



Operating Instructions

SKC Deployable Particulate Sampler (DPS) System



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Form 38049 Rev 1702

DPS System Quick Guide

Media Preparation and Installation

1. Prepare impaction discs and filters.
2. Disassemble impactor.
3. Insert collection filter in filter cassette.
4. Press prepared impaction disc into top of filter cassette.
5. Reinsert filter cassette in impactor.
6. Reassemble impactor.

Sampling Setup and Calibration

1. Set up sample pump. Set pump flow rate to 10 L/min. (*See Leland Legacy Quick Guide. For advanced programming, see Leland Legacy Operating Instructions.*)
2. Screw calibration adapter onto impactor.
3. Use tubing with quick-connect to attach pump inlet to outlet of impactor. Use short tubing to connect inlet of calibration adapter to outlet of calibrator to form a calibration train. Calibrate pump flow rate with calibrator. Record flow rate. Reset accumulated data if required.
4. Disconnect calibrator and remove calibration adapter from impactor. Remove calibration media and place new unexposed media in impactor.
5. Mount bracket at desired location.
6. Screw impactor onto mounting bracket.
7. Screw rain cover onto impactor.

Sampling

1. Turn on pump and record pertinent data. (*Leland Legacy pump may be started manually or automatically, see Quick Guide.*)
2. Turn off pump after desired sample time has elapsed. Record pertinent information.
3. Remove rain cover, reinstate calibration train, and verify pump flow rate.

Sample Removal

1. Use quick-connect to detach tubing from pump.
2. Disassemble impactor.
3. Remove impaction disc.
4. Remove filter cassette, disassemble, and remove collection filter.
5. Place collection filter in appropriate container for shipping.

Table of Contents

Introduction.....	1
Performance Profile	2
Principle of Operation	3
Media Preparation	4
Impactor Preparation	4
Cleaning	4
O-ring Care.....	4
Inserting a Collection Filter into the IMPACT Sampler	5
Inserting an Impaction Disc into the IMPACT Sampler	6
Sample Pump Operation.....	7
Charging the Battery	7
Reading the Charging Status LED	8
Battery Setup.....	8
Battery Replacement.....	9
Leland Legacy Quick Guide	10
Calibration and Sampling	11
Calibration	11
Sampling	12
Sample Removal, Shipping, and Analysis	13
Removing the Collection Filter and Impaction Disc.....	13
Shipping Samples	13
Analysis	13
Ordering Information.....	14
Li-Ion Battery Shipment.....	16
Warranty	16



Indicates a reminder or note



Indicates a warning or caution

INTRODUCTION

The SKC DPS System is a compact, portable, battery-operated, and cost-effective particulate sampling system that ensures the ability to monitor particulate matter (PM) in indoor and outdoor environments and in urban, industrial, or rural settings. The system features the fully programmable constant flow Leland Legacy® Sample Pump, the IMPACT Sampler, and other equipment needed for effective ambient PM10 or PM2.5 sampling. All components are packaged in an easily carried heavy-duty Pelican® case from which the system operates. *See Figure 1.*

The heart of the DPS System is the patented* IMPACT Sampler. This inertial impactor is designed to remove particles larger than a specific cut-point (2.5 µm or 10 µm) by capturing them on a disposable oiled impaction disc that reduces particle bounce. Particles smaller than the cut-point are collected on a 47-mm filter. The IMPACT Sampler mounts easily and makes media changes fast and simple with its convenient removable filter cassette and opener.

* U.S. Patent No. 7,334,453



The SKC DPS System includes a Leland Legacy Sample Pump with connection case and charger (100-240 V), IMPACT sampling head, 2 filter cassettes, calibration adapter, rain cover for sampling head, 25 disposable impaction discs, filter cassette opener, tubing with quick-connect fitting, and mounting bracket in a heavy-duty lockable carry case. Two external battery assemblies with adapters are packaged separately.

