V-OVG User Manual

Owlstone Vapour Generator with Vertical Oven

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Contents

About this Manual

This user manual contains information you need to install and operate the Owlstone V-OVG system.

Additional information and updates are available from www.owlstonenanotech.com under the Vapour Generator product tag. The website also provides details of permeation source availability as well as software tools such as concentration calculators (see 'Calculating Concentrations' section on page 14).

1 Safety

This user manual contains important information regarding the safe operation of the Owlstone V-OVG. It is essential that the user manual be read and understood before commencing any work with the system.

Using the V-OVG in a way that is not specified in this manual could be harmful to the health of the operator and co-workers.

This symbol is used throughout this document to highlight important safety considerations.

2 Notices

2.1 Copyright

2.2 Disclaimer

Owlstone Ltd makes no representations or warranties, either expressed or implied, with respect to the contents hereof and specifically disclaims any warranties, merchantability or fitness for any particular purpose. Furthermore, Owlstone Ltd reserves the right to revise this publication and to make changes from time to time in the contents hereof without obligation to notify any person of such revision or changes.

2.3 Notice of Proper Use of Owlstone Ltd Instruments

The supplied system is in compliance with international regulations. If this system is used in a manner not specified by Owlstone Ltd, the protection provided by the system could be impaired

2.4 Contacting Owlstone

Visit the Owlstone website (https://www.owlstonemedical.com) for up to date contact details and service support:

For general inquires please email support@owlstone.zendesk.com

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2.5 Recycling and Disposal

This product has been designed and manufactured with high quality materials and components, which can be recycled and reused.

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC and\so should not be disposed of in normal waste.

For users outside the European Union consult local authorities for correct disposal or contact Owlstone Ltd.

2.6 Certificate of Conformity

Owlstone Ltd performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the system is delivered to you, it meets all relevant electromagnetic compatibility (EMC) and safety standards as described in the declaration below.

Owlstone Ltd declares under its responsibility that the electronic product V-OVG is in conformity with the following standards:

- **EMC Directive**

  The V-OVG system complies with the following standards:

  CR47: 2006 Class A Code of Federal Regulations: pt 15 Subpart B – Radio Frequency Devices – unintentional radiators

  EN61326-1:1997 Electrical equipment for measurement, control and laboratory use – EMC requirements, Group 1, Class B equipment (emission section only)

  EN1326-1:1997 Electrical equipment for measurement, control and laboratory use – EMC requirements, Industrial Location Immunity (immunity section only)

  EN61000-3-2:2000 Electromagnetic compatibility (EMC) – part 3-2: Limits – Limits for harmonic current emissions (equipment input current up to and including 16A per phase)

  EN61000-3-3:1995 (+A1/A2) Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low voltage supply systems for equipment with rated current <= 16A per phase and not subject to conditional connection

- **Low Voltage Safety Compliance**

  This device complies with Low Voltage Directive EN 61010-1:2001.

  Changes that you make to your system may void compliance with one or more of these EMC and safety standards. Changes to your system include replacing a part or adding components, options, or peripherals not specifically authorized and qualified by Owlstone Ltd. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Owlstone Ltd or one of its authorized representatives.

- **FCC Compliance Statement**

  This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

3 Introduction

3.1 Overview

The V-OVG system comprises a modified 19" rack that is designed to house a series of instruments to provide the functionality and adaptability needed to create a wide range of vapour standards.

The system is modular, the user must select the modules which they wish to employ from the range of standard Owlstone products OVG-4, V-OVG, OFC-1 and OHG-4.

- The OVG-4 is the Owlstone Vapour Generator. This unit incubates permeation devices at specified temperatures in a known flow of gas to create an accurate and precise chemical vapour standard.
- The V-OVG is a configuration of the Owlstone Vapour Generator with a large vertically mounted oven for use with multiple, physically large or specialist permeation devices.
- The OHG-4 is the Owlstone Humidity Generator, which can create and monitor a range of humidities from 1* to 90% RH (* lower humidity depends on the %rh of the users gas supply).
- The OFC-1 is the Owlstone Flow Controller, which provides an accurate diluent gas flow that increases system functionality and compliments OVG-4,V-OVG and OHG-4 sub-units.

3.2 Note on harmful substances

The V-OVG can be used with a wide range of permeation devices many of which could, if they burst, release toxic or harmful quantities of the material they contain.

For this reason, it is essential that the user conduct a risk assessment for the substances to be used in the V-OVG and establish safety protocols to cope with the release of such materials both in the normal operation of the unit and in the case of a permeation source bursting and releasing its contents all at once.

These protocols must include suitable installation (e.g. in a fume cupboard, provision of extraction, etc.) and operational procedures to protect the operator.

3.3 An introduction to Permeation Devices

The OVG-4 / V-OVG is designed to house and incubate permeation devices at a set temperature, as well as provide a controlled diluent gas flow to generate the desired chemical concentration of the vapour standard.

At the heart of the OVG-4 / V-OVG is the disposable permeation device (not supplied) which is usually constructed from 1/4" PTFE tubing as shown in Figure 3. The oven can house a permeation device with a diameter of up to 8mm and a length of up to 160mm.

In the device is a two-phase system the first phase of which is a liquid or solid reservoir of the desired chemical generating a stable saturated headspace in the second gaseous phase. It is in this gaseous phase that the chemical dissolves into, and permeates through, the walls of the tube at a constant rate.

Permeation devices are usually calibrated gravimetrically at a given temperature with the permeation rate stated in ng min^{-1}. Once the chemical vapour is released from the device it mixes with, and is carried away by, a known diluent gas flow (ml min^{-1}) and hence the desired concentration (ng ml^{-1}) for the vapour standard is created.

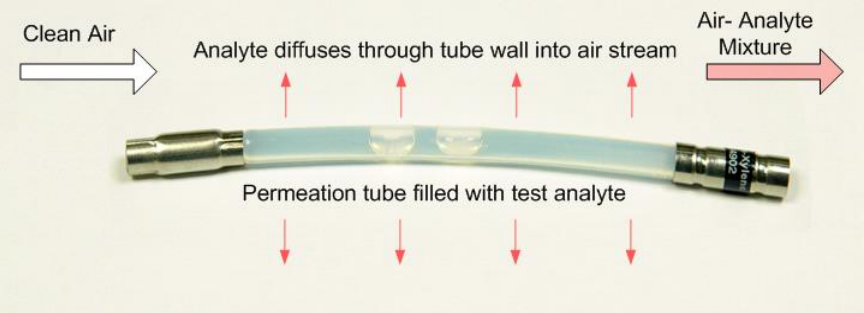


Figure 1 - Example of permeation device

3.4 Calculating concentrations

Calculating concentration with the Split Flow closed

The exhaust flow can be opened or closed dependent on user requirements. When the exhaust valve is closed, the OVG-4 / V-OVG works as a normal vapour generator where the concentration (Equation 1) can be altered by adjusting the sample flow.

$$[i] = PR / F_{SA} \qquad \text{(Equation 1)}$$

Where [i] = Concentration / ng ml^{-1}
PR = Permeation rate / ng min^{-1}
F_{SA} = Sample flow / ml min^{-1}

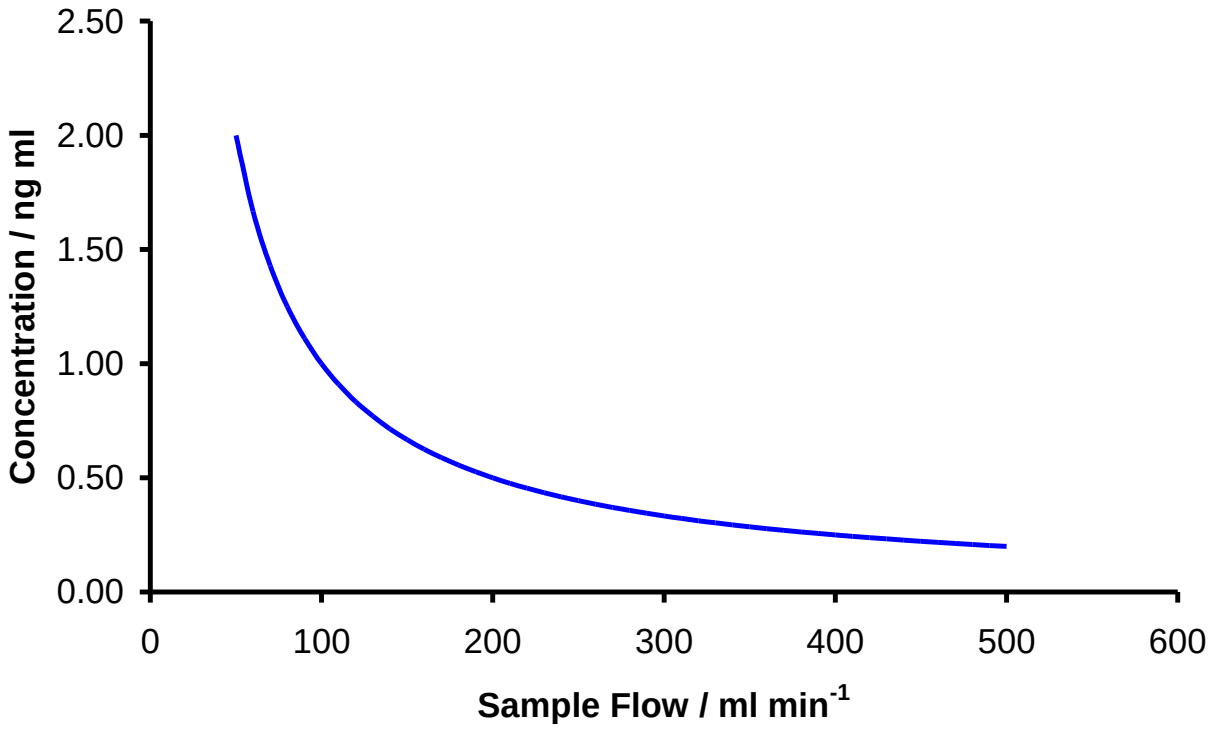


Figure 2 - Theoretical concentrations at different sample flows with a permeation rate of 100ng min^{-1}

Calculating concentration with the Exhaust Flow open

With the exhaust flow open the concentration can be adjusted using the split control whilst the sample flow remains constant. With the exhaust flow open the concentration is calculated by dividing the permeation rate by the sum of the split and sample flow, therefore adjusting either flow will alter the concentration (Equation 2).

