

ACTI-VOC

Low-flow pump



Operator Manual

Version 1.0

QUI-1086

March 2013

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1 Introduction

1.1 Notices

This manual was prepared exclusively for the owner of the Markes International ACTI-VOC Low-flow pump. The material within this manual is proprietary information and is to be used only to understand, operate, and maintain the instrument. By receiving this document, the recipient agrees that neither this document nor the information disclosed within nor any part thereof shall be reproduced or transferred, physically, electronically or in any other form, or used or disclosed to others for manufacturing or for any other purpose except as specifically authorised in writing by the manufacturer.

1.2 Disclaimer

The seller assumes no responsibility whatsoever, to any party whatsoever, for any property damage, personal injury, or death received by or resulting from, in whole, or in part, the improper use, installation, or storage of this product by the user, person, firm, entity, corporation or party not adhering to the instructions and warnings in this manual, or otherwise provided by the seller or from not adhering to all federal, state, and local environmental and occupational health and safety laws and regulations.

The seller shall not be liable for direct, indirect, consequential, incidental or other damages resulting from the sale and use of any goods and sellers' liability hereunder shall be limited to repair or replacement of any goods found defective. This warranty is in lieu of all other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for use or for a particular purpose which are expressly disclaimed.

1.3 Warnings

READ AND UNDERSTAND ALL WARNINGS AND INSTRUCTIONS BEFORE USE

- Failure to read, understand, and comply with ALL accompanying literature, product labels, and warnings could result in property damage, severe personal injury, or death.
- Read and understand ALL applicable environmental health and safety laws and regulations. Ensure complete compliance with ALL applicable laws and regulations before and during use of this product.
- **DO NOT** remove, cover, or alter any label or tag on this product, its accessories, or related products.
- **UNDER NO CIRCUMSTANCES** should this product be used except by qualified, trained, technically competent personnel.
- **DO NOT** operate this product should it malfunction, require repair, or have a cracked or broken case. **DO NOT** repair or modify this product, except as specified in this manual. No user-serviceable parts are located within the case. Contact Markes International for service-related queries.
- Use only specified Markes parts when performing maintenance procedures described in this manual. Intrinsic safety certifications become void by substitution of components, unauthorised repair or alteration.
- This product is intended for both indoor and outdoor use when protected from splashed or wind-blown liquids. The unit is not waterproof, so **NEVER** submerge the unit in water. Pump failure or faulting may result.
- This product presents a possible static hazard. Do not rub the product with a dry cloth.
- **DO NOT** charge the battery in an explosive atmosphere.
- This product uses rechargeable nickel-metal-hydride batteries, which should always be fully charged before use. Use only the battery pack and chargers specified in this manual. **DO NOT** insert any foreign objects into the contact slot. Shorting contacts will blow the protective fuse.
- If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected. Examples of

aggressive substances are acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials. Examples of suitable precautions are regular checks as part of routine inspections, or establishing from material data sheets that it is resistant to specific chemicals.

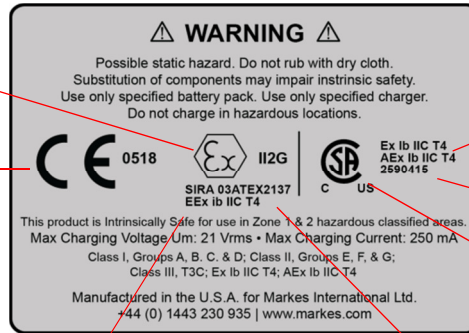
- **DO NOT** operate the product with a dirty or blocked inlet filter or kinked tubing. Pump failure or faulting may result.
- Both charger and battery become warm during charging.

1.4 Certifications

Explosion protection:

II = Equipment group
2 = Equipment category
G = Hazardous gases, vapors or mists

CE marking and number of notified body responsible for production



Explosion protection equipment in compliance with:
Ex = IEC 60079-11

AEx = FM 3610
ib = Intrinsic safety protection method
IIC = Gas group
T4 = 135 °C, maximum external surface temp.

Certification number

CSA marking

Explosion protection equipment in compliance with:
EEx = CENELEC EN 50014 series
ib = Intrinsic safety protection method
IIC = Gas group
T4 = 135 °C, maximum external surface temp.

EC-type examination certification number

1.5 Technical support contact details

In the first instance please contact your supplier. If they are unable to resolve your query, please contact Markes International (details below).