Figure 1. DPS System

PERFORMANCE PROFILE

Flow Rate:	10 L/min
50% Cut-point:	10 µm or 2.5 µm
Run Time:	> 24 hours on one battery charge
Power:	Rechargeable lithium-ion (Li-Ion) battery, 7.4 V, 12-Ah capacity, [†] 88.8 Wh
Battery Recharge Time:	15 hrs
Impaction Discs:	<ul style="list-style-type: none">• Recommended impaction disc to reduce particle bounce: 37-mm disposable pre-oiled porous plastic disc (supplied with DPS System)• For chemical analysis of larger particles: 37-mm filter (quartz or PTFE[§])
Collection Filter:	47-mm quartz or PTFE [§] with support ring
Analysis:	Gravimetric and/or chemical
Tubing:	3/8-in ID reinforced flexible PVC (supplied)
Temperature:	Charging: 32 to 113 F (0 to 45 C) Storing: -4 to 95 F (-20 to 35 C) Operating: 32 to 104 F (0 to 40 C)
Operating Humidity:	0 to 95% non-condensing
Altitude:	Do not use pump beyond 7500 ft.
RFI/EMI Shielding:	CE marked
Case Dimensions:	18.5 x 14.1 x 6.9 in (47 x 36 x 18 cm)
Complete System Weight:	13 lbs (5.9 kg)
Sampling Head (Impactor) Dimensions:	2.6 dia. X 1.8 H x 3.8 L in (7 x 5 x 10 cm)
Sampling Head (Impactor) Weight:	0.5 lb (0.23 kg)

Note: The DPS System provides data similar to data from Federal Reference Method samplers. The DPS System is not a U.S. EPA reference or equivalent method for compliance sampling.

[†] DPS Systems contain Leland Legacy pumps with Li-Ion batteries and may be subject to special shipping regulations.

[§] Back pressure on PTFE filters can vary within the same lot.

 **Use in non-explosive environments only. Not intrinsically safe**

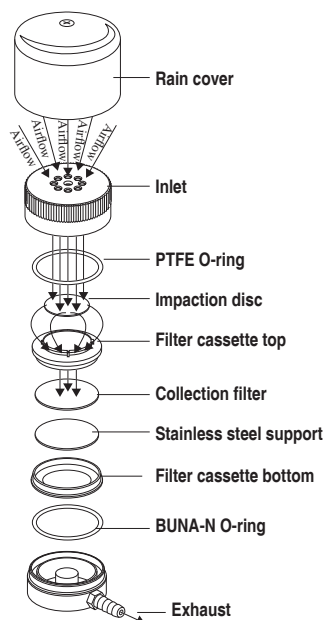
PRINCIPLE OF OPERATION

A sample pump draws particle-laden air at a flow rate of 10 L/min through an inertial impactor to separate airborne particles according to aerodynamic diameter. *See Figure 2.* Particles enter the impactor through eight nozzles on top of the sampler. The inlet nozzles are sized to operate at a 10 L/min flow rate, causing eight airjets to impinge onto the impaction disc positioned below the inlet nozzles. Particles larger than the sampler cut-point with enough inertia to cross the airstream lines impact on the impaction disc. The airflow, containing smaller particles, makes a sharp turn, passes through the openings in the top of the filter cassette, and follows through to a 47-mm filter where the smaller particles collect.

The top of the filter cassette accommodates the impaction disc. For optimum impactor performance, a 37-mm oiled porous plastic disc is recommended as disposable collection substrate (supplied with system). If chemical analysis of larger particles is desired, a 37-mm filter (quartz or PTFE) may be used.



*The two main components of the DPS System:
IMPACT Sampler and Leland Legacy Sample Pump*



Exploded view of IMPACT Sampler

Figure 2. IMPACT Sampler and Leland Legacy Sample Pump

MEDIA PREPARATION

Collection Filters: Equilibrate and pre-weigh filters in a clean environment according to appropriate procedures. Record the weight as the pre-sample weight.

Impaction Disc: *Ready-to-use pre-oiled disposable plastic impaction discs are included with the system (qty. 25). Replacement pre-oiled plastic discs are available as SKC Cat. Nos. 225-395 (qty. 25) and 225-395A (qty. 50). Using an oiled impaction disc reduces particle bounce.*

37-mm filters (quartz or PTFE) may be used if chemical analysis of larger particles is desired.

IMPACTOR PREPARATION

Cleaning

For optimum performance, the IMPACT Sampler inlet, exhaust, and filter cassette should be cleaned after five runs or upon a noticeable buildup of material. This will remove oil buildup from the top of the filter cassette and other residue built up from frequent sampling. Disassemble the impactor 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.**

O-ring Care

Visually inspect the condition of the BUNA-N exhaust O-ring (*see illustration on page 3 for location*). Ensure the O-ring surface is smooth (i.e., without cracks, cuts, or other damage). Ensure the O-ring is fitted properly in its channel. Replace the exhaust O-ring if there is apparent damage, stretching, or thinning. It is recommended that the PTFE inlet O-ring be replaced by the manufacturer only.