Figure 3 outlines the different concentration ranges that can be generated by using the exhaust flow in conjunction with both high and low sample flows.

$$[i] = PR / [F_{SP} + F_{SA}] \qquad \text{(Equation 2)}$$

Where [i] = Concentration / ng ml^{-1}
PR = Permeation rate / ng min^{-1}

F_{SA} = Sample flow / ml min^{-1}
F_{SP} = Split flow / ml min^{-1}

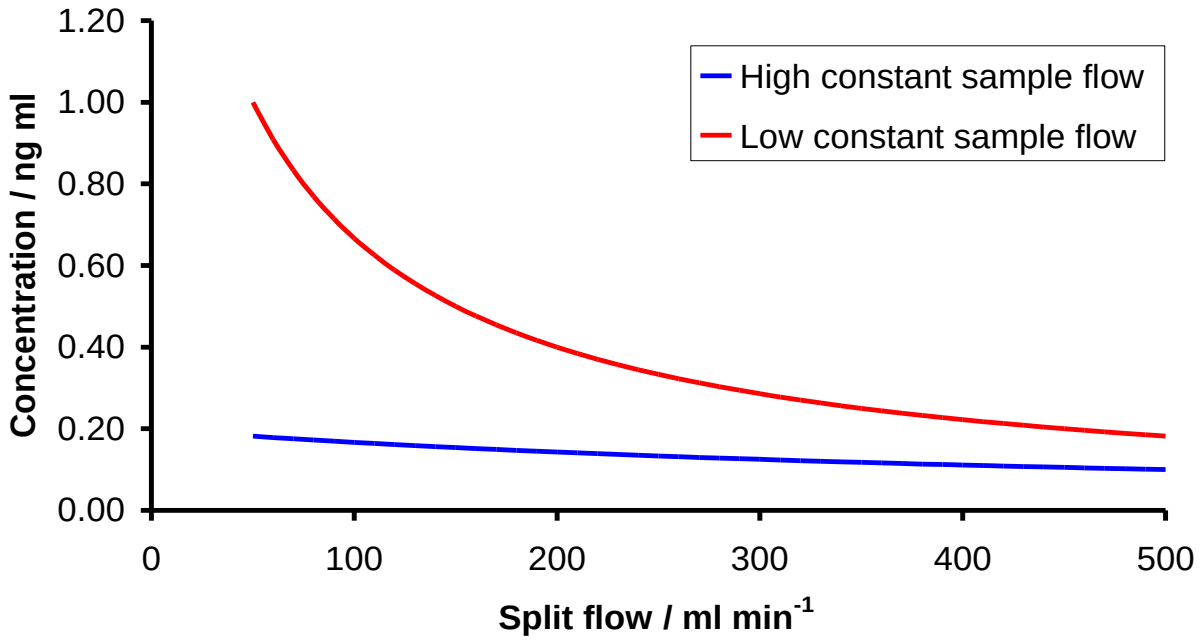


Figure 3 - Theoretical high and low constant sample flow concentrations at different exhaust flows. Concentrations calculated using an analyte permeation rate of 100ng min^{-1}

A concentration calculator is available at www.owlstonenanotech.com to simplify the setting of flows, temperatures and splits in order to give a particular concentration for a particular source.

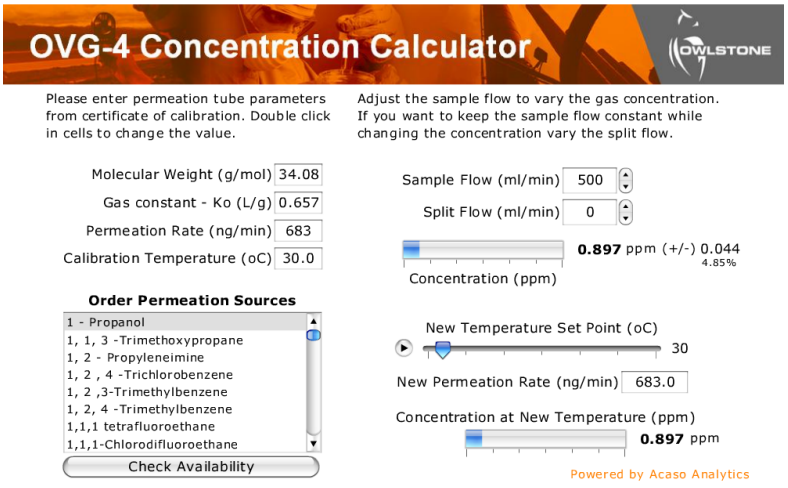


Figure 4 - Concentration calculator

3.5 V-OVG Parameters and Operating Ranges

Parameter	Operating Range
Power supply – inlet	100 – 240vAC
Power supply - output	24V, 220W, max 9.16A
Gas	Air or nitrogen
Inlet pressure	40psi – 90psi
Inlet consumption Typ.	Typ. 0.5 – 1.5 litres.min^{-1}
Inlet consumption Max	Max 10.5 litres.min^{-1} (3x V-OVG systems, full exhaust flow)
Inlet connection	¼” Swagelok tube fitting
Sample Outlet pressure	20psi max
Sample Outlet flow range	20 – 250 ml.min^{-1}
Sample Outlet connection	¼” or 1/8” Swagelok tube fitting depending on model
Exhaust pressure	< 30psi
Exhaust flow range	0 ml.min^{-1} to > 3,000 ml.min^{-1}
Exhaust connection	¼” Swagelok tube fitting
Oven Diameter	40mm
Oven Depth	120mm
Oven Temperature	30 to 100C ±0.1C in 0.1C increments
Fuse	F2.5A H 250V

Figure – 5: Operating parameters for the V-OVG

Flow Path

Figure 6 is a schematic of the flow path through the V-OVG.

The carrier gas first passes through the permeation oven where the air / analyte mix is achieved. This gaseous mixture is then split into two separated flows, the Sample Flow (blue) and the Exhaust Flow (green). The concentration of analyte exiting the Sample Outlet port is dependent on these two flows.

The Sample Flow is controlled by a mass flow controller with an accuracy of 1.5%. The Exhaust Flow is set manually using the Exhaust control needle valve.

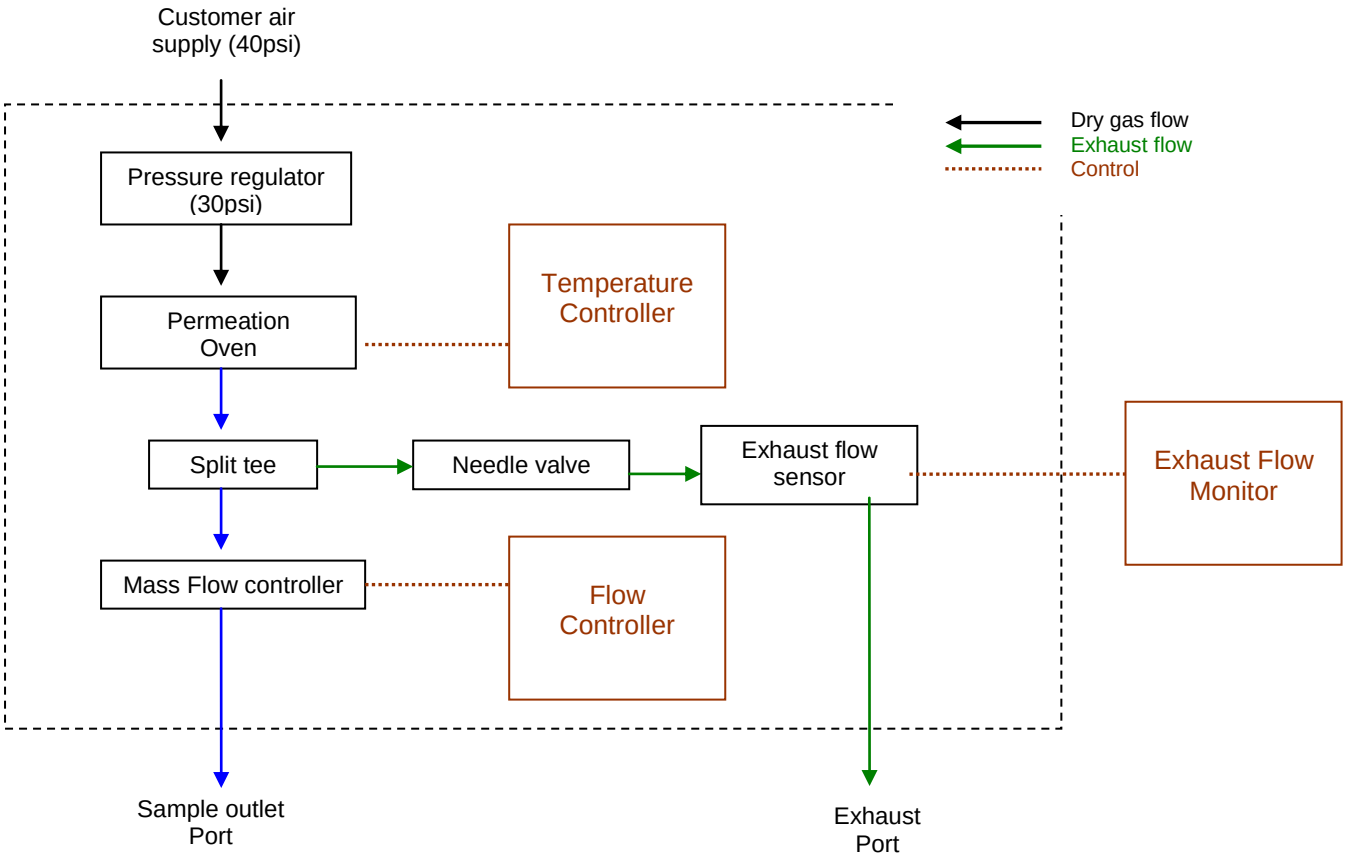


Figure 6 – V-OVG flow path schematic

4 Pre-installation guidelines

4.1 Location

The V-OVG system is designed to create chemical vapours. To limit the user's exposure to these vapours it is strongly recommended that the V-OVG system be operated in a fume hood, or well-ventilated space.

4.2 Environment

Do not place in the following environments:

- Space that is poorly ventilated or confined. Allow at least 50cm clearance from walls and free flow of air around the system
- Locations with an ambient temperature above 30^{o}C
- Locations where the altitude is greater than 10,000 feet.
- Do not place the unit on fabric or any other soft surface
- Do not cover the unit with a cloth or any other item
- Do not place near flammable materials
- Where maximum relative humidity exceeds 80 %

4.3 Power

The V-OVG is supplied with a power supply that is automatically compatible with all conventional mains power supplies: 100-240V, 50-60Hz, max 2.5A. It is not necessary to manually select or switch voltages. The maximum power consumption of the V-OVG is 220 W.

The power supply is supplied with a 5A IEC mains lead with a plug appropriate for the country of use.

