Mercury Vapour Indicator User Manual V1.6

Register your instrument online to receive your Extended 2 Year Warranty. See page 3 for details.

MVI Manual Part Number: 26002

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Declaration of Conformity

Manufacturer:	Shawcity Limited, Pioneer Road, Faringdon, Oxon., SN7 7BU
Product:	MVI Mercury Vapour Indicator
Product Description:	Hand held detector comprising dual beam UV absorption module for the detection of Mercury vapour
EMC Directives:	83/336/EEC 91/263/EEC 92/31/EEC
Standards Applicable:	EN 55022: 1987 Class B EN 50082-1: 1992 Table 1
Date of Issue:	8th January 1996

On behalf of Shawcity Limited, I hereby certify that the listed apparatus conforms to the protection requirements of the EMC Standards listed above.

David Hughes
Technical Manager
Shawcity Ltd

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Statements

Warranty

Standard Warranty can be extended to up to 2 years on the MVI when registering your instrument via our website: www.ionscience.com/instrument-registration

To receive your Extended Warranty, you need to register within one month of purchase (Terms and Conditions apply). You will then receive a confirmation email that your Extended Warranty Period has been activated and processed.

Full details, along with a copy of our Warranty Statement can be found by visiting: www.ionscience.com/instrument-registration

Warnings

Mercury amalgamates with gold, silver, stainless steel, aluminium and copper alloys. Accidental trapping of Mercury can cause serious damage to vital parts of electronic equipment and delicate instruments. Mercury is also toxic if inhaled, ingested or absorbed through the skin or eyes. Care must always be exercised when handling Mercury.

The MVI employs an internal Ultra-Violet light source operating in the 254 nm region. Ultra-Violet radiation is dangerous and if for any reason the lamp is operated whilst exposed, UV protective glasses must be worn.

High voltages are used in this instrument and the cover should only be removed by qualified technicians.

Ion Science Limited can accept no responsibility for the incorrect use of the instrument that cause harm or damage to persons or property. It is the user's responsibility to appropriately respond to the readings given.

Quality Assurance

Ion Science Limited is an ISO 9001:2008 accredited company.

Disposal

Please dispose of the MVI, its components and any used batteries in accordance with all local and national safety and environmental requirements. This includes the European WEEE (Waste Electrical and Electronic Equipment) Directive. Ion Science Limited offers a take back service. Please contact us for more information.

Calibration and Repair Facility

Ion Science Limited offer a repair and calibration service. Please contact us for more information:

Training

Ion Science would be happy to provide training in the operation and maintenance of the MVI. Please contact us should this be of interest.

Statements

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Introduction

The Mercury Vapour Indicator (MVI) is primarily used to monitor environments where Mercury or any of the Mercury compounds are produced, processed or stored and applications where Mercury vapours may pose a health hazard to personnel.

Units of measurement used for detecting Mercury vapour are micrograms/cubic metre expressed as $\mu g/m^3$.

The MVI has two manually switched ranges of measurement:

0-200 $\mu g/m^3$ with a resolution of 0.1 $\mu g/m^3$
0-2000 $\mu g/m^3$ with a resolution of 1 $\mu g/m^3$

Principle of Operation

A sample of the immediate atmosphere under investigation is drawn by the pump into a glass sampling cell where a Ultra-Violet light source is absorbed by the sample. Photodiode detectors are used to measure the intensity of radiation passing through the sample chamber. The optical system is designed specifically to detect Mercury in the Ultra-Violet region of 254 nm.

The presence of Mercury vapour will reduce the radiation energy reaching the photodiode detector in proportion to the vapour concentration. This change is then converted into an electrical signal and conditioned to provide a linear reading on the front LCD as $\mu g/m^3$.

An audible alarm is fitted which gives warnings when preset conditions are achieved.

Specification

Function	Surveying atmospheres for Mercury (Hg) concentrations below and above the accepted exposure limit
Detector	Dual beam Ultra-Violet absorption module
Measuring Ranges	0.1-199.9 and 1.0-1999 µg/m^3 (user controlled)
Sensitivity	0.1 µg/m^3 and 1.0 µg/m^3
Accuracy	± 5 micrograms or ± 10% of reading
Repeatability	± 5% FSD
Response Time	Approximately 3 seconds
Temperature Range	+10°C to +50°C
Battery Type	15 Volt NiMH rechargeable
Battery Life	Greater than 6 hours after full charge
Dimensions	145 x 295 x 80 mm (120 mm with handle)
Weight	5 lb 3 oz (2.35 kg)
Linearity	Higher than 5% from 0 to 500 µg/m^3
Zero Drift	Less than 5 µg/hour
Alarms	Audible alarm factory preset to 25 µg/m^3
Datalogger	0-2 volt for use with a datalogger (not supplied)
Operation	After a short warm up the MVI gives real time indication of Mercury vapour levels through the PTFE probe

Packing List

The MVI is sent to you packaged in a lightweight, waterproof structural resin instrument case with foam insert.

