

OVG-4 Operation

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

Permeation Device

At the heart of the OVG-4 is the disposable permeation device (not supplied), is usually constructed from 1/4" PTFE tubing and rod as shown in Figure 8; however the oven can house a permeation device with a diameter up to 8mm and a length of 160mm. In the device is a two-phase system the first phase 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 for 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 dilutant gas flow (ml min^{-1}) and the desired concentration (ng ml^{-1}) for the vapour standard is created.

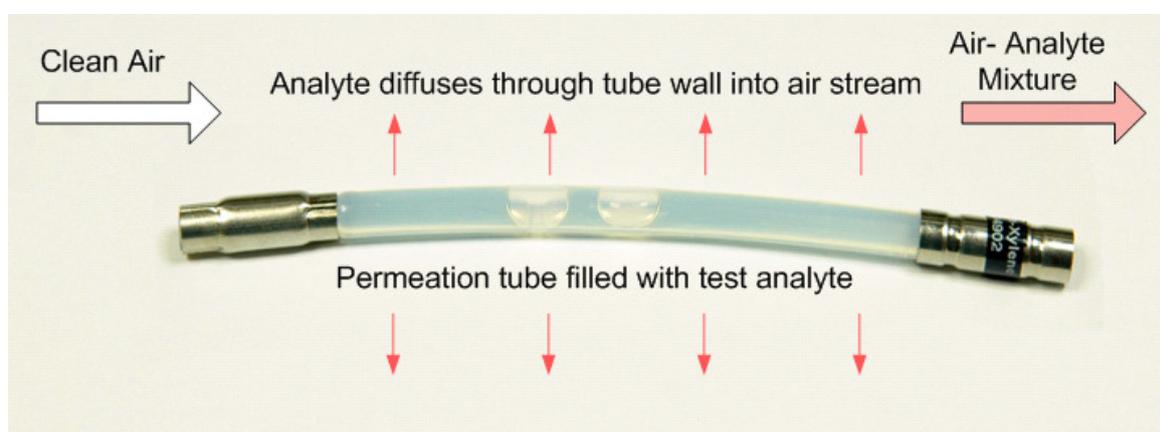


Figure 8 - Example of permeation device

Loading and Removing Permeation Devices



Important: Even though each part of the GEN-SYS is leak-tested and Swagelok fittings are used throughout, it 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 OVG-4

Loading a permeation source:

- Turn off power and gas supply to the OVG unit
- Using a 7/8" spanner (not provided) loosen and remove the oven inlet (1/2" Stainless steel nut)
- Using personal protective equipment load the permeation source (Dimensions no greater than 160mm length and 8mm diameter as sources can swell) into the oven inlet,
- Push the permeation source 3-5cm into the permeation oven
- Replace the oven inlet and turn until finger tight
- Using the 7/8" spanner tighten a further quarter turn, **DO not over tighten**
- Reconnect gas and power supply
- Set temperature and flow rates
- Once system stabilises acknowledge flow deviation alarm.
- Allow permeation stabilization



When the split flow is open always ensure that the split access port is covered with the blanking nut.

Important:

- It is recommended that each new device loaded into the permeation oven has a 2 day incubation period before use.
- When the OVG-4 is incubating a chemical permeation source and sampling is not required, always have the split open. This will ensure that a gas flow constantly passes over the permeation source and is routed to the exhaust port.

Removing a permeation source:

- Turn off power and gas supply to the OVG unit
- Using a 7/8" spanner (not provided) loosen and remove the oven inlet (1/2" Stainless steel nut)
- Using personal protective equipment and the permeation source extractor carefully remove the permeation source and check for any damage and leaks. (if leaked see trouble shooting guide)
- Replace the oven inlet and turn until finger tight
- Using the 7/8" spanner tighten a further quarter turn, **DO not over tighten**
- Reconnect gas and power supply
- Set temperature to 100C and sample and split flow rate to 500ml min⁻¹
- Leave unit to clean down



Figure 9 – Always use the supplied extraction tool

Temperature Control

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

The permeation oven temperature is digitally controlled from 30 to 100°C in 1C increments with 0.2C variation; this 0.2C variation means a 98% accuracy of the certified permeation rate is obtained. As a general rule of thumb if the incubation temperature is increased/decreased by 10C you double or half the permeation rate of your device.

Setting Temperature

To set the temperature of the permeation oven use the arrow keys (red circle) of the left Eurotherm controller labelled Temperature as shown in Figure 9. The Minimum and maximum temperature of the permeation oven are 25C and 100C respectively.