Warning! If power to the unit is interrupted there will be an increase in concentration of chemical vapour levels within the unit.

If the unit is found in a powered down state it is suggested that the user purge the permeation oven of excess vapour by opening the split flow fully for 2 hours.

4.4 Gas supply

The V-OVG requires a pressure regulated supply of air / nitrogen at 40 - 90 psi. As the V-OVG is primarily used to validate instrument detection capabilities it is recommended that the gas supply has a dew point lower then -35^{0}C, is free from impurities (Hydrocarbons less than 0.1ppm methane) and particulates (less then 30µm) . It is also recommended that all gas lines be constructed of refrigeration grade copper or stainless steel tubing and connected using Swagelok fittings.

If the gas supply is interrupted whilst a permeation source is being incubated within the V-OVG, the concentration of the chemical will increase until it has reached a saturated level.

For this reason, any interruptions in the gas supply will result in the flow controller alarming, when this happens the permeation oven is switched off to minimise vapour build-up.

If the system is found in this state, please close the sample outlet and purge the oven through the exhaust (i.e. open the split flow control fully).

4.5 Exhaust

A separate exhaust line of at least ¼" OD and of <2 meters in length should be made ready to connect to the exhaust outlet of the V-OVG system.

This line should be checked for chemical compatibility with the users vapours, it is recommended that it is exhausted to a fume hood.

Check the condition of the exhaust line at regular intervals for blockages and leaks. The customer is responsible for ensuring the integrity of any exhaust lines.

4.6 Analyte(s)

Check chemical compatibility: Materials in the flow path include PTFE, copper, stainless steel, and Viton®. The user must ensure that permeation devices are neither corrosive nor reactive with materials in the flow path.

Always refer to the Material Safety Data Sheets relevant to the vapour(s) you are handling and ensure adequate risk controls and COSHH are in place before using potentially hazardous vapours / gases with the V-OVG.

4.7 General Installation safety requirements

1. The V-OVG system will get warm during operation, especially the oven lid.
2. Do not place liquids on or near the V-OVG. Liquid spill may cause instrument failure.
3. Ensure cabling is routed behind the system, at bench level, posing no risk of tripping. Ensure that all cables are detached from V-OVG before attempting to move the unit.
4. The V-OVG has not been designed for drop tests; any such test or accidental drop will cause damage to the system.

The V-OVG rack unit can weigh up to 25kg please take care in handling to avoid injury.

5 Installation Guidelines

5.1 Tools required

- 7/16" spanner

- 9/16” spanner

5.2 Installation Procedure

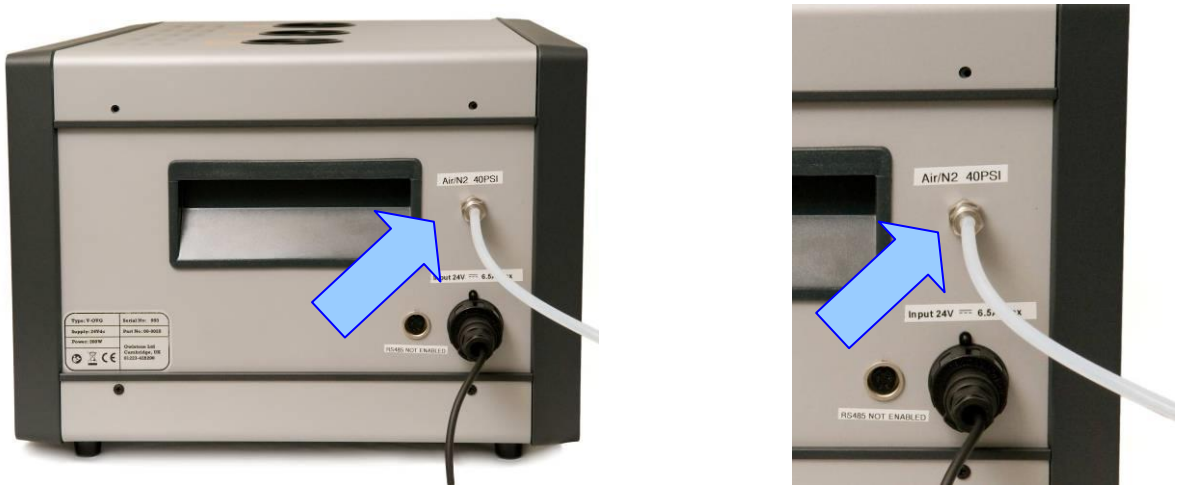
1. Locate the instrument
2. Gas line Installation
3. Exhaust line Installation
4. Connect the External Power Supply
5. Remove caps from all Sample Outlet ports
6. Switch the power supply on
7. Open the Exhaust Flow

1. Locate the instrument

V-OVG is designed to generate chemical vapours. To limit the user’s exposure to these vapours it is strongly recommended that the V-OVG be operated in a fume hood, or well-ventilated space.

Ensure adequate space and air-flow around the unit. Do not use where ambient conditions exceed 30°C

2. Gas line Installation



Remove the nylon cap from the Air Inlet port on the rear of the system.

Connect a clean dry air supply to the stainless steel ¼" inlet situated on the side of the rack unit. It is recommended that ¼" analytical grade stainless steel tubing be used; however refrigeration copper tubing or PTFE may also be used.

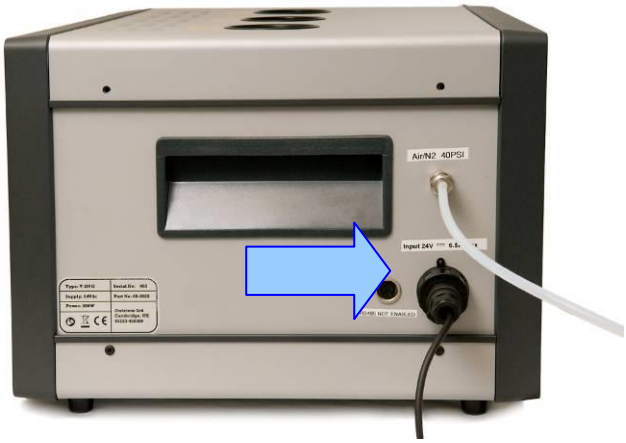
Owlstone recommend the user fit a venting toggle valve in this line. It is important that the pressure supply is removed from the system before attempting to open the V-OVG oven.

3. Exhaust line Installation

Remove the nylon cap from the Exhaust port on the front of each V-OVG sub-unit supplied with the system.

Connect a 2 meter exhaust line to this port venting into a fume-hood, with a ¼" Swagelok fitting. It is important to note that using longer lengths of exhaust line or an exhaust under negative pressure will affect the split flow exiting each V-OVG.

4. Connect the External Power Supply



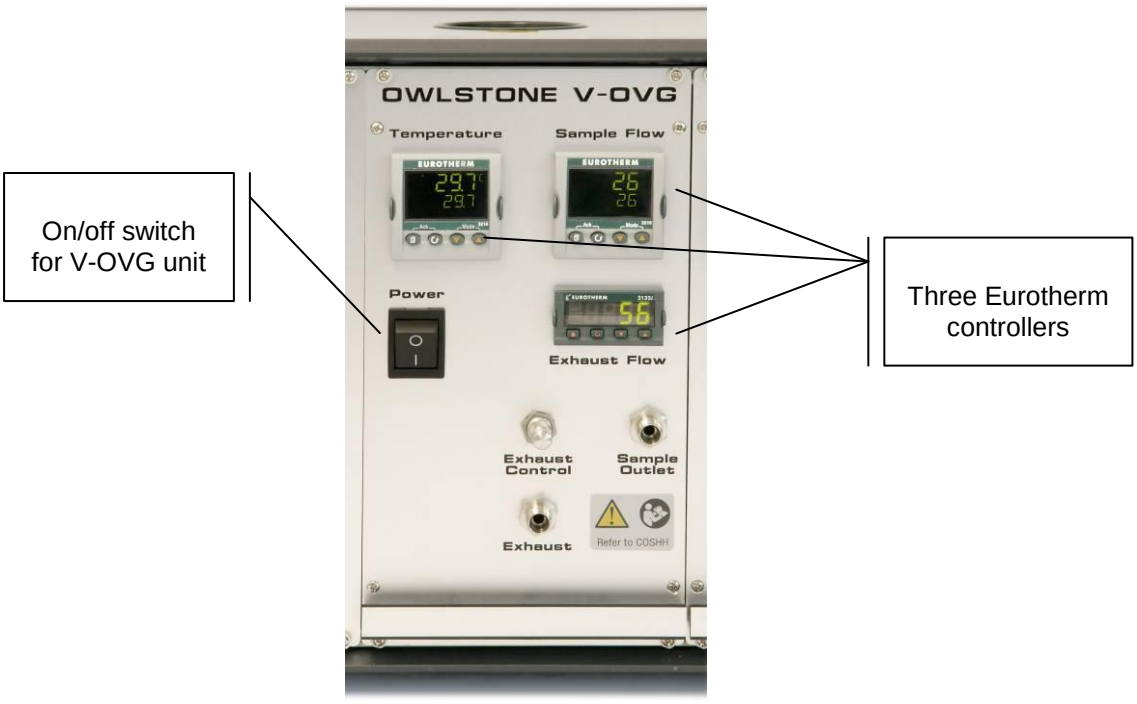
Connect the power supply to the back of the V-OVG Rack Unit and plug to your mains power supply. Ensure that the mains plug is accessible during operation.