Address: Gwaun Elai Medi Science Campus, Llantrisant, RCT, CF72 8XL, UK

Website: www.markes.com

E-Mail: techsupport@markes.com

Tel.: +44 (0)1443 230935

Fax: +44 (0)1443 231531

2 Components

(1) Air inlet

The air inlet is located on the filter housing and provides a built-in means of attaching tubing for suction sampling.

(2) Air inlet pump filter

A 10 µm nylon air inlet pump filter protects the pump assembly from dirt.

(3) Flow adjustment

Requires flat-bladed screwdriver.

(4) Battery check

This green LED (B) indicates that sufficient battery power is available to run the pump for 8 hours under normal load conditions.

(5) ON/OFF switch

(6) Fault indicator

This red LED (F) indicates a flow fault due to excessive back-pressure or insufficient battery voltage to maintain flow. If flow changes exceed 5%, fault icon appears. If fault exceeds 30 seconds, pump shuts down and display will show sample time.

(7) Clock display

The Clock display shows the continuous run-time (in minutes, to two decimal places), and will lock-in the sample time upon fault indication. The time will reset to zero when the power switch is turned OFF and then back ON again.

(8) Outlet port

The Outlet port provides a receptacle for the bag sampling accessory. The screw-cap prevents dirt from entering the Outlet port when not in use.

(9) Bag sampling accessory

When installed into the Outlet port, this accessory provides a means for filling air sampling bags.

(10) Case screw

These screws must remain tight and should be checked prior to beginning sampling.

(11) Charging jack

The Charging jack receptacle is used to connect a charger for recharging the internal battery pack.

(12) Belt clip

(13) Rechargeable battery pack

(14) Mode indicator

The Mode indicator visually confirms the sampling mode selected (black for constant-flow, and white for constant-pressure).

(15) Mode selector

The Mode selector is used to change the sampling mode. The selector is used for unlocking, indexing, and re-locking the mode selector valve while changing from constant-flow mode to constant-pressure mode.

(16) Hex key

(17) Back-pressure adapter

The metal Back-pressure adapter gives the required minimum back-pressure the pump needs for low-flow TD use. Use this in conjunction with the 1/8" tubing from (18) with standard 1/4" and 6 mm o.d. TD tubes for flows up to 100 mL/min.

(18) Tubing assembly

Use the plastic tube adapter, shown as part of the tubing assembly, in place of the Back-pressure adapter when sampling onto SafeLok tubes or at flows greater than 100 mL/min.

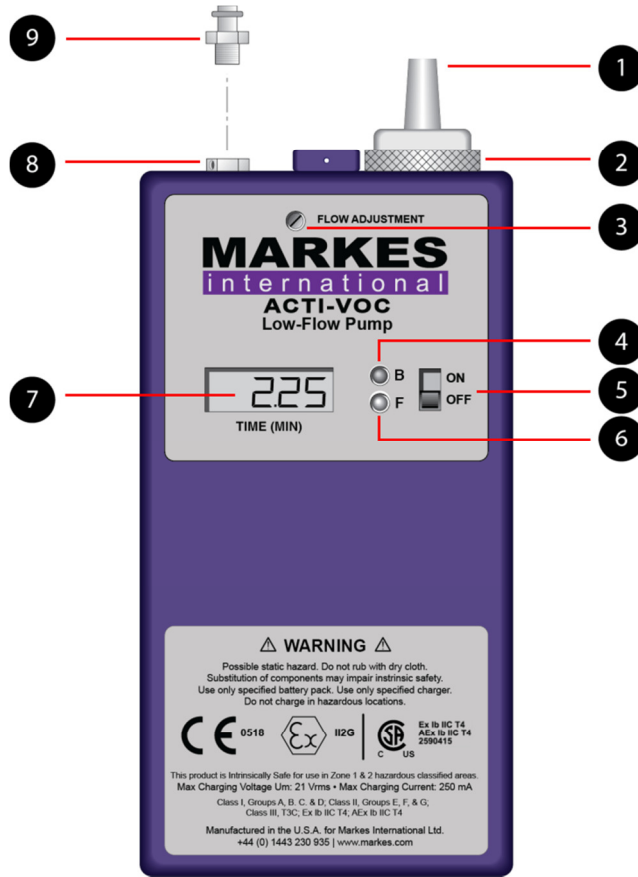


Figure 1: Front view of ACTI-VOC.