Figure 10 - Eurotherm temperature controller

Temperature Control Alarms

The temperature controller alarms when a deviation of $\pm 0.2C$ from the set point is encountered (see Figure 10), this signifies that the permeation rate of the device inside the oven is outside the maximum allowable error. With a warning message "Oven temperature outside set point" to turn off / acknowledge the alarm press the Menu and scroll button together on the temperature controller (blue circle).

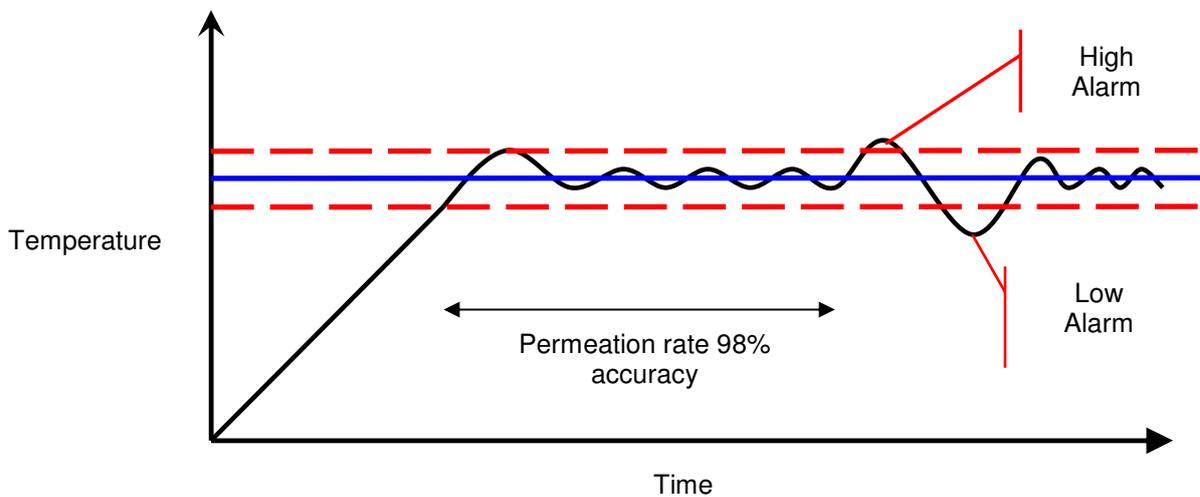


Figure 11 - Set point deviation alarm

Flow Path and Flow Control

Figure 11 is a schematic of the flow path through the OVG-4; the pressure throughout the system is kept at a constant 30psi by the internal pressure regulator. The carrier gas passes through the permeation oven

where the air / analyte mix is achieved. This gaseous mixture is split into two separated flows, the sample flow (blue) and split flow (Green), the concentration of analyte exiting the sample flow is dependent on these two flows. The sample flow is controlled via an analogue mass flow controller with a 1.5% accuracy of the maximum flow; the split flow is manually set via the split control valve and split access at the front of the OVG-4.

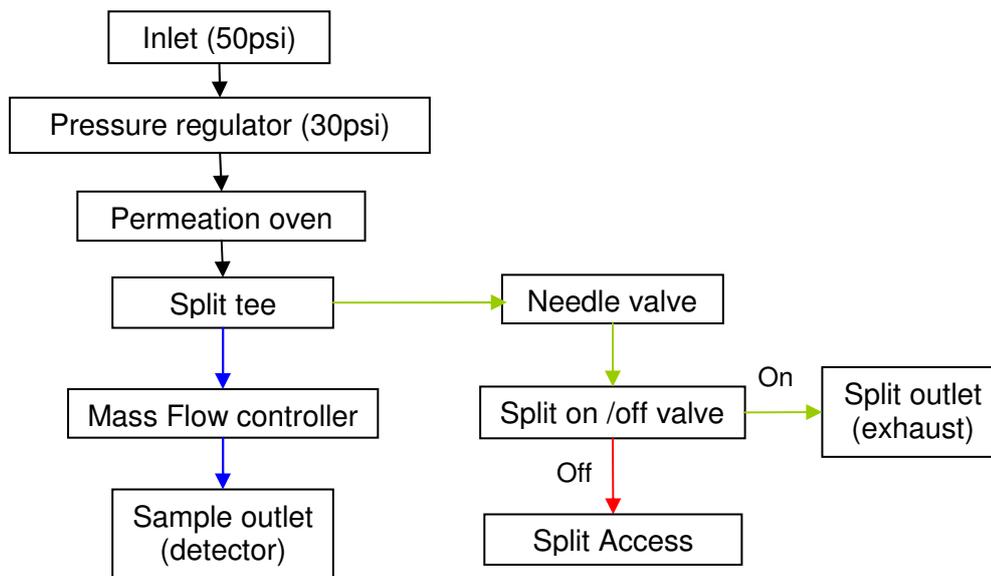


Figure 12 - Schematic of flow path through the OVG-4

Setting Sample 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 12. The maximum and minimum flows are 500 and 50ml min⁻¹ respectively