5. Remove caps from all Sample Outlet ports

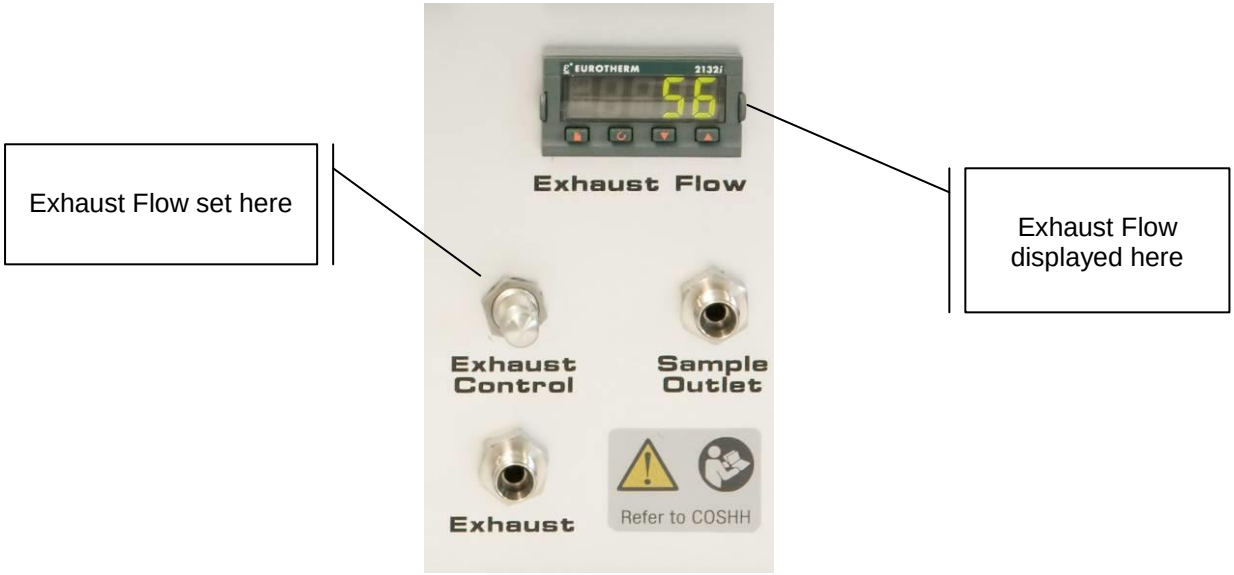
To preserve the cleanliness of the flow path Owlstone ship the V-OVG system with Sample Outlet ports capped. These caps should be removed before use.

6. Switch the power supply on

Following application of mains power, the user must switch on each V-OVG sub-unit. At this point the LED displays of the three Eurotherm controllers will light up.



7. Open the Exhaust Flow



To prevent a potentially dangerous build up of vapor in the permeation oven it is essential that a small Split Flow is set before incubating your first permeation source.

Owlstone recommend at least 100 ml min-1 split flow at all times.

The needle valve controlling the exhaust flow is designed not to close fully. When it is in the closed position there will still be an exhaust flow of ~30 ml min-1. This prevents vapour build up in the oven and back diffusion.

Do not attempt to force the needle valve shut as this will damage the thread and the seal. Do not cap off the exhaust outlet.

5.3 Resetting Flow Controller Alarms

If during the installation procedure the user switches on a sub-unit without first removing the cap from the Sample Outlet port then an ALARM will indicate on the Eurotherm Sample Flow controller.

In the case of V-OVG, when an alarm occurs on the Sample Flow controller the permeation oven is also switched off to prevent vapour build-up. Once the temperature within the oven drops by more than 0.2°C from set-point then the Temperature controller will also alarm.

To reset the alarms

1. First resolve the problem. The most likely cause of a flow alarm is that the Sample Outlet is capped, or inadequate air pressure has been supplied to the rear of the V-OVG rack.

   If this is not the case refer to the Troubleshooting Section of this manual.

2. The Sample Flow will recover to the set-point. Once the set-point is reached reset the alarm by pressing the two buttons shown in the red circle below at the same time.

3. Once the Sample Flow controller alarm has been acknowledged the temperature of the permeation oven will start to rise. The alarm on the Temperature controller cannot be acknowledged until the temperature of the oven is within 0.2degrees of the set-point.

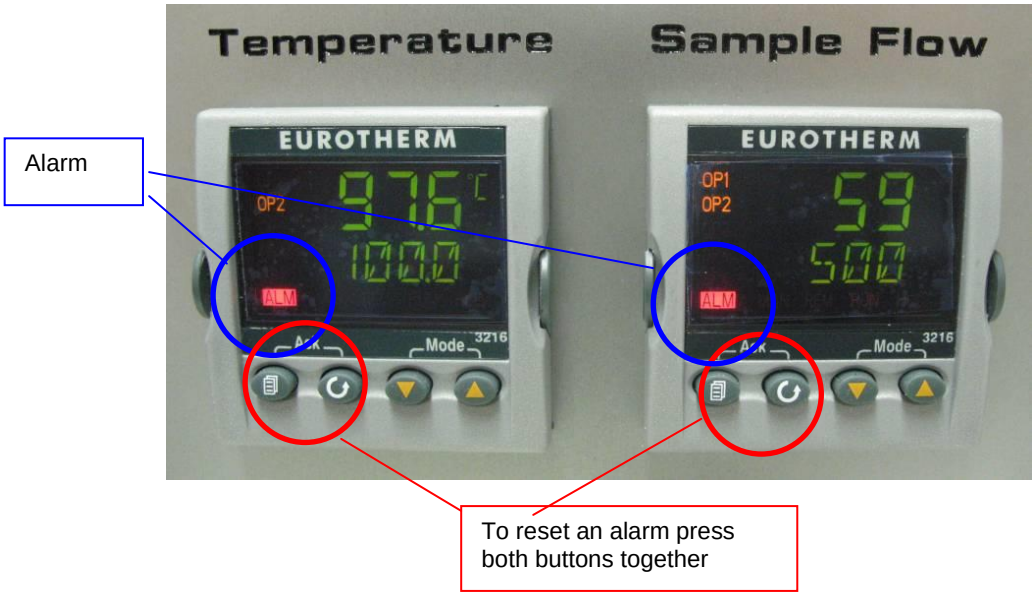


Figure – 7 Alarm condition

6 User Guide

6.1 Overview

The V-OVG (Figure 8) is a versatile chemical vapour generator that when used in the GEN-SYS rack unit either on its own or in a combination of two or three units can generate single or multiple gas mixtures.

The V-OVG comprises of two main sections, 1) the permeation oven and 2) the flow control system.

The oven chamber can hold multiple ¼" diameter PTFE permeation sources up to 12cm length, temperature is digitally controlled from 30 to 100C ±0.1C in 0.1^{o}C increments.

The flow control system comprises of Sample and Exhaust flows. The Sample flow is digitally controlled from 20ml min^{-1} to 250ml min^{-1} in 1ml.min^{-1} increments, the exhaust flow is adjusted manually using the needle value.

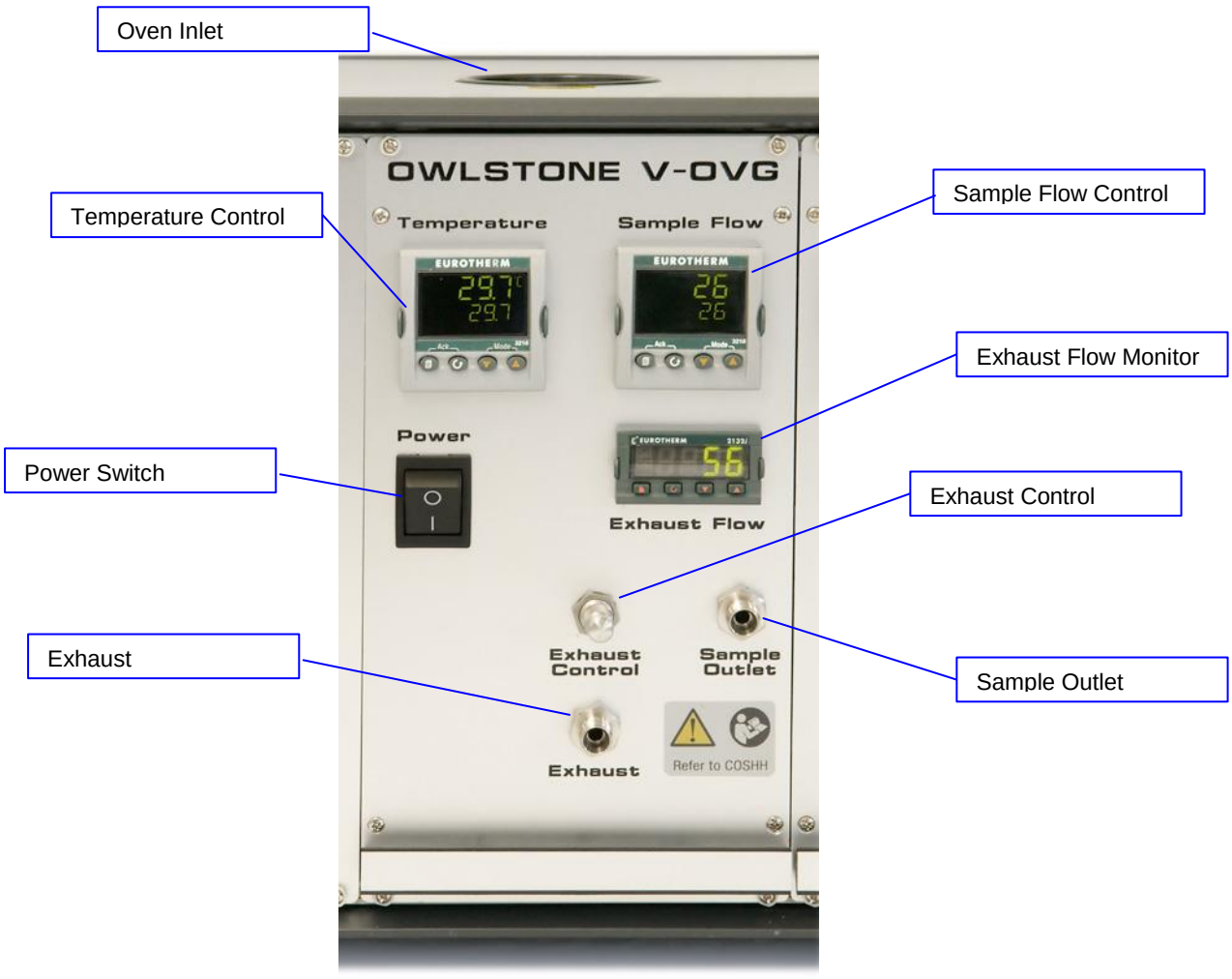


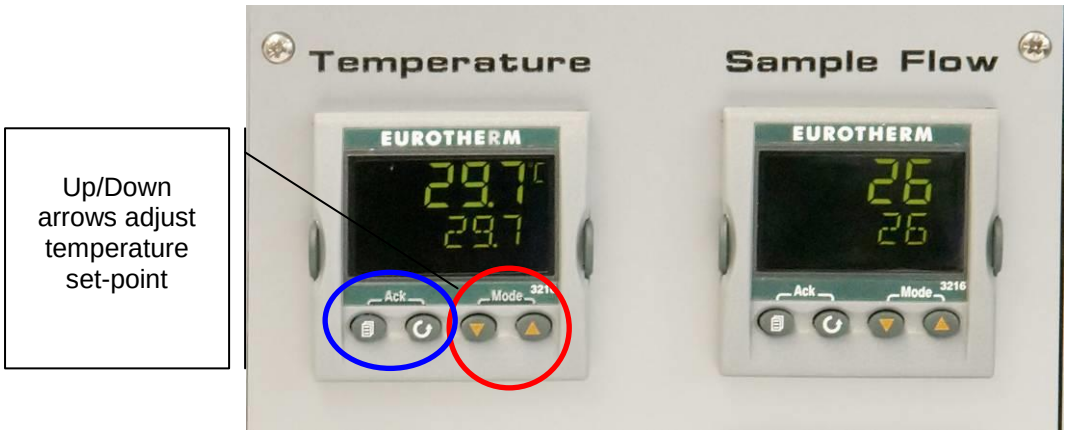
Figure 8 – The V-OVG

6.2 Set permeation temperature

The concentration of the chemical found in the gaseous phase of the device is dependent on the vapour pressure of the compound. Given that the vapour pressure of a chemical is directly affected by temperature, temperature is the main physical parameter controlling the permeation rate of the chemical from the device.