Inserting a Collection Filter into the IMPACT Sampler

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



Unscrew the inlet from the exhaust.



Remove the filter cassette.



3a. Use the filter cassette opener to open the filter cassette.

3b. Slide the filter cassette horizontally into the "U" of the opener until the two halves of the cassette loosen. Gently pull halves apart.



Ensure the stainless steel support screen is in place in the bottom of the filter cassette.



Using forceps, place a preweighed 47-mm filter on the support screen.



Press the filter cassette top into the filter cassette bottom.



Reinsert the cassette into the impactor.

Technical Tidbit

- Use forceps to carefully insert and remove the collection filter. See *Accessories for forceps*.

Inserting an Impaction Disc into the IMPACT Sampler

For PM_{2.5} or PM₁₀ sampling, insert an impaction disc only after a collection filter has been loaded into the filter cassette.

For PM_{2.5} or PM₁₀, ensure a collection filter has been loaded into the filter cassette (see Inserting a Collection Filter into the IMPACT Sampler).

1



2

Place the impaction disc in the recessed area on the filter cassette top. The rough side of the impaction disc should face up. SKC-supplied discs are stamped with "UP" on the appropriate side.



3

Place the filter cassette on the exhaust and screw the impactor inlet and exhaust together just until tight. Further hand-tighten by 1/4 turn only.

! Keep the sampler upright until the inlet is securely screwed onto the exhaust to prevent the impaction disc from being dislodged.

! Do not overtighten the impactor inlet and exhaust. Do not use the barbed fitting as leverage when tightening.

Technical Tidbits

- Install the rain cover (included with the DPS System) on the inlet of the IMPACT Sampler when sampling outdoors.
- SKC recommends using a new impaction disc for each sample.

SAMPLE PUMP OPERATION

The user may choose to operate the pump manually in the field (on/off), program a schedule into the pump manually, or program the pump for multiple schedules from a PC with optional DataTrac® Software for Leland Legacy (see *Ordering Information, Accessories*).

See Quick Guide for operating instructions for the SKC Leland Legacy Sample Pump. For advanced programming, see the complete Leland Legacy Pump Operating Instructions.



Charging the Battery

Completely charge a new battery pack using the SKC-approved charger (Cat. No. 223-241) before operating the pump. It may be necessary to charge the battery a few times before maximum battery capacity is achieved.



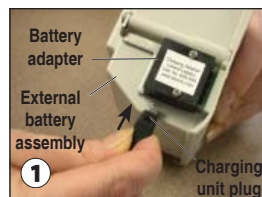
Cautions:

- Do not charge or operate the pump with or without a charger in hazardous locations.
- Use only the SKC-approved charger for this pump. Use of an unapproved charger may damage the battery and pump and voids any warranty.
- Do not open, disassemble, short circuit, crush, incinerate, or expose the battery to fire or high temperatures.
- Tampering with the battery pack voids any warranty.
- Ensure proper orientation of charging cable before plugging it into the charging jack. Improper orientation/contact will short-circuit the battery and voids any warranty.
- Short-circuiting the battery pack will render it immediately inoperative.
- Failure to follow warnings and cautions voids any warranty.

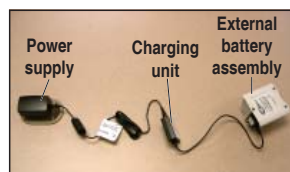


The battery pack may be kept on the SKC-approved charger for an indefinite time.


1. Insert the plug from the charging unit into the charging port on the battery adapter (on top of the external battery assembly).
2. Insert the plug from the power supply into the jack on the charging unit.
3. Install the appropriate wall plug on the power supply and plug the power supply into a power outlet.



The battery will recharge in approximately 15 hours. For a complete charge, do not run the pump connected to the external battery assembly during



charging. After charging is complete, disconnect the battery from the charger and connect the pump to the battery (see *Battery Setup*).


 *After charging the battery pack, it is good practice to run the pump for approximately 5 minutes before calibrating. This ensures the battery is in more steady-state conditions and improves the agreement in pre and post-sampling calibrations.*

Reading the Charging Status LED

The Li-Ion Charging Unit indicates battery charge status via an LED on the unit that blinks in specific patterns. Observe the LED steadily for > 5 seconds to read charge status.