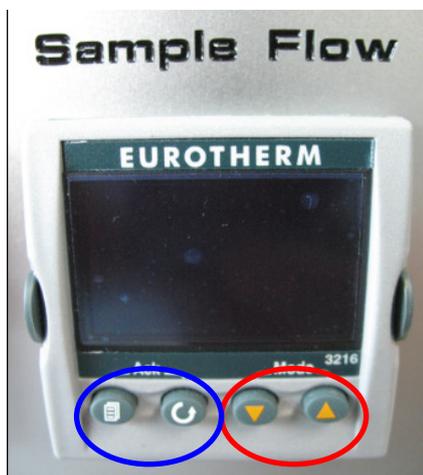


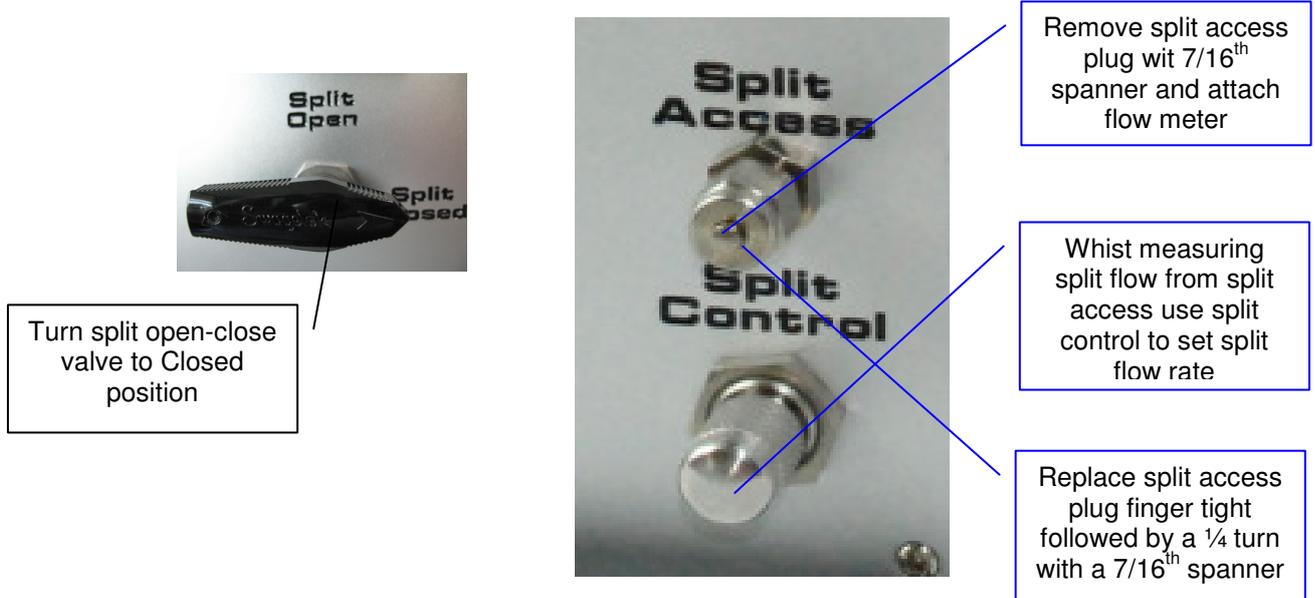
Figure 13 Eurotherm sample flow controllers

Flow control alarms

“Flow interruption alarm” Indicates that the flow to the unit has been interrupted and that the permeation oven has been turned off. This is to reduce the level on concentration build up in the permeation oven when the flow has been restricted. To reset and turn the permeation source oven back on press the menu and scroll button together.

Setting the split flow

Referring to figure 12 to set the split flow **fully** turn the split open-closed valve fully to the split closed position. Removed the split access plug and attach a digital flow meter or other flow measuring device. using the split control valve set the flow rate to the desired level and replace the split access plug.



Finally **fully** turn the split open-closed valve fully to split open position



Figure 14 How to change the split flow



Warning: When using the split open closed valve, always ensure that it is fully turned to the open or closed position



Warning: Always replace the split access plug after measuring the split flow, ensuring that the blanking has not cross threaded and is closed sufficiently (finger tight, followed with a 1/4 turn with a 7/16th spanner), as failure to do so could result in uncheck release of vapour.



Always have the split flow set within the range of 100 – 1000ml min⁻¹.