The permeation oven temperature is digitally controlled from 30 to 100^{o}C in 0.1^{o}C increments with 0.2C variation. This 0.2C variation means a 98% accuracy of the certified permeation rate can be obtained.

As a general rule - if the incubation temperature is increased / decreased by 10C you double / half the permeation rate of your device.



Using the Up-Down arrows on the temperature controller set your intended incubation temperature. Before using your first permeation source, wait for the oven temperature to stabilize at set-point.

Temperature Control Alarms

The Eurotherm controller will alarm and display the message “Oven temperature outside set point” if the temperature deviates by more than ±0.2C from the set point (see Figure 6).

To acknowledge the alarm press the Menu and scroll button together (see blue circle in Figure 5 above).

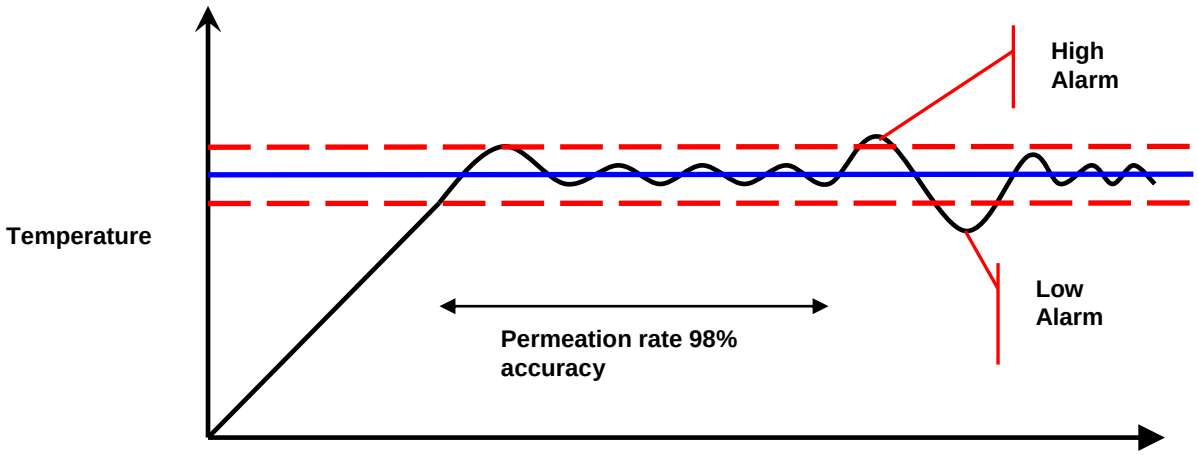


Figure 9 - Set point deviation alarm

6.3 Set Sample Flow

Using the Up-Down arrows on the temperature controller set your intended sample flow rate.

The total flow across the permeation source is the sum of the sample flow and exhaust flow.

The Sample Flow is set by using the up and down arrow keys (red circle) on the right Eurotherm controller as shown in figure 8. The maximum and minimum flows are 500 and 50ml min^{-1} respectively

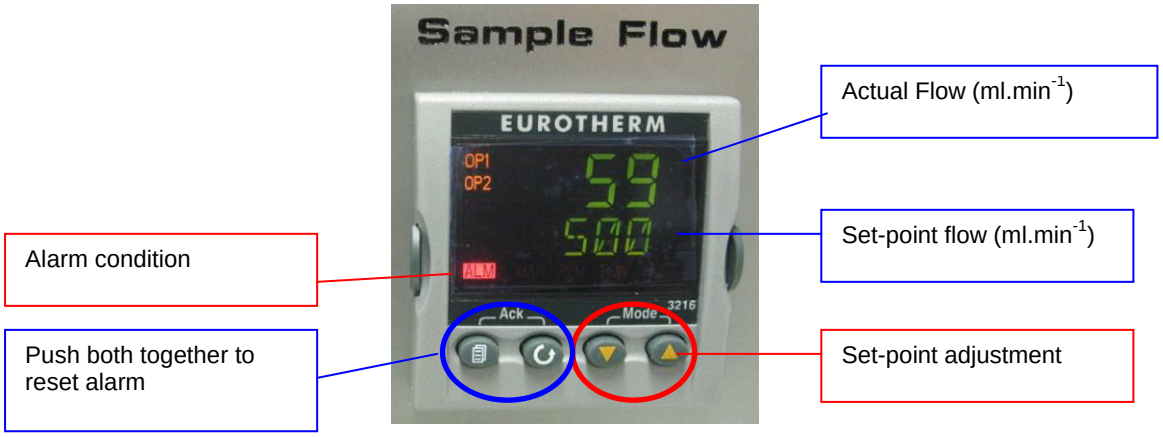


Figure 10 - Eurotherm Sample Flow controller

Sample Flow control alarms

A “Flow interruption alarm” indicates that the flow to the unit has been interrupted and that the actual flow has deviated by more than 40ml from the set-point.

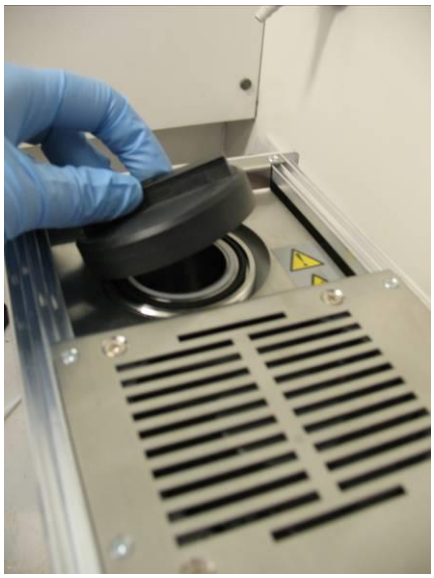
To protect the user from any potentially dangerous build up of chemical vapour inside the permeation oven and flow path the permeation oven is automatically switched off whenever a flow alarm occurs.

To both reset the alarm and restart the permeation oven press both menu and scroll buttons together (refer to the blue circle in figure 8).

6.4 Insert a permeation source

Important: Even though each part of the GEN-SYS is leak-tested and Swagelok fittings are used throughout, the system is not guaranteed leak-proof.

Always refer to the Material Safety Data Sheets relevant to the vapour(s) you are handling and ensure adequate risk controls and COSHH are in place before using potentially hazardous vapours / gases with the V-OVG



To insert a permeation source into the oven, first disconnect the air supply to the V-OVG and wait for the unit to depressurise. (Sample and Exhaust Flows should read 0 ml min^{-1}). Unscrew the black lid of the oven, located on the top surface of the V-OVG.

Insert the permeation source into the central well of the oven, check the condition of the sealing O ring and re-screw the lid.

Important: It is recommended that each new device loaded into the permeation oven is allowed a 2 day incubation period before use.

When the V-OVG is incubating a chemical permeation source and sampling is not required, always have the exhaust flow open. This will ensure that a gas flow constantly passes over the permeation source and is routed to the exhaust port.

It is good practice to apply a label to the front of the V-OVG indicating to other users 1- chemicals present inside the oven, and 2- the date when the permeation device was loaded

Important:

- **It is recommended that each new device loaded into the permeation oven is allowed a 2 day incubation period before use.**
- **When the V-OVG is incubating a chemical permeation source and sampling is not required, always have the exhaust flow open. This ensures that a gas flow constantly passes over the permeation source and hence prevents vapour build up.**

6.5 Setting the Exhaust Flow

The Exhaust Flow is adjusted using the needle valve. The minimum achievable exhaust flow is approximately 30ml/min. DO NOT OVERTIGHTEN THIS VALVE.

The Exhaust Flow indicator display gives a digital read-out indicating ml/min exhaust flow. For applications where accurate exhaust flow measurement is required Owlstone recommend the user check actual exhaust flow using a flow meter of known accuracy.

Warning: As a preventative measure to protect against unnecessary build-up of vapour concentrations inside the oven on occasions when the Sample Outlet is capped, or outlet pipe work blocked, always ensure the Exhaust Control is set to exhaust at least 100ml min^{-1}.

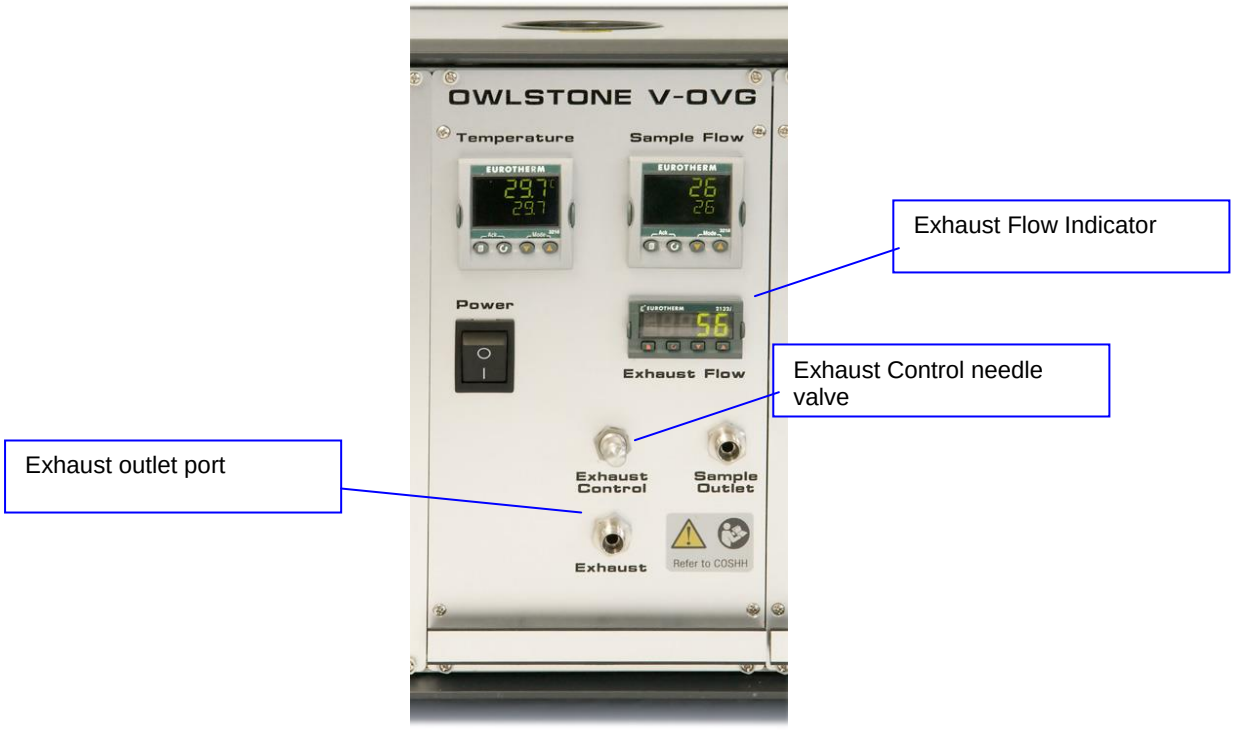


Figure 11 – V-OVG Exhaust

6.6 Sample outlet

If required, the testing device can sample directly from the sample outlet. Otherwise suitable tubing is recommended to transfer the sample gas flow to the target instrument / experimental set-up.