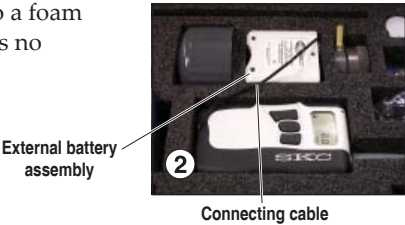
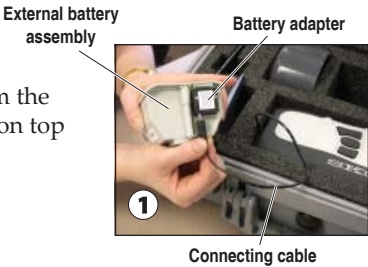
LED Action				Charge Status
ON * steady				Charge in progress
ON * 2 sec	OFF ○ .25 sec	ON * 2 sec	(Repeats)	Approximately 80% charged
OFF ○ 2 sec	ON * .25 sec	OFF ○ 2 sec	(Repeats)	Charge completed



 *For more information on SKC pump Li-Ion batteries, go to <http://www.skcinc.com/instructions/1918.pdf>.*

Battery Setup

1. Insert the plug on the connecting cable from the pump into the jack on the battery adapter (on top of the external battery assembly).
2. Insert the external battery assembly into a foam compartment in the case. Ensure there is no tension on the connecting cable.



Battery Replacement

1. **Record all necessary data before unplugging the pump from the battery.**
2. Remove the plug on the connecting cable from the jack on the battery adapter (on top of the external battery assembly).
3. Insert the plug on the connecting cable into the battery adapter jack on a new, fully charged external battery assembly.
4. Insert the external battery assembly into the foam compartment in the case. Ensure there is no tension on the connecting cable.

Leland Legacy Quick Guide

Terms »

Star button *

- Scrolls through run time data and Setup options

Up and down arrow buttons ▲▼

- Toggle between display choices and increase or decrease sampling parameters in Setup

Button sequence

▼ * = press buttons individually

[▲▼] = press simultaneously

▲▼ = security code, always press in sequence

Security code *▲▼*

- Prevents unauthorized changes to the pump's sampling program

Programming Sequences »

- **To activate pump (e.g., to change pump from Sleep to Hold):**

Press any button.

- **To change pump from Hold to Run or Run to Hold:**

Press [▲▼].

- **To reset accumulated data:**

Press [▲▼], then *▲▼*. Press * until *CLr* displays then press [▲▼]; press * until *End* displays then press [▲▼].

- **To set pump flow rate:**

Press [▲▼], then *▲▼*. Flow rate and SET flash. Press ▲ or ▼ to change flow rate. Press * until *End* appears then press [▲▼] to save setting and place pump in Hold.

- **To calibrate flow rate with standard calibrator:**

Press [▲▼], then *▲▼*. Flow rate and SET flash. Press ▲ or ▼ to change flow rate. Press * once. *ADJ* displays. Press ▲ or ▼ until desired flow rate is indicated on calibrator. When finished, press * until *End* displays then press [▲▼] to save new setting and place pump in Hold. *For CalChek Calibration, see operating instructions.*

- **To change temperature scale from F to C or C to F:**

Press [▲▼], then *▲▼*. Press * until temperature displays. Press ▲ or ▼ to switch units; press * until *End* displays then press [▲▼] to save new setting.

- **To change atmospheric pressure scale (mm, mb, In):**

Press [▲▼], then *▲▼*. Press * until pressure displays then press ▲ or ▼ to switch units; press * until *End* displays then press [▲▼] to save new setting.

- **To change time scale (12 Hr/24 Hr/Dela):**

Press [▲▼], then *▲▼*. Press * until 12 Hr, 24 Hr, or Dela displays then press ▲ or ▼ to switch units; press * until *End* displays then press [▲▼] to save new setting. *To set delayed start (Dela), see operating instructions.*

- **To change clock:**

Press [▲▼], then *▲▼*. Press * until clock displays then press ▲ or ▼ to change flashing hour; press * to move to minutes and ▲ or ▼ to change setting. Press * until *End* displays then press [▲▼] to save new setting.

- **To change the sampling time function:**

Press [▲▼], then *▲▼*. Press * until *ST L/min* displays then press ▲ to change flashing digit; press * until *End* displays then press [▲▼] to save new setting. To delete, follow above steps and press ▼ until 0 appears. Exit Setup.

Note: When in Setup, choosing Esc instead of End will exit Setup without saving new settings.

CALIBRATION AND SAMPLING

Calibration

- ❗ Allow pump to equilibrate after moving it from one temperature extreme to another.

