gm)

† U.S. Patent No. 7,073,402
** Back pressure on PTFE filters can vary within the same lot.*

Principle of Operation

SKC Reusable 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. **See www.skcinc.com/prod/225-380.asp and click on More Information for performance graphs.**



Media Preparation

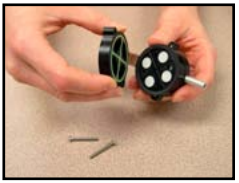
Filters: Condition and weigh filters according to method used. Record the weight as the pre-sample weight.

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.

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

Inserting Impaction Substrates into the PPI

1. Ensure a support and collection filter have been loaded into the base plate (*see Inserting a Collection Filter*).

2. 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.

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

Pins will allow impactor to be assembled one way only.

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

5. 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, preweighed media (*see Media Preparation*).

2. Record sample start time on label.

3. Clip 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 PPI.

5. Use flexible tubing to attach the PPI outlet 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 record sample stop time.

8. Reinstate calibration train and verify flow rate (*see Calibration*).

9. 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 and Analysis

Package and transport samples and blanks in a manner that will prevent sample loss and contamination and send to an accredited laboratory for gravimetric or chemical analysis.

Cleaning

For optimum performance, the PPI inlet and the 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.skcinc.com/instructions/Parallel Particle Impactor Paper.pdf

> Reference 2 is an author-created, un-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

2013 OSHA Notice of Proposed Rule Making (NPRM), https://www.osha.gov/silica/nprm.pdf

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

Ordering Information

PPI Samplers, *require filter, substrates, and support*	**Cat. No.**
Respirable PPI (gold), 2 L/min, aluminum	**225-380**
Thoracic PPI (blue), 2 L/min, aluminum	**225-381**
Respirable PPI (orange), 4 L/min, aluminum	**225-382**
Respirable PPI (red), 8 L/min, aluminum	**225-383**
Recommended Collection Filters for PPI, *required for sampling* *Select a filter based on your application.*	
PVC Filters, 37 mm, 5.0-µm pore size, pk/100	**225-5-37**
PTFE Filters,*§ 37 mm, 2.0-µm pore size, with laminated PTFE support, for metalworking fluids (NIOSH 5524), pk/50	**225-27-07**
MCE Filters, 37 mm, 0.8-µm pore size, pk/100	**225-5**
Filter Supports, *required for sampling. Select either cellulose or stainless steel.*	
Support Pads, cellulose, 37 mm, pk/100	**225-27**
Support Screen, stainless steel, 37 mm, wide mesh, ea	**225-26**
Impaction Substrates, *four required for each sample*	
Porous Plastic Discs, $^3/_8$-inch diameter, pre-oiled, ready to use, disposable, pk/200 *Limited shelf-life*	**225-388**
Accessories	
Multi-purpose Calibration Jar	**225-111**
Forceps, stainless steel, with non-serrated flat tips	**225-8371**
Filter-Keeper, for transporting and storing 37-mm filter samples, pk/10	**225-8303A**

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§ If using PTFE Filter Cat. No. 225-27-07 as specified in NIOSH 5524 for Metalworking Fluids, follow the procedure in NIOSH Draft Appendix for NIOSH 5524 at www.skcinc.com/instructions/38030.pdf to mitigate problems with weight instability and subsequent high blanks following extraction. ***Failure to follow the procedure in the NIOSH Draft Appendix will result in invalid samples.***

For Disposable PPI Samplers,
visit www.skcinc.com/prod/225-3841.asp.

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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