A 1/8" or ¼" Swagelok compression fitting is provided at the Sample Outlet port depending on the model, this is intended for use with 1/8" or ¼" tubing. Ensure that the inner diameter of tubing is no less than 1mm.

Do not over tighten. For pre-swaged fittings, a leak tight connection can typically be achieved using Swagelok fittings by following the procedure "finger tight followed by an additional ¼ turn using a spanner". For new fittings, tighten to finger tight then an additional ¾ turn.

To increase the range of concentration that can be generated additional diluent gas can be introduced downstream of the sample outlet. The Owlstone Flow Controller (OFC-1) is designed for this purpose.

Before opening the sample outlet to the outside air verify that the concentration of the substance you are using does not exceed the Occupational Exposure Limit.

7 Preventative Maintenance

7.1 V-OVG system rack

Maintenance requirements for the V-OVG system rack are limited however Owlstone recommend the following tasks are performed periodically:

- Check that all internal cables are intact with no damaged insulation or frays.
- Check that all pipe-work is in good condition, check all Swagelok fittings are tight.
- Cleaning: Clean the outside of the equipment carefully using a cloth dampened with water, do not use chemical cleaning agents. Before using any other cleaning or decontamination method, check with your local Owlstone representative to make sure that the proposed method will not damage the equipment.
- If potentially hazardous material is spilt onto the equipment, disconnect the power supply and have it checked by a competent person. It is the user's responsibility to carry out appropriate decontamination if hazardous material is spilt on the equipment.
- Check that the V-OVG rack is situated correctly. The unit should be situated clear of all other equipment with adequate air flow around the rack. The system should not be used as a shelf.

7.2 V-OVG sub-unit

Although the V-OVG is designed to be run continuously at the set point temperature with minimum maintenance, to ensure prime performance it is recommended that the following steps are taken:

Maintenance Activity	Schedule	Procedure
System bake-out for 1 day	Every time a permeation device is exchanged	After removing device, set temperature to 100C and have the exhaust and sample flow at 250 ml min^{-1}
Recalibration	Annual	Contact Owlstone. Temperature and flow controllers will be recalibrated

8 User Maintenance Procedures

8.1 Disconnecting power from the GEN-SYS rack

This section describes how to disconnect the GEN-SYS rack from air, exhaust and power services.

Warning: Inlet gas line pressure must be vented before following this procedure.

1) Vent the gas supply line that provides pressure to the GEN-SYS system. Do not proceed unless pressure has been vented from this line.

2) Using a 9/16” spanner disconnect the inlet gas line from the rear of the GEN-SYS system.

3) If in use, using a 9/16” spanner disconnect the exhaust line from the rear of the GEN-SYS system

4) The DC power connection is unscrewed by hand.

8.2 Removing a sub-unit

Note on safety

Customers are expected to make their own assessment of COSHH / chemical safety before following this procedure. Customers should also consider undertaking a risk assessment before attempting procedures described in this document.

Always physically disconnect Inlet Air, Exhaust and DC power from the rear of the GEN-SYS rack before following this procedure.

Always ensure sub-units are switched off before removing them from the GEN-SYS rack.

Always allow V-OVG sub-units to cool before removing them from the GEN-SYS rack.

To improve access, it is often more convenient to remove any pre-existing V-OVG sub-units from the GEN-SYS rack. This is not essential and may impact the users COSHH evaluation.

Warning: The user is responsible for considering all chemical safety implications / COSHH before following this procedure.

Always disconnect DC power, exhaust and gas supply from the rear of the GEN-SYS rack before following this procedure.

Always consider chemical safety before following this procedure.

1) Switch off power to the unit

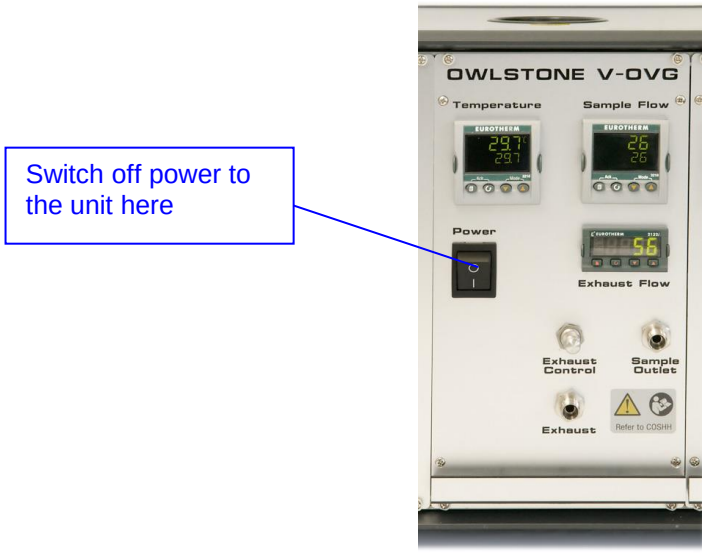


Figure 12 – V-OVG front panel

2) Allow the V-OVG to cool down to room temperature

3) Unscrew and remove the 4x screws from the front panel of the V-OVG as shown below

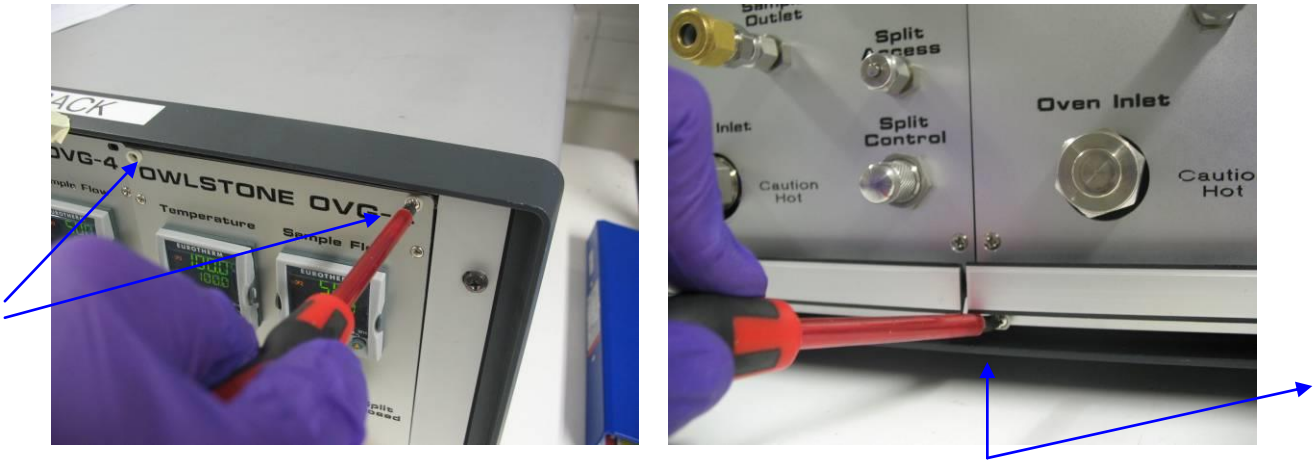


Figure 13 – photograph showing the 4x screws used to mount the V-OVG

4) Remove the 'roof' panel from the rack

Unscrew the 4x screws shown below. The roof panel can then be lifted off.

Figure 14 - removing the roof panel

5) Disconnect DC power and gas supply

Both DC power and gas supply are removed by hand.

The DC power connector is removed by pulling gently. The gas supply QC is removed by sliding the tapered end of the quick-connect towards the rear of the V-OVG

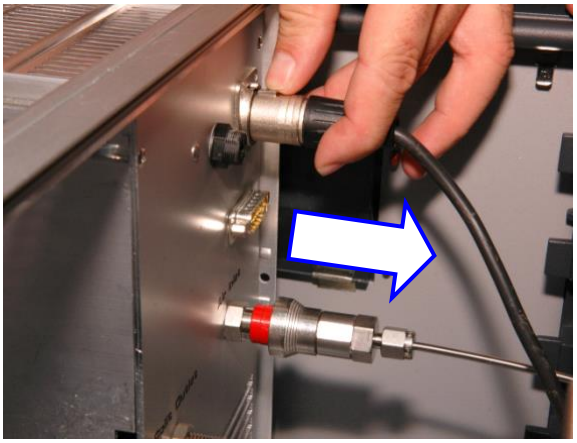


Figure 15 – disconnect DC power cable

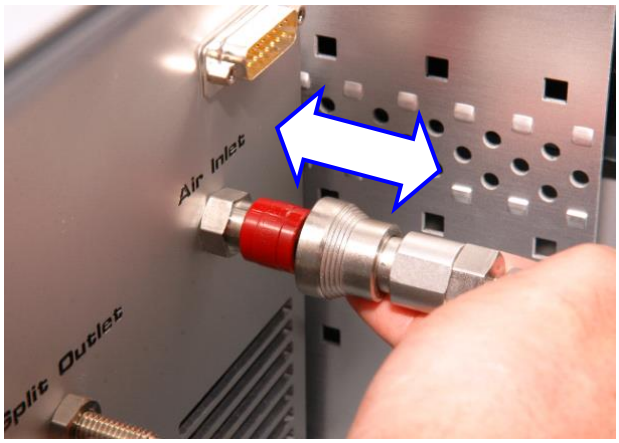


Figure 16 – disconnect gas line 'quick-connect'

Disconnect the exhaust line

Using a 7/16" spanner unscrew the 1/8" Swagelok fitting on the rear of the V-OVG.