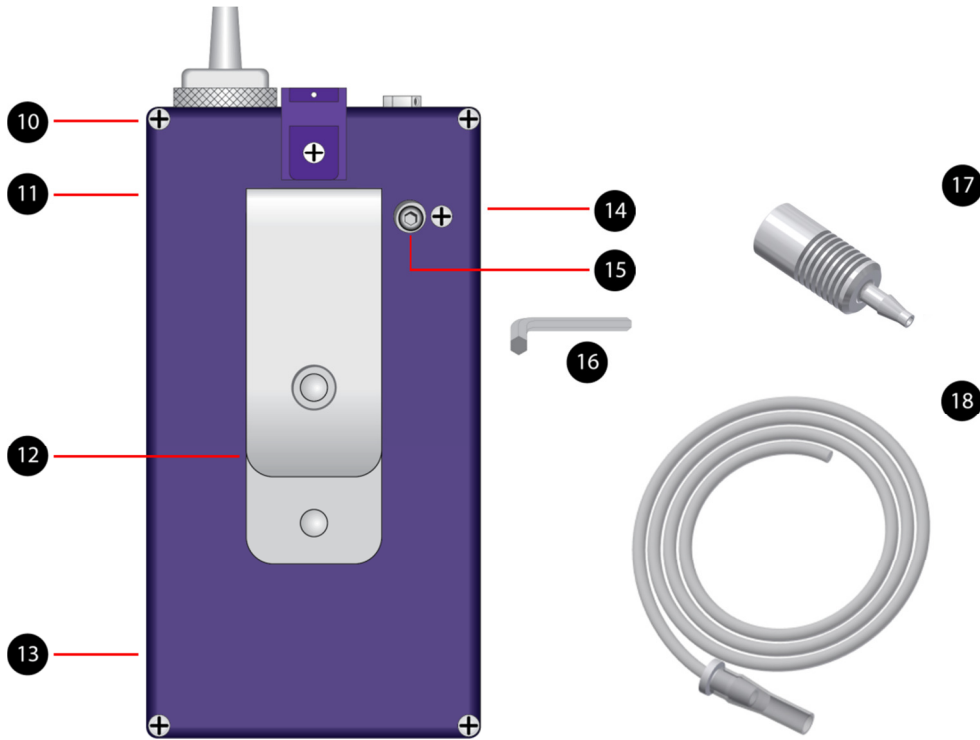


Figure 2: Back view of ACTI-VOC.

3 Pump operation

3.1 Setting a constant flow rate

Calibration (flow rate verification) must be performed before sampling and when setting the flow rate. See Figures 3 and 4.

- Ensure the ACTI-VOC is fully charged
- Insert the Hex key (❶) into the hex head screw on the pump.
- Turn the key anticlockwise (❷) to change the mode.
- Continue turning the key until the mode indicator shows black for constant flow (❸).
- Turn the key clockwise (❹) to lock your selection.

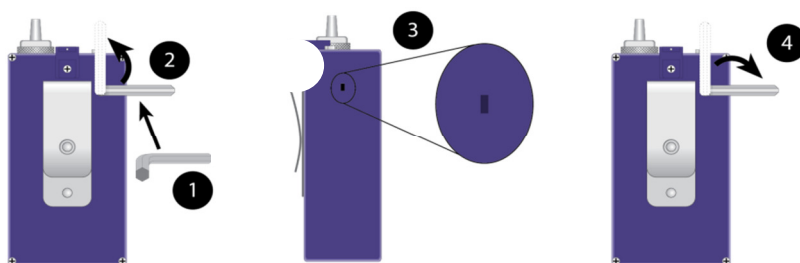


Figure 3: Setting the pump to constant-flow mode.

- Attach tubing to the pump inlet.
- Connect a TD tube to the tubing via the appropriate adapter. Use the back-pressure adapter when setting flows up to 100 mL/min; use the plastic tube adapter assembly when setting flows in excess of 100 mL/min.
- Connect the TD tube to a suitable flow measuring device, e.g. digital flowmeter or primary standard wet bubble cell.