Contents should be carefully removed and checked against the packing list. Any discrepancies between the contents and packing list must be reported to Ion Science Limited within 10 days of receipt of shipment. Ion Science cannot be held responsible for shortages not reported within that period.

Item	Description	Quantity
1	MVI instrument	1
2	MVI battery charger	1
3	Charcoal in line filter	1
4	PTFE probe and filter assembly (including 10 water trap filters)	1
5	MVI operation manual	1
6	Explorer case with foam inserts	1

Description

The Mercury Vapour Indicator (MVI) is a compact, self contained and completely portable instrument which indicates the amounts of Mercury in micrograms/cubic metre.

The indicating digital display and carrying handle are mounted on the top cover. A female luer connector is provided at the end of the instrument to accommodate a dust and water trap filter with PTFE extension probe. In addition, a length of flexible tubing may be connected to the filter for greater convenience when checking floor areas or gratings.

The internal Nickel Metal Hydride battery is rechargeable using a plug-in battery charger. The operating time when fully charged is greater than 6 hours. Warm up time is approximately 10 minutes and direct readings are indicated on an easy to read LCD display.

The audible alarm provides warning of three pre-defined conditions:

	Condition	Audible Signal
1.	High Mercury vapour concentration greater than 25 $\mu g/m^3$	Slow pulse (1/sec)
2.	Negative reading from -20 $\mu g/m^3$ and lower	Continuous tone
3.	Low battery	Fast pulse (3/sec)

The audible alarm is inhibited during the first 5 minutes of operation.

Operating Controls

The MVI indicating display and all operating controls are mounted on the front panel where they are readily accessible when the unit is held in the operating position.

1. The **ON/OFF** switch is located immediately below the display and to the left. In the **ON** position the MVI will operate and display. In the **OFF** position, battery power to the MVI is disconnected. The instrument MUST also be switched **OFF** to enable charging.

2. The **Zero Adjust** control is located at centre of the panel between the handle and display. A ten turn potentiometer is used to manually set the display to zero, provided that the instrument is in a Mercury free atmosphere. The MVI is designed to show both positive and negative readings and can be adjusted between ± 240 µg/m^3 by use of the zero control. Zero drift shown on the display is normal and is caused by changes in temperature or humidity. The zero control is used to cancel out any negative or positive change on the display prior to taking a reading.

3. **Range Switch**

   a) **2000** in this range the instrument will measure over a range of 0-2000 µg/m^3 in steps of 1 µg/m^3.

   b) **200** in this range the instrument will measure over a range of 0-200 µg/m^3 in steps of 0.1 µg/m^3.

Operating Controls

4. **Indicating Display**

This shows the Mercury concentration in the monitored environment.

Range: 0-2000 µg/m^3

Range: 0-200 µg/m^3

Operating Controls

Important Note

The display will indicate **LO BAT** when batteries require charging. ***Please note the instrument does not operate reliably when* LO BAT *is indicated.***

Battery Charging

Universal Battery Charger (A-26220)

Battery Charging

The MVI incorporates a NiMH battery with a continuous duty cycle of greater than 6 hours' operation. The full charge cycle for the battery is 16 hours.

Recharging

Switch the instrument off. Connect the MVI battery charger to the instrument. Use only the MVI charger supplied with the instrument. Use of an alternative charger may damage the instrument and will void the warranty. The green charging LED lamp located immediately below the ON/OFF switch will light indicating the batteries are accepting charge.

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Only store the unit in a fully charged state.

IMPORTANT NOTE

Only use the Ion Science universal battery charger (Part Number: A-26220) provided with your instrument.

Preparing the MVI for Use

It is recommended that you zero your instrument in a known 'clean environment' using fresh air.

1. Turn the instrument **ON** and ensure the **LO BAT** indication does not appear.
   • If **LO BAT** does appear then charge the unit for 16 hours before proceeding to next step (refer to Battery Charging Section of this manual for further information).