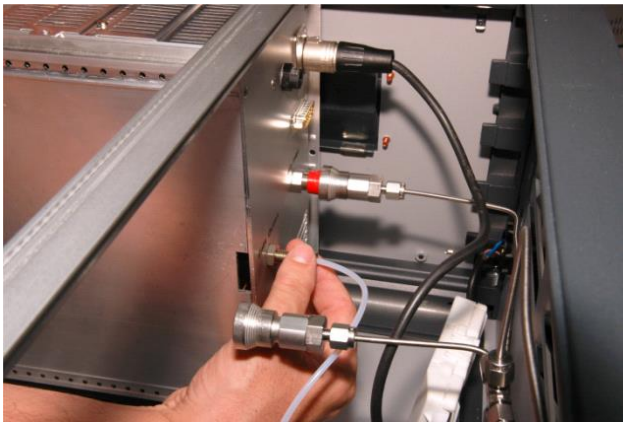


Figure 17 – disconnecting the exhaust

6) Carefully remove the V-OVG from the rack

Use both hands to carefully slide the V-OVG out of the GEN-SYS rack.

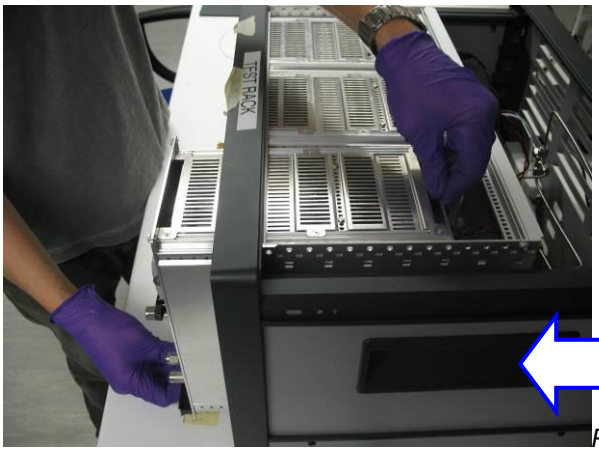


Figure 18 – removing an V-OVG from the GEN-SYS rack

8.3 Installing additional Sub-Units

Installing the V-OVG sub-unit follows the procedure described in section 4 in reverse.

1) Mount the V-OVG sub-unit in the GEN-SYS rack

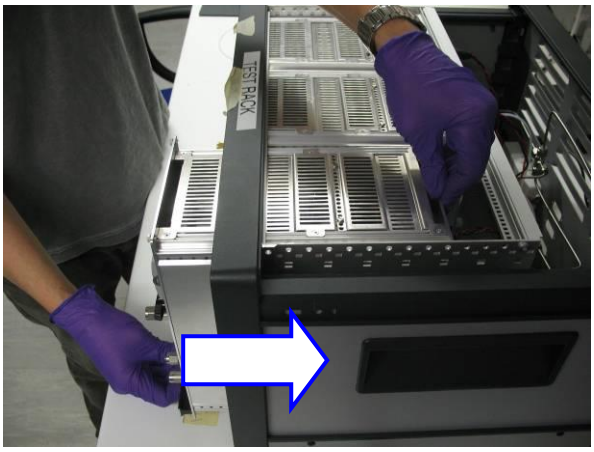


Figure 19 – mounting a sub-unit

2) Connect quick connect to the rear of the V-OVG as shown below.

Pushing the valve firmly until a click is heard.

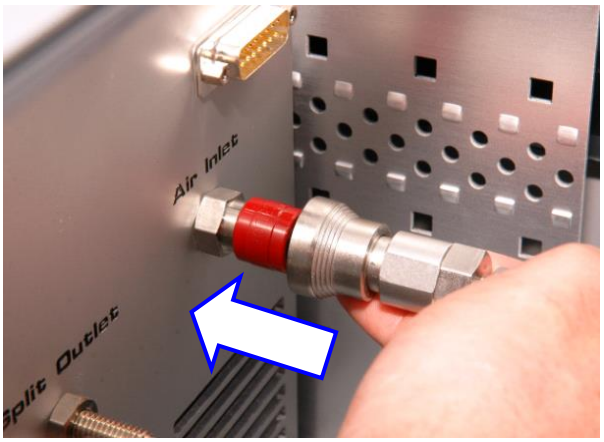


Figure 20 - Connect Quick Connect Valve

3) Connect DC power cable

Connect the DC power cable to the power socket on the rear of the V-OVG as shown below.

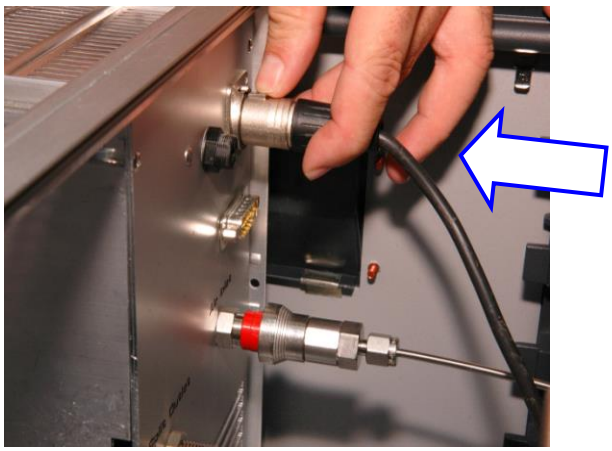


Figure 21 - Plug power cable into socket

4) Connect the exhaust line

Finally attach the PTFE exhaust line to the split outlet.

The Swagelok 1/8” nut must be tightened by hand before applying an additional ¼ turn using a 7/16” spanner.

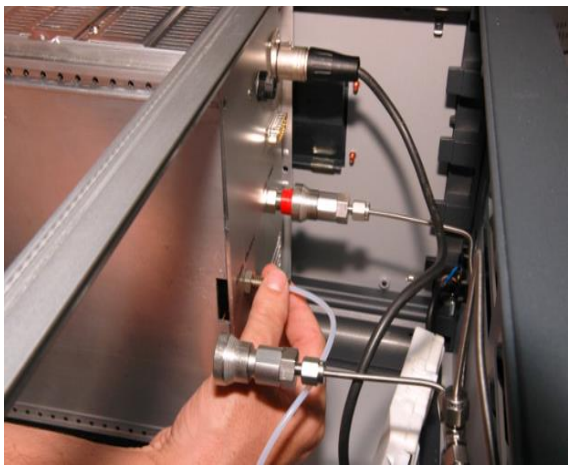


Figure 22 - Attach PTFE exhaust line to split outlet

5) Connect the RS485 cable

*** If your system is not fitted with RS485 communication capability then you can ignore this step ***

Figure 30 shows a GEN-SYS system fitted with only 1x V-OVG sub-unit. The 2x unused RS485 cables along with the terminating connector are strapped to the base of the OVG rack.

To fit additional sub-units the RS485 connectors must be fitted to the back of each OVG as shown below in figure 31. The terminating connector is not required if 3x sub-units are fitted into the GEN-SYS rack.

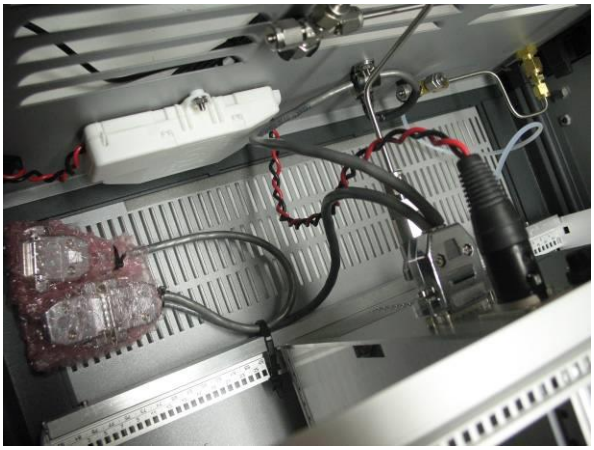


Figure 23 –RS485 system with single sub-unit

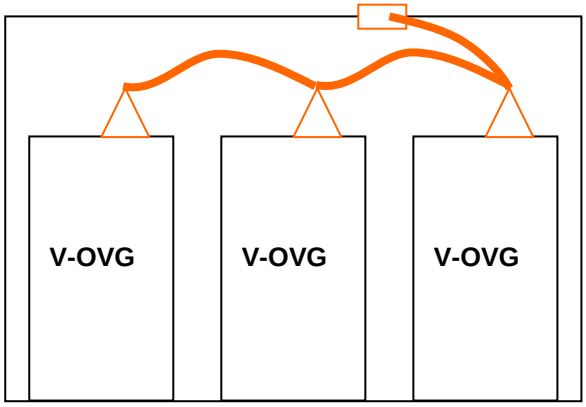


Figure 24 – RS485 cable in orange

6) Replace the roof panel

Replace the roof panel and tighten the 4x screws.

7) Re-connect DC power, Air, Exhaust to the rear of the GEN-SYS system

8) RS485 addressing

Eurotherm controllers must each have a unique address on the RS485 bus. Owlstone will always configure Eurotherm controllers supplied in a system with unique addresses. If a single sub-unit is supplied then the addresses will be 1 and 2.

If the user adds further OVG -4 sub-units then each Eurotherm controller must be configured with a unique address. This address is configured through the front panel of the Eurotherm (ref: Eurotherm user manual).

8.4 Replacing the fuse

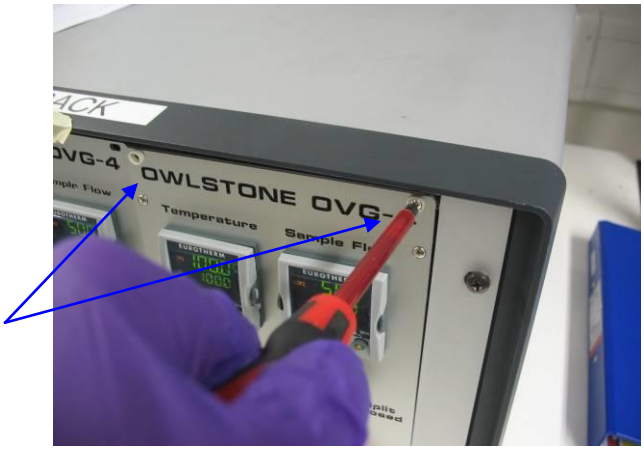
The fuse is mounted on the rear panel of the V-OVG.