Calibrate pump flow rate with the IMPACT Sampler in line (loaded with representative filter and impaction disc). *See pump and calibrator operating instructions.*

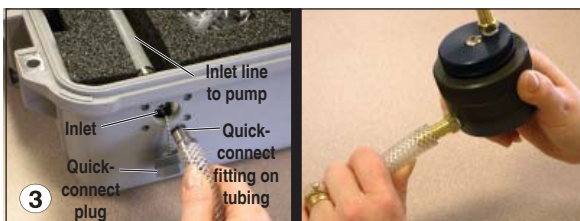
Set the pump flow rate to 10 L/min (see Leland Legacy Quick Guide). Ensure the pump has run for 5 minutes before proceeding with calibration. Ensure the rain cover is removed from the inlet and that the impactor is loaded with representative media and fully assembled (see Inserting a Collection Filter into the IMPACT Sampler and Inserting an Impaction Disc into the IMPACT Sampler).

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Screw the calibration adapter onto the impactor inlet.

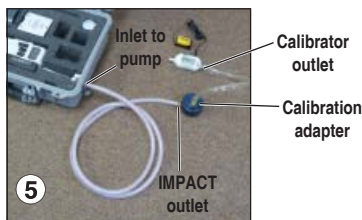


Unscrew the quick-connect plug. Use tubing with a quick-connect fitting to attach the case (pump) inlet to the outlet of impactor.

- ❗ Ensure O-ring is installed on the quick-connect fitting before inserting it into the inlet. Absence of the O-ring can affect measurements.



Use a short length of calibration tubing to connect the inlet of the calibration adapter to the outlet of a calibrator to form a calibration train.



5

Calibrate pump flow rate with a calibrator. **Adjust** the flow rate until the calibrator displays 10 L/min (see Leland Legacy Quick Guide). Record the flow rate. Reset the accumulated data before sampling. See pump and calibrator operating instructions.

When calibration is completed, disconnect the calibrator and tubing from the calibration adapter. Remove the calibration adapter from the impactor. Remove the representative media and replace with fresh media for sampling.

6

Sampling

- !** Allow pump to equilibrate after moving it from one temperature extreme to another.

1. Replace the representative sample media used for calibration with new, pre-weighed media (*see Media Preparation and Impactor Preparation*).
2. Mount the bracket at the desired location and at breathing zone height (6 feet or 2 meters) using wire ties or other fasteners. Mount the impactor on the mounting bracket by threading the clamp knob into the bottom of the impactor.



3. Insert the screw on the rain cover into the screw hole in top of the impactor inlet and rotate the cover until tight.



4. Turn on the pump and record sample start time, ambient temperature, ambient pressure, and other pertinent data.



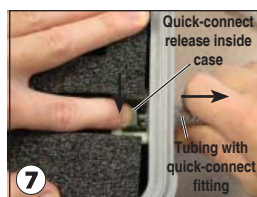
Sample start time and duration can be programmed into the Leland Legacy Sample Pump in advance and sampling may be started manually or automatically.



Record all necessary data before disconnecting the pump from the battery and reconnecting to the new battery.



5. After desired sample time has elapsed, turn off the pump and record the sample stop time, total volume, ambient temperature, ambient pressure, and other pertinent data.
6. Remove the rain cover, reinstate the calibration train and media, and verify the flow rate (*see Calibration*).
7. Reach inside the case and press quick-connect release while pulling the tubing from the inlet. Remove tubing from the impactor.



Technical Tidbits

- The supplied rain cover should be used for all outdoor sampling.
- Keep the Leland Legacy sample pump inside the Pelican case and the case closed during sampling to protect the sample pump from weather.

SAMPLE REMOVAL, SHIPPING, AND ANALYSIS

Removing the Collection Filter and Impaction Disc



Unscrew the impactor inlet from the exhaust.



Locate the recessed area on the filter cassette top and remove the impaction disc. If chemical analysis of larger particles is desired, place in an appropriate container for shipping to a laboratory for analysis (see Ordering Information, Accessories for glass jars).



Gently lift the filter cassette from the exhaust.



4a. Use the filter cassette opener to separate the two halves.

4b. Slide the filter cassette horizontally into the "U" of the opener until the two halves of the cassette loosen. Gently pull halves apart.



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

Shipping Samples

Package and transport samples and blanks in a manner that will prevent sample loss and contamination. See *Ordering Information, Accessories for the petri dish slide for transporting samples*.