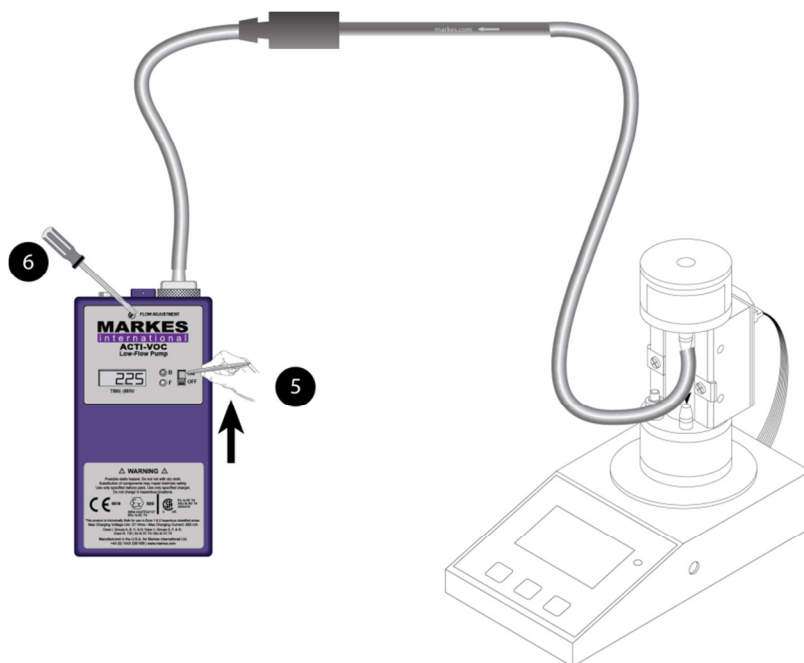


Figure 4: Setting a constant flow rate.

- Turn on the pump using a pointed instrument such as a ballpoint pen (5).
- Make sure the flow measuring device is on and working.
- Use a flat-bladed screwdriver to make flow adjustments on the pump itself (6).
- When the desired flow rate has been reached, turn off the pump and flow measuring device. The pump is now ready for sampling.

3.2 Using constant-pressure mode

Constant-flow mode is the recommended operating mode for TD applications.

Constant-pressure mode allows pumping in the flow range 1–350 mL/min, but the range is dependent on tube impedance and the flow needs to be adjusted with a third-party in-line flow controller (not supplied with the pump – contact your local Markes International dealer for more information). Flows greater than 200 mL/min will not be achievable with all TD tube types.

To switch to constant-pressure mode:

- Insert the Hex key into the hex head screw on the pump.
- Turn the key anticlockwise to change the mode.
- Continue turning the key until the mode indicator shows white for constant pressure.
- Turn the key clockwise to lock your selection.
- Attach tubing to the pump inlet.
- Connect the TD tube to the tubing via the in-line flow controller. (When setting a sampling flow with the pump in constant-pressure mode, the actual tube which is to be used for sampling should be used to set the flow.)
- Connect the TD tube to a suitable flow measuring device, e.g. digital flowmeter or primary standard wet bubble cell.
- Turn on the pump using a pointed instrument such as a ballpoint pen.
- Adjust the flow through the tube using the in-line flow controller.
- Once the desired flow rate has been reached, the pump is ready for sampling.

Note: In this mode the flow adjustment screw on the pump does NOT set/alter the flow rate and should not be used. The flow needs to be adjusted with a third-party in-line flow controller (contact your local Markes International dealer for more information).

3.3 Taking a personal sample



Figure 5: Taking a personal sample.

- Remove both storage caps from the pre-conditioned TD tube using the CapLok tool.
- Place the pump, tubing, appropriate adapter and sample tube on the worker as shown (1), making sure that the sampling flow direction arrow on the TD tube is pointing in the correct direction (towards the pump). The tube can be held in position with a penclip.
- Use a pointed instrument such as a ballpoint pen to turn on the pump (2).
- When sampling is completed, use a pointed instrument such as a ballpoint pen to turn off the pump (3). Record the sample data.
- Re-cap the sample tube (finger-tight-plus-a-quarter-turn) with the CapLok tool.
- When the pump is turned off after a sample run, the total run time in minutes (to the nearest 0.01 minute) is displayed. To calculate the total air volume sampled, use the following formula:

$$\text{Total air volume (L)} = \frac{\text{Sample flow rate (mL/min)} \times \text{Sample time (min)}}{1000}$$

4 Maintenance

4.1 Battery maintenance

ACTI-VOC uses rechargeable nickel-metal-hydride (NiMH) batteries that must be fully charged and properly maintained to obtain the maximum run time. The battery is rated at 4.8 V (720 mA h).