2. Allow the instrument to run until you see a stable reading
   • This should happen after 3 – 4 minutes when operating in the 0 – 2000 range
   • Allow 10 minutes before operating in the 0 – 200 range

3. As soon as the reading is stable you can zero the instrument
   • rotate the 'zero adjust control knob' until '000' shows on the LCD screen

4. Fit the PTFE probe and filter

If you suspect you are in an area contaminated with mercury, you MUST connect the charcoal filter to the inlet of the MVI before adjusting the zero control knob.

Due to the nature of the carbon filter case and the materials used, it can give odours which will show as a small negative reading on the MVI when removed.

Preparing the MVI for Use

The MVI is now ready for use.

When using the instrument it is important to remember that Mercury is heavier than air and therefore measurement should be taken at approx 1 foot (30 cm) from ground.

After use, switch the instrument **OFF** and recharge the batteries if necessary. ***Please remember the MVI may not operate correctly when LO BAT is indicated on the display.***

Interferences

The MVI detector operates on the principle of UV light absorption. There are substances other than Mercury which also cause light absorption and these substances are know as interference vapours.

Some of the interference vapours encountered are various hydrocarbons, water vapour, Sulphur compounds and particles such as smoke. There is no measurable interference from Carbon Monoxide, Carbon Dioxide or Ammonia. High concentrations of water vapour will give readings of between 5 to 10 µg/m³, however if the MVI is zeroed at a similar humidity, this will not be seen.

Table of some interferences at 100 ppm concentration:

Compound	Reading in µg/m³
Benzene	20
Toluene	3.5
Acetone	3.0
Ethyl Alcohol	6.0
Ethyl Acetate	3.0

User Maintenance

Filter Replacement

Charcoal (Zero) Filter

It is advised that you replace the carbon filter after exposure to contaminants as it will become saturated with use. To check the condition of the filter, use the following procedure:

a) Turn the instrument **ON** and ensure that the **LO BAT** indicator does not appear.

b) Allow the instrument to warm up for 10 minutes. Zero the instrument in fresh air.

c) Connect the charcoal filter to the MVI. The reading should not increase by more than 4 µg. If the reading increases by more than 4 µg then the filter must be replaced.

Always replace end caps to maximise life of filter.

PTFE Probe and Filter Assembly

The MVI is supplied with a PTFE probe and luer filter. This can become contaminated or loaded with dust in regular use. Typical symptoms of contamination are a sluggish response to Mercury and an unstable zero. If either of these symptoms occurs then the filter must be replaced.

Replacing the filter:

a) Unlock the luer filter and discard
b) Replace with a new filter

User Maintenance

Audible Alarm Level

The Mercury alarm level is factory set at 25 µg/m^3. If a different alarm level is required please contact Ion Science Ltd for adjustment information.

MVI Health Check

Over time the internal filter and tubing can become contaminated. We, therefore, recommend carrying out an occasional health check to ensure that the instrument is clean and not giving slow or false readings. There are 4 simple tests as detailed below which can be carried out by the user.

Prior to testing switch on the MVI and select the 2000 range. Leave the instrument to stabilise for 10 minutes before proceeding.

Test 1: Can the MVI be zeroed?

Zero the MVI in clean air (do not use the charcoal filter). Can the MVI be zeroed? If not, then a service is required. If yes, then continue.

Test 2: Check for internal contamination

Using a clean piece of flat card or plastic, block the air flow to the luer connector. This will force air to be drawn from the internal parts and any contamination will show on the display. If the reading increases by a value greater that 5 ug/m^3 then the MVI internal parts are contaminated and service is required.

Test 3: Check for case contamination

Use a clean, dry cotton bud and scrub the lid top where dirty. Offer the bud to the luer inlet and note any reading changes. A change of greater than 5 ug/m^3 indicates the case requires some cleaning.

Test 4: Does the MVI detect Mercury?

Obtain a sample of mercury and offer this to the inlet. Check that the MVI responds accordingly. If the instrument does not detect any Mercury then the MVI will require servicing.

Consumable Items

Description	Part Number
Zero Filter	A-31057
PTFE Probe and pack of 10 filters	A-26007
Manual	26002
Universal Battery Charger	A-26220

Calibration and Repair

The MVI requires annual calibration to maintain the best accuracy. Ion Science Ltd will calibrate the instrument against a near Primary Standard and issue a certificate of calibration. If any calibration or repair work is required please return the instrument to the Service Department at Ion Science Ltd. A written estimate will be provided for all work.

For further information please contact our Service Department on + 44 (0) 1763 208503 or via email on service@ionscience.com and they will be pleased to assist you.

Calibration Room