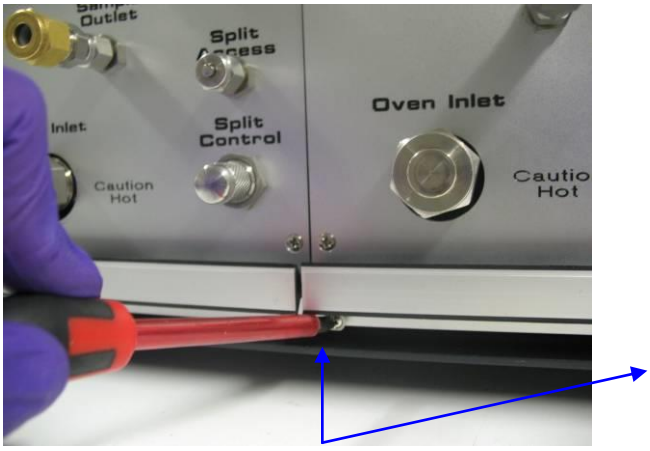
Important notes:

The fuse is a safety device designed to protect V-OVG hardware from internal damage. The user should never replace a fuse without understanding the root cause of failure.

Procedure

1. Remove the four screws holding the V-OVG in place.
2. Gently remove the unit from the GEN-SYS rack





3. Disconnect Air and Power from the rear of the V-OVG
4. The fuse holder is opened by twisting the cap ¼ turn
5. Replace the fuse
6. Repeat steps 1 – 4 above, in reverse order.

8.5 Resetting the thermal trip

Internal to the V-OVG product is a mechanical thermal trip (MTT) that activates if the oven temperature exceeds 115°C. Once the trip has activated the V-OVG oven will no longer heat up.

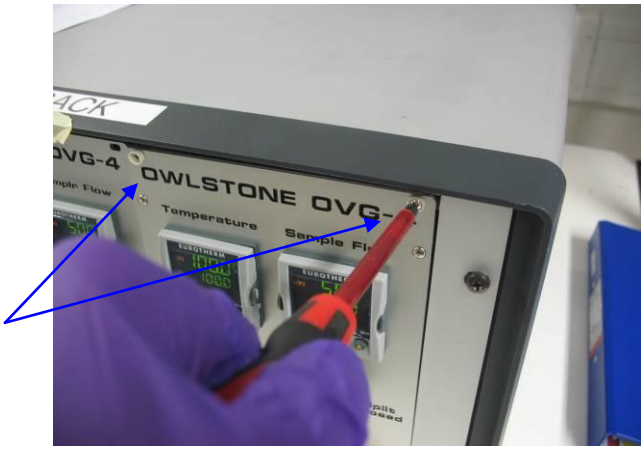
Important notes:

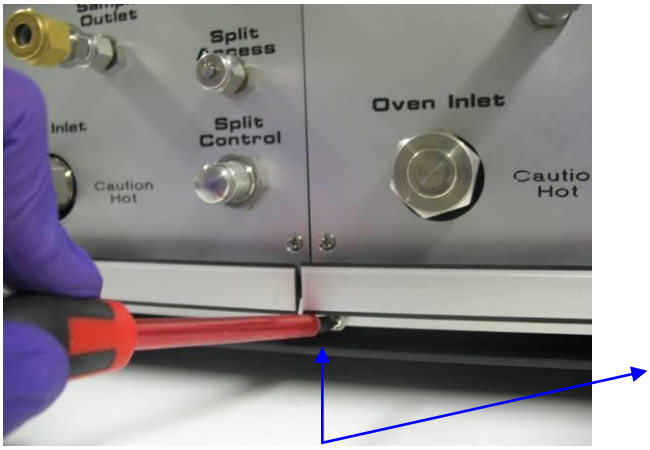
The MTT is a safety device designed to protect V-OVG hardware from internal damage. The user should never reset without understanding the root cause of failure.

Always contact Owlstone for advice before undertaking this procedure.

Procedure

1. Switch off the V-OVG
2. Remove the four screws holding the V-OVG in place.
3. Gently remove the V-OVG from the GEN-SYS rack





4. Disconnect Air and Power from the rear of the V-OVG
5. On the rear of the V-OVG is a red button. Press firmly to reset the MTT

6. Reconnect power and air at the rear of the V-OVG
7. Gently install the V-OVG into the GEN-SYS rack. Replace the four screws.
8. Switch on the V-OVG
9. Check that hardware is working properly. Does the oven heat up when the set-point temperature > actual temperature? If the oven heats up the MTT was reset.
10. If the system does not heat up or if the MTT fails a second time contact Owlstone support.

8.6 Resolving Temperature oscillations (AUTO TUNE)

1. Before you start the auto tune sequence the V-OVG temperature should be in the mid-range, Owlstone recommend 60°. Use up and down arrows on the Eurotherm controller to enter the set point.

2. Depending on the starting temperature set point you may have to wait for an hour for the set point to be reached before commencing the auto-tune.

3. Once the display shows 60° navigate to the auto tune menu option.

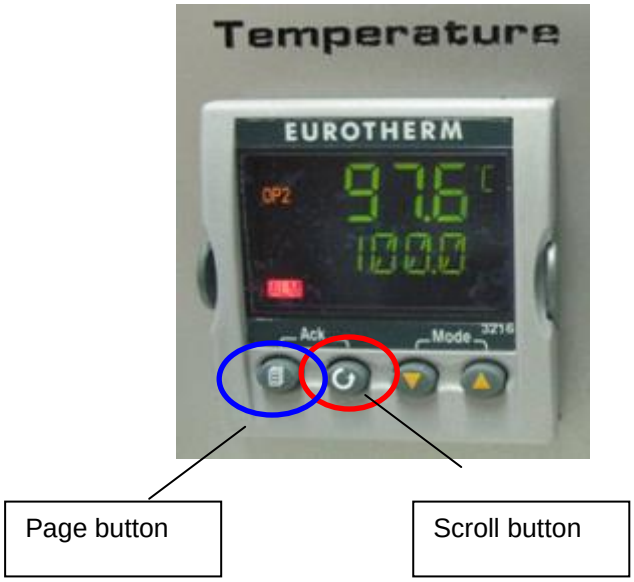
    1) Press and hold the Page button until Level 3 is displayed (approximately 5 seconds). When prompted on the screen enter access code 3 by using the up arrow. Wait a few seconds.

    2) Next press the Scroll button until A.Tune (auto tune) is displayed on the controller screen.

    3) Press the up arrow to set the A.Tune value to 'on'. After a few seconds the auto tune sequence will start, press the Page button to return to the normal view.

4. When the auto tune is complete the auto tune message will stop being displayed on the screen.

In the event of on-going unwanted oscillations contact Owlstone support.



9 Troubleshooting Guide

Table - 1

Problem	Possible solution
No power to sub-unit	• Check that the external power supply has power and is connected correctly to the rear of the V-OVG rack. • Remove the upper panel from the V-OVG rack and check that all internal power leads are connected correctly to individual sub-units (refer to sub-unit installation instructions) • Check sub-unit fuses, replace if necessary. Fuse ratings are specified on the rating label on the rear of each sub-unit. • Contact Owlstone
Output flow does not reach set-point	• Check pressure supplied to the rear of V-OVG rack is at least 40psi **If sample flow is <u>higher</u> than the set-point:** • There may be a problem internal to the unit, contact Owlstone. **If sample flow is <u>lower</u> than the set-point:** • Disconnect the Sample Outlet from any downstream flow lines (in the case of OHG-4 this port is labelled “Wet Air Outlet”). If the sample flow recovers and is stable at the set-point then the resistance of the downstream lines may be too great. Consider increasing pipe diameters, shortening lines, removing restrictions. • Check that there are no leaks inside the V-OVG rack. Remove upper panel, check and tighten all Swagelok fittings. • (OHG-4 specific) If the sample flow is still below the set-point then check that both Wet Air and Dry Air control valves are not near closed and hence causing an unnecessary restriction. Try opening both valves a little to reduce the restriction whilst keeping the same %rh at the sample outlet.
Output flow is unstable	• Check pressure supplied to the rear of V-OVG rack is at least 40psi • Run an AUTO-TUNE at your target flow, refer to section xx in this manual.

Table - 2	
Problem	**Possible solution**
Unstable or inaccurate concentration generation	• Check V-OVG system for leaks
Split flow non-operational (OVG-4, V-OVG)	• Check exhaust port is not capped. • Contact supplier
Contamination	• Bake out the unit at 100^{o}C with the split and sample flow at 250 ml min^{-1}until contamination has been removed
Chemical vapour concentration is decreasing	• Change permeation source
Not reaching correct temperature	• Check whether the Flow Interruption alarm is activated, if ALM is shown on the Flow Controller then the problem may be associated with the Flow side of the instrument, not the oven. • If the oven remains at room temperature contact Owlstone
System overshoots set-point temperature	• Contact Owlstone

9.1 Spare Parts

The following spare parts are available from Owlstone. Please contact your Sales Manager for pricing.

P/N	Part Name
01-0182	V-OVG Oven Lid Assembly
01-0174	V-OVG Diffusion Tube Assembly
02-0683	V-OVG Oven Liner
02-0686	V-OVG Oven Washer (PTFE seal)
02-0769	Permeation Source Hanger
50-0502	O-rings, Viton, 75shore, 45.0 x 3.0mm
50-0508	Fuse, 2.5A, fast-blow

9.2 Owlstone Support

The V-OVG User Manual, as well as more information on the GEN-SYS modular vapour generation system and permeation sources, is available at our support website:

http://owlstone.zendesk.com/home

For help with any further questions or problems, please contact Owlstone directly on our support address:

support@owlstone.zendesk.com

9.3 Warranty

Owlstone Ltd warrants that equipment supplied will perform to the advertised specifications for a period of 12 months. Should any **material failure of the product occur** within 12 calendar months of delivery Owlstone Ltd will repair or replace the equipment free of charge given our satisfaction that sub-standard performance is genuinely the result of defective material or workmanship and not caused by fair wear and tear

If required, please contact Owlstone Ltd for further detail regarding exact terms of the warranty.

10 Returns

10.1 Chemical Safety

Owlstone takes chemical safety seriously. Customers are not permitted to return hardware to Owlstone without prior authorisation. Please consult your Owlstone representative regarding the returns procedure.

Before equipment can be returned customers are required to fill out a Decontamination Certificate and submit to Owlstone for review. After H+S review Owlstone will issue a returns number (#RMA).

The Decontamination Certificate, p/n 90-0027, can be downloaded from our support website.

10.2 Packaging

Customers are encouraged to retain the original equipment packaging in case a future need arises for equipment return. Owlstone cannot take responsibility for transit damage to poorly packed equipment.

For further advice regarding correct packaging of Owlstone equipment please contact Owlstone.