- Do not charge the battery pack in an explosive atmosphere.
- Make certain the charger plug is fully inserted into the jack on the battery pack (see Figure 2, label 11, for the location of the Charging jack).
- The charger can be damaged by line transients and overvoltage. Although this is not a common problem, long-term reliability can be improved by use of a surge/overvoltage protector.
- Both charger and battery pack become warm during charging.
- Do not short battery terminals, as this will blow the internal fuse.
- All NiMH batteries lose charge when not in use. If the battery pack has not been charged for 3–4 days, recharge it before use. NiMH batteries stored for extended periods should be recharged every 1–2 months to avoid complete discharge.
- The battery pack has an estimated life of 300–500 charge–discharge cycles, depending on use. The table below shows the estimated battery life based on usage level.

Pump usage	Estimated battery life
High (40–60 hours per week)	1–1½ years
Medium (20–39 hours per week)	1½–2½ years
Low (<20 hours per week)	2½ years

4.2 Filter maintenance

Under normal operating conditions, the pump filter should be changed after approximately six months or 250 hours of operation, or when needed. Failure to change the filter as it becomes dirty will decrease the pump's back-pressure capability and performance range.

- Blow all dust and debris from around the filter housing. Grasp the knurled edge of the filter housing assembly and rotate counterclockwise. Check the new filter housing assembly to make sure that the sealing O-ring is present on the internal boss. Install the new filter housing assembly onto the pump rotating the knurled edge clockwise. Do not overtighten.

4.3 Back-pressure adapter O-ring

The back-pressure adapter connects the TD tube to the pump using an O-ring seal. It is recommended that this O-ring is replaced every twelve months, or whenever it is noticeably damaged.

The ACTI-VOC is supplied with two spare O-rings (spares are also available for order as a pack of 10 – Markes International part number U-COV45).

The O-rings can be replaced easily using Markes' O-ring extraction and insertion tools (or other similar implements) as described below.

- Use Markes' O-ring extraction tool (or similar pointed implement) to hook out the O-ring, taking care not to scratch the groove in which the O-ring is seated, nor to damage the white PTFE insert behind.



Figure 6: Back-pressure adapter with O-ring extraction tool.

- Take the replacement O-ring and push it into back-pressure adapter by hand.
- Use Markes' O-ring insertion tool (or similar blunt-ended implement) to locate the replacement O-ring into the groove inside the back-pressure adapter.



Figure 7: Inserting a new O-ring into the back-pressure adapter.

- Run the O-ring insertion tool around the inner diameter of the O-ring to ensure it is free from distortions.

5 Parts list

5.1 Accessories

Part number	Description
C-FLMTR	Digital flowmeter
C-LFPCAL-120	Primary standard low flow calibrator, 120 V
C-LFPCAL-230	Primary standard low flow calibrator, 230 V

5.2 Spare parts

Part number	Description
SERZ-1076	ACTI-VOC filter assembly
SERZ-1070	ACTI-VOC bag sampling accessory
SERZ-0351	O-ring extraction tool
SERZ-0285	O-ring insertion tool
SERFLP-5002	ACTI-VOC charger
SERZ-1097	Plastic tube adapter assembly
SERLFP-5003	Back-pressure adapter
C-CPLOK	CapLok tool
U-COV45	O-Ring, low-emission, 5.92 mm i.d., pk 10

6 Specifications

Dimensions

63.5 mm (W) × 34.9 mm (H) × 117.5 mm (L)
2.50" (W) × 1.38" (H) × 4.63" (L)

Weight

Main unit: 340 g (12 oz)

Operating range (Constant-flow mode)

20–200 mL/min

Operating range (Constant-pressure mode)

1–350 mL/min, range dependent on tube impedance. Flows greater than 200 mL/min are not achievable with all TD tube types.

Pressure range

Back-pressure up to 25" H₂O.

Flow control

5% of set point or ±3 mL/min, whichever is greater

Battery type

Rechargeable nickel-metal-hydride battery pack

Battery output

4.8 V, 720 mA h

Charging

Internal (external with adapter)

Operating temperature

–20 °C to 45 °C (–4 °F to 113 °F)

Storage temperature

–40 °C to 45 °C (–40 °F to 113 °F)

Charging temperature

0 °C to 45 °C (32 °F to 113 °F)

Additional features

- Flow fault indication LED
- Battery check LED
- Belt clip
- Dual filtration system
- External flow adjust
- Elapsed timer clock module – LCD display
- Automatic instant-fault shutdown function
- RFI shielding