Analysis

Gravimetric and/or chemical by an accredited laboratory

ORDERING INFORMATION

Description	Cat. No.
DPS System *#∞ includes a Leland Legacy Sample Pump with connection case, charger (100-240 V), 2 external battery assemblies with adapters (packaged separately), IMPACT [‡] sampling head, 2 filter cassettes, calibration adapter, rain cover for sampling head, 25 disposable impactation discs, ^Δ filter cassette opener, tubing with quick-connect fitting, and mounting bracket, in a heavy-duty lockable carry case	
PM10 Kit	100-3901
PM2.5 Kit	100-3903

* Provides data similar to data from Federal Reference Method samplers. The DPS System is not a U.S. EPA reference or equivalent method for compliance sampling.

DPS Systems contain Leland Legacy pumps with Li-Ion batteries and may be subject to special shipping regulations. See next page.

Δ Limited shelf-life

∞ Use in non-explosive environments only. Not intrinsically safe

‡ U.S. Patent No. 7,334,453

Recommended Collection Filters for System (not supplied with system)	
<i>Select a filter based on your application; required for sampling</i>	
Quartz Filters , 47 mm, Tissuquartz™, 432 μm thick, pk/25	225-1823
PTFE Filters , ^{§‡} 47 mm, 2.0-μm pore size, with PMP support ring, pk/50	225-1747

Sampling Heads/Replacement Parts	
IMPACT Samper includes filter cassette, calibration adapter, and rain cover for sampler; <i>requires collection media (see above) and impactation substrate (see below) sold separately</i>	
PM2.5	225-392
PM10	225-390
IMPACT Sampler Inlet Only	
PM2.5	P54204
PM10	P54202

Impactation Discs for System	
<i>Select an impactation disc based on your application.</i>	
Recommended to Reduce Particle Bounce:	
Replacement Pre-oiled Impactation Discs	
porous plastic discs, 37 mm, ready to use, disposable,	pk/25 225-395
required for sampling, <i>limited shelf-life</i>	pk/50 225-395A
For Chemical Analysis of Larger Particles:	
Quartz Filters , 37 mm, Tissuquartz, 432 μm thick, pk/25	225-1822
PTFE Filters , [§] 37 mm, 2.0 μm, laminated PTFE support, pk/50	225-27-07

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

‡ Maximum operating temperature is 464 F (240 C) based on PMP support ring.

Accessories	
TSI 4146 Calibrator Kit , 0.01 to 20 L/min, includes calibrator, soft-sided case, mounting lugs, tubing (1/4-inch ID), battery pack, 6 AA batteries, inlet filter, dampening module, NIST certificate, and manual	770-4146
Filter Cassette	225-396
Forceps , stainless steel	225-8371
Petri Dish Slide , for filter transport, pk/100	225-2-01
Glass Jars for Chemical Analysis	pk/8 225-8376
	pk/36 225-8377
DataTrac Software for Leland Legacy includes software on CD and DataTrac adapter cable	877-92

ORDERING INFORMATION

Replacement Parts		Cat. No.
IMPACT Sampler Inlets	PM10	P54202
	PM2.5	P54204
IMPACT Sampler Inlet O-rings, pk/3		P31989
IMPACT Sampler Exhaust		P21279
IMPACT Sampler Exhaust O-ring		P31988
Quick-connect O-rings, pk/3		P31996
Filter Cassette		225-396
Cassette Opener		225-397
Rain Cover, grey		225-398
Mounting Bracket		225-399
Quick-connect Fitting, on 6.5-foot reinforced PVC tubing		P42741
Reinforced Flexible PVC Tubing, 7.5 feet		P30004
Silicone Tubing, 0.4 feet, pk/2		P30255A
Calibration Adapter		225-394
Calibration Tubing, 1 foot, Tygon®		P3006
External Battery Assembly with battery adapter		223-247
Battery Adapter, for replacement of adapter on external battery assembly (Cat. No. 223-247)		223-248
Battery Connection Case with cable and plug		223-249
DPS/DVS Charger Adapter		223-245
DPS/DVS Charging Unit		P22300

About Li-Ion Battery Shipment

Rechargeable lithium-ion batteries for use with SKC sample pumps have been tested in accordance with the UN Manual and are proven to meet requirements of each test in the *UN Manual of Tests and Criteria*, Part III, subsection 38.3. The batteries are rated below 100 watt-hours (Wh). Consult with your carrier for information on Lithium Battery Shipping Regulations for UN 3480 and UN 3481 or visit SKC's website for more information at www.skccinc.com/catalog/pdf/instructions/1921.pdf

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>.